



INTEGRATED HEALTH PROJECTS

MANCHESTER ROYAL INFIRMARY - PROJECT RED

NOISE ASSESSMENT FOR PLANNING

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Acoustic & Engineering Consultants Limited

Suite 316 Broadstone Mill, Broadstone Road, Stockport, SK6 6BD
Telephone 0161 449 5900 mail@aecltd.co.uk www.aecltd.co.uk

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Prepared by:



D M Terry BSc(Hons) MIOA

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1.0 INTRODUCTION

General

- 1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Integrated Health Projects (IHP) to undertake a baseline noise survey and noise assessment for planning purposes, of the proposals for the extension and refurbishment of Manchester Royal Infirmary (MRI), known as Project Red.
- 1.2 MRI is located approximately 20 metres to the southwest of Upper Brook Street (A34), which is a main road in and out of Manchester city centre. The proposals are to construct a new three storey extension to the MRI and a roof top plant room and the refurbishment of existing ground floor areas. The new extension will contain a mix of single and multi-bed wards/treatment rooms, operating theatres and various other spaces including offices and meeting rooms.
- 1.3 The nearest noise sensitive receptors to the proposed development, which have been considered in this assessment, are:
 - A. MRI (the Site)
 - B. Travelodge (90m to the southeast)
 - C. Sanctuary Students Accommodation (90m to the north)
- 1.4 This noise assessment report provides the following:
 - Noise criteria for external plant noise emissions and guidance on internal noise level limits;
 - The findings of a baseline noise measurement survey;
 - Assessment of building services plant noise limits;
 - Assessment of external noise levels and site suitability, and
 - Provides mitigation measures where appropriate.
- 1.5 Meeting the proposed criteria for internal noise levels and external plant noise emissions would also satisfy the relevant BREEAM requirements.
- 1.6 This report has been updated to include the most recent rooftop plant layout in Figure 4.1.
- 1.7 Acoustic terminology used in this report is presented in Appendix A.

CDM Regulations

- 1.8 It should be noted that AEC does not make recommendations on specific products to be used, although the report may make reference to products that could meet the relevant acoustic parameters. It is assumed that the health and safety requirements for any implied/inferred products are confirmed and adhered to, prior to use during the construction period.

2.0 BASIS OF ASSESSMENT

National Planning Policy Framework

- 2.1 Current national planning policies are set out in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government and dated March 2012 and revised in February 2019.
- 2.2 The planning policies which relate specifically to noise, were updated in July 2019 and are presented in paragraphs 170, 180 and 182 and are reproduced below:

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise.

180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

(a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life ;

(b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

Noise Policy Statement for England

- 2.3 The terms ‘significant adverse’ and ‘adverse’, in the NPPF above, are references to the Noise Policy Statement for England (NPSE), published by DEFRA, published in March 2010. One of the main aims of this policy is also to avoid significant adverse effects on health and quality of life.
- 2.4 Further to the above, the Governments ‘*Planning Practice Guidance*’ dated 6 March 2014 and updated on 22 July 2019 states states:

'Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.'

- 2.5 In addition, the guidance indicates that, whilst noise can override other planning concerns, it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect as to whether or not noise is likely to pose a concern.

External Building Services Plant – Assessment Method

British Standards

- 2.6 External noise from building service plant is typically assessed to the guidance in BS 4142-2014+A1-2019 'Methods for rating and assessing industrial and commercial sound' (BS4142).
- 2.7 In BS4142, noise impacts are assessed by comparing the calculated 'rating level' from the external plant against the existing baseline background sound level, as assessed at the nearest noise sensitive receptor(s).
- 2.8 When assessing the potential noise impacts, 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. BS4142 states that:
- A difference of around +10dB or more is likely to be indicative of a significant adverse impact, depending on context.
 - A difference of around +5dB or more is likely to be indicative of an adverse impact, depending on context.
 - The lower the rating level relative to the background level, the less likely it is that the specific sound source will have an 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.
- 2.9 A 'rating level' ($dB_{L_{Ar,Tr}}$) is obtained by applying a character correction to the 'specific noise level' ($dB_{Aeq,Tr}$) of a noise source (e.g. plant noise). The correction is applied if the noise has a defined acoustic character such as being tonal, impulsive, distinctive or intermittent in nature.
- 2.10 The magnitude of the correction is dependent on the character of the noise source and its level of perceptibility at the receiver. A correction of between 0 to +6dB and 0 to +9dB can be applied if the noise source is tonal or impulsive, respectively. Where the specific sound has characteristics, which are neither tonal nor impulsive but are distinctive against the residual sound climate, a +3dB penalty can be applied. A +3dB penalty can also be applied if the specific sound is intermittent in nature.

