

Date: 29th June 2022

Ref: 22174/001/js

**HIGHGATE SCHOOL SCIENCE BLOCK EXTENSION
EXTERNAL PLANT SOUND ASSESSMENT**

ENVIRONMENTAL SOUND SURVEY REPORT

Client: Highgate School

Report au

Approved

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1.0 Introduction

- 1.1 An environmental sound level survey has been undertaken to determine the prevailing background sound levels at the nearest appropriate assessment location regarding the proposed plant installation associated with the development at Highgate School, N6 4AY and to establish appropriate sound emission criteria for new building services plant in accordance with local authority requirements.
- 1.2 This report can be used to support the planning application for the development.
- 1.3 To allow for flexibility in design for the plant, this report sets out plant sound emission limits have been established in accordance with likely local authority criteria at the nearest appropriate assessment location. A full plant sound emission assessment will be completed to address any planning conditions relating to sound.

2.0 Site Description

- 2.1 It is understood that the proposed plant will consist of six Mitsubishi CAHV-P500YB-HPB Ecodan air source heat pumps (ASHP) in a rooftop louvered enclosure.
- 2.2 The nearest appropriate assessment location has been determined to be the rear façades of the Alms Houses, 15 to 37 Southwood Lane to the east of the development site. The rear façade of 15 Southwood Lane is only about 2.5m from the shared boundary with Highgate School.

3.0 Site Sound Survey

- 3.1 Instrumentation: NTI XL2 Class 1 sound level meter (Serial No. A2A-10121-EO). The instrument was powered by an external battery and stored in a weather proof case. The instrument was checked for calibration before and after use with a Larson Davis type CAL 250 calibrator whereupon no calibration drift was recorded. The instrument was used in accordance with manufacturer's instructions.
- 3.2 Location: The monitor was located at the proposed location of the development and is considered representative of the sound climate at the nearest appropriate assessment location. The microphone was located on a tripod giving a measurement position approximately 2.3m above local ground level. Refer to Appendix 1 for the site plan and sound monitoring location.
- 3.3 Periods: Sound level monitoring was continuous from 17:00 hours on 7th June 2022 to 17:30 hours on 10th June 2022. The sound level meter was configured to monitor sound levels continuously in fifteen-minute intervals.
- 3.4 Weather: The prevailing weather conditions over the survey period were dry and calm. Wind speed, although not recorded, was considered to be less than 5 m/s throughout the survey periods.
- 3.5 Site Sound Characteristics: The ambient sound level was characterised by distant traffic sound from the surrounding road network and birdsong. It is considered that no unusual events occurred during the survey period, and the data is a true representation of ambient and background sound levels in the area.

3.6 Surveyor: Jay Butler (AMIOA)

3.7 Results: The results of the survey are summarised below in Table 1 showing the recorded values of background sound (L_{A90} dB). These results are considered free field sound levels. Appendix 2 presents graphical results for the whole survey period.

Table 1: Summary of Sound Measurement Results

Description	Typical Measured Background Sound Level
Daytime weekday (07:00 to 19:00)	42 dB L_{A90} (15 minutes)
Evening weekday (19:00 to 23:00)	38 dB L_{A90} (15 minutes)
Night-time (23:00 to 07:00)	34 dB L_{A90} (15 minutes)

3.8 Refer to Appendix 3 for a glossary of terms.

4.0 Plant Sound Criteria

4.1 From past projects undertaken for Highgate School it is understood that a typical planning condition imposed by the London Borough of Haringey upon plant associated with a development is as shown below:

'The design and installation of new items of fixed plant hereby approved by this permission shall be such that, when in operation, the cumulative noise level $L_{Aeq, 15 min}$ arising from the proposed plant, measured or predicted at 1m from the façade of nearest residential premises shall be a rating level of at least 5dB(A) below the background noise level L_{AF90} . The measurement and/or prediction of the noise should be carried out in accordance with the methodology contained within BS 4142: 1997. Upon request by the local planning authority a noise report shall be produced by a competent person and shall be submitted to and approved by the local planning authority to demonstrate compliance with the above criteria.'

