



Noise Impact Assessment of proposed Use of First Floor as Additional Sitting Area

Client: Caramello of Disbury
Address: 10 Whitechapel Street,
Manchester,
M20 6UB
Date: 10/10/2019



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Executive summary

An environmental noise survey and noise impact assessment has been undertaken to assess the potential increase in noise levels from the use of the first floor as an additional sitting area at Caramello of Didsbury, on the surrounding noise-sensitive receptors. The measured background sound levels have allowed an entertainment noise assessment to be undertaken.

Internal noise levels of the existing café at ground floor level were measured by NOVA Acoustics Ltd. These levels have been used to assess the amount of sound breaking out of the proposed development and thus incident on the closest NSR. The noise levels are predicted to fall below the prevailing background sound level in all frequency bands at both NSR1 and NSR2, provided the measured noise level is not exceeded.

A noise breakthrough assessment has been undertaken to assess the structure-borne transmission through the adjoining wall. The findings of the assessment have shown that the existing 400mm brickwork wall does not require any further upgrade to achieve the required octave band sound reduction (R_w) shown in Table 9.0.

Recommendation and Mitigation Overview

- A noise management plan as detailed in Section 4.3 should be followed to prevent unnecessary impact on the amenity of the surrounding residents.
- Further recommendations and mitigation are presented within the body of the report including building element specifications.

The findings of this report should be submitted to the local authority for written approval before any works commence.



1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the use of the first floor as an additional sitting area associated to the existing cafe ('the Proposed Development') at 10 Whitechapel Street, Manchester, M20 6UB ('the Site').

The Applicant has submitted a full planning application no. 124435/FO/2019 ('the Application') to Manchester City Council.

Accordingly, the following technical noise assessment has been produced to accompany the Application to the Local Authority.

This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

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:

- Baseline sound monitoring survey to evaluate the prevailing sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels at the NSR.;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England and Wales, Entertainment Noise Legislation and other relevant standards.

1.3 Legislation, Policy and Guidance

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

- National Planning Policy Framework (2019)
- Noise Policy Statement for England
- The Environmental Protection Act, 1990
- IEMA Guidelines on Noise Impact Assessments
- ISO 9613-2 Attenuation of sound during propagation outdoors
- BS EN 12354-4 Building Acoustics
- Entertainment Noise Legislation

2. Site Description & Background Information

2.1 Site & Surroundings

The proposed site is located at 10 Whitechapel Street, Manchester, M20 6UB. The surrounding area is comprised of predominantly commercial units to the east and residential to the west. To the south of the proposed development runs Whitechapel Street with low levels of road traffic throughout the day and night time periods. To the south and north-east, is a car park associated with the surrounding commercial premises, e.g. 'Co-op Food' and 'Expo Longe', among others, which operate up to 23:00. To the east, approximately 50m away, is A5145, which facilitates medium to high traffic flow and was constantly audible at the proposed site.

