Guidance -
Noise and vibration management: environmental permits

July 2021

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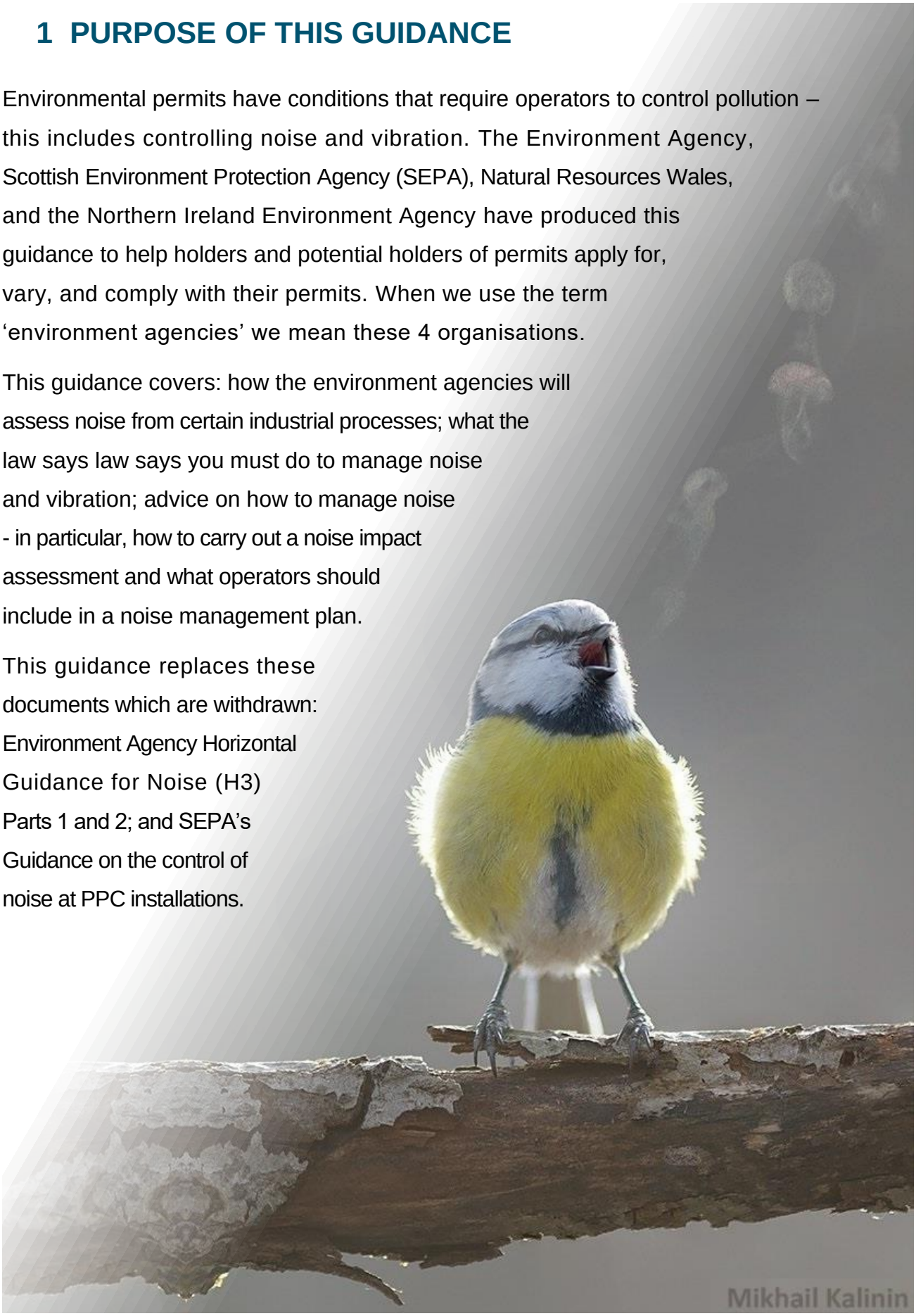
1 PURPOSE OF THIS GUIDANCE

Environmental permits have conditions that require operators to control pollution – this includes controlling noise and vibration. The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales, and the Northern Ireland Environment Agency have produced this guidance to help holders and potential holders of permits apply for, vary, and comply with their permits. When we use the term 'environment agencies' we mean these 4 organisations.

This guidance covers: how the environment agencies will assess noise from certain industrial processes; what the law says law says you must do to manage noise and vibration; advice on how to manage noise - in particular, how to carry out a noise impact assessment and what operators should include in a noise management plan.

This guidance replaces these documents which are withdrawn: Environment Agency Horizontal Guidance for Noise (H3) Parts 1 and 2; and SEPA's Guidance on the control of noise at PPC installations.



2 WHY REGULATING NOISE IS IMPORTANT

The environment agencies have a duty to regulate noise from certain industrial processes to protect and improve the environment, public health and wellbeing.

Noise was defined in the Wilson report published in 1963 as ‘unwanted sound’. In this guidance the term ‘noise’ includes vibration unless we have indicated otherwise.

Noise is recognised by the World Health Organization (WHO)[1] as the second most harmful environmental stressor in Europe (behind air pollution). The harmful effects come from the stress reactions it causes in the human body (which continue during sleep). These reactions can lead to increased heart rate, high blood pressure, cardiovascular disease, premature deaths, cognitive impairment, sleep disturbance, hypertension, and annoyance. The latest WHO figures estimate 16,000 premature deaths and 1.6 million healthy life years are lost across western Europe each year because of environmental noise pollution.

Noise is often a greater issue for the health of deprived communities, who tend to have housing in noisier areas (for example, closer to industry, airports, or busy roads). These communities have an increased rate of hospitalisation for hypertension and cardiovascular disease. Cognitive impairment in children can reduce levels of educational attainment and impact upon future life chances.

Preventing or controlling noise at source is usually the most appropriate and cost-effective way of protecting and improving the environment. For example, rather than retro-fitting noise barriers to reduce a noise problem, you would buy quiet equipment, keep it well maintained, and site it away from noise sensitive receptors (NSRs).

[1] WHO Environmental Noise Guidelines for the European Region 2018

3 NOISE ASSESSMENT REQUIREMENTS

3.1 When a noise assessment is needed

Operators (or permit applicants) must consider the potential noise impact of their site. They may need to carry out noise impact assessments at the permit application stage, when applying to vary a permit, or to comply with specific permit conditions.

