



PLANNING NOISE ASSESSMENT

BONHAMS AND FLINTS, FLANSHAM

PALLANT HOMES LIMITED

NOVEMBER 2017

PLANNING NOISE ASSESSMENT BONHAMS AND FLINTS, FLANSHAM

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REVISION HISTORY

Version	Comments	Changes made by	Approved by
V1.0	First draft version	TOB	RNM
V2.0	First issued version following comments	TOB	RNM
V3.0	Second issued version including updated site plan	TOB	RNM
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1 INTRODUCTION

Anderson Acoustics Ltd was commissioned by Pallant Homes Limited to undertake a noise assessment for the proposed development at Bonhams and Flints, Flansham.

We understand the proposed development involves the development of an open site and land around existing properties in Flansham to provide 23 new residential dwellings. A noise assessment has been requested to support the planning application for this 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 provides details of the design of the building envelope against environmental noise and

Section 6 considers noise in outdoor living areas.

The report is summarised in Section 7.

2 NOISE UNITS, POLICY AND CRITERIA

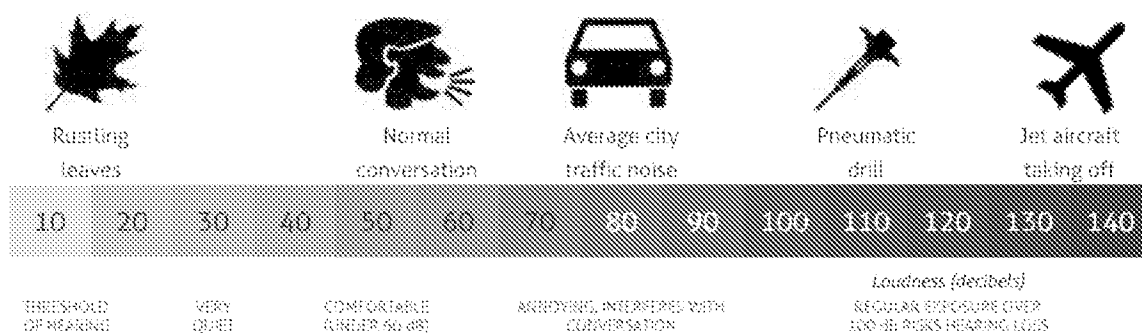
2.1 Noise Units

There is a million to one ratio between 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 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 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.

The following absolute values for good and reasonable indoor noise levels are presented in The Standard:

Table 2.1: British Standard 8233 Indoor Noise Levels

Activity	Location	Daytime	Night-time
Resting	Living room	35 dB $L_{Aeq, 16\text{hour}}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16\text{hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16\text{hour}}$	30 dB $L_{Aeq, 8\text{hour}}$

Notes: Daytime assessment period - 07:00 to 23:00 hrs

Night-time assessment period - 23:00 to 07:00 hrs

BS 8233 also provides guidance on calculating the sound insulation performance requirements for the external envelope or facade of a building where this is made up of a number of different elements.

2.2.2 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 [5].

Table 2.2: 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. We have interpreted this as no more than two events per hour, which therefore equates to up to 16 events over an 8 hour night-time period.

2.2.3 Summary of environmental noise criteria

Having considered the above criteria a design limit of 35 dB $L_{Aeq,T}$ is to be achieved in living rooms and 30 dB $L_{Aeq,T}$ in bedrooms at night. In addition, individual noise events should not normally exceed 45 dB $L_{AF,max}$ within bedrooms at night.

3 SITE DESCRIPTION

3.1 Existing Site

The proposed development site is located within the grounds of existing residential premises and on derelict farm land north of Felpham Relief Road (A259).

The site is bordered by housing to the south and west, and by farm land to the east. The major sources of noise are Felpham Road (A259) to the south the site. The site is screened from the A259 to the south by a noise attenuating barrier sat atop a planted bund.

Observations during the site visits indicated that the noise levels were reasonably low across the site with the main source of noise attributed to road traffic noise from occasional passing cars on the A259 and distant traffic on the surrounding major roads.

3.2 Proposed Development

The proposal is to build 23 new dwellings on the derelict farm and neighbouring land.

The proposed layout of the development is presented in Figure A2 of Appendix A.

4 NOISE MEASUREMENTS

4.1 Unattended Noise Survey

Continuous unattended noise measurements were taken over 4 days to ascertain the variation in noise levels across the site.