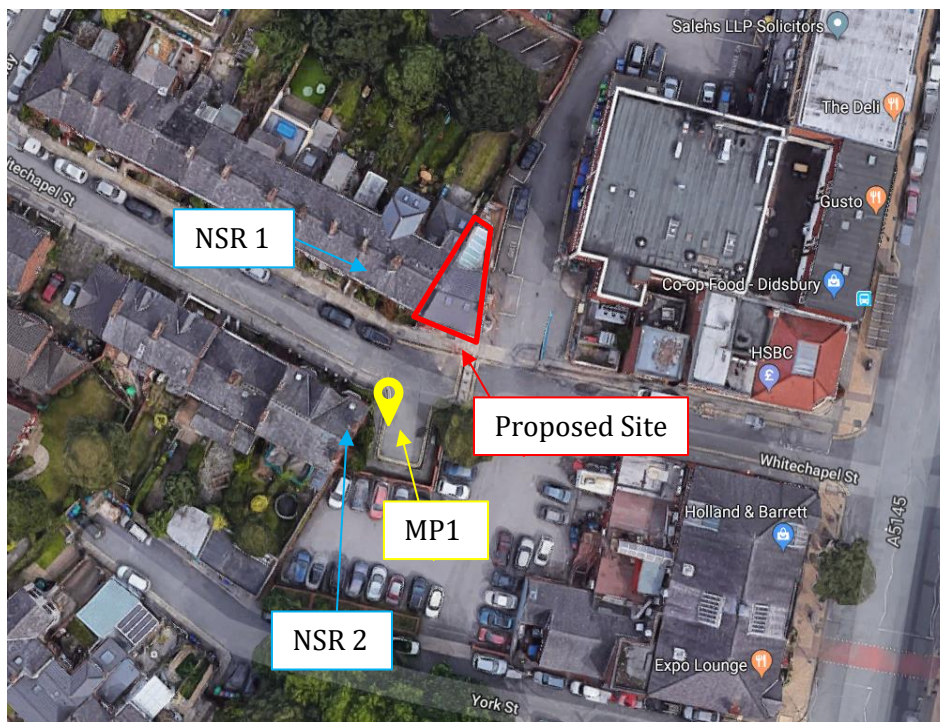


Figure 1.0 - Site and Surroundings

2.2 Background

The site is an existing café at the ground floor level. It is proposed to use the first floor as an additional sitting area. The proposed first-floor sitting will operate during the same hours as the existing and it will have similar capacity. Therefore, the site will split over two floors, ground and first floor. The ground floor level will be kept as existing, comprised of a sitting area, patisserie counter and ice cream preparation area. The first floor will be comprised of a sitting area and a storeroom. There is potential for both entertainment noise i.e background music and general activities to break out of the building as well as breakthrough the separating wall into the adjacent dwelling.

3. Environmental Noise Survey

In order to characterise the sound profile of the area of the proposed development, a short term 3-hour environmental sound survey was carried out on the 2nd October 2019. In addition, a spot measurement was undertaken on the existing ground floor café.

3.1 Measurement Methodology

For the sound monitoring, the sound level meter was placed at ground floor level about 1.5m from the ground. The microphone was positioned at least 3m away from any reflective surface. The monitoring position was chosen in order to collect representative sound levels of the area during the week day time periods. This position was also representative of the sound levels at the NSR. The measurement position 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	T246471	≤0.5
CESVA CB006 Class 1 Calibrator	901955	

Table 1.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a 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 windshield for the entire measurements period. Calibration certificates can be provided upon request.

3.3 Weather Summary

As the environmental noise survey was carried out over a short term 3-hour period no records of weather conditions were taken. However, during the monitoring, the weather was calm with wind speeds of less than 5m/s and no precipitation. 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.

Measurement Position MP1				
Measurement Time Period ('t')	$L_{Aeq,t}$	$L_{Amax,t}$	$L_{A90,t}$	$L_{A10,t}$
Day 1 – 02/10/19 – 13:00 – 16:00	51.0	82.0	49.0	52.0
Hour 1 – 02/10/19 – 13:00 – 14:00	50.0	69.0	47.0	52.0

Hour 2 – 02/10/19 – 14:00 – 15:00	50.0	82.0	46.0	51.0
Hour 3 – 02/10/19 – 15:00 – 16:00	51.0	74.0	47.0	52.0

Table 2.0 – Sound Survey Summary Results

3.4.2 Background Sound Level Summary Results

The following table shows a summary of the background sound level results during the measurement period.

Measurement Position MP1				
Measurement Period ('t')	L _{A90,t}	Statistically most Repeated L _{A90,t}	Min. L _{A90,t}	Max. L _{A90,t}
Day 1 – 02/10/19 - 13:00 – 16:00	47.0	46.0	46.0	48.0

Table 3.0 – Background Sound Level Summary Results

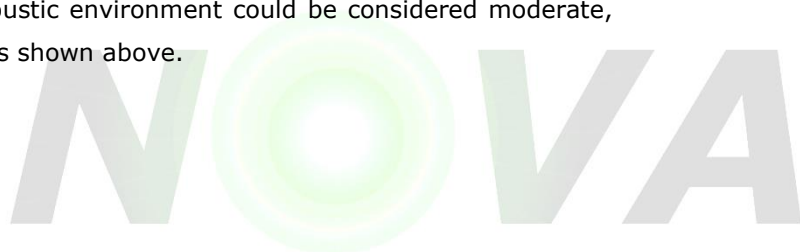
The following table shows a summary of the octave band L₉₀ sound levels measured during the measurement period.

Measurement Position MP1							
Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)						
	63	125	250	500	1K	2K	4K
L _{90,t} during the day	63.0	54.0	50.0	46.0	44.0	39.0	35.0

Table 4.0 – Background Sound (L90) Octave Band Leq,t during day

3.5 Subjective Impression & Context

The acoustic environment surrounding the site was typical of an urban location with the dominant noise sources in the area being that of road noise and commercial noise from the surrounding commercial and retail units. In general, the acoustic environment could be considered moderate, this is further corroborated by the measurements shown above.



4. Noise Assessment

The following section analyses:

- The noise emissions from the proposed first floor sitting area breaking out.
- The noise emissions from the proposed first floor transferring through the adjoining building to the neighbouring dwelling.

4.1.1 Internal Noise Level

The following table presents the sound levels measured during the spot measurement on 02/10/2019. The monitoring was carried out at the existing café on the ground floor. The measurement includes people talking, babies crying, low background music and noise from preparing drinks. Noise from preparing drinks was found to be very loud. However, no drinks are going to be prepared in the proposed 1st-floor seating area, thus it can be concluded that the recorded sound levels at ground floor present a worst-case scenario and then the usage of the following readings is deemed to be robust.

