CAMDEN PSBP
HAMPSTEAD SECONDARY SCHOOL

ENVIRONMENTAL NOISE SURVEY REPORT
119205 AC 7V2

Date: 09.03.2015	Authorised by: Owen Downey MIOA Senior Acoustic Consultant	Signed:
	For and on behalf of HRS Services Ltd.	

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1. Introduction

1.1 Wates Construction appointed HRS Services Ltd. (HRS) to carry out an environmental noise survey for the proposed construction of a new building at Hampstead Secondary School.

1.2 The purpose of this assessment is to determine suitability of the existing noise climate at the site with regard to satisfying the relevant criteria given in Department for Education Acoustic Performance Standards for the Priority Schools Building Programme v1.7 June 2013, and inform acoustic design of the project with particular reference to indoor ambient noise levels within teaching spaces, and establishing background noise levels at nearby noise sensitive receptors.

1.3 The acoustics team at HRS is formally trained in acoustics and all members are qualified with an acoustics degree or post-graduate acoustic level qualification. Specialising in Building Acoustics, all acoustics staff are either Corporate (MIOA) or Associate (AMIOA) Members of the Institute of Acoustics. HRS have been UKAS accredited for on-site sound insulation testing (laboratory no. 2587) since 2006 and are routinely accepted by both the BRE and Building Control nationwide as 'suitably qualified' for acoustic assessment purposes. HRS Senior Acoustic Consultant, Owen Downey, is the lead consultant responsible for this assessment. Owen has a BSc (Hons) in Audio Technology and Acoustics from Salford University, and is a Corporate Member of the IOA (MIOA). Owen therefore meets the BRE definition of a suitably qualified acoustician.

1.4 This document has been prepared for the sole use, benefit and information of Wates Construction for the purposes set out in the document or instructions commissioning the works. The liability of HRS in respect of the information contained herein will not extend to any third party.

1.5 This report is limited to addressing the specific acoustic issues contained herein and is based on information and drawings provided by the client.

1.6 Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature; to assist the reader, a glossary of terminology is included in Appendix I.

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2. Site Description

2.1 The proposed location of the new building is off Westbere Road, in the London Borough of Camden, within the grounds of Hampstead School.

2.2 The grounds are currently occupied by the existing Hampstead School buildings and associated car parking and recreational areas. The grounds are bounded by Westbere Road to the west, with a railway line situated approximately 120m to the west from the location of the proposed building. Residential roads are located to the north and south, Horton Avenue and Menelik Road, respectively. Playing fields extend approximately 400m to the north-east and east of the school grounds.

2.3 HRS understands the proposed scheme involves the demolition of the existing 'quad' building, remodelling of the surrounding open ground and the construction of a new 3-storey classroom block, sports hall and recreation areas.

2.4 The prevailing noise climate at the location of the proposed buildings was dominated by distant road traffic, with occasional passing trains and aircraft, although all transport noise was of a low-level.

2.5 The noise climate during the night time survey was controlled by distant traffic noise and occasional passing cars on Westbere road. No cars passed on Menelik Road or Horton Avenue during the night survey, and no rail traffic was noted.

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3. Noise Survey

3.1 A daytime ambient noise survey was undertaken in order to assess the current noise climate at the site of the school. Measurements were taken during typical school hours on 29th August 2014

3.2 Noise levels were measured using a UKAS calibrated B&K 2260 Investigator Class 1 precision integrating sound level meter. Calibration checks were carried out both before and after the measurements with no significant variance observed. Noise was measured in terms of broadband A-weighted indices and spectral terms to assist with the design of noise control measures. Weather conditions during the survey were dry and calm with wind speeds of less than 5 ms^{-1}. The sound level meter was mounted on a tripod at an approximate height of 1.5m and fitted with a proprietary outdoor microphone kit.

3.3 Although BB93 specifies indoor ambient noise levels in terms of $L_{Aeq,30min}$, where there is negligible change in noise level, shorter measurement periods are generally accepted as being representative. Generally, 10 minute measurement periods were taken as providing representative samples of the prevailing noise climate.

3.4 Daytime measurements were taken at positions D1 and D2 are considered representative of noise levels incident upon the façade of the proposed buildings. Noise levels at these positions were dominated by distant road traffic noise, with very occasional noise from road traffic on Westbere Road.

3.5 Daytime measurements at position D3 were taken in order to determine noise levels from traffic on Westbere Road.

3.6 Night time measurements were taken on the morning of 29th August 2014 at measurement position N1 and N2; representative of noise levels at the nearest noise sensitive receivers located on Menelik Road and Horton Avenue respectively. In general, night time background noise levels were very consistent and measurements at N1 are considered to be representative of measurements at N2.

