PLANNING NOISE ASSESSMENT

35-37 HIGH STREET, SHOREHAM

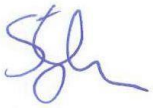
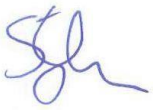
MORETONS INVESTMENTS LTD

DECEMBER 2019

PLANNING NOISE ASSESSMENT
35-37 HIGH STREET, SHOREHAM

Our Ref: **4442_001R_1-0_JE**

Client:	**George Dobson** Moretons Investments 16 Ship Street Brighton BN1 1AD
Report by:	**Anderson Acoustics Limited** 3 Trafalgar Mews 15 – 16 Trafalgar Street Brighton BN1 4EZ www.andersonacoustics.co.uk T: 01273 696 887
Date:	**3 December 2019**
Project No:	**4442**
Status:	**Final**

Author	**Jamie Easton** Consultant AMIOA		**3 December 2019**
Reviewed	**Stephen Scott** Senior Consultant MEng MIOA		**3 December 2019**
Approved	**Stephen Scott** Senior Consultant MEng MIOA		**3 December 2019**

This document has been prepared using all reasonable skill and care. Anderson Acoustics Ltd accepts no responsibility or liability for any third-party data presented in this report or used for the basis of drawing any conclusions. This document is confidential to the named client above and Anderson Acoustics Ltd accepts no responsibility or liability resulting from third party use of this document or for a purpose other than for which it was commissioned.

REVISION HISTORY

Version	Comments	Changes made by	Approved by	Date
1.0	First issued version	JE	SCS	03/12/2019

PAGE LEFT INTENTIONALLY BLANK

CONTENTS

1	INTRODUCTION	6
2	NOISE UNITS, POLICY AND CRITERIA	7
3	SITE DESCRIPTION	13
4	NOISE LEVELS ON SITE	15
5	COMMERCIAL/INDUSTRIAL NOISE ASSESSMENT: BS 4142	20
6	PRO-PG STAGE 1 ASSESSMENT	24
7	PRO-PG STAGE 2: FULL ASSESSMENT	25
8	CONCLUSIONS	28
9	REFERENCES	29

1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Moretons Investments Ltd in November 2019 to undertake a noise assessment for the proposed residential development at 35-37 High Street, Shoreham to be used in support of a planning application. The project involves the redevelopment of an existing commercial premises into 8 flats above a ground floor commercial space.

This report presents the results of our environmental noise survey and provides guidance on appropriate façade elements to ensure that an acceptable internal noise environment is capable of being achieved. The report also presents a noise assessment from existing plant and commercial spaces to the proposed development.

Noise units, acoustic terminology and environmental noise criteria relevant to the assessment have been presented and briefly discussed in Section 2 of this report.

A brief description of the site and proposed development is given in Section 3.

The methodology and results of an environmental noise survey undertaken at the site are given in Section 4.

Section 5 details the ProPG Stage 1 assessment, which in turn leads to Section 6 where the ProPG Stage 2 - Acoustic Design Statement is outlined.

The report is concluded in Section 7.

2 NOISE UNITS, POLICY AND CRITERIA

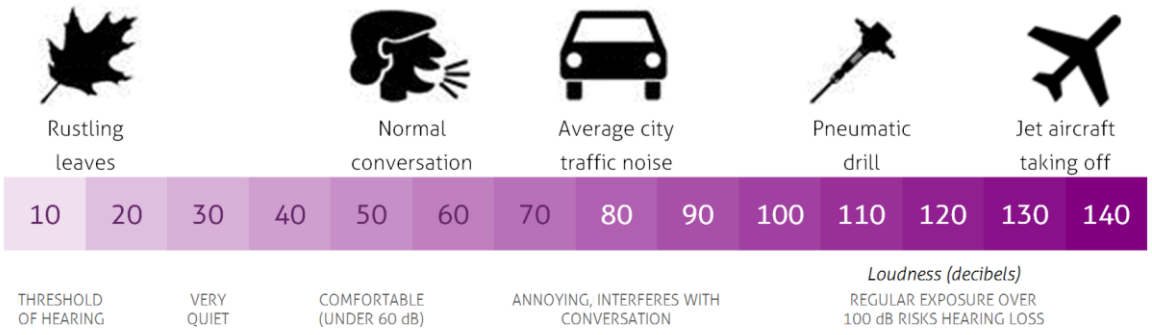
2.1 Noise Units

There is a ten million to one ratio between the acoustic energy associated with the threshold of hearing and the highest tolerable sound pressure. Noise is therefore measured using a logarithmic scale, to account for this wide range, called the decibel (dB). Noise is defined as unwanted sound and the range of audible sound varies from around 0 dB to 140 dB.

The human ear is capable of detecting sound over a range of frequencies from around 20 Hz to 20 kHz, however its response varies depending on the frequency and is most sensitive to sounds in the mid frequency range of 1 kHz to 5 kHz. Instrumentation used to measure noise is therefore weighted across the frequency bands to represent the sensitivity of the ear. This is called 'A weighting' and is represented as dB(A).

It is generally accepted that under normal conditions humans are capable of detecting changes in steady noise levels of 3 dB, whilst a change of plus or minus 10 dB is perceived as a doubling or halving of the noise level. An indication of the range of noise levels commonly found in the environment is given below.

Figure 2.1: Typical noise levels



A number of different indices are used to describe the fluctuations in noise level over certain time periods. The main indices include:

$L_{A90,T}$ This is the noise level exceeded for 90% of the measurement period and provides a measurement of the quieter 'lull' periods in between noise events. It is often referred to as the background noise level.

$L_{Aeq,T}$ This is the "equivalent continuous A weighted sound pressure level" and is the level of a notional steady sound which has the same acoustic energy as the fluctuating sound over a specified time period. It is often used for measuring all sources of noise in the environment, which can be referred to as the ambient noise.

$L_{Amax,F}$ This is the maximum sound pressure level measured in a given time period with the sound level meter set to 'fast' response.

Reference is often made to acoustic measurements being undertaken in 'free-field' or 'façade' locations. Free-field measurements represent a location away from vertical reflecting surfaces, normally by at least 3.5 metres. A façade measurement is undertaken or calculated to a position 1 metre from an external façade and a correction of up to 3 dB can be applied to account for the sound reflected from the façade. This latter position is often used when assessing the impact of external noise affecting residents inside properties.

2.2 Relevant Guidance

2.2.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE)[1] was published on 15 March 2010. It sets out the long-term vision of the Government's noise policy, which is to promote good health and a good quality of life through the management of noise within the context of sustainable development.

The NPSE sets out 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; and
- where possible, contribute to the improvement of health and quality of life."

The NPSE describes a number of effect levels that may be used to define effects in the context of noise policy, as follows:

- **NOEL – No Observed Effect Level -** This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **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

In March 2014 further guidance on interpreting the effect levels was published on the Government's Planning Practice Guidance. This planning practice guidance was updated and expanded on the 22nd of July 2019. This includes a table that summarises noise exposure hierarchy, noting this is based on the likely average response of a population. This table is presented in Table 2.1.

Table 2.1 Noise exposure hierarchy and effect levels

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behavior, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behavior, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			

Present and disruptive	The noise causes a material change in behavior, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behavior, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.2.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[2] was first published on 27 March 2012 and updated in February 2019. The NPPF sets out how the Government's planning policies should be applied. In terms of the detail of policies on environmental issues such as noise, the intention is for Local Planning Authorities to set their own guidance. This will form part of or be referred to in the relevant Local Plan.

2.2.3 British Standard 8233

British Standard BS 8233:2014: *Sound insulation and noise reduction for buildings – Code of practice*[3] provides guideline values for internal noise levels within a number of building types including residential dwellings.

