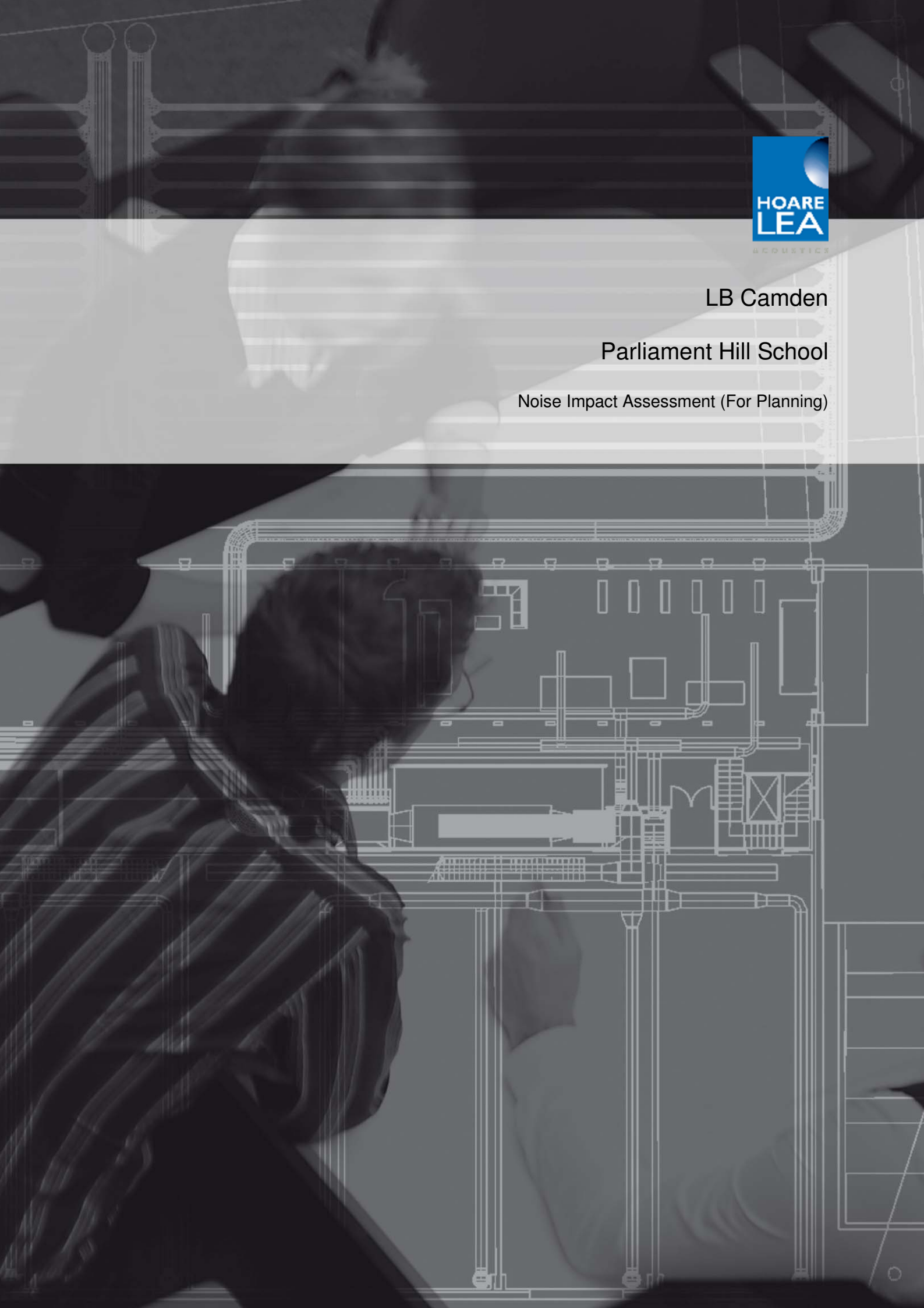


LB Camden

Parliament Hill School

Noise Impact Assessment (For Planning)

Tel: +44 (0) 1202 654 600
Fax: +44 (0) 1202 654 601

Enterprise House
Old School Close
Ferndown
Bournemouth
Dorset
BH22 9UN

Audit Sheet

Revision	Description	Date	Issued by	Reviewed by
Draft	For Review	14/11/2013	TH	BD
1	For Comment	18/11/2013	TH	BD
2	For Issue	29/11/2013	TH	BD
3	Revised – New Layout	13/01/2014	TH	BD
3	Revised – For Planning	17/02/2014	TH	BD

Contents

Figures

Appendices

1.0 Introduction

Hoare Lea Acoustics has been appointed by LB Camden to act as architectural acoustic design consultant in connection with the proposed development at Parliament Hill School. The proposal comprises the part demolition and part refurbishment of the existing school buildings and development of a new building.

