



Domino's, Wrexham
Plant Noise Assessment

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prepared for

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1.0 Introduction

1.1 It is proposed to convert an existing retail unit at Unit 6, Gwersyllt SC, Wrexham LL11 4NT, for use as a Domino's Pizza outlet.

1.2 A noise survey has been undertaken to determine the existing noise levels at the nearest residential noise-sensitive receivers to the site. The survey results have been used to set plant noise limits in line with historical planning conditions.

1.3 This report sets out the survey and assessment methodology and results, along with the mitigation specified, and demonstrates that atmospheric plant noise can be easily controlled.

2.0 Site Description

2.1 The site can be found at Unit 6, Gwersyllt SC, Wrexham LL11 4NT, situated within a retail park on Dodds Lane. The retail park comprises several retail units, a garage, cafes and a fish and chip shop.

2.2 To the north of the site runs Hope Street, Gwersyllt rail station and residences on High Street and Station Court. To the east runs Dodds Lane, with residences opposite and further residences beyond.

2.3 To the south east is Gwersyllt Community Primary School and playing fields. To the west runs the rail line with Fairwood Drive beyond with multiple residences and a small industrial area.

2.4 The main noise sources in the area are the existing plant items serving the neighbouring units, the rail line and local road traffic.

3.0 Planning Context

Local Authority Guidance

3.1.1 The proposed store is within the jurisdiction of Wrexham County Borough Council, who have historically provided the following guidance when considering the installation of new plant items:

"The rating level of any noise generated by air handling plant associated with the development shall not exceed the pre-existing background level at any time. The noise levels shall be determined at nearby noise sensitive premises, and measurements and assessment shall be made in accordance with BS4142:2014 Methods for rating and assessing industrial and commercial sound."

3.1.2 It is therefore clear that the noise limit should be set at equal to background to meet the Local Authority requirements.

BS 4142:2014+A1:2019

3.2 The current iteration of BS 4142 is BS 4142:2014 + A1:2019, which describes how to assess the noise impact on existing dwellings as a result of any new mechanical services associated with the proposed development. It has been drawn from as appropriate to inform this assessment, as required by the planning condition.

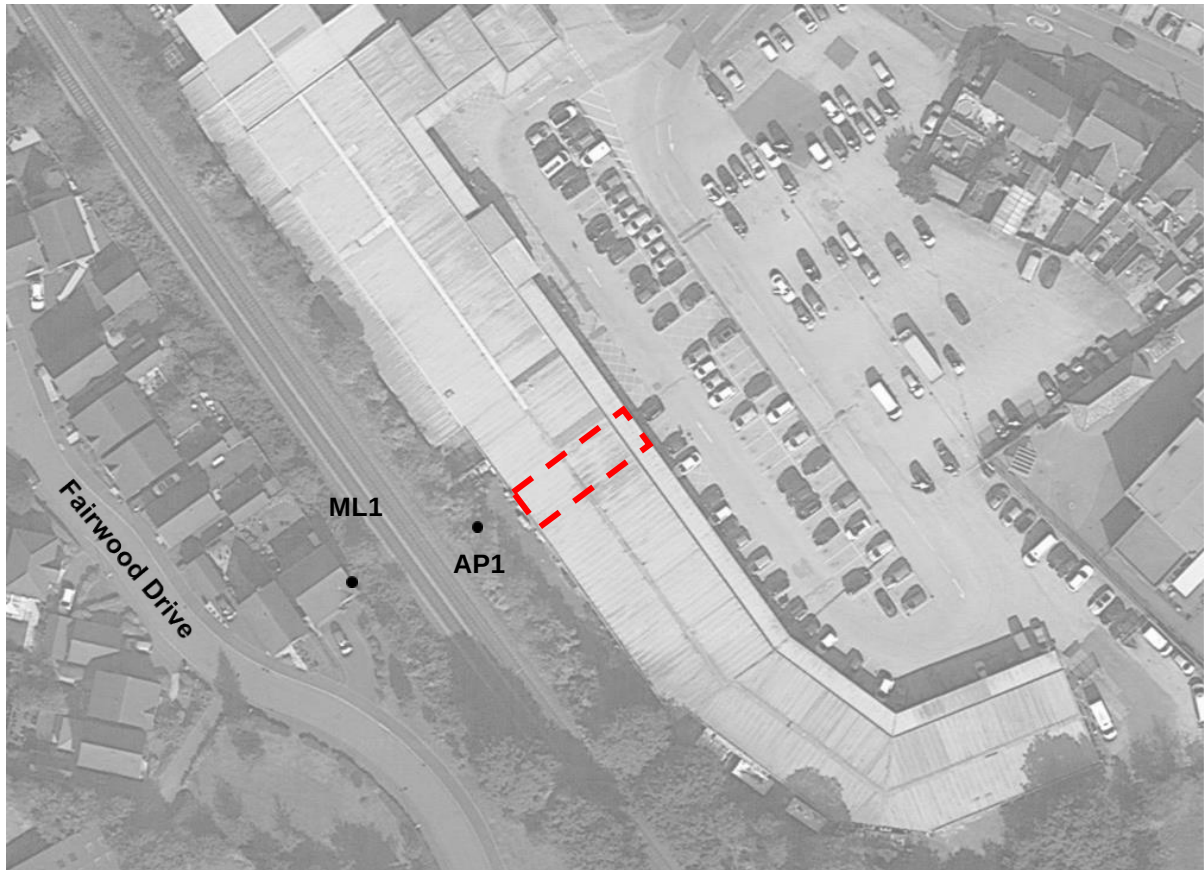
3.3 BS 4142 sets out that the Rating Level, $L_{Ar, Tr}$, is determined by considering the noise emissions from a plant item and adjusting the specific level to account for the acoustic characteristics of the noise. Acoustic feature corrections can be made to account for tonality, impulsivity, intermittency, and other characteristics present in the resultant sound at the assessment position. The magnitude or appropriateness of any correction will depend both on the type of noise source and the context in which it is perceived.