The environment agencies will treat noise in the same way as any other polluting emission. If noise is audible at any of the following types of locations, they will regard it as 'possibly causing and impact': residential properties, schools, hospitals, offices, public recreation areas, other NSRs, or noise sensitive habitats. Where noise is possibly causing an impact, the operator must carry out an assessment to determine the level of impact, and how much work needs to be done to prevent or minimise noise pollution. Operators must prevent significant pollution and also comply with the requirements to use 'appropriate measures'[2] or 'best available techniques' (BAT[3])[4] to prevent, or minimise, noise pollution.

3.2 Required competency and standards

Noise impact assessments should be carried out to an appropriate standard and by competent personnel (for example, holders of an Institute of Acoustics Diploma in Acoustics and Noise Control, or Certificate of Competence in Environmental Noise Measurement with relevant experience). Monitoring noise in the environment is a specialist field. Monitoring should be carried out by a qualified acoustician, who can demonstrate competency in environmental work (rather than for example occupational health and safety work).

You must use BS 4142[5] to quantify the level of environmental noise impact from industrial processes. In rare circumstances, other methods may also be appropriate (for example, NANR45[6] for assessing existing low frequency sound inside a residential property). If you want to assess impact using another method, you should discuss and agree this with your regulator before you start the assessment.

[2] Waste Framework Directive 2018/851

[3] Landfill Directive Installations: for "BAT to prevent or minimise noise pollution" read "all reasonable steps taken to prevent noise nuisance"

[4] In this guidance Appropriate Measures and Best Available Technique are equivalent and interchangeable

[5] BS 4142: Methods for rating and assessing industrial and commercial sound

[6] NANR http://usir.salford.ac.uk/493/1/NANR45-procedure_rev1_23_12_2011.pdf

Where vibration is an issue, you should contact the regulator for specific advice.

3.3 How to do a noise impact assessment – 4 steps

There are 4 steps you must follow when you carry out a noise impact assessment. A summary of these follows. You will need to present your findings in a noise impact assessment report. If you do not include all the information required by the relevant standards, we are likely to reject your submission. To support this guidance, we have produced a suggested structure for a noise impact assessment report (at Appendix 1). This clarifies the level of detail the environment agencies expect to see.

Step 1 – desktop risk assessment

To do this you:

- identify plant or operations that could be audible at any known (or proposed) NSR (include noise sources that are not routine – for example, emergency pressure relief or venting systems);
- describe and rank the noise sources in terms of their potential off-site impact - note what they sound like and when they operate;
- identify current and proposed NSRs by name, type, location and distance from source; and
- describe the land between your site and the NSR and whether any natural or man-made features could increase or decrease the audibility of the sound at the NSRs.

If noise emissions could cause pollution at a NSR, then you will need to carry out a noise impact assessment. This will be the case in most circumstances. Noise pollution could cause annoyance or loss of amenity at a NSR, such as not being able to have windows open or sit in the garden.

Step 2 – off-site monitoring survey

You should carry out the survey at NSRs using appropriate measurement equipment to the standards defined by BS 4142.

In all noise impact assessments, you must include a comprehensive subjective description of the acoustic environment.

For industrial noise impacts where the sound is neither impulsive nor tonal, but you can readily distinguish it against the usual acoustic environment, the environment agencies will expect you to apply a minimum character correction of +3 decibels (dB) *"other"*. This is unless you can robustly justify that you do not need such a correction.

Note on L_{A90} background sound levels under BS 4142.

BS 4142 requires that when you carry out impact calculations, the noise levels you use should be typical of the period of interest. Specific sound levels can vary due to operational loads, or conditions that affect the transfer of sound energy from one point to another (propagation conditions) – or both. Background sound levels can vary significantly at different times and locations around your site. You may need a series of background sound level monitoring surveys, and more than one noise impact assessment calculation, to reflect these variations in background sound levels.

When considering overall site impact, you must make sure background sound levels at NSRs are not influenced by site noise. When monitoring during *"site-shutdown"* periods, you will need to consider noise from maintenance activities or noise sources such as ventilation, cleaning pumps, and refrigeration units as these are often still operating. If it is not possible to determine the background sound level at NSRs because of site noise, you must use alternative locations and provide information to justify why you have chosen that location.

BS 4142 notes that to assess the typical impact, you must use figures that represent the typical (rather than the lowest) recorded background sound levels. You should also consider worst-case impact scenarios for proposed and existing operations. This is because NSRs are often impacted by atypical sound sources, low background sound, or favourable propagation conditions (such as being downwind from the noise source).

When you apply for a variation, do not include noise from the existing site (before changes) as part of the background or the residual sound levels. Your noise impact assessment must consider all the noise resulting from the proposed variation – the existing site and the variation together. Show both components clearly and then add them together to give a new total for site noise at the receptors. The impact assessment will be based on this new value, known as the 'specific level' in BS 4142.

Step 3 – source assessment

To do this you must quantify emissions from the noisiest items of plant or operations identified in Step 1. Use this data to estimate the impact of these noise sources using BS 4142. You can also use modelling software. You should recognise that there can be significant uncertainty associated with the generic sound power levels in BS 5228[7], the manufacturers' data, and 'as constructed' performance predictions.

[7] BS 5228: Code of practice for noise and vibration control on construction and open sites

You should collate the information gathered in Steps 2 and 3 into a noise impact assessment report. The requirements for this are in BS 4142 or BS 7445[8].

Table 1 below summarises how the 'level of noise' impact relates to BS 4142 descriptors.

Table 1 – levels of noise

Level of noise impact	Closest corresponding BS 4142 descriptor
Unacceptable level of audible or detectable noise. This level of noise means that significant pollution is being, or is likely to be, caused (regardless of whether you are taking appropriate measures). You must take further action, or you may have to reduce or stop operations. The environment agencies will not issue a permit if you are likely to be operating at this level.	**Significant adverse impact** (following consideration of context)
Audible or detectable noise. This level of noise means that noise pollution is being, or is likely to be, caused at a receptor. **Your duty** is to use appropriate measures to prevent or, where that is not practicable, minimise noise. **You are not in breach** if you are using appropriate measures. But you will need to rigorously demonstrate that you are using appropriate measures.	**Adverse impact** (following consideration of context)
No noise or barely audible / detectable noise. This level of noise means that no action is needed beyond basic appropriate measures / BAT.	**Low impact* / no impact** (following consideration of context)

*Note: Low impact does not mean there is "no pollution". However, if you have correctly assessed it as low impact under BS 4142, the environment agencies may decide that taking action to minimise noise is a low priority. Caveat: BS 4142 is unlikely to be the appropriate methodology on its own to assess low frequency noise.

