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THE GROVE HOTEL, BUXTON

NOISE IMPACT ASSESSMENT

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Description	This report details a noise survey of existing noise levels to The Grove Hotel, Buxton, which will be refurbished to create new residential apartments. This report outlines the impact of the noise levels measured and identifies a scheme of mitigation required to meet suitable noise levels internally.	Ramboll Arkwright House Parsonage Gardens Manchester M3 2LF United Kingdom T +44 161 827 1890 https://uk.ramboll.com

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SUMMARY

AH2 Buxton Limited are proposing to refurbish The Grove Hotel, Buxton, to create new residential apartments on the upper three floors. It is understood the ground floor retail units will remain unchanged.

External noise levels have been measured and used to determine a suitable noise insulation strategy so that suitable internal noise levels can be met. The methodology and criteria of this assessment have been discussed with Local Authority.

For habitable rooms overlooking Terrace Road (A515), standard thermal glazing and ventilators can be used. An acoustic ventilator will be required to bedrooms to control regular maximum noise events, which are due to vehicular movements external to the building.

Noise levels to the rear of the building are much lower due to the screening provided to the A515. However, a service yard to local shops is situated to the rear, as well as several condensers which are expected to provide cooling to a shop in the area during summertime. These noise sources are discussed within this report but are not expected to provide any significant impacts to the new residential units. It is recommended that an alternative means of ventilation is provided to rooms facing these sources so that windows may be closed when needed. A trickle vent is expected to be sufficient for this purpose.

This report provides limits for external plant where any extract systems, or mechanical ventilation systems are subsequently proposed.

1. NOISE SURVEY

1.1 Noise Survey Details

A baseline noise survey was undertaken between Thursday 2nd December and Friday 3rd December 2021. Since the dominant source of noise in the vicinity of The Grove Hotel is road traffic on Terrace Road (A515), a noise logger was left at LT1, extended from the façade out of third floor window (façade measurement). This noise logger was left on site for just under 24-hours in order to measure noise levels during a full daytime period and overnight. It is considered that this was a sufficiently large data set to establish the typical noise climate external to the building.

Noise levels to the rear of the building are much lower due to the screening provided to the A515. Some brief attended measurements at ST1 were taken to the rear of the building, and it was observed that a service yard serving local shops as well as several condensers are located to the rear of the building.

The measurement locations are shown in Figure 1.