Description	Octave Band Sound Pressure Level, Hz (dB)							
	63	125	250	500	1K	2K	4K	Overall (A)
Internal Noise Level	61.0	63.0	67.0	67.0	65.0	66.0	58.0	71.0

Table 5.0 – Internal Noise Level

4.1.2 Noise Breakout Analysis

The noise breaking out of the proposed first-floor sitting area has been calculated considering the weakest element of the façade which is the glazing. During the site visit, the engineer was advised by the contractor that the installed glazing is assumed to be double glazing 6mm glass / 12mm air cavity / 8.8mm laminated glass. The sound reduction of the installed glazing has been calculated using INSUL 8.0 software. The technical datasheet can be found in Appendix F. The Nearest Sensitive Receptor has been found to be the adjacent dwelling to the east (NSR1). However, the closest dwelling across Whitechapel Street has submitted complaints about the existing cafe thus it has been considered in the subsequent assessment as NSR2.

NSR1								
Description	Octave Band Sound Pressure Level, Hz (dB)							
	63	125	250	500	1K	2K	4K	Overall (A)
Internal Noise Level	61.0	63.0	67.0	67.0	65.0	66.0	58.0	71.0
R Glazing 4/12/8.8	21.0	23.0	22.0	34.0	42.0	43.0	48.0	37.0
External Level _{L1-R-6}	34.0	34.0	39.0	27.0	17.0	17.0	4.0	28.0
Distance to NSR 1m	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Uncertainty	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Level at NSR	37.0	37.0	42.0	30.0	20.0	20.0	7.0	31.0

Table 6.0 – Noise Level at NSR Summary

4.1.3 Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a 'typical' background sound level for a given period. Due to the inherent uncertainty in analyzing the impact of amplified music due to the distinctive nature and characteristics of it, the lowest values have also been considered within the assessment.

Table 7.0 outlines a summary of the octave band background sound level for the measurement period.

Measurement Position MP1							
Frequency Analysis	Z-weighted Octave Band Sound Power Level, Hz (dB)						
	63	125	250	500	1K	2K	4K
L _{90,t} during the day	63.0	54.0	50.0	46.0	44.0	39.0	35.0

Table 7.0 – Summary of Background Sound Levels

4.1.4 Music Breakout Assessment

The calculated music level at the NSR is compared with the 'typical' background sound level during the operational period of the proposed site. The analysis is shown in the following table.

NSR 1								
Amplified Music Breakout Assessment	Octave Band Sound Pressure Level, Hz (dB)							
	63	125	250	500	1K	2K	4K	Overall (A)
Noise Level at NSR	37.0	37.0	42.0	30.0	20.0	20.0	7.0	31.0
Background Sound Level (L90)	63.0	54.0	50.0	46.0	44.0	39.0	35.0	46.0
Exceedance over Background Sound Level	-26.0	-17.0	-8.0	-16.0	-24.0	-19.0	-28.0	-15.0

Table 8.0 – Amplified Music Breakout Assessment

Discussion

NSR1

As can be seen in the assessment above, the noise levels incident on the NSR1 fall a minimum of 8 dB below the prevailing background sound level, indicating 'Low Impact'. This equates to "No Observed Adverse Effect Level" when assessed in accordance with the NPPF.

Furthermore, considering the fact that the internal monitoring was carried out with the ground floor sitting area operating at its maximum capacity and that the measurement includes sound from preparing drinks, which was found intermittent but loud and it is not intended to be carried out on the first floor, it can be concluded that the measured noise levels represent a worst-case scenario and the assessment above is deemed to be robust.

NSR2

The dwelling across the road has submitted complaints about the existing café. However, as can be seen in Appendix C, there is a minimum of 10m distance between the proposed first floor and the closest residential window across Whitechapel Street. According to the following formula;

$$L2 = L1 - 20 * \log\left(\frac{r_2}{r_1}\right)$$

The distance attenuation provided by 10m is 20.0 dB. Therefore, the noise levels at NSR2 fall a minimum of 28 dB below the prevailing background sound level, again indicating "No Observed Adverse Effect Level" when assessed in accordance with the NPPF.

4.2 Assessment of Structure Borne Noise Transference

The Proposed Development adjoins a dwelling that is directly adjacent to the west and thus there is a high likelihood that the dwelling will be impacted by structure-borne noise transferring through the adjoining partition, as well as flanking sound. The following analysis shows the required sound insulation of the adjoining wall, it must be noted that NR15 curve is too stringent at mid and higher frequencies and will be likely significantly lower than background noise levels at habitable spaces. The partition will be designed to achieve the NR15 criteria within the 63Hz and 125Hz octave bands and NR25 for the remaining bands.

Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)							
	63	125	250	500	1K	2K	4K	Overall (A)
Internal Noise Level	61.0	63.0	67.0	67.0	65.0	66.0	58.0	71.0
NR15/25 Curve (dB)	47.0	35.0	35.0	29.0	25.0	22.0	20.0	30.0
Required Octave Band SRI (R_w)	14.0	28.0	32.0	38.0	40.0	44.0	39.0	41.0

Table 9.0 – Noise Transfer Analysis

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.

