Residential Noise Survey

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	1 Blucher Street
	Barnsley
	S70 1AP
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Version	1	2	3
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Executive summary

A noise survey has been undertaken to assess the suitability of the site at 1 Blucher Street, Barnsley, S70 1AP for residential development. It is proposed that the first floor of the existing YMCA be converted into seven apartments. The measured noise levels at MP1 and MP2 have allowed a BS8233:2014 noise assessments to be carried out.

ProPG Stage 1 Initial Noise Risk Assessment

ProPG Stage 1 Initial Risk Assessment shows that site falls into noise risk category 'Medium Risk'. However, residential premises are located in similar location along Chesterfield Road, thus it is assumed that if appropriate acoustic design is implemented the amenity of all future residents can be fully protected.

BS8233 Assessment

Outline mitigation measures have been recommended in section 4.2.2, including glazing and ventilation for each one of the facades. These recommendations will be sufficient to achieve internal noise levels within the proposed development according to BS8233:2014 noise criteria. An overview of all recommendations can be found below:

Recommendations and mitigation overview
- All glazing along the north-eastern façade requires a minimum sound reduction of 31 dB $R_w + C_{tr}$ and 35 dB R_w. - All glazing within bedrooms along the north-western facade requires a minimum sound reduction of 29 dB $R_w + C_{tr}$ and 35 dB R_w. - All glazing within living rooms along the north-wastern façade requires a minimum sound insulation of 26 dB $R_w + C_{tr}$ - All ventilation within the development requires a sound reduction of 35.0 dB $D_{n,e,w}$.

The findings of this report will require written approval from the Local Authority prior to work commencing.

1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the Proposed Development') at 1 Blucher Street, Barnsley, S70 1AP ('the Site').

The Applicant is preparing a planning application to be submitted ('the Application') to Barnsley Metropolitan Borough Council.

Accordingly, the following technical noise assessment has been produced to accompany the Application to Barnsley Metropolitan Borough Council.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2 Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Ambient sound monitoring survey to evaluate the prevailing sound levels incident on the Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels incident on the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the surrounding noise sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England and Wales, BS8233:2014, World Health Organization Guidelines and other relevant standards.

1.3 Legislation, Policy and Guidance

This report is primarily based on the following legislation, policy and guidance.

- National Planning Policy Framework (2018)
- Noise Policy Statement for England
- ProPG: Planning & Noise
- BS8233:2014`Guidance on sound insulation and noise reduction for buildings'
- BS EN 12354-4 Building Acoustics

2. Site Description & Background Information

2.1 Site & Surroundings

The proposed site is located at 1 Blucher Street, Barnsley, S70 1AP. The proposed site is in a town centre location thus the surrounding area is a mixture of residential and commercial premises. To the north-east of the proposed site, there is Blucher Street which facilitates low to medium levels of road traffic. Along Blucher Street there is also a Royal Mail sorting office which operates from 09:00 to 17:30 Monday to Saturday. To the north-west, is Pitt Street, which facilitates medium levels of traffic flow. Approximately 40m from the site, there is 'Lidl Barnsley' and associated car park. 'Lidl' is open every day from 08:00 to 20:00 except Sundays which it operates from 10:00 to 16:00. To the north east, is Barnsley city centre with multiple commercial premises as shops, bars, pubs and clubs, among commercial activity. Some of those premises are open up till 02:00. The south-west of the proposed site the area is dominated by the West Way highway.

Due to the location of the proposed site, the dominant noise sources incident on the north-west façade is that of noise from the cars passing by Pitt St, West Way and commercial units in the vicinity. Along the north-east façade the noise from Royal Mail sorting office, and Blucher Street is dominanat.