An environmental noise survey is required to quantify the existing ambient and background noise levels at the site in order to establish the design constraints on noise emissions from the operation of plant. The noise survey will also provide information required to establish the acoustic performance of the building façade and ventilation strategy to ensure all internal spaces are in accordance with the requirements of Building Bulletin 93 (BB 93).

This report provides a description of the results from the no02ise survey undertaken, an assessment to determine the external noise limits for building services plant required to meet the Local Authority's general noise emission limits and advice regarding the building envelope and ventilation strategy in accordance with Building Bulletin 93 (BB 93).

2.0 Site Description

2.1 Existing Site

Parliament Hill School is an all-girls secondary school located within the London Borough of Camden and is bound by Highgate Road to the north-east.

The proposal comprises the demolition of the existing Heath building and construction of two new buildings to the rear of the Morant building. In addition, the proposal seeks to refurbish and refresh the existing Morant and Courtyard buildings.

The surrounding buildings along Lissenden Gardens and Highgate Road are generally residential in nature; however there is an existing public house (The Bull and Last) immediately opposite the school on Highgate Road. To the north of Parliament Hill School is the William Ellis School and to the west is Hampstead Heath.

The proposed development site (indicative only) is identified in Figure 1 attached and the proposed floor plans are provided in Figures 2 to 5 attached.

2.2 Local Noise Conditions

The surrounding noise climate is formed predominantly by local road traffic noise from the immediate road network around the site, in particular Highgate Road to the east, but also from more distant roads including Gordon House Road (B518) to the south.

It should be noted that the London Overground is located approximately 220m to the south; as such the noise climate includes distant train movements. Similarly, occasional aircraft noise is also audible.

Figure 1 attached displays a plan view of the existing site with the measurement locations identified.

3.0 Basis of Assessment

3.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework [1] sets out the Government's current planning policies for England and how these are expected to be applied.

With regards to local noise planning policies, Section 11 paragraph 123 of the NPPF 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 upon them because of changes in nearby land uses since they were established;
- 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.'

Reference is made to the DEFRA Noise Policy Statement for England 2010 (NPSfE). This latter document is intended to apply to all forms of noise other than that which occurs in the workplace and includes environmental noise and neighbourhood noise in all forms.

The NPSfE advises that the impact of noise should be assessed on the basis of adverse and significant effect but does not provide any specific guidance on assessment methods or limit sound levels. Moreover, the document advises that it is not possible to have 'a single objective noise-based measure…that is applicable to all sources of noise in all situations'. It further advises that the sound level at which an adverse effect occurs is 'likely to be different for different noise sources, for different receptors and at different times'.

In the absence of specific guidance for assessment of environmental noise within the NPPF and the NPSfE, it is considered appropriate to base assessment on current British Standards and national guidance. These are considered to be Local Authority guidance, BS 4142, BS 8233 [2] and the World Health Organisations [3] (WHO) guidelines.

3.2 BS 4142

Current Government advice to Local Planning Authorities in both England and Wales makes reference to BS 4142 [4] as being the appropriate guidance for assessing commercial operations and fixed building services plant noise. This British Standard provides an objective method for rating the likelihood of complaint from industrial and commercial operations. It also describes means of determining noise levels from fixed plant installations and determining the background noise levels that prevail on a site.

The complaints assessment method is based on the subtraction of the measured background noise level from the rating level determined. The rating level is the source noise level (either measured or predicted) corrected for tone or character (if necessary). The difference is compared to the following criteria to evaluate the likelihood of complaint.

- A difference of around +10 dB or more indicates that complaints are likely.

- A difference of around +5 dB indicates a marginal significance for complaint.

- A difference of -10 dB or less is a positive indication that complaints are unlikely.

The objective complaint rating method is only applicable for external noise levels.

3.3 Building Bulletin 93

Building Bulletin 93 [5] (BB93) is the current Building Control requirement document for the acoustic design of schools. The document provides performance standards suitable to provide acoustic conditions in schools that facilitate clear communication of speech between teachers and students, and that do not interfere with study activities.

