



Noise Impact Assessment of a Proposed Restaurant & Associated Fixed Plant

Client: Fornax Properties Ltd, LDM House, 46 Great Ancoats St, M4 5AB

Site Address: 128 Withington Road, Whalley Range, Manchester, M16 8FB

Date: 07/11/2022



Authorisation and Version Control

Report Prepared by	Mr. T Watkin PGDip, AMIOA
Report Checked by	Mr. M Caley, MSc, MIOA
Report Approved by	Mr. A T Martin, MSc, MIOA, MCIEH, MIET, MInstSCE
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Executive Summary

An environmental noise survey and noise impact assessment have been undertaken to assess the potential level of impact arising from the noise breakout and the installation of a kitchen extraction system at 128 Withington Road, Whalley Range, Manchester, M16 8FB for a restaurant development. The measured background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

Amplified Music Noise Breakout Assessment

Provided the mitigation measures specified within this report are implemented prior to the first operation and retained thereafter, the amplified music noise breaking out of the Proposed Development is predicted to be at least 5.0 dB below the prevailing background sound levels in all octave frequency bands. This is classed at 'No Observed Effect level' ('NOEL') when assessed in accordance with the NPSE and NPPF and complies with Condition 7a of the approved planning application '132180/FO/2021'.

BS4142:2014 Noise Impact Assessment of Proposed Kitchen Extraction System

Provided the mitigation measures specified within this report are implemented, the BS4142:2014 Rating Noise Level of the extraction system is predicted to be a minimum of 7.0 dB below the prevailing background sound level at the most affected NSR (Noise Sensitive Receptor). This is classed as 'Low Impact' in accordance with B4142:2014, 'No Observed Effect Level' ('NOEL') when assessed with the NPSE and NPPF, and complies with Condition 8a of the approved planning application '132180/FO/2021'.

An overview of all recommendations can be found in the table below:

Recommendations and Mitigation Overview

- A music limiting device should be installed capable of setting the maximum octave band amplified music limit levels presented in Table 3.0 should be adhered to.
- All glazed elements within the proposed single-story extension should adhere to the minimum octave band sound reduction presented in Table 4.0.
- A lobbied door system should be installed at the rear glazed doors of the single-story extension.
- A distributed P.A. system should be installed.
- Install 1 No. CP03-CA-560-2D silencer between the fan outlet and the flue terminus.
- Install 1 No. elbow lined with 25mm insulation between the fan outlet and flue terminus.
- House the extract within a minimum of a 0.5mm steel enclosure. Any enclosure should be internally lined with a sound absorptive material to reduce the reverberant build-up of sound energy that would otherwise reduce the enclosures effectiveness.
- The extraction system should not operate outside of the operating hours 07:00 – 23:00.

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

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the noise breakout and installation of a kitchen extraction system for a restaurant ('the Proposed Development') at 128 Withington Road, Whalley Range, Manchester, M16 8FB ('the Site').

The applicant has received conditional approval for planning application – 132180/FO/2021 'Erection of a single storey rear extension, retractable front awning and rear flue' ('the Application') from Manchester City Council. The following conditions imposed by Manchester City Council require discharging:

"7a.) The premises shall be acoustically insulated and treated to limit the breakout of noise in accordance with a noise study of the premises and a scheme of acoustic treatment that have been submitted to and approved in writing by the City Council as local planning authority. The scheme shall be implemented in full before the use commenced or as otherwise agreed in writing by the City Council as local planning authority.

Where entertainment noise is proposed the LAeq (entertainment noise) shall be controlled to 5dB below the LA90 (without entertainment noise) in each octave band at the façade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands shall be controlled so as to not exceed (in habitable rooms) 47dB and 41dB (Leq,5min), respectively.

8a.) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the use commences or as otherwise agreed by the City Council as local planning authority.

The following technical noise assessment has been prepared to discharge the above planning conditions imposed by Manchester City Council.

This report details the existing background sound climate at the nearest Noise Sensitive Receptors, as well as the predicted noise emissions associated with the site and recommend mitigation measures where necessary.

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

Scope & Objectives

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

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the nearest Noise Sensitive Receptor ('NSR') to Site;
- Sound monitoring at the site to measure specific noise emissions from any noise generating equipment deemed to be a cause for concern.
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2021), Noise Policy Statement for England (2010), British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound' and Manchester City Councils 'Core Strategy – Policy DC 26'. Further information on the legislation and the latest Entertainment Noise Legislation can be found in Appendix B.

Background

The proposal includes the following relevant items:

- The erection of a single story flat roofed extension at the rear of the property to facilitate a ground floor seating area for the restaurant.
- The client has stated daily operational hours of 07:00 to 23:00.
- The client has stipulated that any amplified music will be for background purposes and will be set to a level to allow for 'normal' conversation, e.g. not having to raise your voice.
- A kitchen extraction system is to be installed along the northern elevation.
- It is assumed the extraction system will only run during the operational hours of the proposed development.

2. Environmental Noise Survey

Measurement Methodology

In order to characterise the sound profile of the area surrounding the proposed development, a long-term environmental sound survey was carried out between 30/09/2022 and 04/09/2022. For the long-term sound monitoring a sound level meter was located at first floor height along the rear façade of the development site. Due to the microphones proximity to the fabric of the building, appropriate façade corrections have been applied to the measured results. The monitoring position was chosen in order to collect representative sound levels at the proposed development during the proposed operational periods of the restaurant. The monitoring location is shown in Figure 1.0 below.



