REPORT TITLE:

Noise Assessment at Red House 281 Oxford Rd, Gomersal, Cleckheaton BD19 4JP.

CLIENT DETAILS:

Ryedale Testing.

DATE:

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REPORT REFERENCE:

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Issue/Revision	Description/Comments	Date	Prepared by	Approved by
-	Checked & Authorised	26/07/21	JCB	MJ
A	Minor changes	24/09/21	JCB	MJ

1 Executive Summary

The prevalent noise levels at the site named Red House 281 Oxford Rd, Gomersal, Cleckheaton BD19 4JP have been measured over a working day period to assess the impact of the existing noise sources on the proposed residential developments.

The site is affected by traffic noise from Oxford Rd, and sporadic traffic noise from the adjacent public car park located at the northern boundary. It is considered that using guidelines from the World Health Organisation alongside levels provided in BS8233 for noise conditions within dwellings will ensure that 'significant adverse impacts on health and quality of life' are avoided as required by the Noise Policy Statement for England.

Consequently, an adequate level of noise mitigation measures will be required to ensure that future residents of the site are protected from the existing ambient noise.

If mitigation measures are included to achieve the specified internal noise levels, future residents of the proposed development will be protected from the dominant noise sources. Mitigation measures should include the use of appropriate glazing coupled with trickle ventilation.

This report also includes a noise impact assessment from the use of the Red House during short-term lettable accommodation to the nearest residential properties. The assessment also includes the impact of the use of the proposed car park serving the guests attending the Red House.

A noise management plan in order to mitigate the noise impact at the nearest residential during the short-term lettable accommodation is also included in this report.

2 Introduction

Pace Consult was commissioned by Ryedale Testing to undertake an assessment of the noise impact associated with the proposed development at Red House 281 Oxford Rd, Gomersal, Cleckheaton BD19 4JP

There is a potential for road traffic noise to have an impact on the proposal. Therefore, the impact of the existing noise levels has been considered in assessing the site's suitability for residential use.

The assessment was undertaken in accordance with national standards and guidelines for residential dwellings.

It should be considered that the refurbishment works which are planning to be completed within the grade II* listed building are extensively restricted due to the historical characteristic of the building. Therefore, the relevant acoustic guidelines recommend a relaxation of the internal levels when the proposed development is considered necessary or desirable.

BS8233:2014 states the following regarding necessary or desirable developments.

NOTE 7 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.

Alternative acoustic guideline such as Part E of Building regulations, also includes a statement regarding the special nature of historic buildings. This guideline states the following:

0.7 *In the case of some historic buildings undergoing a material change of use, it may not be practical to improve the sound insulation to the standards set out in Tables 1a and 1b. The need to conserve the special characteristics of such historic buildings needs to be recognised[1], and in such work, the aim should be to improve sound insulation to the extent that it is practically possible, always provided that the work does not prejudice the character of the historic building, or increase the risk of long-term deterioration to the building fabric or fittings. In arriving at an appropriate balance between historic building conservation and improving sound insulation it would be appropriate to take into account the advice of the local planning authority's conservation officer. In such cases it will be reasonable to improve the sound insulation as much as is practical, and to affix a notice showing the sound insulation value(s) obtained by testing in accordance with Regulation 20A or 12A, in a conspicuous place inside the building.*

[1] 3 BS 7913 The principles of the conservation of historic buildings, 1998 provides guidance on the principles that should be applied when proposing work on historic buildings

3 The Site

3.1 Location and Description

The site is bounded by Oxford Rd to the Eastern boundary, by residential properties to the southern and western boundaries, and by a public car park to the northern boundary. The main noise source affecting the proposal is traffic noise from Oxford Rd.

Figure 1 below shows the location of the site relative to the surrounding area with survey locations indicated (L1 to L4).

Figure 1. Measurement positions

3.2 Proposed Development

The proposal is to convert the Red House (Grade II listed building) from a formal museum to a short-term lettable accommodation. The figure below shows a representative site plan of the proposal. There is also the proposal to convert the existing Cart Shed into four residential accommodations.

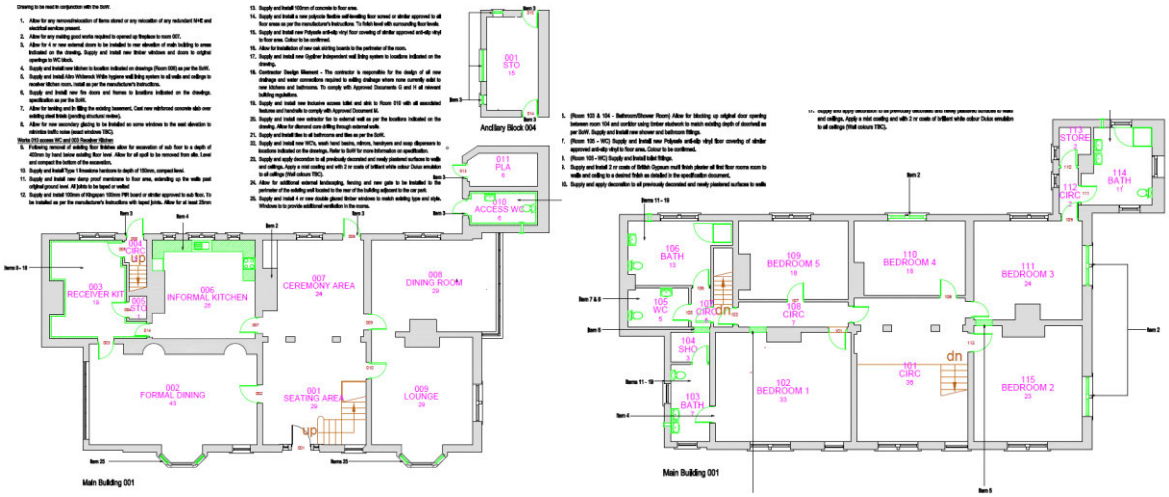


Figure 2. Main Building ground and first floor

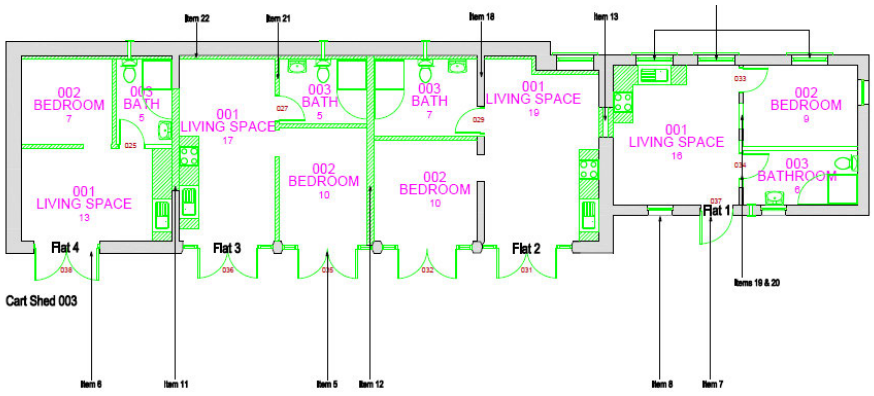


Figure 3. Cart Shed.

4 Assessment Methodology

4.1 National Planning Policy Framework and the Noise Policy Statement for England

National Planning Policy Framework and the Noise Policy Statement for England

The National Planning Policy Framework (NPPF) sets out the general requirements for gaining planning permission. Comments regarding noise found within the document are as follows.

S15. Para 170

Planning policies and decisions should contribute to and enhance the natural and local environment by:
e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

S15. Para 180

180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life 60;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

The NPPF references the Noise Policy Statement for England (NPSE) which intern references two concepts used by the World Health Organisation (WHO) which can be used to ascertain relevant noise levels for individual sites. The concepts are LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level).

The NPPF then gives three aims to adhere to:

Aim 1 – Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
Aim 2 – Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development.

Aim 3 – Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

To avoid 'significant adverse impacts on health and quality of life', by creating a situation where the impact of noise lies below the SOAEL we will refer to both BS8233 : 2014 – *Sound Insulation and noise Reduction for buildings,* and the World Health Organisation (WHO) *'Guidelines for Community Noise'* which both provide good criteria for internal noise levels for residential buildings.

