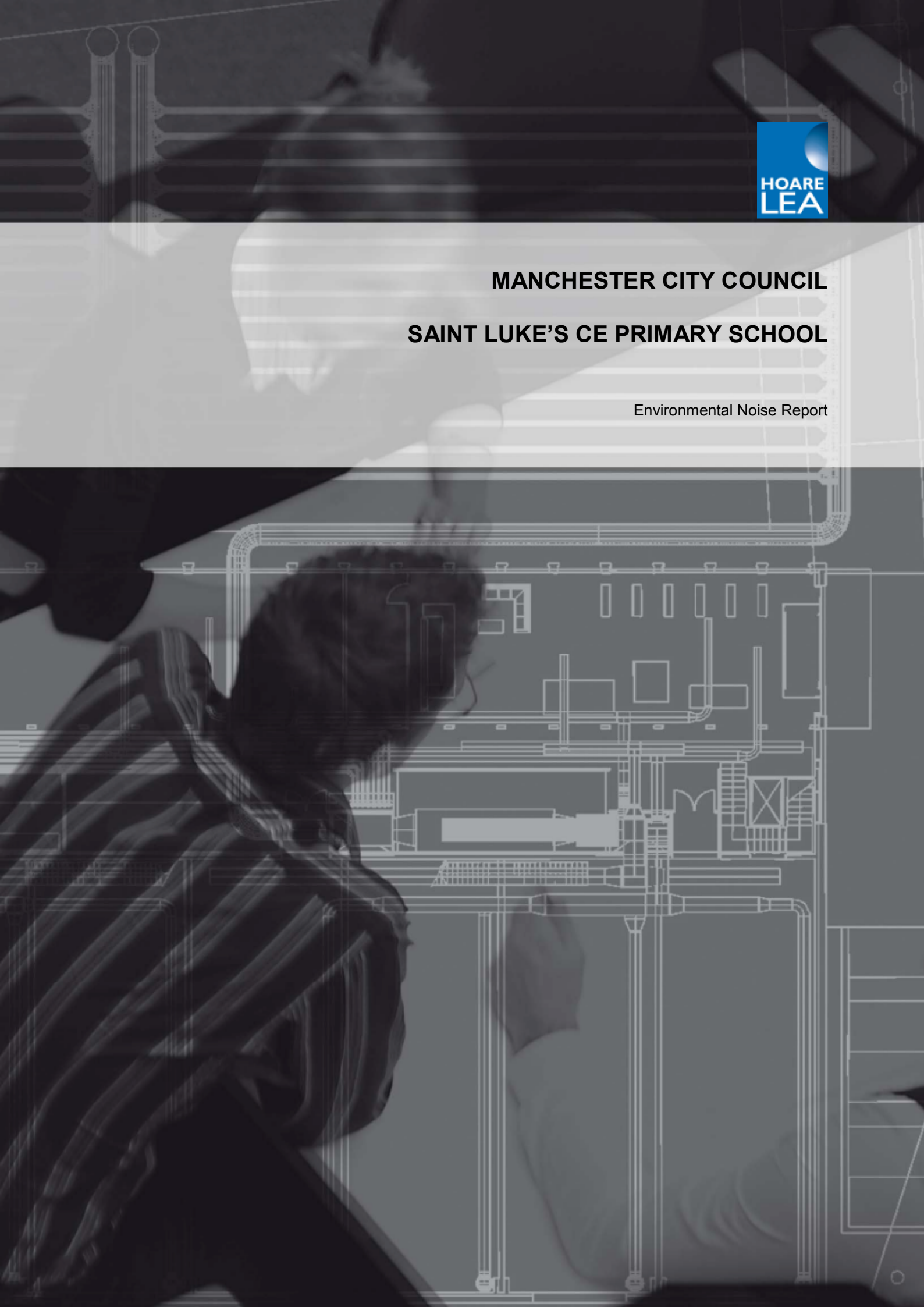

MANCHESTER CITY COUNCIL

SAINT LUKE'S CE PRIMARY SCHOOL

Environmental Noise Report

MANCHESTER CITY COUNCIL PRIMARY SCHOOL FRAMEWORK

SAINT LUKE'S CE PRIMARY SCHOOL

ENVIRONMENTAL NOISE REPORT

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1.0 INTRODUCTION

Hoare Lea Acoustics at the request of Manchester City Council have been appointed to carry out an acoustic noise monitoring exercise to determine the prevailing ambient noise conditions in the vicinity of the Saint Luke's CE Primary School, Longsight, Manchester, as part of the MCC Primary School Framework. This report details the findings of the initial survey works and serves to set noise emission limits associated with MEP services so that the associated planning requirements can be discharged.