4.3 Recommendations & Mitigation

Building Envelope

Glazing

Windows can be considered the weakest point of a façade in terms of noise reduction. It is understood that all glazing has been already installed using the glazing spec provided by the contractor during the site visit. However, if any new glazing, including doors and screens, are proposed to be installed, the units will require a minimum sound reduction index value of 37.0 dB R_w . The glazing unit shown in Table 10.0 would provide a suitable sound reduction. The performance is specified for the whole window unit, including frame and other design features.

Glazing Configuration	Attenuation (dB)
<i>Double Glazing</i>	
4mm Glass – 12mm Air Cavity – 8.8mm Laminated Glass	37.0 R_w

Table 10.0 – Glazing SRI

Sound Insulation of Adjoining Wall

The acoustic performance of the existing 400mm brickwork partition wall has been calculated using INSUL software and no further upgrade is needed. The technical datasheet can be found in Appendix F. The predicted acoustic performance of this floor detail is shown in Table 11.0 below.

Frequency Analysis	Z-weighted Octave Band Sound Pressure Level, Hz (dB)							
	63	125	250	500	1K	2K	4K	Overall (A)
Predicted Octave Band SRI (R_w)	41.0	43.0	51.0	58.0	63.0	68.0	72.0	61.0
Required Octave Band SRI (R_w)	14.0	28.0	32.0	38.0	40.0	44.0	39.0	41.0

Table 11.0 – SRI of Partition Floor

Noise Management Plan

The following recommendations are measures that should be implemented on the operation of the site to ensure a low likelihood of impact at the NSR.

- Where possible all windows in the 1st-floor seating area should remain fully closed throughout periods of operation.
- All staff should be trained in noise reductive work practices where possible.

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 log ₁₀ (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. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} 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. L ₉₀ 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. L ₁₀ 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.

A

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 $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ 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 (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. 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 180 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.

The Environmental Protection Act, 1990

Irrespective of planning consents, the Environmental Protection Act 1990 places a duty on the local authority to investigate complaints of noise nuisance made by a person living within its area. Where the local authority is satisfied that a statutory nuisance exists or is likely to occur or recur it must serve an abatement notice requiring abatement of the nuisance.

The Act does not define nuisance. The law only requires the investigating officer to be of the opinion that the effect of the noise on the average reasonable person would cause a nuisance or be prejudicial to health, e.g. preventing restful sleep.

There is no set level above which an intrusive noise may be considered a statutory nuisance and each case has to be considered on its merits. Matters to be considered include the level of the noise, its character, frequency of occurrence, time of occurrence and duration.

Nuisance has been defined in common law as "*an unlawful interference with a person's use or enjoyment of land, or of some right over, or in connection with it*"¹. However, annoyance is not

necessarily a nuisance as common law has defined annoyance as *"a wider term than nuisance, and if you find a thing which reasonably troubles the mind and pleasure, not of a fanciful person or of a skilled person who knows the truth, but of the ordinary sensible English inhabitant of a house- if you find there is anything which disturbs his reasonable peace of mind, that seems to be an annoyance, although it may not amount to physical detriment to comfort."*²

The WHO Guidelines Environmental Health Criterion 12 defines noise annoyance as *"a feeling of displeasure evoked by a noise"* the Criterion notes there are many factors involved in the evocation of this displeasure. These include spectral content, duration and time of day and non-acoustical factors such as the degree of control the receptor has over the noise, perceived necessity or economic considerations.³

References:

¹ *Read v Lyons and Co. Ltd, 1945,*

² *Tod-Heatly v Benham, 1888 and Dennis & Others v Davies, 2009*

³ *World Health Organization, 1980*

IEMA Guidelines on Noise Impact Assessments

The IEMA Guidelines for Environmental Noise Assessment address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidelines set out key principles for noise impact assessment relevant to all types of project regardless of size. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognizes that the effect associated with a noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day. The Guidelines accept that a simple change in noise levels using a single noise indicator may fail to adequately reveal the actual noise impact of the proposal. The character of the noise must be considered and the Guidelines suggest comparing several noise indicators such as the LAeq, L_Amax and LA90 as a more rigorous approach.

Absolute levels such as those set out in WHO Guidelines are also considered and the Guidelines suggest that a change in noise levels in an area where the existing levels are above WHO Guidelines should be considered as having more of an adverse effect than a change in noise levels in an area where existing levels are well below.

The Guidelines stop short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site by site basis regarding relevant national and local standards.

