Lower Horsebridge, Hailsham

Noise Impact Assessment

On behalf of **DECIMUS LTD**

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1 Introduction

1.1 Background

1.1.1 Peter Brett Associates LLP (PBA) has been commissioned to undertake a noise impact assessment to support a full planning application for a proposed residential development at Lower Horsebridge, Hailsham.

1.1.2 This report assesses the current sound climate at the site and considers the suitability of the site for residential development, along with the external building fabric requirements with respect to achieving typical internal ambient noise levels.

1.1.3 It should be noted that unless conditioned as part of the planning process, achieving the proposed internal ambient noise levels are not statutory.

1.2 Site Description and Location

1.2.1 The site is located along the A271 to the east of Lower Horsebridge village. A site location plan is provided in **Figure 1**.

Figure 1: Location Map (Map Data © 2017 Google)

1.2.2 The site currently supports rank grassland and overgrown scrubby vegetation. The site is surrounded by existing residential, agricultural, recreational and business uses. The A271 is the main traffic route through Lower Horsebridge.

1.2.3 The proposed development is to consist of 10 residential dwellings with associated external private amenity areas.

1.2.4 A public house is located to the north of the site. However, in discussion with the owners, it became apparent that music events and noise generating activities are limited. No building services plant (which could be a potential source of noise) was noted during the site visit.

1.2.5 The external area at the public house does not appear to be used either for outdoor dining, or as a beer garden. The external area instead comprises a small children's play area which is not considered to be a significant source of noise.

1.2.6 During our sound surveys, which covered potentially busy periods on Friday evening and Saturday, no identifiable noise from the public house was audible. We would highlight that there are existing residential receptors in closer proximity to the public house than the proposed development.

1.2.7 Potential noise impacts from the public house on the proposed residential development are therefore deemed to be insignificant and are not considered any further in the assessment.

1.3 Scope of Assessment

1.3.1 The purpose of this report is to describe the existing noise climate at the proposed development site in order to provide an assessment of the suitability of the site for its intended residential use, and to provide recommendations in relation to external building fabric requirements.

1.3.2 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in **Appendix A.**

2 Legislation, Planning, Guidance and Criteria

2.1 Local Policy

2.1.1 Rother District Council adopted their Core Strategy on 29th September 2014. The Core Strategy forms part of the statutory Development Plan for the District and will be used in the determination of all planning applications. The Core Strategy has replaced the previous Local Plan (2006).

2.1.2 Rother District Council Core Strategy does not include any noise specific guidance, however policy OSS3: Location of Development states:

"In assessing the suitability of a particular location for development, when both allocating land for development and determining planning applications, sites and/or proposals should accord with the relevant policies of this Core Strategy and be considered in the context of:…

…(viii) Any constraints relating to land stability, contamination, air quality, agricultural land quality and coastal erosion, and the ability to satisfactorily address these;…"

2.1.3 Whilst the above does not directly relate to noise, it is important to note that development will be required to address any potential impacts to or from the environment.

2.1.4 Rother District Council Local Plan (2006) has been superseded by the adoption of the Core Strategy. The Local Plan had no specific guidance regarding the noise, however it did refer to using PPG 24 as guidance on noise matters. It should be noted that PPG24 has now been replaced by the National Planning Policy Framework.

2.2 Relevant National Policy

The National Planning Policy Framework (NPPF)

2.2.1 The NPPF was published in March 2012. In respect of noise, paragraph 109 of the document 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 … noise pollution."

2.2.2 The NPPF goes on to advise in paragraph 123 that:

"Planning policies and decisions should aim to:

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

2.2.3 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the *"significant adverse impacts".*

Noise Policy Statement for England (NPSE)

2.2.4 The NPSE was published in March 2010. The document seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It also sets out the long term vision of Government noise policy in paragraph 1.6:

"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."

2.2.5 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

2.2.6 The first two aims of the NPSE (paragraph 2.20) follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation. They are:

- NOEL – No Observed Effect Level 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; and

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

2.2.7 The NPSE extends these to the concept of a significant observed adverse effect level (paragraph 2.21):

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

2.2.8 The NPSE notes in paragraph 2.22: *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".*

Planning Practice Guidance

2.2.9 The Government's Planning Practice Guidance (PPG) provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.

2.2.10 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

2.2.11 The LOAEL is described in Paragraph 005 of the PPG for Noise as the level above which "*noise starts to cause 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.*"

2.2.12 The PPG identifies the SOAEL as the level above which "*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.*"

2.3 Other Relevant Guidance

British Standard 8233: 2014 'Guidance on Sound Insulation and noise reduction for buildings'

2.3.1 BS 8233, in relation to this planning application, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.

2.3.2 The guideline values relate to steady external noise without a specific character, previously termed 'anonymous noise'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources, such as busy road traffic.

