WHAT MAKES A NOISE LIMIT ACCEPTABLE?

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1 INTRODUCTION

Around 40 years ago, the author found himself periodically having to visit various Council owned housing estates in London to see a resident who was complaining about a noise affecting them. Very early on in the visit, having established that I could hear the said noise (which was not always the case) I was asked “What’s the limit, then?” At this point I had to explain that there were no limits as such for this type of situation but that I would carry out an investigation and endeavour to find the source of the noise and identify measures to reduce its impact. (More often than not, it was an un-isolated toilet extract fan).

Around 20 years ago, when the Environmental Noise Directive was being transposed into UK law, some pressure groups were advocating that the legislation should include limits on the noise exposure experienced at residential properties from road, rail and air transport sources. The Government at the time resisted the temptation to include such limits in the legislation, and, as hopefully will be seen, that was the correct decision to make.

This paper discusses some of the issues relating to the use of noise limits, including

- what noise limits mean;
- in what circumstances they might be used;
- the question of enforcement; and
- what other options there might be to avoid using noise limits.

2 WHAT IS MEANT BY A NOISE LIMIT?

As implied by the first example in the Introduction, having a noise limit for a particular situation is an attractive means of noise management. If the sound exceeds the limit value, then something has to be done to reduce the level. If the limit value is not exceeded, nothing more needs to happen.

But what does the limit value mean? If exceeding it requires action, it can be inferred that the impact is such that the effects on health and quality of life are at such a level that they must not occur. And this is regardless of the utility of the noise making activity, including any social, economic and these days, arguably, the climate benefits that arise. So drawing on language found in the English noise management policy, if the exposure is above the limit, then it is unacceptable.

2.1 The National Planning Policy Framework[1]

Those working in consultancy in England should be familiar with this document. It was first published in 2012 and has undergone a couple of revisions since then. The paragraphs relating to noise have broadly remained the same, certainly in terms of the required outcome, although the relevant paragraph numbers do tend to alter with each revision. The current version came out in 2021. Having said that, a further revision is expected this year, but according to the relevant Government website, its publication has been delayed.

In the 2021 version, paragraph 174 (e) states:

> *Planning policies and decisions should contribute to and enhance the natural and local environment by: …*
>
> ***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. …;*

Although included with other issues, the bold text shows the policy requirements relating to noise. Therefore, in policy terms, any noise limit applied relates to the threshold above which an unacceptable risk or an unacceptable level of noise pollution occurs. It is an absolute and must not be exceeded, under any circumstances, in order to comply with policy.

2.2 Planning Practice Guidance (Noise)[2]

The web-based Planning Practice Guidance on Noise (PPG:N) includes a Noise Exposure Hierarchy Table[3], which describes the type of impact that is associated with various effect thresholds. Figure 1 shows that table

Figure 1
Noise Exposure Hierarchy Table

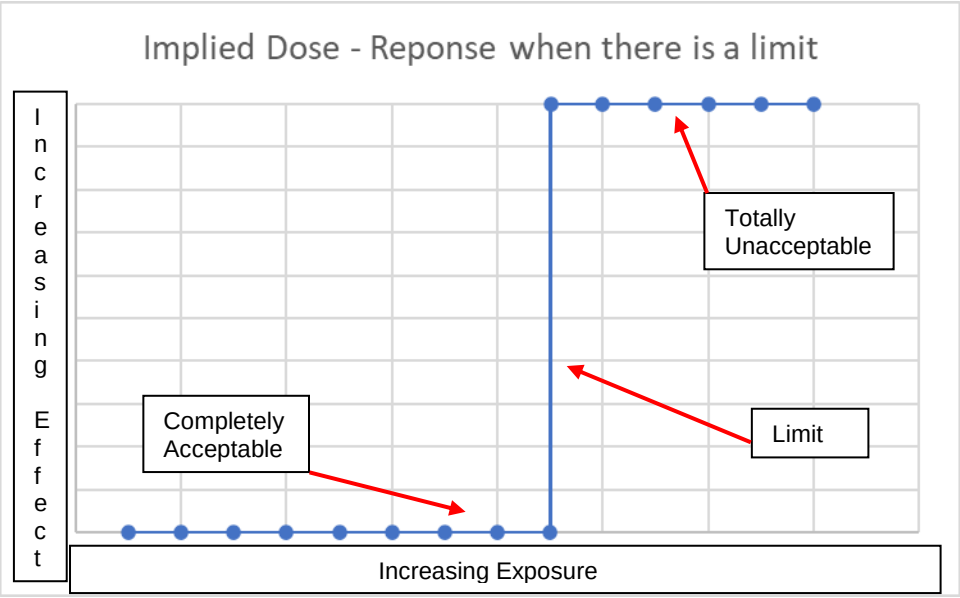
Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