The Guidelines contain effect descriptors for changes in noise levels and for noise effect levels. These are summarized below:

Effect Descriptors

Very substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 12.0 – IEMA Guidelines effect descriptors

Noise Effect Level				
Time	Lowest Adverse Effect Level	Observed	Significant Adverse Effect Level	Observed
07:00 - 23:00	50 dB $L_{Aeq,16\text{ hour}}$		60 dB $L_{Aeq,16\text{ hour}}$	
23:00 - 07:00	40 dB $L_{Aeq,8\text{ hour}}$		55 dB $L_{Aeq,8\text{ hour}}$	
	60 dB L_{AFMax} (at the facade)		80 dB L_{AFMax} (at the facade)	

Table 13.0 – IEMA Guidelines noise effect level

The Guidelines are not prescriptive as to how a noise impact assessment should be carried out, and allow assessors to consider factors such as frequency spectra, days and times of operation, frequency of operation and any other factor which allows the noise to be assessed in context.

ISO 9613-2 Attenuation of sound during propagation outdoors

The ISO 1996 series of standards specifies methods for the description of noise outdoors in community environments. Part 2 of ISO 9613 is intended to enable noise levels in the community to be predicted from sources of known sound emission. The method is general in the sense that it may be applied to a wide variety of noise sources, and cover most of the major mechanisms of attenuation.

This standard provides guidance on the outdoor propagation of sound. It is widely used to establish the different attenuations that occur during the transmission of the sound from the sources to the receivers. The total attenuation is the sum of the following: geometrical divergence, atmospheric absorption, ground effect, barriers, and miscellaneous other effects.

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.

Entertainment Noise Legislation

Noise from entertainment venues, e.g. noise from recorded music, live bands or karaoke, can be particularly annoying for residents and business if it is not adequately contained within the venue. When considering the potential impact of a proposal for an entertainment premises or residential near to entertainment premises a consideration for the overall noise level (L_{Aeq}) and the 63Hz and 125Hz octave band noise levels. Music noise in the 63Hz and 125Hz octave bands, which is described as 'bass noise' is particularly difficult to contain and the impulsive and non-steady character of low frequency music noise is particularly disturbing for residents exposed to it.

A lively city centre bar can operate around 95 dB L_{Aeq} and nightclubs can be even higher at 105 dB L_{Aeq} . The range of level of 63Hz and 125Hz octave bands is wider than the a-weighted levels and can be up to 115 dB L_{eq} and 110 dB L_{eq} respectively (Davies et al 2005).

There is a lack of consensus on an assessment method for noise levels within habitable rooms regarding entertainment noise. The design aim should be to design to 'inaudible*'. The building structure is therefore key, and will usually involve a high performing solution in either the music venue or residential premises. Existing noise standards/criteria are not appropriate for evaluating low frequency noise; in almost all other situations the established noise descriptors are based on the A-weighted sound level (dBA) which effectively filters out low frequency sound (Moorhouse et al 2011).

**Noise is considered to be inaudible when it is at a sufficiently low level such that it is not recognizable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question. The DEFRA report 'Noise from Pubs and Clubs – Phase 1', which, on page 17 reproduces the Institute of Acoustics (IOA) working group guidance to achieve music noise levels which are 'virtually inaudible' inside a residential property.*

When dealing with noise control, especially at the lower frequencies it is usual to look at the octave band data as a Z-weighting (linear) and not the A-weighting, due in main to the amount you have to 'take off', resulting in meaningless data (-26.2dB at 63Hz) and also with respect to the sound insulation performance of various construction materials. Rather than just A-weighted levels being assessed e.g. internal noise levels as per BS8233:2014; a low frequency band analysis should be carried out (McCullough et al 2004).

In the 'Procedure for the assessment of low frequency noise complaints – Revision 1', Moorhouse *et al* (2011) use limits for low frequency noise levels in 1/3 octave bands between 10Hz and 160Hz. For the assessment of low frequency music noise, it is more practical to consider the 63Hz and 125 Hz octave bands. The Noise Council's Code of Practice on 'Environmental Noise Control at Concerts' suggests limits on both these octave bands. The DEFRA report 'Noise from Pubs and Clubs – Phase 1' suggests limits on 1/3 octave bands. However, the problem with this suggestion, and one of the reasons it is not widely used, is due to the difficulty in obtaining 1/3 octave band sound insulation performance data for various construction materials. With regards to assessing music noise at the 63 Hz and 125 Hz octave band levels a good correlation is shown between the NR 15 curve and Moorhouse curve at low frequencies. See Figure 2.0.