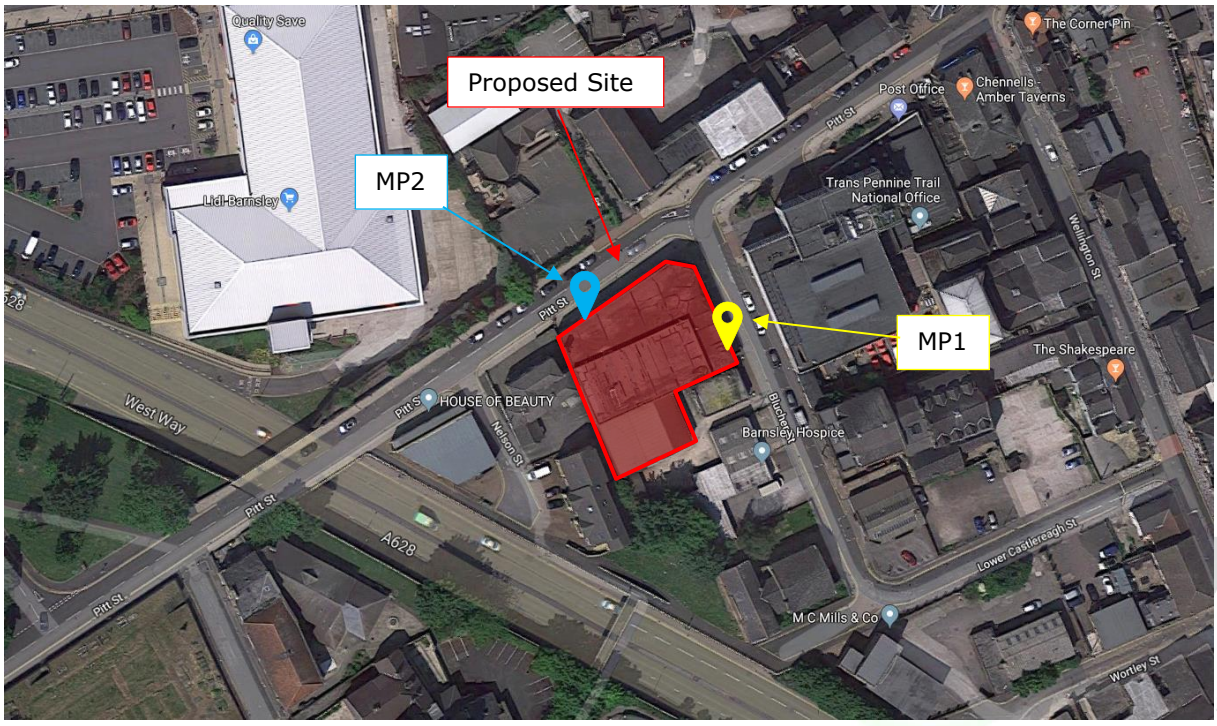


Figure 1.0 - Site and Surroundings

2.2 Background

The site is an existing disused YMCA (Young Men's Christian Association) building. It is proposed that the 1st floor of the existing building be converted into seven apartments. A Location Map can be found in Appendix C.

3. Environmental Noise Survey

In order to characterise the sound profile of the area of the proposed development, two long-term 96-hour environmental sound survey were carried out at MP1 and MP2 from the 22nd to 26th November 2018.

3.1 Measurement Methodology

For the long-term sound monitoring, the sound level meters were placed at 1st floor level protruding from windows on site. MP1 was placed on the north-eastern façade and MP2 was positioned on the north-western façade. Both microphones were positioned approximately 1m away from the building facade. The monitoring position was chosen in order to collect representative sound levels of the area during the week and weekend day time and night time periods. The monitor position was chosen in order to assess the sound levels incident on the prosed site. The measurement positions can be found in Figure 1.0.

3.2 Measurement Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T246458	≤0.5
CESVA CB006 Class 1 Calibrator	901927	
SVAN 977 Class 1 Sound Level Meter	34826	≤0.5
SVAN Class 1 Calibrator SV31	32569	

Table 1.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective wind shield for the entire measurements period. Calibration certificates can be provided upon request.

3.3 Weather Summary

The long-term environmental noise survey was carried out over an un-manned 96-hour period. Therefore, no records of weather conditions were taken. However, during the set up and collection of the monitoring equipment the weather was calm with wind speeds of less than 5m/s and no precipitation. All measurements have been compared with met office weather data of the area and periods of elevated weather conditions have been excluded from the subsequent calculations. For the short-term manned monitoring, the weather conditions were suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise.

3.4 Results

3.4.1 Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for the measurement period for both measurements positions MP1 and MP2.

Measurement Position MP1				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Day 1 - 22/11/18 – 12:40 - 23:00	59.0	93.0	55.0	62.0
Night 1 – 22/11/18 – 23:00 – 07:00	53.0	81.0	45.0	57.0
Day 2 - 23/11/18 - 07:00 – 19:00	66.0	92.0	56.0	61.0
Night 2 – 23/11/18 – 23:00 – 07:00	56.0	92.0	50.0	59.0
Day 3 - 24/11/18 - 07:00 – 09:45	59.0	97.0	57.0	60.0
Night 3 – 24/11/18 – 23:00 – 07:00	59.0	96.0	54.0	62.0
Day 4 - 25/11/18 - 07:00 – 09:45	58.0	94.0	54.0	60.0
Night 4 – 25/11/18 – 23:00 – 07:00	53.4	90.0	46.0	54.8
Day 5 - 26/11/18 - 07:00 – 11:00	59.0	85.0	57.0	60.0

Table 2.0 – Sound Survey Results Summery – MP1

Measurement Position MP2				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Day 1 - 22/11/18 – 12:40 - 23:00	61.0	92.0	57.0	62.0
Night 1 – 22/11/18 – 23:00 – 07:00	55.0	94.0	47.0	57.0
Day 2 - 23/11/18 - 07:00 – 19:00	60.0	97.0	58.0	62.0
Night 2 – 23/11/18 – 23:00 – 07:00	57.0	97.0	52.0	59.0
Day 3 - 24/11/18 - 07:00 – 09:45	60.0	93.0	58.0	61.0
Night 3 – 24/11/18 – 23:00 – 07:00	59.0	97.0	53.0	62.0
Day 4 - 25/11/18 - 07:00 – 09:45	59.0	90.0	55.0	60.0
Night 4 – 25/11/18 – 23:00 – 07:00	53.5	88.4	48.0	56.3
Day 5 - 26/11/18 - 07:00 – 11:00	60.0	85.0	57.0	61.0

Table 3.0 – Sound Survey Results Summery – MP2

The following table shows a summary of the maximum sound level results during the measurement period for MP1.