In some cases, where you have not yet built or commissioned a site or new item of plant, modelling may help assess a new proposal. Where you have used a noise model, it should comply with the calculation requirements of ISO 9613[9].

You may need to do some validation monitoring to provide confidence in the model outputs. Depending on the level of impact and potential environmental risk, this may take place following commissioning activities, or as part of a routine monitoring programme.

[8] BS 7445: Description and measurement of environmental noise

[9] ISO 9613: Acoustics – attenuation of sound during propagation outdoors

However, for most new proposals the best evidence is likely to come from comparable sites that are carrying out the operation proposed without problems. When looking at comparable sites, you should consider the uncertainty, and how comparable the reference sites are.

In particular, consider:

- the reference site may have different weather and dispersion conditions (including topography);
- noise pollution can differ in frequency, level, duration or offensiveness due to different operating conditions or site-specific engineering differences;
- the quality of monitoring data at the reference site; and
- that the community near the new site may be more or less sensitive than at the reference location.

Step 4 – Best Available Technique / Appropriate Measures justification

For any particular case, the environment agencies have to decide whether or not you are causing (or are likely to cause) unacceptable noise pollution, even is appropriate measures are used. It is your responsibility to avoid significant pollution and to demonstrate that you are using BAT or appropriate measures to prevent, or where that is not practicable, to minimise noise impact.

You should assess the findings of Steps 1 to 3 with your acoustic consultant and present a justification that you are (or will be) using BAT to prevent or minimise polluting noise emissions. The BAT justification is the critical part of any noise impact assessment submitted to the environment agencies.

Place the noise impact into context (see 3.6 ‘How the context affects an assessment’), and demonstrate that emissions have been prevented or minimised as far as reasonably practicable. For your justification:

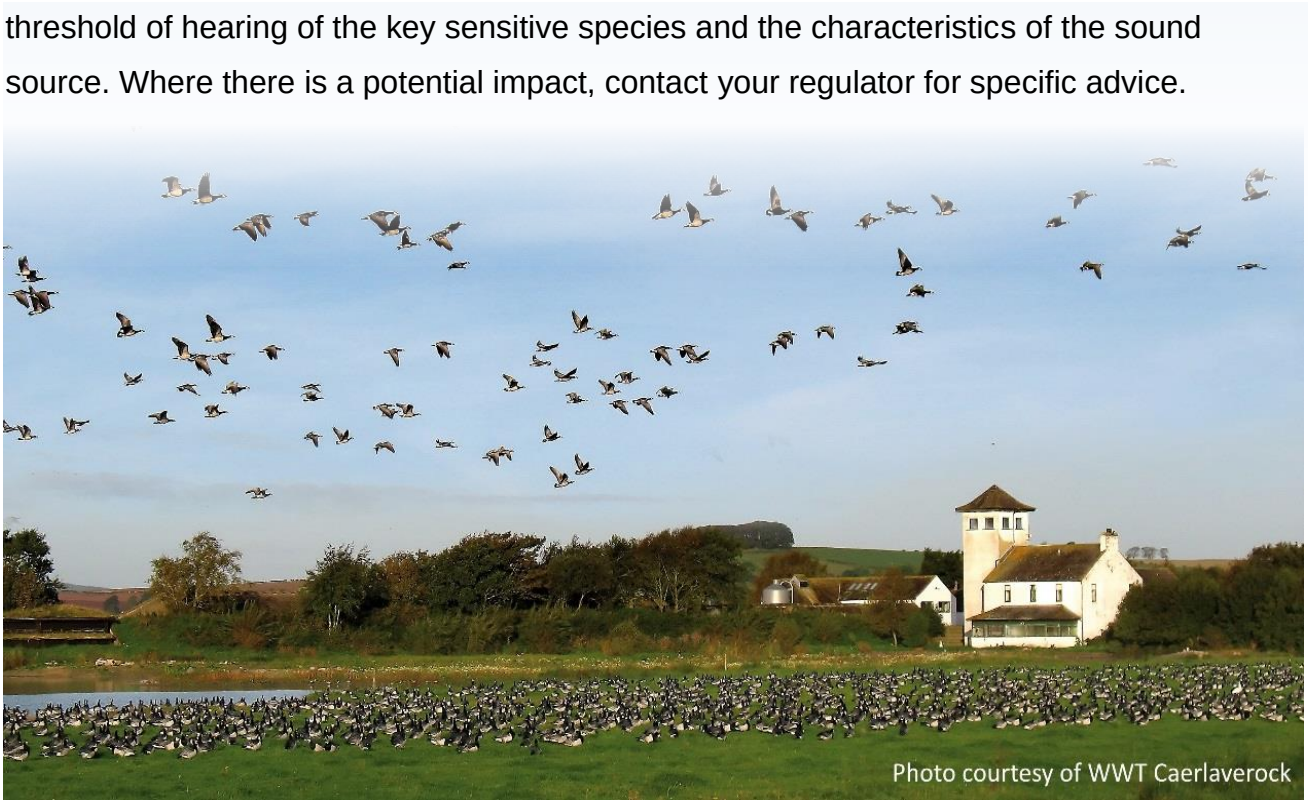
- concentrate on the dominant noise sources (and where necessary consider the influence of individual sub-components within a system);
- detail all existing noise attenuation measures (enclosures, silencers, location of kit, operating time restrictions, maintenance regimes, etc.);
- for dominant noise sources, consider all noise reduction techniques and come to a reasoned determination of what is achievable;
- where upgrades are identified – state the predicted impact of the works and commit to firm completion timescales; and
- develop a Noise Management Plan (if there will be an impact beyond the site boundary).

3.4 Noise impact on other species

In some cases, you may need to consider the impact of noise on other species and habitats as well. For example, if your site is next to a Site of Special Scientific Interest or nature reserve. In these instances, it is not appropriate to use the BS 4142 methodology because this standard is based on human hearing and sensitivity to sound. The frequency of human hearing ranges from 20Hz to 20kHz, which is quite different to other species. For example, many species of birds have relatively insensitive hearing above 10kHz but are more sensitive at lower frequencies. Sounds that might trouble humans may not be detectable by other species, and vice versa.

The impact of noise on non-human species is a growing area of research and must be considered on a species-by-species basis. Studies suggest that disturbances such as noise, light and close proximity of humans can have an impact on wildlife. This could cause changes in behaviour such as foraging, the pitch of bird song, reproduction rates and population density. These impacts are not limited to vertebrates. For example, a recent study found that boat noise reduced the growth rate of freshwater mussels, indicating noise as a source of stress. The population density of one species will in turn impact other parts of the food chain, even if those other species are not directly affected by the noise.