Figure 1.0 – Indicative Site Layout (Imagery ©2022 Google, Imagery ©2022 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2022)

Context & Subjective Impression

The area surrounding the site is mixed in nature with both commercial properties and residential dwellings in close proximity. The acoustic environment is deemed to be 'typical' for this type of area and the noise profile at the rear of the development site (location of NSR1) is dominated by road traffic noise emissions from Withington Road.

Adjoining the proposed development to the north is 'Mediterranean Café' which operates 07:00 to 16:00 hours, daily, and has a kitchen extraction flue installed along the rear façade. This kitchen extraction system was only faintly audible during lulls in road traffic noise emissions. Adjoining the proposed development to the south is a vacant takeaway restaurant unit formally called 'Mr Hot Chinese Takeaway'. A kitchen extraction flue is present along the rear façade of the property however, it was unused for the duration of the environmental sound survey.

Situated approximately 2.5m to the north-west of the proposed development is a mosque; 'MinHaj-UI-Quran International'. It is understood that HMO rooms are present on the upper floors of the mosque, and as such are considered to be the closest Noise Sensitive Receptors (NSR1). A residential dwelling is located approximately 40m from the western boundary of the development site and is considered to be NSR2.

Environmental Noise Survey Results

The following tables outline the background sound levels measured during the most sensitive operational hours of the proposed development that will be used in subsequent assessments. A full summary of results can be found in Appendix D.

Measurement Position MP1							
Measurement Period ('t')	Octave Band L_{90,t} (Hz, dB)						
	63	125	250	500	1k	2k	4k
Night 3: 19:00 – 23:00	45.0	41.0	42.0	36.0	37.0	32.0	22.0

Table 1.0 – Octave Band Background Sound Levels

The typical background sound level has been calculated using the method provided in Appendix A of Manchester City Council's 'Planning and Noise Technical Guidance' document. For this method, the arithmetic average of each 15-minute measurement period is calculated and the lowest average is considered to be the typical background sound level. Further summary results for the entire measurement period can be found in Appendix D.

Description	L_{A90,15min} (dB)
Arithmetic Average of Dataset	43.0
Minimum Average of Dataset	41.0
Minimum of Dataset	38.0
Maximum of Dataset	48.0

Table 2.0 – Global Background Sound Level Results

As can be seen in the table above, the minimum average of the dataset is 41.0 dBA which has been used in the subsequent assessments.

3. Noise Breakout Assessment

In the following section, the noise breaking out of the proposed development is assessed.

Proposed Criteria – Entertainment Noise

In order to achieve 'low impact' and to comply with Condition 7a of the approved planning application, the amplified music noise emitted from the Proposed Development should be at least 5.0 dB below background sound level in all octave frequency band at the most affected NSRs.

Required Mitigation Measures

In order to achieve the criteria, the following mitigation measures should be implemented prior to the first operation and retained thereafter.

Amplified Music Limit Levels:

The following table presents the maximum amplified music limit levels in the centre of the ground floor restaurant/extension.

Maximum Amplified Music Limit Levels								
Sound Source	Octave Band L_{eq} (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Amplified Music Limit Levels	77.0	74.0	77.0	82.0	85.0	80.0	70.0	87.0

Table 3.0 – Maximum Amplified Music Limit Levels

The amplified music limit levels above may be suitable for live acoustic music acts that do not include acoustic drum kits and do not rely on low frequency content.

The example noise limiting system shown below would be appropriate for this task, however, other manufacturers may also provide appropriate equipment. This should be researched prior to purchase.

- Cesva LRF04-F – Frequency Filter Sound Level Limiter-recorder

External acts or DJs should be prohibited from using their own equipment unless plugged into the main FOH system through the volume control measures. It should be noted that any automated volume control measures should be installed and activated by an appropriately experienced noise control consultant/engineer to ensure that the equipment operates effectively.

Building Fabric

The external walls of structure are proposed to be brickwork cavity walls assumed to provide sufficient sound reduction; therefore, the noise breakout assessment will be conducted considering the weakest elements of the building's fabric, the glazed elements.

Glazing and Ventilation

It is assumed that all heating and cooling will be provided by air-conditioning systems and thus there will be no requirement for ventilation systems to penetrate the façade and compromise the sound insulation.

To achieve the criteria, the glazing (skylights and glazed doors) should be a minimum configuration of 6mm glass / 16mm argon cavity / 8.8mm (Optiphon) glass providing 41.0 dB R_w of sound reduction. It should be noted that any glazing configuration may be installed providing it achieves the sound reduction criteria specified within Table 4.0 below.

Minimum Sound Reduction of Glazed Elements								
Description	Octave Band SRI L_{eq} (Hz, dB)							R_w (dB)
	63	125	250	500	1k	2k	4k	
Sound Reduction of Glazed Elements	24.0	25.0	27.0	38.0	48.0	47.0	55.0	41.0

Table 4.0 – Minimum Sound Reduction of Glazed Elements

External Doorsets & Lobbied Entrances:

Any external door sets should provide a minimum sound reduction of 40.0 dB R_w . It is advised to install a lobbied door system for patrons to enter and exit the glazed doors along the rear of the single story extension.

