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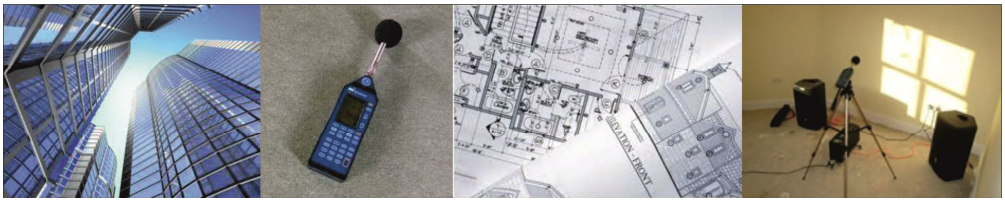

BLOCKS F, G & H
AGAR GROVE
LONDON
NW1 9SU

ENVIRONMENTAL NOISE ASSESSMENT
v.1

Client:
HILL PARTNERSHIPS LIMITED
The Power House
Gunpowder Mill
Powdermill Lane
Waltham Abbey
Essex
EN9 1BN

1 March 2017
Ref: M3878

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CONTENTS

1. SUMMARY 2
2. INTRODUCTION 3
3. SURVEY OF EXISTING NOISE LEVELS 4
4. ASSESSMENT OF NOISE LEVELS 6
4.1 National Planning Policy Framework (March 2012) 6
4.2 Noise Policy Statement for England (March 2010) 7
4.3 DCLG Guidance Note, 2013 - 'Noise' 8
4.4 BS8233:2014 – 'Guidance on Sound Insulation and Noise Reduction for Buildings' 11
4.5 WHO 'Guidelines for Community Noise (1999) 12
5. RECOMMENDATIONS FOR NOISE ATTENUATION MEASURES 13
Target Noise Level 14
Target Noise Level 14
Target Noise Level 14
6. MECHANICAL SERVICES NOISE EMANATING FROM THE BUILDING 17
7. CONCLUSION 19

Figure 1: Site location 20
Figure 2: Proposed Site Plan 21
Figure 3 - Variation of Measured Noise Levels 22

Appendix I - Terminology Relating To Noise 23

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Issue No.	1
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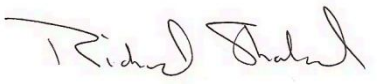
Signature	
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Date	1 March 2017

1. SUMMARY

1.1 An assessment of ambient noise has been undertaken at a proposed residential development at Agar Grove, NW1 9SU (see Figure 1 – Site Location).

1.2 It is proposed to re-develop the existing land with the introduction of some 57 residential dwellings spread over three blocks (see Figure 2 – Proposed Site Plan).

1.3 The existing ambient noise climate affecting the site has been established by survey (Section 3), and this has confirmed a typical variation in day time and night time levels.

1.4 The relevant planning and design guidance for new residential developments has been provided in Section 4.

1.5 Means of attenuating the external noise levels have been submitted (Section 5.4 et seq., in the form of a specification for the façade glazing and possible means of acoustically ventilating the building.

1.6 It is concluded that, with these measures in place, the occupants of the new properties can be provided with an acceptable acoustic environment.

1.7 Finally, noise levels on external balcony space may rise above the WHO guidelines, but the report discusses the limited means of amelioration, the likely impact of this on residents, and the situations (including here) where WHO guidance may be overlooked.

2. INTRODUCTION

2.1 An assessment of environmental noise has been undertaken at Agar Grove, NW1 9SU, on behalf of Hill Partnerships Ltd.

2.2 The site is situated south of Agar Grove and east from Agar Place / Wrotham Road. To the south of the site is the North London Railway Line, (see Figure 1 – Site Location).

2.3 It is proposed to construct three new blocks in the north-west corner of the site, as indicated in Figure 2 and described below:

Block F	14 dwellings in a 4 storey block
Block G	23 dwellings in a notionally 6 storey block
Block H	20 dwellings in a 5 storey block

2.4 It is recognised that the proposed development may be subject to noise, principally from vehicular traffic passing by on Agar Grove, Agar Place and Wrotham Road.

2.5 Given the acoustic nature of the surrounding acoustic environment, it will be necessary to ensure the scheme provides sufficient protection for the prospective occupants of new residential buildings.

2.6 Formally, the objectives of the current exercise may be summarised as follows:

(i) To determine the existing ambient noise climate in the vicinity of the development site;
(ii) To assess likely noise levels at the facades of any new buildings, and to specify a suitable façade construction to ensure acceptable conditions;
(iii) To consider external noise levels and advise on any requirements for site screening.