In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 2.2:

Table 2.2: British Standard 8233 Indoor Noise Levels

Activity	Location	Daytime	Night-time
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 $L_{Aeq, 8hour}$

Notes: Daytime assessment period – 07:00 to 23:00 hrs
Night-time assessment period – 23:00 to 07:00 hrs

2.2.4 World Health Organisation Guidelines

The following guideline values for community ambient noise levels in specific environments are presented in the World Health Organization (WHO) Guidelines for Community Noise[4].

Table 2.3: WHO Guideline Noise Values

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours	dB $L_{Amax,F}$
Dwelling indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

The 45 dB $L_{AF,Max}$ criterion applies to "single sound events" within bedrooms at night. This guideline is generally interpreted as the value that individual noise events should not normally exceed. WHO states that for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night.

2.2.5 WHO Noise Guidelines for Europe

To ensure compliance with Planning Noise Advice Document: Sussex[5], night-time max levels should not exceed the L_{Amax} level recommended in WHO Night Noise Guidelines for Europe[6]. The document states "*42 dB(A) is proposed as the currently best estimate of the threshold for conscious awakening by transportation noise. This would mean that the no observed effect level (NOEL L_{Amax}) for transportation noise events is at most 42 dB(A). The most sensitive instantaneous effect that has been studied extensively in field studies is motility. A single interval with (onset of) noise-induced motility by itself cannot be considered to be adverse*".

2.2.6 ProPG: Planning and Noise

ProPG (Professional Practice Guidance: Planning and Noise)[7] was jointly developed by the Institute of Acoustics (IOA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH) to guide Local Planning Authorities (LPAs) and Practitioners in assessing the suitability for residential development on sites predominantly exposed to airborne transport noise.

ProPG introduced a sequential 2-stage approach allowing for early consideration of noise issues at Stage 1 followed by more detailed consideration of noise issues at Stage 2, should this be identified as necessary in Stage 1.

Stage 1 introduces the concept of noise risk categories ranging from Negligible Risk to High Risk to help LPAs in making accelerated straightforward decisions for low risk sites and to provide guidance for more detailed consideration associated with challenging higher risk sites.

Following the outcome of Stage 1, Stage 2 then applies to sites assessed as low to high risk. This stage should not be necessary for sites assessed as negligible risk.
Stage 2 requires consideration be given to four key elements:

- Element 1: Good Acoustic Design Process
- Element 2: Internal Noise Level Guidelines
- Element 3: External Amenity Area Noise Assessment
- Element 4: Other Relevant Issues

Further details on these elements are discussed in the acoustic design section of this report.

Table 2.4 provides a summary of ProPG's noise risk categories and their associated fee-field noise levels, along with the assessment implications.

Table 2.4: Stage 1 - Initial Site Noise Risk Assessment

Risk Category	Indicative Daytime Noise Levels $L_{Aeq,16hr}$	Indicative Night-time Noise Levels $L_{Aeq,8hr}$	Pre-Planning Application Advice
Negligible Risk	< 50 dB	< 40 dB	Indication that the development site is likely to be acceptable from a noise perspective and application need not normally be delayed on noise grounds.
Low Risk	50 - 60 dB	40 - 50 dB	Indication that the development site is likely to be acceptable provided a good acoustic design process is followed and is confirmed in a detailed

Risk Category	Indicative Daytime Noise Levels $L_{Aeq,16hr}$	Indicative Night-time Noise Levels $L_{Aeq,8hr}$	Pre-Planning Application Advice
Medium Risk	60 - 70 dB	50 - 60 dB	Acoustic Design Statement confirming how noise will be mitigated.
High Risk	> 70 dB	> 60 dB	Indication that the development site may be refused on noise grounds unless a good acoustic design process and detailed Acoustic Design statement can demonstrate the significant noise risk can be mitigated.

Notes

1. Noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

2. 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 not dominant.

3. $L_{Aeq,16hr}$ is for daytime 07:00-23:00, $L_{Aeq,8hr}$ is for night-time 23:00 to 07:00.

4. An indication that there may be more than ten noise events at night (23:00-07:00) with $L_{Amax,F}$ > 60 dB means the site should not be regarded as negligible risk.

2.2.7 British Standard 4142:2014+A1:2019

Guidance on the rating of noise from fixed installations and sources of an industrial nature is provided in British Standard (BS) 4142[8]. This standard has been updated in 2019, which provides a procedure for the measurement and rating of noise levels outside dwellings in mixed residential and industrial areas. A methodology for predicting the likelihood of adverse impact is also provided in this document although the assessment of nuisance explicitly falls outside the scope of this British Standard.
Relevant to this development, this standard can be used for assessing the impact of sound at the proposed new residential dwellings from existing fixed plant.

The rating level ($L_{Ar,Tr}$) is defined in BS 4142 is used to rate the industrial source (known as the specific noise source) outside residential dwellings. This level is obtained by adding a correction of between 0 and 6 dB for tonal noise sources and between 0 and 9 dB for impulsive sources. Additionally, corrections of 3 dB can be made for other sound characteristics and intermittency of the noise source.

Reference time intervals, T_r, of 1-hour and 15-minutes are specified for the determination of rating levels during the day and night, respectively.

The method for predicting the likelihood of complaints is based on differences between the rating level and the background $L_{A90,T}$ noise level. The Standard states that:
"

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context.
d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact depending on the context."*

2.2.8 Planning Noise Advice Document: Sussex

The Planning Noise Advice Document: Sussex July 2015[5] Paragraphs 1.36. and 1.3.7. provide the following regarding planned residential developments located near to existing transport and commercial noise sources:

1.3.6. For a new noise sensitive development near an existing source of transport noise (road, rail, ports or aircraft) the LAeq (16hr day and 8hr night), or the shortened calculation method, should be measured, as agreed. In addition, suitable shorter term LAeq, LA90, LA10 and LAmax would be expected to give a clearer picture of the existing noise environment. This could also apply to extensions/ alterations to existing development.

1.3.7. For a new noise sensitive development next to a commercial noise source, where practical, each existing potential noise source would need to be measured separately and details provided of the hours of operation, the LAeq, the tonality, character, impulsivity and/or intermittency of the noise (see BS4142) and the hours of occurrence. The existing background noise level (LA90) will also have to be measured with and without the commercial noise sources in operation. This could also apply to extensions/ alterations to existing development.

Paragraphs 5.5.2. and 5.5.3. state the following with regard to achieving suitable in internal ambient noise levels in habitable rooms:

5.5.2. Design control measures should aim to meet the recommended standards set out in table 4 of BS 8233:2014 and the night-time L_{Amax} level recommended in the WHO's Night Noise Guidelines for Europe (2009), unless there are particular reasons why this is not considered appropriate. In such cases, a clear explanation of the reasons should be provided.

5.5.3. While it is acknowledged that noise mitigation measures can be used in a lot of cases to achieve suitable internal levels, it is important that preference is given to criteria based on windows being partially open. If it is not possible to achieve suitable internal levels with the windows opened, then details of alternative ventilation must be supplied.

With regard to location of new noise sensitive developments near to existing industrial/commercial noise sources the guidance states the following:

5.6.1. Careful consideration will need to be given to proposals that are likely to site new noise sensitive developments near to existing industrial, commercial, entertainment premises ports and airports.

5.6.2. There is no protection offered in law to existing premises, from nuisance complaints made by new residents. This may result in formal action being taken against these premises if a statutory nuisance is established.

5.6.3. Therefore, in general, where it is apparent to the LPA that existing noise from an existing industrial, commercial, entertainment premises, ports and airports is likely to cause disturbance or a statutory nuisance to new residents, the development is unlikely to be supported unless clear evidence can be shown that adequate noise attenuation to the existing noise sources can and will be provided.

5.6.4. In some circumstances, legal agreements can be entered into, whereby the developers provide the necessary measures to attenuate the existing noise through adequate sound proofing or re-locating of the noise source.