With the typical reason given for imposing such a condition being, "to protect the amenities of nearby residential occupiers consistent with Policy 7.15 of the London Plan 2016 and Policy DM1 of The Development Management DPD 2017".

BS4142: 2014 +A1:2019 Criteria

4.2 Guidance on sound from mechanical services plant is contained in British Standard 4142:2014 "Method for rating and assessing industrial and commercial sound". BS4142 sets out a method by which the likely magnitude of adverse impact of sound from a commercial or industrial use on residential premises can be determined.

4.3 The method is based upon establishing the existing background $L_{A90, t}$ sound levels at the nearest appropriate assessment location against which the likely levels of sound from the proposed development are assessed. Sound from the proposed plant is assessed over a reference time interval of 1-hour during the day (07:00 hrs – 23:00 hrs) and 15-minutes during the night (23:00 hrs – 07:00 hrs).

4.4 The $L_{Aeq, 1hr}$ or $L_{Aeq, 15min}$ sound level from the proposed plant, as calculated to the appropriate assessment location, is the "specific sound level" of the plant. If it is likely that sound from the plant will be tonal at the assessment locations, or will be intermittent enough to attract attention, acoustic penalties will be added to the specific

sound level. The specific sound level is also to be corrected to account for “on-time” during the reference time interval if the plant is not continuous.

- 4.5 The *rating sound level* is then referenced to the background sound level and the difference noted. The likelihood of adverse impact is determined from the BS4142 method as indicated below;
- a) *Typically, the greater this difference, the greater the magnitude of the impact.*
 - b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
 - c) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
 - d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

5.0 Mechanical Plant Sound Emission Limits

- 5.1 In line with the above, it is proposed that plant sound emission is controlled to achieve a *rating sound level* 5 dB below the representative measured background sound levels for the given hours of operation when assessed to 1m from the worst affected window of the nearest appropriate assessment location. Accordingly, the proposed plant sound emission limits for this development are as follows:

Table 2: Proposed Mechanical Plant Sound Emission Criteria – Residential Properties

Description	Proposed Plant Sound Emission Criteria to Residential Buildings
Daytime weekday (07:00 to 19:00)	37 dB LAeq (1 hour)
Evening weekday (19:00 to 23:00)	33 dB LAeq (1 hour)
Night-time (23:00 to 07:00)	29 dB LAeq (15 minutes)