2.7 This report details the investigations carried out in respect of each of these objectives and summarises the conclusions which have been reached.

3. SURVEY OF EXISTING NOISE LEVELS

3.1 The first step in the assessment of potential noise impact is to measure and describe the existing ambient noise levels affecting the site.

3.2 A noise survey was undertaken from Friday 19th February until Friday 26th February 2016.

3.3 A Rion NL-52 Type 1 sound level meter was set up in the north-east corner of the site (see Figure 1 – Site Location).

3.4 The microphone of the meter was attached to an extendable light stand and set up at first floor level, on the north elevation of the site compound.

3.5 The equipment was configured to measure 5 minute samples of the following acoustic parameters:

L_{Aeq} The A-weighted equivalent continuous sound pressure level which, over the sample period, contains the same acoustic energy as the time-varying signal being recorded.

L_{Amax} The A-weighted maximum sound pressure level recorded during each sample period (as measured on fast response).

L_{A90} A statistical parameter representing the A-Weighted noise level exceeded for 90% of each sample period. This is commonly used to describe the underlying 'background noise level'.

3.6 Weather conditions throughout the survey period are summarized in the following table;

Date	Average Temperature (°C)	Events	Wind Speed (m/sec)	
			Average	Maximum
Friday 19th	4	Mainly dry with some rain	3.6	8.9
Saturday 20th	10	Mainly rain with dry spells	7.2	13.4
Sunday 21st	12	Dry with occasional showers	8.3	11.9
Monday 22nd	7	Mostly rain but dry at night	5.0	9.2
Tuesday 23rd	6	Dry	2.5	4.2
Wednesday 24th	4	Dry	1.1	3.6
Thursday 25th	3	Dry	1.9	4.2
Friday 26th	4	Dry	2.2	6.1

3.7 The equipment was calibrated before and after the survey and showed no significant variance.

3.8 Figure 3 shows the variation in noise levels during the survey period, and the table below confirms the measured levels during each of the standard day time and night time periods;

Period		Day Time $L_{Aeq, 07.00 – 23.00}$	Night Time $L_{Aeq, 23.00 – 07.00}$	Typical $L_{Amax, fast}$ Night
Friday 19th	dB(A)	63.5*	60.5	75
Saturday 20th	dB(A)	61.5	56.5	74
Sunday 21st	dB(A)	59.8	56.4	75
Monday 22nd	dB(A)	63.8	56.7	79
Tuesday 23rd	dB(A)	63.4	57.1	77
Wednesday 24th	dB(A)	63.2	57.6	78
Thursday 25th	dB(A)	63.9	58.4	77

**Part measurements*

3.9 The L_{Amax} levels shown in the table above are the peak values based on the 90th percentile, and may exclude exceptional 'one-off' events during the night.

3.10 Section 5 of this report will discuss these noise levels, in respect of their suitability for residential building.

4. ASSESSMENT OF NOISE LEVELS

4.1 National Planning Policy Framework (March 2012)

4.1.1 The National Planning Policy Framework defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people, and their answerable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

4.1.2 Section 123 states

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 businesses wanting to develop in continuance of their 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.*

4.1.3 The Framework states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution. It does not, however, provide any specific formal guidelines.

4.2 Noise Policy Statement for England (March 2010)

4.2.1 The document "Noise Policy Statement for England", referenced within the NPPF sets out the following vision for on-going noise policy:

> *"Promote good health and quality of life through the effective management of noise within the context of Government policy on sustainable development."*
>
> *This vision should be achieved through the following Noise Policy 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".*

4.2.2 To achieve these objectives the Noise Policy Statement sets out three noise levels to be defined by the assessor:

- **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 occur.

4.2.3 The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

> *"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development... .. This does not mean that such adverse effects cannot occur."*

4.2.4 Where noise levels are below the LOAEL it is considered there will be no adverse effect. Once noise levels are below the NOEL there will be no observable change. No objective values are offered within the NPSE, as the document does indicate that each site should be considered on its own merits.

