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Noise Risk Assessment & Acoustic Design Statement

Prepared: 18th June 2021

Report No	21622-1
Client	Sy Homes (LH) Ltd
Site	Lord Hill Hotel Abbey Foregate Shrewsbury, SY2 6AX

1. Quality Management

Report Number	21622 - 1
Issue	Issue 1
Prepared	18th June 2021
Prepared By	Jonathan Seiffert BSc, TechIOA
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2. Limitations

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2.1.7.

3. Contents

4. Executive Summary

4.1.1. An environmental noise survey has been carried out for a proposed residential development at Lord Hill Hotel, Abbey Foregate, Shrewsbury, SY2 6AX ("Proposed Development").

4.2. Measurement, Assessment and Evaluation

4.2.1. The survey was carried out to BS7445-1:2003[1] and BS7445-2:1991[2] which are covered under our UKAS Accreditation.

4.2.2. The interpretation of the data and the specification of suitable mitigation or treatment are outside the scope of our UKAS accreditation but is covered in our 17025 Quality Management System and reporting procedure.

4.3. Scope

4.3.1. This report covers all aspects of the noise survey, including:

- the identification of acoustic design criteria;
- an objective sound pressure level survey of the existing site;
- analysis of the data;
- the design of any mitigation to meet the required internal noise criteria

4.4. Noise Risk Assessment

4.4.1. A noise risk assessment of the proposed development has been carried out based on the results of the objective sound pressure level survey.

Risk assessment	Comment
High	*"High noise levels indicate that there is an increased risk that the development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice."*

Table 1 – Noise risk assessment for the Proposed Development site

4.5. Results Summary

4.5.1. The facade sound insulation required to meet the guideline values from BS8233:2014 are summarised in Table 2. The glazing performance has been specified in terms of the road traffic corrected weighted sound reduction index, $R_w + C_{tr}$, and the ventilator performance has been specified in terms of the road traffic corrected element normalised level difference $D_{ne,w} + C_{tr}$.

Living rooms (Daytime)	Bedrooms (Night-time)
35dB $R_w + C_{tr}$ /41dB $D_{ne,w} + C_{tr}$	32dB $R_w + C_{tr}$ /38dB $D_{ne,w} + C_{tr}$

Table 2 – Required facade sound insulation (Glazing/Ventilator)

[1] BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Description of quantities and procedures"
[2] BS7445-2:1991 "Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use"

5. Background

5.1. Noise Policy Statement for England

5.1.1. The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to *"promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".*

5.1.2. This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

5.1.3. The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

5.2.1. The National Planning Policy Framework (NPPF) was published on 19th June 2019 and sets out the Government's planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:

> *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*

5.2.2. The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:

1. avoid noise giving rise to significant adverse impacts on health and the quality of life;
2. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
3. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.

5.2.3. Existing businesses near to proposed development should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

5.3. National Planning Practice Guidance

5.3.1. The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) which was updated on the 22nd July 2019 to reflect the changes made to the NPPF and make it more accessible.[3]

[3] http://planningguidance.communities.gov.uk/

5.3.2. It advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category. A summary of the effects of noise exposure (in terms of health and quality of life) associated with both noise generating developments and noise sensitive developments is presented within the PPG and reproduced in Table 3.

Perception	Examples of outcomes	Effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect (NOAEL)	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very intrusive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 3 – Noise exposure hierarchy

5.3.3. There are a number of factors that determine whether a noise could be a concern to a receptor. These include: the absolute level of the noise and when it occurs, whether it is existing or new to the area, temporal characteristics, spectral content and the acoustic absorption in the area.

5.3.4. It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include: engineering the noise sources to be quiet, minimising the impact of noise through layout, using conditions/obligations to restrict activities, mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

6. Introduction

6.1.1. An environmental noise survey has been carried out for a proposed residential development at Lord Hill Hotel, Abbey Foregate, Shrewsbury, SY2 6AX.

6.2. Proposed Development

6.2.1. An image showing the proposed location and layout of the Proposed Development is given in Figure 1.

Figure 1 - Plan showing the layout of the Proposed Development

6.3. Noise Climate

6.3.1. At the time of the survey visits the technician noted that the noise climate on site was dominated by road traffic noise.

7. Assessment Criteria

7.1. Noise From Existing Transportation Sources

7.1.1. The Professional Practice Guidance (ProPG) was published in May 2017 refers specifically for the consideration of new residential developments that will be exposed predominantly to airborne noise from transport sources. The ProPG advocates a two stage risk based approach to noise when planning new residential developments:

- Stage 1 – an initial noise risk assessment of the site; and
- Stage 2 – a systematic consideration of the acoustic design.