2.0 SITE DESCRIPTION

The school site is located in Longsight, Manchester. It is bounded by residential dwellings to the North and East and is bounded by the A6 Stockport Road to the South and West.

The proposed works consist of partial refurbishment of the existing school and new-build extensions providing additional classrooms on the existing playfield located between the A6, Stockport Road, and the existing school. The proposed plant room has direct line of sight to the A6 Stockport Road.

3.0 MANCHESTER COUNCIL CRITERIA

In an e-mail to Manchester City Council, Richard Knightley, Environmental Health Officer at Manchester City Council provided the following information with regards to criteria for MEP plant noise emissions.

"Externally mounted ancillary plant, equipment and servicing shall be acoustically treated in accordance with a scheme designed so as to achieve a noise level of 5dB below the existing background (L_{A90}) in each octave band at the nearest noise sensitive location.

This should be in accordance with a scheme submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site."

In line with common practise, it has been assumed that the plant noise level is to be derived in accordance with BS4142: 1997- "Method of rating industrial noise affecting mixed residential and industrial areas". The standard is the only applicable guidance for assessing the likelihood of noise complaints resulting from the operation of industrial noise sources.

It is important to note that the full details of the plant and equipment to be used as part of this development are not defined and are still in stages of design. As such, the basis of this assessment will be to determine the noise limit beyond which plant noise emissions shall not exceed. A further assessment of the final plant and equipment will be prepared at a later stage.

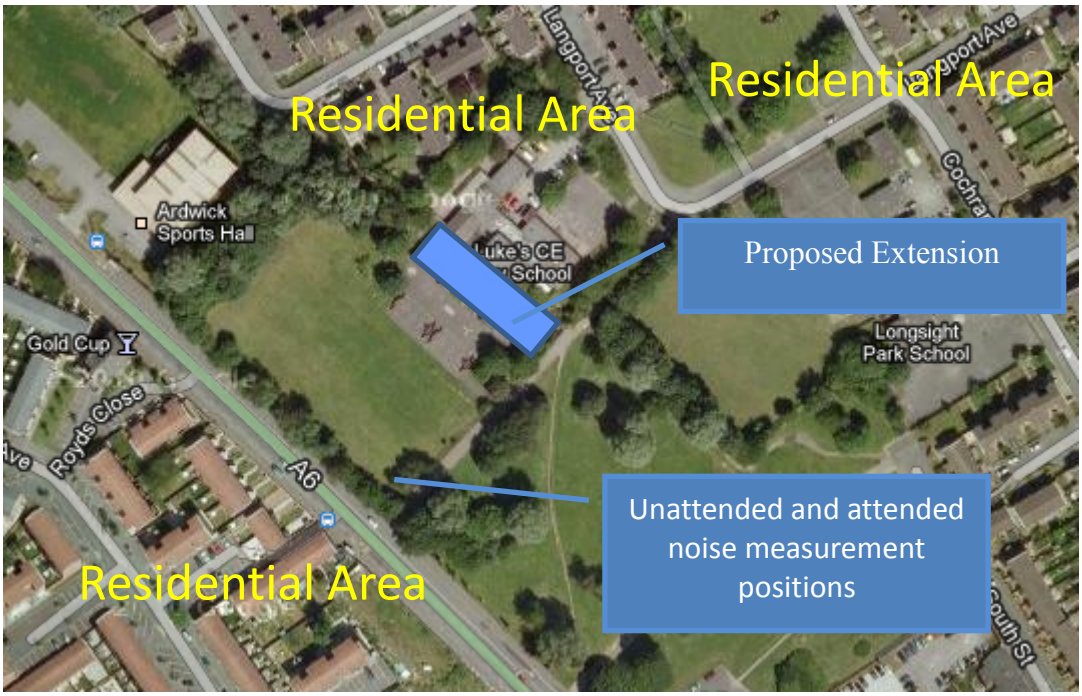
4.0 BASELINE NOISE SURVEYS

The proposed plant room is to face the A6 Stockport Road. The nearest residential dwellings having direct line of sight the plant room are located on the other side of the A6 Road.