4.2.5 Guidance as to a numerical definition of LOAEL may therefore be given by the following Standards.

4.3 DCLG Guidance Note, 2013 - 'Noise'

4.3.1 The Department of Communities and Local Government provided further guidance to support the NPPF. The section, Noise, published in August 2013 advises:

> *Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.*
>
> *Noise may override other planning concerns in certain circumstances, neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development.*
>
> *Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:*
>
> - *whether or not a significant adverse effect is occurring or likely to occur;*
> - *whether or not an adverse effect is occurring or likely to occur; and*
> - *whether or not a good standard of amenity can be achieved.*
>
> *This would include identifying whether the overall effect of the noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.*
>
> *At the lowest extreme, when noise is not noticeable, there is by definition no effect. As the noise exposure increases, it will cross the no observed effect level as it becomes noticeable. However, the noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.*

As the exposure increases further, it crosses the lowest observed adverse effect level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts 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).

Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.

4.3.2 The table below summarises the noise exposure hierarchy, based on the likely average response:

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

4.3.3 The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. These factors include:

- *the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;*
- *for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;*
- *the spectral content of the noise (i.e. whether or not the noise contains particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into*

account along with the existing and, where appropriate, the planned character of the area.

4.3.4 The adverse effects of noise may be mitigated in one of the four broad approaches:

- *engineering:*
- *layout:*
- *using planning conditions/obligations to restrict activities; and*
- *mitigating the impact on areas likely to be affected by noise.*

4.3.5 The noise impact on residential developments may be partially off-set if the residents of those dwellings have access to:

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*
- *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;*
- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*
- *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance).*

4.4 BS8233:2014 – 'Guidance on Sound Insulation and Noise Reduction for Buildings'

4.4.1 There is much guidance on the levels of intrusive noise which would be considered acceptable within residential accommodation and new buildings. Typical advice is found in British Standard 8233:2014 "Guidance on Sound Insulation and Noise Reduction for buildings". Following similar guidance in the 1999 World Health Organisation report "Guidelines for Community Noise", the Standard sets out the following limits for indoor ambient noise levels within living rooms and bedrooms. This suggests:

BS 8233 Guideline Values

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	35 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	40 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	35 dB(A) LAeq, 16 hr	30 dB(A) LAeq, 8 hr

4.4.2 It is usually considered that an open window will provide a reduction of some 10-15 dB(A)[1]. Therefore the 'good' internal standards quoted above would equate to the following targets immediately outside:

Activity	Location	0700 - 2300	2300 - 0700
Resting	Living Room	48 dB(A) LAeq, 16 hr	-
Dining	Dining room/Area	53 dB(A) LAeq, 16 hr	-
Sleeping	Bedroom	48 dB(A) LAeq, 16 hr	43 dB(A) LAeq, 8 hr

4.4.3 BS8233 recognises that, where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB, and reasonable conditions will be achieved.

4.4.4 It should be noted that the levels quoted in BS8233 are intended to reflect the acceptability of steady, continuous noise. Sources of intermittent and tonal noise may generate greater annoyance for a similar overall magnitude. Whilst BS8233 does not explicitly state a correction for those circumstances, it may be appropriate to consider that the Good and Reasonable standards would be achieved with levels which are perhaps 5 dB lower than stated in the table above.

4.4.5 It is also noted that BS8233 was written from a view of designing new buildings to protect occupants from existing noise sources. This does necessarily infer, however, that the acceptability of an occupant to an absolute level noise within a building will be different if the introduction of the noise source post-dates the construction of the building.

4.5 WHO 'Guidelines for Community Noise (1999)

4.5.1 The World Health Organisation indicates that, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}.

4.5.2 The document also provides guidance on the impact of peak noise levels on sleeping conditions. This suggests that levels above 45 dB(A) LAmax inside a bedroom would be disturbing to sleep. With windows open, this would equate to a level of approximately 58 dB(A) L_{Amax} externally.

[1] Reference PPG24 Planning & Noise, which adopted a mid-range value of 13 dB(A)

5. RECOMMENDATIONS FOR NOISE ATTENUATION MEASURES

INTERNAL NOISE LEVELS

5.1 Section 4.4.1 of this report has provided guidance for internal noise levels within residential rooms as stated within BS8233.