You should identify any potentially noise sensitive wildlife areas and consider both the threshold of hearing of the key sensitive species and the characteristics of the sound source. Where there is a potential impact, contact your regulator for specific advice.



3.5 Vibration impact assessments

We recommended that you consider vibration early in the risk assessment process, as it can be difficult and costly to mitigate retrospectively. You should get advice from a dedicated vibration specialist as this is a niche area of acoustics.

Vibration impact assessments should follow the methodology of BS 6472[10].

Human response to vibration varies. Residential receptors or sedentary workplaces will typically have a lower vibration detection threshold than busier and more active environments. As well as annoyance and disturbance, a key concern is often whether the vibration will cause structural damage, for example to people's homes - and this can cause great anxiety. However, other than at low frequencies, vibration levels would be physically intolerable to humans before they reached levels capable of causing structural damage. You should use BS 6472 to predict the human response to vibration and the probability of adverse comment.

As with noise, the characteristics of vibration are as important as overall magnitude. You should take in to account these characteristics of the vibration source: duration (constant or intermittent), amplitude (steady or fluctuating), and transience (stationary or moving).

You should consider the distance to receptors because impact is reduced with distance. Topography will influence the transmission of ground borne vibration. Soil conditions in the direct vicinity of receptors will determine how vibration transmits into the receptor building. The receptor building itself and its structural components (foundations, walls, and floors) will have natural frequencies determined by their dimensions and construction materials. BS ISO 4866[11] provides guidance on measuring and evaluating vibration effects on structures.

If the vibration is accompanied by noise, this may worsen the perceived impact. This is regardless of whether that noise is from the same source, or is caused by the vibration (for example, rattling furniture or fittings). What is reported as vibration is in fact excitation of windows, for example by airborne sound. You must consider vibration within the wider context of noise at the receptor.

[10] BS 6472: Guide to evaluation of human exposure to vibration in buildings

[11] BS ISO 4866: Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures

If the initial risk assessment indicates a risk of vibration outside the site boundary, you must submit a vibration impact assessment to your regulator. Where vibration impacts have been predicted, you should also provide calculations and modelling files.

You must provide your regulator with a vibration management plan if there is a risk of vibration or, after getting a permit, vibration pollution impacts outside your site boundary. The vibration management plan should prevent or minimise vibration impacts at local receptors using BAT or appropriate measures. It is important that you use a suitably qualified vibration specialist during this process.

Photo courtesy of Soundguard Acoustics

3.6 How the context affects an assessment

The context in which a noise occurs is critical to assessing the severity of the pollution. Not every receptor will have the same response to the same noise pollution. In a particularly sensitive situation, the pollution may result in a ‘significant adverse’ impact. Whereas it would be an ‘adverse’ impact in another less sensitive situation.

BS 4142 allows the context of the situation to inform the assessment outcome. Whilst context allows you to interpret impact thresholds (to a degree), there are practical limits to the extent of the interpretation. It is unlikely you could adjust the assessment outcome beyond the neighbouring band (for example, modifying a BS 4142 outcome of more than 10dB to be less than an ‘adverse’ impact).

Different elements of the context may sway the assessment outcome in different directions, so you should consider all the elements together. Context should consider:

- weekdays vs weekends
- what the sound ‘means’*
- time of day
- the absolute sound level
- where the sound occurs
- local attitudes
- new industry or new residences
- intrinsic links between the source and receptor
- the residual acoustic environment
- the exceedance (traditional BS 4142)
- the land use at the receptor (for example, gardens vs yards)
- whatever else might be particular to that individual situation

More sensitive	Less sensitive
More houses in the location	More industry in the location
Noise during antisocial hours	Noise only between 9am to 5om
Noise at weekends	Noise on weekdays only
Well used amenity area (private rear gardens)	Rarely used amenity area (open front yards)
Natural soundscape	Polluted soundscape
Meaningful sound*	Bland sound
New industry	Long-standing industry
Highly sensitive receptor	Less sensitive receptor

*Where the sound conveys an unpleasant meaning beyond its mere acoustic content

Some examples of how the context could affect an assessment are:

- an isolated industry affecting many residences may be considered more sensitive;
- the animal noises from an abattoir may be considered more sensitive;
- industrial noise affecting what would otherwise be a very tranquil village could be considered more sensitive;
- a busy industrialised port with historically associated housing may be considered less sensitive;
- if the noise from an industry is almost indistinguishable from the commonly prevailing road noise, it could be considered less sensitive;
- bland, outdoor noise in the dead of night may be considered less sensitive, and;
- façade sound levels at an unused attic window could be considered less sensitive.

There is no strict limitation as to what elements could make a context more or less sensitive. However, if you are modifying your assessment outcomes you must fully justify this otherwise, we will reject your noise impact assessment.

3.7 Dealing with uncertainty

Operators must identify and minimise the sources of uncertainty associated with any noise measurement or prediction. You do not always have to objectively quantify the uncertainty in your noise impact assessment, but doing this can help you identify the uncertainties you need to minimise. BS 4142 requires noise impact assessments to consider and minimise the effect of uncertainty. The amount of effort put into minimising uncertainties should be proportionate to the risk that the site presents, and the likely scale of the uncertainty. If you have made no effort to minimise the uncertainty in your noise impact assessment, then your assessment will not meet the requirements of BS 4142, the potential error in the assessment will be too large to be acceptable, and we will reject your assessment.

The uncertainty of a noise impact assessment is highest when the monitoring periods are short, and when the noise source is erratic or variable. More detailed sources of information on uncertainty are available in BS 4142, and Craven and Kerry (2007)[12].

[12] Craven and Kerry (2007) “A Good Practice Guide on the Sources and Magnitude of Uncertainty Arising in the Practical Measurement of Environmental Noise” (2007).

Table 2 below summarises some methods that can minimise measurement uncertainty.