BB93 states that the sound insulation performance of the building envelope needs to be sufficient to reduce the external environmental noise in sensitive areas to the internal ambient noise levels in Table 1. The indoor ambient noise level includes noise contributions from external sources outside the school premises (including road, rail and air traffic) and building services.

Table 1 below provides the performance standards for teaching spaces as shown within BB93 when they are unoccupied and unfurnished.

It should be noted that BB93 provides performance standards for ancillary spaces, such as offices, staff rooms and toilets. These are intended for guidance purposes only and do not form any part of the Building Control requirements.

Type of Room	Upper Limit for the Indoor Ambient Noise Level $L_{Aeq,30min}$ dB
General teaching areas, classrooms, seminar rooms, language laboratories	35[1]
Open-plan: Teaching Areas Resource Areas	 40 40
Music: Music classroom Small practice / group room Ensemble room Performance / recital room Recording Studio Control room for recording	 35[1] 35[1] 30[1] 30[1] 30[1] 35[1]
Libraries: Quiet Study Areas Resource Area	 35[1] 40
Science Laboratories	40
Drama Studio	30[1]
Design and Technology: - Resistant Materials, CAD CAM Areas - Electronics/control, textiles, food, graphics, design/resource areas	 40 40
Art Rooms	40
Assembly halls, multi-purpose halls (drama, PE, audio/visual presentations, assembly, occasional music)	35[1]
Indoor Sports Hall	40
Interviewing / counselling rooms, medical rooms	35[1]
Ancillary Spaces: *Offices, staff rooms* *Corridors, stairwells* *Changing Areas* *Toilets*	*40* *45* *45* *50*

Table 1: Performance Standards for Indoor Ambient Noise Levels when Unoccupied and Unfurnished

Note [1]: For rooms having limits of 35 dB or less, the noise level should not regularly exceed 55 dB $L_{A01,30min}$.

Additionally BB93 states that:

"Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$."

Although it should be noted that this statement is provided for guidance purposes only and does not form part of any Statutory Requirements, it is none the less an aspirational target for external spaces.

3.4 Building Bulletin 101

Building Bulletin 101 (BB 101) [6] provides the regulatory framework in support of the Building Regulations for the adequate provision of ventilation in schools. BB 101 states that:

"When the Design Capability Supply Rate of 8 l/s per person is provided by natural ventilation, the design should achieve the BB 93 performance standards for the indoor ambient noise levels in Table 1.1 of BB 93 when they have been increased by 5 dB $L_{Aeq,30min}$."

As such, a 5 dB relaxation in the noise intrusion criteria is applicable for the supply rate of 8 l/s with natural ventilation.

3.5 Local Planning Policy

3.6 Camden Development Policies 2010-2025, Local Development Framework

Camden's Development Policies form part of the Local Development Framework (LDF) and contains a single policy relating to noise, Development Policy (DP) 28.

3.6.1 Development Policy 28 – Noise and Vibration

DP 28 states the following:

"The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a) Development likely to generate noise pollution; or

b) Development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided."

In relation to the control of noise from new sources, the policy states:

"The Council will only grant permission for plant or machinery if it can be operated without causing harm to amenity and does not exceed our noise thresholds."

The policy goes on to provide a table defining noise levels from plant or machinery at which planning permission will not be granted, this table is copied below for reference.

Noise Description and Location of Measurement	Period	Time	Noise Level
Noise at 1 metre external to a sensitive façade	Day, Evening and Night	0000 - 2400	5 dB(A) < L_{A90}
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade	Day, Evening and Night	0000 - 2400	10 dB(A) < L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade	Day, Evening and Night	0000 - 2400	10 dB(A) < L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90} > 60 dB	Day, Evening and Night	0000 - 2400	55 dB L_{Aeq}

Table 2: Noise Levels from Plant or Machinery at which Planning Permission will not be Granted

On the basis of DP 28 and as seen in previous conditions imposed by Camden Council, the following requirements with relation to internal noise levels and building services noise are proposed.

3.6.2 Building Services - Noise

On the basis of Table 2 above, Camden Council is understood to require the building services noise emission limit to be 5 dB below the existing background noise level ($L_{A90,T}$) where the measured $L_{A90,T}$ is less than 60 dB, such that noise from building services plant does not increase the existing background noise level. Table 3 below outlines the criterion.