In the context of assessing noise impact from the site, acceptable amenity levels for gardens are discussed within WHO Guidelines for Community noise, these criteria are also taken up by BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'.

4.2 British Standard BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

The scope of BS8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

BS8233 suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests an internal noise level of 35 dB $L_{Aeq,T}$ during day time, and 30 dB $L_{Aeq,T}$ during night time within bedrooms. In the daytime, the standard recommends 35 dB $L_{Aeq,T}$ in living rooms and in 40 dB $L_{Aeq,T}$ dining rooms. Table 4 below is extracted from this document.

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

4.3 World Health Organisation (WHO) 'Guidelines for Community Noise'

This document states that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. According to this document, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}. To avoid any possibility of

sleep disturbance, indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{Amax} for single sound events. These indoor noise levels correspond to sound pressure levels at the outside façades of the living spaces of 45 dB L_{Aeq} and 60 dB L_{Amax}. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.

4.4 ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise.

This document encourages improvements in the consistency and quality of planmaking and decision-taking in relation to acoustic matters. The context is primarily development control, although some of the content is relevant to strategic planning. The preparation of this ProPG acknowledges and reflects the Government's overarching Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and Planning Practice Guidance (including PPG-Noise), as well as other authoritative sources of guidance. This ProPG provides advice for Local Planning Authorities (LPAs) and developers, and their respective professional advisers.

The primary goal of this ProPG is to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise.

The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that it is "not dominant".

This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach.

Stage 1 – an initial noise risk assessment of the proposed development site; and
Stage 2 – a systematic consideration of four key elements.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- *Element 1 – demonstrating a "Good Acoustic Design Process";*
- *Element 2 – observing internal "Noise Level Guidelines";*
- *Element 3 – undertaking an "External Amenity Area Noise Assessment"; and*
- *Element 4 – consideration of "Other Relevant Issues".*

The two stages are described below:

Stage 1:

This section illustrates how an initial noise risk assessment is linked with an increasing risk of adverse effect from noise and how this in turn is broadly associated with indicative noise levels derived from current guidance and experience. The indicative noise levels are intended to provide a sense of the noise challenge at a potential residential development site and should be interpreted flexibly having regard to the locality, the project and the wider context. The figure 1 is included below.

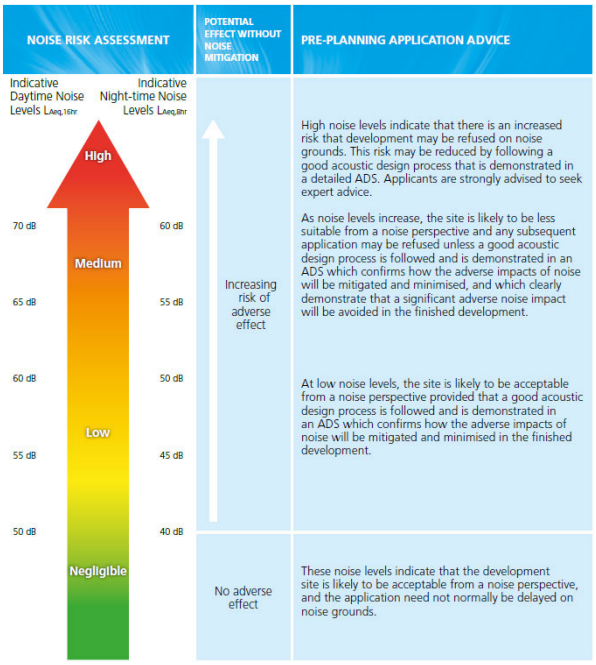


Figure notes.

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise *mitigation measures.*
b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
c. LAeq,16hr is for daytime 0700 – 2300, LAeq,8hr is for night-time 2300 – 0700.
d. An indication that there may be more than 10 noise events at night (2300 – 0700) with LAmax,F > 60 dB means the site should not be regarded as negligible risk.

Stage 2: The four key elements.

Stage 2: Element 1 – Good Acoustic design Process.

Good acoustic design should provide an integrated solution whereby the optimum acoustic outcome is achieved, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements.

Stage 2: Element 2 – Internal Noise Levels Guidelines.

The recommended ProPG internal noise level guidelines are included below.

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\ hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\ hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hr}$	30 dB $L_{Aeq,8\ hr}$ **45 dB L_{AmaxF}** (Note 4)

NOTE 1 The Table provides recommended internal LAeq target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources.
NOTE 2 The internal LAeq target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise.
NOTE 3 These internal LAeq target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.
NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB LAmax,F more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).
NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded, subject to the further advice in Note 7.
NOTE 6 Attention is drawn to the requirements of the Building Regulations.
NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal LAeq levels start to exceed the internal LAeq target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal LAeq levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (see Section 3.D).

Stage 2. Element 3 – External Amenity Area Noise Assessment.

The ProPG external amenity area noise assessment reflects and extends the advice contained in BS8233:2014 and the current Government guidance in PPGNoise as detailed in the Element 3 box below.

3(i) "If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended".
3(ii) "The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr."
3(iii) "These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."
3(iv) Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process.

3(v) Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden orlarge open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.*

Stage 2: Element 4 – Assessment of Other Relevant Issues.

This element seeks to build upon relevant national and local planning and noise policies (item 4(i)) to provide a systematic list of recommendations for the issues that should be considered before making a judgement about the noise aspects of a particular planning proposal for new residential development. The recommended relevant issues are included below.

4(i) compliance with relevant national and local policy
4(ii) magnitude and extent of compliance with ProPG
4(iii) likely occupants of the development
4(iv) acoustic design v unintended adverse consequences
4(v) acoustic design v wider planning objectives

4.5 BS4142:2014+ A1:2019 Methods for rating and assessing industrial and commercial sound

BS 4142: 2014 + A1:2019 provides a numerical means of assessing the significance of building plant noise. A key aspect of the BS 4142 assessment procedure is a comparison between the background noise level in the vicinity of noise sensitive receptors and the rating level of the noise source under consideration. The relevant parameters in this instance are as follows:

Background Sound Level, $L_{A90,T}$, defined in the Standard as the 'A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels';

Specific Sound Level, $L_{Aeq,T}$, the 'equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T (being 1 hour for assessments between 07:00-23:00hrs and 15 minutes for night time assessments 23:00-07:00hrs) ; and

Rating Level, $L_{Ar,Tr}$, the specific sound level plus any adjustment made for the characteristic features of the sound'.

BS 4142 allows for, as an absolute worst case, a cumulative +15 dB correction to be applied to the specific sound level based upon the presence or expected presence of the following 'Acoustic Feature Corrections':

Tonality – up to +6 dB penalty;
Impulsivity – up to +9 dB penalty (this can be summed with tonality penalty)
Intermittency – up to +3 dB penalty
Other sound characteristics (neither tonal nor impulsive but still distinctive) – +3 dB penalty.

The amendment made to BS4142 in 2019 does however allow for the focus on one characteristic if it is dominant above others, reducing or even eliminating the corrections which would have otherwise been added together arithmetically, in a more reasonable approach to assessment.

BS 4142 provides guidance as to the likely response from sensitive residential receptors to new fixed noise sources (e.g. building plant or services) through comparison of the rating level of the new noise source with the existing background level. The higher the rating noise level in comparison to the background noise level, the greater the likelihood of complaints arising. BS 4142 requires separate analysis for day and night time periods.

The criteria for determining the significance of changes in noise levels from building services plant, based on guidance within BS 4142, and the potential effect on noise sensitive receptors are presented in below.

Rating level is 10 dB(A) below background Very Low (LOAEL)

Rating level is equal to background Low

Rating level is +5 dB(A) above background Medium (SOEAL)

Rating level is +10 dB(A) or more above background High

The Rating Level is the noise level attributable to the new source(s), plus penalties if the new source has tonal or intermittent characteristics.

The Background Level is taken as the L_{A90}; this is the ambient noise level in the absence of the source which is exceeded for 90% of the time.

LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

A cumulative BS 4142: 2014 +A1: 2019 rating level for all new items of mechanical plant – equivalent to the prevailing Background Noise Level (L_{A90} dB) at all sensitive receptors would be expected to have a Low Impact of nearby receptors.

4.6 Acoustic ventilation and overheating. Residential design guide.

This acoustic design guide provides an approach as to how the competing aspects of thermal and acoustic comfort can be managed.
This guide is intended for the consideration of new residential development that will be exposed predominantly to airborne sound from transport sources, and to sound from mechanical services that are serving the dwelling in question.

Basically, the recommended indoor ambient noise levels is related to the duration for which the "overheating condition" occurs. The figures below include an example of the recommended indoor ambient sound levels during day/night-time based on the duration of the overheating conditions.

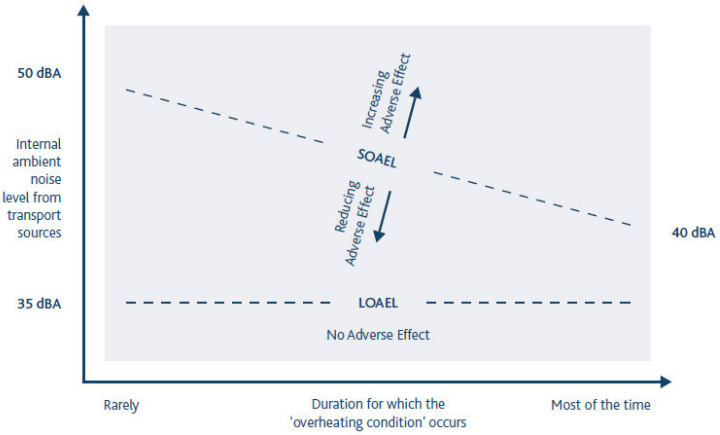


Figure 4. Daytime conditions.

As can be seen from the figure above, if the overheating condition occurs most of the time, the recommended indoor ambient noise levels should not exceed 40 dBA during daytime (bedrooms/living rooms areas). However, If the overheating occurs rarely, the indoor ambient sound levels should not exceed 50 dBA in order to avoid adverse noise effect.

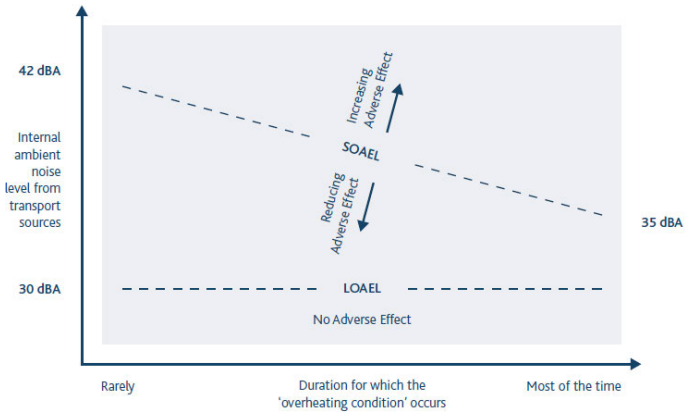


Figure 5. Night time conditions.

During nigh time conditions, the indoor ambient sound levels in bedrooms should not exceed 35 dBA, when the overheating condition occurs most of the time, and 42 dBA when the overheating occurs rarely. Living rooms noise criteria is not considered during night-time conditions.

4.7 Guidelines for Environmental noise impact assessment

These guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- *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 (for use only where the assessment is undertaken within an EIA).*
-

In order to assess the potential noise impact on nearby residential properties, the table below includes the scale of significance effect for change in noise level.

TABLE 7-14 IMPACT FROM THE CHANGE IN SOUND LEVELS
(Source HS2 Phase 1 Environmental Statement)

Long-term Impact Classification	Short-term Impact Classification	Sound level change dB L_{pAeqT} (positive or negative) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB
Major		≥ 10 dB

Figure 6. Impact from the change in sound levels.

Negligible effect occurs when the calculated noise levels will not have a representative increase in the ambient noise levels affecting the nearby residential receptors.

5 Survey Method and Equipment

5.1 Survey

The noise survey was carried out between Thursday 22nd and Friday 23rd July 2021 to measure representative noise levels at the site of the proposed development during a typical weekday period.

The noise survey comprised of two unattended and two attended monitoring locations on site which are described in detail below.

- Location 1. The sound level meter was located adjacent to the external boundary wall of the main building. The microphone was positioned at 1.5 m above ground level, and 3 m from any reflective surface.
- Location 2. Internal noise measurements within the proposed dining room (Room 008). The microphone was positioned at 1.2 m above floor level, and 1.5 m from any reflective surface.
- Location 3. The sound level meter was positioned at the western boundary next to the proposed Cart shed building, and nearest noise sensitive properties located at the southern boundary. The microphone was positioned at 1.5 m above ground level, and 3 m from any reflective surface.
- Location 4. The sound level meter was positioned at the Northern edge of adjoining car park close to the nearest residential properties. The microphone was positioned at 1.5 m above ground level, and 3 m from any reflective surface.

Noise measurements were made with a calibrated precision grade sound level meter which achieves the requirements of BS EN 61672:2003. The survey was carried out in accordance with the principles of BS 7445:1997 Parts 1-3, 'Description and Measurement of Environmental Noise', and British Standard BS4142: 2014: Methods for rating and assessing industrial and commercial sound.

5.2 Equipment

Table 1. Equipment			
Item Description	Serial Number	Calibration due date	Notes
Brüel & Kjaer Analyser	3009813	05/07/2023	Locations 1 & 3
Brüel & Kjaer Microphone	3080408	05/07/2023	
Brüel & Kjaer Analyser	2645027	13/08/2021	Locations 2 & 4
Brüel & Kjaer Microphone	3087393	13/08/2021	
Brüel & Kjaer Calibrator	2671671	21/09/2021	
Brüel & Kjaer Calibrator	2478250	20/01/2022	
Comark Digital Thermometer	908650	09/03/2022	

The sound level meters were calibrated before and after the survey. No significant drift was noted between the two reference checks.

5.3 Weather

In order to evaluate the weather conditions weather check measurements were undertaken on site. During the weather checks, it was noted that the climatic conditions were stable during the whole measurement period. During the visits the sky was clear.

Table 2. Weather condition.			
	ºC	Wind speed m/s	Barometric pressure mB
Thursday 22nd July 2021	16-26	< 5	999-1015mB
Friday 23rd. July 2021	18-20	< 5	1020

6 Survey Results

The measurement survey at all monitoring locations comprised of consecutive measurement periods in terms of the most relevant standards and guidelines. The Tables below show the period noise levels measured at all monitoring locations. These have subsequently been used as the basis for establishing the dominant noise levels across the site.

Table 3. Measured continuous noise level MP1

Time	Period $L_{Aeq,\,T}$ dB (Log Average)	$L_{Amax(fast),\,T}$ dB	$L_{A90,T}$ dB Statistic mode
Day (07:00 – 23:00)	70	95th Percentile 84 Average 78	49
Night (23:00 – 08:00)	66	95th Percentile 80 Average 75	41

Table 4. Measured continuous noise level MP2

Time	Period $L_{Aeq,\,T}$ dB (Log Average)	$L_{Amax(fast),\,T}$ dB	$L_{A90,T}$ dB Statistic mode
Day (17:00 – 23:00)	32	95th Percentile 61 Average 48	21
Night (23:00 – 08:00)	28	95th Percentile 50 Average 40	24

Table 5. Measured continuous noise level MP3

Time	Period $L_{Aeq,\,T}$ dB (Log Average)	$L_{Amax(fast),\,T}$ dB	$L_{A90,T}$ dB Statistic mode
Day (11:20 – 14:15)	48	95th Percentile 58 Average 53	41

Table 6. Measured continuous noise level MP4			
Time	**Period $L_{Aeq,\,T}$ dB** (Log Average)	**$L_{Amax(fast),\,T}$ dB**	**$L_{A90,T}$ dB** Minimum Background
Day (11:36 – 14:40)	50	95th Percentile 72 Average 62	41

7 Site Suitability for Residential Development

7.1 Noise Assessment

External noise levels have been predicted for the sensitive façades of the proposed development that will be exposed to the highest levels of noise. All calculations are based on the results of the noise monitoring exercise.