Distributed PA System:

It is advised to install a distributed P.A. system which will minimise the internal sound level required to achieve a uniform and distributed music level.

A distributed sound system involves installing a higher quantity of speakers all emitting at a lower level. This takes advantage of the proximity of the listener to the speaker, thus reducing the overall noise emissions whilst maintaining a feeling of 'loudness'. The speakers should be focused on the main operational area and not located near to entrances and exits. All speakers should be installed on appropriate anti-vibrational mounts where required.

Noise Breakout Calculations & Assessment

The following table shows the predicted levels of noise breakout at the worst affected NSR(1). The calculations have been undertaken considering the following assumptions:

- The closest windows of NSR1 (as indicated by the green façades in Figure 1.0) are located approximately 4m from the skylights and glazed rear door.
- The glazing is the weakest element of the façade in terms of sound reduction and breakout through the structural elements will be negligible. The sound power of the glazed elements has been calculated using the formula: $L_{W,rad} = L_{P,rev} + 10 \cdot \log(S) - Cd + TL$, where; S is the surface area of the glazed element, Cd is the correction for the difference between reverberant internal conditions and non-reverberant external conditions (-6.0 dB), and TL is the transmission loss provide by the element (TL is calculated via the element surface area and sound reduction in Table 5.0).
- Based on the dimensions of the glazed doors and skylight, the planar propagation loss from the glazed elements to the closest NSR has been calculated from the point source region.
- The propagation loss from the glazed doors have been calculated assuming $\frac{1}{4}$ sphere radiation as the glazed elements are located at the corner of two reflecting planes (the ground and the building's façade).
- The propagation loss from the skylight have been calculated assuming $\frac{1}{2}$ sphere radiation as the skylight is located against one reflecting plane (the flat roof of the extension).
- It is assumed there is no acoustic shielding between the glazed elements and either NSR.

Noise Breakout Assessment – NSR1								
Description	1/1 Octave Frequency Band (Hz, dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Amplified Music Limit Levels (L_1)	77.0	74.0	77.0	82.0	85.0	80.0	70.0	87.0
$L_{W,rad}$ of Glazed Doors	57.0	53.0	54.0	48.0	41.0	37.0	19.0	50.0
Plane Propagation Loss – Point Source Region (Q4)	-18.0	-18.0	-18.0	-18.0	-18.0	-18.0	-18.0	
$L_{W,rad}$ of Skylight	55.0	51.0	52.0	46.0	39.0	35.0	17.0	48.0
Plane Propagation Loss – Point Source Region (Q2)	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	
Cumulative Breakout Noise Level at NSR1 Window	40.0	36.0	37.0	31.0	24.0	20.0	2.0	32.0
Background Sound Level (L_{90})	45.0	41.0	42.0	36.0	37.0	32.0	22.0	41.0
Exceedance of Background Noise Level	-5.0	-5.0	-5.0	-5.0	-13.0	-12.0	-20.0	-7.0

Table 5.0 – Noise Breakout Assessment at Most Affected NSR

Discussion

As can be seen in the assessment above, the octave band sound levels of amplified music noise breaking out of the proposed development are predicted to be at least 5.0 dB below measured background sound levels in any octave frequency bands, which is classed as 'No Observed Effect Level' ('NOEL') when assessed in accordance with the NPSE and NPPF.

Further to this, it should be noted that the assessment is based on the time period when impact is expected to be highest. For all other time periods the level of impact is expected to be reduced.

4. BS4142:2014 Noise Impact Assessment

The following section of the report analyses the expected impact from the noise emissions associated with the external fixed plant.

Required Mitigation Measures for Kitchen Extraction System

The proposed kitchen extraction system includes the following relevant elements:

- 1 No. FlaktWoods 56JMv/16/4/5/32 Extract Fan mounted on the northern elevation, approximately 1.8m above the ground.

NOVA Acoustics has been informed that the 560mm dia. kitchen extraction flue penetrates the northern façade and runs into the externally mounted extract fan. The flue then runs vertically and terminates approximately 1m above the eaves.

Based on the plans provided by the client, the following assumptions have been used within the subsequent calculations:

- The extraction terminus is located a minimum 6m from the closest window of NSR1.
- The extraction fan is located approximately 6m from the closest window of NSR1.