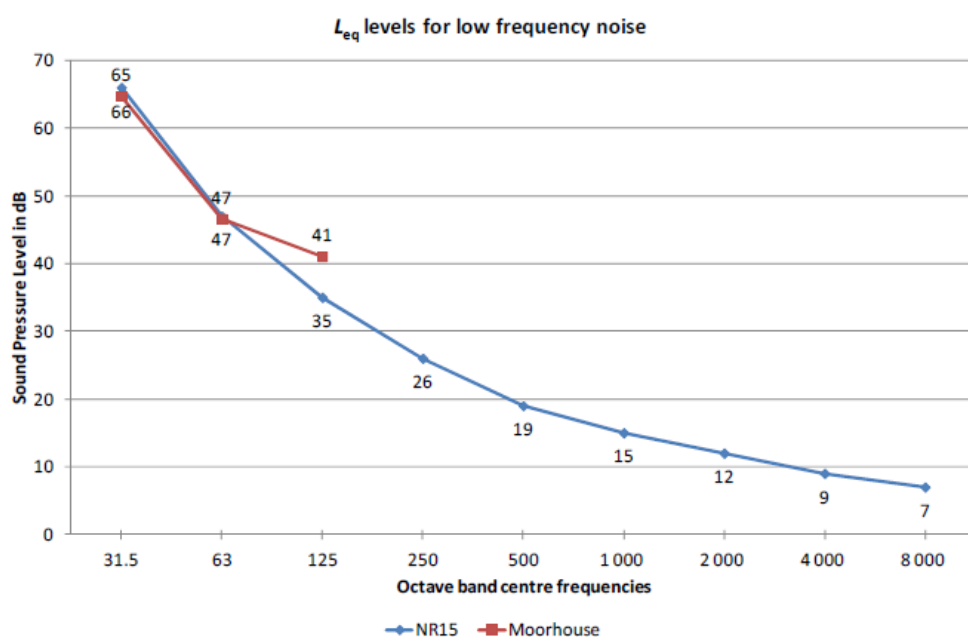


Figure 2.0 – Moorhouse Low Frequency Noise Rating Curve

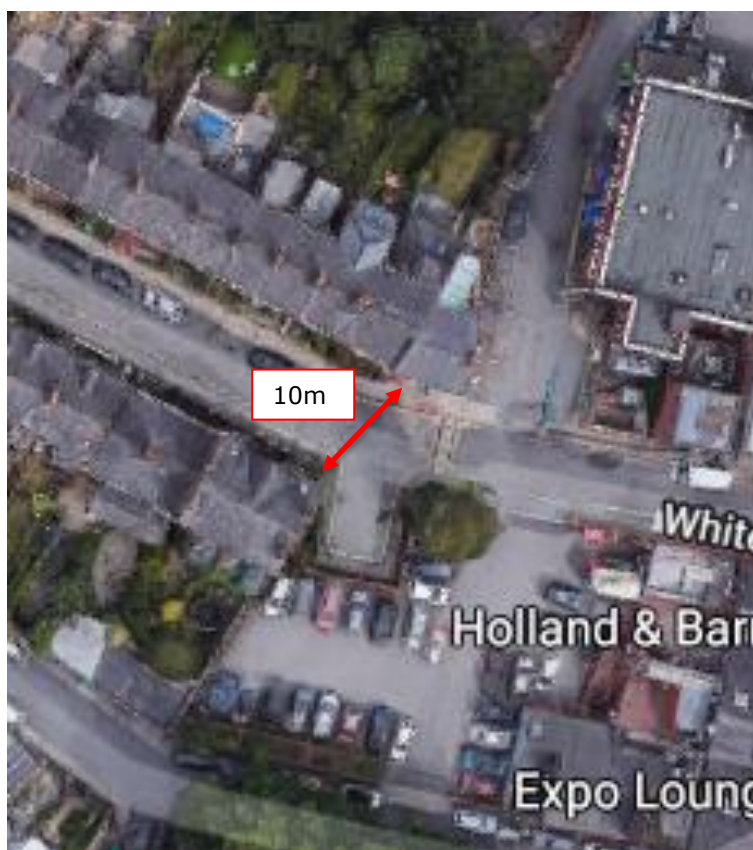
However, The NR curve may be too stringent at mid and higher frequencies and may be lower than background noise levels in habitable spaces. Further, the NR curve is most commonly used to set limits for mechanical services noise in buildings i.e. steady, continuous noise sources. Music noise has distinctive characteristics and as such can be described as unsteady and non-continuous in comparison. Even though the Moorhouse curve does not specifically relate to entertainment noise (as per the caveat in the revised edition) these levels provide a good practical basis to assess low frequency music noise. They also provide a workable prediction for planning applications and a measurement method and assessment for in-situ low frequency issues in existing habitable spaces. Therefore, a criterion that would achieve a condition of 'inaudible' / 'virtually inaudible' which is applicable for new residential developments that are structurally connected to entertainment venues (or vice versa) would be: *'Music noise levels in the 63Hz and 125Hz octave centre frequency bands (L_{eq}) should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB (L_{eq}), respectively'*. This criterion may also be applicable for new residential developments that are structurally separate from an existing entertainment venue.

