

ARR/PPN/C/2411.02 Rev A

25th March 2021

Noise Impact Assessment

Assessment of the noise impact on surrounding
properties for proposed "Secret Bar" Extension at
The Washhouse, 19 Shudehill, Manchester, M4 2AF

Prepared for :-

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1.0 **SUMMARY**

The area surrounding the proposed development is already extremely busy with road traffic, mechanical equipment, pedestrians and bars, some of them open until well into the early hours.

The proposed bar is to be a "Secret Bar" and, by design and branding, will be visually and aurally hidden from the outside world. It is table service food and drink and the music inside will be background music only.

There is already extraction to the rear but this is to an alley which is already very noisy with mechanical plant. No additional mechanical equipment is proposed but it would be a straight forward process to condition the mechanical plant so as to keep within reasonable noise limits.

We could not positively locate any residential property in the vicinity, although we understand that some properties to the rear and some further up Shudehill may be designated as such. Even so, the nature of the proposed "Secret Bar" and the already bustling atmosphere of the area means that the existing ground floor area has no significant impact at all, and it is inconceivable that the proposed will have any more.



A R Raymond



P J Durell

2.0 INTRODUCTION

ADC was asked to carry out an independent assessment of the potential noise impact of extending the existing “Secret Bar” to the first and second floor of no.19 and also first floor of no.21-23. This report builds on the report submitted for the original application to the existing ground floor bar and restaurant development.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

The report refers heavily to the original report dated 12th March 2015 for the existing ground floor use. The key findings and recommendations are reviewed and updated where necessary.

We sum-up and conclude at the end, along with brief recommendations.

3.0 ASSESSMENT STANDARDS

3.1 NPPF, NPSE and NPPG

The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) provide nothing in the way of quantitative criteria but instead provide general policy aims and statements and some guidance on how certain situation can be interpreted.

The NPPF’s main statement on noise is to be found in paragraph 180:-

- 180 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^(footnote here refers to NPSE – see below);
 - 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.

Paragraph 182 is also relevant:-

- 182 Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

The NPPF refers to the NPSE which sets out the following aims:-

1. avoid significant adverse impacts on health and quality of life;
2. mitigate and minimise adverse impacts on health and quality of life; and
3. where possible, contribute to the improvement of health and quality of life.

It also introduces the concepts of:

- NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

The NPPG section on noise adds some further detail, much of it reproducing the NPPF and NPSE, but some useful qualitative guidance is provided in a table as reproduced below.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

It also makes the point that the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation, including the level of the noise in absolute terms and how it might compare with the underlying background noise, the impulsiveness or intermittence pattern of the noise, its spectral content, and the time of day. It discusses in very general terms the issues to consider when introducing noise sources to existing noise sensitive area, new residential development in areas affected by existing noise sources (most of which have their own specific guidance, such as BS 4142, BS 8233, etc.) and the potential impact on wildlife.

3.2 BS 8233

BS 8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations.

Table 4 of BS 8233 gives the desirable criteria for indoor ambient noise levels for dwellings as follows:-

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

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,16hour}$	45 dB $L_{Aeq,16hour}$

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions. Note that the new version does not explicitly state criteria for bedroom noise in terms of dB L_{Amax} .

Garden area criteria are unchanged with 50 dB L_{Aeq} and 55 dB L_{Aeq} being considered desirable and reasonable respectively.

Note that the new version of BS 8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

3.3 BS 4142

BS 4142 was updated in November 2014. The standard is very complicated but, basically, it describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes
- sound from fixed installations which comprise mechanical and electrical plant and equipment
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Characteristics and Context

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, we need to add a character correction to the specific sound level to obtain the rating level.

These features can include tonality, impulsivity and intermittency with corrections typically ranging potentially from 0dB to 9 dB. Corrections at the higher end would represent characteristics which are highly perceptible in the context of the ambient noise as a whole. Corrections at the lower end would represent characteristics which are just perceptible in the presence of the ambient noise as a whole,

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 effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Assessment

We obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and considering the following.

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) 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 low impact, depending on the context.

Where the initial estimate of the impact needs to be modified due to the context, pertinent factors need to be taken into consideration, including the following.

1) The absolute level of sound.

For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound.

We need to consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

3.4 Music Noise

Music noise criteria are a subject of considerable debate. However, we can keep things simple here by the fact that only background music is proposed. Music noise is also covered in 3.4 below.

3.4 MCC Planning and Noise Technical Guidance

Manchester City Council has produced a very comprehensive guidance document covering most situations where noise is an issue for planning.