3.0.1 Full details of BS 4142:2014+A1:2019 methodology can be found in **Appendix B** of this document.

4.0 Noise Survey

4.1 An unattended noise survey was undertaken to the rear of the unit between 7th and 8th September 2022. Full details of the noise survey can be seen in **Appendix A** at the end of this document.

4.2 Noise measurements were taken at a single location (ML1), chosen to be representative of residences most affected by the proposed plant items, which can be seen in the figure below.



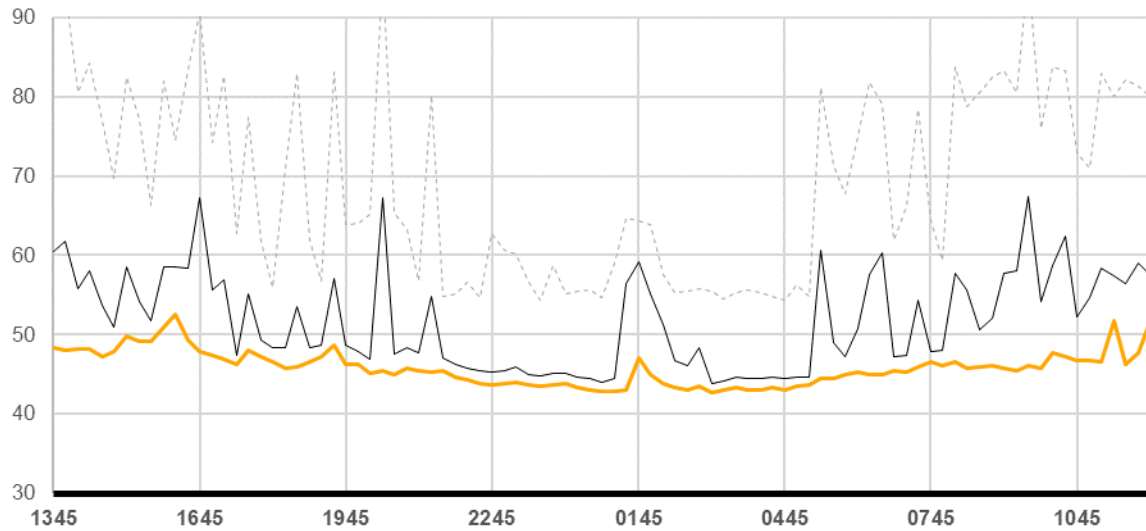
Aerial imagery courtesy Google Maps

4.3 The position outlined above is located within a yard area, to the rear of the unit. This is described in more detail in **Appendix A**.

4.4 The following noise levels were measured at position ML1 over the duration of the noise survey:

Noise Measurement Results at ML1

■ $L_{Aeq,15min}$, ■ $L_{Amax,f}$, and ■ $L_{A90,15min}$ in terms of sound pressure (dB, x-axis) against time (hhmm, y-axis).