Manchester City Council's Noise Policy Guidance

- 2.11 Section 3.6.1.5.1 of the Planning & Noise Technical Guidance (PNTG) document issued by Manchester City Council (MCC) in December 2015 states the following:

“Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

‘Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages.”

Proposed Noise Level Limit

- 2.12 Based on the MCC guidance and BS4142 guidance, it is proposed that **the rating noise level from the proposed development is controlled to -5dB below the existing background noise level at the nearest noise sensitive receptors**. This would give a strong indication that the specific sound would have a low impact and would satisfy the Local Authority requirements.

Site Suitability (HTM 08-01) – Assessment Methodology

- 2.13 In terms of acoustics for healthcare buildings, and the suitability of the site, appropriate design advice is included in the Department of Health's Special Services *‘Health Technical Memorandum 08-01: Acoustics’* (HTM 08-01). To comply with HTM 08-01, the noise limits detailed in Table 2.1, below, for noise breaking in from external sources and mechanical services plant, should not be exceeded.

Table 2.1 – Maximum Allowable Internal Noise Levels (HTM 08-01)

Room type		External Sources, dBL _{Aeq,1h}	Mechanical services noise (NR)
Single bed ward	Day (0700 to 2300h)	40	30
	Night (2300 to 0700h)	35 (& 45dBL _{AFmax})	
Multi bed ward	Day (0700 to 2300h)	45	
	Night (2300 to 0700h)	35 (& 45dBL _{AFmax})	
Operating theatres		40	40
Small offices and meeting rooms (e.g. consulting, private office, small treatment, interview, small seminar)		40	35

- 2.14 With regard to the night-time maximum noise level limits for the wards, this is based on typical sources of noise, not occasional events (e.g. vehicle horns and helicopters).

3.0 BASELINE NOISE SURVEY

Measurement Methodology

- 3.1 AEC attended site on Thursday 10 and Friday 11 September 2020 to undertake external noise level measurements. Daytime measurements were undertaken on Friday between approximately 1100 and 1400h. Night-time measurements were undertaken on Thursday between approximately 2300 and 0100h.
- 3.2 The noise measurement survey was undertaken in general accordance with BS:7445-1: 2003 “*Description and measurement of environmental noise*” (BS7445-1) and HTM 08-01. The full measurement method is provided in Appendix B.
- 3.3 Noise measurements were undertaken on the proposed development site, and locations representative of the Travelodge and Sanctuary Students, identified as Location A, B and C, respectively, on the attached Figure B-1 in Appendix B below.

Measurement Results

- 3.4 The noise climate around the proposed development site was dominated by road traffic on Upper Brook Street and constant mechanical building services noise associated with the existing hospital buildings. There are also occasional vehicle movements on North Road within the hospital site, however, these are low speed vehicle movements and not particularly noisy. Road traffic noise is also the dominant noise source at the nearby noise sensitive receptors.
- 3.5 The free-field noise levels affecting the proposed development (Location A) are around 66dBL_{Aeq,1hr} during the daytime and 59dBL_{Aeq,1hr} during the night-time. In addition, free-field night-time maximum noise levels would typically be around 72dBL_{Amax,F} due to vehicles passing on Upper Brook Street.
- 3.6 The background noise levels measured at the Travelodge and Sanctuary Students buildings were 57dBL_{A90,15mins} and 48dBL_{A90,15mins} during the daytime and night-time periods, respectively. This background noise was mostly due to road traffic noise on Upper Brook Street, and other surroundings roads, and building services noise from the existing hospital site.
- 3.7 Noise from ambulance sirens and helicopters are not included in this assessment. Ambulances were not using their sirens on-site during the noise survey and there were no helicopter flyovers observed. It is understood that occasional noise from these sources would be a site management issue, where applicable.
- 3.8 It should be noted that while the noise measurements were taken during the Covid-19 restrictions, there was regular traffic on Upper Brook Street. Therefore, it is anticipated that the measured noise levels are broadly representative of normal conditions.
- 3.9 In order to check the measured road traffic noise levels from Upper Brook Street (A34), AEC has reviewed the strategic noise maps produced by the Department of Agriculture, Environments and Rural Affairs (DEFRA). These are publicly available online and excerpts are provided in Appendix C. The measured traffic noise levels are comparable to the DEFRA predicted noise levels for ‘normal’ conditions and therefore, would indicate that AEC’s on-site measurements are suitable for use in this noise assessment.