The octave spectra used in the assessment of the noise intrusion into the proposed residential are shown below. The night-time maximum noise levels are based on the 95th percentile of the levels measured during the survey for a robust assessment.

Table 7 Example noise level octave spectrums used for building envelope calculation (MP1)								
Freq. Hz	63	125	250	500	1 k	2 k	4 k	Average dBA
Day-time L_{eq}	73	67	65	64	67	61	53	70
Night-time L_{eq}	68	62	62	61	64	58	50	66
Night-time $L_{max(fast)}$	82	79	79	76	76	70	68	80

Table 8 Example noise level octave spectrums used for building envelope calculation (MP2)								
Freq. Hz	63	125	250	500	1 k	2 k	4 k	Average dBA
Day-time L_{eq}	50	42	35	27	23	20	14	32
Night-time L_{eq}	45	38	31	24	16	13	10	28
Night-time $L_{max(fast)}$	61	58	56	41	34	34	30	50

Table 9 Example noise level octave spectrums used for building envelope calculation (MP3)								
Freq. Hz	63	125	250	500	1 k	2 k	4 k	Average dBA
Day-time L_{eq}	58	47	42	43	45	38	29	48

7.2 Building Envelope Sound Insulation Main Building.

Based on the internal noise measurements completed in the proposed dining room (Room 008) it can be concluded that the existing external walls (masonry wall), and existing glazing have sufficient thickness and mass to mitigate the noise intrusion up to levels recommended by the relevant acoustic guidelines in dining, lounge, and ceremony areas.

However, the proposed bedrooms located at first floor level will require a secondary glazing to be installed behind the existing glazing in order to mitigate the noise intrusion. The secondary glazing should have a minimum sound reduction of R_w 35 dB (secondary glazing build up should be as follow: existing glazing, cavity 50 mm minimum, and secondary glazing with a minimum sound reduction of R_w 35 dB). The secondary glazing should be installed in bedroom 2 (115), bedroom 3 (111), bedroom 1 (102), and bedroom 5 (109).

There are many suppliers which are specialized in supplying secondary glazing for listed buildings, the link below includes one of these suppliers.

https://www.citysoundglazing.co.uk/listed-buildings/?gclid=Cj0KCQjw_OzrBRDmARIsAAIdQ_JLZ5T3wmPJq1Z4VnmW83_j_F0g2bpXOD9ImthiT4Ik4TprhyAsbowaAsSXEALw_wcB

The new glazing in bedrooms 3 (111), bedroom 2 (115), and bedroom 4 should have the following sound reduction.

Table 10 – Specification for the building envelope.								
Freq. Hz	63	125	250	500	1 k	2 k	4 k	**Average**
Glazing – Bedrooms	25	28	31	42	45	50	58	**44dB R_w**
Trickle vent Bedroom	34	37	37	36	47	49	55	**44 Dn,w**

By employing the above attenuating measures, it would be possible to attain the internal noise levels within dwellings recommended in British Standard BS 8233:*2014 Guidance on sound insulation and noise reduction for buildings*.

An example of the noise intrusion calculations based on the proposed glazing and trickle vent recommended in the above table in bedroom 3 is included below, the calculation is based on the highest measured individual noise events during night-time (worst case scenario). The assessment is completed according to the methodology recommended by BS8233:2014 *(Section G.2 Typical design problem: More rigorous calculation).*

BS8233:2014 Calculation of Sound transmission into a building

Project		**Date**	
Client		**Consultant**	

Building elements & Areas	**Total M²**
S_{ew} - External Wall Area	11.44
S_{wi} - Area of Windows within Room	2 66
S_{rr} - Area of Ceiling within Room	22.50
Total Façade Area	**14.10**
Total Area of transmitting elements	**36.60**

Constants	
A0	10
A (0.16√T)	19.44
No. Vents	1

	W	L	H	V	Rt (s)
Room Data	4 5	5	2.7	60.75	0.5

	Constructions & Performance Data:						
Construction	*63*	*125*	*250*	*500*	*1K*	*2K*	*4K*
Window Double glazing	25	28	31	42	45	50	58
Vent	34	37	37	36	47	49	55
External Wall	43	41	49	56	62	67	72
Roof/Ceiling	22	35	48	56	60	56	60

	Source Noise & Element Contributions						
	63	*125*	*250*	*500*	*1K*	*2K*	*4K*
Source Lp	82	79	79	76	76	70	68
Window	-36.4	-39.4	-42.4	-53.4	-56.4	-61.4	-69.4
Vent	-39 6	-42.6	-42 6	-41 6	-52.6	-54.6	-60.6
Wall	-48.1	-46.1	-54.1	-61.1	-67.1	-72.1	-77.1
Ceiling	-24.1	-37.1	-50.1	-58.1	-62.1	-58.1	-62.1
Cumulative SRI	**-23.7**	**-34.1**	**-39**	**-41.2**	**-50.7**	**-52.4**	**-57.9**
Plus 10log S/A	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Façade Effect	3	3	3	3	3	3	3
RESULT	64.0	50.6	45.7	40.5	31.0	23.3	15.8

A weighted Internal Level	43.6

Figure 7. Noise intrusion calculations (Bedroom 3).

As can be seen from the above table, the calculated noise levels in bedroom 3 affected by the highest individual noise events is 44 $L_{Amax(fast)}$ dB, which is 6 dB below the recommended acoustic criteria. (≤45 $L_{Amax,fast}$ + 5 dB relaxation) in bedrooms during night time.

The average levels (L_{Aeq} dB) during day and night-time in bedrooms are also compliant with the recommended criteria.

7.2.1 Noise intrusion during overheating conditions.

The calculated noise intrusion into habitable spaces included in the previous section are based on the sound reduction provided by the existing structures and the recommended acoustic glazing and trickle vent. The required ventilation is provided by trickle vents (open) as recommended by the relevant acoustic guideline BS8233:2014.

In order to evaluate the noise intrusion during overheating conditions, the methodology and assessment recommended by the acoustic guide *Acoustics ventilation and overheating, Residential design guide* is included in the table below.

Sound transmission by percentage view of different building elements

Project:		Date:	25-Jul-21

Building elements & Areas		Total M^2
External Wall	81%	11.44
Window	15%	2.16
Open window	4%	0.50
	Total	14.10

Distance to source	1	
Total distance to receiver point	1	

		W	L	H	Rt (s)
Room Data	Volume	4.4	5	2.7	0.5

	63	*125*	*250*	*500*	*1K*	*2K*	*4K*
Source Lp	**68**	**62**	**62**	**61**	**64**	**58**	**50**
External Wall	43	41	49	56	62	67	72
Window	25	28	31	42	45	50	58
Open window	21	14	11	18	10	14	15
Composite ®	30.9	27.6	25.3	32.4	24.5	28.5	29.5
10log-ST/0.163xV	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4	-1.4
Distance Loss	0	0	0	0	0	0	0
Factor	3	3	3	3	3	3	3

	63	*125*	*250*	*500*	*1K*	*2K*	*4K*	*dBA*
Resultant	**39**	**36**	**38**	**30**	**41**	**31**	**22**	**42.1**

Figure 8. Noise intrusion during overheating conditions (Bedroom 3).

