

ENVIRONMENTAL NOISE ASSESSMENT

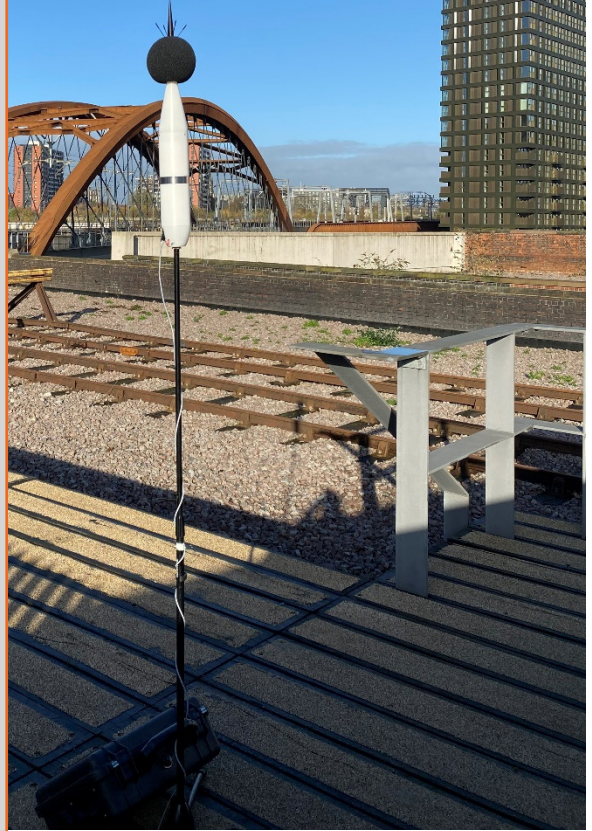
OLD STATIONMASTERS HOUSE ON BEHALF OF WILES and MAGUIRE LIMITED

WILES&MAGUIRE

13 DECEMBER 2022

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AEI ACOUSTICS LIMITED



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DOCUMENT CONTROL

REFERENCE:	ENA001_1038_JH_Rev A	
TITLE:	ENVIRONMENTAL NOISE ASSESSMENT, OLD STATIONMASTERS HOUSE	
CLIENT:	WILES and MAGUIRE LIMITED	
SITE ADDRESS:	OLD STATIONMASTERS HOUSE, LIVERPOOL ROAD, MANCHESTER M3 4FP	
DATE OF SURVEY	25 – 28 NOVEMBER 2022	
PREPARED BY:	 James Hendley AMIOA Acoustic Consultant	
CHECKED BY:	 Ian French MIOA Acoustic Consultant	
REVISION	COMMENTS	DATE
-	First Issue	
A	Updated to clients glazing specification	15.12.22

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1. Introduction

AEI Acoustics Limited have been appointed by Wiles and Maguire Limited to undertake an Environmental Noise Assessment for the proposed conversion of the Old Stationmasters House, Liverpool Road, Manchester M3 4FP, from existing office spaces to holiday let accommodation.

The property forms part of the Science and Industry Museum and is a listed building. The property is a three-story end of terrace that is brick built, with a slate roof and traditional timber sash windows with 4mm single glazing panes.

The property is flanked by roads to both sides (Liverpool Road and Water Street) and an elevated railway system comprising of multiple railway lines. The surrounding area is a mix of commercial, industrial and residential properties including the museum and newly acquired railway sidings that runs parallel to the building (see image 1)