3.7 The measurement results are detailed in Appendix II and summarised in Table 1 below.

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Table 1: Summary of measured daytime noise levels, dB(A)

Measurement Location	Daytime		
	$L_{Aeq,10min}$	$L_{AF10,10min}$	$L_{AF90,10min}$
D1	48 – 52	50 – 57	44 – 45
D2	51 – 52	53 – 55	44
D3	66 – 67	70	52 – 54

Table 2: Summary of measured night time noise levels, dB(A)

Measurement Location	Night Time		
	$L_{Aeq,5min}$	$L_{AFmax,5min}$	$L_{AF90,5min}$
N1	38 – 40	53 – 54	36 – 37
N2	38	54	36

Figure 1: Proposed site layout, overlaid on photograph, with approximate measurement positions

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4. Design Requirements

Part E Building Regulations - BB93

4.1 *Approved Document E (2003) of the Building Regulations* includes new 'school' buildings, within its scope under Requirement E4 of Part E of the Building Regulations 2010. Section 8 of Approved Document E states that the normal way of satisfying Requirement E4 for new school buildings is to meet the performance standards set out in Building Bulletin 93 'Acoustic Design of Schools' (BB93).

4.2 BB93 provides guidance for acoustic design and mainly considers the following acoustic issues:

- Indoor ambient noise levels (IANLs) in unoccupied spaces
- Airborne and impact sound insulation between spaces
- Reverberation in teaching and study areas
- Sound absorption in corridors, entrance halls and stairwells

4.3 For schools procured under PSBP, the DfE published a separate document for use in determining acoustic performance standards, Acoustic Performance Standards for the PSBP v1.7, June 2013 (PSBP). It is understood that the document will be used in this capacity on the scheme.

Control of External Noise Impact from Building Services

4.8 Whilst HRS are aware that the scheme is targeting the BREEAM 2014 Pol 05 credit covering control of noise impact from building services, it is common for Local Authorities to have more stringent criteria. At the time of writing HRS are aware of Camden Development Policy 28.

BREEAM POL 05 – Control of noise pollution

4.9 For control of mechanical services noise in all buildings, BREEAM 2014 Pol 05 states that the credit may be awarded;

" Where there are or will be noise-sensitive areas or buildings within 800m radius of the assessed development a noise impact assessment in compliance with BS 7445:1991 has been carried out and the following noise levels measured/determined:

a. Existing background noise levels at the nearest or most exposed noise-sensitive development to the proposed development or at a location where background conditions can be argued to be similar.

b. The rating noise level resulting from the new noise-source.

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The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (0700hrs to 2300hrs) and +3dB at night (2300hrs to 0700hrs) compared to the back-ground noise level. "

The requirements of BREEAM Pol 05 are less stringent than those of DP28, and as such will be expected to be met by default.

Façade Noise Exposure

4.10 The overall sound insulation performance of the external building envelope will be dictated by the glazing as this is typically the weakest acoustic element. Based on the measured external noise levels, provision of standard thermal double glazing should be capable of providing suitable sound insulation. Glazing and solid façade build up for the new scheme should nonetheless be further assessed at the detailed design stage to ensure that internal noise criteria are satisfied. HRS recommends that third octave sound insulation test data for the glazing system – including the framing –is requested from glazing suppliers for full assessment.

Ventilation Strategy

4.11 Generally, teaching spaces are to incorporate a hybrid ventilation system and, therefore, suitable ventilation can be achieved with windows closed, thereby maintaining the sound insulation of the building envelope to meet PSBP IANL targets. In hybrid ventilation systems, the systems shall be specified to ensure that combined noise levels from intrusive noise and building services noise are below the IANLs given in Table 1 of PSBP.

4.12 Section 2.1.4 of PSBP includes the following statement:

"When systems are operating in natural ventilation mode, with windows and vents set to provide a carbon dioxide concentration of 1500 ppm or less for the design mid-season weather condition, the IANL shall not exceed the IANLs given in Table 1 by more than 5dB. The design mid-season weather condition is defined as an inside air temperature of 20 °C and outside air temperature of 11 °C with an average external wind speed of 1.5 m/s."

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4.13 In line with PSBP guidance, the hybrid ventilation system provides a means to increase air velocity to improve comfort during unusually hot weather, e.g. by opening windows, use of local fans, boosting mechanical ventilation. Under peak summertime conditions (daily average outdoor temperature >23°C), the room users may determine their preferred balance between thermal comfort (e.g. via open windows) and higher IANL. It would be expected in these instances for IANLs to be no greater than 5dB in excess of the IANLs specified in Table 1 of PSBP on the basis of external levels being between 48 and 52dB L_{Aeq}.