The calculated noise ingress in bedroom 3 based on the measured average noise levels during night-time is L_{Aeq} 42 dB. The table overleaf compares the calculated internal noise levels against the criteria recommended by the *Acoustics ventilation and overheating, Residential design guide.*

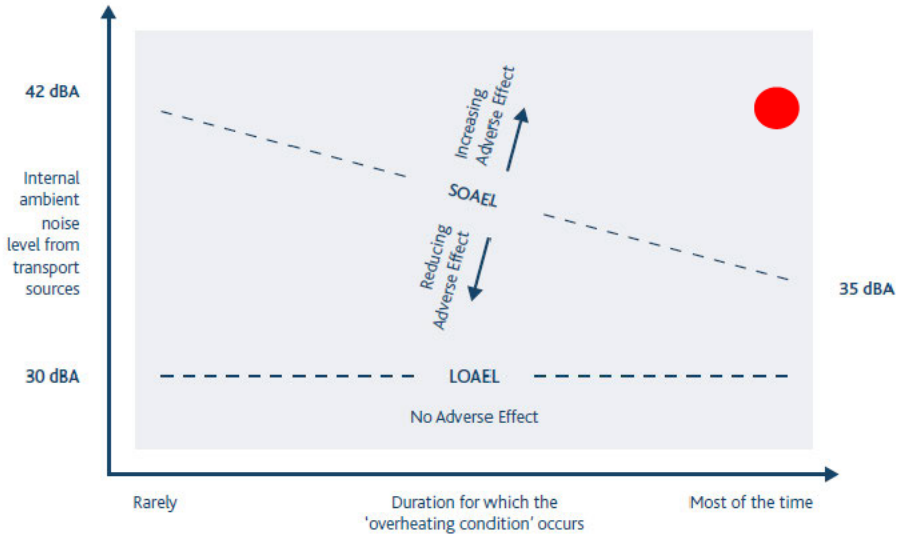


Figure 9. Night-time conditions (Bedroom 3).

As can be seen from the above figure, assuming that the overheating condition during night-time is likely to happen most of the time, opening windows as a main ventilation strategy is not a suitable solution. Therefore, mechanical ventilation such as MVHR units are recommended in bedrooms which are at risk of overheating.

The noise intrusion during daytime and individual noise events during night-time are also clearly above the SOAEL where a noise causes a material change in behaviour e.g., having to keep windows closed most of the time.

7.3 Building Envelope Sound Insulation Cart Shed.

The noise levels affecting this building is low, and therefore high acoustically rated windows, and trickle vents will not be required. The recommended acoustic rates of these elements are included below.

Table 11 – Specification for the building envelope.

Freq. Hz	63	125	250	500	1 k	2 k	4 k	**Average**
Glazing – Bedrooms	15	21	17	25	35	37	31	**29 dB R_w**
Trickle vent Bedroom	29	36	38	36	32	37	39	**35 Dn,w**

Internal noise levels during overheating conditions are expected to be below the levels recommended by the relevant acoustic guidelines.

7.4 External amenity areas

The sound levels measured at the position MP3 are 48 L_{Aeq} dB, which is below the levels recommended by the relevant acoustic guidelines, which recommends that the acoustic environment of external amenities areas that are intrinsic part of the overall design should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.

8 Noise from Fixed Installations and Mechanical Plant

Noise levels generated by mechanical plant and experienced by local receptors depends upon a number of variables, the most significant of which are considered to be as follows.

- Noise generated by plant or equipment used on site, generally expressed as sound power levels (SWL).
- Distance between the noise source and the receptor.
- Attenuation due to ground absorption, atmospheric and barrier effects.
- Periods of operation of the plant on the site, known as its "on-time".

It is possible that the proposal will include installations of ventilation and mechanical plant. However, at this stage, no information is available with regard to the fixed installations and mechanical plants that are to be installed as part of the proposed development.

Consequently, it is not possible to present an inclusive assessment of the noise effects of such plant. However, in order to ensure that background noise levels at the nearest noise sensitive receptors do not increase significantly as a result of the development, design noise limits for electrical and mechanical plant have been provided.

The noise limits have been based on achieving the quietest background noise level recorded during the noise survey.

Table 12 : Noise Limit for Fixed Installations of Mechanical Plant, $L_{Ar,Tr}$ (dB)	
Daytime	Night-time
41	41

If fixed installations and mechanical plant are designed to achieve the above-mentioned noise limits at the nearest residential receivers complaints will be minimised.

There are a number of measures that can be introduced to control noise from the mechanical and fixed plant installation associated with the proposed development. Consideration should be given to reducing noise at point of generation (e.g., by selecting

quieter plant) or containment of noise generated (e.g., by insulating buildings which house machinery and/or providing purpose-built barriers around the site).

9 Noise assessment of the proposed noise sources.

It is understood that the main building is going to be used as a short-term lettable accommodation, which may include family celebrations, such as special birthdays, christenings, and sporadic special function events with amplified music. Therefore, this section includes the noise impact assessment during these special events affecting the nearest residential properties.

The total number of guests attending these events are approximately 40 who will be attending the house and its garden during the day

In order to evaluate the noise impact from these events, the following noise scenarios have been considered.

- **Scenario 1.** Special event in the ceremony area with amplified music, doors and windows closed.
- **Scenario 2.** Special event in the ceremony area with amplified music, doors and windows open.
- **Scenario 3.** Special event in the formal dining room, doors and windows closed. No amplified music considered.
- **Scenario 4**. Special event in the formal dining room, doors and windows open. No amplified music considered.
- **Scenario 5.** Special event in the garden with amplified music.
- **Scenario 6.** Special event in the garden no music.
- **Scenario 7.** Noise impact from the use of the proposed car park and associated traffic noise.

Notes.

- The total number of guests attending the special events are 40, however for the purposes of the assessment is considered that 20 guests will be speaking louder and other 20 guests will be listening.

- The traffic noise from the cars attending the proposed development and associated car park is calculated according to the methodology included in the Calculation of Road Traffic Noise edited by the department of transport (Welsk office).

- The calculated noise levels from the proposed acoustic scenarios are compared against the existing average noise levels measured at the proximity of the nearest residential properties.

- The noise break out from the building due to the different internal activities assumes the sound reduction provided by the existing structures, and existing glazing. The internal noise levels calculation is executed according to VDI 3760 and the outdoor noise propagation is executed according to the methodology described within ISO 9613-2.

9.1 Uncertainty in the calculations

The following steps were taken in order to reduce the level of uncertainty within the sound measurements and calculations:

- The sound level meter was immediately calibrated before and after the survey, the difference between the initial calibration value, and the final calibration check of completion of measurements did not exceed ± 0.5 dB.

- The sound emission calculation has been undertaken using recognised sound propagation software.

It is considered that the uncertainty in the results is extremely low due to the following:

- Favourable weather conditions during the background measurements

- The sound emission calculation using appropriate software was verified by Pace Consult Ltd. peer reviewed.

- The sound levels measurements were completed based on the recommendation included within the relevant acoustic guidelines such as BS4142: *Methods for rating and assessing industrial and commercial sound*, and BS 7445-1:2003 *Description and measurement of environmental noise. Guide to quantities and procedures.*

9.2 Nearest Noise sensitive receptors.

The noise impact assessment includes two nearest noise sensitive receptors located at the southern and northern boundaries respectively, which have the potential to be affected by the proposal. The figure below includes the noise sensitive receptors which are included within the noise impact assessment.

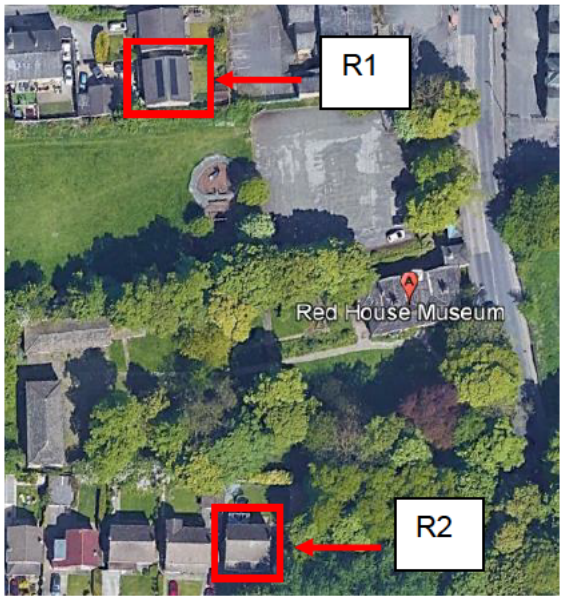


Figure 10. Nearest residential properties.

9.3 Scenario 1.

Special event in the ceremony area with amplified music, doors and windows closed.

The calculation assumes the following sound levels.

Table 13. Sound levels during conversation. Lw dB									
	Sum dB	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Raised voice	78	65	65	70	75	72	64	57	48

The amplified music assumes two speakers with the following sound levels. It is recommended that the noise levels from the speakers at 1 m will not exceed 80 dBA in order to minimise as much as possible the noise impact.