The continuous monitoring of ambient noise levels was undertaken at 2.5 m above local ground level under 'free-field' conditions to replicate first for bedroom window receptor.

The approximate location of the unattended noise monitoring position is shown on Figure A1 in Appendix A.

Noise levels were measured using a Rion NL-52 precision integrating sound level meter fitted with a weatherproof windshield. The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box. The sound level meter has valid calibration certificates which is traceable to national standards.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. Fifteen minute consecutive measurements of $L_{Amax,F}$, $L_{Aeq,T}$, and $L_{A90,T}$ noise levels were obtained between 08:35 hrs on Friday 31st March and 06:00 hrs on Monday 3rd April 2017.

The equipment was calibrated on site, before and after the survey using a Rion NC-74 sound calibrator to generate a calibration level of 94.0 dB at 1 kHz. No significant calibration drifts were observed.

4.2 Weather Conditions

Weather conditions during the unattended survey period have been obtained from internet sources www.wunderground.com (weather station at Greenwood Avenue - Bognor Regis IENGLAND885) which indicates no periods of significant rainfall and occasional periods of moderate windspeeds above 5m/s. At the time of set-up and collection of the noise monitor the weather conditions were dry with negligible wind.

Review of the captured data indicates that measured noise levels throughout the survey are consistent and therefore do not indicate an impact due to weather conditions.

Graphical data of the weather conditions are presented in Figure A4 of Appendix A.

4.3 Noise Survey Results

The results of the continuous noise monitoring surveys are presented in graphical form in Figure A3 of Appendix A.

A summary of the daytime ambient $L_{Aeq,16hr}$ and night-time ambient $L_{Aeq,8hr}$ noise levels recorded at the unattended measurement positions is presented in Table 4.1 below.

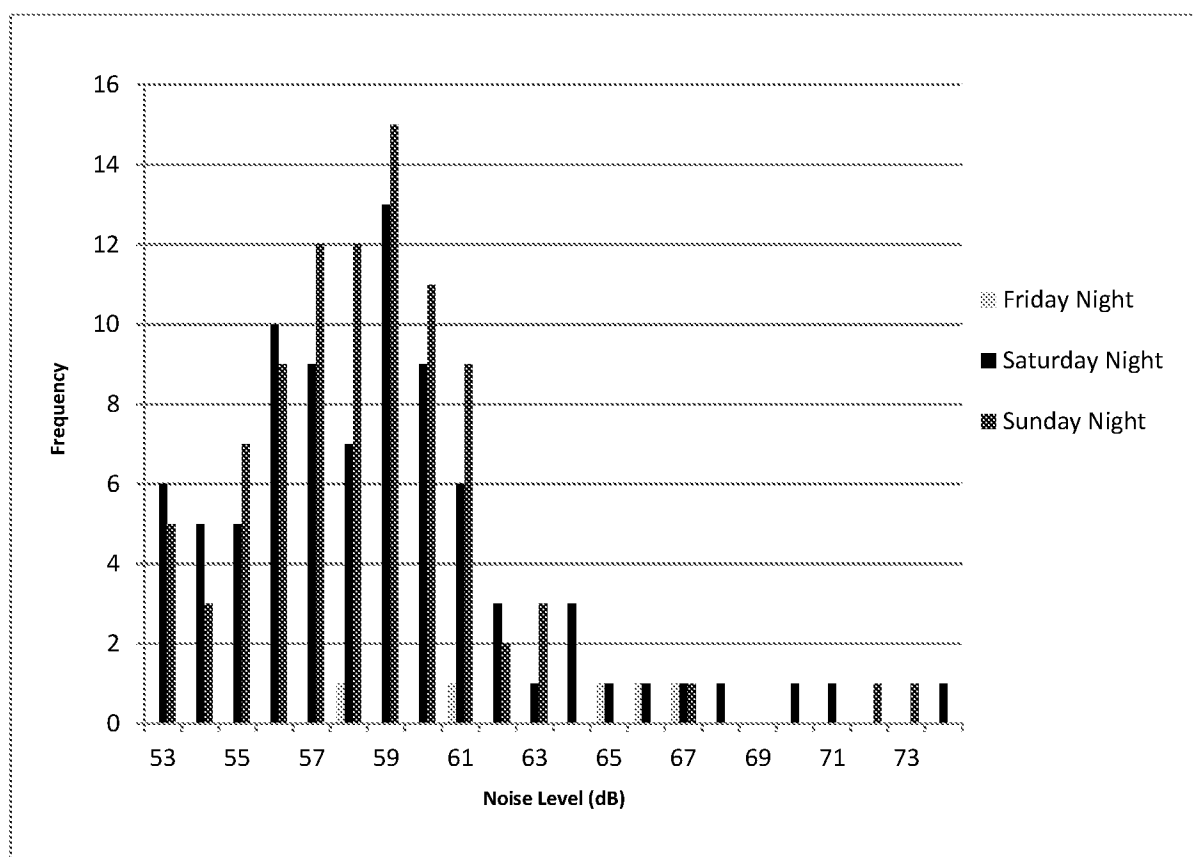
Table 4.1: Summary Results of Unattended Noise Survey (free-field)