Relevant to this application are the sections on *Entertainment Venues*, and *Noise and Vibration from Fixed Plant/Equipment*.

Entertainment Venues

Relevant extracts from the MCC guidance are as follows:-

There is a lack of consensus on an assessment method for noise levels within habitable rooms with regard to entertainment noise. The design aim however, should be to design to 'inaudible'. The building structure is therefore key, and will usually involve a high performing solution in loud music venues.

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We would agree that the design aim should be for music to be inaudible (or *virtually* inaudible, as clarified later, due to the difficulty giving an absolute and unambiguous definition to the word "inaudible").

The guidance further adds:-

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.

It is not clear why the guidance singles out new residential when the section seems to be primarily related to new entertainment venues, or why it emphasises structurally connected buildings, but the criterion should be transferable to all relevant situations.

The USP, and very nature of The Washhouse, is that of a "Secret Bar" and this brand in particular appears take the "secret" side of it further than most. As such the noise generation is background music only and normal conversational speech being dominant. The MCC guidance however states the following:-

Applicants and consultants should note that although a particular business model may require a 'chilled out' or 'acoustic' venue, planning approval for an entertainment venue will remain in place as long as the development exists. Subsequent owners or tenants may wish to provide much louder entertainment in the future.

For this reason applicants and consultants should predict the noise impact of a proposed entertainment venue using noise levels that are representative of those found in 'typical' venues of the kind being applied for. Consultants should provide their rationale for using particular noise levels and reference the source of the noise levels used during their predictions.

1

[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.

The first paragraph is potentially exceptionally onerous in this case as it seems to imply that we should assess and design as if the proposal was for something much more noisy, and we would suggest that such an approach would be unreasonable. However, the second paragraph seems to suggest that we can approach the assessment in terms of typical venues of the type. In fact the phrase “Entertainment Venue” is probably misleading and “Hospitality Venue” would be more appropriate, which is not specifically covered by the MCC guidance.

Noise and Vibration from Fixed Plant/Equipment

It is our understanding that no new equipment is proposed, but the following is stated in the MCC guidance:-

‘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 (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.

The guidance makes many references to carrying out assessments in accordance with BS 4142. While we understand the basic rationale of the above criterion, we must point out that it is far more stringent than BS 4142. Firstly, there are no requirement in BS 4142 that levels should be 5 dB below background. Secondly, BS 4142 crucially rates the impact based on the numerical assessment and adds “*depending on the context*”. This is one of the most important and routinely misunderstood aspects of a BS 4142 assessment. Without it, equipment would be assessed in the vibrant heart of a city centre the same as a quiet residential suburb.

However, as stated, there is unlikely to be any new equipment and, if there is, we show later that it is likely to be well below all criteria anyway, and controllable by a suitable condition.

4.0 SURVEY DETAILS

It was agreed with Environmental Protection Officers that there was no advantage reassessing the background/general noise climate in the current lockdown situation, particularly given that we carried out a survey for the original application in 2015.

Full details are stated in the original report.

The measurements we carried out from approximately 22:00 on 4th February 2015 (a Wednesday evening) and up until 02:30 in the early hours of the same night. There was actually very little variation in the underlying background levels as the steady noise was from existing mechanical equipment.

The main measurement positions were as shown on the plan below.

The microphone was 1.5 m above ground. It was generally around 1m from facades (the rear alley was narrow and a position to the front had to be on the pavement out of the way of passing pedestrians).



5.0 RESULTS AND DISCUSSIONS

Generally the area was noisy, even though it was a Wednesday night. A Sunday or Monday might be a little quieter but a Friday or Saturday would be much noisier.

The survey times were chosen to cover the night time impact but the underlying background noise comprised steady mechanical equipment and so unlikely to change at any time.

5.1 Background/Ambient Noise

Basic results were as follows:-

<i>Time</i>	<i>Position</i>	<i>Index</i>	<i>dB(A)</i>
Log Average	1	Leq	55
		Lmax	63
		L90	53
	2	Leq	57
		Lmax	71
		L90	53
	3	Leq	69
		Lmax	79
		L90	58

<i>Time</i>	<i>Position</i>	<i>Index</i>	<i>dB(A)</i>
Lowest (in terms of LA90)	1	Leq	55
		Lmax	63
		L90	52
	2	Leq	55
		Lmax	72
		L90	52
	3	Leq	64
		Lmax	76
		L90	57

Positions 1 and 2 were in the alley to the rear called Well Lane or Thornley Brow, depending on the source consulted. The noise was completely dominated by mechanical plant and occasional taxis. Music noise was also audible at times.