Baseline noise measurements were taken at the nearest representative noise sensitive location to the site between 15:33 on Tuesday 13th November 2012, concluding at 10:05 the following day.

Measurements were unattended in order to characterise the typical background noise climate as required by BS4142. The measurement location is highlighted in Figure 1.

Figure 1: Site plan



Additional hand held measurements took place next to the unattended noise measurement position to obtain the noise spectrum.

4.1 Unattended Measurements

Unattended measurements were taken using a Type 1 logging sound level meter. The measurement system was calibrated before and after the survey, with no significant drift in sensitivity observed.

The meter was situated on the school playfield, 10m away from the school boundaries.

Subjectively, the location was deemed representative of the typical noise levels experienced by the nearest potentially affected residents on Stockport Road. The microphone was mounted externally on a pole positioned at ground floor level (approximately 1.2m above local ground level) and was of sufficient distance away from reflecting planes such that measurements are considered to be free-field.

No other noise from other plant serving buildings in the immediate vicinity was audible during set up and collection of the monitoring equipment.

The logging equipment was set to record noise levels every 5 minutes during the survey period to capture the worst case requirements of BS4142 at night. The measurement descriptors stored by the meter included, amongst others, the L_{Aeq}, L_{Amax} and L_{A90}.

4.2 Attended Measurements

Octave band measurements were conducted simultaneously with unattended measurements between approximately 0900-1000 hours during the morning of Wednesday 14th November.

Hand held measurements were taken using a Type 1 sound level meter at a height of approximately 1.2m above ground floor level. The measurement system was calibrated before and after the survey, with no significant drift in sensitivity observed. During the attended survey, weather conditions were dry with low winds. The weather conditions were therefore not considered to have adversely affected the measurements that were obtained.

5.0 MEASUREMENT RESULTS

This section summarises the results of the noise monitoring exercise.

5.1 Unattended Measurements

The following Figure 2 and Table 1 below summarises the results of the unattended measurements for background noise levels during daytime and night-time.