7.1.2. An initial noise risk assessment is required to determine the prevailing sound pressure levels at the location of the Proposed Development to indicate whether the proposed site is at a negligible, low, medium or high risk from noise caused by transportation sources. The assessment is based on free-field levels on the existing site and, therefore, does not take into account any new treatment (such as bunds or fences) that will be introduced as part of the development. The guidance on negligible, low, medium and high risk levels has been summarised in Figure 2.

Risk	Day		Night	
High	≈ 70dB(A)		≈ 60 dB(A)	High noise levels indicate that there is a risk of refusal. High risk may be mitigated and minimised by following a good acoustic design process that is demonstrated in an ADS.
Medium	≈ 65dB(A)		≈ 55dB(A)	As noise levels increase the site is less suitable, from a noise perspective. Any application may be refused unless a good acoustic design process is illustrated in an ADS.
Low	≈ 55dB(A)		≈ 45dB(A)	At low noise levels the site is likely to be acceptable, from a noise perspective.
Negligible	<50dB(A)		<40dB(A)	These noise levels indicate that the development site is likely to be acceptable from a noise perspective and the application need not normally be delayed on noise grounds.

A. *Indicative noise levels should be assessed without inclusion of the acoustic effect of any schem 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. *$L_{Aeq,16hr}$ is for daytime 0700-2300, $L_{Aeq,8hr}$ is for night-time 2300-0700*
D. *An indication that there may be more than 10 noise events at night (2300-0700) with L_{AFMAX} > 60dB means the site should not be regarded as negligible risk.*

Figure 2 – Stage 1 – Initial site noise risk assessment

7.1.3. The ProPG stresses that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker.

Element 1 – Good Acoustic Design Process

7.1.4. Good acoustic design should avoid 'unreasonable' acoustic conditions and prevent 'unacceptable' acoustic conditions. ProPG notes that good acoustic design does not mean over-engineering or 'gold plating' all new developments but instead should aim to provide an optimum acoustic outcome for a particular site.

Element 2 - Internal Noise Level Guidelines

7.1.5. The guideline values proposed are the same as those provided in BS 8233:2014 and WHO, including the recommendation that maximum noise levels should not exceed 45dB L_{Amax} more than 10 times per night.

Element 3 - External Amenity Area Noise Assessment

7.1.6. Sound pressure levels of 50 – 55 dB $L_{Aeq,16hr}$ in gardens and external amenity areas, where such areas are an intrinsic part of the overall design. If these values cannot be achieved in all areas, the development should be designed to achieve the lowest practicable noise levels. The provision of relatively quiet alternative publically accessible external amenity space may help to offset the noise impact in high noise areas.

Element 4 - Assessment of Other Relevant Issues

7.1.7. It is acknowledged that there may be other local issues affecting the ability to achieve the required acoustic design criteria

7.2. Guideline Values

7.2.1. BS8233:2014 draws on the results of research and experience to provide information on the design of buildings that have internal acoustic environments appropriate to their function. The standard provides guideline internal values for dwellings for steady external noise sources. These have been summarised in Table 4.

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

Table 4 – BS8233:2014 guideline values for internal ambient noise levels from steady external noise sources

7.2.2. The guideline values are issued by the World Health Organisation (WHO) and assume normal diurnal fluctuations in external noise. They are expected to be achieved based on normal annual data and not in all circumstances. For example, it is normal to exclude occasional events such as fireworks night or New Year's Eve.

7.2.3. For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$ with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In such cases, the lowest practicable levels should be achieved in external amenity areas but the development should not be prohibited.

7.3. Ventilation and Overheating Requirements

7.3.1. This section addresses ventilation issues that may conflict with the acoustic design of the building. They are provided for reference purposes only as this report is addressing the acoustic parameters of the development and building design only.

7.3.2. BS8233:2014 states that, if relying on closed windows to achieve the guideline values, there needs to be an appropriate alternative ventilation scheme that does not compromise the facade sound insulation or the resulting noise level. However, rooms should have adequate ventilation, i.e. trickle ventilators should be assumed to be open for any assessment. Ventilation requirements for dwellings are covered under Building Regulations Approved Document F[4] ("ADF"). It describes the purpose of ventilation as for the removal of stale air from inside a building and replacement with fresh air from outside.