2.3.3 The desirable internal ambient noise levels for dwellings are presented in **Table 2.1**.

Table 2.1: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$
*Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax, depending on the character and number of events per night. Sporadic noise events could require separate values.			
Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.			
Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.			

*A selection of the available notes

2.3.4 The standard also provides advice in relation to desirable levels for external noise. It states in paragraph 7.7.3.2 that:

"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 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.

…

In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

World Health Organisation, Guidelines for Community Noise, 1999

2.3.5 The World Health Organisation (WHO) *Guidelines for Community Noise* (1999) also sets out guidance on suitable internal and external noise levels in and around residential properties. The following internal noise levels are recommended by the WHO:

- 35 dB $L_{Aeq,T}$ in living rooms over a 16-hour day; and
- 30 dB $L_{Aeq,T}$ in bedrooms during the 8-hour night.

2.3.6 With respect to the night-time maximum noise levels, the WHO guidelines state in paragraph 3.4 that:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAFmax more than 10-15 times per night."

2.4 Proposed Assessment Criteria

2.4.1 In the absence of specific local policy, it is considered appropriate to use industry standards to inform the selection of suitable assessment criteria for the proposed development.

2.4.2 The levels used as the proposed assessment criteria are detailed in **Table 2.2** and **Table 2.3**. In addition, we have proposed a night-time maximum noise level criterion based on guidance detailed within BS 8233:2014 and WHO guidelines.

Table 2.2: LOAEL and SOAEL Noise Levels (Indoor Ambient Noise Levels)

Proposed LOAEL and SOAEL for Indoor Ambient Noise Levels in New Residential Dwellings		
Level	**Daytime (07:00 hours to 23:00 hours)**	**Night-time (23:00 hours to 07:00 hours)**
LOAEL	35 dB $L_{Aeq,16hours}$	30 dB $L_{Aeq,8hours}$ 45 dB L_{Amax}
SOAEL	45 dB $L_{Aeq,16hours}$	40 dB $L_{Aeq,8hours}$

2.4.3 Based on guidance, the proposed LOAEL and SOAEL external noise levels in amenity areas are detailed in **Table 2.2**.

Table 2.3: Proposed LOAEL and SOAEL Noise Levels (External Noise Levels in Amenity Areas)

Proposed LOAEL and SOAEL for Outdoor Ambient Noise Levels (Free Field) in New Residential Dwelling Amenity Areas	
Effect Level	**Daytime (07:00 hours to 23:00 hours)**
LOAEL	55 $L_{Aeq,16h}$ (dB)
SOAEL	60 $L_{Aeq,16h}$ (dB)

3 Environmental Sound Survey

3.1 Methodology

3.1.1 A fully automated environmental sound survey was undertaken from approximately 14:00 hours on Friday 23 June 2017 to approximately 14:00 hours on Saturday 24 June 2017 in order to determine the current sound climate at the site.

3.1.2 The survey was undertaken over a 24-hour period so as to obtain the typical daytime and night-time incident sound levels experienced at the site.

3.1.3 Sound measurements were undertaken at three positions around the site, selected to represent typical noise levels incident on the proposed development. The measurement positions are detailed in **Figure 2** and described in **Table 3.1**. At each location the microphone was fixed to a pole at an approximate height of 1.5 m above ground level in a free-field position.

Figure 2: Environmental Sound Survey Locations (Map Data © 2017 Google)

Table 3.1: Description of Measurement Locations

Position	Description
1	Northern boundary of the site with the play area of the adjacent pub, approximately 20 m from the A271.
2	South-western area of the site, approximately 80 m from the A271 and approximately 20 m from the adjacent substation.
3	Eastern area of the site, approximately 1.5 m from the A271.

3.1.4 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the weather conditions throughout the entire survey period. However, at the beginning of the survey period, the temperature was approximately 20°C with a light breeze (< 5m/s^{-1}), approximately 80% cloud cover and no precipitation. At the end of the survey period, the temperature was approximately 18°C with a light breeze (< 5 m/s^{-1}), approximately 100% cloud cover and no precipitation. It is understood that no precipitation was experienced during the survey period. These conditions are therefore considered suitable for obtaining representative sound level measurements.

3.1.5 The $L_{Aeq,T}$, $L_{A90,T}$ and L_{AFMax} levels were measured over 15-minute periods.

3.1.6 The sound level meter was located in an environmental case, with the microphone connected to the sound level meter via an extension cable. The microphone was fitted with the manufacturer's windshield.

3.1.7 The instrumentation used in the survey is listed in **Table 3.2**. Field calibrations were performed before and after the measurements with no significant fluctuation recorded (<0.5dB). Calibration certificates are available upon request.