References:

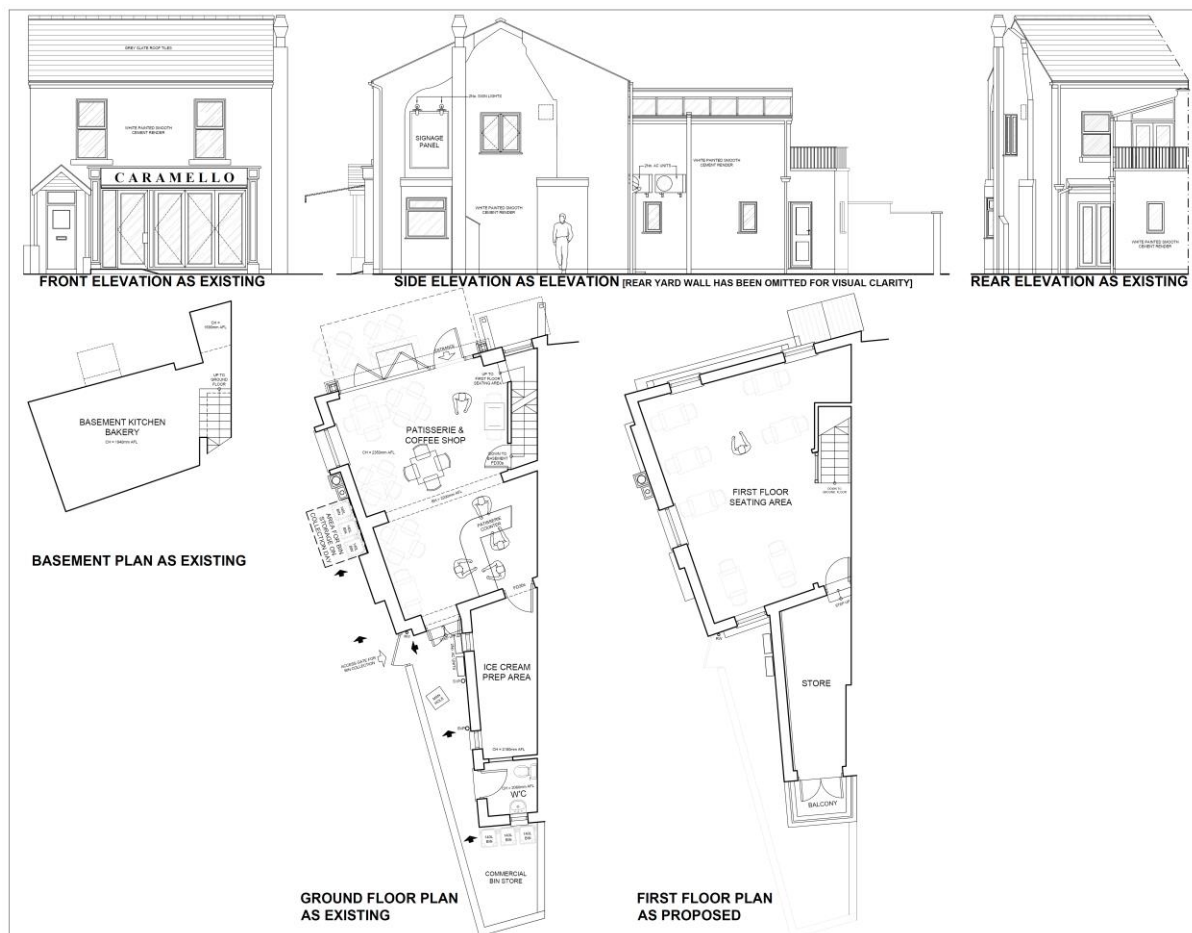
- i) Institute of Acoustics (2002) – Good practice guide on the control of noise from pubs and clubs – Draft Annex 2.*
- ii) McCullough et al (2004) A practical evaluation of objective noise criteria used for the assessment of disturbance due to entertainment music*
- iii) Moorhouse et al (2005) Proposed criteria for the assessment of low frequency noise disturbance, Defra (updated in 2008 and 2011)*