Description of Noise Source	Noise Emission Limit
Building Services	$L_{Ar,Tr} = L_{A90,T} - 5$ dB(A)

Table 3: Camden Council's Noise Emission Limits for Building Services

In addition, plant noise that is tonal, contains a specific character or is intermittent, is required to be an additional 5 dB(A) below the existing background noise level. The methodology used here follows BS 4142.

In instances where the measured background noise level $L_{A90,T}$ exceeds 60 dB, Camden Council is understood to require a fixed building services noise emission limit of 55 dB.

4.0 Environmental Noise Surveying

An acoustic survey has been carried out at the proposed site to establish the prevailing environmental noise conditions local to the site, so as to determine building services plant noise emission limits and to advise upon the building envelope and ventilation strategy.

The survey comprised two different aspects:

- Automatic unattended noise measurements (commenced Tuesday 24th September through to Tuesday 1st October 2013); and
- External attended octave band noise measurements (on Friday 20th September 2013).

The measurement instrumentation used is listed in Appendix A attached and a general acoustic terminology is provided in Appendix B.

During the measurement periods, temperatures remained warm with some precipitation and winds varying in both direction and strength.

4.1 Unattended Noise Measurements

The unattended noise survey comprised seven days of automatic measurements by a single logger at existing roof level. The position of this noise monitor is shown as position L1 in Figure 1 attached. This measurement position was considered “free-field” at a height of approximately 1.5 metres above roof level.

Measurements recorded consisted of five minute samples of ambient noise levels ($L_{Aeq,5min}$ in dB), maximum noise levels ($L_{Amax,5min}$ in dB) and background noise levels ($L_{A90,5min}$ in dB) between Tuesday 24th September 2013 and Tuesday 1st October 2013.

A time history of the L_{Aeq}, L_{A90} and L_{Amax} from the unattended measurements recorded at position L1 is shown in Figure 6 attached.

Background noise levels measured at the unattended noise logger indicate that the lowest levels could drop to approximately $L_{A90,1hr}$ 43 dB during the daytime (0700 to 2300) and $L_{A90,5min}$ 31 dB during the night-time (2300 to 0700).

4.2 Attended Noise Measurements

Octave band measurements have been conducted at four positions at ground floor level. The position of these measurements at ground floor level is shown as positions S1, S2, S3 and S4 in Figure 1 attached. All of these measurements were hand-held samples at a height of approximately 1.2m above ground floor level and considered “free-field”.

Table 4 below provides a summary of the overall results. Octave band measurements were conducted over several five and ten minute periods but given the nature of the surrounding noise climate are deemed to be representative of a thirty minute period. Full details of the hand-held octave band measurements at all positions during the daytime are shown in the tables within Appendix C attached.

Measurement Position	Maximum $L_{Aeq,30min}$ dB	Maximum $L_{A01,30min}$ dB	Minimum $L_{A90,30min}$ dB
S1	58	68	51
S2	58	66	49
S3	46	54	42
S4	46	55	42

Table 4: Summary of Attended Noise Measurements

5.0 Noise Sensitive Areas

A noise sensitive area is defined as landscapes or buildings where the occupiers are likely to be sensitive to noise created by new plant installed in the proposed development, including residential areas. The nearest noise sensitive areas to the proposed site is therefore identified as the proposed development itself, William Ellis School (approximately 20m to the north) and residential dwellings along Highgate Road and Lissenden Gardens (approximately 60m to east and 15m to the south respectively) as indicated in Figure 7 attached.

6.0 Noise Emissions of Fixed Plant

Noise levels due to building services serving the proposed development are advised to meet the following noise level criteria shown below in Table 5 one metre from the nearest noise sensitive area as defined within Section 5.0 above (expressed as "free-field"). These are based on the background noise levels measured at position L1, which are deemed representative of the nearest noise sensitive receptor.

There is unlikely to be any significant building services plant operating overnight associated with the proposed school development, however night-time noise emission limits have been provided should building services plant need to remain operational overnight.

Period	Lowest Prevailing Background Noise Level $L_{A90,T}$ dB	Noise Emission Limit Calculation $L_{Ar,Tr}$ dB
Daytime (0700 to 2300)	43	38
Night-Time (2300 to 0700)	31	26

Table 5: Building Services Noise Emission Limits

It should be noted that these are the combined operational noise levels of proposed fixed plant at the nearest noise sensitive façade (expressed as "free-field"). As such, the combined operational noise levels of all plant are required to achieve the noise limits defined within Table 5.