Measurement Position MP1			
Measurement Period ('t')	**$L_{AFMax,15min}$**	**Statistically most Repeated $L_{AFMax,15min}$**	**No. of exceedances of 80 dB $L_{AFMax,15min}$**
Night 1 – 22/11/18 – 23:00 – 07:00	81.0	68.0	2
Night 2 – 23/11/18 – 23:00 – 07:00	92.0	69.0	5
Night 3 – 24/11/18 – 23:00 – 07:00	96.0	74.0	5
Night 4 – 25/11/18 – 23:00 – 07:00	90.0	68.0	2

Table 4.0 – Maximum Sound Level Summary Results

Discussion:

As can be seen in the results presented above, the highest statistically most repeated $L_{Amax,15min}$ value during the night periods was 74.0 dB. However, this value was exceeded more than ten times. According to ProPG this presents an unacceptable possible impact on the quality of life. Thus, a more representative $L_{Amax,15min}$ value is 80.0 dB which over the entire measurement period was only exceeded 2 times during the Night 1 & 4 and 5 times during Night 2 & 3. Consequently, this $L_{Amax,15min}$ value is deemed typical and will be used in the subsequent assessment.

The following table shows a summary of the maximum sound level results during the measurement period for MP2.

Measurement Position MP2			
Measurement Period ('t')	**$L_{AFMax,15min}$**	**Statistically most Repeated $L_{AFMax,15min}$**	**No. of exceedances of 80 dB $L_{AFMax,15min}$**
Night 1 – 22/11/18 – 23:00 – 07:00	94.0	80.0	4
Night 2 – 23/11/18 – 23:00 – 07:00	97.0	74.0	5
Night 3 – 24/11/18 – 23:00 – 07:00	97.0	75.0	6
Night 4 – 25/11/18 – 23:00 – 07:00	88.0	72.0	1

Table 5.0 – Maximum Sound Level Summary Results

Discussion:

As can be seen in the results presented above, the highest statistically most repeated $L_{Amax,15min}$ value during the night was 80.0 dB. This value was not exceeded more than ten times throughout any of night-time periods. Consequently, this $L_{Amax,15min}$ value is deemed typical and will be used in the subsequent assessment.

4. Noise Assessment

4.1 ProPG Stage 1 Initial Noise Risk Assessment

Considering the noise levels measured across the entire measurement period, the development site falls into Noise Risk Category (NRC) 2. As shown in the following table.

Noise Risk Category	Potential Effect if unmitigated	Pre-Planning Application Guidance
2 - Medium $L_{Aeq, 16hour}$ < 60 - 70dB $L_{Aeq, 8hour}$ < 50 – 60dB	Significant adverse effect on health and quality of life	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimize, and which clearly demonstrated that a significant adverse noise impact will be avoided I the finished development.

Table 6.0 – Noise Risk Category for Site

Discussion:

As can be seen in the assessment above the proposed site falls into noise risk category 2 'Medium Risk'. It is assumed however that if appropriate acoustic design is implemented the amenity of all future residents can be fully protected. Furthermore, residential premises can be found in a similar location along Chesterfield Road and thus the site is deemed suitable for residential development.

4.2 BS8233:2014 Noise Assessment

4.2.1 Internal Noise Level Assessment

The following section analyses the ambient sound levels incident on the development compared with the internal noise level criteria presented within BS8233:2014.

To ensure a robust analysis the following considerations have been taken:

- The highest $L_{Aeq,16hour}$ during the day and $L_{Aeq,8hour}$ night.
- The $L_{AFmax,15min}$ of 80 dB exceeded less the 6 times per night.

The following table analyses the required composite SRI required of the dwelling to achieve appropriate internal noise levels.

Measurement position	Location	Time Period	Façade Noise Level	BS8233 Criteria	Min. SRI Required (dB)
MP1	Bedroom / Living Room	Day time	66.0	35 dB $L_{Aeq,16hour}$	31.0 $R_w + C_{tr}$
	Bedroom	Night time	59.0	30 dB $L_{Aeq,8hour}$	29.0 $R_w + C_{tr}$
	Bedroom	Night time	80.0	45 dB $L_{Amax,8hour}$	35.0 R_w **

MP2	Bedroom / Living Room	Day time	61.0	35 dB $L_{Aeq,16hour}$	26.0 R_w + C_{tr}
	Bedroom	Night time	59.0	30 dB $L_{Aeq,8hour}$	29.0 R_w + C_{tr}
	Bedroom	Night time	80.0	45 dB $L_{Amax,8hour}$	35.0 R_w **

Table 7.0 – BS8233 Internal Noise Level Analysis

Building Envelope

The noise levels within the proposed dwellings will be dictated by the configuration, materials and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels in combination with a superior quality appropriate acoustic glazing specification.

a) Facades

The prediction of the performance of the facade is based upon a construction of 200mm brick and is calculated within INSUL software, the expected performance is shown in the following table.