4.5 The representative measured background noise levels, over relevant periods, are set out in the table below.

Table 1 Representative measured background noise levels

Location	Representative Measured Background Noise Level, $L_{A90,T}$ dB	
	Open Period (11h00-23h00)	Closed Period (23h00-11h00)
ML1 – Rear of site	46	43

4.6 The existing noise climate was controlled by local road traffic and rail with influence from local plant.

Plant Noise Limits

4.0.1 Based on historically accepted local authority guidance and in line with BS 4142 the following noise limits (in terms of rating levels) have been set out below:

Table 2 Noise emission limits

Location	Noise Emission Limit, $L_{A,Tr}$ dB	
	Open Period (11h00-23h00)	Closed Period (23h00-11h00)
Nearest noise sensitive receivers	46	43

4.0.2 These noise limits apply at 1 m from the outside of the nearest residential windows to the proposed plant.

5.0 Plant Noise Assessment

Proposed Installation

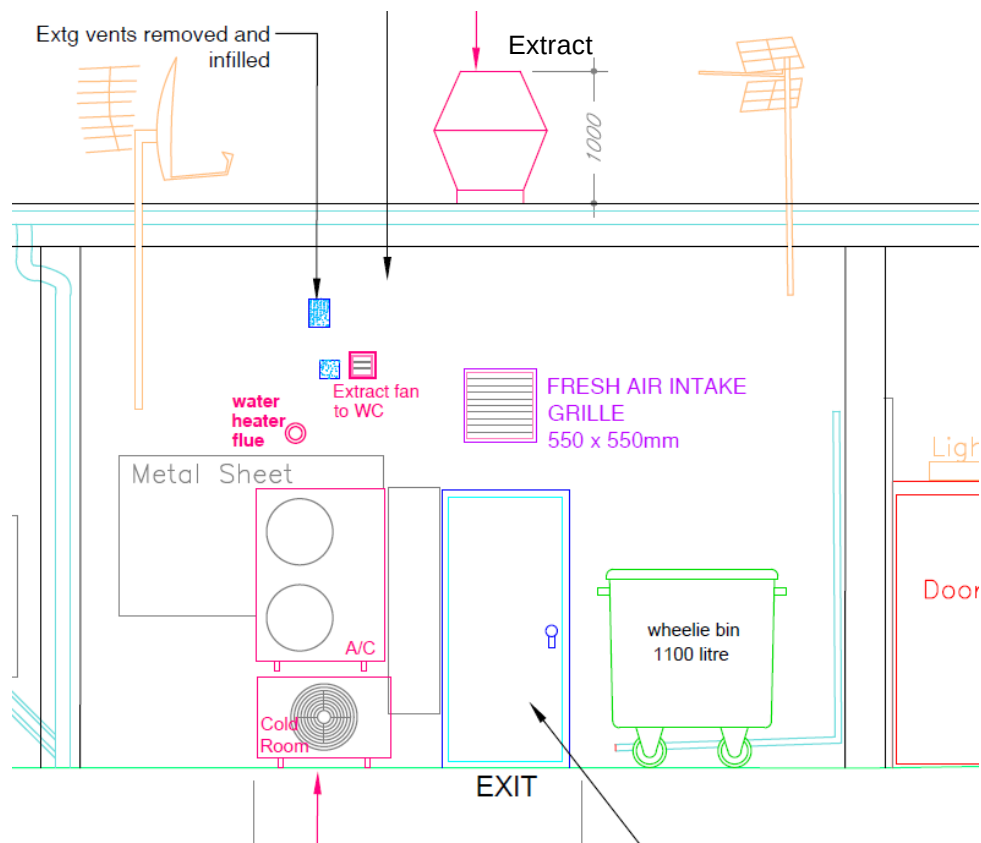
5.1 The following table outlines the proposed plant items to be installed.

Table 3 Proposed mechanical plant

Item	Manufacturer	Type
Air Conditioning Unit	Mitsubishi Heavy Industries	FDC224KXZPE1
Cold Store Condenser	Tecumseh	Sylensis SIL 4519Z
Extract Fan	Flaktwoods	JM560
Fresh Air Fan	Air Vent Tech	SPW5

5.2 The fresh air and extract fans are to be housed within the building's demise, with the fresh air fan duct terminating at a grille at high level on the rear façade. The extract fan ductwork runs upwards through the building, terminating 1m above the flat roof.