selection of quiet plant items; atmosphere side attenuation to air handling plant, and potentially other mitigation measures e.g. acoustic louvers to plant rooms.

- 4.7 It should be noted that noise from the building services plant will also need to be controlled to meet appropriate noise levels inside adjacent hospital buildings. This should not be an issue with a solid concrete roof and parapet edge protection.

Plant Mounting

- 4.8 The proposed building services plant is located in the 1st floor and roof top plant rooms. It will therefore be necessary to control structure-borne noise by effectively isolating plant from the supporting structure where required.

5.0 ASSESSMENT OF SITE SUITABILITY

- 5.1 Although this is not thought to be a strict planning requirement, an outline assessment of site suitability is provided below.

Internal Noise Levels

- 5.2 The proposed development will be mechanically ventilated therefore windows will not need to be opened to provide background ventilation. Therefore, to meet the HTM 08-01 internal noise levels, detailed in Table 2.1 above, a suitable sound insulation performance for glazing will need to be specified. Indicative calculations show that the glazing would need to be better than standard thermal glazing. A performance of 36dBRw / 29dBRw+C_{tr} could be suitable e.g. 10mm glass / 12-20mm cavity / 6mm glass. However, this will require further consideration as the design develops.
- 5.3 The sound reduction specification of the glazing will not be particularly onerous in order to reduce external noise and comfortably meet appropriate internal limits specified in HTM 08-01. Other façade element would need to achieve a performance of 10dB higher than the glazing i.e. approximately 39R_w+C_{tr}. This would be achieved by most standard building envelope constructions and would not be particularly onerous.
- 5.4 Therefore, in terms of noise, the site is considered suitable for development of noise sensitive uses, including wards, treatment rooms, and meeting rooms.

6.0 CONCLUSIONS

- 6.1 AEC attended the proposed development site on Thursday 10 and Friday 11 September 2020 to undertake a baseline noise survey. This survey established the noise levels affecting the proposed development and the baseline background noise levels at the existing noise sensitive residential receptors.
- 6.2 The night-time background noise levels measured at the residential receptors was around $48\text{dBL}_{A90,T}$. As such, it is recommended that free-field rating level from all new building services plant should be controlled to no greater than $43\text{dBL}_{A,T}$ external to the windows of the existing noise sensitive properties to comply with the proposed noise limit.
- 6.3 Achieving this plant noise limit would give a strong indication of a low impact on the noise sensitive receptors, in accordance with BS4142 and it should not be particularly onerous to meet this limit. It would also meet Manchester City Council's requirements for controlling noise from building services plant. Standard design/mitigation measures will be incorporated, including: selection of quiet plant items; atmosphere side attenuation to air handling plant, and potentially other mitigation measures e.g. acoustic louvers to plant rooms.
- 6.4 In terms of the site suitably, although not a strict planning requirement, the proposed development site has been surveyed and, in terms of noise, it is considered suitable for development of the proposed noise sensitive uses, including wards, treatment rooms and meeting rooms. The building will be mechanically ventilated avoiding the need to open windows for ventilation and appropriate acoustic glazing will be specified, which will be developed with the design team.
- 6.5 Based on the above assessment, and the implementation of the standard noise mitigation measures, noise should not be considered a determining factor in relation to the planning permission being sought for the proposed development.