Frequency (Hz)	**63**	**125**	**250**	**500**	**1K**	**2K**	**4K**	**R_w**
Façade SRI	41	44	42	47	55	63	68	53

Table 8.0 – Façade SRI

Any other configuration of external walls that would achieve at least these insulation figures will be suitable for the development.

b) Roofs

If the dwelling has rooms within the roof space the roof system will require additional sound insulation to achieve appropriate internal noise levels. If the roof, is being utilized as a voided loft space with thermal insulation the following detailing is not required. The ceilings in the roof space should consist of 100mm 45kg/m^2 fitted tightly between the 200mm roof joists and 2no. 15mm SoundBloc plasterboard fixed to resilient bars to achieve a uniform sound reduction. The expected performance as predicted within INSUL software is shown in the following table.

Frequency (Hz)	**63**	**125**	**250**	**500**	**1K**	**2K**	**4K**	**R_w**
Roof SRI	33	45	52	57	60	57	61	58

Table 9.0 – Roof SRI

Any other configuration of roof that would achieve at least these insulation figures will be suitable for the development.

c) Glazing

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. To provide a robust assessment the composite SRI required for the entire building envelope will be used to provide the glazing specification.

Glazed elements installed in all the living rooms and bedrooms require a minimum sound reduction index value as shown in 8.0. The glazing units shown in the following table would provide a suitable sound reduction, any other window capable of providing this attenuation will be suitable. The performance is specified for the whole window unit, including frame and other design features.

Facade	Location	Glazing Configuration	Attenuation (dB)
North-east	Bedrooms & Living rooms	*Double Glazing* 10 mm Glass / (6-16 mm) Air Cavity / 6 mm Glass	32.0 $R_w + C_{tr}$ 35.0 R_w
North-west	Bedrooms	*Double Glazing* 8 mm Glass / (6-16 mm) Air Cavity / 6 mm Glass	29.0 $R_w + C_{tr}$ 35.0 R_w
	Living rooms	*Double Glazing* 6 mm Glass / (6-16 mm) Air Cavity / 4 mm Glass	28.0 $R_w + C_{tr}$

Table 10.0 – Glazing SRI

The glazing system above will protect the amenity of the occupants of the dwellings against the extraneous noise. The glazing specifications have been taken from the BS6262 – 2 and Pilkington's Optiphon range however any glazing providing the same attenuation can be used.

** The location of the facades can be found in Appendix D.*

d) Ventilation

BS8233 States;

"If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

and

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Alternatively, acoustic ventilation units are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

It is recommended that an alternative ventilation system is installed to fully protect the amenity of future inhabitants. As stated in BS8233:2014 section 5.4.4, having complete enclosure of the noise

source or receiver is the most effective barrier of sound. An alternative ventilation strategy allows for maximum sound insulation from the noise source whilst still maintaining a sufficient level of ventilation. It is recommended that the alternative ventilation should provide the same resistance to sound as the glazed elements. The following table provides ventilation systems that meets the above recommendations.

Model	Attenuation (dB)
Titon Sonair F+	55dB $D_{n,e,w}$
Simon Acoustic Trickle Ventilation	38dB Open / 41dB Closed $D_{n,e,w}$

Table 11.0 – Ventilation Specification

If the above ventilation systems are not deemed suitable for the development, then a mechanical heat-recovery ventilation (MHRV) system should be employed. It should be noted that if a MHRV system is used, the self-generating noise from the system will need to conform to the internal noise levels outlined in BS8233:2014.

4.2.2 Assessment of Structure Borne Noise Transference

The Proposed Development adjoins a commercial unit on the ground floor and thus there is a high likelihood that the proposed dwellings will be impacted by structure borne noise transferring through the adjoining partition, as well as flanking sound if not appropriately treated.

A sound insulation test was carried between the 1st floor and the exiting ground floor commercial unit. The test was undertaken to ascertain the sound index reduction of the existing partition floor. The table below shows the results taken from the sound insulation test report. Moreover, the technical report can be found in Appendix F.

Sound Insulation Test	$D_{nT,w}$ Octave Band Sound Pressure Level, Hz (dB)					
	125	250	500	1K	2K	Dnt,w + ctr
Ground floor to 1st floor	47.6	50.3	50.1	53.4	54.0	53.0

Table 12.0 – Sound Insulation Test Results

The following analysis shows the internal noise level within the ground floor commercial that could be reached before the noise rating Curve NR25 is exceeded.

Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)					
	125	250	500	1K	2K	Dnt,w + ctr
Octave Band SRI Existing Floor ($D_{nT,}$)	48.0	50.0	50.0	53.0	54.0	53.0
NR 25 curve (dB)	44.0	35.0	29.0	25.0	20.0	30.0

Internal Noise Limit	92.0	85.0	79.0	78.0	74.0	83.0

Table 13.0 – Amplified Music Transfer Analysis

Discussion:

As can be seen in the assessment above, when comparing with NR25, the existing partition floor between ground floor and 1st floor allows an Internal Noise Limit ranged from 92.0 to 74.0 dB. This noise levels are typical from premises with a high sound emission. Whilst undertaking the site visit and subsequent research, it was found all commercial units along the ground floor are retail and it is highly unlikely that the noise levels presented above will be exceeded. Thus, the existing floor is deemed to be robust enough in order to warranty the full amenity of the residential premises on the 1st floor. In addition, the existing floor provides an overall airborne sound insulation of 53.0 dB $D_{wn,t}+C_{tr}$, which can be considered as a high performance as it is 10 dB above the 43 dB $D_{nt,w + Ctr}$ Building regulations Part E criteria for partition floors between commercial units and residential.