5.0.1 The condensing units are to be wall mounted to the rear of the building on the rear façade. The plant positions can be seen in the submitted drawing *DB474-A504*, separate to this report. An excerpt of this drawing can be seen below.



Assessment Methodology

5.3 The assessment uses manufacturers' noise data for each plant item. This noise data and the expected operational regime of the plant suggests that no character corrections need be applied.

5.4 Noise emissions from the proposed plant installation has been considered to the nearest noise sensitive receivers, as described below:

- AP1 – Residential window of the residence to the rear of the unit, on the opposite side of the rail line.

5.5 Levels of plant noise have been calculated at the assessment position by correcting for radiation, screening and distance losses, duct and bend losses and façade reflections as appropriate. Calculation sheets are not included here for the sake of brevity but can be provided on request.

Required Mitigation Measures

5.6 It will be necessary to install mitigation to meet the noise limits at the assessment position.

5.7 The fresh air fan will require an atmospheric side, in-duct attenuator. The acoustic performance of this silencer must meet the insertion losses outlined in the table below in each octave band, as a minimum.

Table 4 Required mitigation insertion losses

Mitigation Type	Equipment	Minimum Required Insertion Loss (dB) at octave band centred frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
In-duct	Fresh Air	4	7	13	19	23	23	16	13

5.8 To provide guidance on selecting and allowing for such mitigation, we would expect a silencer 900 mm long and with 40 % open area to be suitable to achieve the required losses. It is again noted that the insertion losses set out above are the requirement, not the example sizes or free areas.

5.9 The in-duct silencer should be mounted internally, to avoid break out noise from the silencer casing, and be as close to the fan as practicable. All fans should be mounted on anti-vibration mounts and have flexible duct work to control structure-borne sound transmission.

5.10 Any pressure drops from the attenuator or the atmospheric duct termination grilles should be limited to 40 Pa to avoid regenerated noise. The fresh air intake and extract air discharge louvres should be sized at a face velocity of not more than 2 m/s.

Results

5.11 With the outlined mitigation measures in place, the following plant noise levels are predicted at the assessment position.

Table 5 Noise emission levels at the nearest noise sensitive receivers

Location	Assessed Rating Noise Level, $L_{Ar,Tr}$ dB (limit)	
	Open Period (11h00-23h00)	Closed Period (23h00-11h00)
AP1	45 (46)	40 (43)

5.12 With the proposed plant installation in place, the noise limits set out within this report are not expected to be exceeded.

6.0 Conclusions

6.1 It is proposed to convert an existing retail unit at Unit 6, Gwersyllt SC, Wrexham LL11 4NT, for use as a Domino's Pizza outlet. A noise survey has been undertaken to determine the existing noise levels at the nearest noise-sensitive receivers to the site. The survey results have been used to set plant noise limits in line with historical planning conditions.

6.2 Mitigation is required on the proposed fresh air fan, taking the form of an in-duct silencer. A full noise reduction specification is set out in full within this report.

6.3 The mitigation specified will enable the plant noise limits to be met. Other mitigation solutions are available, however the key principle is that it is possible to achieve the relevant noise limits and therefore the requirements of the local authority.



Appendix A: Noise Survey

Details and results of the environmental noise survey

An unattended noise survey was undertaken in a free field position at the boundary of the site to the rear of the unit between 13h45 on 7th September and 12h15 on 8th September 2022. The measurements were taken at a position representative of the nearest noise sensitive receiver to the rear of the unit.