It can be seen that if the exposure is “Present and very disruptive”, this is defined as an Unacceptable Adverse Effect and must be prevented. Consequently, the inference is that any noise limit lies at the boundary between a Significant Observed Adverse Effect and an Unacceptable Adverse Effect.

2.3 The Effect of a Noise Limit

If a situation has a noise limit, the implied dose-response relationship follows that shown in Figure 2.

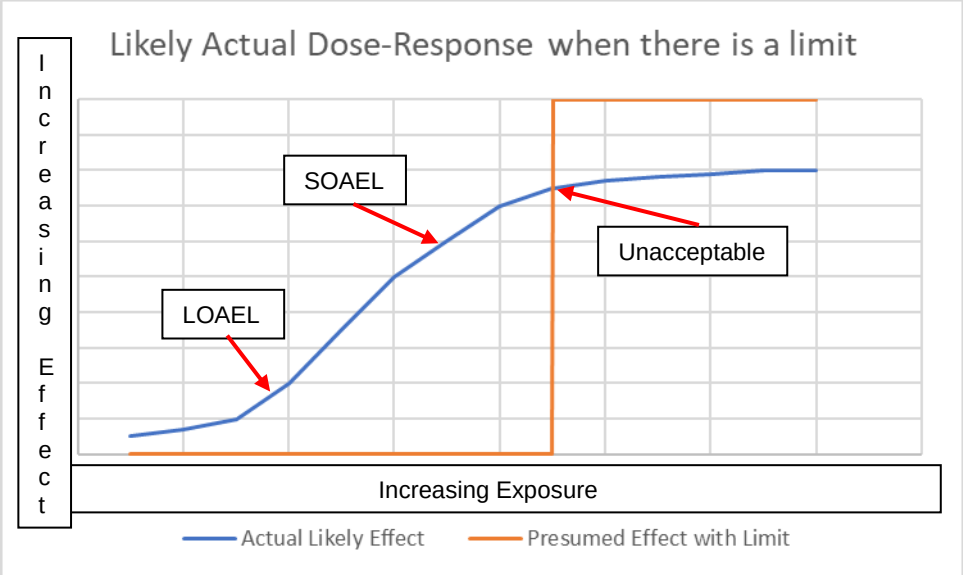
Figure 2
Implied Dose-Response Relationship when a Noise Limit applies



If there is a defined noise limit, the noise maker is allowed to cause an impact to just below the noise limit. But associated with that, is the implication that there is no adverse impact up until the limit is exceeded.

However, the actual dose response would look something like that shown in Figure 3.

Figure 3
Likely actual Dose-Response Relationship when a Noise Limit applies



It can be seen that adverse and significant adverse effects can occur before the limit is reached.

Therefore, going back to the second example mentioned in the Introduction, the likely consequence of setting a limit for, say, the exposure of residential properties to road traffic noise would mean that as long as the impact was kept below the limit, all would be well. Depending on the level of exposure at which the limit is set, that may not be the case.

If the limit was set at a relatively low value, many locations would exceed it already and there would have to be serious changes in society's behaviour to meet that limit. Set it at a relatively high level, the fear would be that permitted traffic noise levels would gradually rise everywhere to just below the limit, and this would not be a desirable outcome. Hence the Government did make the right decision 20 years ago not to have such a limit.

Notwithstanding these arguments, the management of noise from construction sites and from concerts tend to operate with exposure limits in place. These values must not be exceeded, but the exposure can rise to that limit value.

The simplicity for noise management in operating with noise limits in place cannot be ignored. Nevertheless, if a noise limit is set, it is important to consider what it means in terms of effect and actually whether operating with such a limit does comply with national policy and adequately protects health and quality of life.

3 WHAT IS ACCEPTABLE?

Having discussed an 'unacceptable' impact, it is worth considering the word 'acceptable'. It is often to be found in reports describing an expected outcome.