APPENDIX A – Acoustic Terminology in Brief

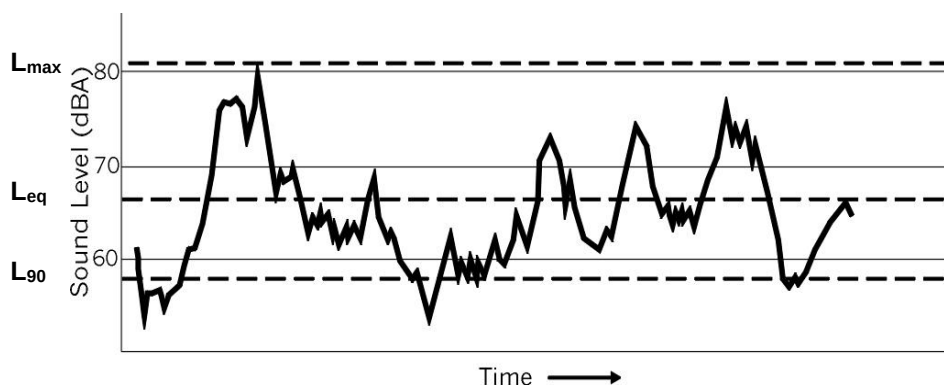
Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz (*Hz*), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discrete frequency - a 'pure tone' - most sound is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA*, normally used to assess the effect of noise on people. The dBA weighting emphasises or reduces the importance of certain frequencies within the audible range.

Sound Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as fifteen minutes or one hour, the statistically determined results being used to quantify various aspects of the sound.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of sound can be described by several different levels. The most common of these are described below. It should be noted that in many instances in the main body of text, the unit will be preceded by a dB descriptor in the report e.g. $L_{Aeq,T}$ could be written $dB_{L_{Aeq,T}}$



Example of Sound Level Varying With Time

$L_{Aeq,T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the “average” sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises and can be considered as the “ambient” noise level.
$L_{A10,T}$	The (A-weighted) sound level exceeded for 10% of a measurement period. It is the value often used to describe traffic noise.
$L_{A90,T}$	The (A-weighted) sound level exceeded for 90% of a measurement period. It is the value often used to describe background noise.

L_{Amax}	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.
Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.

Other Acoustics Units

NRC	Noise Reduction Coefficient – a single figure number sometimes used to describe the performance of sound absorbing materials based on a combination of its absorption coefficient at various frequencies.
NR	Noise Rating – a graphical method for assigning a single number rating to a noise spectrum and is often use to specify noise level limits for mechanical services.
R_w	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
$R_w + C_{tr}$	Single number rating used to describe the <u>laboratory</u> airborne sound insulation properties of a material or building element (normally windows) over a range of frequencies, typically 100-3150Hz, adjusted to adjusted by a spectrum adaptation to provide the reduction of traffic noise.
D_w	Single number rating used to describe the on-site airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
$D_{nT,w}$	Single number rating used to describe the on-site airborne sound insulation performance properties of a material or building element over a range of frequencies, typically 100-3150Hz, which is calculated in terms of a standardized reverberation time of 0.5 seconds.
T_{mf}	A BB93-specific reverberation time criterion, taken from Table 1.5 of Section 1 of BB93, for airborne sound insulation in schools and is the average value of the reverberation times one of the frequency range 500Hz–2KHz.
RT	The RT (Reverberation Time) of a space is defined as the time it takes for the sound pressure level to reduce by 60dB. It is not always possible to measure the full 60dB decay, so the first 20dB decay (T_{20}) or 30dB decay (T_{30}) is used to approximate the reverberation time (T_{60})
$D_{n,e,w}$	Weighted element-normalised level difference. Single number rating used to describe the sound insulation performance.

APPENDIX B – Noise Survey Details

Date & Time of Survey:	Thursday 10 September 2020, 2300 to 0100h. Friday 11 September 2020, 1100 to 1400h.					
Personnel:	Michael Ridley (AEC).					
Equipment Used:	B&K 2250 lite Real Time Analyser (AEC Kit 4).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2003 ' <i>Electro acoustics – sound level meters - Part 1 Specifications</i> ' for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	10/09/2020	Night	Dry	10°C	Northerly and 0-2m/s (negligible)	20%
	11/09/2020	Day	Dry	18°C	Northerly and 0-3m/s (negligible)	70%
Measurement Locations:	Attended measurements were undertaken at three locations around the development site. Identified as A to C on Figure B1 and described below. A – 2m from the edge of North Road and 20m from the edge of Upper Brook Street. B – 7m from the nearest edge of Upper Brook Street. C – 8m from nearest edge of Grafton Street.					
Measurement Details:	Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	B & C - free-field, A – façade.					
	Full results for the attended measurements are given in Tables B1 and B2.					
Measured Data:	Full octave band centre frequency data was obtained for all measurements.					