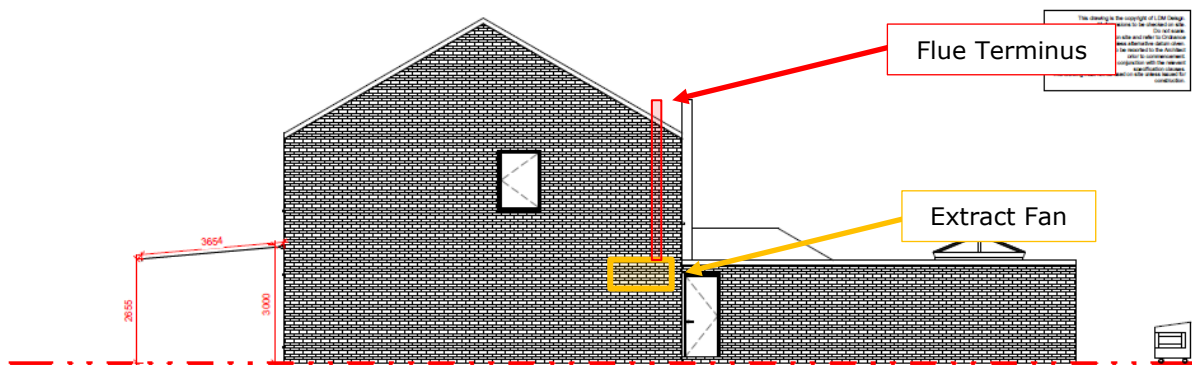


Figure 2.0 – Indicative Kitchen Extraction Layout

In order to achieve 'Low Impact' in accordance with BS4142:2014 and comply with Condition 8a of the approved planning application, the following mitigation measures should be installed prior to the first operation of the site and retained thereafter:

- Install 1 No. CP03-CA-560-2D silencer between the fan outlet and the flue terminus.
- Install 1 No. elbow lined with 25mm insulation between the fan outlet and flue terminus.
- House the extract within a minimum of a 0.5mm steel enclosure. Any enclosure should be internally lined with a sound absorptive material to reduce the reverberant build-up of sound energy that would otherwise reduce the enclosures effectiveness.

It should be noted that any products may be used so long as they achieve the minimum sound reductions specified within the table below.

Minimum Required Sound Reductions of Kitchen Extraction Mitigation									
Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dB)
	63	125	250	500	1k	2k	4k	8k	
Ductwork Silencer Insertion Loss	-4.0	-9.0	-17.0	-27.0	-29.0	-28.0	-23.0	-23.0	--
Acoustic Enclosure SRI	-4.0	-6.0	-9.0	-14.0	-19.0	-25.0	-30.0	-30.0	18.0 R _w

Table 6.0 – Minimum Sound Reduction of Kitchen Extraction Mitigation Elements

BS4142:2014 Noise Impact Assessment

The table below outlines the cumulative Rating Noise Level at the NSRs. The manufacturers datasheets used in the calculations can be found in Appendix F. Full calculations can be found in Appendix E.

Cumulative Rating Sound Level at NSR1		
Description	Extraction Outlet	Fan Casing Breakout
Sound Power Level* (dBA)	51.0	43.0
Distance to NSR (m)	6	6
Directivity Factor (Q)	2	4
Specific Sound Level at NSR1** (dBA)	27.0	22.0
Cumulative Specific Noise Level at NSR1 (dBA)	29.0	
Acoustic Correction Feature – Tonality & Intermittency*** (dB)	+5.0	
Cumulative Rating Noise Level at NSR1 (dBA)	34.0	

Table 7.0 – Plant Noise Emissions & Cumulative Rating Noise Level at NSR1

*Sound Power Level inclusive of proposed mitigation measures.

**The noise level at the NSR has been calculated using the equation: $L_p = L_w - 20 \cdot \log(r) - Q$, where; L_w is the sound power level considering the proposed mitigation measures, r is the distance between the source and receptor, and Q is the propagation constant: $Q2$ is hemispherical for the source being located adjacent to 1 reflecting plane, and $Q4$ is $\frac{1}{4}$ sphere propagation for the source being located at the junction of two reflecting planes.

***A +2.0 dB penalty for possible tonal elements and +3.0 dB penalty for potential intermittent operations have been applied to the specific sound levels in accordance with BS4142:2014.

The Rating Sound Level has been assessed in accordance with BS4142:2014 at the most affected NSR. The BS4142:2014 assessment can be seen in the table below.

BS4142:2014 Assessment – Day Time (Operational Hours)			
NSR	Results	Value (dBA)	Notes
1	Rating Sound Level	34.0	Acoustic feature corrections as shown in Table 7.0.
	Background Sound Level	41.0	As shown in Table 2.0.
	Excess of Rating Level Over Background Sound Level	-7.0	The assessment indicates 'Low Impact'

Table 8.0 – BS4142:2014 Noise Assessment of Proposed Extraction System

Discussion

As can be seen in the assessment above, the rating sound Level is predicted to be 7.0 dB below the prevailing background sound level at the most affected NSR. This indicates 'Low Impact' in accordance with BS4142:2014 and 'No Observed Effect Level' ('NOEL') when assessed in accordance with the NPPF and NPSE.

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.

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 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.

B.1 – National Planning Policy Framework (2021)

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 174e, 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 185 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 impact 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.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 185 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.

B.3 – British Standard BS 4142:2014+A1:2019 – ‘Methods for rating and assessing industrial and commercial sound’

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ ‘specific sound level’, immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinct against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

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. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: “The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- “Typically, the greater this difference, the greater the magnitude of the impact.”
- “A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”
- “A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”
- “The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, depending on the context.”

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;

- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

B.4 – Entertainment & Leisure Noise Legislation

Noise from entertainment and leisure venues, e.g. noise from recorded music, live bands, gyms 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 3.0.