Figure 2: Background Noise Level Time-History

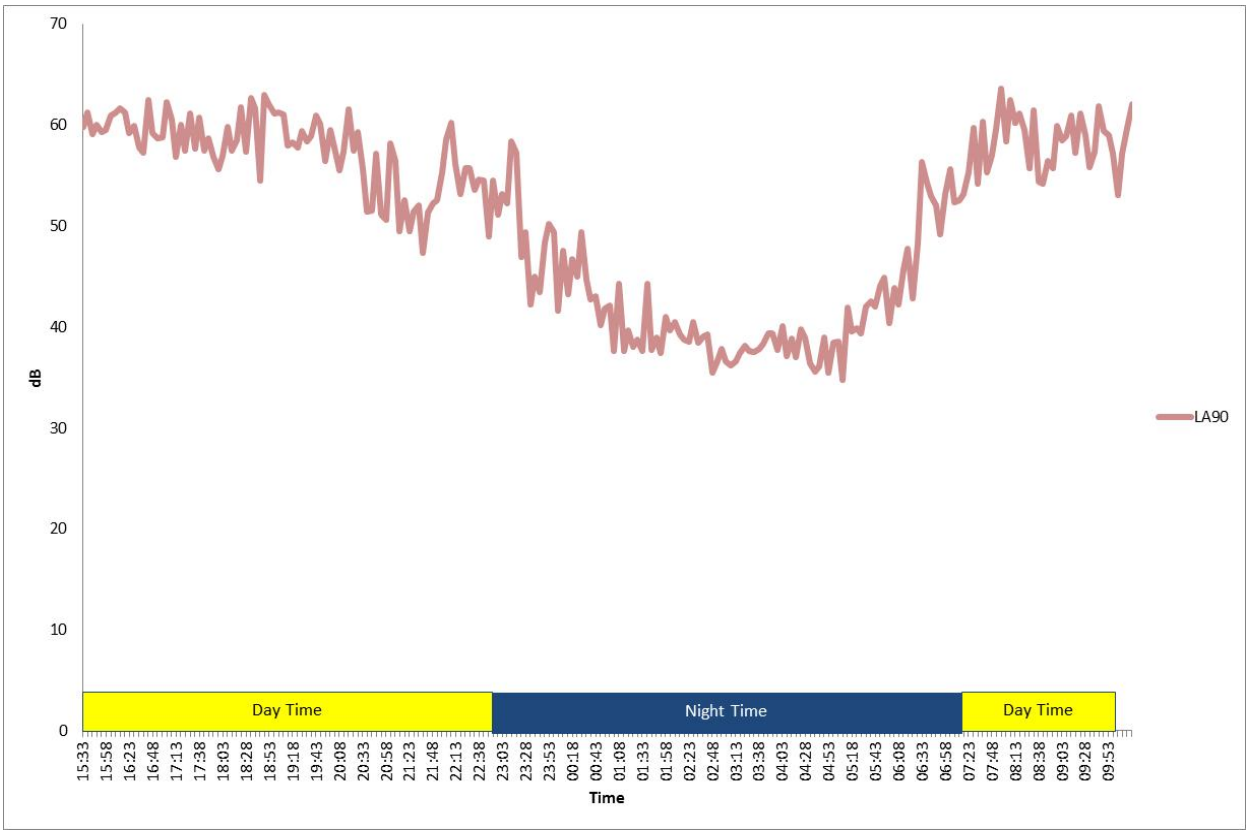


Table 1: Summary of Unattended Measurements

Day	Date	Minimum Background Noise Levels	
		Day $L_{A90(1hour)}$ dB[1]	Night $L_{A90(5min)}$ dB[2]
Tuesday	13th November 2012	53	35
Wednesday	14th November 2012	53	N/A

Notes

1 Hourly values are the calculated arithmetic average of the corresponding 5 minute values for that period.

2 Night time period commences at 2300 until 0700 hours the following day.

5.2 Attended Measurements

Table 2: Summary of Attended Measurements

Start Time	Duration	dB L_{90}							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	dB(A)
0934	5 minutes	64	59	58	52	58	54	41	61
0941	5 minutes	63	58	57	50	56	52	39	59
0946	5 minutes	62	57	54	47	54	49	36	57
0951	5 minutes	64	58	56	48	54	49	37	57
0957	**5 minutes**	**61**	**57**	**52**	**45**	**49**	**44**	**33**	**53**
1002	5 minutes	62	58	54	48	55	50	37	58

*** Measurement used to determine octave band limits**

6.0 DISCUSSION OF RESULTS

Both the daytime and night-time results varied over the survey duration by an approximate range of 25dB(A). The lowest measured hourly daytime L_{90} value during day 1 (Tuesday 13th November 2012) and day 2 (Wednesday 14th November 2012) was 53 dB(A) on each day. The lowest measured 5 minute night-time value was 35dB(A).

Manchester City Council requires the rating level to be 5dB below these values and also applies to octave band source noise levels. This implies a daytime noise level of 48dB(A) and a night time level of 30dB(A). BS4142 considers night time noise levels lower than 35dB(A) to be very low however a 30dB(A) limit should be achievable given the small scale nature of the schools extension. Careful plant selection will be required and should be reviewed during the design process.

It should be noted that octave band data was not measured directly by the logger. Instead, attended measurements have been adjusted to match the lowest hourly and five-minute minimum values provided in Table 1. A validation exercise was carried out at the logger location to check that this approach was viable and the results of the exercise are presented below.