Table 3.2: Instrumentation

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date	Next Calibration Date
Sound Level Meter	RION	NL-52	542901	30/08/2016	30/08/2018
½" Pre-polarised microphone		UC-59	06478	30/08/2016	30/08/2018
Pre-amplifier		NH-25	42929	30/08/2016	30/08/2018
Sound Level Meter	RION	NL-52	542903	17/02/2017	17/02/2019
½" Pre-polarised microphone		UC-59	06480	17/02/2017	17/02/2019
Pre-amplifier		NH-25	42931	17/02/2017	17/02/2019
Sound Level Meter	RION	NL-52	1043456	15/02/2017	15/02/2019
½" Pre-polarised microphone		UC-59	07231	15/02/2017	15/02/2019
Pre-amplifier		NH-25	43485	15/02/2017	15/02/2019
Sound Calibrator	RION	NC-74	34746691	13/07/2016	13/07/2017

3.2 Assumptions/Limitations

3.2.1 The engineer noticed nothing unusual in terms of the noise climate at the time of the survey, when setting up and collecting equipment. This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

3.3 Environmental Sound Climate

3.3.1 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the dominant noise sources or specific noise events during the entire survey period. However, at the beginning and end of the survey period, it was noted that on-site sound levels were dominated by vehicular movements on the surrounding road network, namely the A271 and A22. During Saturday morning, there was a brief period of heavy rainfall signified by an increase in noise levels at all positions. This period has been excluded from our assessment.

3.4 Environmental Sound Survey Results

3.4.1 A summary of the sound survey results is presented in **Table 3.3.** The results have been plotted on a time history graph, detailing the full results of the 24-hour, automated environmental sound survey. This can be found in **Appendix B**.

Table 3.3: Summary of Measured Environmental Sound Survey Results

Location	Period, T	$L_{Aeq,T}$ dB	Typical* L_{AFMax} dB	Typical $L_{A90,T}$ dB
LT 1	Daytime (07:00 – 23:00 hours)	61	N/A	53
	Night-time (23:00 – 07:00 hours)	59	68	41
LT 2	Daytime (07:00 – 23:00 hours)	52	N/A	50
	Night-time (23:00 – 07:00 hours)	48	63	44
LT 3	Daytime (07:00 – 23:00 hours)	72	N/A	62
	Night-time (23:00 – 07:00 hours)	64	83	42

* Based on the 10-15th highest recorded L_{AMax} sound level during the time period.

4 Suitability of Site for Residential Development

4.1 Sound Levels in External Amenity Areas

4.1.1 Calculations have been undertaken to determine and assess the likely sound levels in private amenity areas associated with the proposed dwellings.

4.1.2 **Figure 3** shows the locations of the amenity areas.

Figure 3: Site Layout (Courtesy of bdb design, Drawing No. 2774-11 A)

4.1.3 A 1.8 m high close-boarded timber fence is proposed around each of the amenity areas. To increase the attenuation, it is recommended that this barrier height is raised to 2.5 m for Plots 1 and 10. These barriers would also provide attenuation for the external amenity areas for Plots 2 and 8-9. The fence should be specified to achieve a minimum mass per unit area of 10kg/m^2.

4.1.4 Calculations indicate that noise levels in external amenity areas to the rear of Plots 3 - 7 are likely to fall below the proposed LOAEL.

4.1.5 **Table 4.1** below details the noise levels that are likely to be achieved in external amenity areas serving Plots 1-2 and 8-10 accounting for barrier and distance corrections, based on measurements undertaken at LT3.

Table 4.1: Calculated Outdoor Amenity Noise Levels – Daytime, Plots 1-2, 8-10

Property	Distance from A271 (m)	Distance Attenuated Level (dB)	Barrier Attenuation (dB)	Calculated Noise Level in External Amenity Areas dB $L_{Aeq,16h}$
1	15	71	-12	59
2	24	69.6	-12	57
8	26	68	-12	56
9	21	69	-12	57
10	13	71	-12	59

4.1.8 Calculations indicate that with the barriers in positon noise levels are likely to fall between the proposed LOAEL and SOAEL criteria in Plots 1-2 and 8-10.

4.1.9 Whilst the LOAEL is exceeded we would highlight that BS 8233:2014 states that *"in noisier areas, such as adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

4.1.10 As such, as the development has been designed to include mitigation in the form of boundary treatments (within the constraints of the scheme) to achieve the lowest practicable levels in external amenity spaces, residential use of the site should not be prohibited.

4.2 Internal Sound Levels (External Building Fabric Specification)

4.2.1 An analysis of the proposed external building fabric has been undertaken in order to ascertain the required acoustic performance of the glazing and ventilation elements to achieve the criteria detailed in **Section 2.4.2.** Compliance with the acoustic performance specifications detailed herein is likely to ensure that acceptable internal noise levels are achieved.