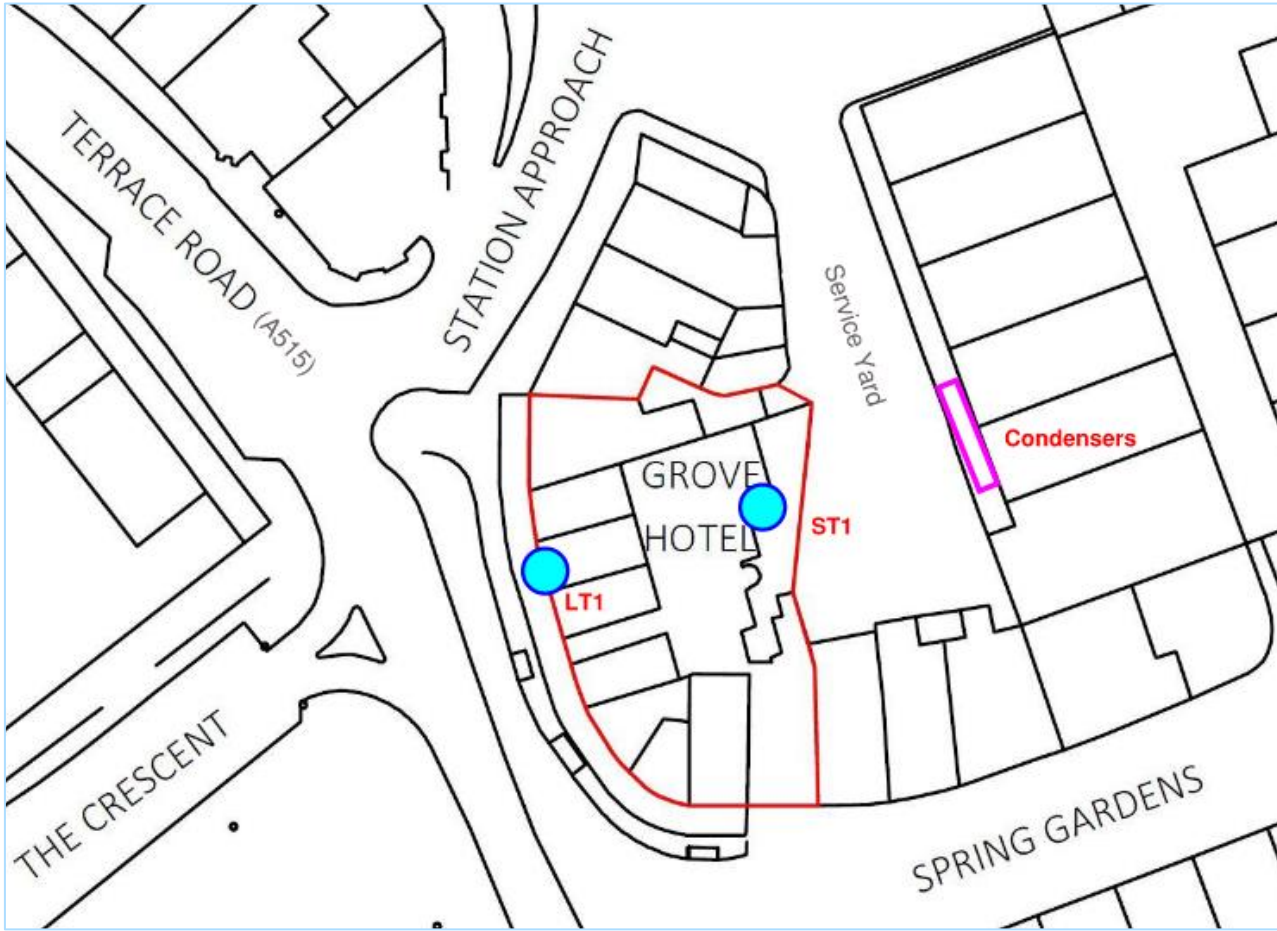


Figure 1 – Noise measurement location

1.2 Equipment

The following equipment was used to carry out the noise survey:

- Norsonic Nor140 Type 1 Sound Level Meter (serial no. 1403396)
- Norsonic Sound Calibrator (serial no. 132853)

The sound level meters were calibrated before and after the measurements were taken and no significant drift in calibration was observed. All equipment owned by Ramboll is subject to regular calibration traceable to national standards. Copies of calibration certificated are available upon request.

1.3 Weather

During the attended measurements and deployment of the noise logger, the weather was dry and partly overcast with wind speeds significantly less than 5m/s. The average temperature during the day was 1-3°C, dropping below 0°C at night.

The weather data recorded by a local weather station during the unattended measurement period is summarised below. Wind was in a variable direction.

1.4 Noise Climate

The noise climate to the west of The Grove Hotel is dominated by road traffic noise on Terrace Road. Noise levels to the rear are screened from road traffic. The potential noise sources of the service yard and condensers are discussed within this report in the subsequent assessment section.