Appendix C – Location Plan

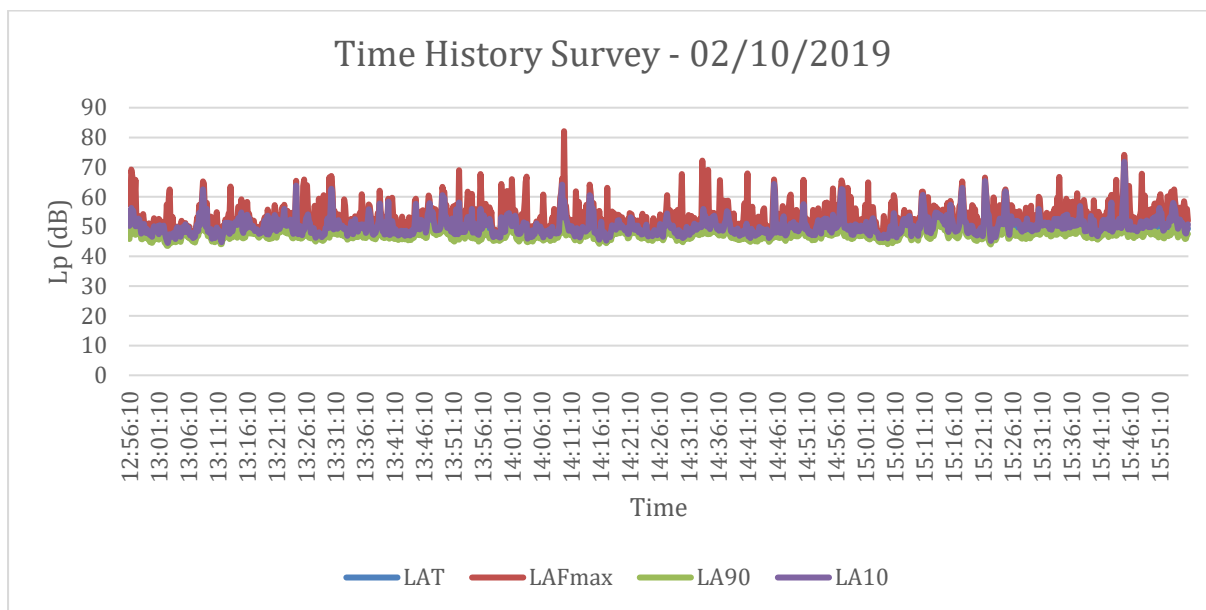


Appendix D – Site Plans



NOVA

Appendix E – Environmental Sound Survey



Appendix F – Datasheets

Sound Insulation Prediction (v8.0.9)

Program copyright Marshall Day Acoustics 2015

- Key No. 5567

Margin of error is generally within $R_w \pm 3$ dB

Job Name:

Job No.:

Page No.:

Notes:

Date: 8 Oct 19

Initials: NOVA Acoustics

File Name: Install Glazing at 1st Floor.ixl



R_w 40 dB

C -2 dB

C_{tr} -6 dB

D_{nTw} 42 dB [V:50m3]
[A:11m2]

System description

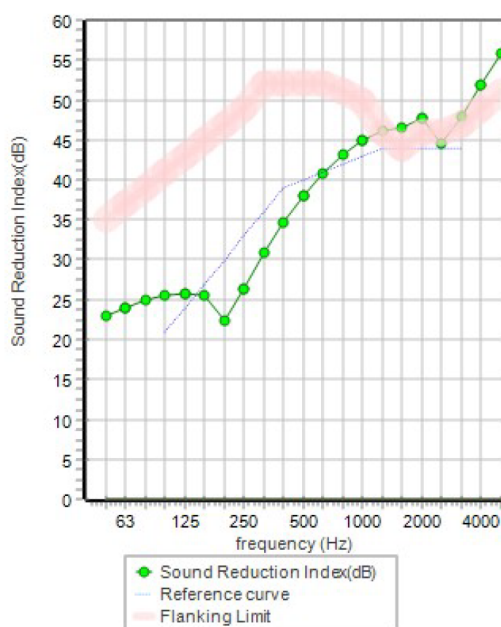
+ 1 x 6.0 mm Glass (ρ :2430 kg/m³, E :52GPa, η :0.02)

+ 1 x 9.2 mm Laminated Glass (generic PVB-0.38 mm) (ρ :2430 kg/m³, E :46GPa, η :0.06)

Mass-air-mass resonant frequency =182 Hz

frequency (Hz)	R(dB)	R(dB)
50	23	
63	24	24
80	25	
100	26	
125	26	26
160	26	
200	22	
250	26	25
315	31	
400	35	
500	38	37
630	41	
800	43	
1000	45	45
1250	46	
1600	47	
2000	48	46
2500	44	
3150	48	
4000	52	51
5000	56	

Panel Size 2.7x4 m; Mass 36.6 kg/m²



Sound Insulation Prediction (v8.0.9)

Program copyright Marshall Day Acoustics 2015

- Key No. 5567

Margin of error is generally within $R_w \pm 3$ dB

Job Name:

Job No.:

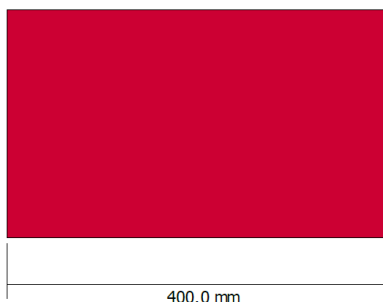
Page No.:

Notes:

Date: 8 Oct 19

Initials: NOVA Acoustics

File Name: Party Wall.ixl



R_w 64 dB

C -1 dB

C_{tr} -5 dB

D_{nTw} 66 dB [V50m3]
[A:11m2]

System description

Panel 1 : 1 x 400.0 mm Brick (p:1600 kg/m3,E:8.9GPa, η :0.06)

frequency (Hz)	R(dB)	R(dB)
50	46	
63	44	44
80	42	
100	44	
125	47	46
160	49	
200	52	
250	54	54
315	57	
400	59	
500	62	61
630	63	
800	65	
1000	66	66
1250	68	
1600	69	
2000	71	71
2500	72	
3150	74	
4000	75	75
5000	77	

Panel Size 2.7x4 m; Mass 640.0 kg/m2