5.2 It is therefore recommended that any new buildings be designed to achieve the following levels:

Living Rooms:	35 dB(A) $L_{Aeq,\ 07.00 – 23.00}$
Bedrooms:	30 dB(A) $L_{Aeq,\ 23.00 – 07.00}$, and also
	45 dB(A) $L_{Amax,\ 23.00 – 07.00}$

5.3 Table I below defines the outside to inside sound level difference, dB(A) and overall performance targets required through each façade of the buildings. These figures are based initially on the targets of Para 5.2 and the measured noise levels given in Para 3.8. In summary the typical noise levels measured were;

Reference Free Field Noise Levels	**dB(A)**
Daytime $L_{Aeq,\ 16hrs}$	63
Night-time $L_{Aeq,\ 8hrs}$	58
Night-time L_{Amax}	78

5.4 Levels have been adjusted to account for the façade reflections which will occur in front of the new building and, the distance between the measurement location and the building. The final column indicates the sound level difference required across the facade. This is simply the difference between the facade noise level and the internal target. In the case of the bedrooms, where there are two parameters to consider, it can be seen that the difference is determined by the peak noise levels, this being more onerous than the L_{Aeq} noise levels.

TABLE I – PREDICTED OUTSIDE TO INSIDE NOISE LEVELS

Block F			
Elevation	**External Noise Level**	**Target Noise Level**	**Outside to inside level difference**
All Elevations			
Living Rooms	57 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	22 dB(A)
Bedrooms	52 dB(A) $L_{Aeq, 8 hrs}$ 72 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	22 dB(A)

Block G			
Elevation	**External Noise Level**	**Target Noise Level**	**Outside to inside level difference**
South Facade			
Living Rooms	57 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	22 dB(A)
Bedrooms	52 dB(A) $L_{Aeq, 8 hrs}$ 72 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	22 dB(A)
East & West Facades - North of Central Stairwell			
Living Rooms	64 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	29 dB(A)
Bedrooms	59 dB(A) $L_{Aeq, 8 hrs}$ 79 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	34 dB(A)
East & West Facades - South of Central Stairwell			
Living Rooms	61 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	26 dB(A)
Bedrooms	56 dB(A) $L_{Aeq, 8 hrs}$ 76 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	31 dB(A)
North Facade			
Living Rooms	69 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	34 dB(A)
Bedrooms	64 dB(A) $L_{Aeq, 8 hrs}$ 84 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	39 dB(A)

Block H			
Elevation	**External Noise Level**	**Target Noise Level**	**Outside to inside level difference**
South Facade			
Living Rooms	57 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	22 dB(A)
Bedrooms	52 dB(A) $L_{Aeq, 8 hrs}$ 72 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	27 dB(A)
East & West Facades			
Living Rooms	64 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	29 dB(A)
Bedrooms	59 dB(A) $L_{Aeq, 8 hrs}$ 79 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	34 dB(A)
North Facade			
Living Rooms	69 dB(A) $L_{Aeq, 16 hrs}$	35 dB(A) $L_{Aeq, 16hrs}$	34 dB(A)
Bedrooms	64 dB(A) $L_{Aeq, 8 hrs}$ 84 dB(A) $L_{Amax, fast}$	30 dB(A) $L_{Aeq, 8hrs}$ 45 dB(A) L_{Amax}	39 dB(A)

5.5 Table II confirms the required glazing performance and recommendations of glazing configurations:

TABLE II – GLAZING PERFORMANCE REQUIREMENT

Block / Elevation	Room Type	Target Glazing Performance, Rw + Ctr	Possible Glazing Configuration
Block F			
All Elevations	Living Rooms	27 dB	4 / 18 / 4 / 18 / 4
All Elevations	Bedrooms	27 dB	4 / 18 / 4 / 18 / 4
Block G			
South	Living Rooms	27 dB	4 / 18 / 4 / 18 / 4
South	Bedrooms	27 dB	4 / 18 / 4 / 18 / 4
East/West, North of Stairwell	Living Rooms	27 dB	4 / 18 / 4 / 18 / 4
East/West, North of Stairwell	Bedrooms	32 dB	4 / 16 / 4 / 18 / 6.4
East/West, South of Stairwell	Living Rooms	27 dB	4 / 18 / 4 / 18 / 4
East/West, South of Stairwell	Bedrooms	32 dB	4 / 16 / 4 / 18 / 6.4
North	Living Rooms	32 dB	4 / 16 / 4 / 18 / 6.4
North	Bedrooms	36 dB	10 / 12 / 4 / 12 / 6
Block H			
South	Living Rooms	27 dB	4 / 18 / 4 / 18 / 4
South	Bedrooms	27 dB	4 / 18 / 4 / 18 / 4
East/West	Living Rooms	27 dB	4 / 18 / 4 / 18 / 4
East/West	Bedrooms	32 dB	4 / 16 / 4 / 18 / 6.4
North	Living Rooms	32 dB	4 / 16 / 4 / 18 / 6.4
North	Bedrooms	36 dB	10 / 12 / 4 / 12 / 6

5.7 Whichever level of glazing is provided for these sensitive facades, it is of course the case that when the windows are opened, the acoustic performance of the windows will be irrelevant. It may therefore be necessary to provide alternative means by which habitable rooms may be background-ventilated whilst keeping the acoustic integrity of the façade.