7.3.3. ADF prescribes three types of ventilation provision:

1. **Whole dwelling ventilation** – running continuously (includes background ventilation)
2. **Extract ventilation** – removing vapour/pollutants from a space e.g. from bathrooms and kitchens
3. **Purge ventilation** – manually controlled rapid ventilation

7.3.4. ProPG[5] states that the internal noise guidelines are generally not applicable under "purge ventilation" conditions as defined by ADF, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

7.3.5. Where a means of ventilation is required as an alternative to open windows, there are four broad categories of ventilation system that each meet the requirements of ADF:

System 1 – Background ventilators and intermittent extract fans
System 2 – Passive stack ventilation
System 3 – Continuous mechanical extract ventilation (MEV)
System 4 – Continuous mechanical supply and extract with heat recovery (MVHR)

Systems 1-3 require penetrations in the facade to allow air to flow into and out of the building. In order to control the noise break-in from external noise sources, it should be checked that the penetration offers sufficient resistance to the passage of sound. The sound insulation of these, typically small, penetrations is often specified in terms of the element normalised sound pressure level difference, $D_{ne,w}$, which is often corrected for the spectrum shape of road traffic using the C_{tr} correction term.

7.3.6. Ventilation provisions, including open windows, will not necessarily meet cooling needs. Building Regulations Approved Document L2a[6] ("ADL2a") requires that overheating be mitigated by controlling the solar gains by means of building orientation, shading and the g-value of the glazing. It recommends that the developer assess the overheating risk using CIBSE TM 37.[7]

7.3.7. Where one of these assessments indicates that open windows are required to control overheating, consideration of the likely impact on future residents is required. An assessment methodology has been presented in Table 5, based on draft guidance published by the ANC.

[4] Approved Document F: Means of Ventilation (2010 Edition)
[5] The Professional Practice Guidance on Planning and Noise, ANC, May 2017
[6] Approved Document L2a : Conservation of Fuel and Power (2013 Edition)
[7] CIBSE Guide TM 37 "Design for Improved Solar Shading Control"

Risk Category	External Free-Field Level		Rationale
	Day, $L_{eq,16\text{-}hour}$	Night, $L_{eq,8\text{-}hour}$	
Low	≤ 52dB	≤ 47dB	The threshold between low and medium is defined as the "good" guideline values from BS8233 plus a 5dB relaxation, as prescribed by ProPG, and a 12dB allowance for the attenuation provided by an open window.
Medium	52dB < L ≤ 62dB	47dB < L ≤ 55dB	The daytime threshold between medium and high is based on 50dB $L_{Aeq,T}$ being the upper threshold for reasonable internal daytime conditions plus a 12dB allowance for the attenuation provided by an open window.
High	> 62dB	> 55dB	The night-time threshold between medium and high is based on the WHO guidelines, which state that a sizeable proportion of the population is highly annoyed and sleep-disturbed at these external levels

Table 5 – Assessment methodology for noise through an open-window

8. Survey

8.1. Measurement Locations

8.1.1. Fixed position monitoring took place at two positions to account for the likely dominant noise sources. The monitoring equipment was located 1.5m from the ground and at least 3m from the next nearest reflecting surface. The monitoring positions are shown in Figure 3.