Flanking sound within an existing building cannot be objectively analysed and thus the above performance is based on all potential flanking routes being treated. Any comment building elements that adjoin separate areas of the building, such as common internal wall and floors, steelwork, risers or lift shafts should be acoustically treated to minimise flanking sound.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

National Planning Policy Framework (2018)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2018. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

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;

Paragraph 180 states:

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; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Noise Policy Statement for England

Paragraph 123 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy 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.

To achieve this vision the Statement identifies the following three aims:

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;*
- *Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

ProPG: Planning & Noise

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on the management of noise within the planning system in England.

Noise can have a significant effect on the environment and on the quality of life enjoyed by individuals and communities. For these reasons, noise is a material consideration in the planning process and a key aspect of sustainable development. Noise must therefore be considered and given serious attention when new developments might create additional noise and when new developments would be sensitive to the prevailing acoustic conditions.

It aims to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;

- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments.
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

This document describes an acoustic design process which is multi-faceted and that seeks to deliver the best acoustic outcome for a particular site. The advice and procedures contained in the ProPG are restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from existing transport sources. New housing is the most common type of new residential development, however the ProPG can also be applied to other types of residential developments such as residential institutions, care homes etc.

The document a Stage 1 Initial Site Risk Assessment, as follows:

Noise Risk Category	Potential Effect if unmitigated	Pre-Planning Application Guidance
0 – Negligible $L_{Aeq, 16hour}$ < 50dB $L_{Aeq, 8hour}$ < 40dB	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
1 - Low $L_{Aeq, 16hour}$ < 50 - 60dB $L_{Aeq, 8hour}$ < 40 - 50dB	Adverse effect on health and quality of life	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process in followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and the minimized in the finished development.
2 - Medium $L_{Aeq, 16hour}$ < 60 - 70dB $L_{Aeq, 8hour}$ < 50 – 60dB	Significant adverse effect on health and quality of life	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimize, and which clearly demonstrated that a significant adverse noise impact will be avoided I the finished development.
3 - High $L_{Aeq, 16hour}$ > 70dB $L_{Aeq, 8hour}$ > 60dB	Unacceptable adverse effect on health and quality of life	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.

Table 14.0 – ProPG Stage 1 Initial Risk Assessment Criteria

BS8233:2014`Guidance on sound insulation and noise reduction for buildings'

The British Standard BS 8233: 2014, Guidance on Sound insulation and noise reduction for buildings provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, WHO Guidelines on Community Noise, 1999. The criteria desirable levels of steady state, "anonymous" noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 15.0 - BS8233 criteria for internal noise levels in dwellings

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable and in such locations, development should be designed to achieve the lowest practicable levels.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

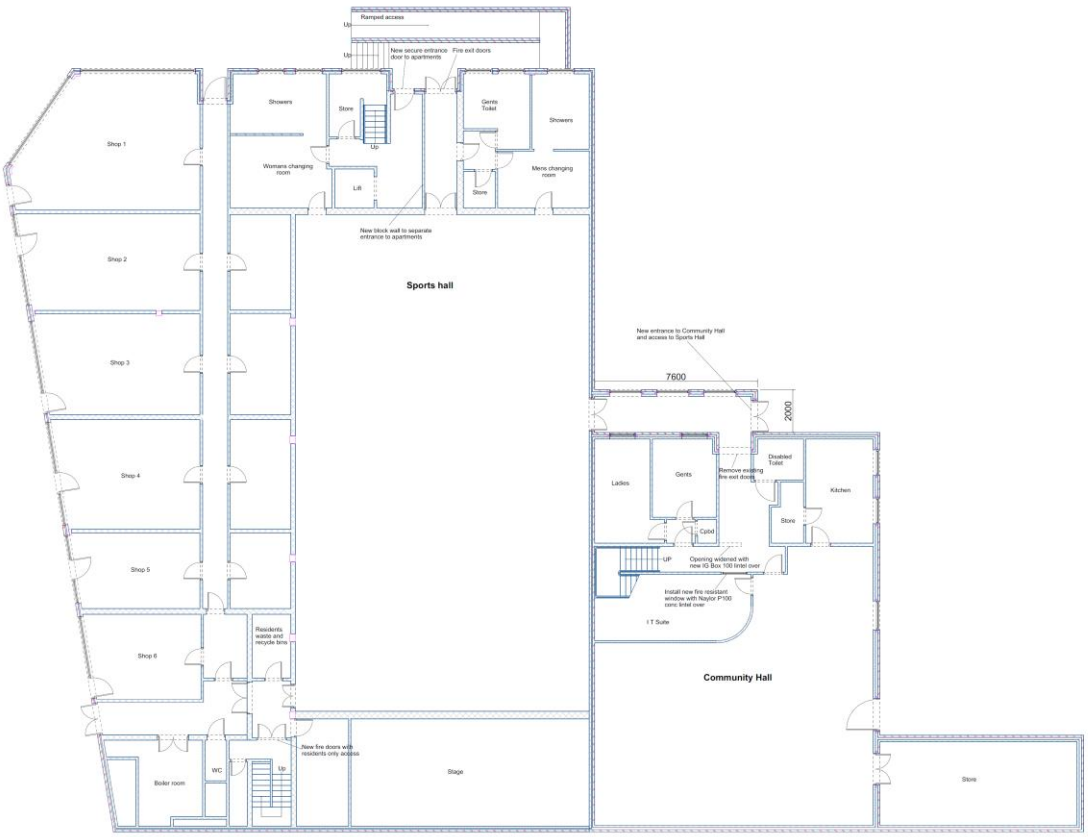
BS EN 12354-4 Building Acoustics

Estimation of acoustic performance of buildings from the performance of elements – Transmission of indoor sound to the outside