2.2.9 Internal Noise Criteria, Entertainment/Fixed Plant Noise

There are no British Standards for suitable internal noise criteria associated with noise sources that contain specific features such as patron/music/fixed plant noise.

Research papers on the topic include *NANR 163 Noise from Pubs and Clubs*[9] and *NANR 45 Proposed criteria for the assessment of lower frequency noise disturbance*[10] conducted on behalf of The Department for Environmental Food and Rural Affairs (DEFRA). Although specific to music/patron noise, they can also be considered appropriate for other noise sources containing specific features, such as fixed plant.

The outcome of which suggests the following:

- To protect the amenity of future occupants, noise intrusion should be limited to not exceed a level of NR 25 and L_{Aeq} 27 dB inside habitable rooms of the new dwellings.

3 SITE DESCRIPTION

3.1 Existing Site

The site is located on Shoreham High Street with the Crown and Anchor pub to the east and Tosca Ristorante at ground floor level with dwellings on the floor above to the west. The building is currently an unused commercial space that was previously a bank. It is understood that the Crown and Anchor is open from 11:00 to 23:00 Monday to Thursday, 11:00 to 01:00 Friday and Saturday, then from 12:00 to 23:00 on Sundays. A pub garden is located at the rear of the Crown and Anchor which has direct line of site with the proposed development. Tosca Ristorante is understood to be open from 11:30 to 23:00 on Monday to Sunday.

An aerial view of the site location is shown in Figure 3.1, which highlights the proposed site area and adjacencies.

Figure 3.1: Site location (highlighted in red) ©2019 Google



3.2 Proposed Site

The project involves the redevelopment of the site to provide 8 new flats at first and second floor level. It is understood that the development proposes to retain the existing windows.

Figure 3.2: Proposed Development Layout



4 NOISE LEVELS ON SITE

The prevailing noise conditions in the area have been determined by detailed environmental noise surveys, comprising a mix of attended and unattended measurements. The unattended surveys were undertaken over a 9-day period at two measurement locations, between Tuesday 5th and Thursday 14th November 2019, in order to determine the environmental noise conditions in the area.

The sound environment of the proposed site is predominantly governed by road traffic noise from A259 located to the north of the proposed development and commercial noise from the adjacent restaurant to the west.

4.1 Instrumentation

All noise measurements were undertaken by a consultant certified as competent in environmental monitoring. All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[11]. A full inventory of this equipment is shown in Table 4.1 below. All equipment's calibration certificates are available on request.

Table 4.1 Inventory of Measurement Equipment

Measurement type	Item	Make and Model	Serial Number	Calibration	
				Certificate number	Expiry Date
Noise (Unattended)	Sound Level Meter	Rion NL-52	00610202	UCRT19/1036	10/01/2021
	Preamplifier	NH-25	10611		
	Microphone	UC-59	06171		
	Calibrator	Rion NC-74	35015349	UCRT19/1215	18/02/2020
Noise (Unattended and Attended)	Sound Level Meter	Rion NL-52	00620960	UCRT19/1868	05/08/2020
	Preamplifier	NH-25	21001		
	Microphone	UC-59	03878		
	Calibrator	Rion NC-74	35015349	UCRT19/1215	18/02/2020

The noise measurement equipment used during the survey was calibrated at the start and end of each measurement. The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred.

4.2 Unattended noise survey

Unattended noise measurements were undertaken to the front (North) and rear (South) of the site. The locations were chosen in order to understand the variation of sound levels throughout typical day and night periods. Measurements were undertaken between Tuesday 5th and Thursday 14th November 2019.
Third octave band measurements were undertaken in order to obtain the frequency content of the noise impacting on the proposed development, needed to determine the sound insulation performance requirements of the building envelope.

4.3 Attended noise survey

Attended noise measurements were undertaken to understand the operational noise level of plant located at roof level of the adjacent restaurant to the west. Measurements were undertaken on Thursday 14th November 2019. Third octave band measurements were taken to obtain the frequency content of the noise impacting on the proposed development, needed to determine the sound insulation performance requirements of the building envelope. Noise levels were measured over 1-minute periods to establish a suitably representative level at the positions around the site.

4.4 Weather Conditions

During the surveys undertaken in November 2019, weather conditions were dry with light to moderate winds whilst setting up unattended equipment on 5th November 2019. Weather conditions were noted to be wet with light winds during collection on 14th November 2019. The weather conditions were considered acceptable for noise measurements. Any periods of adverse weather have been noted and noise data has been assessed for potential impacts due to weather conditions.

Table 4.2: Weather Conditions

Date	Period	Maximum Precipitation Rate	Max Wind Speed, m/s	Max Gust Speed, m/s	Maximum Temperature, °C
Tuesday 5th November 2019	Daytime (07:00 to 23:00)	2	3	5	13
	Night-time (23:00 to 07:00)	0	1	3	9
Wednesday 6th November 2019	Daytime (07:00 to 23:00)	7	9	10	11
	Night-time (23:00 to 07:00)	0	13	15	12
Thursday 7th November 2019	Daytime (07:00 to 23:00)	0	9	10	11
	Night-time (23:00 to 07:00)	0	0	1	8
Friday 8th November 2019	Daytime (07:00 to 23:00)	0	2	4	10
	Night-time (23:00 to 07:00)	0	2	3	5
Saturday 9th November 2019	Daytime (07:00 to 23:00)	0	12	14	11
	Night-time (23:00 to 07:00)	4	2	4	7
Sunday 10th November 2019	Daytime (07:00 to 23:00)	0	3	5	11
	Night-time (23:00 to 07:00)	0	13	15	11
Monday 11th November 2019	Daytime (07:00 to 23:00)	0	6	9	10
	Night-time (23:00 to 07:00)	0	4	6	6
Tuesday 12th November 2019	Daytime (07:00 to 23:00)	0	10	13	9
	Night-time (23:00 to 07:00)	0	2	4	8
Wednesday 13th November 2019	Daytime (07:00 to 23:00)	2	14	17	10
	Night-time (23:00 to 07:00)	5	13	15	8
Thursday 14th November 2019	Daytime (07:00 to 23:00)	4	6	7	8
	Night-time (23:00 to 07:00)	0	1	2	6

4.5 Noise Survey Results

4.5.1 Unattended noise survey

A summary of the daytime ambient $L_{Aeq,16hr}$ and night-time ambient $L_{Aeq,8hr}$ noise levels measured is presented below in Table 4.3 and 4.4, along with the typical $L_{Amax,\ F}$ level. Full time history results are shown in Appendix A1 and A2.