4.2.2 Our external building fabric analysis has assumed the following:

- Room Absorption

  We have assumed the bedrooms and living rooms to be acoustically 'soft' with carpets, curtains and other soft furnishings. For the purposes of our analyses we have assumed the average typical absorption coefficients detailed in **Table 4.2.**

  Table 4.2: Average Absorption Coefficients

Room Type	Average Absorption Coefficient (α) at Octave Band Frequency (Hz)				
	125	250	500	1000	2000
Bedrooms / Living Rooms	0.18	0.25	0.27	0.31	0.32

- Proposed External Building Fabric

  Table 4.3 details typical sound reduction indices associated with the proposed external building fabric constructions.

Table 4.3: Typical Sound Reductions of Proposed Building Fabric Constructions

Construction	Typical Sound Reduction Indices (dB) at Octave Band Centre Frequency (Hz)				
	125	250	500	1000	2000
102.5mm Brick / 140mm block cavity wall	41	45	45	54	58
Concrete tiles on timber joists with plasterboard ceilings (minimum 12.5kg/m^2) and thermal insulation	24	34	40	45	49

- Ventilation

  The proposed dwellings will be equipped with intermittent extract fans and background ventilators, as per System 1 in Approved Document F. This decision is based on non-acoustic factors.

4.2.3 Our calculations have been based on building and window dimensions obtained from drawings produced by bdb design and are described in **Table 4.4** below.

Table 4.4: Room Dimensions Used for External Building Fabric Assessment

House Type	Room	Room Dimensions (m)			Window Area (m^2)
		Length	Width	Height	
A	Living Room	6.0	3.0	2.8	6.0
	Bedroom	3.0	2.75	2.8	1.5
B	Living Room	5.5	3.25	2.8	3.7
	Bedroom	2.7	2.7	2.8	1.5
C	Living Room	6.0	5.0	2.8	6.6
	Bedroom	3.5	2.0	2.8	1.0

4.3 Calculated Incident Sound Levels

4.3.1 Based on the environmental sound survey data and the proposed site layout, **Table 4.5** details the calculated incident sound levels. Distance corrections have been applied to Plots 1-2 and 8-10 in line with CRTN methodology.

Table 4.5: Calculated Incident Sound Levels in Octave Bands

Property	Period	Parameter	Incident Sound Levels (dB)at Octave Band Centre Frequency (Hz)						dBA
			125	250	500	1k	2k	4k	
1	Daytime (07:00 – 23:00 hours)	$L_{eq,T}$	66	65	64	68	64	56	**71**
	Night-time (23:00 – 07:00 hours)	$L_{eq,T}$	54	53	54	58	58	46	**61**
		L_{FMax}*	78	76	71	73	69	61	**76**
2	Daytime (07:00 – 23:00 hours)	$L_{eq,T}$	64	63	62	66	62	54	**69**
	Night-time (23:00 – 07:00 hours)	$L_{eq,T}$	52	51	52	56	52	44	**59**
		L_{FMax}*	76	74	69	71	67	59	**74**
8	Daytime (07:00 – 23:00 hours)	$L_{eq,T}$	63	62	62	65	62	54	**68**
	Night-time (23:00 – 07:00 hours)	$L_{eq,T}$	51	51	52	55	52	43	**58**
		L_{FMax}*	76	74	68	71	66	59	**74**
9	Daytime (07:00 – 23:00 hours)	$L_{eq,T}$	64	63	63	66	63	55	**69**
	Night-time (23:00 – 07:00 hours)	$L_{eq,T}$	52	52	53	56	53	44	**59**
		L_{FMax}*	77	75	69	72	67	60	**75**
10	Daytime (07:00 – 23:00 hours)	$L_{eq,T}$	66	65	65	68	65	57	**71**
	Night-time (23:00 – 07:00 hours)	$L_{eq,T}$	54	54	54	58	55	46	**61**
		L_{FMax}*	79	77	71	74	69	62	**77**
3, 4, 5, 6, 7	Daytime (07:00 – 23:00 hours)	$L_{eq,T}$	60	46	47	46	42	38	**51**
	Night-time (23:00 – 07:00 hours)	$L_{eq,T}$	59	44	43	39	36	36	**47**
		L_{FMax}*	71	68	57	56	53	53	**64**

*The L_{FMax} levels shown above are the tenth-highest measured maximum sound pressure level in each octave band for the night-time period during the survey (23:00 – 07:00 hours).

4.4 Specification and Guidance on Construction

4.4.1 Incident sound levels will vary across the development. In our experience,. **Appendix C** details the sound reduction performance specification for the glazed elements of the external building fabric for each plot, with further detail summarised below.

4.4.2 The glazing performance specifications apply to the glazing package as a whole inclusive of glazing, louvres, spandrel panels, framing, opening lights, doors, seal etc. The performance of the glazing system will depend on many factors such as the glazing configuration, size of windows panels, quality of framing, quality of sealing etc.

4.4.3 The proposed windows should be tested in accordance with BS EN ISO 10140-2:2010 and that the quoted minimum sound reduction specifications are met by the system as a whole, including frames, trickle ventilators etc. as appropriate, and not just the glass.