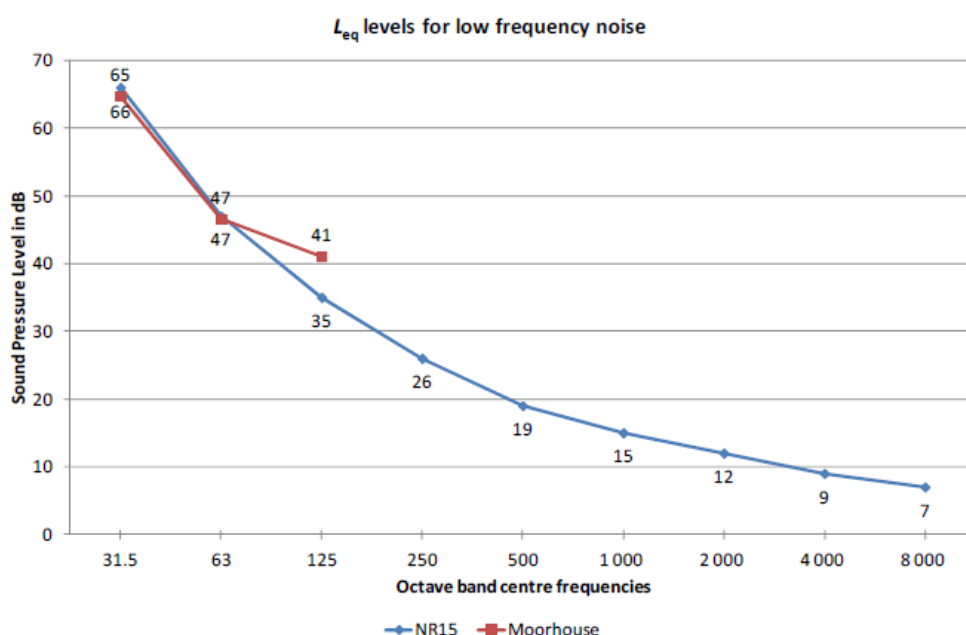


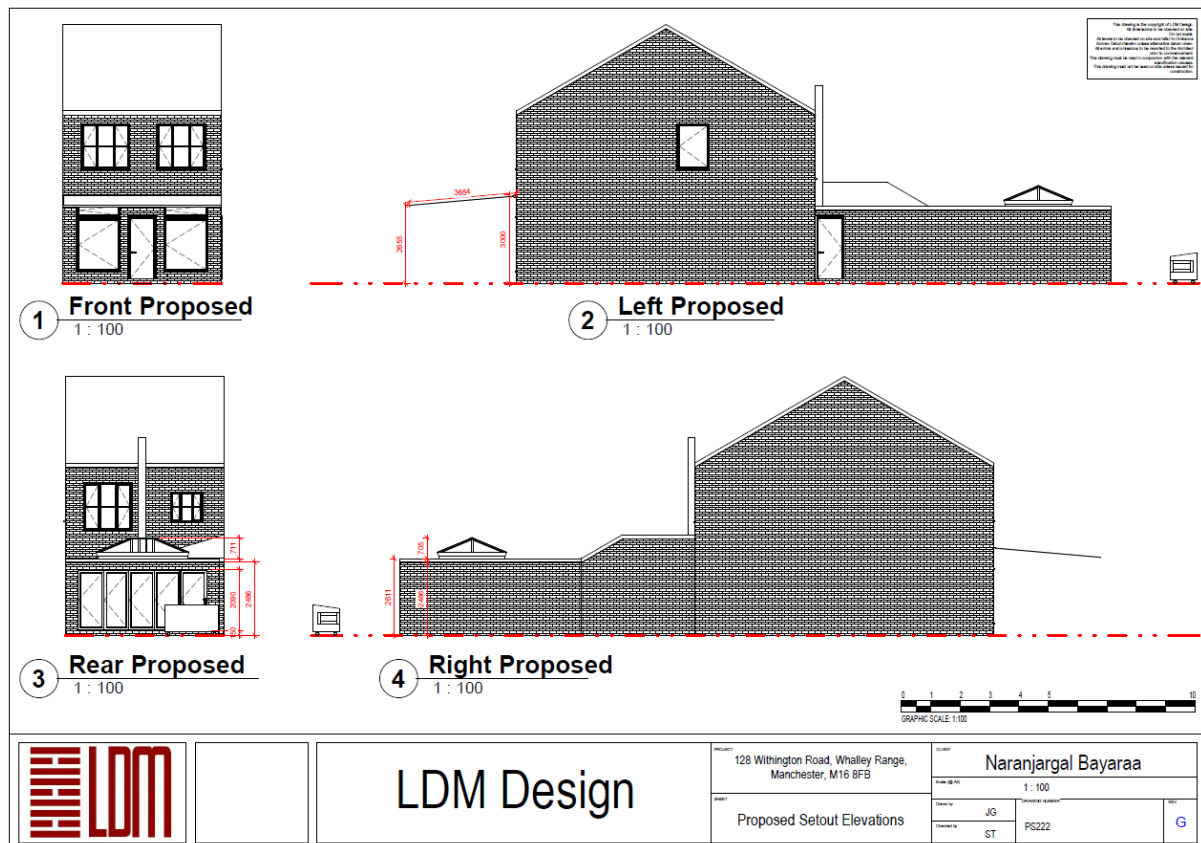
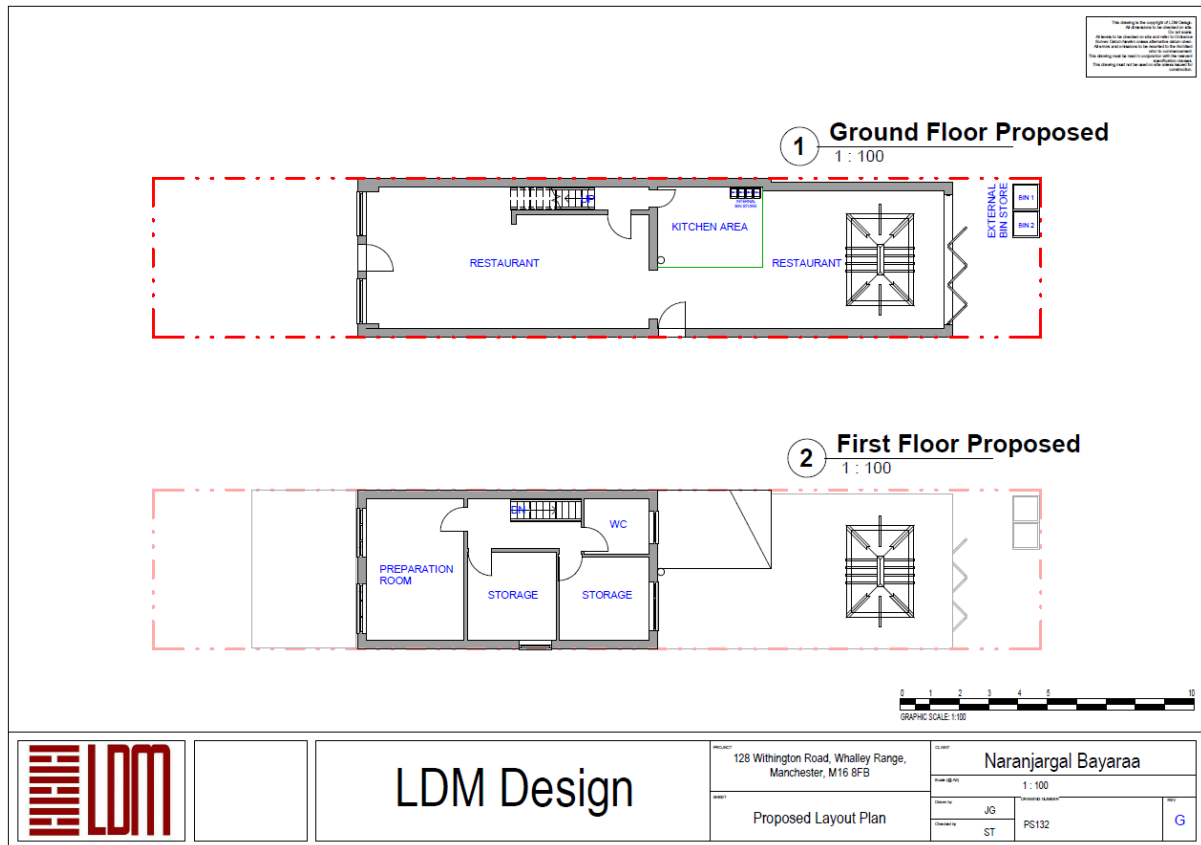
Figure 3.0 – Moorhouse Low Frequency Noise Rating Curve