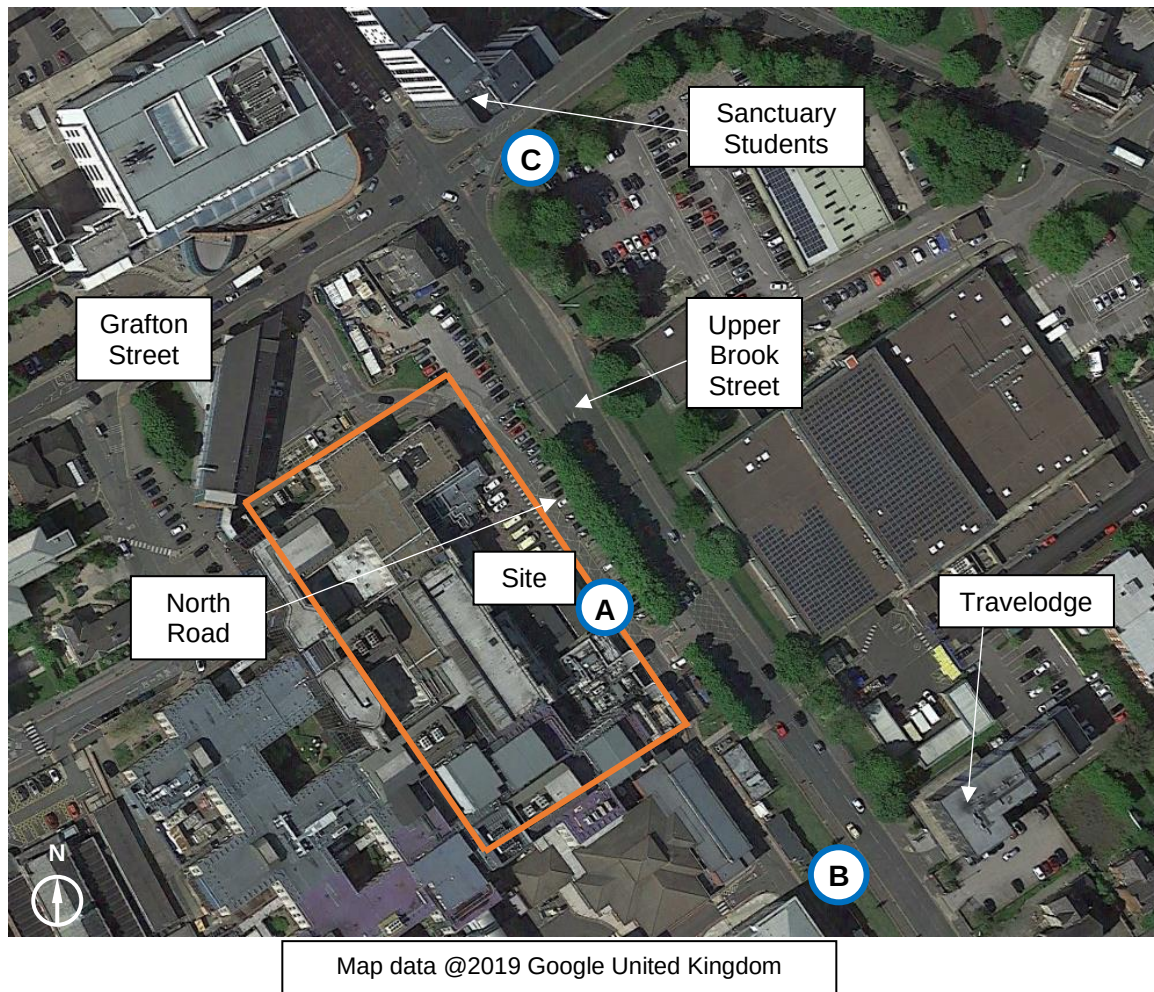
TABLE B1 – Measured Daytime Noise Levels