Monitoring Period	Daytime (07:00 to 23:00 hrs)			Night-time (23:00 to 07:00 hrs)		
	$L_{Aeq, 16\text{ hr}}$	$L_{Amax, 5min}$ Range	$L_{A90, 5min}$ Average	$L_{Aeq, 8\text{ hr}}$	$L_{Amax, 5min}$ Range	$L_{A90, 5min}$ Average
Fri 31/03/17	54.9	54.3 - 85.9	50.3	49.3	51.1 - 75	60.4
Sat 01/04/17	54.7	52.7 - 84.9	50.0	46.7	46.8 - 71.9	55.3
Sun 02/04/17	52.7	52.0 - 83	48.0	49.8	30.0 - 65.7	55.4
Average	54.1	52.0 - 85.9	49.4	48.6	30.0 - 75	57.0

The unattended noise survey results in Table 4.1 indicate that the average free-field daytime and night-time ambient noise levels at the measurement location are 54 dB $L_{Aeq, 16hr}$ and 49 dB $L_{Aeq, 8hr}$ respectively.

The frequency of maximum night-time noise events has been assessed for the long-term survey period and can be seen in Figure 4.1. This shows that over the survey period, a free-field level of 67 dB L_{Amax} is not normally exceeded during the night.

Figure 4.1: Maximum night time L_{Amax} events



4.4 Attended Noise Survey

4.4.1 Procedure

Attended noise measurements were carried out on Friday 31st March to further understand the spread of noise around the site.

Noise levels were recorded in three positions (see Figure A1 of Appendix A) using a Norsonic 140 precision integrating sound level meter mounted approximately 1.2 m above ground. The meter was set up to measure ambient noise levels over consecutive 1 minute periods.

The equipment was calibrated before and after the survey using a Norsonic 1251 sound calibrator to generate a calibration level of 113.9 dB at 1 kHz. No significant calibration drifts were observed.

4.4.2 Weather Conditions

Weather conditions during the survey were dry with light to moderate winds. It is considered that the weather had no adverse effect on the recorded noise levels.

4.4.3 Results

Table 4.2 shows the results of the measurements carried out at the attended positions. For each measurement position, the $L_{Aeq,15min}$ noise levels have been obtained. This shows that free-field ambient levels across the main area of the site are generally low with negligible variation.

Table 4.2: Summary Results of Attended Noise Survey (free-field)

Position	Duration mins	$L_{Aeq,T}$ dB	Dominant Source
Measurement Position 1	15	53.9	Bird song, passing traffic on A259 and distant road traffic.
Measurement Position 2	15	52.3	
Measurement Position 3	15	54.3	

4.5 Results Summary & Discussion

The noise survey results summarised in section 4 indicates:

- Daytime and night-time free-field ambient noise levels of 54 and 49 dB $L_{Aeq,T}$ respectively;
- Daytime free-field ambient noise levels across the site ranged between 52 - 86 dB L_{Amax} ;
- Night-time free-field L_{Amax} values of 67 dB are not normally exceeded on site.

5 SOUND INSULATION OF BUILDING ENVELOPE

This section of the report sets out the proposed measures to ensure the development is sufficiently protected against noise.

The assessment assumptions are set out below together with the calculated minimum sound insulation requirements of the building envelope. Example glazing specifications are given where relevant to indicate what glazing would achieve the performance requirements.

The assessed ambient noise levels incident on the site are taken from Section 4 of this report. An addition of 3dB has been applied to the measured noise levels to account for façade conditions in calculating resultant internal noise levels.

Full spectral calculations are provided in Appendix B.

The area of glazing and method of ventilation in any particular room, along with the room size and room acoustic conditions, affect the degree of reduction in noise transmission from outside to inside. An assessment using some generic assumptions has been carried out. These may require reviewing during detail design development.