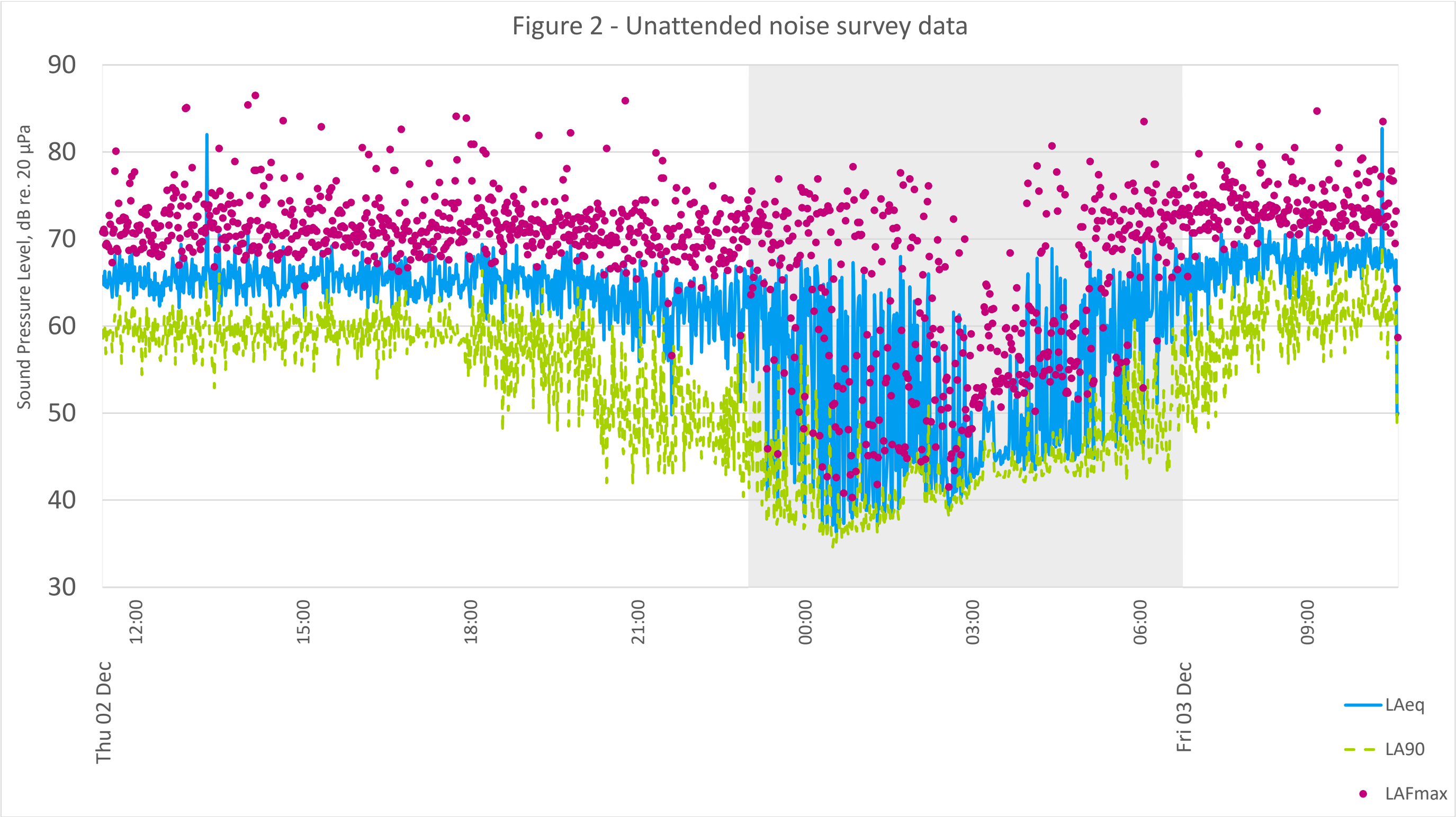
1.5 Results

The results of the attended measurements are given in Table 2 below the time history is provided in Figure 2.

Measurement Location	Time	L _{Aeq} dB	L _{A90} (mode) dB
LT1	11:25 to 22:59	62*	59
	07:00 to 10:30	65*	61
	Daytime average of both data sets	63	
	23:00 to 06:59	58*	43
ST1	10:49	50	48
	11:20	50	48

Table 1: Noise Survey Results Summary

* corrected to free-field (minus 3dB correction)



2. DISCUSSION WITH LOCAL AUTHORITY

Ramboll discuss the requirements for a noise survey with Matthew Rhodes, Environmental Health Officer (Pollution Specialist) at High Peak Borough Council.

During the discussion, it was agreed that the primary noise source affecting the development is road traffic on the A515. Therefore, a fixed sound level meter over an extended period was considered a suitable means of establishing the existing noise levels external to The Grove Hotel. The additional sources of the delivery yard and condensers were noted and Ramboll confirmed these could be assessed as a desk-based study using archive data and noise data for similar condenser units.

It was agreed that the assessment would use the guidance of BS8233:2014 '*Guidance on sound insulation and noise reduction for buildings*'. In addition, Mr Rhodes requested that attention was paid to ProPG: Planning & Noise - Professional Practice Guidance on Planning & Noise 2017 (ProPG), although it was acknowledged that for existing sites, some of the planning with respect to noise cannot be designed out.

In addition to the above, Ramboll discuss maximum noise levels and it was agreed that noise levels should not typically exceed 45dB $L_{A_{fmax}}$ internally. This guidance is commonly referred to in acoustics guidance, such as the superseded version of BS8233, WHO Guidelines for Community Noise (1999), and ProPG.

For new plant, Ramboll proposed to use guidance in BS4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*'. Where new plant is proposed, noise emissions must be controlled to 5dB existing background levels at the nearest sensitive receptor(s).

3. DESIGN CRITERIA

3.1 ProPG: Planning & Noise - Professional Practice Guidance on Planning & Noise 2017

ProPG: Planning & Noise - Professional Practice Guidance on Planning & Noise 2017 (ProPG) aims to encourage '*better acoustic design for new residential development and aims to protect people from the harmful effects of noise*'.

The guidance highlights that '*Noise can have a significant effect on the environment and on the health and quality of life of individuals and communities*' and '*Noise exposure can lead to a range of adverse effects including sleep disturbance and annoyance*'.