For plant noise that is tonal, contains a specific character or is intermittent, the limits of Table 5 above need to be reduced by 5 dB(A). Therefore, a worst case design basis would be to achieve the values of Table 5 minus 5 dB(A).

Prior to installation, a detailed assessment of the noise emissions from all building services plant shall be undertaken to ensure compliance with the building services noise emission limit. The resultant sound pressure level one metre from the nearest noise sensitive receptor shall be calculated using the principles of ISO 9613-2 [7] and compared to the noise emission criterion.

All items of building services plant will be selected such that compliant noise emissions at the nearest noise sensitive receptor are provided. Attenuators and acoustic screening will also be provided, if necessary, to ensure compliance with these limits.

8.0 Building Envelope and Ventilation Strategy

The sound insulation properties of the building envelope and ventilation strategy depend upon the external noise levels present at the façade and the proposed design criteria for the internal noise levels of specific rooms, dependant on their use.

Table 6 below provides an outline review of the proposed internal spaces with regards to the required sound insulation on different façades as identified in Figure 8 attached.

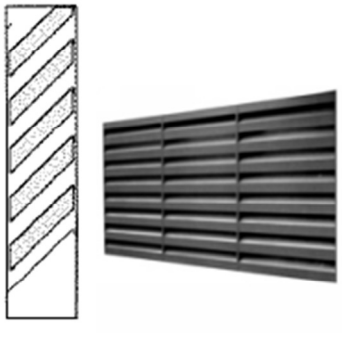
Façade	Internal Space	Noise Levels (dB)				
			All Ventilation		Natural Ventilation (Open Windows) Only	
		Measured External $L_{Aeq,30min}$	BB93 Proposed Internal (Maximum) $L_{Aeq,30min}$	Minimum Level Difference D	BB 101 Proposed Internal (Maximum) $L_{Aeq,30min}$	Minimum Level Difference D
North-Eastern	Performance Spaces (Music Recital, Drama)	58	30	28	35	23
	General Teaching Rooms & Meeting Rooms	58	35	23	40	18
	Open Plan Teaching, Science, Sports Hall	58	40	18	45	13
	Toilets	58	50	8	55	3
All Other	Performance Spaces (Music Recital, Drama)	48	30	18	35	13
	General Teaching Rooms & Meeting Rooms	48	35	13	40	8
	Open Plan Teaching, Science, Sports Hall	48	40	8	45	3
	Toilets	48	50	-2	55	-7

Table 6: Natural Ventilation Feasibility

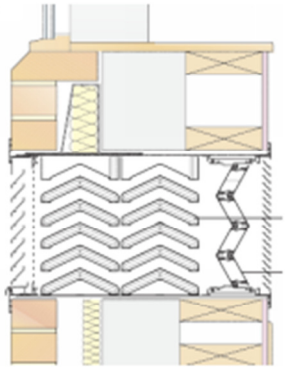
Simple natural ventilation through the use of opening windows will provide a level difference (D) in the order of 10 dB. It can be seen from Table 6 above that the Toilets on the north-eastern façade and rooms with a BB 93 upper limit for indoor ambient noise level of 35 dB or greater on all other façades can be considered for natural ventilation via opening windows provided the relaxation criteria of BB 101 is applied.

Passive acoustically attenuated ventilation can generally be designed to provide a level difference (D) in the order of 20 dB to 25 dB. It can be seen that internal spaces with a BB 93 upper limit for indoor ambient noise level of 35 dB or greater on the north-eastern façades and 30 dB or greater on all other façades can be considered for passive acoustically attenuated ventilation.

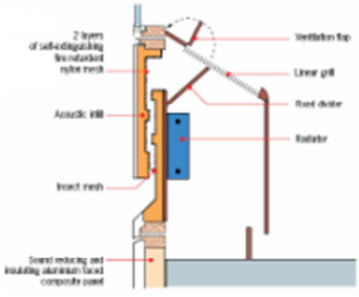
The acoustic treatment required to permit passive acoustically attenuated ventilation would be extensive and the following images describe three ways of how this may be achieved with a through-the-wall type system. The specifics of any such system will be determined during detailed design.



Option 1. Proprietary Acoustic Louvres (e.g. Passivent)



Option 2. Proprietary Through Wall Vents



Option 3. BB93 Bespoke System

All other internal rooms on the north-eastern façade requiring noise levels of less than 35 dB (BB 93 $L_{Aeq,30min}$) would require full mechanical ventilation.