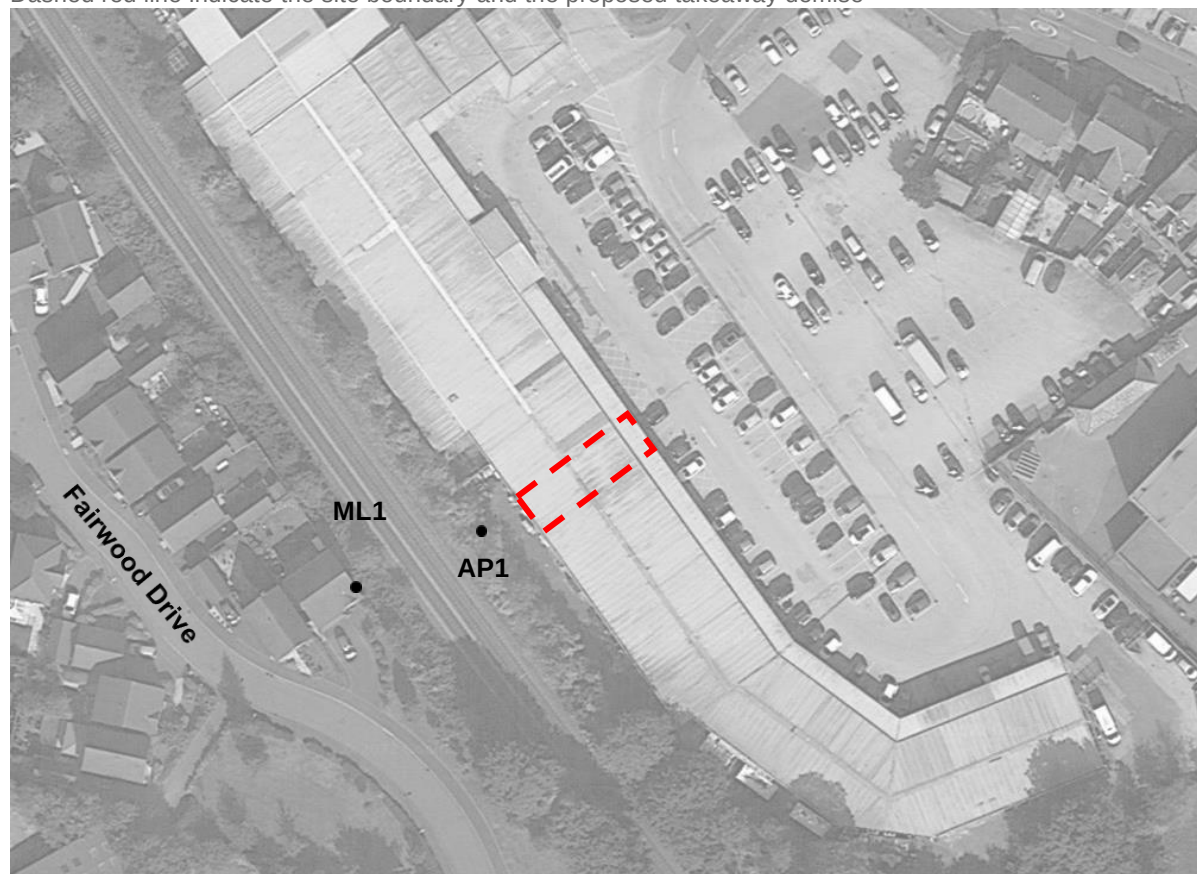
Measurements of the L_{Aeq} , L_{Amax} and L_{A90} indices were recorded over consecutive 15-minute periods for the duration of the unattended survey.

Table 6 Measurement location

Location	Detail
ML1	Microphone at 2.5m above ground level, to the rear of the site, in a free field position. Measurements were unattended. The noise climate is controlled by local road traffic the train line with some influence from local plant.

Aerial photo showing noise measurement location and assessment position

Dashed red line indicate the site boundary and the proposed takeaway demise



Aerial imagery courtesy Google Maps

6.4 Noise measurements were made using equipment set out in the following table. The sound level analyser was calibrated before and after the survey to ensure any drift was within acceptable limits.