- Predictions have been made using the general method set out in BS EN 12354-3:2000;
- Sound insulation data are based on both library data and specific manufacturers' data. It has been assumed that the on-site performance will be comparable with manufacturer's claimed performance;
- The predictions assume good quality workmanship, for example that windows, doors and opening lights are well sealed. Poor workmanship or low quality seals may result in predicted internal noise levels being exceeded;
- It has been assumed that the external walls will be of a brick and block cavity construction.
- The Roof for all units comprises tile slated roof with 12 mm plasterboard ceiling and sound absorbent layer.
- The ventilation strategy is for natural ventilation with two trickle ventilators in each habitable room. The number of background or trickle ventilators has a substantial influence on the sound insulation of the building envelope. Current guidance on complying with the Building Regulations (Approved Document F 2010) offers many options to provide adequate ventilation. Some of these are preferable with regards to noise break-in, such as whole house ventilation with heat recovery as no trickle vents are required. Other options require anywhere between 1 and 6 vents per room. This report assumes 2 no. ventilators per room.
- The area of glazing in any particular room, along with the room size and room acoustic conditions, affects the degree of reduction in noise transmission from outside to inside. We understand that at this stage room dimensions and glazing areas have not been finalised, we have therefore based our calculations on generic living rooms and bedrooms. Details are given in Table 5.1 below.

Table 5.1 Generic room and building element dimensions

Dimension	Living Room	Bedroom
Volume (m ³)	45	25
Glazing area (m ²)	5	2
External wall area (m ²)	5	7

- Plots along the southern and western boundary of the site will be exposed to noise from the A259 at levels stated in Section 4 of this report. The introduction of plots along this boundary will provide additional screening from the A259 resulting in a reduction in noise levels of between 5 to 10 dB. Facades not exposed to the southern and western boundary of the site will be considered separately, these are identified in Figure A2 of Appendix A.
- Significant deviation from the assumed construction types and room dimensions may necessitate review of building envelope assessment.
- Daytime ambient noise levels in living rooms not to exceed 35 dB $L_{Aeq,16hr}$
- Ambient noise levels in the bedrooms at night not to exceed 30 dB $L_{Aeq,8hr}$ and for individual noise levels (from vehicle pass-bys) not normally to exceed 45 dB $L_{AF,max}$

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 140-3: 1995 “*Laboratory measurement of airborne sound insulation of building elements and rated in accordance with BS EN ISO 717-1:1997 Acoustics - Rating of sound insulation in buildings and of building elements Part 1. Airborne sound insulation*”.

For unit ventilators, the measurements are based on BS EN ISO 140-10: 1995 Laboratory measurement of airborne sound insulation of small building elements and rated in accordance with BS EN ISO 717-1:1997 “*Acoustics - Rating of sound insulation in buildings and of building elements Part 1. Airborne sound insulation*”.

5.1 Sound insulation requirements of building envelope

Calculations made indicate that the proposed external wall and roof build up described above will provide sufficient resistance to external noise such that only the specification of the glazing and ventilation need be considered. Details of the recommended performance requirements are provided below.

Table 5.2: Façade performance requirements

Area	Item	Performance Requirements	
		Window Units	Ventilators
Facades exposed to southern and western boundary (identified in Figure A2 in Appendix A)	Bedroom	Standard double glazing with a minimum performance of 35 dB R_w and 29 dB $R_w + C_{tr}$ such as SGG 4/12/6mm.	Acoustic trickle ventilators with a minimum performance of 38 dB $D_{n,e,w}$ and 36 dB $D_{n,e,w} + C_{tr}$
	Living Room	Requirement for thermal purposes will provide necessary acoustic performance.	Standard passive trickle ventilators with a minimum performance of 31 dB $D_{n,e,w}$ and 30 dB $D_{n,e,w} + C_{tr}$
All other facades	Bedroom	Requirement for thermal purposes will provide necessary acoustic performance.	Standard passive trickle ventilators with a minimum performance of 31 dB $D_{n,e,w}$ and 30 dB $D_{n,e,w} + C_{tr}$
	Living Room	Requirement for thermal purposes will provide necessary acoustic performance.	Standard passive trickle ventilators with a minimum performance of 31 dB $D_{n,e,w}$ and 30 dB $D_{n,e,w} + C_{tr}$

6 NOISE LEVELS IN OUTDOOR LIVING AREAS

Guidelines such as those of the World Health Organisation advise that to protect people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 50 dB $L_{Aeq,T}$ for steady noise levels and 55 dB $L_{Aeq,T}$ should be regarded as an upper limit.