Table 14. Sound levels speakers Lw dB									
	Sum	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Speaker sound levels	94	86	86	87	88	84	80	70	45

The calculated noise levels against the pre-existing noise climate at the nearest residential is included in the table below.

Table 15. Noise assessment during day time.			
ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	24	48	-24
R2	24	50	-26

As can be seen from the above table the calculated noise levels is substantially below the measured ambient noise levels, and therefore the noise impact from the proposed activities in the ceremony area will be negligible at the nearest residential properties.

The noise map of this scenario is included in the Annex.

9.4 Scenario 2.

This scenario includes a special event in the ceremony area with amplified music, doors and windows open.

Table 16. Noise assessment during day time.			
ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	47	48	-1
R2	47	50	-3

As can be seen from the above table the calculated noise levels is below the measured ambient noise levels, and therefore the noise impact from the proposed activities in the ceremony area will be negligible.

The noise map of this scenario is included in the Annex.

9.5 Scenario 3.

Special event in the formal dining room, doors and windows closed. No amplified music considered.

Table 17. Noise assessment during day time.			
ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	21	48	-27
R2	27	50	-23

As can be seen from the above table the calculated noise levels is substantially below the measured ambient noise levels, and therefore the noise impact from the proposed activities in the ceremony area will be negligible.

The noise map of this scenario is included in the Annex.

9.6 Scenario 4.

Special event in the formal dining room, doors and windows open. No amplified music considered.

Table 18. Noise assessment during day time.

ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	40	48	-8
R2	48	50	-2

As can be seen from the above table the calculated noise levels is below the measured ambient noise levels, and therefore the noise impact from the proposed activities in the ceremony area will be negligible.

The noise map of this scenario is included in the Annex.

9.7 Scenario 5.

Special event in the garden with amplified music. The amplified music should be restricted to 80 dBA at 1 m from the speakers.

Table 19. Noise assessment during day time.

ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	40	48	-8
R2	48	50	-2

As can be seen from the above table the calculated noise levels is below the measured ambient noise levels, and therefore the noise impact from the proposed activities in the ceremony area will be negligible.

The noise map of this scenario is included in the Annex.

9.8 Scenario 6.

Special event in the garden no music.

Table 20. Noise assessment during day time.

ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	40	48	-8
R2	45	50	-5

As can be seen from the above table the calculated noise levels is below the measured ambient noise levels, and therefore the noise impact from the proposed activities in the ceremony area will be negligible.

The noise map of this scenario is included in the Annex.

9.9 Scenario 7.

Noise impact from the use of the proposed car park and associated traffic. The calculation assumes nine cars arriving at the car park by adjacent roads at the same time.

Table 21. Noise assessment during day time.

ID	Calculated Sound Pressure Level dBA	Pre-Existing Ambient Noise Level LAeq dB	Calculated noise levels against pre-existing ambient noise level
R1	40	48	-8
R2	47	50	-3

As can be seen from the above table the calculated noise levels is below the measured ambient noise levels, and therefore the noise impact from an intensive use of the car park will be negligible at the nearest residential properties.

The noise map of this scenario is included in the Annex

10 Noise management plan (short-term lettable accommodation).

This management plan details potential noise generating activities associated with the operation of the proposal as a short-term lettable accommodation and provides recommendations to mitigate the noise levels.

- *managing bookings*
- *access and egress from the building by patrons*
- *deliveries (bottle bank collections during the day period)*
- *emptying bottles*
- *management of smoking/garden area*

Managing Party Bookings.

- The noise impact on residents should be considered before booking or organising an event.
- Good communication with the closest neighbours. The nearest residentials attitude to the proposal can also be improved through good resident liaison and information distribution and the provision of a helpline to respond to queries or complaints. It is therefore recommended that good relations can be developed by keeping residents informed of any event and by treating complaints fairly and expeditiously. This builds trust and understanding between the operator and the community.
- A method should be set up for recording and responding to any kind of noise complaints from the residents within appropriate time limits. It is also recommended that an internal communication procedure will be set up in order to deal with noise issues and complaints.
- The premises holder should make available and regularly promote a contact number for local residents to contact the premises to discuss any specific noise incident.
- It is well established that people's attitudes to noise can be influenced by their attitudes to the source, activity, or operator itself. Noise from a site will tend to be accepted more readily by local residents, if they consider that the operator is taking all possible measures to avoid unnecessary noise.
- Staff should be provided with adequate training and advice on noise control measured and made aware of the internal procedures for assessing and controlling noise and dealing with the recorded complaints.

- Implemented best practice by briefing staff about the necessity in reducing noise levels. The noise emission from the speakers should be set up by using a sound-limiting device which should be set up to a maximum sound level of 80 dBA. It is also recommended to mitigate the bass (low frequency), as this can easily travel across the building structure.

- Access to the sound limiting device should be restricted.

Access and egress from the building by guests

- It is recommended to play more gently music at the end of the event which can help to calm the mood and guests will be less noisy when they leave the premises.
- Instruct the staff to remind guests to be quiet when they leave the premises.
- Include signs in prominent areas asking guests to be quiet when leaving.
- Door staff should be used in order to control the access, and they should assist in reducing disturbance by actively managing the entrance and exit.
- Staff should be instructed on their responsibility to reduce noise from guests as they arrive and leave the premises.
- Method for controlling queuing outside the premises and control of congregation of guests outside should be implemented.
- The staff should guide the guests on routes to take as they depart in order to minimise noise nuisance.
- The operator should provide arrangements for calling taxis or hire vehicles and liaison with dedicated service provider. The provider should be made aware of the necessity of arriving and departing the premises as quietly as possible, i.e., avoiding sounding their horns.
- Staff should complete routine monitoring outside the premises during opening hours in order to evaluate any action which will increase the noise levels.
- Provision of a closed-circuit television (CCTV) in order to monitor activities during the arrival and departure of guests. The surveillance can also provide an effective information to prevent incidents that may cause noise issues.
- Staff will encourage the gradual dispersal of guests to minimise noise nuisance.

Management of smoking/garden area

- Any external smoking area should be carefully considered in order to avoid noise nuisance.
- Management of outdoor smoking area is important; it is therefore recommended that guests using the smoking area or outside areas should be monitored by staff in order

to control the number outside the premises. This is in order to prevent unsatisfactory number of guests outside. Staff will make requests for guests to return inside as soon as possible.

- It would be prudent to reduce access to any smoking area at late evening in order to control noise nuisance.

Deliveries (bottle bank collections during the day period)

- As a general recommendation, noisy activities such as deliveries, collection of waste and cleaning should not take place during late evening or early morning.
- It is recommended to limit the number and/or frequency of deliveries/collections.
- Carefully management of goods movements in order to avoid congested peak hours. Late deliveries/collection should be avoided.

Emptying bottles

- Refuse and empty bottle/barrel storage should be completed in a designated internal area (storeroom) and not outside the premises.
- Avoid placing of refuse bottles into receptables outside the premises at any time.

11 Conclusions

The impact of noise associated with the proposed developments at Red House 281 Oxford Rd, Gomersal, Cleckheaton BD19 4JP. has been assessed.

Throughout, the assessment has been undertaken with reference to British Standards and national and international guidance on noise impact.

The noise levels have been assessed with consideration to the National Planning Policy Framework and the Noise Policy Note for England. Following these policies, figures from the WHO's 'Guidelines for Community Noise', Pro PG, and BS8233 '*Sound Insulation and Noise Reduction for Buildings*' have been used to assure that 'significant adverse impacts on health and quality of life' are avoided. To achieve these internal noise levels envelope constructions have been suggested.

The calculated noise emission from the proposal in high levels of occupancy during short term residential accommodation for holiday letting is below the existing noise climate at the nearest residential properties. The calculated noise levels during high occupancy of the car

park are also below the existing noise climate measured at the nearest residential properties.