Table 7 Measurement equipment

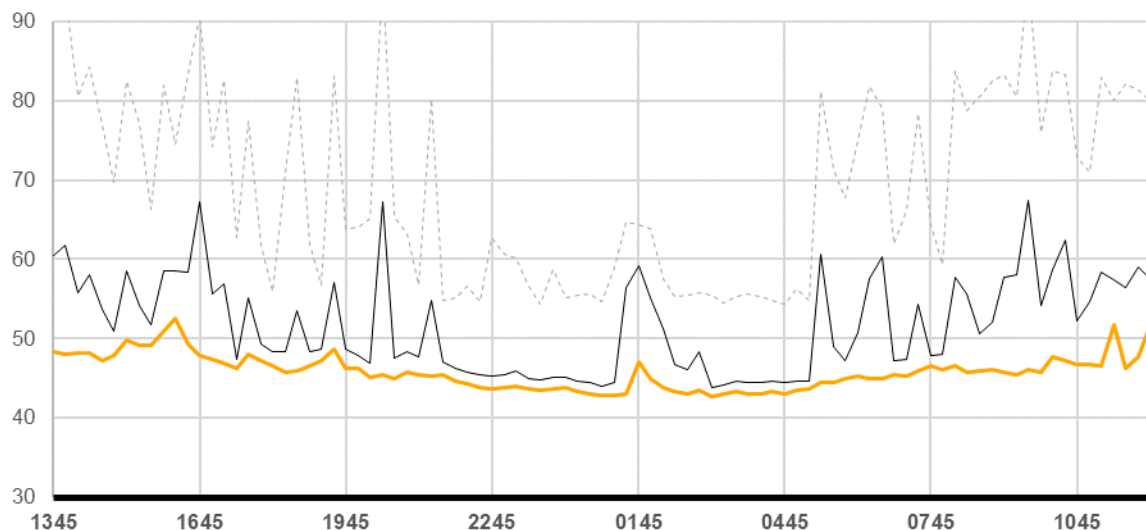
Location	Item	Detail
All measurement positions	Sound level analyser	Norsonic 140
	Outdoor microphone kit	Norsonic 1217
	Acoustic calibrator	Norsonic 1255

During the set up and collection of the survey, the weather was cool and overcast with a light breeze. Historical weather data¹ shows these conditions remained unchanged throughout the unattended survey period, with a light on collection of the survey.

The following time history graph presents the measured noise levels throughout the full survey period.

Noise Measurement Results at ML1

■ $L_{Aeq,15min}$, ■ $L_{Amax,f}$, and ■ $L_{A90,15min}$ in terms of sound pressure (dB, x-axis) against time (hhmm, y-axis).



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¹ <https://www.wunderground.com/>

Appendix B - Planning Policy and Guidance

British Standard BS 4142

British Standard 4142:2014+A1:2019 (Methods for rating and assessing industrial and commercial sound) states in section 1.1:

“This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

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

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

The standard states its applications as,

“This standard is applicable to the determination of the following levels at outdoor locations:

- a) rating levels for sources of sound of an industrial and/or commercial nature; and*
- b) 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.”*

BS 4142 sets out a daytime assessment period of 1 hour and night time period of 15 minutes. The assessment methodology requires that a “specific level” from a given noise source is determined considering these time periods. Character corrections should be added if the noise has tonality, impulsivity, intermittency or other such characteristics; this gives the “rating level” of a given noise source. The level of the correction is based upon how the noise is perceived, as set out in the standard.

The rating level of noise, $L_{Ar, Tr}$, for the relevant assessment period is the calculated noise level at the nearest receiver location, adjusted to take into account the acoustic characteristic of the noise. Acoustic feature corrections can be made to account for tonality, impulsivity, intermittency and other characteristics present in the resultant sound at the receiver position. The magnitude or appropriateness of any correction will depend both on the type of noise source and the context in which it is perceived. Similarly, in accordance with BS 4142, the period of time for which an individual noise source is active during the relevant reference time period will also be considered in establishing the rating level.

It will also be necessary to consider the existing noise climate and what sound sources contribute to it. For example, where a noise generating activity is proposed adjacent to an existing similar noise generating site, the impact of the new noise source would be less than if it were to be planned in a location where its character and type is different to and more noticeable than any existing noise source nearby.

With regard to the background sound level against which the rating level is compared, the standard states the following:

“In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.”

The periods of interest over a 24 hour day are usually related to day time activities (07:00-23:00h) and night time (23:00-07:00h). However the standard makes the following statement:

“Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods.”

Therefore, the periods of time which can be considered as ‘waking up’ and ‘falling asleep’ stages, for example 06:00h to 07:00h and 23:00h to 24:00h, may need to be considered independently. Alternative periods may also be identified where breakdown beyond the standard day and night time analysis will be necessary, for example where background sound levels are shown to be regularly elevated.

Once the rating level at each receptor has been calculated, reference can be made to the following commentary in BS 4142 in relation to conducting an initial assessment of the impact, based on the difference between the rating level of the noise source and the pre-existing background sound level.

“Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

NOTE 1 More than one assessment might be appropriate.

a) Typically, the greater this difference [between industrial site noise rating level and baseline background level], the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

From the above, it can be concluded that ensuring noise emissions from a given site or activity do not exceed noise limits set at a level 5 dB above the representative background noise levels at a given receptors will provide an indication that noise adverse effect will **not** occur.