ProPG encourages the early consideration of noise issues through at 2-Stage assessment 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 referred to 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”.

Element 3 would not apply to The Grove Hotel.

3.2 Stage 1 - ProPG Initial Site Noise Risk Assessment

ProPG advises that an initial noise risk assessment of the development site should be taken at the earliest opportunity. This should identify the likely risk of adverse effects from noise where no mitigation measures are included as part of the design proposals. The risk levels are categorised as either high, medium or low.

Figure 3 below shows the Stage 1 initial site noise risk assessment from ProPG. The graphic shows how increased noise levels directly relate to an increased risk of adverse effects for the future occupants of a development, and therefore increases the importance of good acoustic design.

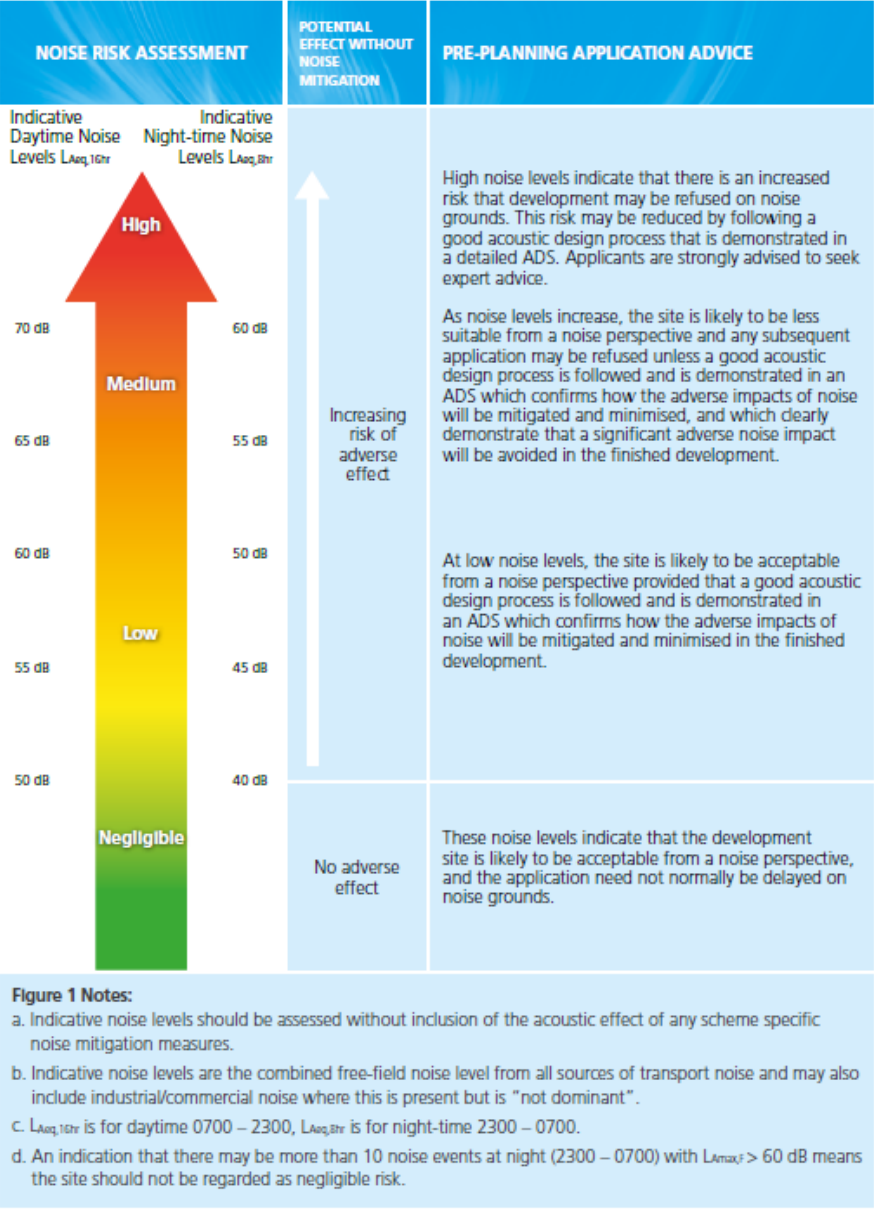


Figure 3 - ProPG Stage 1 initial site noise risk assessment

As can be seen from Table 2, noise levels external to The Grove Hotel are 63dB L_{Aeq} during the day based on an average of the daytime measurements, and 58dB L_{Aeq} during the night. Noise levels to the rear of the building are expected to be in the order 50dB L_{Aeq} during the day and around 45dB L_{Aeq} at night.