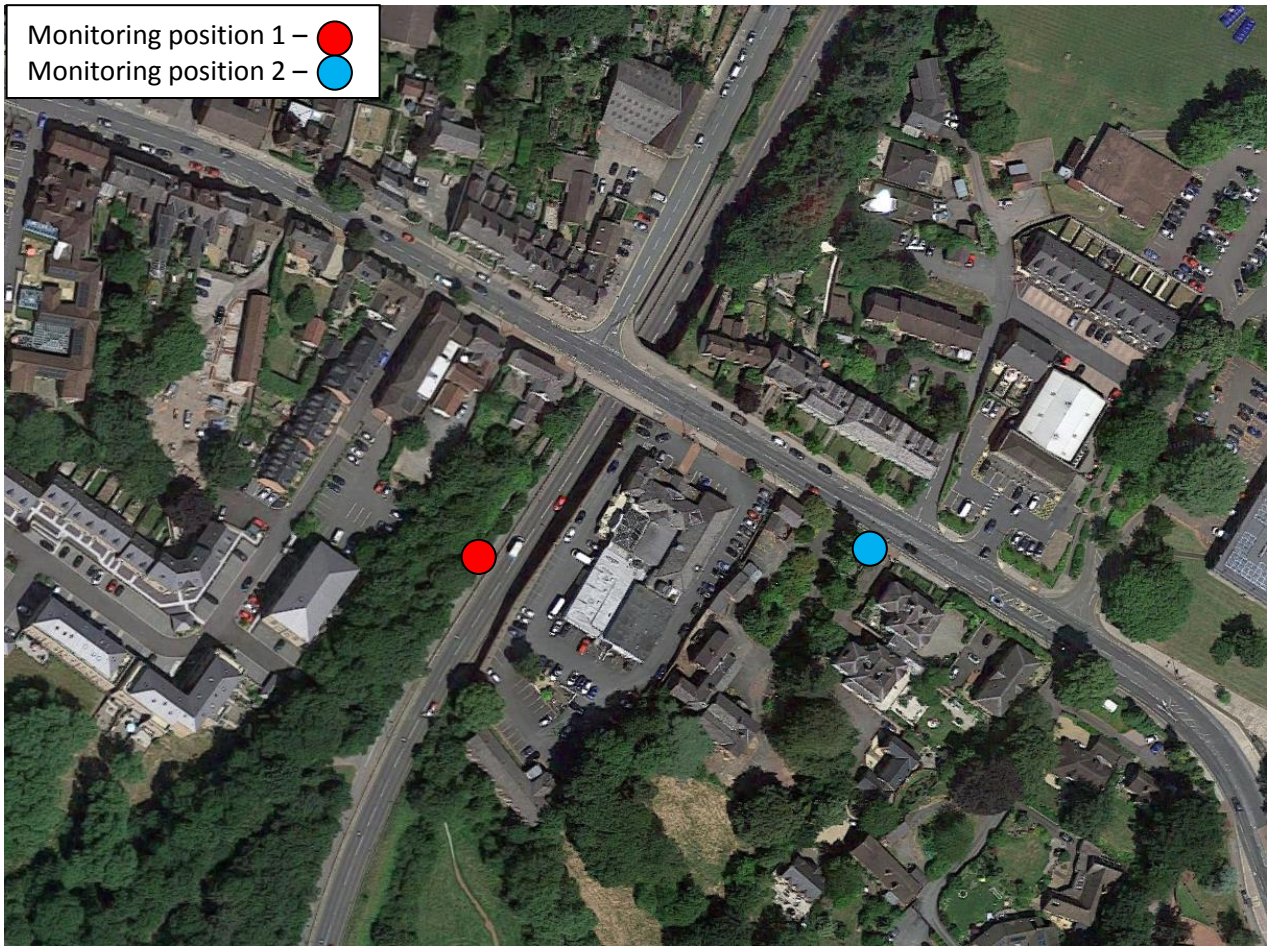


Figure 3 - Noise monitoring locations on site

8.1.2. The measurement instrumentation used during the survey is detailed in the appendix. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003[8] before and after the surveys. The calibration details are also detailed in the appendix.

8.2. Meteorology

8.2.1. During the survey the weather information was noted. This is summarised in Table 6.

	9th June 2021	11th June 2021
Roads(Wet/Dry)	Dry	Dry
Wind Speed (ms^{-1})/Direction	3 / SSW	5 / WSW

Table 6 - Meteorological data noted during the survey

[8] BS7445-1:2003 "Description and measurement of environmental noise – Part 1: Guide to quantities and procedures"

8.3. Measurement and Timescale

8.3.1. Unattended monitoring was carried out between 9th June 2021 and 11th June 2021. The measurements that have been made are summarised in Table 7

Monitoring position	Date	Type	Quantity
1	09/06/2021 – 11/06/2021	Fixed/unattended	$L_{Aeq,5min}$
2	09/06/2021 – 11/06/2021	Fixed/unattended	$L_{Aeq,5min}$

Table 7 – Measurements made at the site of the Proposed Development

8.3.2. Sound pressure measurements were subsequently averaged into hourly, daytime and night-time periods. The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2[9]. All sound pressure levels are in dB (re 20μPa).

8.4. Results Summary

8.4.1. The fixed position external measurement results are summarised in Table 8.

Measurement location	Daytime dB, $L_{Aeq,16hr}$	Night-time dB, $L_{Aeq,8hr}$
1	70.5	61.4
2	66.7	59.3

Table 8 - Summary of the external sound pressure levels measured

[9] BS7445-2:1991 "Description and measurement of environmental noise – Part 1:Guide to the acquisition of data pertinent to land use"

9. 3D Noise Model

9.1.1. A 3D noise model has been constructed using SoundPLAN™ in order to predict the propagation of sound across the site of the Proposed Development. The calculation procedure has been used from ISO9613-2:1996[10] to predict the propagation of sound from source to receiver, taking into account distance, screening, and atmospheric and ground conditions. Terrain data has been taken from Defra

