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6.4.11.1 Environmental Statement

Appendix 11.1 Noise and Vibration Guidance

Planning Act 2008

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms
and Procedure) Regulations 2009

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1. Appendix 11.1 Noise and Vibration Guidance

1.1. Planning Practice Guidance – Noise

1.1.1. The Planning Practice Guidance (PPG) provides detail about how the effect levels of noise can be recognised. Above the **No Observed Effect Level (NOEL)** noise becomes noticeable, however it has no adverse effect as it does not cause any change in behaviour or attitude. Once noise crosses the **Lowest Observed Adverse Effect Level (LOAEL)** threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. Increasing noise exposure further might cause the **Significant Observed Adverse Effect Level (SOAEL)** threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused. At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise. Table 1-1 summarises the noise exposure hierarchy.

Table 1-1 National Planning Practice Guidance noise exposure hierarchy

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 non-awakening sleep	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of Outcomes	Increasing Effect Level	Action
	disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.		
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

1.1.2. The PPG summarises the approach to be taken when assessing noise. It accepts that noise can override other planning concerns, but states:

“Neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separate from the economic, social and other environmental dimensions of proposed development”

1.2. Guidelines for Environmental Noise Impact Assessment, 2014

1.2.1. The guidelines consider the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidance covers the following:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels.

1.3. British Standard 8233: 2014 Guidance on Sound Insulation and noise reduction for buildings (BS8233)

1.3.1. British Standard 8233 “*Guidance on sound insulation and noise reduction for buildings*” 2014, suggests the following guideline noise levels and states that they are based on guidelines issued by the World Health Organisation;

- 35 dB LAeq (16 hour) during the day time in noise sensitive rooms
- 30 dB LAeq (8 hour) during the night time in bedrooms
- 45 dB LAf,Max during the night time in bedrooms
- 50 dB LAeq (16 hour) desirable external noise levels for amenity space such as gardens and patios
- 55 dB LAeq (16 hour) upper guideline value which would be acceptable in noisier environments.

1.3.2. In addition, for internal noise levels it states;

“Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.”

1.3.3. Furthermore, with regard to external noise, the Standard states:

“However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited”.

1.4. British Standard 4142:2014 Methods for rating and assessing industrial and commercial sound (BS4142):

- 1.4.1. BS4142 is used to rate and assess sound of an industrial and/or commercial nature including:
- 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; and
 - 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.
- 1.4.2. The standard is applicable to the determination of the following levels at outdoor locations:
- rating levels for sources of sound of an industrial and/or commercial nature; and
 - ambient, background and residual sound levels, for the purposes of:
 1. Investigating complaints;
 2. Assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
 3. Assessing sound at proposed new dwellings or premises used for residential purposes.
- 1.4.3. The purpose of the BS4142 assessment procedure is to assess the significance of sound of an industrial and/or commercial nature.
- 1.4.4. BS4142 refers to noise from the industrial source as the 'specific noise' and this is the term used in this report to refer to noise which is predicted to occur due to activities associated with industrial noise. The 'specific noise' sources, of the existing industrial premises that have been observed are detailed in Section 3 of this report.
- 1.4.5. BS4142 assesses the significance of impacts by comparing the specific noise level to the background noise level (LA90). Section 3 of this report provides details of the background noise survey undertaken.
- 1.4.6. Certain acoustic features can increase the significance of impacts over that expected from a simple comparison between the specific noise level and the background noise level. In particular, BS4142 identifies that the absolute level of sound, the character, and the residual sound and the sensitivity of receptor should all be taken into consideration. BS4142 includes allowances for a rating penalty to be added if it is found that the specific noise source contains a tone, impulse and/or other characteristic, or is expected to be present. The specific noise level along with any applicable correction is referred to as the 'rating level'.

- 1.4.7. The greater the increase between the rating level over the background noise level, the greater the magnitude of the impact. The assessment criteria given by BS4142 are as follows:
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
 - The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 1.4.8. During the daytime, BS4142 requires that noise levels are assessed over 1-hour periods. However, during the night-time, noise levels are required to be assessed over 15-minute periods.
- 1.4.9. Where the initial estimate of the impact needs to be modified due to context, BS4142 states that all pertinent factors should be taken into consideration, including:
- the absolute level of sound;
 - the character and level of the residual sound compared to the character and level of the specific sound; and,
 - 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.
- 1.5. British Standard 5228: 2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (BS5228-1), and Part 2: Vibration (BS5228-2):**
- 1.5.1. The activities associated with the earthworks and construction phase of the proposed development will have the potential to generate noise and create an impact on the surrounding area.
- 1.5.2. Guidance on the prediction and assessment of noise from development sites is given in British Standard 5228-1:2009+A1:2014 “Code of Practice for noise and vibration control on construction and open sites – Part 1: Noise” (BS5228-1) and BRE Controlling particles, vapour and noise pollution from construction sites, Parts 1 to 5, 2003.
- 1.5.3. Construction noise can have a disturbing effect on the surrounding neighbourhood. The effects are varied and are complicated further by the nature of the site works, which will be characterised by the type of noise sources and their locations throughout the construction period. The duration of site operations is also an important

consideration. Higher noise levels may be acceptable if it is known that the levels will occur for a limited period.

- 1.5.4. In addition to COPA 1974, BS5228-1 provides guidance on significance criteria for assessing the potential noise impacts associated with the construction phase of large projects. For the purposes of this noise assessment, the noise likely to be generated by the earthworks and construction phase, have been assessed against significance criteria established, using the BS5228-1 ABC Method.
- 1.5.5. The ABC method for determining significance criteria requires the ambient noise levels at existing sensitive receptors to be determined. The ambient noise levels at each existing receptor location are then rounded to the nearest 5dB(A) to determine the appropriate threshold value in accordance with the category value, A B or C, as detailed in Table 1-2.