The following applies to The Grove Hotel:

Level	Risk Assessment
Front elevation overlooking A515	Daytime noise levels of 63 dB L_{Aeq} , with the highest noise levels to the south east parts of the new development. LOW to MEDIUM risk. Night-time noise levels of 58dB L_{Aeq} . MEDIUM risk
Rear elevation	Daytime noise level 50dB L_{Aeq} , assumed representative of general noise climate since the elevation is screened from the road. NEGLIGIBLE to LOW risk. Night-time noise levels of 45dB L_{Aeq} expected based on the relationship of noise levels at the rear compared to the front elevation. LOW risk

Table 2 – Stage 1 initial site noise risk assessment

3.3 Stage 2 – ProPG consideration of four key elements

3.3.1 Element 1 - Good Acoustic Design Process

ProPG states that good acoustic design should be considered at an early stage. The guidance states that a good acoustic design does not specifically mean achieving relevant internal design levels but should seek to provide an optimum acoustic outcome. However, the guidance also states:

'Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided' but recognises that *'occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open.'*

3.3.2 Element 2 – Internal noise level guidelines

ProPG recommends the internal criteria of British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BS 8233:2014) are suitable for the design of residential development.

This standard provides criteria for suitable internal ambient noise levels for dwellings in terms of A-weighted equivalent sound level L_{Aeq} . The noise levels for various spaces are summarised in the table below.

Space	Upper limit for internal ambient noise level dB $L_{Aeq,T}$	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Bedrooms	35	30
Living rooms	35	-

Table 3 – BS 8233:2014 Internal ambient noise criteria for habitable rooms

Instantaneous noise levels shall not regularly exceed 45 dB L_{AFmax} more than 10 times a night in bedrooms at night. ProPG states:

'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 $L_{Amax,F}$, 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 $L_{Amax,F}$ more than 10 times a night.'

With regard to opening windows, ProPG starts to expand on this by identifying:

'...the acoustic performance of the building envelope will be reduced in the event windows are opened for ventilation or cooling purposes, typically reducing the insulation to no more than 10 to 15 dB(A).'

Ideally, a site would achieve suitable internal noise levels with windows open for ventilation. However, where the site is exposed to road traffic as is the case for the front elevation of The Grove Hotel, there is justification for assessing the site with windows closed. ProPG states:

'...special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position.'

Note – target noise levels as per Table 3 would not be expected during purge ventilation (removing odours from painting, burnt food etc).

The requirements for the glazing and ventilators of the scheme are assessed in Section 4.

3.3.3 Element 3 - External Amenity Areas

Not applicable to this scheme.

3.3.4 Element 4 – Other relevant issues

The fourth element of a Stage 2 assessment is to consider other relevant issues. In our experience of developments ventilated by trickle vents, the most important other issue to be considered at this stage is overheating to recognise the needs of future occupants for any alternative ventilation provision to control temperature in the form of open windows or alternative ventilative options.

3.4 Acoustics Ventilation and Overheating – Residential Guide 2020 (AVO)

The AVO Guide was written to help acousticians and developers examine the implications of ventilation strategies on new developments when striking the balance between achieving suitable internal noise levels and overheating.

'The AVO Guide seeks to:

- encourage an assessment of noise that recognises the interdependence between the acoustics, ventilation and overheating designs;*
- provide a means of assessment to satisfy the need to consider acoustics, ventilation and overheating at the planning stage;*

- assist in educating clients, environmental health/planning officers and other stakeholders of the interdependence of design for acoustics, ventilation and overheating.'*

The proposed development will use single trickle vents for background ventilation, and it is expected that opening windows will be used as a strategy to control overheating.

When assessing overheating, the AVO guide suggests a 'two-level assessment procedure' to estimate the potential impact on occupants in the case of the overheating condition. The Level 1 site risk assessment is based on external noise levels where a partially open window can be used to mitigate overheating.

A partially open window will typically provide an outside-to-inside level difference of 13 dB.

The AVO level 1 risk assessment looks at the external noise levels around a site and compares them to a scale of increasing risk (see Figure 4 below).

External noise levels:

- below 53 dB $L_{Aeq,16hrs}$ during daytime or 48 dB $L_{Aeq,8hrs}$ during the night-time are considered Negligible risk.
- Above 63 dB $L_{Aeq,16hrs}$ during daytime or 55 dB $L_{Aeq,8hrs}$ during the night-time are considered High risk.
- Noise levels in between are considered Low to Medium risk.