Table 4.3 Summary results of the Front Façade (North) unattended noise survey

Date	Period	Ambient Noise Level $L_{Aeq,\ T}$, dB	Maximum Night-time Noise Level $L_{Amax,F}$ dB (Top 10 excluded)	Typical Background Noise Level $L_{A90,t}$ dB
05/11/2019	Daytime (15:20-23:00)	70	86	62
	Night-time (23:00-07:00)	67		37
06/11/2019	Daytime (07:00-23:00)	73	84	63
	Night-time (23:00-07:00)	67		47
07/11/2019	Daytime (07:00-23:00)	70	85	64
	Night-time (23:00-07:00)	67		41
08/11/2019	Daytime (07:00-23:00)	71	84	64
	Night-time (23:00-07:00)	66		38
09/11/2019	Daytime (07:00-23:00)	72	82	63
	Night-time (23:00-07:00)	67		43
10/11/2019	Daytime (07:00-23:00)	70	85	63
	Night-time (23:00-07:00)	67		41
11/11/2019	Daytime (07:00-23:00)	72	84	63
	Night-time (23:00-07:00)	66		36
12/11/2019	Daytime (07:00-23:00)	71	85	64
	Night-time (23:00-07:00)	66		36
13/11/2019	Daytime (07:00-23:00)	73	84	62
	Night-time (23:00-07:00)	68		49
14/11/2019	Daytime (07:00-11:00)	72	-	66

Table 4.4 Summary results of the Rear Façade (South) unattended noise survey

Date	Period	Ambient Noise Level $L_{Aeq,T}$, dB	Maximum Night-time Noise Level $L_{Amax,F}$ dB (Top 10 excluded)	Typical Background Noise Level $L_{A90,t}$ dB
05/11/2019	Daytime (15:20-23:00)	55	64	48
	Night-time (23:00-07:00)	50		42
06/11/2019	Daytime (07:00-23:00)	57	73	49
	Night-time (23:00-07:00)	55		50
07/11/2019	Daytime (07:00-23:00)	57	67	53
	Night-time (23:00-07:00)	50		47
08/11/2019	Daytime (07:00-23:00)	56	77	49
	Night-time (23:00-07:00)	56		47
09/11/2019	Daytime (07:00-23:00)	58	78	54
	Night-time (23:00-07:00)	56		45
10/11/2019	Daytime (07:00-23:00)	55	70	48
	Night-time (23:00-07:00)	55		52
11/11/2019	Daytime (07:00-23:00)	58	63	53
	Night-time (23:00-07:00)	51		46
12/11/2019	Daytime (07:00-23:00)	58	68	54
	Night-time (23:00-07:00)	51		45
13/11/2019	Daytime (07:00-12:35)	59	-	51

Table 4.5 Summary results of the south position Noise Levels

Period	Ambient Noise Level $L_{Aeq,T}$, dB	Maximum Night-time Noise Level $L_{Amax,F}$ dB (Top 10 excluded)	Typical Background Noise Level $L_{A90,t}$ dB
Daytime	71	85	63
Night-time	67		41
Daytime	57	78	49
Night-time	53		47

The following L_{Amax} levels have been used as a typical value at which no more than 10 night-time exceedances are likely to occur.

Table 4.6 Summary results of $L_{Amax,F}$ Noise Levels at front and rear positions

Position	$L_{Amax,F}$	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Front	85	85	83	84	82	79	78	76
Rear	78	78	79	75	71	77	71	59

It is noted that the survey falls over the date 5th November, a time of year traditionally associated with fireworks. Examination of the survey results and audio records suggests that firework noise did not make any significant contribution to the measured noise levels.

Figure 4.1 details the $L_{A90,5min}$ values measured at the rear of the proposed development during daytime periods.

Figure 4.1 $L_{A90,5min}$ noise levels during daytime



4.5.2 Attended noise survey

Table 4.7 Attended $L_{Aeq,T}$ Measurement Results

Measurement	Time period	Activity	$L_{Aeq,1min}$	$L_{Amax,1min}$	$L_{A90,1min}$	Note
1	01:00	Plant Noise Operational	61	63	60	Plant noise above Tosca Ristorante operational and audible.

5 COMMERCIAL/INDUSTRIAL NOISE ASSESSMENT: BS 4142

5.1 Assessment

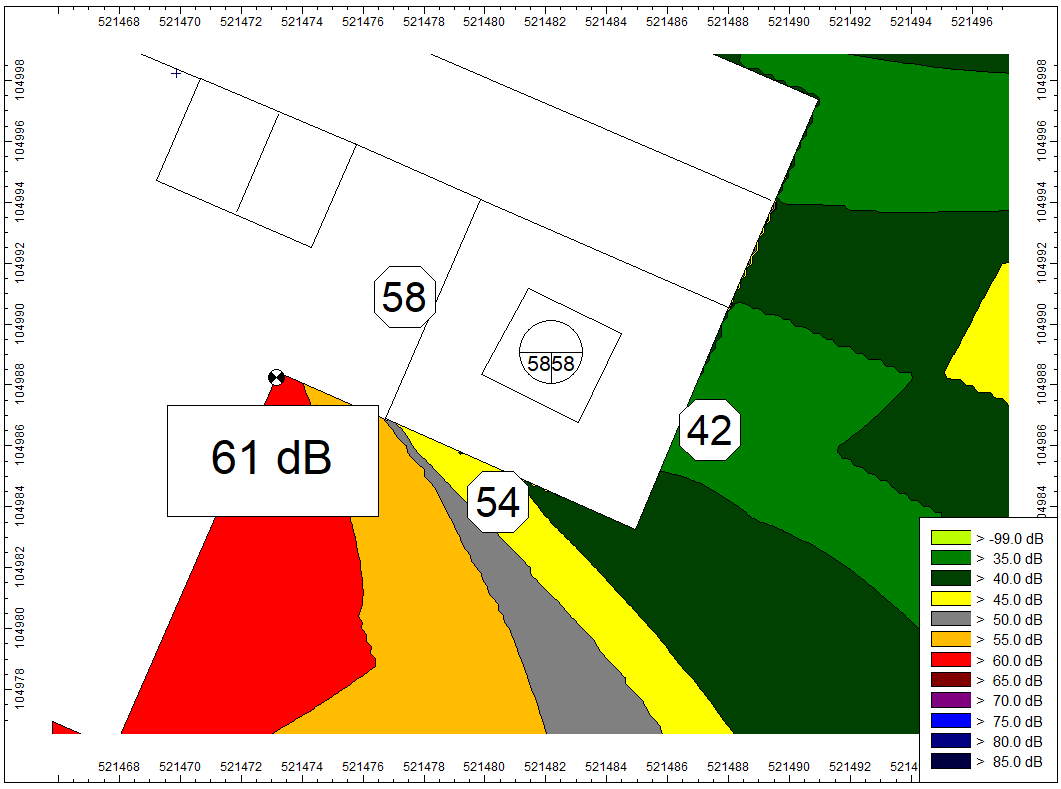
Using the data captured from our noise survey, an assessment of activity at the adjacent commercial premises has been carried out in accordance with BS 4142 to assess the potential impact on the proposed development.

The Crown and Anchor pub is located adjacent to the east of the proposed development and is understood to be operational throughout the week. Observations on site indicate that an extract flue terminates at roof level. During attended measurements the extract flue was inaudible at the east façade window receiver position of the proposed development. The noise environment on the east façade of the proposed development is dominated by road traffic noise from the high street.

Tosca Ristorante is located adjacent to the west of the proposed development and is understood to be operational throughout the week. Plant is located at roof level and is audible at the receiver position. Attended measurements were undertaken to establish the operational noise level of the existing plant during quiet periods to ensure that a representative noise level was recorded. The restaurant is understood to be operational during daytime periods only. The BS 4142 assessment therefore considers the impact of activity on the proposed residential development during the day-time period.

The resulting noise levels at the development are shown in Figure 5.1. The assessment has been made to the nearest window facing Tosca Ristorante at the first-floor level.

Figure 5.1: Calculated Specific Noise Level



A level of 58 dB has been calculated at 1 m from the façade of the development. BS 4142 requires that a correction is applied to the Rating Level if there are any tonal, impulsive or other irregular characteristics likely to attract attention present in the noise source.

Observations indicate that the does not plant possess irregular, impulsive or intermittent characteristics, therefore no penalties have been applied to the rating level. The objective method for assessing the audibility of tones in sound: one third octave method detailed in BS 4142 has been used to determine whether the plant indicates a tonal element. No tonal element was indicated, therefore no penalty has been applied.

Table 5.1: BS 4142 Assessment – properties north of site

Description	Noise Level, dB
Specific Noise Level	58
Acoustic Penalties	0
Rating Level	58
Background Noise Level	49
Level over Background	+9

Based on the above assessment, commercial activity, in the absence of any mitigation, results in a level of $L_{Ar,T}$ 58 dB at the nearest properties. This is +9 dB above the typical background level of 49 dB L_{A90} which, depending on the context of the sound environment at the proposed development, indicates an adverse impact on future occupants, based on BS 4142 assessment guidelines.