Table 2: Minimising potential sources of uncertainty

Source of uncertainty	Method to minimise uncertainty
Weather conditions	Monitor in worst-case or representative weather conditions for propagation (transfer of sound energy) to the receptor
	Do not monitor in wind speeds greater than 5m/s
	Do not monitor when the wind direction is from the receptor to the source
	Do not monitor in the rain or other adverse conditions
Source directivity	When monitoring at a surrogate location closer to the noise source, ensure the surrogate location is on the pathway to the receptor
Measurements	You should always use far-field measurements in preference to near-field because near-field measurements have extremely high levels of uncertainty. If you have not minimised these uncertainties, then we will consider the assessment invalid.
	Monitor levels on the direct sound pathway to the receptor
	Do not estimate the distance to the noise source when using measurements for propagation calculations - always measure it
	Make sure you turn off all other audible equipment
	Make sure you are assessing a representative duration and level of operations
	Have a standardised operating method for each source
Monitoring locations	Use repeatable monitoring locations to enable comparison between assessments by providing National Grid References, photographs, and scaled maps.
	Do not mix free-field and façade measurements in the same assessment
	Avoid sounds that are not representative of the assessment location

Source of uncertainty	Method to minimise uncertainty
Monitoring durations	Monitor for a fully representative period of time
Manufacturers SWL data	Manufacturers' sound power levels (SWL) are typically derived from lab tests under perfect conditions. Be aware that, in real-life situations, plant noise may vary significantly from that expected
Attenuation predictions	The predicted acoustic performance of Operators' buildings tends to be based on sound reduction index (R_W) values of the constituent parts. In practice, the *"as built"* performance of completed structures can be significantly below the acoustic properties predicted for the construction materials. The overall predicted sound attenuation of the building may therefore be overestimated. If meeting specific noise criteria is critical, an option to counter the *"as built"* reduction in sound attenuation performance is to include a safety margin in design of 5 to10dB
	Silencers and enclosures may not achieve the design acoustic performance. Once installed, you should periodically test them to make sure they are suitable
Operator error	BS 4142 reports must include a statement of competency
	Monitoring should be carried out by a qualified acoustician, who can demonstrate competency in environmental (rather than for example occupational health and safety) work
Equipment	Make sure you use an appropriate class of calibrated equipment is used
	Confirm the date of the last laboratory calibration
	Confirm the results of field calibration checks
	Note: sound level monitoring equipment often represents the smallest level of uncertainty

3.8 Soundscape assessment

Soundscape is a new approach that deals with how people feel about, and react to, the sounds around them. This can be influenced by all the senses and the wider context. It focusses on planning and managing the full range of sounds to achieve the best outcome from a human perspective, rather than just trying to reduce unwanted sounds (noise).

Reducing sound levels may not necessarily result in a high-quality acoustic environment because the character of sound is equally important. Some sounds have a positive impact (usually natural), whereas others (usually machine or man-made) have a negative reception, regardless of sound levels. In some cases, a sound that is normally considered undesirable, such as road traffic, may in fact be masking a more unpleasant sound (such as industrial noise).

Soundscape is a multidisciplinary approach. It is affected by various factors including:

- aural (sound sources) settings;
- visual settings;
- landscape (including ease of access to green spaces if, for example, a site is situated near a park);
- site accessibility to all (including people with hearing disabilities);
- cost-effectiveness (to create an appropriate soundscape);
- emotional expectations from a space;
- health and wellbeing;
- enabling community engagement; and
- cultural background of users and other demographic factors.

You should bear all these factors in mind while assessing soundscape quality.

To decide which sounds are appropriate for the environmental settings when assessing and predicting soundscape, you must consider the activities they may enable (for example, factory noise may symbolise local employment), what emotions they may evoke, and what impact they may have.

In some places the existing soundscape may already be poor quality. Adding a further industrial source, even if its sound level is below a defined guidance level, may become a tipping point for an inappropriate soundscape or make it that much harder to fix an existing problem. In another place, due to an already dull soundscape and low emotional expectations, an additional industrial sound source may not be a burden, as its level may be well masked by other sounds (for example traffic).

Methodologies for soundscape assessments

Assessing and predicting soundscape quality is an important part of assessing context for a noise impact assessment. Soundscape assessments can also be useful in assessing the sensitivity of a situation.

ISO 12913[13] is a series of technical specifications (TSs) based on the results of work by the international scientific community and standardisation committees. These documents are also supported by real case studies carried out by the Noise Abatement Society, and independent practitioners' documents. The environment agencies recommend that you base any soundscape assessments submitted to them on methods described in these TSs.

BS ISO 12913-1 defines soundscape as the *"acoustic environment as perceived or experienced and/or understood by a person or people, in context"*. This definition has been accepted by the scientific soundscape community, practitioners and professional organisations (including Noise Abatement Society and UK Institute of Acoustics). It has also been accepted by some governments' policies including Planning Policy Wales and Wales' Noise and Soundscape Action Plan. The BS ISO 12913-1 definition of soundscape is used for all further references in this guidance. You must follow this definition in soundscape assessments that you submit to the environment agencies.

ISO/TS 12913-2: this describes the TSs for soundscape data collection and minimum reporting requirements.

ISO/TS 12913-3: this provides requirements and supporting information on data analysis related to methods of data collected in situ.

[13] ISO 12913: Acoustics – Soundscape

4 PERMIT COMPLIANCE

4.1 Noise conditions in permits

The environment agencies will not grant you a permit if significant noise pollution is expected.

Typically, permits will have a general noise condition to prevent or minimise noise pollution. You may also need to regularly assess the noise impact and implement a noise management plan. Sometimes a permit may have specific operational conditions relating to noise control.

Environmental permits may use different terms depending on their age. For example, the conditions may say that the operator must not cause nuisance, annoyance, offensive noises, offence to human senses, interference with amenities, pollution, an exceedance of a numeric limit etc. Your permit may require you to prevent or minimise noise by using Best Available Techniques, appropriate measures, due diligence, all reasonable precautions, noise management or working plans.

The relevant legislation also uses a variety of terminology. For example, the Landfill Directive states *"measures shall be taken to minimise nuisances and hazards arising from the landfill through noise and traffic"* whereas the Integrated Pollution Prevention and Control Directive or Industrial Emissions Directive includes noise in the definition of pollution, stating that *"…all the appropriate preventive measures are taken against pollution"*. Whichever form of words is used in the permit, the environment agencies will treat it as having the same meaning.

In this guidance, when we refer to the obligation not to cause pollution and the requirement to use appropriate measures, this applies to all terms used in the various noise conditions in permits.

4.2 Appropriate measures to meet permit conditions

You do not need to go beyond 'appropriate measures' when determining the appropriate level of noise control. However, what constitutes 'appropriate measures' varies depending on the risk of pollution.

The most effective strategies may, or may not, involve capital investment. But nearly any method that is implemented will need careful management.

Technology and best practice are constantly changing. You should use the most effective control measures available for your industry sector, with reference to published BAT conclusions where applicable.

You should consider low-noise options within your management of change procedures when installing or renewing potentially noisy plant.

In some circumstances you may choose to use innovative methods to solve a particular problem. Or you may decide to exceed ‘appropriate measures’ to avoid serious pollution that could lead to your permit being revoked.