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 – Site Plans



Appendix D – Environmental Survey

D.1 – Tabulated Summary Noise Data

Background Sound Level Summary – MP1 (Full Period)							
Measurement Period ('t')	Octave Band $L_{90,t}$ (Hz, dB)						
	63	125	250	500	1k	2k	4k
Day 1 – 30/09/22: 15:00 – 23:00	53.0	48.0	48.0	43.0	46.0	42.0	36.0
Night 1 – 30/09/22: 23:00 – 07:00	45.0	41.0	40.0	36.0	39.0	37.0	32.0
Day 2 – 01/10/22: 07:00 – 23:00	52.0	48.0	47.0	42.0	45.0	42.0	35.0
Night 2 – 01/10/22: 23:00 – 07:00	45.0	40.0	41.0	36.0	39.0	36.0	29.0
Day 3 – 02/10/22: 07:00 – 23:00	50.0	46.0	45.0	40.0	43.0	39.0	29.0
Night 3 – 02/10/22: 23:00 – 07:00	42.0	40.0	40.0	34.0	35.0	32.0	20.0
Day 4 – 03/10/22: 07:00 – 23:00	53.0	49.0	47.0	42.0	44.0	40.0	29.0
Night 4 – 03/10/22: 23:00 – 07:00	44.0	43.0	41.0	34.0	35.0	31.0	22.0
Day 5 – 04/10/22: 07:00 – 23:00	53.0	48.0	46.0	42.0	44.0	41.0	34.0