5.2 Noise from The Crown and Anchor

The proposed development overlooks a pub garden located at the rear of the Crown and Anchor to the West. The pub is open from 11:00 to 01:00 on Fridays and Saturdays. The pub garden is accessible for 24 hours as it is not gated.

It is understood that the pub runs a number of events through the week:

- Salsa dancing lessons – Monday Nights
- Quiz Night – Tuesdays from 20:30 to 23:00
- Open Mic Night – First Wednesday of the month from 21:00 to 23:00
- Dancefloor Classic DJ Set – Saturdays from 21:00 to 01:00

To assess the level of impact from the pub operation, noise levels captured at the rear unattended position represent a worst-case scenario for the development, given this position directly overlooks the pub garden and rear entrance. Measured data indicates that activity at the pub during evenings is highly audible. Activity during Friday and Saturday night is made up of patron noise and amplified noise.

Noise levels associated with these periods have been extracted from the recorded data to assess the exposure levels during the busiest periods.

The average ambient noise levels during these periods are summarised below.

Table 5.2: Recorded noise levels at rear unattended locations, busy periods of pub operation

Monitoring Period	Time Period	$L_{Aeq, T}$ dB	$L_{AMax, F}$ dB	$L_{A90, T}$
External Noise Levels				
Salsa Dancing – Monday	19:00 – 20:00	56	73	53
Open Mic Night – Wednesday	20:30 – 21:30	53	72	50
Dancefloor Classics DJ Night - Saturday	23:00 – 01:00	61	93	56

The impact at the proposed residential from the pub is considered to worst case during Friday and Saturday nights. Unattended data has been assessed to provide a maximum $L_{Aeq, 5min}$ spectrum measured between 23:00 to 01:00 on Saturday night. Audio clips have been assessed to provide detail on noise sources during this time to ensure that noise from the Crown and Anchor is being assessed. It is noted that amplified music and patron noise is highly audible at the receiver position. The calculated spectrum has been used to inform of a suitable glazing specification to ensure that internal noise levels remain at a suitable level.

Table 5.3: Calculated spectrum during busy periods of pub operation

$L_{Aeq, T}$	$L_{Amax,F}$	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
67	93	71	71	66	57	57	59	62

5.3 Discussion and Mitigation

The assessment has shown that without mitigation, noise from existing commercial noise sources, discussed in Sections 5.1 and 5.2 of this report, pose a potential risk to the future occupants of the building.

Given the operation of all the commercial noise sources fall outside the control of the developer and that the building is existing in terms of its orientation, mitigation via the building envelope is the only viable measure to manage the noise impact.

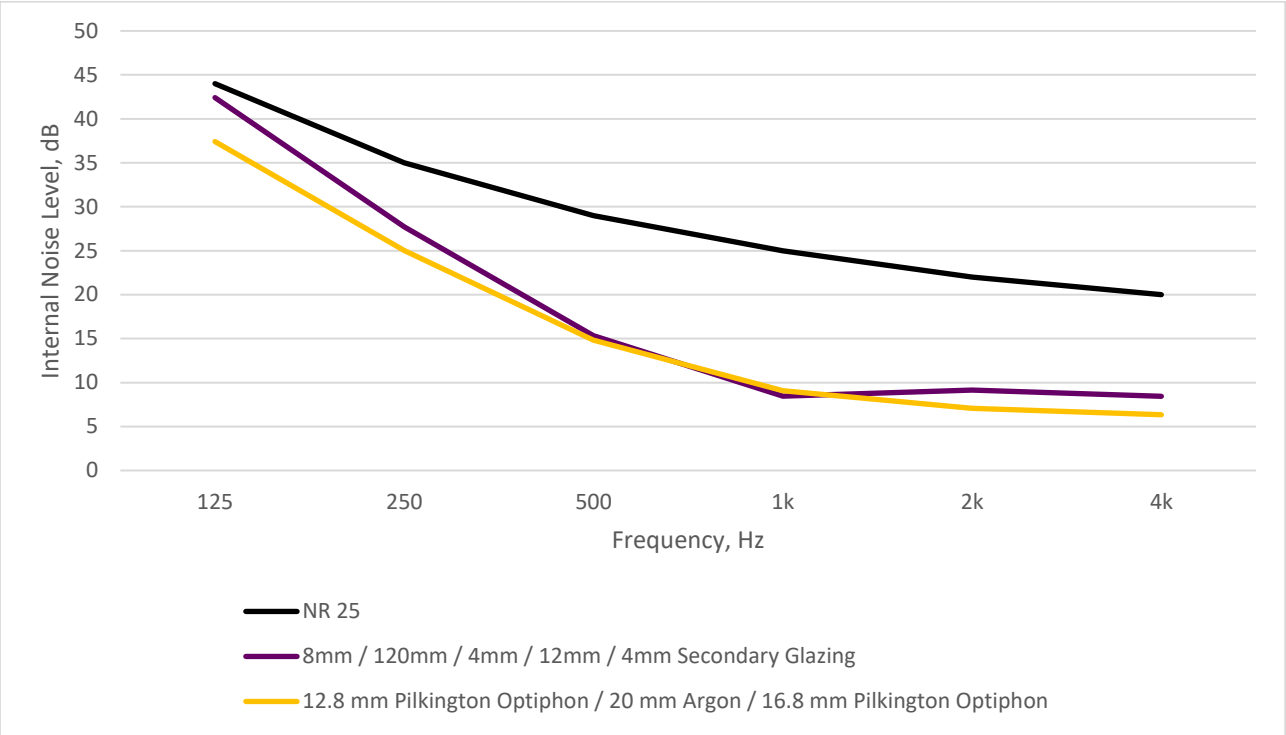
To ensure commercial noise is not detrimental to the amenity of future occupants it will be necessary to upgrade the existing glazing and to ensure adequate ventilation is provided such that opening windows is not a necessity. It is recommended that internal noise levels are controlled to meet a level NR 25 and L_{Aeq} 25 dB. It is understood that the existing glazing is to remain in place. A secondary glazing option has therefore been considered as well as upgrading the existing glazing.

This level of mitigation will also ensure that the surrounding commercial uses can continue their operations without undue or additional constraint.

5.3.1 Glazing

It is recommended that the glazing is upgraded to ensure that internal noise levels remain suitable during busy periods at the nearby commercial areas. Section 7 details the proposed glazing to ensure that future inhabitants are suitably protected from detrimental noise levels. An option of secondary glazing and an upgraded system has been proposed. Table 5.4 indicates that calculated internal noise levels between 125 Hz to 4 kHz are below the NR25 curve.

Table 5.4: Calculated internal spectrum of glazing options



5.3.2 Ventilation

The ventilation system serving the studios would need to fall under System 4 of Approved Document F[12] – Continuous Mechanical Supply and Extract Ventilation with Heat Recovery.

This would comprise a packaged Mechanical Ventilation with Heat Recovery (MVHR) unit located in each dwelling with a supply and extract fan, filter and heat exchanger. It is essential the type of equipment provided incorporates, as standard, a 100% full and filtered 'summer bypass' to avoid the heat in the warm extract air being transferred to the incoming warm but, comparatively cooler external fresh air, thus reducing the potential for overheating.

The equipment should be located in a readily available location and ducted to the rear external wall or roof.

The system should also be designed such that noise from the supply and extract fan, room-side, does not exceed 25 dB L_{Aeq}.