9.1.2. The results of the model have been illustrated in noise contour maps in Figure 4 and Figure 5.

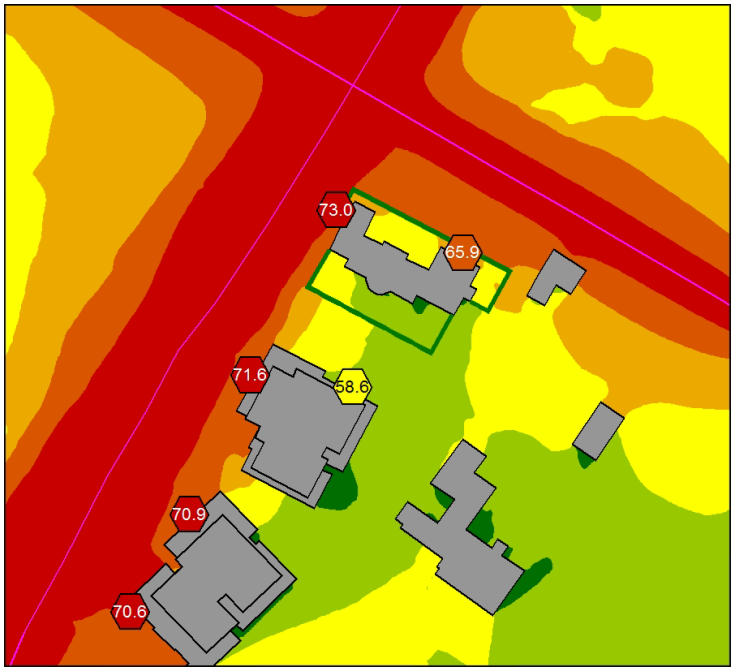


Figure 4 – Noise contour plot showing the propagations of sound across the site during the daytime

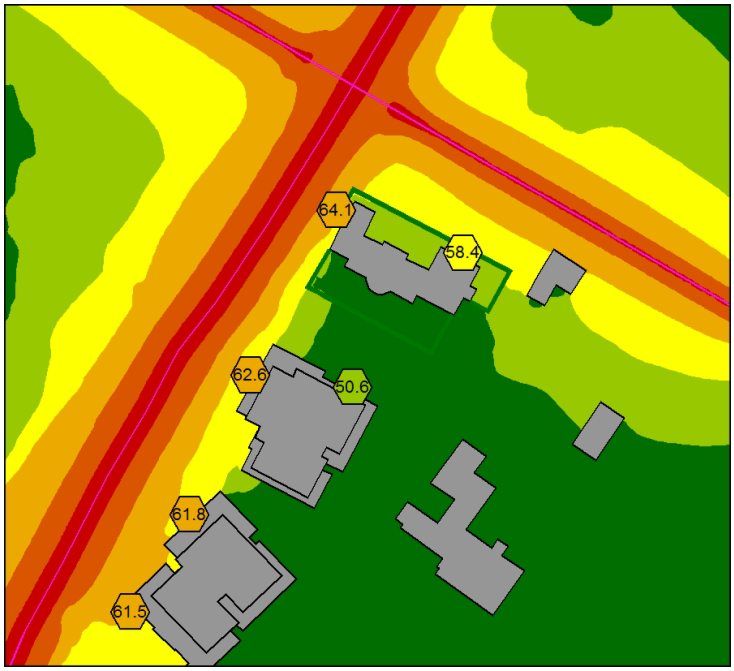


Figure 5 – Noise contour plot showing the propagation of sound across the site during the night-time

Daytime dB, $L_{Aeq,16hr}$	Night-time dB, $L_{Aeq,8hr}$
70.0	61.1

Table 9 - Summary of the worst case, predicted external sound pressure levels

9.1.3. It should be noted that a -3dB correction has been applied to the values in Table 9 to account for reflections from the façade and to provide a free field sound pressure level.

[10] ISO9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation"

10. Noise Risk Assessment

10.1.1. The noise risk assessment should not be seen as the basis for the recommendation to the decision maker. The aim is that higher risk sites will be recognised at the earliest possible stage and the increasing importance of good acoustic design can be emphasised. The risk assessment for the site is summarised in Table 10.

Risk assessment	Comment
High	*"High noise levels indicate that there is an increased risk that the development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice."*

Table 10 – Noise risk assessment for the Proposed Development site

10.1.2. The noise risk assessment indicates that a good acoustic design process, documented in an acoustic design statement, is required in order to ensure that the impacts of noise will be mitigated and minimised.

11. Mitigation

11.1. Element 1: Good Acoustic Design Process

11.1.1. The client has appointed an acoustics consultant at an early stage. The proposed development has been arranged so that dwellings are set back from the dominant noise sources and gardens are located behind their associated dwellings to provide screening.

11.2. Element 2: Internal Noise Level Guidelines

11.2.1. Based on the measured and predicted free-field sound pressure levels at the worst affected facades, the simple calculation method from BS8233:2014 has been used to determine the necessary sound reduction to meet the guideline values. Standard forms of construction are assumed such that the glazing is likely to be the lowest performing facade element.