The measures that are appropriate will depend on the industry sector and site-specific circumstances. They will not be related to the scale of your operations or your financial ability, though they will take costs and benefits into account. Decisions on costs and benefits are based on industry best practice, not on how affordable a noise control measure is to your company.

The effort you put in to controlling noise pollution must be appropriate to the severity of that pollution. A noise control method is more likely to be appropriate for pollution where there are numerous receptors, or where there is significant pollution, or where the noise control method significantly reduces the noise pollution.

You must not plan to pollute up to threshold limits in the guidance documents. These are limits not targets.

You should give priority to controls that can be used at the earliest possible stage in the process. The environment agencies consider that the hierarchy of noise control should be:

i. prevent the generation of noise at source by good design, site layout, and maintenance;
ii. minimise or contain noise at source by observing good operational techniques and management practice;
iii. use effective silencers, physical barriers or enclosures;
iv. use sympathetic timing to control of unavoidably noisy operations; and
v. where possible, increase the distance between source and receptors.

This guidance describes types of control measure and plant you should consider using to prevent or reduce pollution. It does not go into every detail of, for example, how plant and equipment is designed, operated, and maintained. Appropriate measures to reduce or control noise should include but are not limited to:

- assessing noise at different places and times to find where the problem is coming from;
- maintaining equipment so noise levels are reduced (for example, balancing fans and fixing loose covers);
- using enclosure or abatement (for example, acoustic enclosures, silencers, keeping doors and other openings in buildings closed);
- timing your operations sympathetically (for example, do not plan any noisy maintenance work during evenings and weekends);
- siting activities away from sensitive receptors (for example, locating vehicle routes or noisy plant as far away as possible from NSRs);
- switching off plant, vehicles and ventilation units when not in use; and
- reducing, altering, or stopping noisy activities until circumstances have changed, or you have put other appropriate measures in place, so operations can re-start without preventable, or significant adverse, noise impact.

4.3 Changes to site operations

You may sometimes need to carry out temporary works, such as alterations or major maintenance programmes, which will cause more noise than normal. In these circumstances you should notify your regulator and neighbours. You should take reasonable steps to minimise the duration and impact of any such works (for example, by doing the work between 9am and 5pm Monday to Friday excluding Bank Holidays).

If there is an adverse impact beyond the site boundary, you should have a written Noise Management Plan (NMP).

If you are using all appropriate measures to reduce noise pollution, but the noise from your permitted operations is still unacceptable, you will either have to find further measures to reduce noise pollution or risk having to reduce or stop operations.

If your facility has not caused noise problems in the past, but your circumstances have changed (for example, if a new residential development is built closer to the site boundary) you may have to take action to prevent, or where that is not practicable minimise, actual or potential noise pollution.

If operational changes are required, the environment agencies will allow you a reasonable time to make them. Timeframes will depend on how serious the pollution is and how complex the proposed solution.

In some instances, the level of noise impacts may simply be unacceptable. If you cannot resolve this quickly, you will normally have to stop, or reduce, operations until you can find a solution. Ultimately, the environment agencies have statutory powers to suspend or revoke permitted operations if necessary.

Sometimes (for example, when planning the location of a new building) there will be opportunities for measures to be taken which can deliver additional (noise reduction) benefits to society. You are expected and encouraged to take these opportunities, through effective management and control of noise.

5 NOISE MANAGEMENT PLANS (NMP)

5.1 NMP principles

Compliance with a good NMP is an excellent way of demonstrating that your site operations are properly controlled. NMPs should demonstrate your competence, and commitment to controlling noise pollution. It should be clear that you understand the noise pollution potential of any process, and that you have systems in place to manage that risk effectively.

Having an NMP does not mean we will consider you are using all the appropriate measures needed. If your regulator thinks your NMP is not sufficient for its purpose, they may suggest improvements.

You should regularly review your NMP, typically once a year. Your review should also consider land use around the facility and any future developments that may increase the impact.

The scope and level of detail in your NMP should be enough to show that you are effectively managing noise emissions from their premises. All NMPs should, as a minimum, include:

- a clear statement that you understand and accept your responsibilities for controlling noise impact, and that you will regularly review the effectiveness of your NMP;
- a commitment that either you, or your contractors or subcontractors, will make sure that any noise control equipment is designed, operated and maintained appropriately so it controls noise effectively at all times;
- a risk assessment of noise problems from normal and abnormal situations (including worst case scenarios due to, for example, weather, temperature, or breakdowns, and accidents)
- details of the appropriate controls (both physical and management) needed to manage the identified risks;
- confirmation of the level of monitoring that should be in place;
- details of the actions you will take, contingencies, and responsibilities when problems arise (it is particularly important that you include expected actions resulting from exceptional circumstances or where serious pollution may occur);
- confirmation of the procedures in place to consider reducing or stopping operations to avoid serious noise pollution; and
- a procedure for engaging with neighbours to minimise their concerns and respond to complaints.

If the environment agencies consider certain aspects of your NMP do not mee the expected standard, or it does not have all the appropriate measures needed, you should review and amend the plan. If you do not do this:

- we may impose a requirement or restriction on your site operations. We would do this in a way that gives you the right to appeal (for example, by varying your permit to add site specific improvement conditions or a prescriptive condition); and
- we may refuse (or require improvements to) an application if you submitted a sub-standard NMP as part of an application.

For permit holders, if original measures are operating as designed, but are still not completely solving the problem, then you will be given reasonable time to propose and implement improvements that will solve the problem. The environment agencies will set out any requirements in writing. If you do not act, or supply requested information, within the specified timescale this is likely to be a breach of permit conditions or the regulations.

What is a reasonable timescale to find a solution and amend the NMP will depend on how significant the problem is, and how technically difficult the solutions are. Major site modifications may take months or more than a year to complete. But you should present the initial proposals and subsequent detailed plans in a timely manner, either in weeks or months as appropriate.

No NMP can cover every eventuality. Even if you follow the plan, noise pollution may sometimes occur. This would usually indicate that you need to put in place further appropriate measures.

If a noise pollution incident occurs and your NMP does not meet the expected standard, we will take this into account in our enforcement decisions. It will be more difficult for you to demonstrate you were using appropriate measures in any subsequent enforcement action.

Whilst we accepted that no NMP can cover every eventuality; noise emissions from your premises are always your responsibility. We may still consider immediate enforcement if:

- you are not doing something you said you would do in your NMP;
- you have not appropriately specified, designed, operated, maintained or managed a measure in the NMP appropriately; or
- there is a risk of serious impact on human health or the environment.