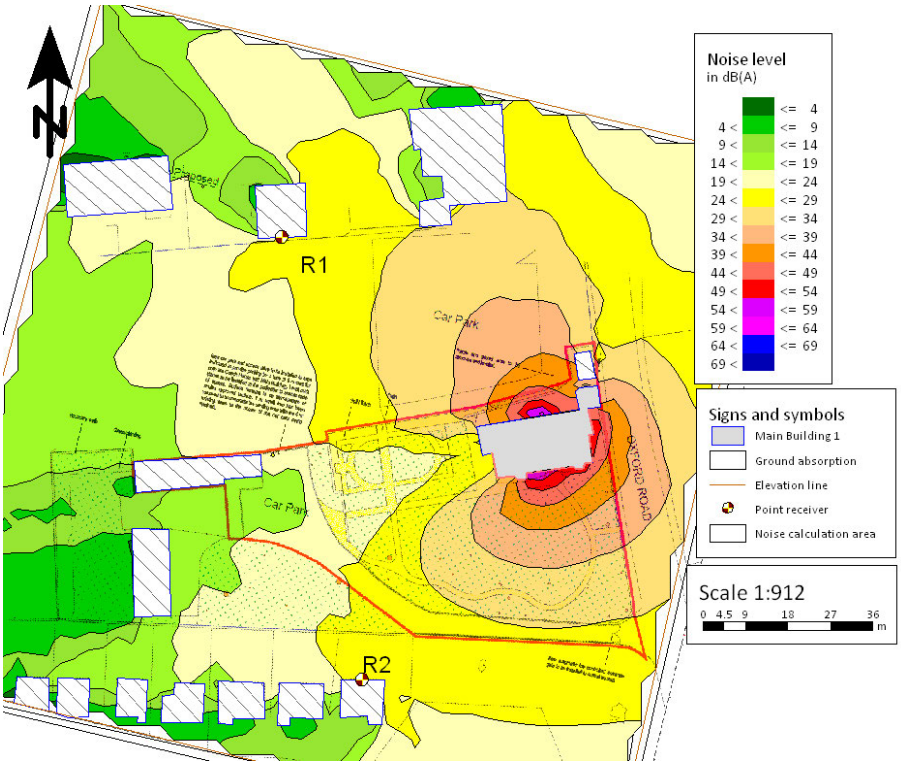
In order to minimise the noise emission during high occupancy a noise management plan is included in this report.

12 References

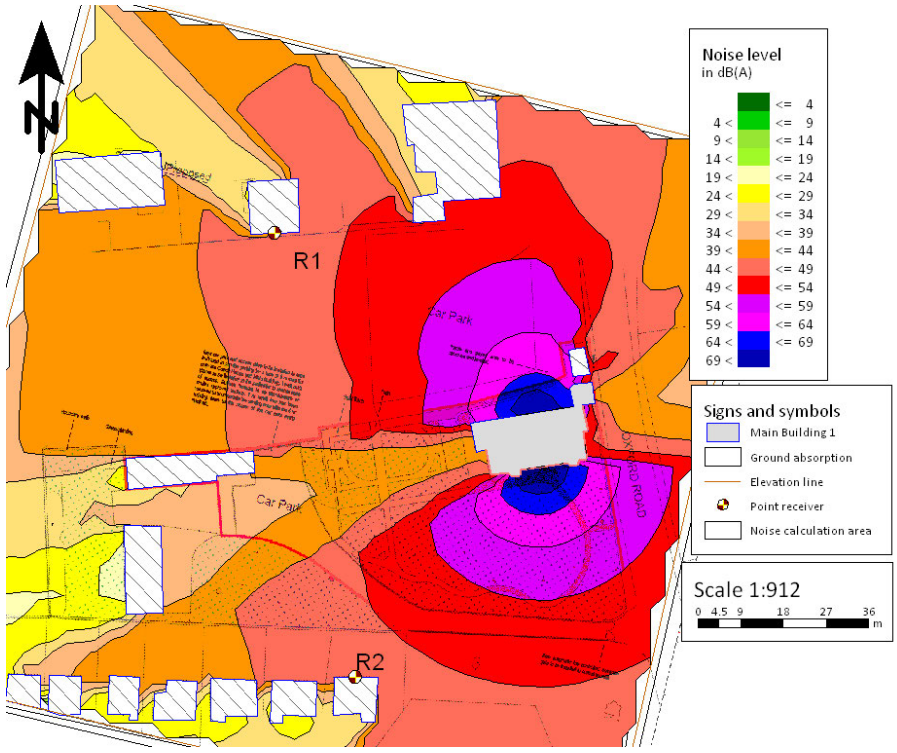
1. National Planning Policy Framework
2. Noise Policy Statement for England
3. British Standard BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings
4. World Health Organisation (WHO) ‘Guidelines for Community Noise’
5. ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise.
6. BS4142:2014+ A1:2019 Methods for rating and assessing industrial and commercial sound
7. Acoustic ventilation and overheating. Residential design guide.
8. Guidelines for Environmental noise impact assessment

Annex 1. Noise maps.

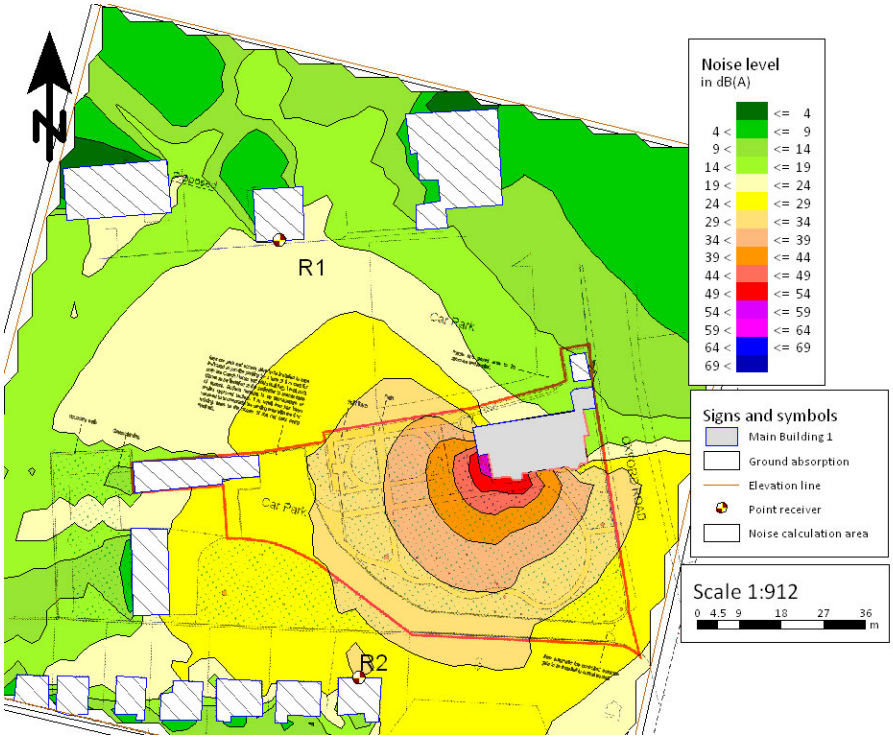
Scenario 1. Noise map.