4.4.4 If the trickle ventilators do not form an integral part of the glazed element they should comply with the specification outlined in **Appendix C** which details the recommended minimum octave band element normalised level differences.

4.4.5 The trickle ventilators (in their open state) shall be tested to BS EN ISO 10140-2:2010. This will involve testing in 1/3 octave frequency bands from at least 100 Hz to 2500 Hz inclusive. These results, together with suitably converted octave frequency band results from 125 Hz to 2000 Hz inclusive, shall be provided for a ventilator unit which is representative of the proposed ventilator for the relevant façade.

4.4.6 It should be noted that the acoustic specification for trickle ventilators is based on a single ventilator with an equivalent free area of 8000 mm^2. If the number of ventilators in a habitable space is greater than one, then the specification should be adjusted using equation (1).

$$(1) \quad Specification + 10\log(\frac{V_{new}}{1})$$

where V_{new} is the total number of ventilators in each habitable room.

4.4.7 For guidance purposes we would suggest that a construction based around the following configurations is likely to prove commensurate with achieving the sound insulation performance specification detailed within **Appendix C.**

Table 4.6: Glazing Configurations

Property	Configuration
1, 10	Uprated double glazing comprising 10mm glass / 16mm cavity / 6mm glass with acoustic trickle ventilator
2, 8, 9	Conventional double glazing comprising 6mm glass / 16mm cavity / 6mm glass with acoustic trickle ventilators
3, 4, 5, 6, 7	Conventional double glazing comprising 6mm glass / 16mm cavity / 6mm glass with standard trickle ventilators

4.4.8 The guidance construction detailed above is provided for indicative costing purposes only. Selected glazing and ventilation systems should be capable of meeting the performance specifications shown in **Appendix C**, with laboratory test certificates being made available in support of the quoted performance. Glazing proposals which simply reflect the guidance constructions indicated in this report will not, in isolation, be sufficient evidence that a glazing configuration will meet the performance specification.

5 Conclusions

5.1.1 Peter Brett Associates LLP (PBA) has been commissioned by DECIMUS LTD to undertake a noise impact assessment to support a full planning application for a proposed residential development of 10 properties at Lower Horsebridge, Hailsham

5.1.2 A fully automated sound survey was undertaken from approximately 14:00 hours on Friday 23rd June to approximately 14:00 hours on Saturday 24th June 2017 in order to determine the current sound climate at the site.

5.1.3 Calculations indicate that sound levels in external amenity areas are likely to fall below the proposed LOAEL level for Plots 3-7.

5.1.4 Calculations indicate that for Plots 1-2 and 8-10 the LOAEL is likely to be exceeded. However, as per BS8233:2014 guidance, mitigation measures have been applied (within the constraints of the scheme) to achieve the lowest practicable levels.

5.1.5 Based on the results of the external building fabric assessment, internal ambient sound levels are likely to meet the proposed LOAEL during daytime and night-time periods with appropriate mitigations measures in place.