If you need to carry out rapid action to solve a noise problem, it is possible that the action may contravene something previously written in your NMP. We would prefer you to take action to solve the problem. You will be given reasonable time to update your NMP after the event.

You may not need a NMP if we agree your site has a permanently low noise impact. However, if problems arise, we may change our assessment and require you to write one.

Every situation is different – here are two examples that demonstrate our approach.

- Example 1: a process plant. The NMP proposes a noise barrier and states the expected level of attenuation. If the noise barrier turns out in practice to be insufficient, the environment agencies will work towards a solution with the operator. But if the operator has not designed, installed, or maintained the noise barrier properly, and normal operations make it ineffective, resulting in avoidable pollution, they may be in breach of their permit. Enforcement action may follow.

- Example 2: a landfill. The NMP proposes gas scavenger lines of given diameters and extraction fans of a given capacity to extract landfill gas. These fans will be fitted with noise attenuators. If, in practice, the attenuators are insufficient, the environment agencies will work towards a solution with the operator. But the operator may be in breach of their permit if the attenuators fail and noise pollution occurs because of a reasonably foreseeable design flaw, poor maintenance, inadequate staff training, or removal of the attenuators to increase gas extraction rates. If this happens, it may result in formal enforcement action. The sort of design flaw that could lead to enforcement action would be something that the operator should have been picked up through reasonable due diligence and normal good practice.

5.2 Incident management plan

Your permit may require you to have an accident or incident management plan. You can include noise-related incidents in this because this is where staff would look in an emergency. However, if the site has a NMP, it may be more appropriate to cover noise related incidents in the NMP as long as it identifies the appropriate response to a situation, and who is responsible for taking preventative action and taking action after an incident.

The environment agencies expect you to identify environmentally critical plant and maintain a list of required spares. This will make sure vital equipment can be repaired quickly.

Where any incident occurs with the potential to significantly affect the environment, Articles 7 & 8 of the Industrial Emissions Directive (and corresponding UK legislation) require operators to take immediate actions to limit the environmental consequences.

Your ultimate control measure when problems arise is to reduce or stop operations to avoid serious noise pollution. Your NMP should include a clear statement of the situations in which this could occur and how you will manage them.

NMPs should identify the points in the operation where significant noise pollution may occur, and where you can impose throughput restrictions or stop production. Where continuous throughput is critical to a business, operators must demonstrate that they have suitable measures in place that will prevent the need to reduce or stop production. For example, you may have redundancy built into your process so you always have standby plant available to use if there is a problem with the primary equipment.

6 NEIGHBOURS AND COMPLAINTS

6.1 Engaging with neighbours

It is important that you engage with the people who may be affected by your activities. Many operators do this as a matter of course and have well-established procedures for communicating with the public. However, some overlook this essential step to managing noise.

Consider that neighbours are likely to perceive noise differently from operators. For an operator, the activity is their livelihood, and they only experienced the noise whilst at work. Operators may become used to the noise, so it no longer seems to be a problem.

For neighbours, noise may mean that they enjoy their homes and gardens less. They may worry that the operator's activities will devalue their property or affect their health. They may feel threatened by the site activities. They may also be concerned about other things such as on-site traffic, dust, or other pollution. Many complaints are for multiple problems, including noise. It may be more than just noise that needs to be addressed.

Whatever the local issues, a perceived threat can be made worse if an operator is not connected, or accountable, to the local community.

If you engage with neighbours at an early stage, they may be more accepting of the situation. Even if they do not accept it, they can still help identify potential problems and help find solutions. Good engagement can include newsletters explaining what you plan to do, website information, meeting with community leaders, open days, and organised visits to the site.

You should:

- make sure that neighbours know how to contact the site if they think that noise is a problem;
- take action to solve the problem promptly;
- inform neighbours about planned and unavoidable noisy activities (for example, testing an emergency generator or steam pressure relief valves); and
- work with neighbours to pinpoint a noise if its source is uncertain.

6.2 Responding to complaints

Your NMP should cover how you will address complaints. You should investigate complaints promptly and take appropriate remedial action. You should tell the complainant, and anyone else likely to have been seriously affected, what has been done or still needs to be done, with timescales. You should record details of the complaint, and actions taken.

When you receive a complaint you should notify your regulator, following the incident reporting conditions in your permit. You would then normally investigate to:

- make sure the process under control;
- check if noise containment measures have failed (for example, has a door been left open);
- see if there is an adverse impact on the local community.

Sometimes, an investigation will show some site activities need to stop or you need to take some other remedial action. You should be prepared for this. Plan effective and proportionate remedial measures and develop contingency plans to apply them. You should be prepared to stop an activity until effective controls are in place, unless stopping it would cause even greater noise or environmental harm.

You should keep auditable records of any investigations you carry out. These records will help you analyse incidents to stop them happening again. You may need to keep records as part of the site NMP or permit conditions.

7 MONITORING

Monitoring needs to reflect the actual or potential impact on the local community. Here is a brief overview of the monitoring methods and where you can use them.

7.1 Operator monitoring plan

You should be clear about your reasons for monitoring. You may want, for example, to:

- assess impact;
- confirm how effective installed control measures are;
- investigate sources and pathways (such as boundary or perimeter monitoring, meteorological monitoring);
- measure the sound levels of emissions.

Monitoring can take different forms:

- subjective assessment of noise impact;
- objective sound level monitoring;
- recording complaints (made directly to you, the environment agencies, or to a third party such as a Local Authority).

A monitoring plan should provide clarity on why and how monitoring will take place, for example:

- steady state operational monitoring to confirm that noise is under control;
- if a noise problem arises, monitoring to help establish what needs to be done;
- if a solution is in place, monitoring to confirm a reduction in noise impact;
- how to interpret the results of any monitoring, including (where feasible) trigger values for further monitoring or remedial action;
- if the terrain is complex, or if noises come from many places, how monitoring will handle this; and
- details of record-keeping and reporting.

APPENDIX 1: SUGGESTED NIA REPORT STRUCTURE

For most industrial noise impact assessments (where sound levels have been monitored) the environment agencies expect you to follow the criteria and reporting requirements of BS 4142. This section sets out what information we expect operators to include in any noise impact assessment submitted to us.

Provide a letter to support the report, detailing the actions you will carry out to meet BAT (if required), based on the current site impact and report recommendations. You must also provide details of timescales for implementing these actions.

Your report and supporting letter may not be assessed by the site officer. So do not leave out any details or assume the person assessing the report has any prior knowledge of your site (for example, any recent or intended future works that may change the noise from the site). You should also include a comparison of recent results with those previously measured.