Table 9.0 – Measured Octave Band Background Sound Level Data – MP1

Measurement Position MP1 – Operational L _{A90} Data						
Time Period ('t')	Day 1 (dB)	Day 2 (dB)	Day 3 (dB)	Day 4 (dB)	Day 5 (dB)	Arithmetic Average (dB)
19:00:00	46.0	48.0	41.0	44.0	45.0	45.0
19:15:00	47.0	47.0	43.0	44.0	46.0	45.0
19:30:00	47.0	48.0	41.0	44.0	45.0	45.0
19:45:00	47.0	46.0	42.0	44.0	46.0	45.0
20:00:00	46.0	47.0	41.0	44.0	45.0	45.0
20:15:00	46.0	46.0	43.0	45.0	44.0	45.0
20:30:00	45.0	44.0	42.0	44.0	42.0	43.0
20:45:00	46.0	45.0	42.0	43.0	42.0	44.0
21:00:00	44.0	43.0	41.0	42.0	42.0	42.0
21:15:00	44.0	44.0	42.0	42.0	43.0	43.0
21:30:00	43.0	44.0	42.0	42.0	44.0	43.0
21:45:00	44.0	44.0	41.0	42.0	43.0	43.0
22:00:00	44.0	44.0	40.0	43.0	42.0	43.0
22:15:00	43.0	44.0	41.0	40.0	42.0	42.0
22:30:00	43.0	42.0	38.0	40.0	44.0	41.0
22:45:00	43.0	42.0	38.0	40.0	42.0	41.0

Table 10.0 – Measured Background Sound Level Data – MP1

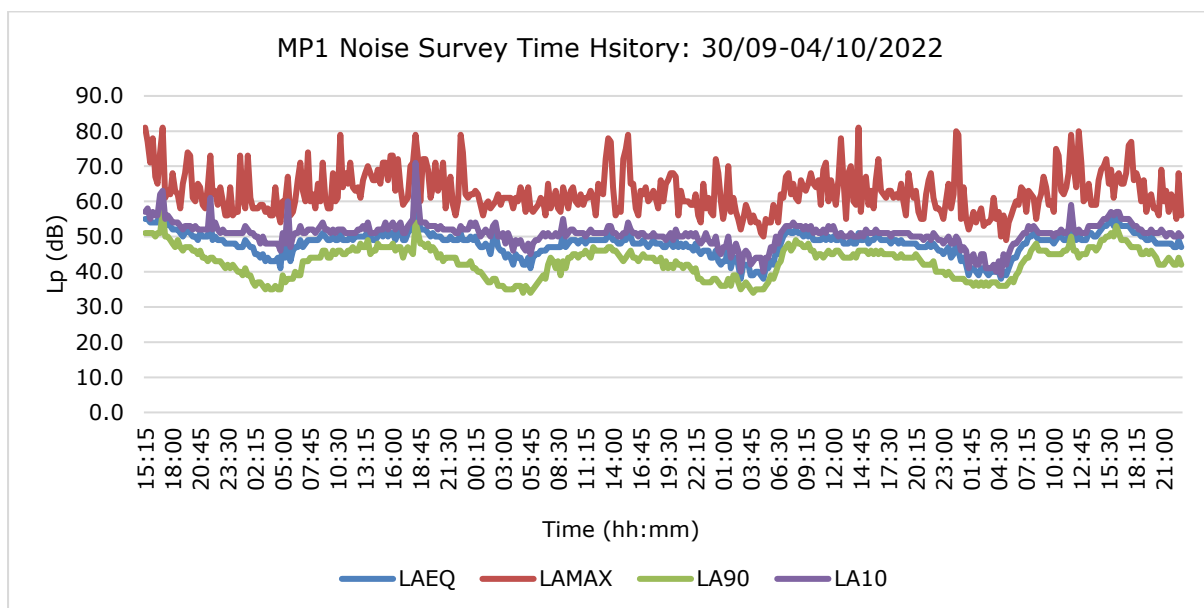


Figure 4.0 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek 971A Class 1 Sound Level Meter	113255	≤0.1
Svantek SV33B Class 1 Calibrator	116639	

Table 11.0 – 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 ≤0.1 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.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Northenden Road (Approx. 5km SW of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
30/09/22: 00:00 – 23:59	4.6 – 12.4	0.0 – 4.3*	E	0.0 – 1.3
01/10/22: 00:00 – 23:59	9.8 – 16.0	0.0 – 5.1*	SE	0.0 – 1.8
02/10/22: 00:00 – 23:59	7.6 – 15.7	0.0	SSE	0.0 – 0.9
03/10/22: 00:00 – 23:59	6.0 – 15.6	0.0	ENE	0.0 – 0.9
04/10/22: 00:00 – 23:59	12.8 – 15.6	0.0 – 2.3	ENE	0.0 – 1.3

Table 12.0 – Weather Summary

**The majority of heavy rainfall took place outside of the assessment period used in the analysis. The background noise levels measured during the assessed time period remained consistently within a 4 dB range throughout the day, and as such the measurements are not thought to have been adversely affected by rainfall.*