If this is done then that would be acceptable

But what is meant by acceptable? Acceptable to whom? The person on the mythical Clapham omnibus? The actual individual concerned? The report's author? The local Councillors? Alternatively, by acceptable, does it actually mean – the outcome will not be too bad', or 'given the circumstances this should be all right'?

It is worth noting that although 'unacceptable' has a clear meaning in policy, as discussed above, the word 'acceptable' does not appear in policy. Having said that it is possible to find statements from politicians and other civil servants not well versed in the details of noise management policy who incorrectly use the word 'acceptable'.

The problem with using the word 'acceptable' to define the outcome to be achieved, is that being not quite 'unacceptable' meets that requirement. And as the Noise Exposure Hierarchy table shows, having an outcome that is not quite 'unacceptable' may result in a far greater adverse effect than intended when suggesting what will occur, or is occurring, is acceptable.

The conclusion, therefore, is to avoid using the word 'acceptable' when describing the desired outcome. Phrases like – 'will comply with national policy'; or 'will avoid significant adverse effects'; or 'is likely to cause an adverse effect for some of the time' are much more precise and less susceptible to ambiguity.

4 SETTING A NOISE LIMIT

If a noise limit is set in the form of "…shall not exceed a certain level/exposure", there has to be a process that enables compliance with that limit to be met. And that involves measurement.

For a noise limit to be effective, it has to be possible for the relevant noise exposure to be measured unambiguously so that compliance with the limit can be checked. There are several factors to address:

Firstly, there is the noise indicator used. Clearly, that could be any indicator as long as it properly reflects the noise impact of the source in question and, if the value is constrained, means that effective management of the noise source occurs.

Secondly, the measurement averaging time cannot be too long otherwise it will involve attended measurements over that period, which may prove impractical or costly. There is an alternative of checking compliance with unattended monitoring, but that raises other issues, as set out later.

An example of dealing with a long averaging time can be found in Calculation of Road Traffic Noise[4] (CRTN). This document describes how eligibility for compensation under the terms of the Noise Insulation Regulations[5] (NIR) can be determined by measurement. The indicator that has to be used is the $L_{A10,18h}$, but instead of measuring for the complete 18 hour period, a shortened method can be used, subject to certain conditions being met. CRTN states that measurements of the L_{A10} may be made over any three consecutive hours between 1000 and 1700. The arithmetic mean of the three $L_{A10,1h}$ values is determined with 1 dB(A) being subtracted from that value to determine the $L_{A10,18h}$. Bearing in mind that the relevant specified noise level for eligibility under the NIR is 68 dB(A), CRTN states that this method can only be used if the result is greater than 69 dB(A) or less than 66 dB(A). In other words, clearly above the specified level or clearly below it. If the result falls between those two numbers, the full 18 hour measurement is needed.

This procedure recognises the challenge of measuring over 18 hours, and that it is possible to use a shortened method. However, it also recognises that there is inherent uncertainty with the shortened

method that is too great for the reliable determination of eligibility if the result is close to the specified level.

Finally, potentially, the most important factor is the requirement for the microphone to measure solely the sound from the source of interest and not any other. Clearly, if that source dominates the soundscape, then this criterion is met. But if not, there must be uncertainty whether or not the measured level is only from the source of interest and, hence there is uncertainty over whether compliance has occurred.

Any noise limit that is set around or even below the prevailing sound level cannot meet this requirement as it will not be possible to check compliance with certainty. It is interesting to note that for construction noise and concert noise, where limits are widely used, for the most part the levels are well above the prevailing sound level. But this is not always the case and those managing the noise level from these sources in this type of situation have to make assumptions about the level from other sources in order to test compliance. This is not impossible to achieve but is quite difficult.

This point is also covered in CRTN where it states;

> *For the purposes of the Noise Insulation Regulations and where there are no other significant noise sources in the area (or they are separately identifiable), measurements…may be appropriate in such circumstances.*

Consequently, there has to be certainty that any measurements used to check compliance with a noise limit are measuring just the source of interest. Of course, if unattended monitoring is used, this outcome can rarely be guaranteed.