The report should consist of two parts (the main body and the appendices). The main body of the report would contain the introduction, main narrative, findings, and recommendations. The appendices would contain any certificates, raw data, and supporting material. Any noise modelling should also be submitted.

To help us review a report quickly, use the same section numbering and headings we have provided in our suggested structure. If a section does not apply to you, then put ‘NA’ in that section. If necessary, justify why it is does not apply. If you do not follow our recommended numbering or heading structure, it will take us longer to assess your submitted report. If you miss out information your report is likely to be rejected.

Main body of the report

Include the following information in the main body of the report.

1) Covering page with sign-off, including

- Company name
- Name and location of the site
- Authorisation or Permit number of the site
- Company contact for whom the report was carried out
- An authorised sign-off of the report by assessor, contractor, or consultant

2) Synopsis

- A one page (maximum) non-technical summary of the report findings

3) Introduction

- A brief descriptive of the site, including (but not be limited to) the following information – describe the type of facility and the activities carried out, describe if there are any variations on the type of work carried out during various times of day (for example, hoppers loaded and deliveries received at night, production early in the morning, cleaning and washing down of plant in the evening, shift changes, operations that only happen during certain hours)
- Also explain the reason for producing the report (for example, site survey, noise impact assessment, complaint investigation, permit application or variation). Please note that you need to do a proportionate noise impact survey. Consider the options to prevent or reduce noise impact in line with BAT or appropriate measures
- Include in your introduction any history of complaints about noise from the facility, previous noise impact assessments for the site, including the main findings and dates - this includes assessments or predictions for other regulators, such as planning, changes on site (which may affect noise impacts) since the last systematic assessment

4) Assessment location.

- This section covers measurement and prediction points
- Provide map(s) of the area that clearly highlight the main noise sources on site, all NSRs you have identified (not just residential properties), monitoring points (include surrogate site locations if used), the site boundary, buildings
- If any receptors have been deliberately left out, justify why
- Provide full justification for choosing a surrogate monitoring location (if used)
- Provide information about the ground type and ground cover between your site and any receptors, geographical context of the location, including the history of the location, other sound sources and other elements of context
- Provide photographs and measurement positions of the assessment locations, including those of any near-field measurements

5) Equipment and meteorology

- This section covers equipment and weather conditions
- Provide details of the monitoring equipment used, including serial numbers and the date it was most recent calibrated by an accredited laboratory
- Provide details of the results of field calibration checks, including any offset and drift
- Provide details of the equipment used to assess the weather during the monitoring
- Provide details of the meteorological conditions for each of the monitoring periods (especially if surveys were undertaken on different days)
- Provide details of the software and protocol used to predict or analyse the sound levels
- Provide details of any audio equipment used to replay audio recordings

6) Methodology

- In this section you present the assessment standard used (most typically BS 4142) and how you implemented that method
- Justify any deviations from the relevant British Standard and explain the effects these have on uncertainty (for example, monitoring during or shortly after rain, no monitoring at night, not free field, higher than recommended wind speed for monitoring, shorter or longer monitoring periods than recommended by the standard)
- Describe the methodology used for any predicted sound levels

7) Noise monitoring data and predictions

- In this section, present the data without further interpretation
- Provide a full justification for duration of measurements (with comments to explain why you considered them representative)
- Provide statistical analysis to justify the L_{A90} (background) level
- Provide details of any noise propagation model, including propagation distances, propagation heights, barriers and ground cover
- Provide the data source for any noise propagation model, including directivity
- Provide subjective descriptions of the specific and residual sound. This will allow the noise impact to be put into context (as per the requirements of BS 4142)
- Time history figures or frequency analysis for relevant measurement periods are often useful
- Record whether any character corrections are appropriate under BS 4142. Where neither tonal nor impulsive corrections apply, the environment agencies will generally expect a +3dB *"other"* correction to be applied for readily distinguishable industrial noise unless you can demonstrate this is not justified

8) Noise impact assessment

- This section uses the data from Section 7 together with the methodology from Section 6 to assess the impact of the noise
- Provide calculations for impact on the receptor, include relevant measured sound levels, a subjective description of the sound. If you have applied an acoustic feature correction, clearly indicate the reason for this, and level of correction applied (for example, tonality, impulsivity, intermittency, or other)
- Tabulate the site impact for each receptor
- Consider the context of the location and the final assessment outcome

9) Noise control

- This section covers how noise impact is (or will be) prevented, or if not practicable, minimised. You can only do this after you have assessed the scale of the pollution (Section 8 of your report). If you do not know how bad the pollution is, or where the noise is coming from, you will have great difficulty controlling it
- Rank the identified noise sources on site from highest to lowest (based on level of impact at each receptor)
- Target the dominant noise source with appropriate noise control measures that will prevent or minimise noise at the receptors
- Quantify the noise control options in decibels, so you can achieve a noise control target based on the noise impact assessment (Section 8)
- This can be an exercise which explores several potential actions and then recommends the most practicable option. Take into account cost, timescales, and potential benefit. You must consider BAT. Tell us why you made your final choice of action.

10) Uncertainty

- This section covers the sources of uncertainty in the measurements or predictions
- Describe the uncertainties associated with the noise sources (for example, processing different materials, different operators, source directivity and distances particularly with near-field measurements, and representative monitoring periods
- Describe the uncertainties associated with the noise pathway (for example, wind direction, ground cover)
- Describe the uncertainties associated with the receptor (for example, facades, other noise sources local to the receptor, uncertainties from the measurement chain, sound level meter drift)
- Describe how each source of uncertainty was minimised
- Describe how the uncertainty could potentially alter the assessment outcome
- Please note that considering and minimising uncertainty is a strict requirement of BS 4142. If you do not show that you have identified and minimised uncertainty, it is very likely we will reject your report

11) Conclusions and next steps

- This section summarises the main findings and proposed tasks or actions, including additional noise control, or further monitoring.

Appendices

These should include, but are not limited to:

APPENDIX 1) Raw noise and weather data for each monitoring location or predicted noise source – ideally in graphical format, or any other measurement details.

APPENDIX 2) Attended monitoring notes – either scanned or transcribed.

APPENDIX 3) Full propagation calculations or predictions.

APPENDIX 4) Date of most recent lab calibration tests for sound level meter, microphone, and field calibrator or relevant calibration certificates.

APPENDIX 5) Credentials of everyone involved in compiling the report - the person undertaking the noise measurements in the field, the report author (if different), and the person authorising the report (if different).

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