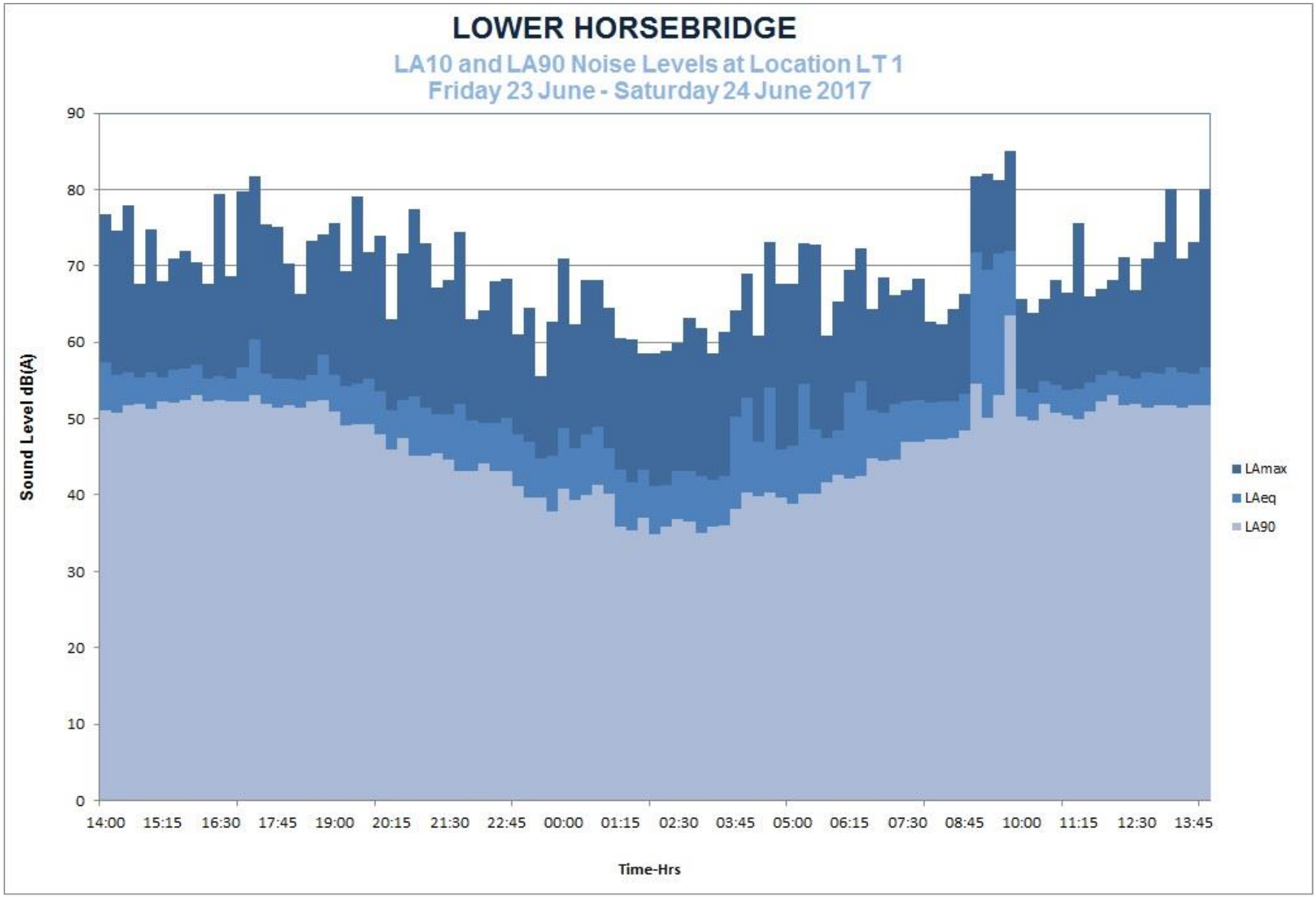
5.1.6 In summary, the assessment has demonstrated that, with appropriate mitigation incorporated into the design and building fabric, the site is suitable for residential development in relation to noise impacts.

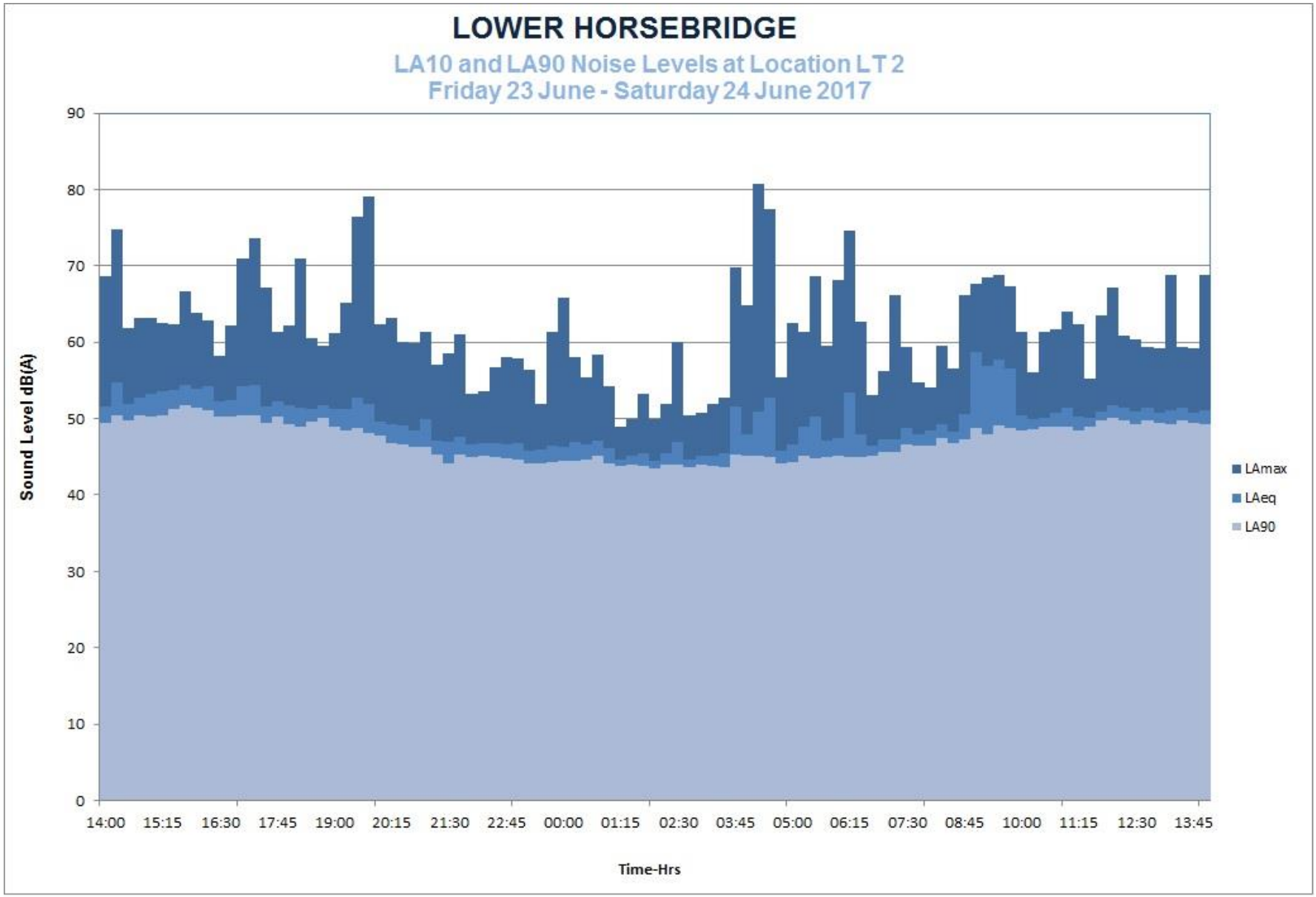
Appendix A Glossary of Acoustic Terminology