6 PRO-PG STAGE 1 ASSESSMENT

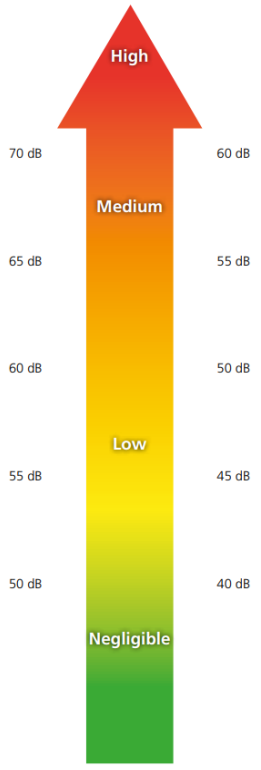
Following ProPG guidance, a Stage 1 – Initial Site Noise Risk assessment has been undertaken to characterise the application site in terms of the likely risk of adverse effects from noise on the future occupants of the development.

An unattended assessment was undertaken to establish the noise levels at the proposed site. Attended measurements have also been undertaken to further understand the acoustic environment.

As can be seen from the results above, the noise levels at the site indicate a 'High Risk' at the front of the proposed development, and a 'Medium Risk' at the rear of the development according to ProPG's Stage 1 – Initial Site Risk Assessment.

ProPG notes that in 'High Risk' and 'Medium Risk' categories, it should be demonstrated that "good acoustic design process" is detailed and that an "Acoustic Design statement can demonstrate the adverse noise risk can be mitigated and minimised". A detailed Acoustic Design Statement is therefore required to ensure that any potential adverse impacts are mitigated and minimised in the completed development. This is provided in the following section.

Figure 6.1 - ProPG Initial site noise risk assessment



7 PRO-PG STAGE 2: FULL ASSESSMENT

Based on the results of the surveys summarised in Section 4.6, following ProPG guidelines a *Stage 2 - Full Assessment* is required. The four key elements to be considered have been assessed based on the assumptions listed in the following section.

7.1 Assumptions

7.1.1 Drawings

Our assessment has been based on the following Architect's drawings.

Table 7.1: Drawings used in the assessment

Drawing Title	Drawing Number	Date
Proposals Floor Plans	19060-P-110	-

It has been assumed that all windows will have a height of 1.5 m and that all rooms will have an internal height of 2.4 m.

7.1.2 Room Reverberation

In order to calculate the internal ambient noise levels within habitable rooms, our analysis has assumed typical reverberation times in furnished bedrooms and living rooms, which have been based on a flat reverberation time of 0.5 seconds across the frequency spectrum between 125 Hz and 4 kHz.

7.1.3 Non-glazed External Wall Areas

It is understood that the proposed external wall areas to residential units will be of masonry construction. The below assumption has been made for the external wall system.

Table 7.2: Assumed sound reduction index (dB) of the external wall construction

Wall	125	250	500	1k	2k	4k	R_w / $R_w + C_{tr}$
Masonry	41	45	45	54	58	58	52 / 48

7.2 Stage 2: Element 1 – Good Acoustic Design Process

Following a good acoustic design process is implicit to achieving good overall design, as required by the Government's planning and noise policy documents NPSE and NPPF.

This process requires a high level, multi-faceted and integrated approach across all disciplines with a view to optimising acoustic conditions inside habitable rooms and in external amenity space.

Section 5 of BS 8233:2014 contains guidance on the sequence of stages to be followed in the planning and early acoustic design of a new development. Section 5.4 of BS 8233:2014 outlines a general approach to determining appropriate noise control measures including the following suggested steps (which may be iterative):

i. Check the feasibility of reducing noise levels and/or relocating noise sources.
ii. Consider options for planning the site or building layout.
iii. Consider the orientation of proposed building(s).
iv. Select construction types and methods for meeting building performance requirements.
v. Examine the effects of noise control measures on the requirements for ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
vi. Assess the viability of alternative solutions.

The designer should then decide which of the following options can be applied to reduce noise levels:

i. Quietening or removing the source of noise.
ii. Attenuating the sound on its path to the receiver.
iii. Obstructing the sound path between source and receiver.
iv. Improving the sound insulation of the building envelope.
v. Using agreements to manage noise.

The main source of noise affecting the proposed development is road traffic noise from the A259 and commercial noise from the adjacent pub during busy hours. Given the height, location and specific physical conditions of the site, it is not practicable to attenuate the noise at source nor the sound propagation path between source and receiver. As such, focus must be applied to the acoustic design of the development, using appropriate building constructions and ventilation strategies which consider not only noise but also thermal comfort, fire, health and safety, CDM and cost.

7.3 Stage 2: Element 2 – Internal Noise Level Guidelines

In order to achieve the internal noise guidelines as set out in Section 2, it is necessary to estimate internal noise levels with windows closed using standard glazing and ventilation products.

An assessment of the external building fabric elements has been undertaken based on the attended spectral $L_{Aeq,\ 5min}$ and $L_{Amax,F}$ levels, and the unattended survey daytime and night-time averages, as set out in Section 4.6 of this report. Guidance is given in the following sections regarding suitable glazing, ventilation and external wall configurations to achieve the required internal ambient noise levels within the proposed residential and commercial spaces. Calculations have been undertaken following the general method set out in BS EN 12354-3:2017 [13].

7.3.1 Ventilation

Due to the surrounding sound environment it is recommended that mechanical ventilation with heat recovery (MVHR) is installed throughout to ensure that windows do not need to be openable for ventilation requirements.

7.3.2 Glazing

Based upon the latest drawings and elevations provided by the architect, detailed calculations have been undertaken in accordance with BS 12354-3 to determine the required worst-case acoustic performances for the glazed elements of the façade, in order to provide appropriate internal noise levels in habitable rooms, during both daytime and night-time periods. The resulting worst-case performance requirements are presented in Tables 7.3 and 7.4, assuming MVHR usage throughout. It has been assumed that existing glazing will provide the sound reduction performance of a 4 mm / 12 mm / 4 mm double glazing system.

Due to the noise environment at the front of the development it is considered appropriate to achieve the criteria of $L_{AF,max}$ 45 dB in line with World Health Organization Guidelines for Community Noise which states; "*for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night*". Whilst the Planning Noise Advice Document: Sussex targets a limit of 42 dB L_{Amax}, this level cannot be guaranteed with the maximum reasonably practicable glazing proposed within this report.

Table 7.3 Minimum sound reduction performance (dB) for the glazed elements of the façade (using an MVHR system) per octave band frequency. Proposed Secondary Glazing

Façade	Room	Glazing example	125	250	500	1k	2k	4k	R_w / $R_w + C_{tr}$
Front (North and East)	All	15mm / 150mm + existing glazing	28	31	42	45	50	58	48 / 42
Rear (South)	All	8mm / 120mm + existing glazing	35	45	49	49	54	63	51 / 46

Table 7.4 Minimum sound reduction performance (dB) for the glazed elements of the façade (using an MVHR system) per octave band frequency. Proposed Glazing Upgrade

Façade	Room	Glazing example	125	250	500	1k	2k	4k	R_w / $R_w + C_{tr}$
All	All	12.8 mm Pilkington Optiphon / 20 mm Argon / 16.8 mm Pilkington Optiphon	35	45	49	50	54	65	51 / 46

The sound insulation requirements of the glazing are applicable to the window system as a whole, including frames, mullions and panels. They are based on BS EN ISO 10140: 2010 "*Acoustics - Laboratory measurement of sound insulation of building elements"* and rated in accordance with BS EN ISO 717-1:2013 "*Acoustics – Rating of sound insulation in buildings and of building elements Part 1. Airborne sound insulation*".

All glazing systems should be capable of meeting the performance specifications detailed above, with test certificates being made available in support. Glazing proposals which only reflect the guidance constructions indicated in this report will not be sufficient evidence that a glazing system will achieve the required performance specification.

The provided ventilation strategy is designed such that windows need not be opened for ventilation. Where the resident chooses to open a window, a satisfactory internal noise level may not be achieved.