Required Mitigation

11.2.2. The single figure glazing and ventilator performance requirements in order to achieve the internal design criteria are summarised in Table 11. The glazing performance has been specified in terms of the road traffic corrected weighted sound reduction index, $R_w + C_{tr}$, and the ventilator performance has been specified in terms of the road traffic corrected element normalised level difference $D_{ne,w} + C_{tr}$.

Living Rooms (Daytime)	Bedrooms (Night-time)
35dB $R_w + C_{tr}$ /41dB $D_{ne,w} + C_{tr}$	32dB $R_w + C_{tr}$ /38dB $D_{ne,w} + C_{tr}$

Table 11 – Required facade sound insulation (Glazing/Ventilator)

11.2.3. A plan showing where these specifications apply has been provided in the appendix.

Glazing and Ventilator Specifications

11.2.4. The glazing and ventilator performance has been specified based on the performance data provided by Saint-Gobain and Greenwood Airvac. These are suggested configurations and any other glazing and vent combination can be used provided it achieves the minimum performance levels given in Table 11. The recommended glazing specification is given in Table 12.

Living Rooms (Daytime)	Bedrooms (Night-time)
Saint Gobain 10(20)6	Saint Gobain 4(6)10

Table 12 - Our recommended glazing configurations

11.2.5. Should penetrations be required for ventilation purposes our recommended ventilator configurations, calculated to work in conjunction with the above glazing specifications, are summarised in Table 13. The specification provides an equivalent area of at least 5000mm^2. It should be checked by a suitably qualified person that this ventilator specification meets the requirements of Approved Document F.[11]

Living Rooms (Daytime)	Bedrooms (Night-time)
Greenwood MA3051 (x2)	Greenwood 5000EAW.AC2

Table 13 - Our recommended ventilator configurations.

11.2.6. Given the assumptions in this method the information in this section should be treated as general guidance only. The acoustic performance of third party products cannot be guaranteed by noise.co.uk.

11.2.7. It should be noted that, in order to meet the internal ambient noise criteria in these areas, the windows will need to remain closed.

[11] Approved Document F: Means of Ventilation (2010 Edition)

11.3. Element 3: External Amenity Area Noise Assessment

11.3.1. BS8223 states that it is desirable that the external noise level for amenity spaces, such as gardens and patios, does not exceed 50dB $L_{Aeq,T}$ with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

11.3.2. However, the standard acknowledges that there may be areas where development is desirable where these guideline values are not achievable. This will be true for higher noise areas such as city centres or urban areas adjoining the strategic transport network. In these situations, a compromise between elevated noise levels and other factors might be warranted, such as:

- the convenience of living in these locations; and/or,
- making efficient use of land resources to ensure development needs can be met.

11.3.3. In this situation, a 1.8m tall close boarded fence has been included in the model around the private garden areas marked on the plans.

11.4. Element 4: Assessment of Other Relevant Issues

11.4.1. To the best of our knowledge, at this current time, the design advice in this acoustic design statement does not conflict with any other local guidance and is not expected to affect amenity for future residents.

12. Conclusions

12.1.1. An environmental noise survey has been carried out at the site of a proposed residential development at Lord Hill Hotel, Abbey Foregate, Shrewsbury, SY2 6AX to determine typical ambient sound levels. The sound levels have been used to calculate the required facade sound insulation to meet the guideline internal levels from BS8233:2014.

12.1.2. Table 11 in section 11 gives the required facade sound reduction by any glazing and ventilator combination to be compliant with the guideline values.

12.1.3. We strongly recommend that this report be passed to the local planning authority for approval prior to any works being carried out.

Appendix

APPENDIX A: Summary Information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991	BS 8233:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Sy Homes (LH) Ltd	
D	Full site address	Lord Hill Hotel Abbey Foregate Shrewsbury, SY2 6AX	
E	Date of surveys	Survey Date: 9th June 2021 – 11th June 2021	
F	Description & identification of Proposed Development	It is proposed to develop the site for residential use.	
G	Brief Description of details of Procedure & equipment	See Section 5 of this report.	

APPENDIX B: Technical Appendix

12.1.4. Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
1	Norsonic 140 (1405560)	Norsonic 1251 (33824)
2	Norsonic 140 (1405559)	Norsonic 1251 (33823)

12.1.5. The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
Norsonic 140 (1405560)	114.0 dB	114.0 dB
Norsonic 140 (1405559)	114.0 dB	114.0 dB