It has been assumed for the purposes of the assessment that the proposed dwellings will have gardens that back onto the southern and western boundary. The proposed site layout in Figure A2 Appendix A shows that the southern and western boundary will benefit from the allocation of open space and planting to obscure any line of sight to the road.

Free-field ambient noise levels from Table 4.1 and Table 4.2 show that daytime noise levels range between 52 dB to 55 dB $L_{Aeq,T}$. These levels are at the upper limit of the WHO guidelines for outdoor living space. Since the levels do not exceed and are unlikely to rise significantly above the guideline limit it has been determined no specific noise mitigation measures need to be implemented to reduce this level.

7 SUMMARY

Anderson Acoustics has carried out a noise assessment of the proposed development of 23 residential dwellings on the open land surrounding and existing residential grounds at Bonhams and Flints, Flansham.

The development is predominantly affected by noise from road traffic to the south and west of the site from the A259.

A set of attended and unattended noise surveys have been carried out and advice provided on the design of the building envelope to ensure that internal noise levels inside habitable rooms and external noise levels in outdoor living space lie within guideline limits of BS8233:2014 and World Health Organisation guidelines.

With the advised ventilation and glazing mitigation measured in place to meet BS8233 conditions for occupants should equate to No Observed Adverse Effect.

8 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: 1999
- 4 World Health Organisation - Guidelines for Community Noise. 2000
- 5 Google Earth, 2017. Version 6.2.2.6613 (September 10th 2015) 50° 48' 02.00"N, 0° 38' 06.28"W, Eye alt 742m

APPENDIX A

FIGURES

Figure A1: Proposed Site Location and Monitoring Locations



(Google Maps 2017)

- Site Boundary 
- Measurement Location 1 
- Measurement Location 2 
- Measurement Location 3 
- Unattended Measurement Location 