5 NOISE LIMITS AND PLANNING CONDITIONS

Any planning conditions imposed have to meet 6 tests for them to be valid. These tests have existed for around 40 years and they are currently set out in the Planning Practice Guidance – Use of Planning Conditions[6]. Within that document, it states:

> ***5.1.1 What should a local planning authority do to ensure that the tests in national policy have been met?***
>
> *Paragraph 55 of the National Planning Policy Framework makes clear that planning conditions should be kept to a minimum, and only used where they satisfy the following tests:*
>
> 1. *necessary;*
> 2. *relevant to planning;*
> 3. *relevant to the development to be permitted;*
> 4. *enforceable;*
> 5. *precise; and*
> 6. *reasonable in all other respects.*
>
> *These are referred to in this guidance as the 6 tests, and each of them need to be satisfied for each condition which an authority intends to apply.*

It goes on to state:

> ***Are there any circumstances where planning conditions should not be used?***
>
> *Any proposed condition that fails to meet one of the 6 tests should not be used. This applies even if the applicant suggests or agrees to it, or it is suggested by the members of a planning committee or a third party.*

Consequently, any planning condition must meet all 6 tests set out above.

In the context of potentially setting a noise limit as part of a planning condition, there are two tests which are particularly relevant. The first is "5 – precise". It has to be unambiguously clear what is to be measured, where it is to be measured and for how long. Careful consideration can usually mean that this test is met.

The more challenging test is "4-enforceable". It has to be possible to measure the source being constrained at the specified location and over the specified time period, without any interference from other sound sources. More often than not, this test is not met, especially when the noise limit is set at or near the prevailing background sound level.

Consequently, when considering having a noise limit in a planning condition, it is essential to be certain that the limit is enforceable and the measurements made to check compliance would be reliable. Otherwise the condition cannot be used.

6 WHEN IS A NOISE LIMIT EXCEEDED?

If a noise limit has been set, and there are no issues regarding the sound source being dominant and easily measurable, is an exceedance of say 0.1 dB truly an exceedance? Colleagues who deal with instrumentation will be able to discuss this point in far more detail, but it seems likely that there must be some uncertainty relating to instrumentation accuracy. Furthermore, given that people cannot detect such a difference, is there really an exceedance?

On that latter point, if a noise limit is used as part of the noise management, then for the integrity of the process, any exceedance, regardless of how small is an exceedance. In some circumstances, there is an acknowledgment of such uncertainties such that if the limit is 75 dB(A), there is some latitude of 1 - 2 dB(A) before there is definitely an exceedance. Whilst pragmatic, it does dilute the robustness of the process.

7 IS THERE AN ALTERNATIVE TO USING A NOISE LIMIT?

As is often the case in acoustics, the answer is 'it depends'. Having said that, for new noise sources, the use of design targets seems to work, with compliance being demonstrated by calculation using a methodology approved by the local planning authority. The advantage for the developer is that the planning condition can be discharged once the calculation is accepted. With a noise limit relying on measurement for compliance, the condition is never discharged until the source of noise no longer occurs.

For the local authority, such a condition has the advantage of enabling them to seek to achieve targets at or below the prevailing sound level. (Although whether such a requirement would be

policy compliant would be debatable). Notwithstanding that point, using a noise limit in a condition to secure such an outcome cannot occur as it would be unenforceable.
Furthermore, if the new noise source is a premise (as defined by the Environmental Protection Act 1990[7]) ,should something change or something goes wrong and those affected start to complain about the noise, the statutory nuisance legislation can be used.

8 CONCLUSION

Hopefully, it can be seen that there are several challenges if noise limits are used as a means of managing noise. The simplicity of having noise limits cannot be ignored but there is the risk of unintended consequences (e.g. inadvertently permitting adverse or even significant adverse effects to occur even though the limit is met). There is also the question of enforceability if there is the intention to use the limit as a planning condition.

As has been mentioned, there are situations where noise limits have been and are used as a means of noise management, but overall, great care and consideration needs to be taken if identifying noise limit seems to be the approach to take. As an alternative, setting a design target in a condition, which is discharged by calculation does work and provides advantages to both developer and regulator.

Great care is also needed if using the word ‘acceptable’. Because ‘unacceptable’ has a clear meaning in policy – seeking to achieve an outcome that is ‘acceptable’ could allow the result to be ‘not quite unacceptable’ which is not likely to be what was intended.

Acousticians spend much of their time dealing with numbers; it is, though, also very important that the right language is used as part of an assessment. If words such as ‘limit’ and ‘acceptable’ are to be used, it is essential that their precise meaning is recognised and understood.

9 REFERENCES

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