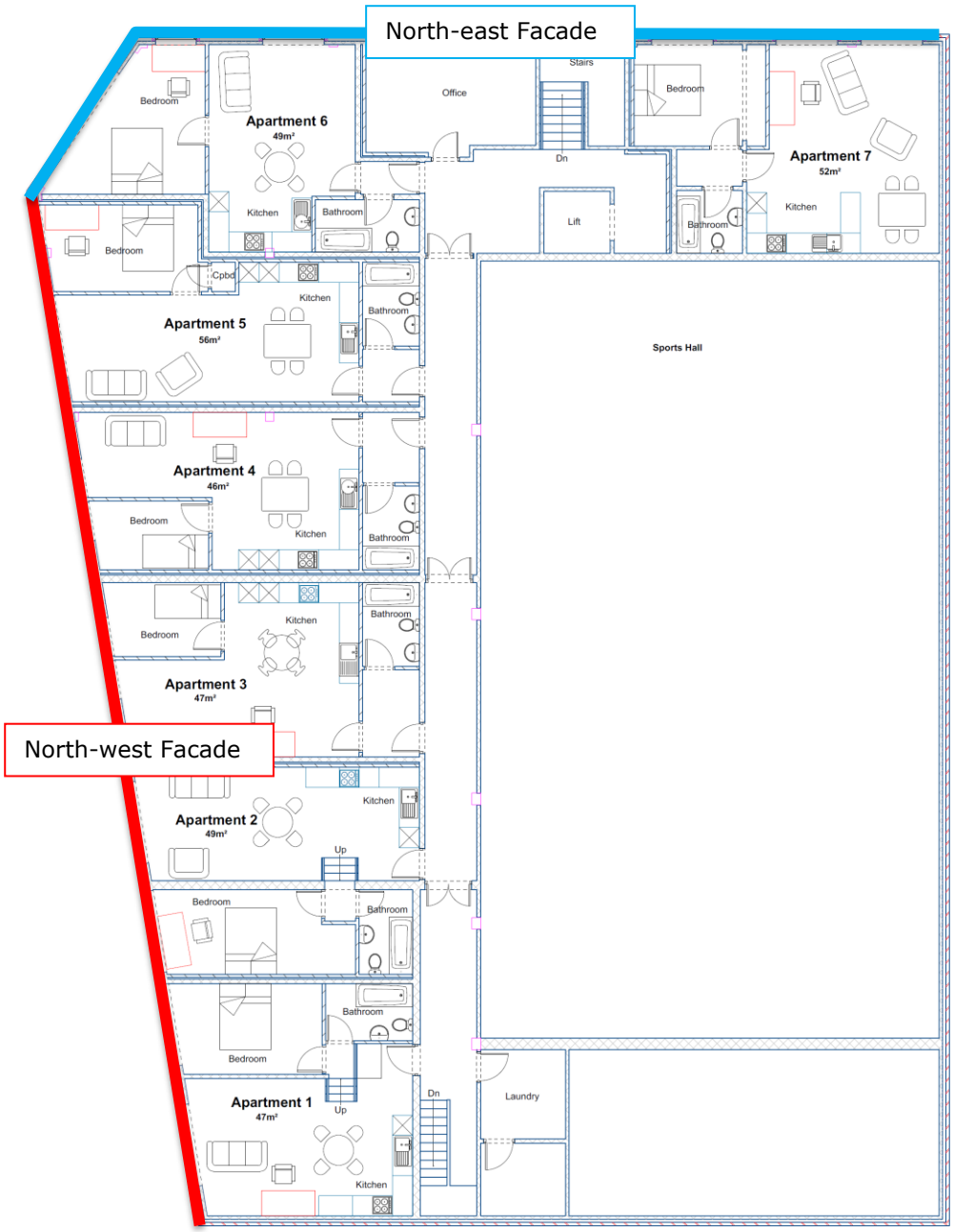
This European Standard describes a calculation model for the sound power level radiated by the envelope of a building due to airborne sound inside that building, primarily by means of measured sound pressure levels inside the building and measured data which characterize the sound transmission by the relevant elements and openings in the building envelope. These sound power levels, together with those of other sound sources in or in front of the building envelope, form the basis for the calculation of the sound pressure level at a chosen distance from a building as a measure for the acoustic performance of buildings.