Figure A2: Proposed Site Master-Plan Illustration

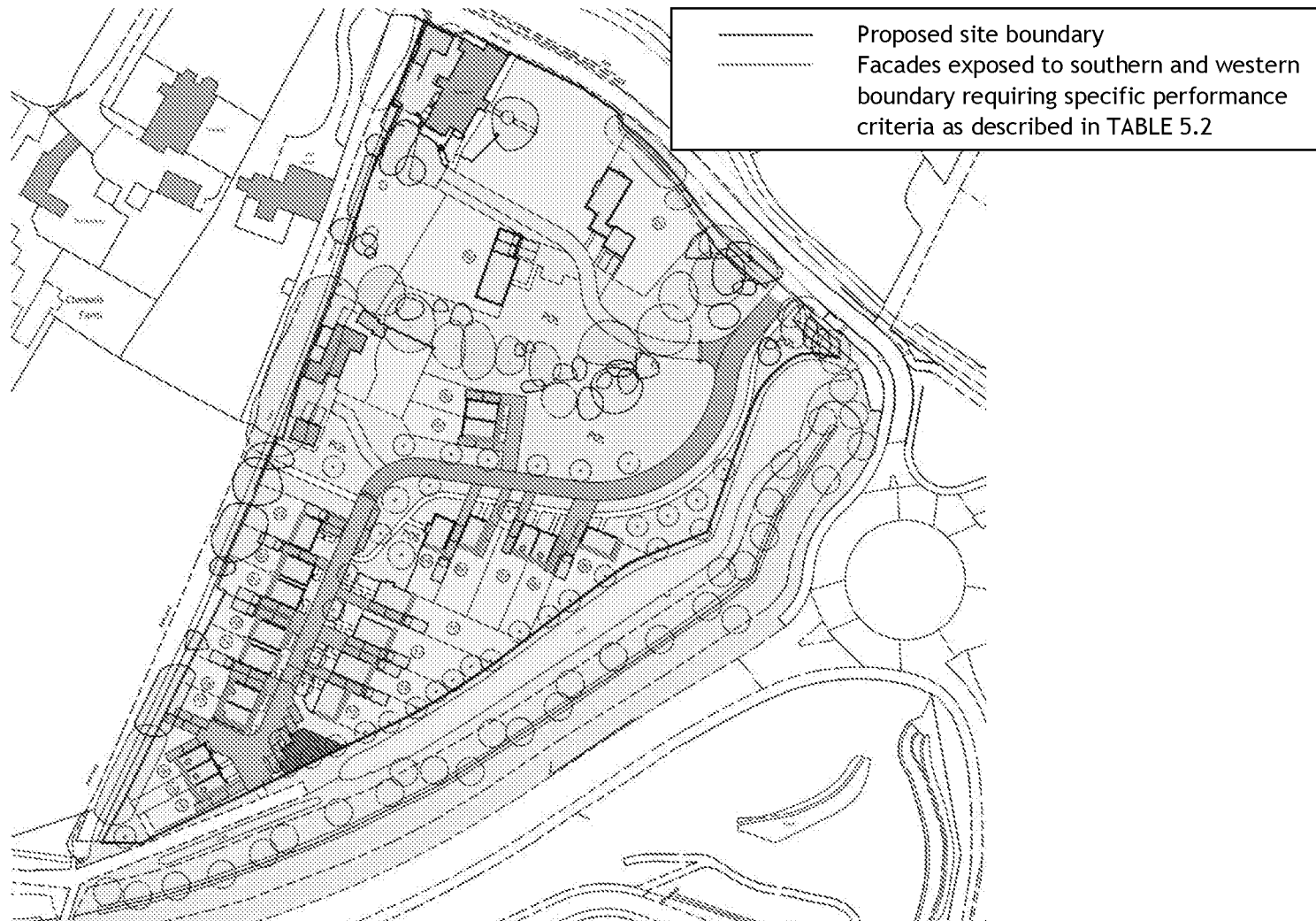


Figure A3: Unattended