5.8 For background ventilation, and acoustic trickle ventilation in the window head could be acceptable. Reference is made to the Sonovent range of trickle vents, and the table below, which summarises the acoustic performance required in each area:

TABLE III – ACOUSTIC TRICKLE VENT PERFORMANCE REQUIREMENT

Block / Elevation	Room Type	Target Vent Performance, $D_{n,e,w}$
Block F		
All elevations	Living Rooms	30 dB
All elevations	Bedrooms	35 dB
Block G		
South	Living Rooms	30 dB
South	Bedrooms	35 dB
East/West, North of Stairwell	Living Rooms	37 dB
East/West, North of Stairwell	Bedrooms	42 dB
East/West, South of Stairwell	Living Rooms	34 dB
East/West, South of Stairwell	Bedrooms	39 dB
North	Living Rooms	42 dB
North	Bedrooms	47 dB
Block H		
South	Living Rooms	30 dB
South	Bedrooms	35 dB
East/West	Living Rooms	37 dB
East/West	Bedrooms	42 dB
North	Living Rooms	42 dB
North	Bedrooms	47 dB

5.9 It is noted, however, that whenever windows are opened to achieve higher ventilation rates, the residual noise levels within the rooms would then exceed an appropriate standard. Specifically, this is considered to be the BS8233 'reasonable' standard (ref. Para 4.4.1 - 4.4.3).

5.10 On that basis, it may be necessary to consider a mechanical solution which would provide a higher air flow rate, whilst allowing residents to keep windows closed if they so prefer. One such option would be a Mechanical Ventilation Heat Recover units serving each dwelling. These operate with a fresh air grill set into the external elevation, providing fresh air to the unit. The air is then ducted to each dwelling, and one or more grills within each. Return air grills draw exhaust air back through the MVHR unit, which then discharges the air to atmosphere through a second grill in the outside wall or roof. Manufacturers do not provide sound transmission loss figures, but conservative calculations indicate that the outside to inside loss through a typical MVHR system will be in the order of 40 dB(A). This would be sufficient for this project.

5.11 If the units are designed to achieve 2 air changes per hour in the habitable rooms, this should be accepted as a reasonable level of purge or thermal comfort ventilation

EXTERNAL AMENITY SPACE

5.12 The World Health Organisation indicates that, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}.

5.13 It is understood that some flats will have balconies and here will be landscaped amenity space between Blocks F and H.

5.14 The predicted noise levels at each facade have been shown within Table I of Para 5.4, and these show that noise levels on balconies may be above recommended WHO criteria.

5.15 The options for attenuating the noise is limited, with balcony safety barrier designed as a solid panel, either glazed or other material, and at least 1.2m high with minimal gaps around the edges.

5.16 It is noted, however, that BS8233 does accommodate the provision of such space in noisy areas:

> ***7.7.3.2 Design criteria for external noise***
> *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 LAeq,T, with an upper guideline value of 55 dB LAeq,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 higher noise areas, such as city centres or urban areas 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.*
>
> *Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. 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 LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.*

5.17 In the central courtyard between the three blocks, noise levels away from the facades should just fall within the WHO guidelines.

6. MECHANICAL SERVICES NOISE EMANATING FROM THE BUILDING

6.1 As indicated earlier, noise from Building Services plant should be designed in accordance with the guidance of British Standard 4142:2014 "Method for rating and assessing industrial and commercial sound".

6.2 It is usually good practice to ensure to design new plant to a level which would be effectively inaudible to neighbouring residents, namely 10 dB below the existing ambient climate.

6.3 The ambient noise survey suggested that background noise levels would typically fall to minimum levels of 40 dB(A) L_{A90} during the day (0700 - 2300) and then 45 dB(A) L_{A90} at night. However, previous surveys on the site (recording levels towards the southern boundary) suggest much quieter conditions away from the traffic on Agar Road. Specifically, levels were found to be in the order of 40 dB(A) L_{A90} during the day (0700 - 2300) and then 37 dB(A) L_{A90} at night.