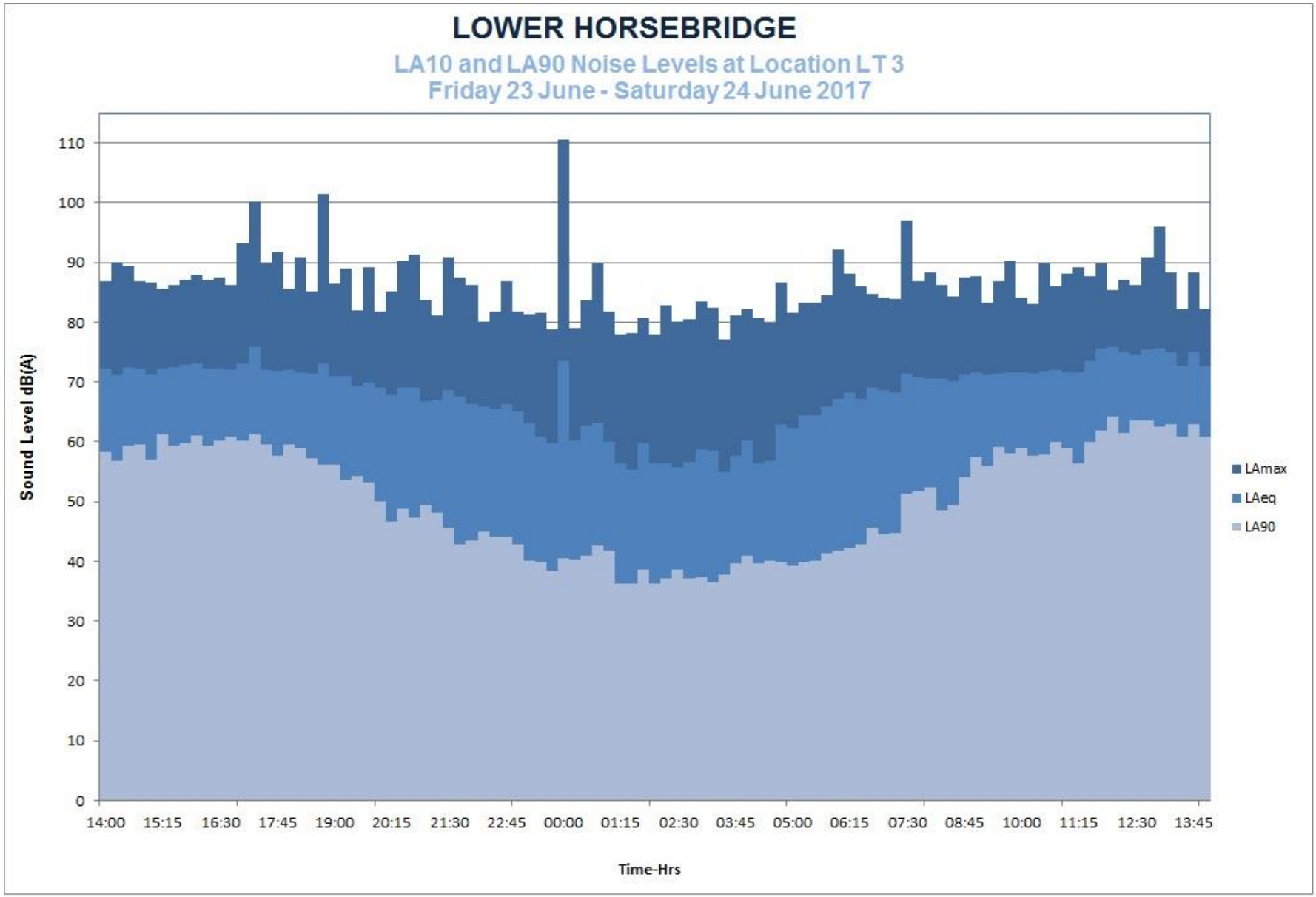
Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Daytime	The period 07:00-23:00 hours.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1/s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Insertion Loss	Insertion loss is the difference in sound pressure level at a single fixed position before and after a noise control element (e.g. enclosure, barrier etc.) is installed.
L_{AE} or SEL	A noise level which, if maintained for a period of 1 second, would cause the same A-weighted sound energy to be received as is actually received from a given noise event.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on