Noise Monitoring Results

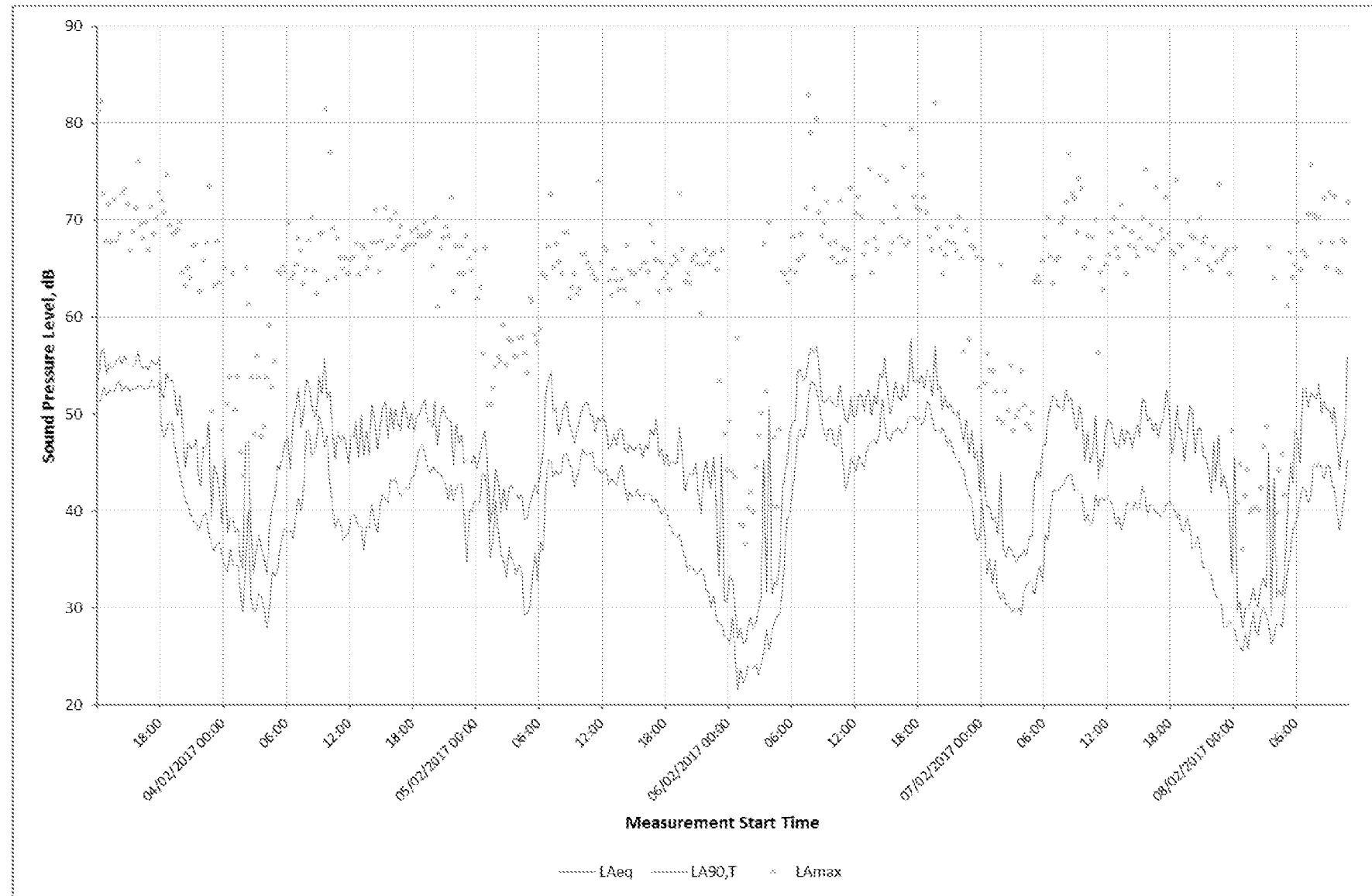
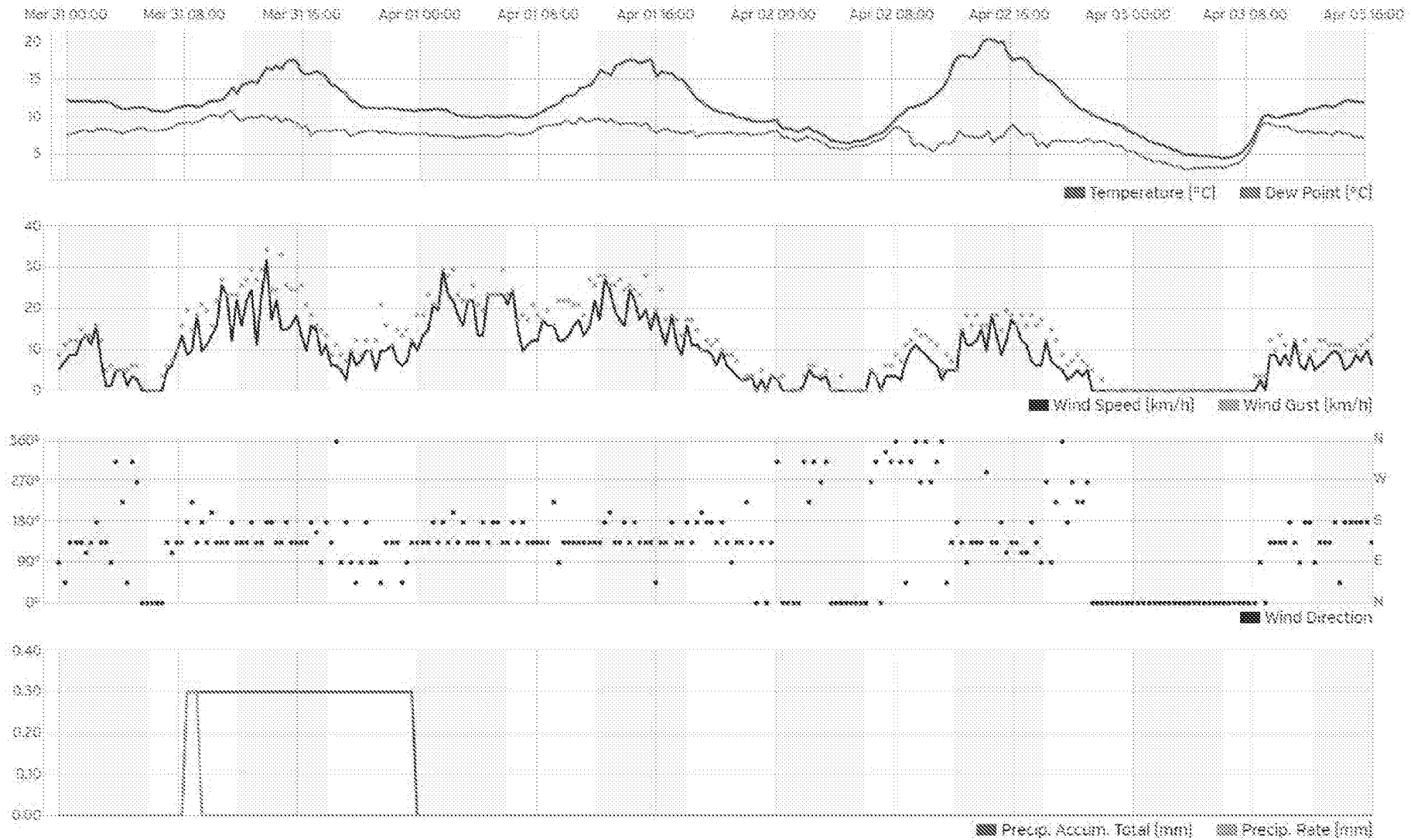