Position 3 was on Shudehill. Here the noise was clearly dominated by traffic and the general pedestrian bustle of the area.

5.2 Review of Original Assessment

The assessment was for a “Secret Bar” and, as its name suggests, it is a venue which will be visually and aurally hidden from the outside world. In fact this brand appears take the “secret” aspect further than most in that it appears to the outside to be a laundrette, which is essentially the entrance lobby. Admittance is based on bookings only. Even the website suggests that it is simply a laundrette, albeit in a somewhat tongue-in-cheek way. It provides table service food and drink and the music is background music only and should be inaudible outside and certainly well below inaudible within nearby residential properties.

The original application was for the ground floor only.

Internal to External noise Breakout

The original assessment assumed a boisterous atmosphere to assume a worst case, with internal noise levels as follows.

<i>Boisterous Bar Levels</i>	<i>Index</i>	<i>dB(A)</i>
Internal	Leq	86
	Lmax	101

Note that full details were presented in Appendix 2 of the original report, and reproduced in Appendix 2 here for convenience, including all levels in octave bands (levels across the audible frequency range).

Assuming this level is found at all internal surfaces, the noise level outside a basic 40mm timber door (no lobby) was predicted to be :-

<i>Predicted Externally</i>	<i>Index</i>	<i>dB(A)</i>
Sound pressure level at notional 1m externally	Leq	47
	Lmax	62

Even at 1m, this was significantly below background noise levels at any position and at any time.

Breakout to Adjoining Properties

We are advised at the time that no residential property adjoined the proposed bar. There were offices and retail to either side and at first floor level. As a worst case, we carried out an assessment of potential breakout to the offices above via the party floor. It was clearly highly unlikely that the boisterous bar levels used above would be present during office hours but, if they were, an on-site sound insulation of

around 40 to 50 dB D_w would give around 36 to 46 dB L_{Aeq} in the offices, which would be entirely suitable for an office environment. As the levels are dominated by speech, there will not be a bass thump issue.

Our original report gave minor general advice which we understand has been implemented. We advised that we could see no practical reason to impose conditions to control internal noise other than perhaps to submit details of the background music system, doors specification and ceiling treatment for approval.

Mechanical Plant

The rear alley was already very noisy with existing equipment. Our original report recommended a noise limit at 1m of 62 dB L_{Aeq} , to give a BS 4142 assessment of *"low impact depending on the context"*. Reducing this by a further 5 dB would comply with the preferred MCC criterion. We suggest that this is not a reasonable criterion in the context, but it should be achievable. The report suggested a condition requiring details to be submitted and approved.

Customers

The area constantly bustles with people and it is instinctively obvious that the impact should be low. There is no outside drinking and so the impact is likely to be restricted to a few smokers only. A brief assessment was carried out and concluded that the impact is likely to be negligible.

5.3 Operational Impact

The existing ground floor operation has been trading for several years now and we understand that there have been no formal or informal complaints about noise from nearby offices, retail or residential.

This is of course crucial information as it does not rely on the inevitable uncertainties of design assumptions, etc. Although we have not witnessed it ourselves, and cannot realistically do so under lockdown, we understand that the subjective impact is essentially zero, and we would intuitively expect that to be the case.

5.4 Proposed Extension

The current application is for essentially the same use as the ground floor but extended to first floor, plus toilets and storage at second and third floor.

We note that one area of the proposed extension is referred to on drawings as "Private Hire Area". We understand that this will be used for meetings and occasional low noise events such as tastings, cocktail classes or similar.

In all cases, we discuss the extension with the same worst case assumptions of internal noise levels of a boisterous bar.

Internal to External noise Breakout

The original report predicted levels at 1m outside a single timber door of 47 dB L_{Aeq} and 62 dB L_{Amax} . Even at 1m, this was significantly below background noise levels at any position and at any time. Applying the same basic calculations to large floor window, basic thermal double glazing would give levels around 51 dB L_{Aeq} and 66 dB L_{Amax} at 1m, still below background noise levels even at 1m.

Appendix 2 of the original report is reproduced in Appendix 2 here, but with Glazing illustration added in.

Breakout to Adjoining Properties

There is no longer any issue with party floors to offices above, although there will be some retail below parts of the first floor extension.