Location	Period, h	Noise Level, dB				Comments
		L _{Aeq}	L _{A10}	L _{A90}	L _{Amax, F}	
A	1100 – 1115	68.2	67.0	55.6	88.8	Road traffic dominant. Negligible plant. Max from road traffic 74.1dB L _{Amax} .
	1201 – 1216	63.7	66.3	56.7	89.4	
	1300 – 1315	63.6	66.8	54.7	74.1	
B	1117 – 1132	70.1	74.0	57.3	79.9	Road traffic dominant. Max from road traffic 79.9dB L _{Amax} .
	1219 – 1234	70.4	74.0	59.7	84.0	
	1317 – 1332	70.4	74.0	59.6	79.0	
C	1136 – 1151	63.5	67.3	56.8	74.6	Road traffic dominant. Max from road traffic 74.7dB L _{Amax} .
	1238 – 1253	64.1	67.9	56.6	74.7	
	1335 – 1350	64.9	67.9	56.9	84.5	

TABLE B2 – Measured Night-Time Noise Levels

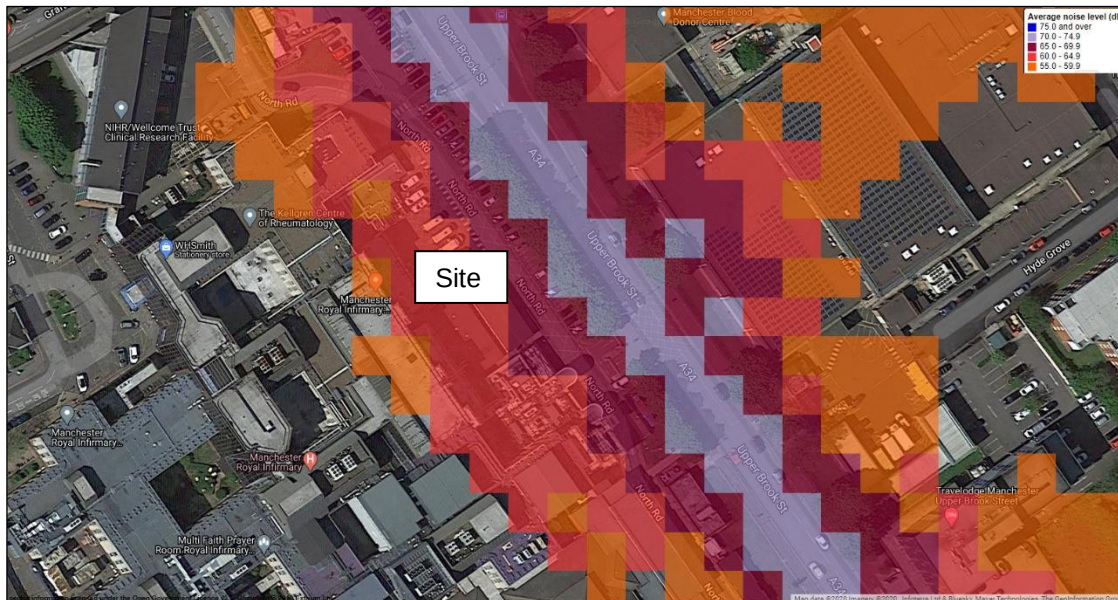
Location	Period, h	Noise Level, dB			Comments
		L _{Aeq}	L _{A90}	L _{Amax, F}	
A	2305 – 2315	61.6	49.9	71.0	Road traffic. Constant background noise due to plant from MRI. Maximum levels due to road traffic.
	2344 – 2354	61.0	49.3	72.3	
	0023 – 0033	60.5	48.9	74.6	
B	2317 – 2327	69.6	54.0	84.4	Road traffic dominant. Maximum levels due to road traffic.
	2356 – 0016	67.7	51.6	80.5	
	0035 – 0045	66.1	47.9	78.3	
C	2331 – 2341	60.7	49.4	74.2	Road traffic dominant. Maximum levels due to road traffic.
	0010 – 0020	60.4	49.8	74.3	
	0048 – 0058	58.4	47.8	71.0	

FIGURE B-1 – Existing Site Showing Noise Measurement Locations



APPENDIX C – Strategic Noise Maps (DEFRA)

C-1 – Daytime Noise Map – $\text{dBL}_{\text{Aeq},16\text{hr}}$ (0700-2300h)



C-2 - Night-time Noise Map – $\text{dBL}_{\text{Aeq},8\text{hr}}$ (2300-0700h)