Table 3: Attended Measurement Validation Exercise

Approximate Start Time	Logger Measurement dB L_{A90}	Attended Measurement dB L_{A90}	Variation
0934	62	61	1dB lower than logger measurement
0941	59	59	Equal to logger measurement
0946	59	57	2dB lower than logger measurement
0951	57	57	Equal to logger measurement
0957	**53**	**53***	**Equal to logger measurement**
1002	57	58	1dB higher than logger measurement

*** Measurement used to determine octave band limits**

As expected, it can be seen that attended measurements show good agreement with logger measurements at the logger location. As noise from A6 characterised the noise climate and was the only noise source of note, it is deemed acceptable to adjust the lowest attended 5-minute L_{90} spectrum in line with logger measurement data as variations in the noise climate relate specifically to variations in traffic noise. The attended measurement used, highlighted in green Tables 2 and 3 above, has a broadband

level equal to the L_{A90} logger location measurement and is also equal to the lowest hourly L_{A90} as captured by the logger. As such, the data used in the exercise is considered to be suitable for the adjustments required.

The proposed combined MEP building services noise limits for the new extension are as set out below. These apply at a measurement location of 1m from the nearest noise sensitive residential properties (measured under 'free-field' conditions) and at any height above 1.2m from the ground.

Table 4: Noise Criteria

Start Time	Duration	Octave Band Noise Limit dB L_{eq}							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	dB(A)
Daytime	1 Hour	56	52	47	40	44	39	28	48
Night-Time	5 minutes	38	34	29	22	26	21	10	30

These values apply to the cumulative levels of noise from all items of plant and equipment that serve the proposed redevelopment, adjusted to take account of any penalties for tonal or impulsive characteristics of the noise that may apply.

7.0 CONCLUSIONS

Hoare Lea Acoustics, at the request of Manchester City Council have carried out the necessary acoustic surveys to determine the prevailing ambient noise conditions in the vicinity of St Luke's CE Primary School, Longsight, Manchester.

This report details the findings of the initial survey works and has established the noise emission limits associated with MEP services in line with Manchester City Council design limits..

APPENDIX A – ACOUSTIC TERMINOLOGY

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm's are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

$L_{eq,T}$

The $L_{eq,T}$ is a parameter defined as the equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. The $L_{eq,T}$ can be seen to be an "average" sound pressure level over a given time period (although it is not an arithmetic average). Typically the $L_{eq,T}$ will be an 'A' weighted noise level in dB(A). It is commonly used to describe all types of environmental noise sources.

$L_{10,T}$

The $L_{10,T}$ is a parameter defined as the sound pressure level exceeded for 10% of the measurement period 'T'. It is a statistical parameter and can not be directly combined to other acoustic parameters. It is generally used to describe road traffic noise.

$L_{90,T}$

The $L_{90,T}$ is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and can not be directly combined to other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

$L_{max,T}$

The $L_{max,T}$ is a parameter defined as the maximum sound pressure level that occurred during the time period 'T'. It is commonly used to describe the highest noise level that occurred during an event such as a vehicle pass-by.

Sound Reduction Index, R

This is defined mathematically as ten times the common logarithm (to base 10) of the ratio of the incident sound power on the building element under test to the transmitted sound power level. It is used to commonly describe the sound insulation of building products. The sound reduction index, is a laboratory measured value. The field measured value would be denoted as R'. There is often a significant difference between the R and R' values due to flanking noise and site workmanship. It is measured in decibels.

Level Difference, D

This is defined as the differences in decibels between the average sound pressure level in a source room on one side of a dividing structure and the average sound pressure level in a receiving room on the other side. (Both rooms being enclosed spaces). The level difference is an absolute measure of the sound insulation of a dividing structure. It is measured in decibels.

Standardised Level Difference, D_{nT}

This is a measure of the level difference, corresponding to a reference value of the reverberation time in the receiving room. A correction term of ten times the common logarithm (to base 10) of the ratio of the actual reverberation time to the reference reverberation time is added to the level difference, D. For residential dwellings the reference reverberation time is 0.5s. The D_{nT} is measured in decibels. It is used as an airborne noise measurement parameter in sound insulation tests.

Reverberation Time, T (or RT)

The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds. Often a 60 dB decay can not be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Airborne Single Number Quantity Weighting

This is a weighting procedure defined in BS EN ISO 717, Part 1 for converting third octave band R, R', D and D_{nT} values to a single number quantity denoted as R_w, R'_w, D_w or $D_{nT,w}$. It is a decibel value.