hepworth acoustics

NEW SCIENCE BLOCK - XAVERIAN COLLEGE, RUSHOLME
PLANT NOISE ASSESSMENT

On behalf of:

AA Projects Ltd

Report No: P23-139-R02v1
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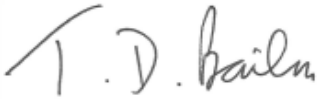
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1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned AA Projects Ltd to carry out a noise assessment in connection with a proposed planning application for a new science block at Xaverian College in Rusholme.

1.2 Xaverian is a sixth form college located in a broadly residential area in Rusholme and comprises eight buildings around the perimeter of College Green. The site location is indicated in Figure 1.

1.3 The proposal is for the demolition of the existing Sunbury Building and construction of a new three storey science block in its place. We understand that there will be some new items of external plant to provide heating/cooling of the building. However, exact proposals for the plant are not currently available at this stage. Nevertheless, we have recommended appropriate noise limits for any new fixed plant/equipment to be installed at the site.

1.1 Therefore, this assessment has included:

- An inspection of the site and surrounding area;
- A background noise survey outside the nearest residential properties.
- Recommending appropriate noise limits for any new fixed plant/equipment to be installed at the site.

1.4 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 NOISE SURVEY

2.1 A baseline background and ambient noise survey has previously been carried out by Hepworth Acoustics in 2021 as part of a separate application for plant associated with the refurbishment of the Firwood building.

2.2 The survey was carried out a location representative of the nearest dwellings to the school. As there has been negligible change to the noise climate since the survey, the survey is still considered representative. Therefore, the results of our 2021 survey have been used for assessment purposes.

2.3 The measurements are representative of the background noise levels at the nearest dwellings to the south on Crescent Range. Attended measurements were taken between 14:00 and 15:30 on Wednesday 6th January 2021. The measurement location is indicated in Figure 1.

2.4 Measurements were taken in 15-minute periods at approximately 1.4m above local ground level and in free-field conditions. The calibration of the sound level meter was checked with a field acoustic calibrator before and after each survey with no variance noted.

2.5 The measured 15-minute values are considered to be representative of the corresponding 1-hour values in line with BS 4142. The results of the noise survey are summarised in Table 1 and the full results are shown in Appendix II. Noise levels at both locations were primarily attributed to road traffic noise and noise from construction works at a nearby dwelling on Crescent Range.

Table 1: Range of Measured Noise Levels (dB)

Location	Daytime	
	$L_{Aeq,15mins}$	$L_{A90,15mins}$
Outside dwellings on Crescent Range	48-58	41-47

3.0 NOISE ASSESSMENT

3.1 British Standard 4142:2014, *'Methods for rating and assessing industrial and commercial sound'* (referred to hereafter as BS 4142) describes methods for rating and assessing sound of an industrial nature including;

- fixed installations which compromise mechanical and electrical plant and equipment;
- loading and unloading of goods and materials at industrial and/or commercial premises.

3.2 BS 4142 requires the 'rating' sound level ($L_{Ar,Tr}$) for the operation to be compared with the background sound level (L_{A90}) in the absence of the operational noise.

3.3 With regard to the background sound level, BS 4142 states that "*it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*."

3.4 The rating level ($L_{Ar,Tr}$) is derived based on the *'specific'* ($L_{Aeq,Tr}$) sound level attributable to the operation, corrected as necessary for the *'residual'* sound level, with an *'character correction'* added for any sound sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.

3.5 A *'character correction'* is added to the specific sound level where *'certain acoustic features can increase the significance of impact'* at the residential locations. BS 4142 corrections for noise characteristics are summarised in Table 2.