The party floor to the retail is based on a concrete floor. We do not know the thickness or what ceiling treatments are below it, but even a basic 100mm floor, with no ceiling and no top floor covering has a performance of 49 dB R_w . Appendix 2 shows a calculation of the break-through to the retail below. It gives us a predicted sound insulation of at least 42 dB D_w "on site" performance. This can be expected to give around 47 dB L_{Aeq} in the retail below which would be more than adequate. It is also reasonable to assume that the sound insulation of the masonry walls to the adjacent uses will be far higher, and obviously the same as on the ground floor.

Mechanical Plant

We are advised that there will be no additional mechanical plant, but a condition requiring details to be submitted and approved would be more than adequate if any is proposed in future.

Customers

Regarding the potential for customers outside, it would be reasonable to assume that there would be more as a result of the extension. However, our original report showed that 9 to 12 people outside would have negligible impact, even directly outside the entrance. There will continue to be no outside drinking and so the only outside customers would be occasional smokers. The front of the site is busy with a general bustle of people and we would still expect the impact to be negligible.

6.0 CONCLUSIONS/RECOMMENDATIONS

The area surrounding the proposed development is already extremely busy with road traffic, mechanical equipment, pedestrians and bars, some of them open until well into the early hours.

The proposed bar is to be a "Secret Bar" and, by design and branding, will be visually and aurally hidden from the outside world. It is table service food and drink and the music inside will be background music only.

There is already extraction to the rear but this is to an alley which is already very noisy with mechanical plant. No additional mechanical equipment is proposed but it would be a straight forward process to condition any future mechanical plant so as to keep within reasonable noise limits.

We could not positively locate any residential property in the vicinity, although we understand that some properties to the rear and some further up Shudehill may be designated as such. Even so, the nature of the proposed "Secret Bar" and the already bustling atmosphere of the area means that the existing ground floor area has no significant impact at all, and it is inconceivable that the proposed will have any more.

We can see no practical reason to impose conditions to control internal noise other than perhaps to submit details of the background music system. If planners are concerned about future occupiers, then a condition requiring details of future sound systems to be submitted and approved should be adequate.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of $20\mu\text{Pa}$ or a sound power of 1pW .

A sound pressure level or SPL should be expressed in dB(re. $20\mu\text{Pa}$). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to given an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq} . For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq} . The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max} . For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax} .

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceeded for a percentage of the time. L_n is the index representing the level exceeded for $n\%$ of the measurement period.

The unit is dB L_n . For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{A_n} .

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceeded for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band from low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq} , L_{max} , L_n , etc. as defined above.

Appendix 2

Measurement and Calculation Details

External Measurements

Time	Position	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
00:42	1	Leq	56	61	59	54	53	52	47	42	38
		Lmax	66	68	66	61	60	62	61	52	50
		L90	53	58	56	52	50	49	44	39	30
00:47	2	Leq	56	61	58	52	51	54	46	42	39
		Lmax	70	66	63	55	61	70	57	56	53
		L90	51	59	56	51	48	47	42	35	29
00:52	1	Leq	55	63	59	54	52	51	46	41	36
		Lmax	62	68	64	58	57	59	54	50	51
		L90	53	61	56	53	49	49	43	39	29
00:57	2	Leq	55	61	58	54	52	51	44	39	33
		Lmax	72	72	65	69	70	70	59	56	53
		L90	52	57	55	52	49	47	42	34	22
01:07	3	Leq	64	69	65	63	60	61	55	47	37
		Lmax	76	68	67	65	73	71	69	66	46
		L90	57	63	61	57	53	53	46	39	30
01:17	1	Leq	55	64	60	55	51	52	46	40	40
		Lmax	61	71	64	59	55	55	49	51	56
		L90	53	60	57	53	50	50	44	36	25
01:22	2	Leq	57	63	59	56	53	51	48	48	43
		Lmax	69	68	63	65	58	56	63	65	55
		L90	53	61	57	54	50	49	44	38	29
01:27	1	Leq	55	63	58	54	52	50	46	40	41
		Lmax	63	69	63	58	57	55	57	51	56
		L90	52	60	56	52	49	48	42	35	25
01:32	2	Leq	57	64	60	56	53	52	51	43	40
		Lmax	69	70	68	63	61	61	66	56	52
		L90	53	60	56	53	50	49	44	36	25
01:42	3	Leq	68	74	71	67	65	65	58	54	45
		Lmax	78	85	79	71	79	66	66	63	58
		L90	57	65	64	56	54	52	47	41	33
01:52	1	Leq	55	61	58	54	51	50	46	40	36
		Lmax	62	69	65	57	60	58	51	45	49
		L90	53	57	54	53	50	48	44	37	25
01:57	2	Leq	59	61	58	56	56	56	49	40	36
		Lmax	75	66	63	60	71	74	62	49	50
		L90	53	59	56	53	51	49	44	37	27
02:02	1	Leq	55	61	58	56	52	51	46	40	37
		Lmax	62	68	63	59	61	56	52	45	51
		L90	54	58	55	54	50	50	45	38	29
02:07	2	Leq	58	64	60	57	54	53	50	44	38
		Lmax	66	73	69	65	62	59	59	54	48
		L90	55	61	56	54	52	51	46	39	29
02:17	3	Leq	72	77	77	69	64	69	65	60	51
		Lmax	82	78	78	67	78	80	70	64	63
		L90	59	62	63	58	53	55	52	44	32