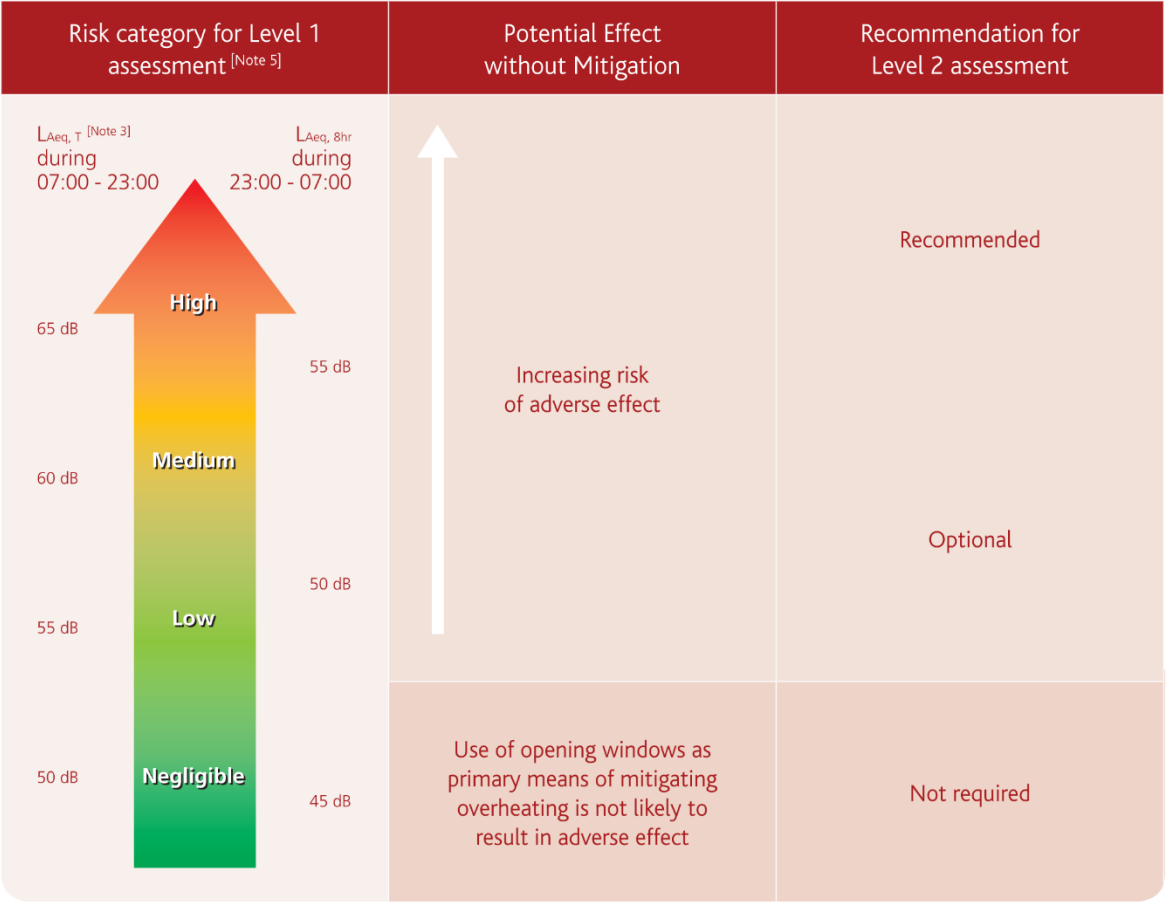


Figure 4 – AVO Level 1 assessment risk categories

During the day, as assessed over a 16-hour timebase, ambient noise level external to front elevation of The Grove Hotel would not exceed 63dB L_{Aeq} and are therefore considered medium-high risk. Daytime noise levels to the rear are considered negligible risk.

At night, noise level of 58dB L_{Aeq} external to front elevation of The Grove Hotel are a high risk. For bedrooms on this elevation there is potential for high risk where overheating occurs and additional ventilation is required, particularly via open windows. To the rear, noise levels of 45dB L_{Aeq} would again be a negligible risk.

A Level 2 assessment is recommended where opening a window will result in significantly higher noise levels than per guidance documents, such as the criteria of BS8233 as referred to in ProPG, even allowing for a relaxation of the internal noise criteria.

When discussing the impact of noise upon people, the concept of ‘Observable Adverse Effect Level’ relates to noise level thresholds at which people start to change their behaviour. For example, the noise level where people raise their voices during conversation, turn their TV up or suffer sleep disturbance.

Where daytime noise levels are ≥ 53 dB L_{Aeq} then it is expected that this defines the point where the occupants will start to change their behaviour (turn up TV) when windows are open. This is because internal noise levels above 40dB L_{Aeq} via partially open window start to exceed recommended internal noise level guidance, even allowing for a 5dB relaxation.