Table 2: Summary of BS 4142:2014 Character Corrections

Noise Character	Correction (dB)				
Tonality	Audibility	Not tonal	Just audible	Clearly perceptible	Highly perceptible
	Correction	0	+2	+4	+6
Impulsivity	Audibility	Not impulsive	Just audible	Clearly perceptible	Highly perceptible
	Correction	0	+3	+6	+9
Intermittency	Audibility	Not Intermittent	Readily distinguishable against residual acoustic environment		
	Correction	0	+3		
Other	Audibility	N/A	Readily distinguishable against residual acoustic environment		
	Correction	0	+3		

3.6 The potential character/feature corrections for tonality, impulsivity and intermittency shown in Table 3 are additive, and therefore significant corrections can be applicable in worst-case situations.

3.7 An initial estimate of the impact of the noise under consideration is determined by subtracting the background level from the rating level. BS 4142 states that:

- Typically, the greater this difference, the greater the magnitude of the impact
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background level, the less likely it is that the operation 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.

3.8 Typically, Manchester City Council require external plant to be designed so as to achieve a rating level of 5 dB below the typical background (L_{A90}) level at the nearest noise sensitive location.

3.9 Therefore, the appropriate criterion for plant noise at this development would be to control the rating level from any externally mounted plant to 5 dB below the existing typical background noise level (L_{A90}) at the nearest dwellings. We have adopted the most regularly occurring background noise level (the mode) from the results of our noise survey at the site as the basis for determining the plant noise limit at the nearest dwellings.

3.10 The mode of the measured background noise levels was 45 dB L_{A90}. The limit is therefore **40 dB $L_{Ar,Tr}$.**

3.11 These noise limits should be straightforward to achieve using conventional noise control measures, subject to careful selection and siting of equipment. If necessary, proprietary acoustic enclosures or screens can be used to reduce noise propagation to the nearest dwellings.

3.12 If necessary, the need to ensure that noise from new plant/equipment is controlled to within the above limits can be secured with an appropriate planning condition.

3.13 We therefore conclude that, subject to appropriate control of plant/equipment noise, there will be no unacceptable noise impact associated with the proposals.

4.0 SUMMARY

4.1 Hepworth Acoustics Ltd was commissioned by AA Projects Ltd to carry out a noise assessment in connection with a planning application for the proposed construction of a new science block at Xaverian College in Rusholme.

4.2 The assessment has included an inspection of the surrounding area, and a background noise survey during the daytime in line with the proposed operating times of the new equipment.

4.3 No details of proposed fixed/plant equipment are available at this stage, so we have recommended appropriate noise design limits, which, if followed, will result in no unacceptable noise impact. The need to control noise from new plant/equipment to within the above limits can be secured with an appropriate planning condition.

4.4 We therefore conclude that, subject to appropriate control of plant/equipment noise, there will be no unacceptable noise impact associated with the proposals.