Summary

Time	Position	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Log Average	1	Leq	55	62	59	55	52	51	46	41	38
		Lmax	63	69	64	59	59	58	56	50	53
		L90	53	59	56	53	50	49	44	38	28
	2	Leq	57	63	59	55	53	53	48	44	39
		Lmax	71	70	66	65	67	69	62	59	52
		L90	53	59	56	53	50	49	44	37	27
	3	Leq	69	74	73	67	64	66	61	56	47
		Lmax	79	81	77	68	77	76	69	65	59
		L90	58	64	63	57	54	53	49	42	32
Time	Position	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Lowest (in terms of LA90)	1	Leq	55	63	58	54	52	50	46	40	41
		Lmax	63	69	63	58	57	55	57	51	56
		L90	52	60	56	52	49	48	42	35	25
	2	Leq	55	61	58	54	52	51	44	39	33
		Lmax	72	72	65	69	70	70	59	56	53
		L90	52	57	55	52	49	47	42	34	22
	3	Leq	64	69	65	63	60	61	55	47	37
		Lmax	76	68	67	65	73	71	69	66	46
		L90	57	63	61	57	53	53	46	39	30

Internal Edge-of Room Noise

<i>Boisterous Bar Levels</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
Internal	Leq	86	80	78	76	83	83	79	73	65
	Lmax	101	92	91	88	98	98	93	92	86

Breakout to Environment

<i>Timber Door</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
Door Area Correction	2 m ²		3	3	3	3	3	3	3	3
Sound Power Level Inside Door	Leq	89	83	81	79	86	86	82	76	68
	Lmax	104	95	94	91	101	101	96	95	89
40mm solid timber door	SRI	-	-19	-25	-29	-30	-27	-30	-34	-33
Inside to Outside	-	-	-6	-6	-6	-6	-6	-6	-6	-6
SWL SPL	-	-	-8	-8	-8	-8	-8	-8	-8	-8
Sound pressure level at notional 1m externally	Leq	47	50	42	36	42	45	38	28	21
	Lmax	62	62	55	48	57	60	52	47	42

<i>Basic Double Glazing</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
Window Area Correction	6 m ²		8	8	8	8	8	8	8	8
Sound Power Level Inside Window	Leq	94	88	86	84	90	90	87	81	73
	Lmax	109	100	99	96	106	105	101	100	94
Basic Double Glazing	SRI	-	-15	-21	-17	-25	-35	-37	-31	-31
Inside to Outside	-	-	-6	-6	-6	-6	-6	-6	-6	-6
SWL SPL	-	-	-8	-8	-8	-8	-8	-8	-8	-8
Sound pressure level at notional 1m externally	Leq	51	59	51	53	51	41	36	36	28
	Lmax	66	71	64	65	67	56	50	55	49

Breakout to Adjoining Properties

<i>To Fretail below</i>	<i>Index</i>	<i>dB(A)</i>	<i>63</i>	<i>125</i>	<i>250</i>	<i>500</i>	<i>1k</i>	<i>2k</i>	<i>4k</i>	<i>8k</i>
Floor Area Correction*	20 m ²		13	13	13	13	13	13	13	13
100mm Concrete	SRI	-49	-31	-37	-36	-45	-52	-59	-62	-59
On-site degradation	SRI	5	5	5	5	5	5	5	5	5
Effective performance	SRI	-44	-26	-32	-31	-40	-47	-54	-57	-54
Est room volume below*	60 m ³		-	-	-	-	-	-	-	-
Est rev time below	0.8 s		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Level Difference	-	-42	-24	-30	-29	-38	-45	-52	-55	-52

* note that these figure are estimated based on the area at the front of the first floor over the news agents. Note that, in this case, the figures cancel each other out so the actual value does not matter.