Table 1-2 Thresholds of Significant Impact from Construction Noise at Residential Receptors in accordance with the ABC Method of BS5228-1

Assessment Category and Threshold Value Period (LAeq)	Threshold Value, in decibels (dB)		
	Category A *1	Category B *2	Category C *3
Daytime (0700 to 1900 hours) and Saturdays (0700 to 1300 hours)	▪ 65	▪ 70	▪ 75
*1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value.			
*2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.			
*3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.			

- 1.5.6. The noise level likely to be generated at the receptor during the construction phase, i.e. the ambient noise level plus construction noise, is then compared to the appropriate category value. If the noise level is greater than the appropriate category value, a significant noise impact may be registered.
- 1.5.7. For the purposes of this assessment it is possible to estimate the degree of impact from the site works (earthworks and construction), according to the suggested standards, by reference to the time periods during which noise levels may occur in excess of the quoted values. These levels can be seen in Table 1-3.

Table 1-3 Construction Noise Assessment Significance Criteria

Magnitude of Impact	Criteria for assessing Construction Noise Impact
Large	Noise levels exceed the Assessment Category threshold level for the duration of the construction works.
Medium	Noise levels exceed the Assessment Category threshold level for periods of more than one month, but for significantly less than the whole duration of the construction works.

Small	Noise levels exceed the Assessment Category threshold level for periods of less than one month.
Negligible	Noise levels do not exceed the Assessment Category threshold level during any period.

- 1.5.8. Work involving heavy plant on an open site is likely to generate vibration, which may, in certain circumstances, propagate beyond the boundary of the site. In situations where particularly heavy plant, vibrating compaction equipment or piling rigs are being used close to the site boundary, nearby properties may experience ground-borne vibration.
- 1.5.9. Guidance on the assessment of vibration from development sites is given in British Standard 5228-2:2009+A1:2014 “Code of Practice for noise and vibration control on construction and open Sites – Part 2: Vibration” (BS5228-2). BS5228-2 2009+A1:2014 indicates that vibration can have disturbing effects on the surrounding neighbourhood; especially where particularly sensitive operations may be taking place. The significance of vibration levels which may be experienced adjacent to a Site is dependent upon the nature of the source.
- 1.5.10. It is not possible to mitigate vibration emissions from an open site. It is important therefore to examine the proposed working method to ascertain what, if any, operations would be likely to cause unacceptable levels of vibration at nearby sensitive locations. It is possible that these operations could be modified to reduce their vibration impacts.
- 1.5.11. BS5228-2 indicates that the threshold of perception is generally accepted to be between a peak particle velocity (PPV) of 0.14 and 0.3mm/sec. In an urban situation it is unlikely that such vibration levels would be noticed. BS5228-2 also indicates that it is likely that vibration of 1.0 mm/s in residential environments will cause complaint, but can be tolerated if prior warning and explanation have been given to residents. The standard also indicates that 10 mm/s is likely to be intolerable for any more than a very brief exposure to this level.
- 1.5.12. The Highways Agency Research report No. 53 “Ground Vibration caused by Civil Engineering Works” 1986 suggests that, when vibration levels from an unusual source exceed the human threshold of perception, complaints may occur. The onset of complaints due to continuous vibration is probable when the PPV exceeds 3mm/sec.
- 1.5.13. British Standard BS6472: 2008 “Guide to Evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting” (BS6472-1) suggests that adverse comments or complaints due to continuous vibration are rare in residential situations below a PPV of 0.8mm/sec. Continuous vibration is defined as “vibration which continues uninterrupted for either a daytime period of 16 hours or a night-time period of 8 hours”. The proposed earthworks and construction works at the site will not cause continuous vibration as defined in BS6472-1.

- 1.5.14. Human perception of vibration is extremely sensitive. People can detect and be annoyed by vibration before there is any risk of structural damage. Cases where damage to a building has been attributed to the effects of vibration alone are extremely rare; even when vibration has been considered to be intolerable by the occupants.
- 1.5.15. It is not possible to establish exact vibration damage thresholds that may be applied in all situations. The likelihood of vibration induced damage or nuisance will depend upon the nature of the source, the characteristics of the intervening solid and drift geology and the response pattern of the structures around the Site. Most of these variables are too complex to quantify accurately and thresholds of damage, or nuisance, are therefore conservative estimates based on a knowledge of engineering.
- 1.5.16. Where ground vibration is of a relatively continuous nature, there is a greater likelihood of structural damage occurring, compared to transient vibration; for example that caused by transiting vehicles.
- 1.5.17. BS5228-2 suggests that the onset of cosmetic damage is 15mm/sec (15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz for residential or light commercial type buildings).
- 1.5.18. The adverse residual impacts are assessed against the categories set out in Table 1-4.

Table 1-4 Construction Vibration Assessment Significance Criteria

Magnitude of Impact	Criteria for Assessing Construction Vibration impact
Large	> 10mm per sec. Vibration likely to be intolerable for more than brief exposure. Approaching the level at which cosmetic damage may occur in light structures.
Medium	5mm - 10mm per second. Tolerance less likely even with prior warning and explanation.
Small	1mm – 5mm per second. Complaints are likely, but can be tolerated if prior warning and explanation given.
Negligible	<1mm per second. Below level at which complaints are likely.