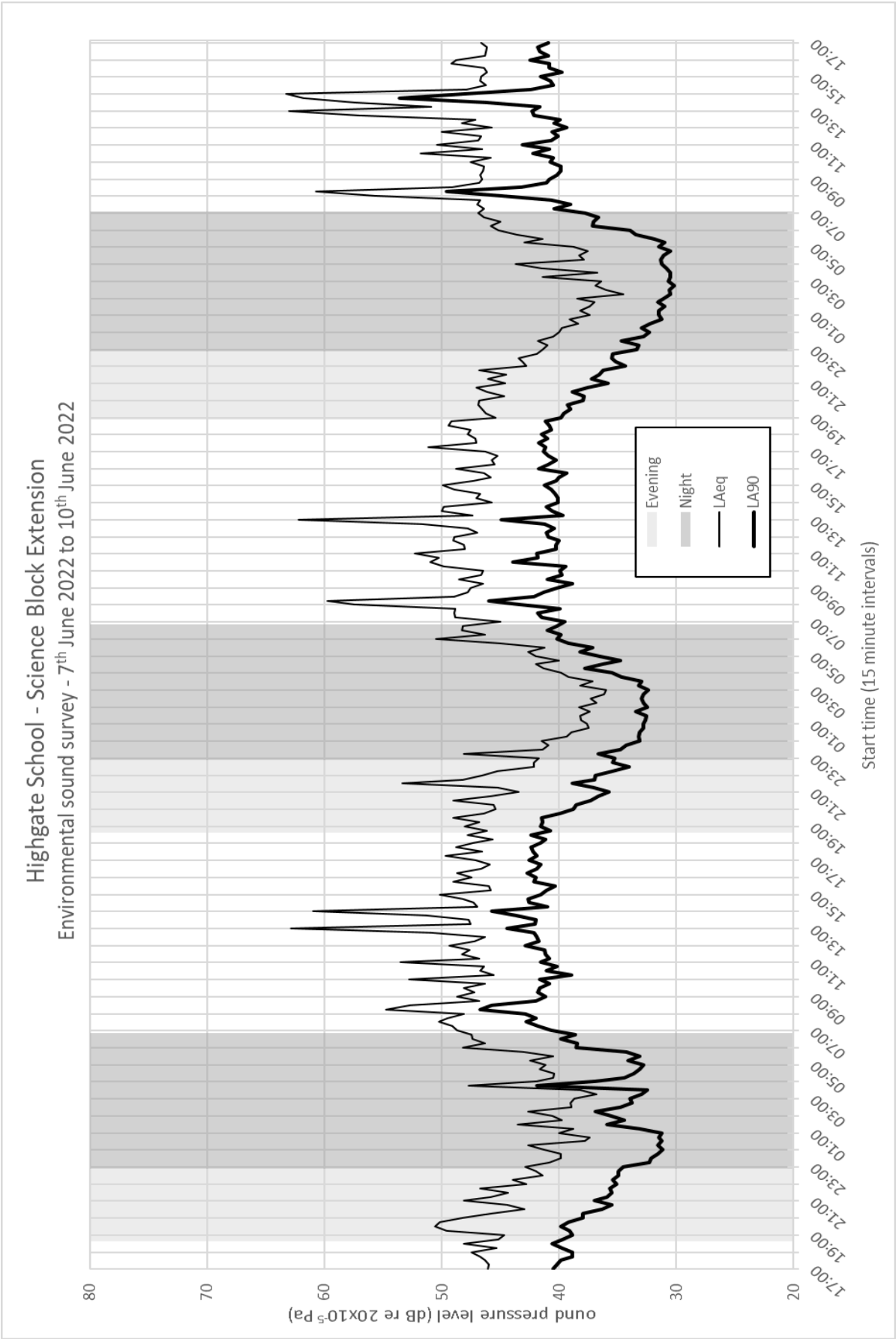
6.0 Conclusion

- 6.1 An environmental sound level survey has been undertaken in the vicinity of the proposed plant installation at the development site to establish the prevailing background sound levels at the site regarding the proposed installation of new building services plant equipment. The location of the nearest appropriate assessment location is the rear façades of the Alms Houses on Southwood Lane; their rear facades being only about 2.5m from the shared boundary with Highgate School.
- 6.2 Based on the results of the survey, mechanical plant sound emission criteria have been proposed in accordance with BS 4142, to be achieved at the worst affected window of the nearest appropriate assessment location.
- 6.3 A full plant sound emission assessment will be completed to discharge any planning conditions regarding sound.