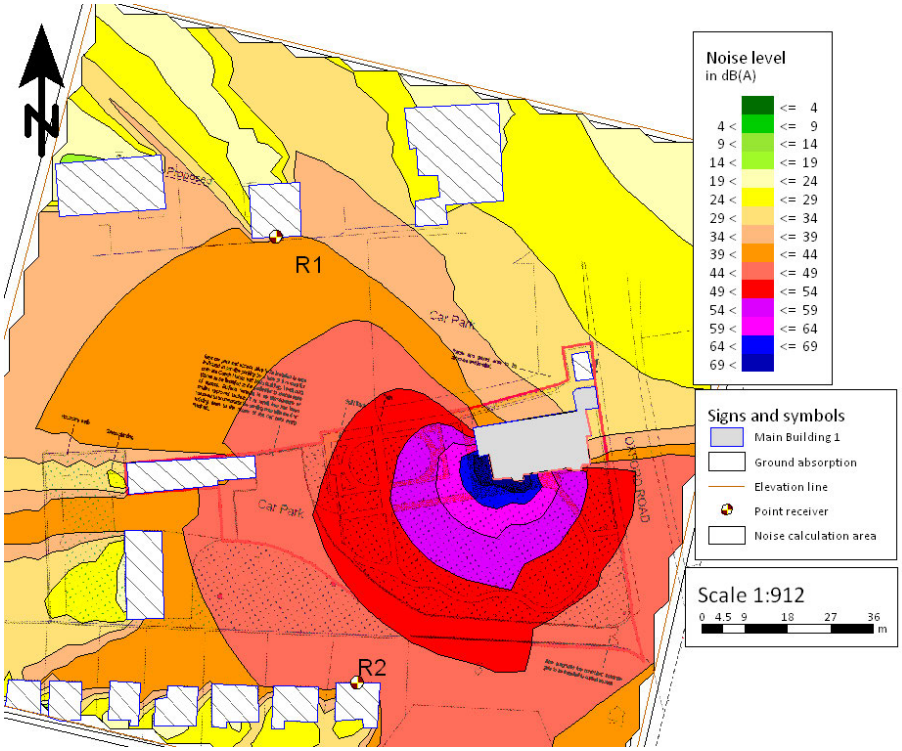
Scenario 2.



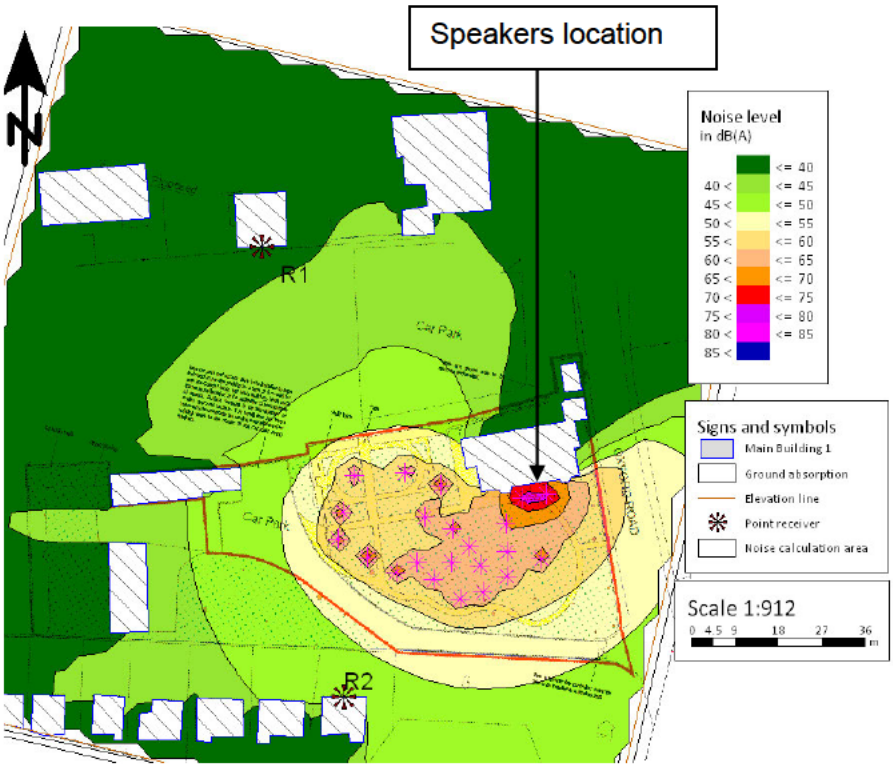
Scenario 3.



Scenario 4.



Scenario 5.

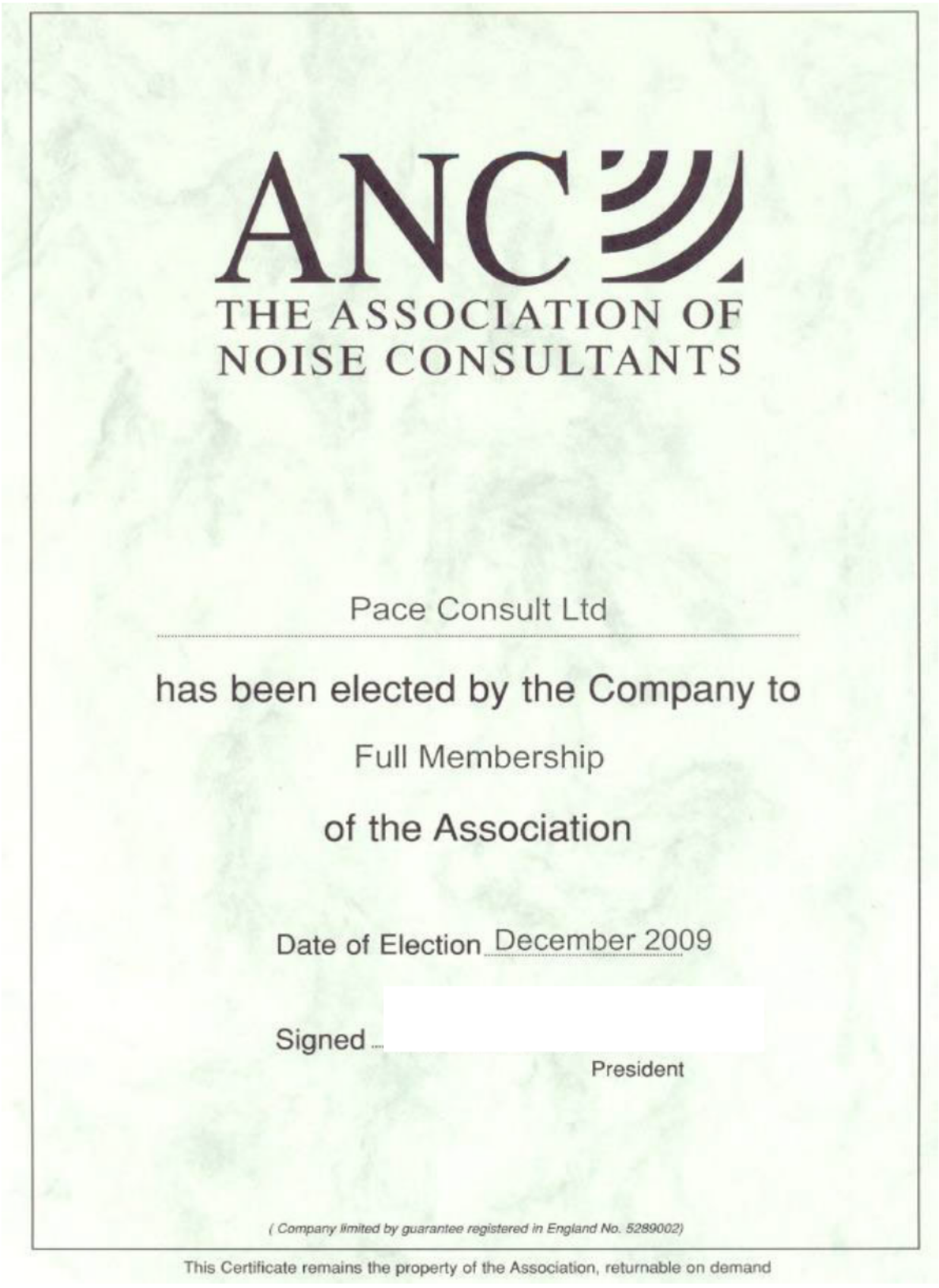


Scenario 6.

Scenario 7.


N
R1
R2
Car Park
Noise level
in dB(A)
<= 40
40 < <= 45
45 < <= 50
50 < <= 55
55 < <= 60
60 < <= 65
65 < <= 70
70 < <= 75
75 < <= 80
80 < <= 85
85 <
Signs and symbols
Road
Surface
Parking lot
Point receiver
Noise calculation area
Scale 1:912
0 4.5 9 18 27 36
m

Appendix 1 ANC Accreditation



ANC

THE ASSOCIATION OF NOISE CONSULTANTS

Pace Consult Ltd

has been elected by the Company to

Full Membership

of the Association

Date of Election December 2009

Signed ...

President

(Company limited by guarantee registered in England No. 5289002)

This Certificate remains the property of the Association, returnable on demand