Figure 1 – Site Location & Noise Measurement Position

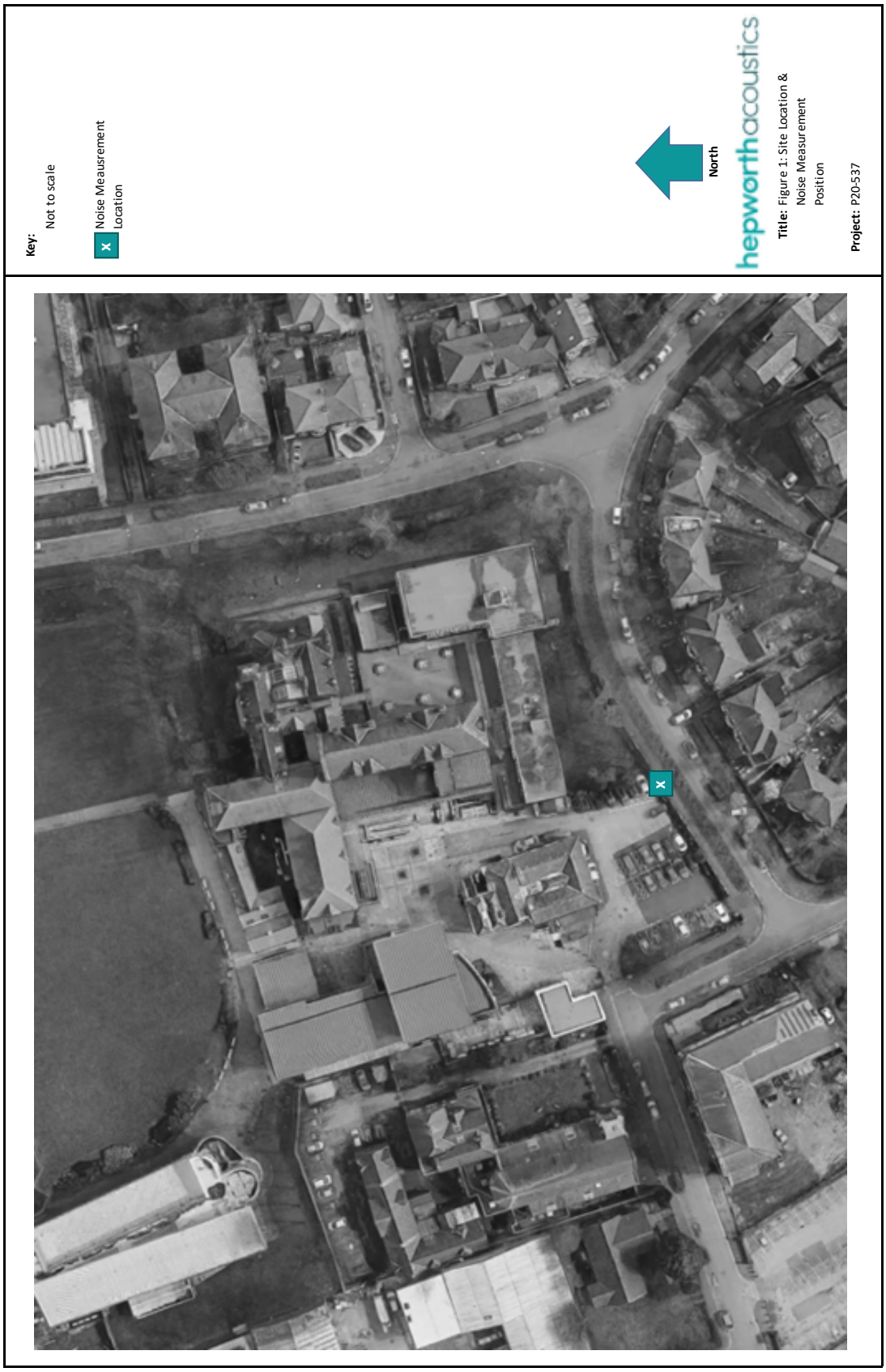
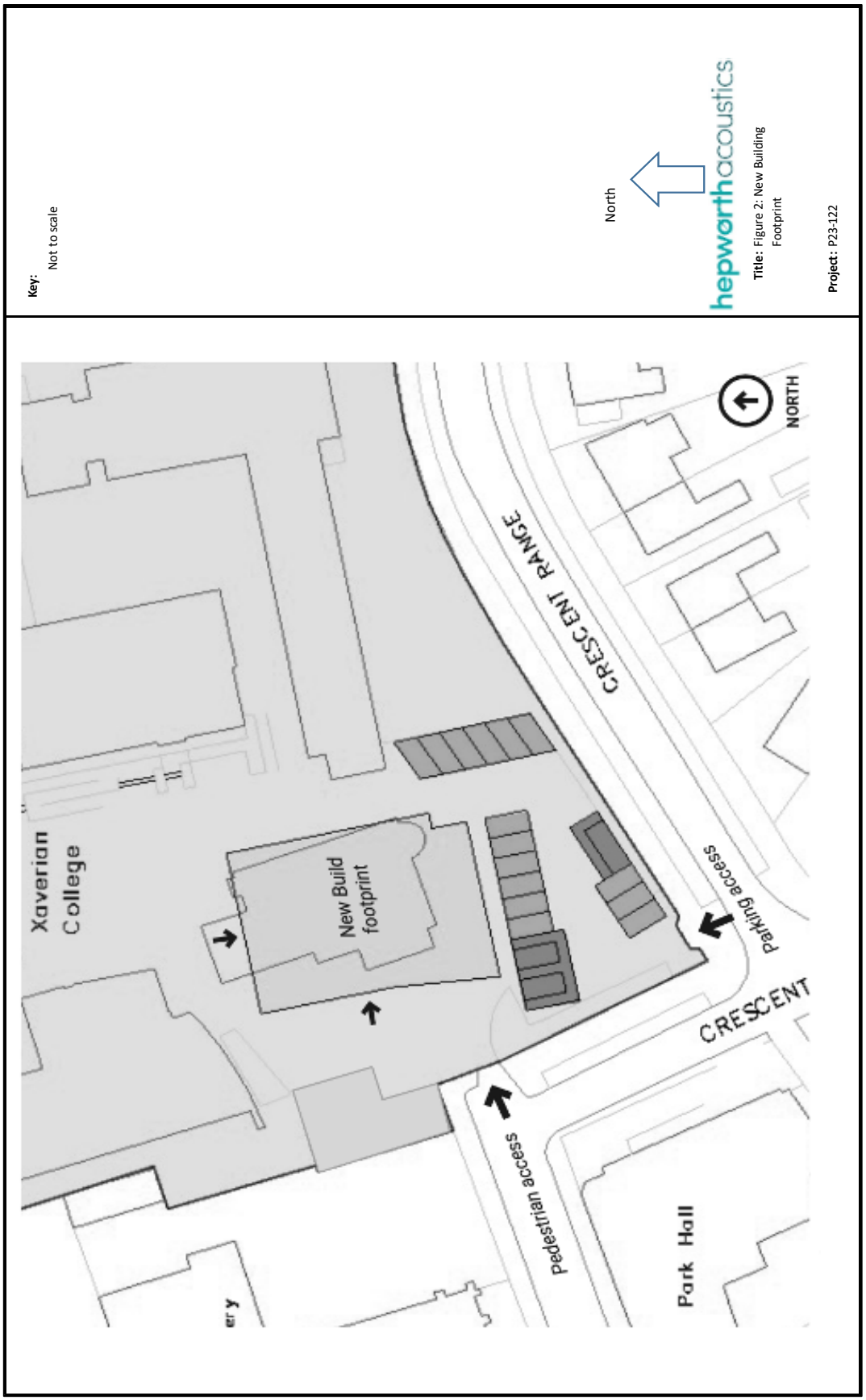