Appendix E – Kitchen Extraction System Calculations

Calculations of Proposed Extraction System with Required Mitigation Measures

Kitchen Extraction Calcs

Rating/Broadband Input				Insertion Loss / Attenuation									Total Cumulative In-Duct Sound Power									
Item / Description	Item	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	31.5	63	125	250	500	1k	2k	4k	8k	
Outlet Lw of 56JM/16/4/5/32		85.3	79.0 (A)												79.0	81.0	76.0	77.0	74.0	71.0	68.0	64.0
CP03-CA-560-2D Silencer					-4.0	-9.0	-17.0	-27.0	-29.0	-28.0	-23.0	-23.0			75.0	72.0	59.0	50.0	45.0	43.0	45.0	41.0
Duct Bend - Type: Radiused, Lining: 25 mm, Theory: CIBSE	560 mm		1 x		0.0	-2.0	-5.0	-7.0	-10.0	-10.0	-10.0	-10.0			75.0	70.0	54.0	43.0	35.0	33.0	35.0	31.0
Duct End - Duct Size: 560mm, Duct Type: Circular, Grille Size: mm, Grille Type: None, Condition: Free Space, Theory: ASHRAE					-10.0	-5.0	-2.0	-1.0	0.0	0.0	0.0	0.0			65.0	65.0	52.0	42.0	35.0	33.0	35.0	31.0
															65.0	65.0	52.0	42.0	35.0	33.0	35.0	31.0
Sound Pressure Level to Atmosphere																						
Item / Description	Rating	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k										
Lw to Atmosphere			51.0 (A)		65.0	65.0	52.0	42.0	35.0	33.0	35.0	31.0										
Point Source Propagation Loss	6.0 m	3.0 dB			-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0										
Outlet Specific Sound Level at NSR			27.0 (A)		41.0	41.0	28.0	18.0	11.0	9.0	11.0	7.0										
Lw of Fan Breakout		69.7	56.0 (A)		69.0	60.0	50.0	52.0	49.0	44.0	49.0	40.0										
SRI of 0.5mm Steel Enclosure (lined)	Rw 18				-4.0	-6.0	-9.0	-14.0	-19.0	-25.0	-30.0	-30.0										
Lw of Enclosure Breakout			43.0 (A)		65.0	54.0	41.0	38.0	30.0	19.0	19.0	10.0										
Point Source Propagation Loss	6.0 m	6.0 dB			-21.0	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0										
Breakout Sound Level at NSR			22.0 (A)		44.0	33.0	20.0	17.0	9.0	-2.0	-2.0	-11.0										
Total Specific Sound Level at NSR			29.0 (A)		46.0	42.0	29.0	21.0	13.0	9.0	11.0	7.0										
Acoustic Feature Correction			5.0 (A)																			
Rating Sound Level			34.0 (A)																			
Background Sound Level (LA90)			41.0																			
Exceedance of BG SL			-7.0																			

Appendix F – Manufacturers Datasheets

Technical Data Sheet

JM Aerofoil

Project Name	: jm single phase pdf
Quotation Number	:
Customer	: nfs
FanCode	56JM/16/4/5/32
FanDiameter /Size	560mm
Blades	5
FanSpeed	1420 rpm
Velocity	10.0 m/s
BladeAngle	32°
Form of Running	B
FanCasing	Long
RequestedDuty	2.45m³/s @ 192 Pa (static)
OutletDynamic Pressure	60 Pa
DutyShaft Power	0.955kW
MaxShaft Power	0.974kW
Total Efficiency	65 %
MotorFrame	CT9
MotorRating	0.970kW
Full LoadCurrent	6.7A
StartingCurrent	13.5A
MotorMounting	Pad
ElectricalSupply	220-240 Volts 50 Hz 1 Phase
StartType	DOL
MotorWinding	Standard
Enclosure	StandardAll
AirDensity	1.2 kg/m³ / 20°C / 0 m / 50% RH
Smoke Venting	NonSmoke Venting
ProductNumber	DX571456

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA@ 3m**
Inlet*	78	81	76	77	74	71	67	63	85	59
Outlet*	79	81	76	77	74	71	68	64	85	59
Breakout*	69	60	50	52	49	44	49	40	70	35
* Lw dB re 10 ⁻¹² W									** dBA re 2x10 ⁻⁵ Pa	

Performance data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with ISO 5801 and is specifically applicable for Ducted installations. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using an auto transformer speed controller for noise sensitive applications.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt 2, 1985 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions. Breakout levels stated are estimated from induct sound power levels and are provided for guidance.

Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

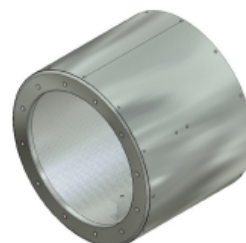
CP03 C Series



CP03 - CA - 0560 Silencer

Available in two standard lengths C Series silencers have excellent attenuation properties, achieved with sound absorbing infill retained in the attenuator casing by a perforated liner. The central pod (code P) is an option to increase the insertion loss, however it will add resistance.

- Fits directly onto 560mm diameter fans
- Standard lengths 560mm (1D) & 1120mm (2D)
- Use up to 70°C (standard construction)
- Systems up to 1000 Pascals
- Special lengths on request



Insertion Loss (dB) - Centre Band Frequency

Product Code	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
CP03 - C* - 0560 - 1D	2	4	7	14	14	9	9	7
CP03 - C* - 0560 - 2D	3	6	10	19	20	14	12	10
CP03 - C*P - 0560 - 1D	3	7	9	18	24	24	20	15
CP03 - C*P - 0560 - 2D	4	9	17	27	29	28	23	23

Replace * in code with A or B for connection pattern. Insertion loss data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

Dimensional Data

Product Code	A (mm)	B (mm)	C (mm)	Weight (kg)
CP03 - CA - 0560 - 1D	560	712	560	22
CP03 - CA - 0560 - 2D	560	712	1120	48
CP03 - CAP - 0560 - 1D	560	712	560	26
CP03 - CAP - 0560 - 2D	560	712	1120	57

Pattern A
12 x M10 - 620 PCD

Pattern B
16- M8 - 605 PCD