Figure A4: Weather History Graph March 31, 2017 - April 3, 2017



APPENDIX B

FIGURES



Job name: Bonhams and Flints, Flansham
 Job no.: 3287
 Façade: Road Facing Façade - Livingroom

RESULT SUMMARY: LAeq DayPredicted Internal Level: **29** dB LA eq, TCriterion: **35** dB LA eq, TDifference: **-6** dB LA eq, T**SOUND INSULATION BY ELEMENT**

Formula	Description	Data	Units	Octave band centre frequency, Hz						dB(A)
				125	250	500	1000	2000	4000	

Reverberation Time	0.5	s	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Receiver Room Volume	45	m ³							

Element 1

L1	Wall (database)	Leg	
-R	Brick-block cavity wall		
+10logS	Element Area	5.0	m ²
-10logA	where A=0.16V/T		
+0			
=L2			
L2tot	Running total		

Façade						
58	52	51	54	50	42	
41	45	45	54	58	58	57
7	7	7	7	7	7	52 Rw 48 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
13	3	1	-4	-12	-21	2.7
13	3	1	-4	-12	-21	2.7

Element 2

L1	Window (database)	Leg	
-R	SGG 4/12/6mm		
+10logS	Element Area	5.0	m ²
-10logA	where A=0.16V/T		
+0			
=L2			
L2tot	Running total		

58	52	51	54	50	42	
23	22	27	38	40	41	57
7	7	7	7	7	7	33 Rw 29 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
31	26	19	12	6	-4	21.6
31	26	20	12	6	-4	21.6

Element 3

L1	Ventilator (database)	Leg	
-R	path (generic)		
+10logSo	Reference Area	20.0	m ²
-10logA	where A=0.16V/T		
+0			
=L2			
L2tot	Running total		

58	52	51	54	50	42	
30	31	31	32	28	28	57
13	13	13	13	13	13	31 Rw 30 Rw+Ctr
12	12	12	12	12	12	
0	0	0	0	0	0	
30	23	22	24	24	15	28.4
33	28	24	24	24	15	29.2



Job name: Bonhams and Flints, Flansham
 Job no.: 3287
 Façade: Road Facing Façade - Bedroom

RESULT SUMMARY: L_{Amax} NightPredicted Internal Level: **39**dB L_{A eq, T}Criterion: **45**dB L_{A eq, T}Difference: **-6**dB L_{A eq, T}**SOUND INSULATION BY ELEMENT**

Formula	Description	Data	Units	Octave band centre frequency, Hz						dB(A)
				125	250	500	1000	2000	4000	

Reverberation Time	0.5	s
Receiver Room Volume	25	m ³

Element 1

L1	Wall (database)	Leg
-R	Brick-block cavity wall	
+10logS	Element Area	7.0 m ²
-10logA	where A=0.16V/T	
+0		
=L2		
L2tot	Running total	

Façade					
66	63	64	67	64	57
41	45	45	54	58	58
8	8	8	8	8	8
9	9	9	9	9	9
0	0	0	0	0	0
24	17	18	12	5	-2
24	17	18	12	5	-2

70

52 Rw 48 Rw+Ctr

Element 2

L1	Window (database)	Leg
-R	SGG 4/12/6mm	
+10logS	Element Area	2.0 m ²
-10logA	where A=0.16V/T	
+0		
=L2		
L2tot	Running total	

66	63	64	67	64	57
23	22	27	38	40	41
3	3	3	3	3	3
9	9	9	9	9	9
0	0	0	0	0	0
37	35	31	23	18	10
37	35	31	23	18	10

33 Rw

29 Rw+Ctr

Element 3

L1	Ventilator (database)	Leg
-R	Acoustic trickle ventilator (generic)	
+10logSo	Reference Area	20.0 m ²
-10logA	where A=0.16V/T	
+0		
=L2		
L2tot	Running total	

66	63	64	67	64	57
30	33	38	37	36	36
13	13	13	13	13	13
9	9	9	9	9	9
0	0	0	0	0	0
40	34	30	34	32	25
42	38	34	34	32	25

38 Rw

36 Rw+Ctr