6.4 It is therefore recommended that the following design targets be applied to the project:

Noise from any new building services plant shall be limited to the following noise levels, assessed at a distance of 1m from the facade of any neighbouring residential properties:

07.00 – 23.00 30 dB(A) $L_{Aeq, 1 hr}$
23.00 – 07.00 27 dB(A) $L_{Aeq, 15 mins}$

If the noise from the plant is tonal or intermittent, these limits should be reduced to account for the acoustic characteristics of the noise as recommended in BS4142.

6.5 It is understood that these targets will be adopted by the mechanical and electrical consultants in their detailed design of the scheme.

7. CONCLUSION

7.1 The foregoing assessment has looked at the levels of ambient noise within the vicinity of a proposed new housing development at Blocks F. G and H, Agar Grove, NW1 9SU, on behalf of Hill Partnerships Ltd.

7.2 It has been concluded that, by specifying appropriate glazing and facade construction along with acoustically treated means of mechanical ventilation, it will be possible to ensure that an acceptable internal environment within the proposed buildings will be met.

7.3 It has been shown that noise levels within the certain balcony areas proposed will be above the WHO's guideline figure of 55 dB L_{Aeq}, but that there is precedent to allow for such conditions.

Figure 1: Site location

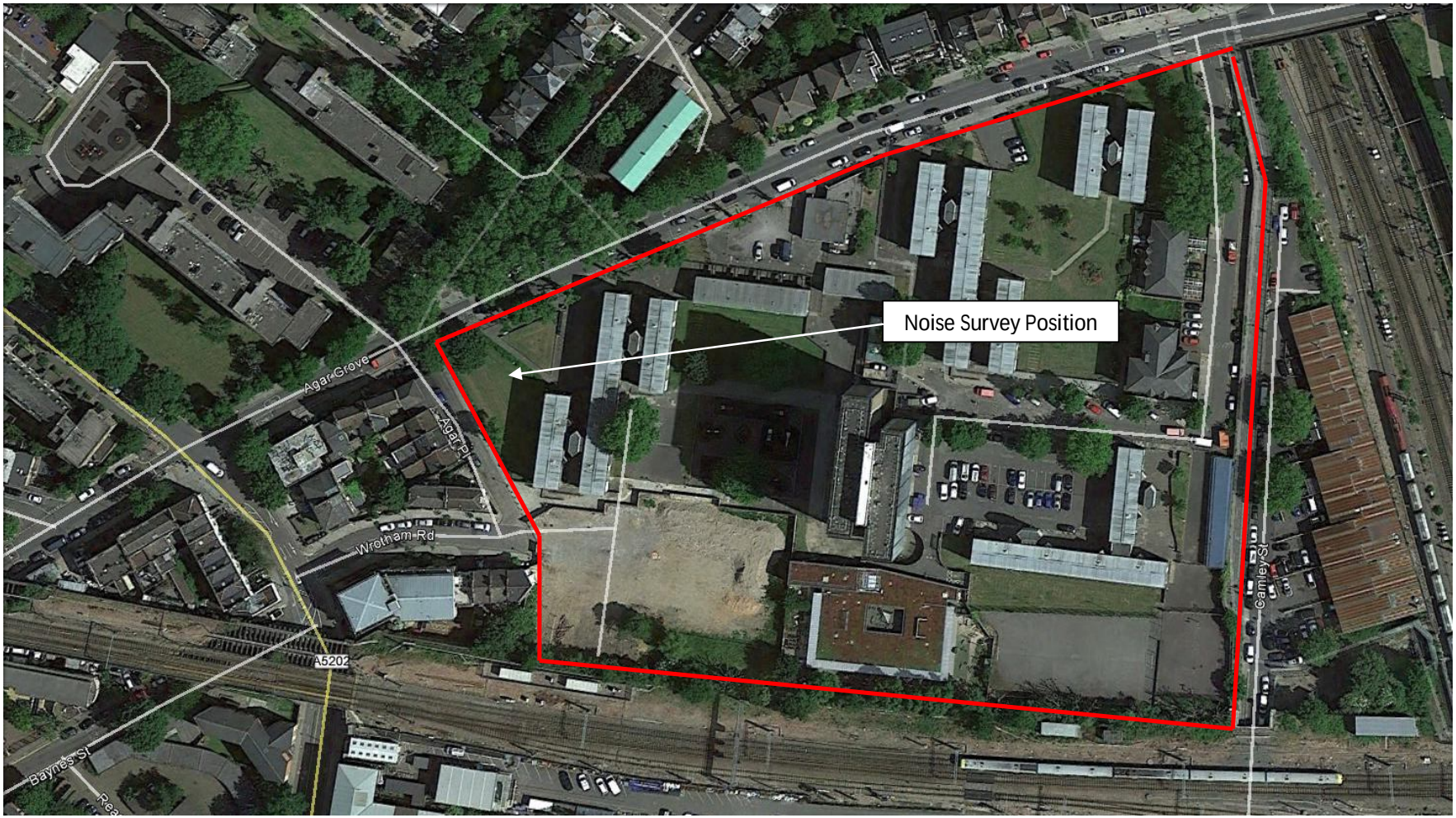


Figure 2: Proposed Site Plan

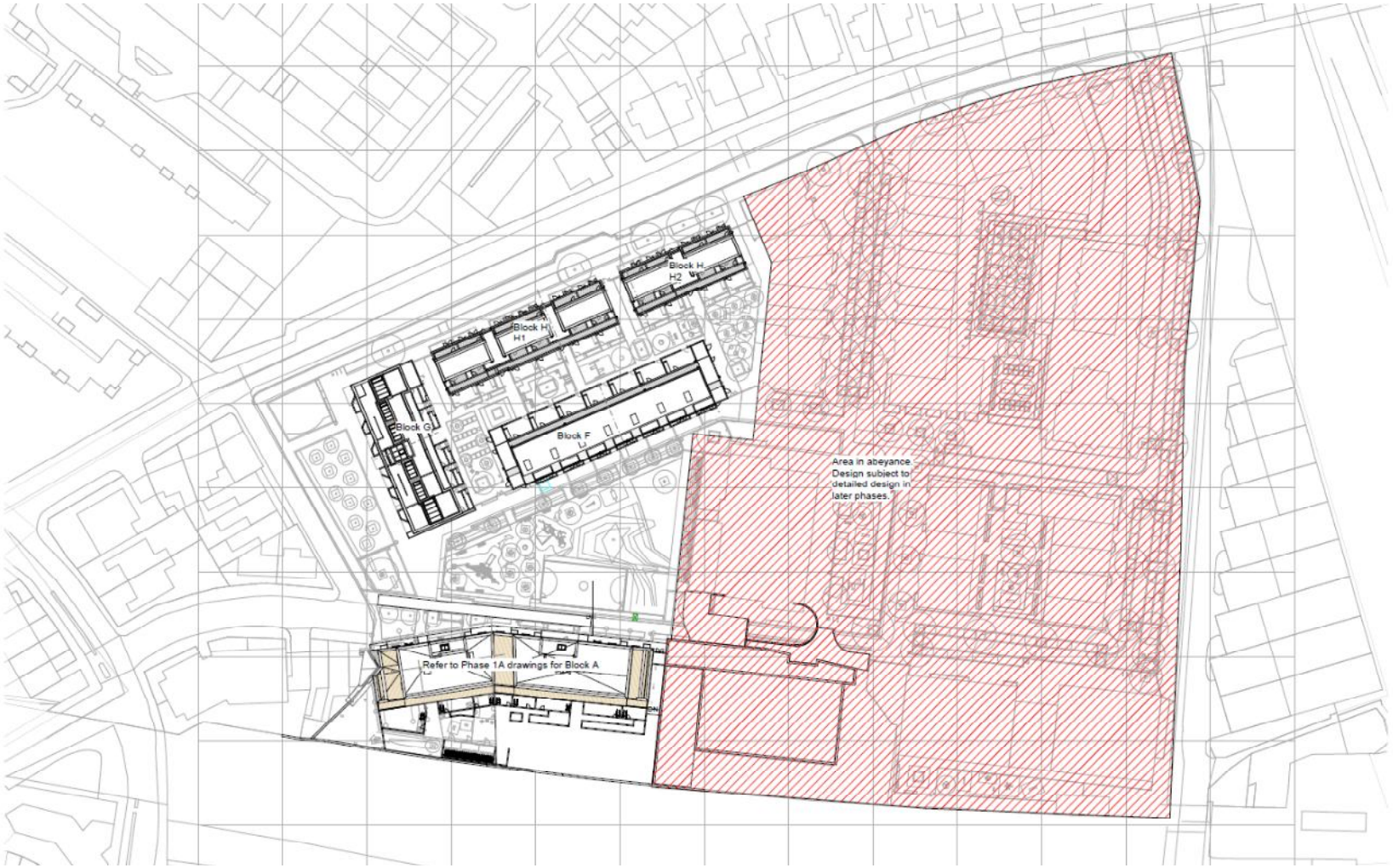
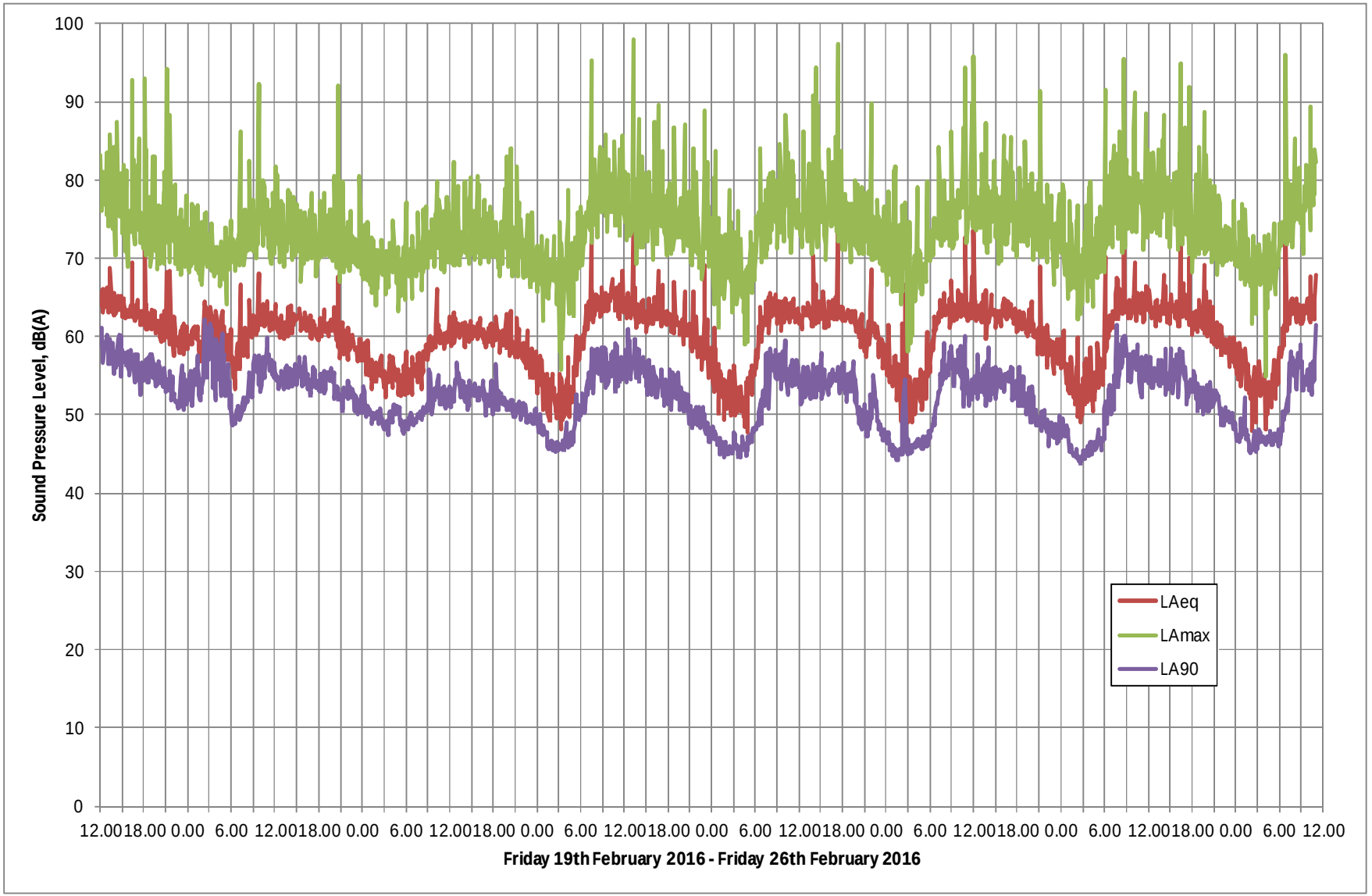


Figure 3 - Variation of Measured Noise Levels



Appendix I - Terminology Relating To Noise

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). 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.
A-weighting, dB(A)	The unit of sound level, weighted according to the A scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level 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.
Leq,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.
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m.
Façade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.
Rw	Single number quantity that characterises the airborne sound insulating properties of a material or building element over a range of frequencies.
Reverberation	The persistence of sound in a space after a sound source has been stopped