Appendix C - Location Plan

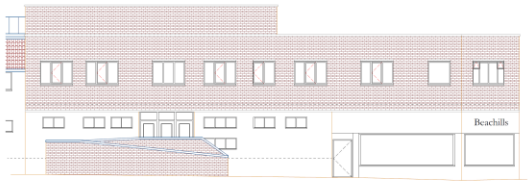
Appendix D – Site Plans



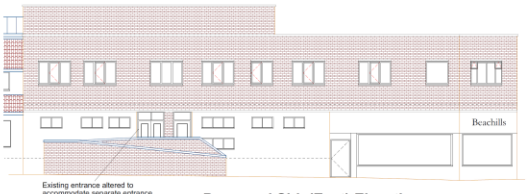
Proposed Ground Floor Plan



Proposed First Floor Plan

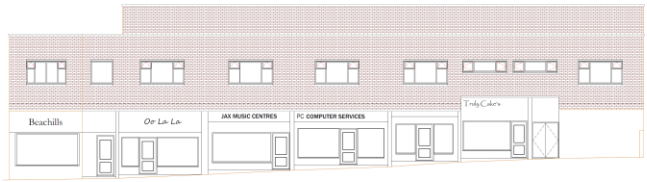


Existing Side(East) Elevation

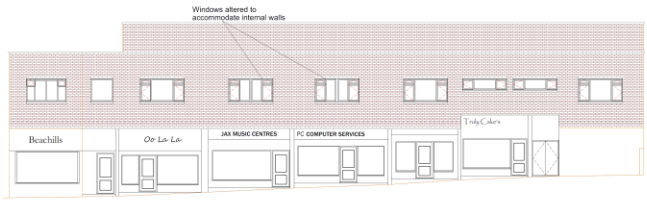


Proposed Side(East) Elevation

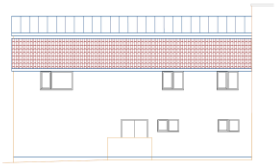
YMCA Main Building



Existing Front(North) Elevation

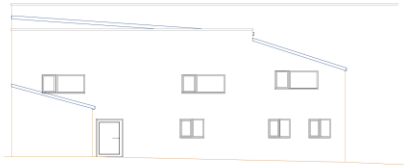


Proposed Front(North) Elevation

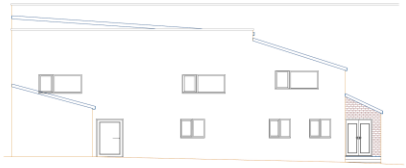


Existing Front(East) Elevation

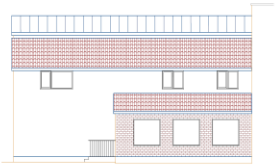
YMCA Community Hall



Existing Side(South) Elevation

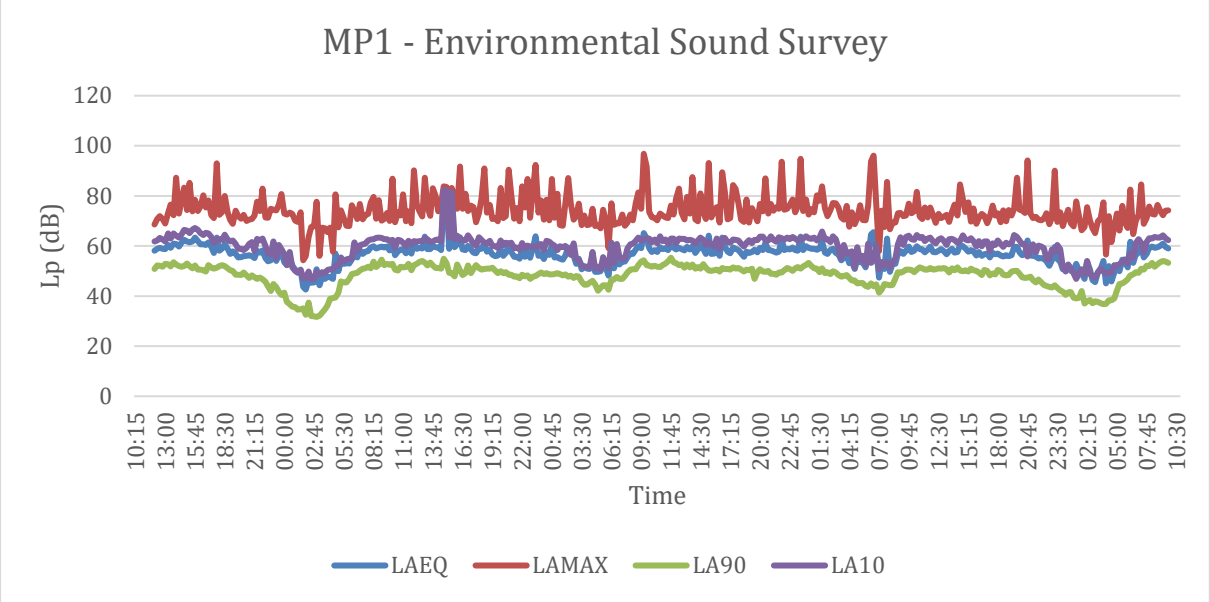


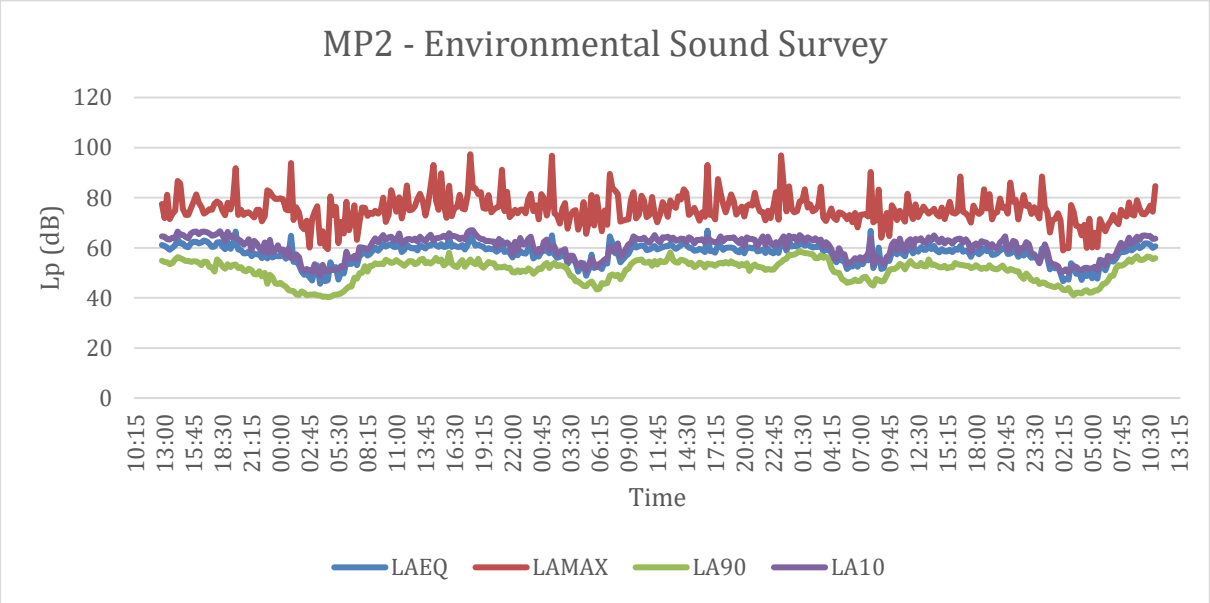
Proposed Side(South) Elevation



Proposed Front(East) Elevation

Appendix E – Environmental Sound Survey





Appendix F – Sound Insulation Test Report