Noise levels to the rear of The Grove Hotel are expected to be less than 53dB L_{Aeq} over a standard 16-hour day, so a change in behaviour is unlikely. Increased noise levels over limited periods due to discrete noise events such as use of the service yard are discussed later.

At 63dB L_{Aeq} as per the front elevation of The Grove Hotel, the occupants would see a greater effect and awareness of noise intrusion where windows are open. An alternative means of providing ventilation to control overheating is the preferred solution in these instances, although it is fully recognised that the opportunities for installing mechanical ventilation systems into a development such as this will be unfeasible, or not possible at all. A suitable window or through the wall ventilator should at least be provided.

4. ASSESSMENT

4.1 Glazing and ventilator requirements

Using the noise data summarised in Table 1 and Figure 2, Ramboll has calculated the outline glazing and ventilator requirements for habitable rooms at The Grove Hotel.

These calculations are based the following initial assumptions about the way the scheme will be developed:

- Volume of 45m³ used for bedrooms and living rooms, with furnished reverberation time of 0.5s
- First and second floor window are approximately 1.7m², and third floor windows 1m²
- One window has been assumed to each bedroom or living room

For the analysis of maximum noise levels, Ramboll reviewed the maximum noise levels measured over the entire night of the survey, which yielded 480 maximum events (the highest each minute). These have been rank ordered so that the 10th highest was selected, which was found to be 74dB L_{AFmax} (free-field corrected). Therefore, it is expected that no more than 10 events will occur each night above this value, which in return will be controlled to ≤ 45 dB L_{AFmax} internally. This applies to bedrooms only.

The glazing and ventilator requirements are summarised below:

Elevation	Room	Requirements	
		Glazing, dB R_w	Vent, dB $D_{n,e,w}$
Front	Living rooms	≥ 31	≥ 35
	Bedrooms	≥ 31	≥ 39
Rear	Living rooms	≥ 31	≥ 35
	Bedrooms	≥ 31	≥ 35

Table 4 – Noise insulation requirements for habitable rooms

The above specifications can be satisfied generally using standard thermal double glazing and standard trickle vents. An acoustically rated ventilator is required to bedrooms on the front elevation overlooking the A515. Important points about these outline specifications are noted below:

Notes

The glazing requirements must be maintained by the frame and seals of the windows.

The volume of a habitable room, reverberation time, and area of glazing all effect the noise level within the room. Therefore, once a final internal layout for the project is available, the following glazing and ventilator proposals must be confirmed suitable with Ramboll. It may be that the specification will change by a marginal amount.

Manufacturers should provide laboratory test data for the selected glazing and ventilators to confirm that these products can achieve the required minimum ratings. The sound insulation performance of glazing and ventilators are octave band specific. Therefore, all proposals must be confirmed suitable by Ramboll prior to procurement.

4.2 Use of the service yard to rear of the building

During the noise survey, Ramboll noted that there is a ‘service yard’ to the rear of The Grove Hotel. A HGV for Next (retail store) was parked during Ramboll’s initial visit to site although no unloading or loading of this vehicle was observed. After making a series of inquiries with the retailer it is understood that that the Next store in Buxton receives two HGV delivers per week, which are limited to normal shop opening hours and not overnight.



Figure 5 - HGV for Next, as observed to the rear of The Grove Hotel

Ramboll has measured noise levels from similar activities at other sites within the UK. Table 5 below identifies the typical noise levels associated with HGVs and unloading of such vehicles over a short duration of time.

Activity	Noise level, dB LAeq
Unloading @ 10m	64-65
Moving of pallet truck @ 10m	51-54
HGV manoeuvre @ 10m	60

Table 5 – Archive source data for HGV and unloading activities

In Ramboll’s experience, continuous unloading of a HGV like this could be for around 20mins where cages or pallets are rolled off the vehicle and empty cages/pallets loaded back on to the HGV. As an example scenario, the following hourly noise level would be expected where this is the case:

Activity	Noise level of activity, dB LAeq	Estimated time of activity	Overall hourly noise level
Unloading @ 10m	64-65	20 mins	60
Moving of pallet truck @ 10m	51-54	20 mins	49
HGV manoeuvre @ 10m	60	4 mins (arrival and departure)	48
TOTAL			61 dB LAeq

Table 6 – Predicted noise levels from unloading over an hourly period

So, over a limited period of one hour twice a week, noise level external to the apartments overlooking the ‘service yard’ could be up 61dB LAeq during an unloading. For such limited HGV deliveries, it is expected that these would provide minimal disruption to the occupants of apartments overlooking this ‘service yard’.