Figure 2: New Build Footprint



Appendix I: Noise Units & Indices

Sound and the decibel

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).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

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.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, 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 can be 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_{Amax} This is the maximum A–weighted noise level that was recorded during the monitoring period.

L_{A90} This is the A–weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II: Noise Survey Results

Date(s):	Wednesday 6th January 2021
Equipment	Brüel & Kjær 2250 'Type 1' sound analyser (serial no. 3011706) with tripod and calibrator
Weather	Dry, cold (~3-5°C), clear skies and calm (<2 m/s)

All levels in dB(A)

Location 1:

Time		Measured Noise Levels (dB)			Comments
Start	End	L_{AFmax}	$L_{Aeq,T}$	$L_{A90,T}$	
14:00	14:15	67.2	55.3	47.0	Construction works at nearby house, passing road traffic and distant road traffic. Birdsong
14:15	14:30	71.6	56.5	45.4	Construction works at nearby house, passing road traffic and distant road traffic. Birdsong
14:30	14:45	73.0	58.1	44.6	Construction works at nearby house, passing road traffic and distant road traffic. Birdsong
14:45	15:00	53.6	47.9	44.6	Passing road traffic and distant road traffic. Birdsong
15:00	15:15	65.4	49.3	42.6	Passing road traffic and distant road traffic. Birdsong
15:15	15:30	64.8	49.5	44.5	Passing road traffic and distant road traffic. Birdsong
15:30	15:45	60.7	47.9	41.1	Passing road traffic and distant road traffic. Birdsong