Standardized level difference according to Resistance to the passage of sound approved document E
Field measurements of airborne sound insulation between rooms

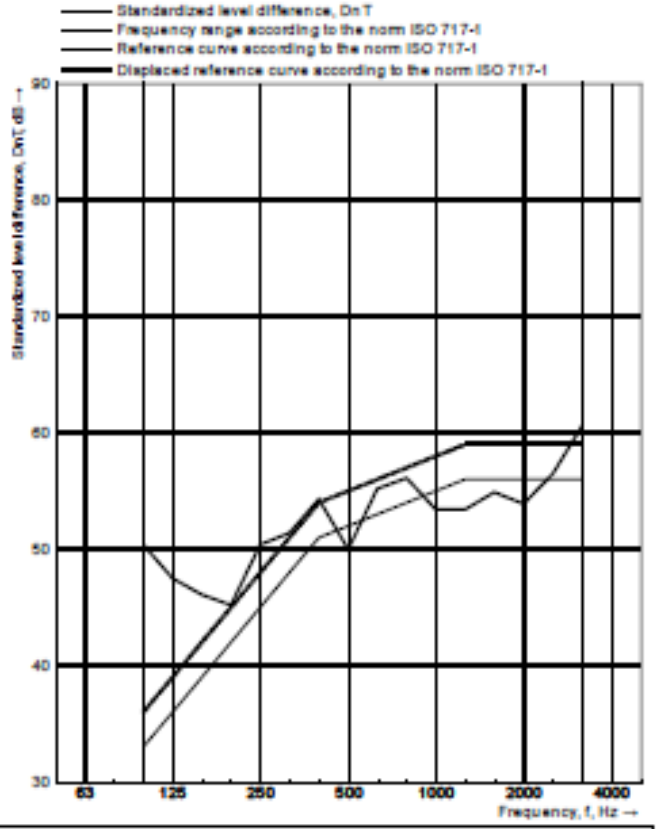
Client : Andrew Meyo

Test date : 05 December 2018

Description and identification of the building construction and test arrangement, direction of measurement :

Source room volume : 100.00 m³
Receiving room volume : 88.00 m³

Frequency f Hz	DnT (1/3 octave) dB
50	–
63	–
80	–
100	50.4
125	47.5 *
160	48.1
200	45.2
250	50.4
315	51.4
400	54.3 *
500	50.0
630	55.2 *
800	56.1 *
1000	53.4 *
1250	53.4 *
1600	54.9 *
2000	53.9 *
2500	56.5 *
3150	60.6 *
4000	–
5000	–



* Maximum background noise correction

Rating according to ISO 717-1

DnT,w (C,Ctr) = 55 (-1 ; -2) dB;

Evaluation based on in situ measurement results obtained by an engineering method (1/3 octave)

No. of test report : 2959AM - A

Name of test institute : NOVA Acoustics Ltd

Date : 05 December 2018

Signature : J. Barratt-Gibson