12.1.6. There was no adverse deviation.

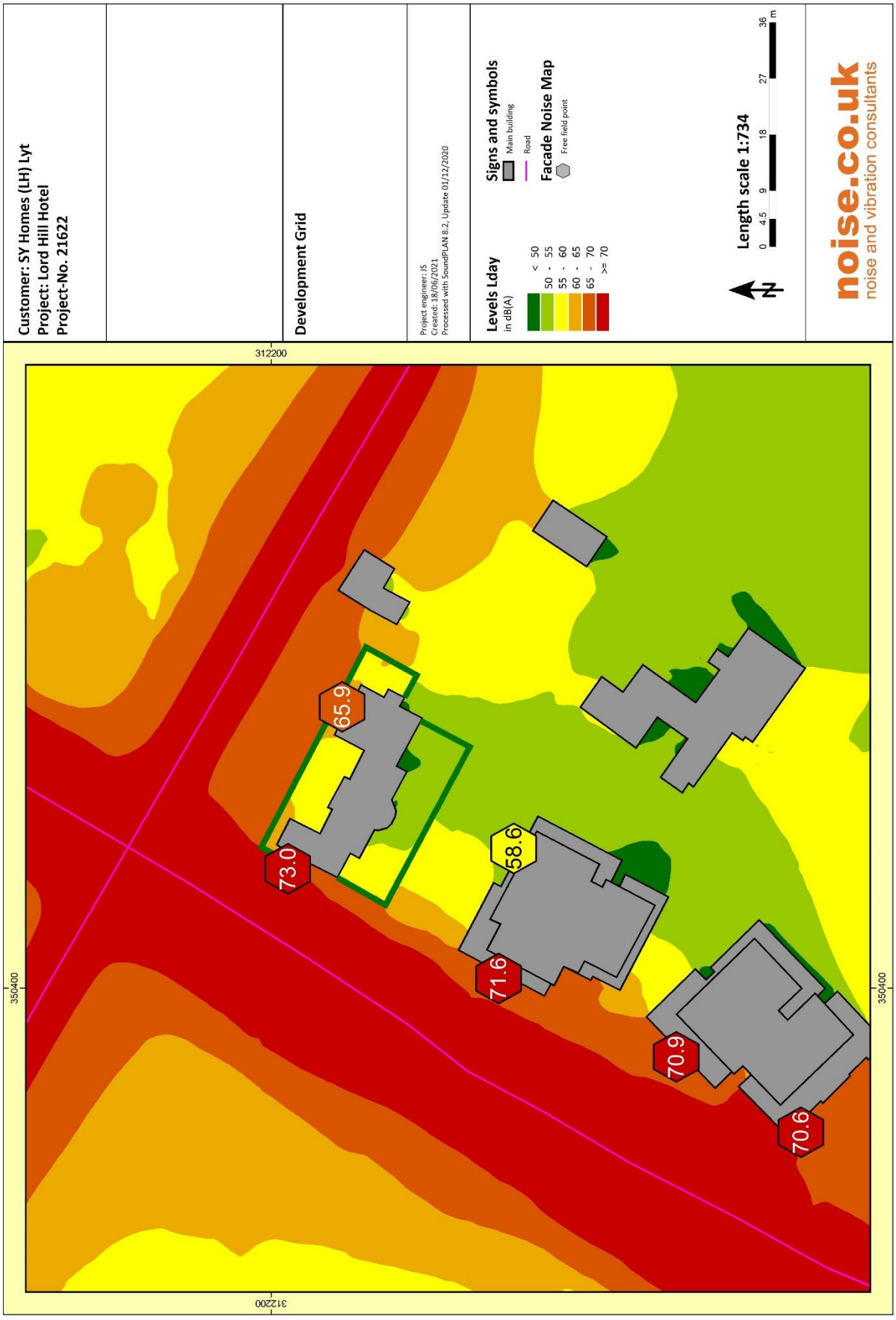
APPENDIX C: Glazing Mark-up Plan

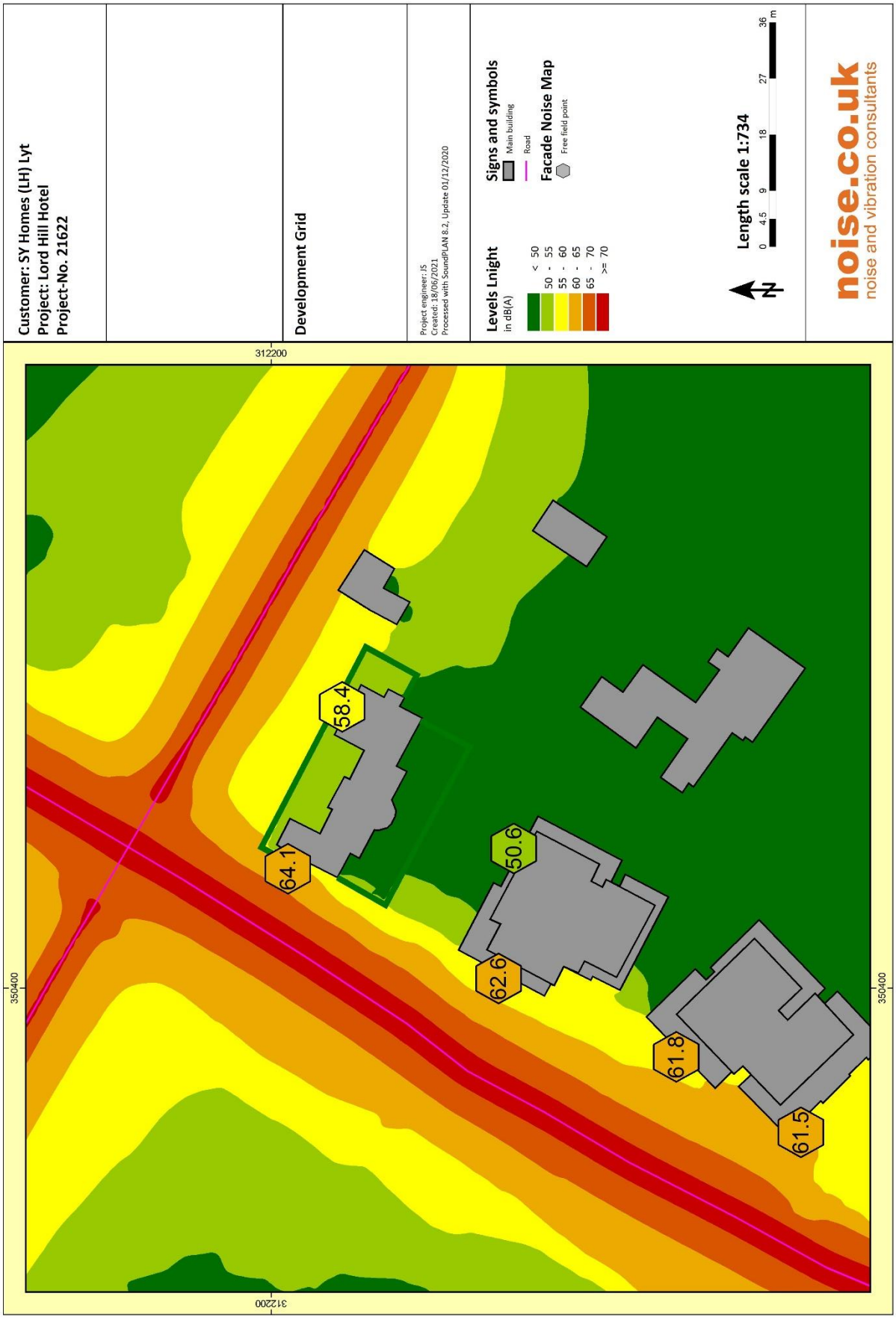
Living Rooms (Daytime)	Bedrooms (Night-time)
35dB $R_w + C_{tr}$ /41dB $D_{ne,w} + C_{tr}$	32dB $R_w + C_{tr}$ /38dB $D_{ne,w} + C_{tr}$

12.1.7. This specification should be applied to all habitable rooms on all floors of the building where the façade is marked up.

12.1.8. Standard thermal double glazing is predicted to be sufficient for all unmarked facades.

APPENDIX D: Full size SoundPLAN image maps


Customer: SY Homes (LH) Lyt
Project: Lord Hill Hotel
Project-No. 21622
Development Grid
Project engineer: JS
Created: 18/06/2021
Processed with SoundPLAN 8.2, Update 01/12/2020
Levels Lday
in dB(A)
< 50
50 - 55
55 - 60
60 - 65
65 - 70
>= 70
Signs and symbols
Main building
Road
Facade Noise Map
Free field point
Length scale 1:734
0 4.5 9 18 27 36 m
N
noise.co.uk
noise and vibration consultants
312200
350400
65.9
73.0
58.6
71.6
70.9
70.6
C:\Users\Admin\Soundplan\Desktop\JS Work\Lord Hill Hotel\Development.sgs


Customer: SY Homes (LH) Lyt
Project: Lord Hill Hotel
Project-No. 21622
Development Grid
Project engineer: JS
Created: 18/06/2021
Processed with SoundPLAN 8.2, Update 01/12/2020
Levels Lnight
in dB(A)
< 50
50 - 55
55 - 60
60 - 65
65 - 70
>= 70
Signs and symbols
Main building
Road
Facade Noise Map
Free field point
Length scale 1:734
0 4.5 9 18 27 36 m
N
noise.co.uk
noise and vibration consultants
312200
350400
64.1
58.4
50.6
62.6
61.8
61.5
C:\Users\Admin\Soundplan\Desktop\JS Work\Lord Hill Hotel\Development night.sgs