Calculations have been undertaken to determine the sound insulation requirements of the building envelope to achieve BB93 internal noise levels ($L_{Aeq,30min}$ and $L_{A1,30min}$) with an assumption that all non-glazed façades achieve a sound reduction of R_w 45 dB. An example of an external wall capable of achieving this requirement is a cavity brickwork wall.

The calculations indicate that glazed façade elements to north-eastern facing rooms are required to achieve a sound insulation performance of minimum R_w 32 dB as a whole unit (frames, seals etc.). Such a performance is readily achievable by a standard thermal double glazing unit.

The location of elements of the new building is such that it is within close proximity of the nearest noise sensitive residential properties to the south. The distance between the closest part of the building and the nearest noise sensitive façade being approximately 15m. In addition, the William Ellis School to the north and other Parliament Hill School buildings will also be considered noise sensitive. In addition to building services plant, there are potentially three noise sources of significance to be considered as follows:

- Activity noise breakout from Activity Hall and Studio (Fitness);
- Activity noise breakout from Design and Technology spaces; and
- Activity noise breakout from the Music Department (including practice and class rooms).

Music noise levels will be in the order of $L_{Aeq,T}$ 90 dB(A) during worst case periods and more typically $L_{Aeq,T}$ 80 dB(A) at other times. With windows open the breakout noise level predicted at the nearest sensitive receptors could be in the order of $L_{Aeq,T}$ 55 dB(A) worst case and more typically $L_{Aeq,T}$ 45 dB(A). These received noise levels are greater than the prevailing background noise levels in areas more screened from road traffic noise and therefore give potential for noise nuisance to prevail.

In order to mitigate the operational noise break-out, it is advised to consider a full mechanical ventilation strategy for all high noise generating spaces such that windows can remain closed. In particular the following spaces are advised to consider full mechanical ventilation:

- All music rooms (including practice and class rooms);
- Design and Technology Spaces; and
- Activity Hall, Hall (Cinema) and Studio (Fitness).

9.0 Summary and Conclusions

Hoare Lea Acoustics has conducted an environmental noise survey for the proposed development at the Parliament Hill School within the London Borough of Camden. Unattended noise monitoring throughout a typical seven day period and sample octave band measurements were conducted.

Background noise levels typical of the daytime and night-time have been measured and used to define building services plant noise emission limits at the nearest noise sensitive receptors. The nearest receptors have been identified as the proposed development itself, the William Ellis School and existing residential dwellings along Highgate Road and Lissenden Gardens.

During the daytime the combined building services plant noise emission contribution limit advised is 38 dB(A) and during the night-time the contribution limit advised is 26 dB(A). A further minus 5 dB correction may be applicable in accordance with the tonal correction defined in BS 4142. It is noted that there is unlikely to be any significant building services plant operating overnight associated with the proposed school development.

All items of building services plant will be selected such that noise emissions at the nearest noise sensitive receptor comply with the derived noise emission criterion. An assessment of the noise emissions from all externally located plant will be undertaken to ensure compliance with the building services noise emissions limits. Additional attenuators and acoustic screening shall be provided, if necessary, to ensure compliance with these limits.

An assessment of the building envelope and ventilation strategy is provided with a level difference (D). Simple natural ventilation via opening windows is permissible for toilets on the north-eastern facing façade and rooms on all other façades to the rear of the Morant Building with an upper limit for indoor ambient noise (BB 93) of 35 dB or greater, providing the relaxation criteria of BB 101 is applied.

All other rooms will need to employ attenuated mechanical ventilation or passive acoustically attenuated ventilation in order to achieve BB 93 compliance for ambient noise levels, as the level differences required are above those achievable with simple natural ventilation.

Noise intrusion calculations have also been undertaken to determine the sound insulation performance requirements of glazed elements to achieve the indoor ambient noise levels defined within BB 93. The calculations indicate that the glazed elements are required to achieve a minimum of R_w 32 dB as a whole unit (seals, frames etc.). Such a performance is readily achieved by a standard thermal double glazing unit.

The potential activity noise generation from the use of rooms within the Music Department, Design and Technology Spaces and Activity Hall has the potential to give rise to noise nuisance at the nearest noise sensitive receptors. It is therefore advised that full mechanical ventilation be considered to all high noise generating spaces (including Music rooms, the Activity Hall and the Hall (Cinema)) to mitigate the impact of activity noise at the nearest noise sensitive receptors.