The glazing and vent specifications set out in Table 4 are capable of controlling noise levels from the HGV activities expected to the rear of the hotel building.

4.3 Noise from nearby condensers

Several wall mounted condenser units were noted opposite to The Grove Hotel on the rear wall of nearby retail units. These can be seen in Figure 5 and Figure 6 below.



Figure 6 – Wall mounted condensers on opposite wall of retail units

The units shown in Figure 6 were not operating at the time of the survey. It is anticipated that these will generally operate during the summer for cooling. Generally, these units are Mitsubishi, Toshiba, and Sanyo wall mounted condenser units.

Without knowing the specific models and operating duty of these units, we have assumed the following sound power levels would apply as based on experience in specifying and assessing similar units on past projects:

- Large Sanyo units: 70dB L_{WA}
- Smaller units: 60dB L_{WA}

Using this data, the following assessment shows the potential impact these units could have on the nearest apartment of The Grove Hotel, which would be approximately 19m from these units.

Activity	Sound Power, dB L_{WA}	Number of units	Correction for number of units	Distance correction for 19m	Correction for wall reflection	Overall hourly noise level at receptor
Large Sanyo unit	70	3	+5dB	-25.5	+3dB	52.5
Small unit	60	7	+8.5dB	-25.5	+3dB	46
TOTAL						53 dB L_{Aeq}

Table 7 – Predicted noise levels from wall mounted units

The predicted noise level of 53dB L_{Aeq} assumes all 10 units operate at the same time, which is unlikely to be the case. As identified in Section, noise levels that are ≥ 53 dB L_{Aeq} defines the point where the occupants will start to change their behaviour (turn up TV) when windows are open. However, the outline noise insulation proposals in Table 4 are more than sufficient to control noise from such wall mounted units when or if they are in use during the hotter parts of the year.

5. EXTERNAL PLANT

5.1 BS4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’

BS4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ (BS4142) provides a methodology for assessing levels from new noise sources against the existing noise climate. The standard defines the new noise source (e.g. plant, or commercial operation etc) as the ‘specific’ noise level.

Since certain acoustic features (tonality, impulsivity, intermittency etc.) can increase the significance of a new noise source when compared to existing background noise levels, BS4142 identifies that suitable acoustic penalties should be applied to the specific noise level where this is the case. This results in a ‘Rating Level’ of the noise source(s) under consideration.

When comparing the specific noise against existing background levels, BS4142 highlights that certain acoustic features such as tonality, impulsivity, and intermittency etc can increase any significance of impact.

Comparison of the Rating Level to the background noise level determines the significance of the new noise source at the receptor(s) under assessment. If the Rating Level is higher than the background noise level, BS4142 identifies there may be an impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB 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. 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.

As discussed with Local Authority, any new plant associated with The Grove Hotel such as mechanical ventilation, must be controlled so that the rating level is controlled to 5dB below typical background levels.

The nearest receptors to the site would be the apartments themselves, which could be affected by building services if located near to the windows habitable rooms.

The following limits apply, which are based on approximating the ‘typical’ lowest background levels shown on Figure 2.

Period	Typical 'lowest' background	Rating level target at the nearest sensitive properties
Day (07:00 to 19:00)	55 dB L _{A90}	50 dB L _{Ar,Tr}
Evening (19:00 to 23:00)	43 dB L _{A90}	38 dB L _{Ar,Tr}
Night (23:00 to 07:00)	37 dB L _{A90}	32 dB L _{Ar,Tr}

Table 8 – Noise limits for new plant serving the scheme

6. CONCLUSION

Ramboll has measured noise levels external to The Grove Hotel, Buxton, which is to be refurbished to create new residential apartments.

Noise levels are dominated by road traffic, which has the greatest impact on the front of the building. Standard thermal glazing can be used in all areas of the scheme with standard trickle vents. An acoustically rated vent is needed to bedrooms on the front elevation to control maximum noise levels at night.

Noise from limited daytime HGV deliveries has been assessed to apartments proposed to the rear of the building, as well as the potential impact of nearby wall mounted condenser units on the opposite external wall of retail units. Both these noise sources are expected to have a low impact on the development and can be mitigated by the glazing and vent specifications outlined in this report.

All final glazing and vent proposals must be confirmed suitable by Ramboll once the scheme proposals are finalised.

Noise limits for external plant are set out in this report.

Based on the findings of this assessment, noise is not expected to be a constraint to the successful planning approval for this scheme.