Appendix 1: Site Plan & Measurement Location



Appendix 2: Environmental Sound survey Results



Appendix 3: Glossary of Terms

Term	Description	Explanation
	Noise	Unwanted sound. In the explanation given below the words 'sound' and 'noise' can often be used interchangeably, depending on context.
dB	The decibel scale	The decibel (or dB) scale is the scale on which sound pressure levels are commonly measured. It is a logarithmic scale and is used for convenience to compress the audible range of sound pressures into a manageable range, from 0 dB to 140 dB. The zero of the scale, 0 dB, corresponds to the threshold of hearing, 0.00002 Pa, and the upper limit, 140 dB, corresponds to 20 Pa, the threshold of pain.
	Sound pressure	Sound is a disturbance or fluctuation in air pressure, and sound pressure, measured in pascals (Pa), is used as a measure of the magnitude of the sound. The human ear can detect sound pressures in the range from 0.00002 Pa to 20 Pa. This is an enormously wide range and so for convenience sound pressures are commonly measured on a decibel (dB) scale.
Lp	Sound pressure level	Instantaneous value of Sound Pressure Level (Lp).
	Sound power	The sound energy radiated per unit time by a sound source, measured in watts (W)
Lw	Sound power level	Sound power measured on a decibel scale: $L_w = 10\log(W/W_0)$, where W_0 is the reference value of sound power, 10^{-12} W.
f	Frequency	The frequency of a musical note is what gives it its pitch. It is the number of cycles of the fluctuating sound pressure which occur each second, and is measured in cycles per second, or Hertz (Hz). The human ear can detect frequencies in the range 20 to 20 000 Hz. Most sounds and sounds are a mixture of all frequencies, called broad-band sound.
	Octave bands Octave band spectra	In order to investigate the frequency content of broad band sounds, called its frequency spectrum, measurements of sound pressure are carried out over a range of frequency bands. The most common method is to split the audio frequency range into 8 or 9 octave bands. An octave is a frequency range from one particular frequency to double that frequency.
	Free-field	A free field sound level measurement is one which is unaffected by the presence of any sound reflecting surfaces. In an outdoor situation this is usually taken to mean with no sound reflecting surfaces within 3 m. of the source.
	Facade correction Factor	The difference between the façade level and the free field level (in the absence of the façade) is called the façade correction factor.
A	A-weighting	One of the three frequency weightings (A, C and Z) used in sound level meters, and defined in BS EN ISO 61672-1; a very widely used method of producing a single figure measure of a broad band sound which takes into account, in an approximate way at least, the frequency response of the human hearing system. The idea is that sound levels measured in this way should give an indication of the loudness of the sound.
L _A (dBA)	A- weighted sound pressure level	The value of the sound pressure level, in decibels, measured using an A-weighting electronic circuit built into the sound level meter. The vast majority of sound measurements are carried out in this way.
L _{Aeq,T}	Equivalent continuous sound level	It represents a measure of the 'average' sound level over the measurement period. It corresponds to the steady level of sound which, over the same period of time, T, would contain the same amount of (A-weighted) sound energy as the time varying sound. Also known as the Average sound level. This is the most common method of measuring time varying sound, and within certain limits gives the best correlation with human response to sound, for example with annoyance.

$L_{AN,T}$	Statistical percentile sound levels	$L_{AN,T}$ is the sound level, usually A-weighted, which is exceeded for N% of the measurement period, T. The most commonly used values are $L_{A10,T}$ used for the measurement and assessment of traffic sound, and $L_{A90,T}$, commonly used as a measure of background sound. $L_{A1,T}$ and $L_{A99,T}$ are also occasionally used to give an indication of the highest and lowest sound levels occurring during the measurement time interval.
	Background sound	Ambient sound which remains at a given site when occasional and transient bursts of higher level ambient sound levels have subsided to typically low levels; it is the sound normally present for most of the time at a given site. It is usually described by the L_{A90} value.
$L_{A90,T}$	Background sound level	Defined in BS 4142 as the value of the A-weighted residual sound at the assessment position that is exceeded for 90 % of a given time interval, T, (i.e. $L_{A90,T}$) measured using time weighting, F, and quoted to the nearest whole number of decibels. (Also see under residual sound). Background sound itself often varies with time and so the $L_{A90,T}$ is almost universally used as the best measure of the 'more or less always present' sound level which underlies short term variations from other sources of sound.
	Specific Sound Source	The sound source under consideration when assessing the likelihood of adverse impact using BS4142:2014.
	Specific Sound Level	The value of $L_{Aeq,T}$ at the assessment position produced by the specific sound source, ref. BS4142:2014.
$L_{ar,Tr}$	Rating Level	The specific sound level, corrected to account for any characteristic features of the sound, by adding a rating penalty for any tonal, impulsive or irregular qualities, ref. BS4142:2014.
T_r	Reference time interval	Specified interval over which the specific sound level is determined, ref. BS4142:2014.
	Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, ref. BS4142:2014.
$L_r = L_{Aeq,T}$	Residual Sound Level	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T, ref. BS4142:2014.