	the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A – weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
LOAEL	Lowest Observed Adverse Effect Level. This is the noise level above which adverse effects on health and quality of life can be detected.
Night-time	The period 23:00-07:00 hours.
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.
Noise Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
SOAEL	Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level, L_p	The sound pressure level, L_p is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Specific Noise Level	The noise source under investigation for assessing the indication of impact, measured as and $L_{Aeq,T}$
Rating Noise Level	The specific noise source plus any adjustment for the characteristic features of the noise, denoted by $L_{Ar,T}$.

Appendix B Sound Time History Graph


LOWER HORSEBRIDGE
LA10 and LA90 Noise Levels at Location LT 1
Friday 23 June - Saturday 24 June 2017
Sound Level dB(A)
90
80
70
60
50
40
30
20
10
0
14:00
15:15
16:30
17:45
19:00
20:15
21:30
22:45
00:00
01:15
02:30
03:45
05:00
06:15
07:30
08:45
10:00
11:15
12:30
13:45
Time-Hrs
LAmax
LAeq
LA90


LOWER HORSEBRIDGE
LA10 and LA90 Noise Levels at Location LT 2
Friday 23 June - Saturday 24 June 2017
Sound Level dB(A)
90
80
70
60
50
40
30
20
10
0
14:00
15:15
16:30
17:45
19:00
20:15
21:30
22:45
00:00
01:15
02:30
03:45
05:00
06:15
07:30
08:45
10:00
11:15
12:30
13:45
Time-Hrs
LAmax
LAeq
LA90


LOWER HORSEBRIDGE
LA10 and LA90 Noise Levels at Location LT 3
Friday 23 June - Saturday 24 June 2017
Sound Level dB(A)
110
100
90
80
70
60
50
40
30
20
10
0
14:00
15:15
16:30
17:45
19:00
20:15
21:30
22:45
00:00
01:15
02:30
03:45
05:00
06:15
07:30
08:45
10:00
11:15
12:30
13:45
Time-Hrs
LAmax
LAeq
LA90

Appendix C External Building Fabric Acoustic Specification

C.1 Glazing Sound Insulation Performance

C.1.1 The complete cladding system shall achieve the following minimum sound reduction indices when tested in accordance with BS EN ISO 10140-2:2010.

Property	Minimum Recommended Sound Reduction Indices (dB) at Octave Band Frequency (Hz)				
	125	250	500	1k	2k
1, 10	26	27	34	40	38
2, 8, 9, 3, 4, 5, 6, 7	20	20	30	36	34

C.1.2 Fully detailed test reports from independent acoustic test authorities shall be supplied. All test reports shall be in English or, a full English translation.

C.1.3 Test data should include the 1/3 octave band results from 100 Hz to 3150 Hz inclusive, together with the corresponding octave band results from 125 Hz to 4000 Hz inclusive.

C.1.4 The test report shall be provided for test samples which are representative of the complete system for the relevant facades – including frames, joints, seals, spandrel panels and opening lights and trickle vents (as appropriate).

C.2 Trickle Ventilation Sound Insulation Performance

C.2.1 Ventilators shall be tested in accordance with BS EN 10140-2:2010. This will involve testing in 1/3 octaves from at least 100 Hz to 2500 Hz inclusive. These results, together with suitably converted octave band results from 125 Hz to 2000 Hz shall be provided for a ventilator unit which is representative of the proposed ventilator for the relevant façade. The following element normalised level differences shall be achieved:

Property	$D_{n,e}$ Values (dB) at Octave Band Centre Frequency (Hz) for Single Ventilator				
	125	250	500	1k	2k
1, 10, 2, 8, 9	35	35	43	45	43
3, 4, 5, 6, 7	31	24	34	31	30

C.2.2 It should be noted that the acoustic specification for trickle ventilators is based on a single ventilator with an equivalent free area of 8000 mm^2. If the number of ventilators in a habitable space is greater than one, then the specification of each ventilator should be adjusted using equation (1).

$$(1)\quad Specification + 10\log\left(\frac{V_{new}}{1}\right)$$

where V_{new} is the total number of ventilators in each habitable room.