The above sound reduction performances would ensure that appropriate BS 8233 internal noise levels are achieved using suitable façade treatments, when utilising any of the proposed ventilation strategies; which should then in turn equate to No Observed Adverse Effect in accordance with the NPSE.

7.4 Uncertainty

The following steps have been taken to reduce uncertainty in the assessment:

- Measured background sound levels are considered to be representative of the quietest times when the commercial premises are in operation and the plant will be most apparent;
- Attended surveys were planned to ensure that weather conditions did not have any significant effect on the measured sound levels. Attended surveys were carried out during dry conditions with measured wind speeds below 5 m/s during each measurement; and
- Measurements were carried out using a Class 1 sound level meter and calibrator both within a year of the date of last calibration.

Although the magnitude of uncertainty has not been quantified, measures have been taken to minimise this uncertainty to a satisfactory level and in accordance with best practice.

8 CONCLUSIONS

Anderson Acoustics Ltd was commissioned by Moretons Investments Ltd in November 2019 to undertake a noise assessment for the proposed residential development at 35-37 High Street, Shoreham, to be used in support of a planning application.

The noise conditions on site indicate that it would be categorised as a 'High Risk' at the front of the proposed development, and a 'Medium Risk' at the rear of the development site according to ProPG Stage 1 - Initial Site Risk assessment guidelines. Following this, a Stage 2 – Full Assessment has been undertaken and advice has been given on the design of the building envelope to ensure that internal noise levels inside habitable rooms lie within guideline limits recommended in ProPG and BS 8233:2014. With the proposed glazing specifications, BS 8233 conditions for occupants should be met, which would in turn equate to No Observed Adverse Effect according to NPSE.

Measurements and assessments made at the site indicate that rooms overlooking the Crown and Anchor Pub to the East are likely to be adversely affected by noise during busy night-time hours. Calculations have been undertaken to establish suitable glazing specifications to mitigate noise levels under typical conditions, which are of high performance.

Based on the ProPG approach followed in this assessment, our recommendation to the decision maker with regard to noise is that "Planning consent may be granted subject to the inclusion of suitable noise conditions". These would be expected with regard to the achievement of appropriate internal noise levels within habitable spaces intended for residential use, appropriate external amenity areas for relative quiet as well as for noise emissions from building services plant associated with the development to nearby sensitive properties.

9 REFERENCES

1 Noise Policy Statement for England (NPSE). 15 March 2010.

2 National Planning Policy Framework (NPPF). 27 March 2012.

3 British Standards Institution. Sound Insulation and Noise Reduction for Buildings – Code of Practice. BS 8233:2014.

4 World Health Organisation - Guidelines for Community Noise. 2000.

5 The Planning Noise Advice Document: Sussex. July 2015

6 World Health Organisation – Night Noise Guidelines for Europe. 2009

7 Institute of Acoustics (IOA), Association of Noise Consultants (ANC) and Chartered Institute of Environmental Health (CIEH). Professional Planning Guidance on Planning and Noise (ProPG): New Residential Development. May 2017.

8 British Standards Institution. Methods for rating and assessing industrial and commercial sound. BS 4142:2014+A1:2019.

9 Department for Environment, Food and Rural Affairs. Noise from Pubs and Clubs NANR 163. May 2006

10 Department for Environment, Food and Rural Affairs. Proposed criteria for the assessment of low frequency noise disturbance. December 2011

11 British Standards Institution. Electroacoustics. Sound level meters. Part 1 Specifications. BS 61672: 2003.

12 Building Regulations 1991: Approved Document F 2010, Ventilation.

13 British Standards Institution. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound. BS12354-3: 2017.

PAGE LEFT INTENTIONALLY BLANK

APPENDIX A

FIGURES

Figure A1: Unattended monitoring position 1 – time history results

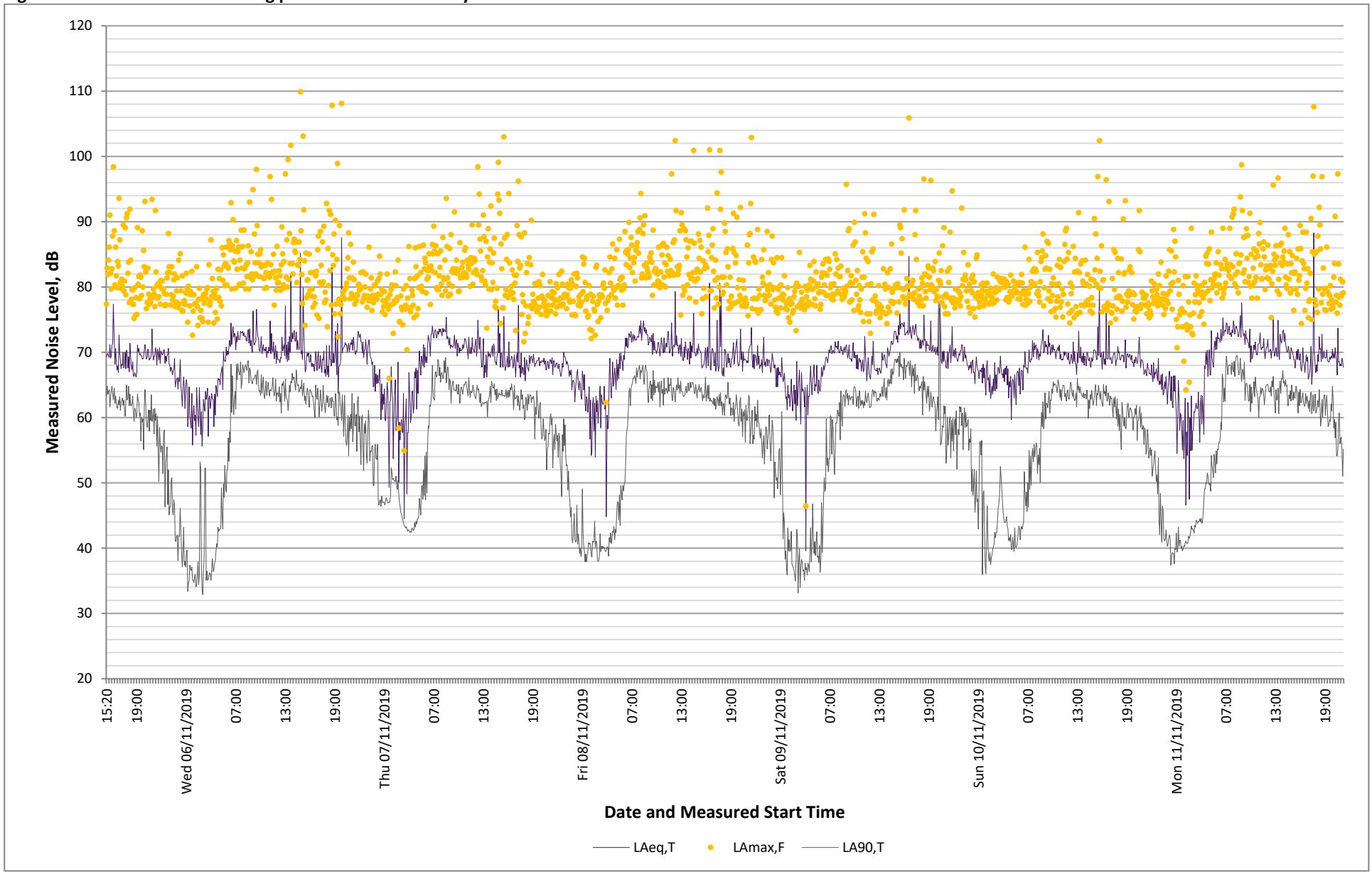
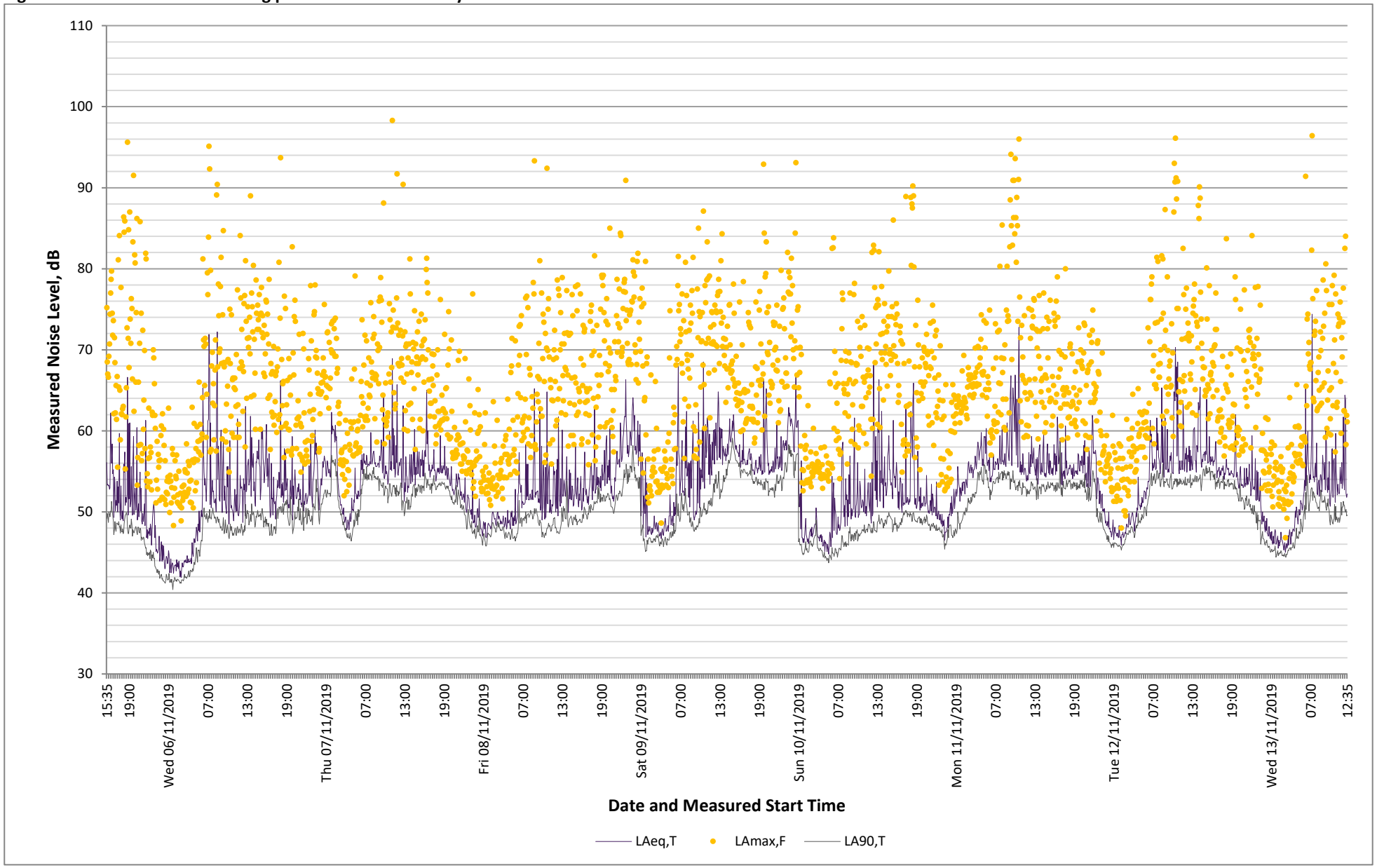