External Areas

4.14 While not covered in PSBP, BB93 states that in terms of sensitivity to noise sites suitable for schools should preferably experience noise levels not exceeding 55dB $L_{Aeq,30min}$ in unoccupied playgrounds, playing fields and outdoor areas. The noise measurement results show that existing daytime ambient noise levels across the site indicative of the proposed external areas range between 48-52dB L_{Aeq}, and therefore external noise levels meet the BB93 target for outdoor teaching activity.

Control of Mechanical Services External Noise Impact

4.16 DP28 of Camden Development Policies 2010 provides guidance on plant noise rating limit in order to minimise disturbance to existing residences. In general, noise from fixed building services plant should be no greater than 5dB below the prevailing background noise at the nearest noise-sensitive receiver, stated in terms of dB L_{A90}, and no greater than 10dB below the prevailing background noise when acoustic features such as tonal or impulsive components are present. Plant noise Rating Limits are outlined in Table 3 below.

4.17 Wherever possible, the general acoustic principal of reducing the level of noise at source is recommended as the best way of reducing noise impact. Where this measure on its own may not be sufficient, additional suitably designed mitigation measures such as noise barriers, lagging materials, or acoustic attenuators/louvres may be used to control the plant noise in order to achieve the required Rating Level.

4.18 Based on HRS Services' background noise survey data provided in this report, assessment in accordance with the requirements of DP28 indicates that total emission levels for plant noise, including acoustic feature corrections where applicable, should not exceed the maximum Rating Level value in Table 3. HRS understands that plant equipment will not be operation outside of normal school operational hours. It is recommended that mechanical engineers are made aware of the proposed plant noise limit in order to inform plant unit specification and selection.

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Table 3: BS7445 Maximum Plant Noise Limits at Nearby Residential Properties

Location	Daytime BS7445 Rating Level $L_{Ar,Tr}$ (dB) 0700-2300hrs	Nighttime BS7445 Rating Level $L_{Ar,Tr}$ (dB) 2300-0700hrs
Nearest residential property	39	31

4.19 The Rating Level described above should be assessed in accordance with BS7445:1991, including appropriate consideration of any tonal or impulsive characteristics of the proposed mechanical services plant. It is prudent to ensure that mechanical services noise is designed to be sufficiently below the external noise limit criteria such that the cumulative noise level from all sources does not exceed the stated target level.

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APPENDIX I – Noise Units and Indices

a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

b) Frequency and hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Glossary of Terms

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{A90} This is the A-weighted sound level which is exceeded for 90% of the measurement period. The L_{A90} is typically used as an indication of background noise levels.

L_{A10} This is the A-weighted sound level which is exceeded for 10% of the measurement period.

L_{A1} This is the A-weighted sound level which is exceeded for 1% of the measurement period.

L_{AFMax} This is the maximum, fast A-weighted sound level during the measurement period.

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APPENDIX II – Survey Results

All noise levels in dB(A)

Daytime noise levels measured on 29th August 2014

The most prominent noise sources at the site were noted as being distant road traffic.

Position	Start Time	$L_{Aeq,10min}$ (dB)	$L_{A10,10min}$ (dB)	$L_{AF90,10min}$ (dB)
D1 Free-field	10:49	48.3	50.2	43.6
	11:22	51.7	56.8	44.6
Position	**Start Time**	**$L_{Aeq,10min}$ (dB)**	**$L_{A10,10min}$ (dB)**	**$L_{AF90,10min}$ (dB)**
D2 Free-field	10:57	51.5	53.4	44.0
	11:29	50.9	54.6	43.8
Position	**Start Time**	**$L_{Aeq,10min}$ (dB)**	**$L_{A10,10min}$ (dB)**	**$L_{AF90,10min}$ (dB)**
D3 Free-field	11:10	66.1	70.2	52.0
	11:37	67.0	70.4	53.8

Night time noise levels measured on 29th August 2014

Position	Start Time	$L_{Aeq,5min}$ (dB)	$L_{Amax,5min}$ (dB)	$L_{AF90,5min}$ (dB)
N1 Free-field	01:41	38.0	53.4	36.0
	01:48	38.2	52.8	35.8
	01:54	40.2	53.8	36.6
Position	**Start Time**	**$L_{Aeq,5min}$ (dB)**	**$L_{Amax,5min}$ (dB)**	**$L_{AF90,5min}$ (dB)**
N2 Free-field	02:05	38.3	54.1	36.1

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APPENDIX III – Site Plan

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