10.0 References

1. National Planning Policy Framework, Department for Communities and Local Government, March 2012.

2. BS 8233: 1999, 'Sound Insulation and Noise Reduction for Buildings - Code of Practice'.

3. World Health Organisation (WHO) - Guidelines for Community Noise, 2000.

4. BS 4142: 1997: 'Method for rating industrial noise affecting mixed residential and industrial areas'.

5. Skills, Department for Education and. Building Bulleting 93, Acoustic Design of Schools.

6. Department for Communities and Local Government, TSO 2006. Building Bulleting 101, 'Ventilation of School Buildings'.

7. ISO 9613-2: 1996, 'Acoustics - Attenuation of Sound during Propogation Outdoors - Part 2'.

FIGURES

Figure 1: Plan of Existing Site – Noise Survey (Indicative Only)

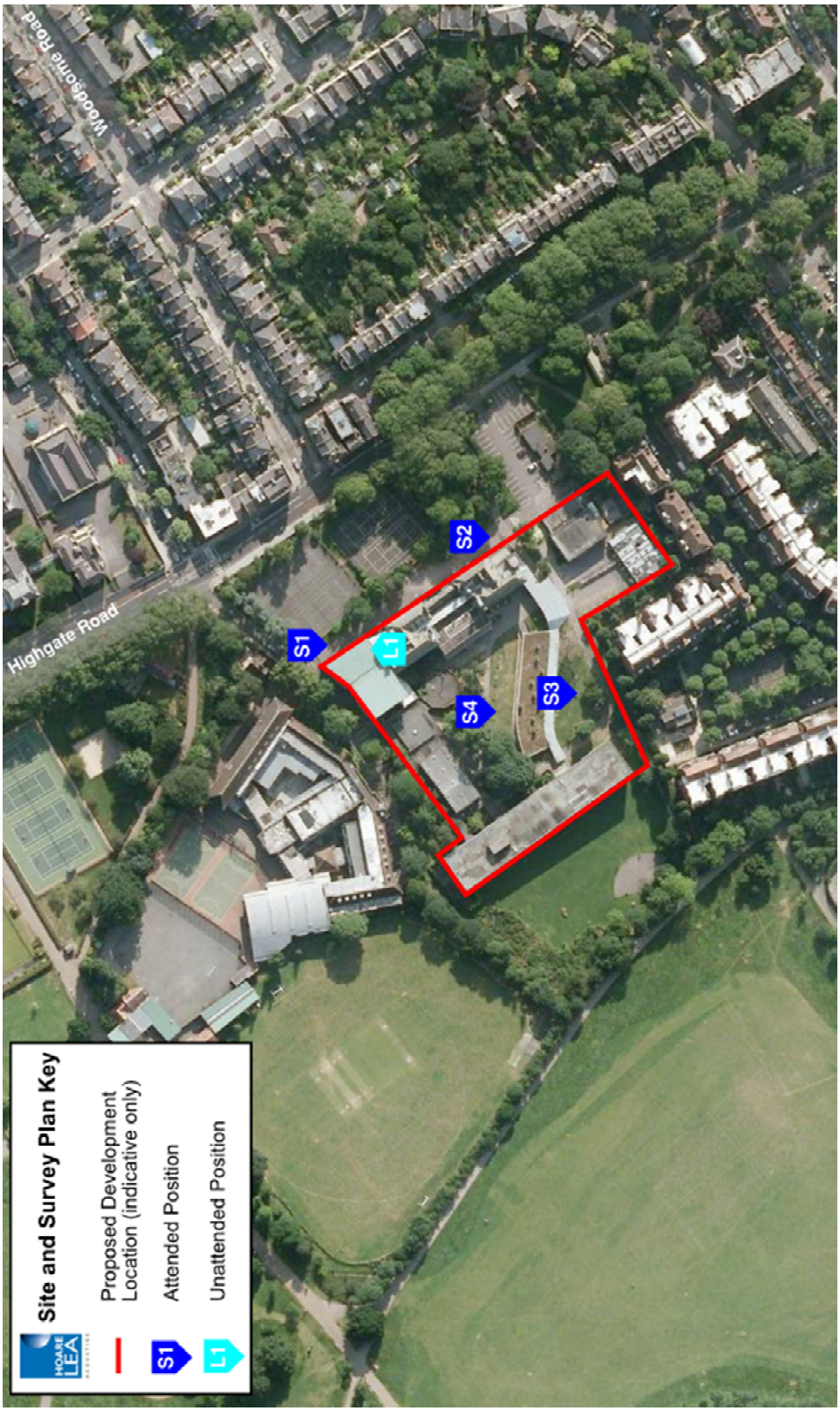


Figure 2: Proposed Lower Ground Floor Plan

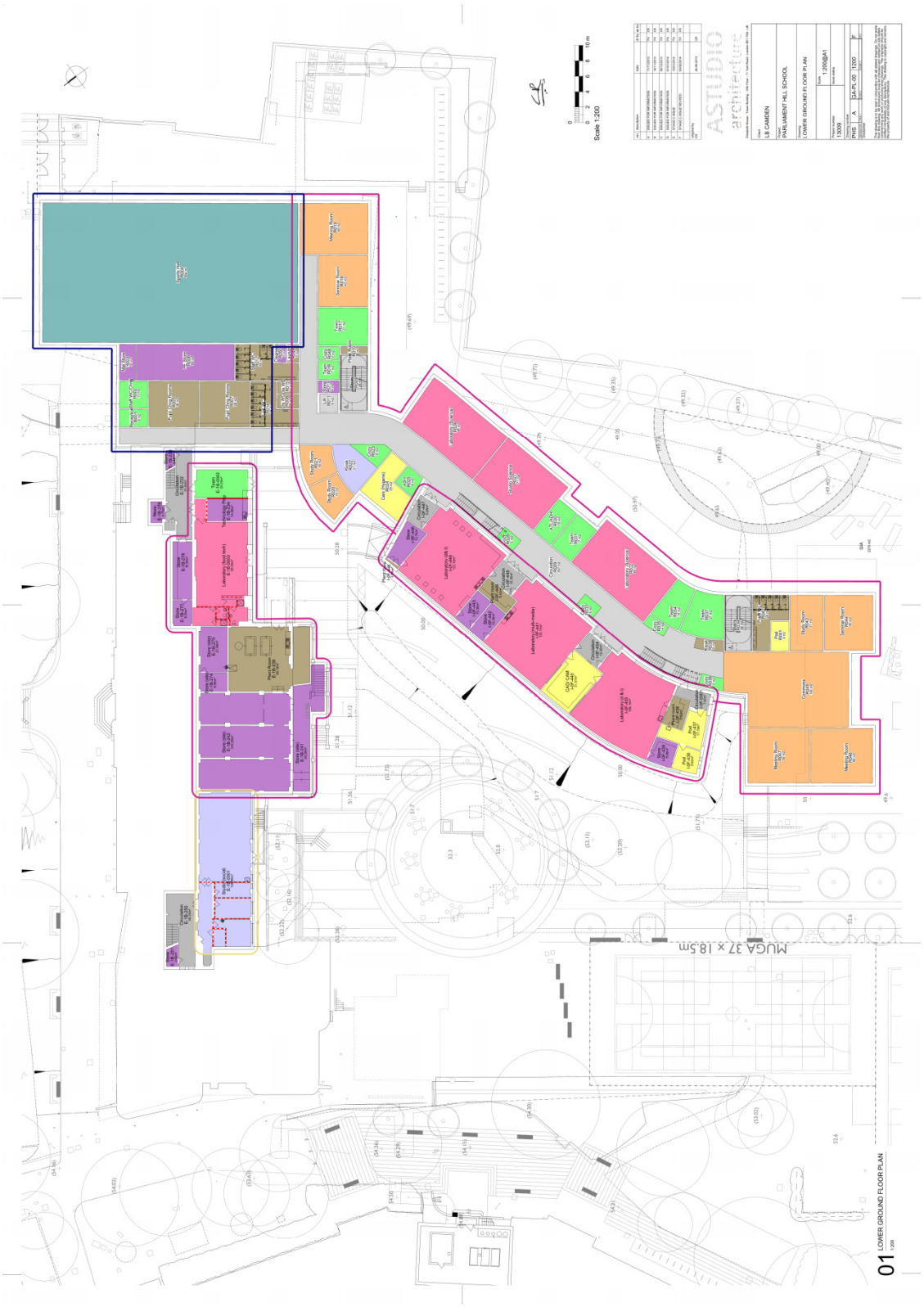


Figure 3: Proposed Ground Floor Plan