Figure A2: Unattended monitoring position 2 – time history results



APPENDIX B

CALCULATED

Figure B.1: 8mm/120mm/4mm/12mm/4mm Secondary Glazing

Sound Insulation Prediction (v7.0.6)

INSUL

Program copyright Marshall Day Acoustics 2012

- Key No. 1502

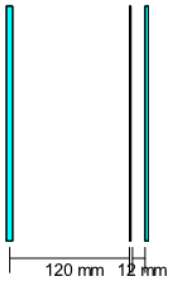
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 2 Dec 19 Initials:JamieEaston

File Name: 8 120 4 12 4.ixl



Rw	49 dB
C	-2 dB
C_{tr}	-6 dB

System description

First pane: 1 x 8.0 mm Glass (m=19.4 kg/m2, fc=1749 Hz, Damping=0.02)

Second pane: 1 x 4.0 mm Glass (m=9.7 kg/m2, fc=3498 Hz, Damping=0.02)

Third pane: 1 x 4.0 mm Glass (m=9.7 kg/m2, fc=3498 Hz, Damping=0.02)

frequency (Hz)	TL(dB)	TL(dB)
50	15	
63	13	15
80	21	
100	26	
125	31	29
160	35	
200	38	
250	41	40
315	43	
400	45	
500	47	47
630	48	
800	50	
1000	50	51
1250	52	
1600	52	
2000	49	51
2500	51	
3150	54	
4000	57	57
5000	60	

Panel Size 2.7x4 m

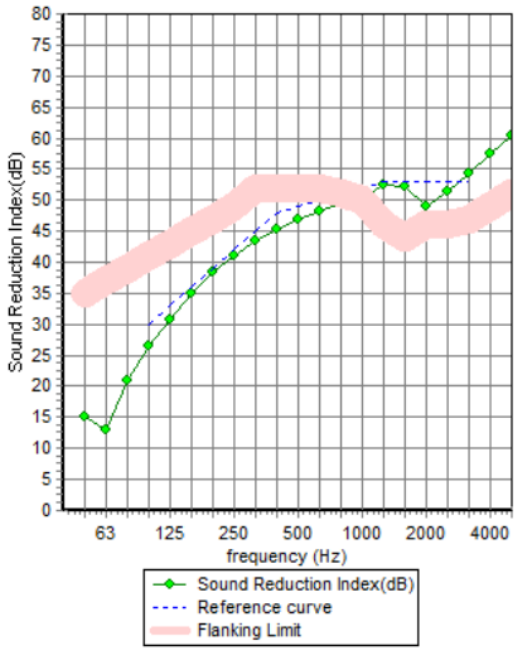


Figure B.2: 14mm/150mm/4mm/12mm/4mm Secondary Glazing

Sound Insulation Prediction (v7.0.6)

INSUL

Program copyright Marshall Day Acoustics 2012

- Key No. 1502

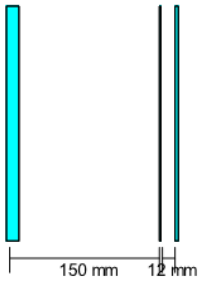
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 2 Dec 19 Initials:JamieEaston

File Name: 14 150 4 12 4.ixl



Rw	52 dB
C	-2 dB
C_{tr}	-5 dB

System description

First pane: 1 x 14.0 mm Glass (m=34.0 kg/m2, fc=999 Hz, Damping=0.02)

Second pane: 1 x 4.0 mm Glass (m=9.7 kg/m2, fc=3498 Hz, Damping=0.02)

Third pane: 1 x 4.0 mm Glass (m=9.7 kg/m2, fc=3498 Hz, Damping=0.02)

frequency (Hz)	TL(dB)	TL(dB)
50	17	
63	22	20
80	29	
100	32	
125	36	35
160	40	
200	43	
250	45	45
315	47	
400	48	
500	49	49
630	51	
800	51	
1000	48	49
1250	49	
1600	52	
2000	55	54
2500	58	
3150	61	
4000	64	63
5000	67	