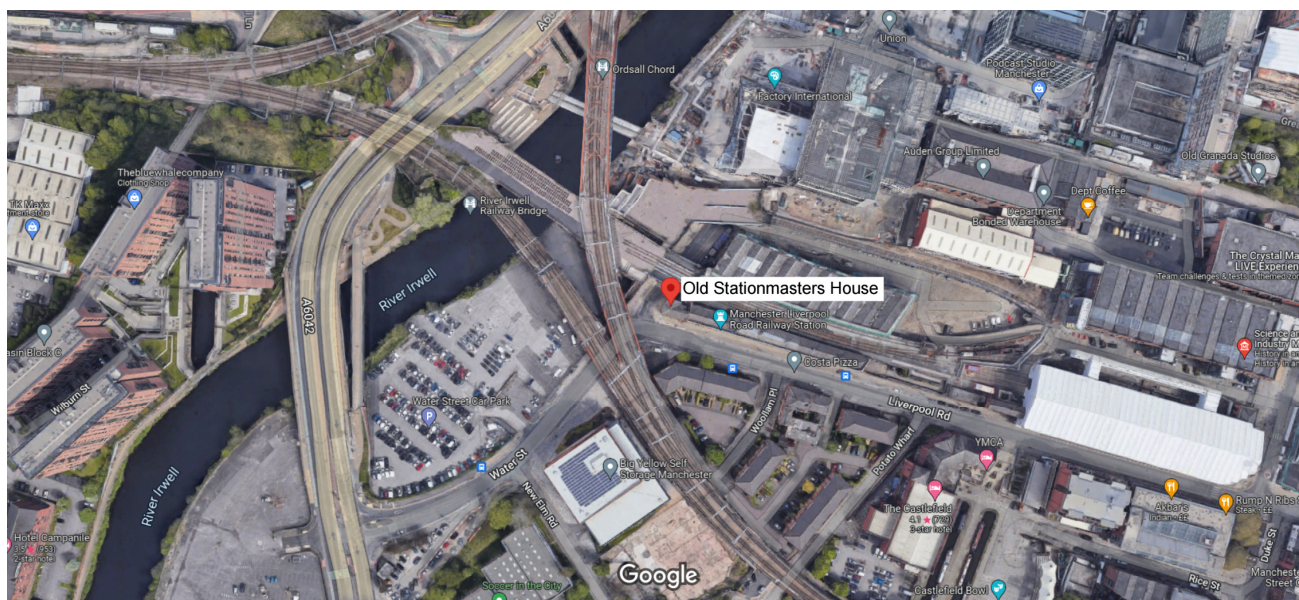


Image 1: Site Location

The assessment is based upon understanding the representative behavior of the existing noise sources and how these affect the internal acoustic levels within the property. The site is complex in nature with varied sources affecting rooms based on elevation and facing.

The assessment is based on rating level comparison against existing background noise levels in accordance with BS4142. Consideration is also given to internal building acoustics and references made to BS8233, National Planning Policy (NPPF) and Guidelines for Community Noise (WHO)

2. Assessment Criteria

2.1. BS4142:2014 Methods for rating and assessing industrial and commercial sound

- 2.1.1. BS 4142:201 was published in October 2014 and has superseded the previous 1997 version. The document presents methods for rating and assessing the potential impact of commercial and industrial sound upon noise sensitive receptors.
- 2.1.2. The 2014 edition of BS 4142 is entitled '*Methods for rating and assessing industrial and commercial sound*' which differs slightly to the former 1997 version of BS 4142 which was entitled '*Method for rating industrial noise affecting mixed residential and industrial areas*'. The 2014 version clearly differentiates the use of the terms 'sound' and 'noise'. The foreword to the new version explains that:
- 'response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood. This edition of the standard recognizes the importance of the context in which a sound occurs.....sound can be measured by a sound level meter or other measuring system. Noise is related to a human response and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive'.*
- 2.1.3. The scope of BS 4142 has been broadened to provide a method for rating and assessing sound of an industrial and/or commercial nature. The scope now specifically includes sound from industrial and manufacturing processes, sound from fixed plant, sound from loading and unloading of goods at industrial and commercial sites and mobile plant forming an intrinsic part of the overall sound from a premises or process.
- 2.1.4. Guidance now introduces the concept of '*context*' to the process of identifying noise impact. Section 11 of BS 4142:2014 explains that:
- 'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs (my emphasis). An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'*
- 2.1.5. It is therefore entirely possible that whilst the numerical outcome of a BS 4142 assessment is indicative of adverse or significant adverse impact, when the proposal is considered in context the significance of the impact is reduced to an acceptable level. However, the opposite may also be true. There are many context points to consider when undertaking an assessment of sound impact including:
- The absolute level of sound;

- The character and level of the specific sound in the context of the existing noise climate. For instance, is the sound to occur in a location already characterised by similar activities as those proposed?;
- The sensitivity of the receptors;
- The time and duration that the specific sound is to occur;
- The conclusions of assessments undertaken using alternative assessment methods, for example WHO guidelines noise values or change in noise level;
- The ability to mitigate the specific sound through various methods, for example by screening, the selection of quiet plant equipment, the use of attenuators and louvres, through the imposition of noise management plans and good practice, façade design and layout/orientation;
- The form and scale of a development. For example, does the proposed development involve a new industrial or commercial premises being built or is the proposal the installation of new plant or an extension to an existing premises?

2.1.6. The comparison of the 'Rating level' with the 'Background **sound** level' in the BS 4142 assessment methodology is retained however new acoustic feature corrections are incorporated in order to determine the rating level. Whereas previously the methodology allowed for the addition of a single 5 dB correction (to account for acoustic features such as tonality, impulsiveness or if the noise was irregular enough to attract attention) it now allows up to 6 dB to be added to the specific sound level for tonality, with an additional correction of 3 dB for intermittency or up to 9 dB to be added depending on the degree of impulsivity. All of these corrections can be added together in linear fashion where appropriate. Where the source is neither tonal nor impulsive but that a feature characteristic is present that makes the sound source readily distinctive a correction of 3 dB can be added. Hence under the latest methodology noise sources that would formerly have only been corrected by up to 5 dB (using BS 4142:1997), may now be corrected by up to 15 dB which could significantly influence the outcome of the assessment.

2.1.7. In order to assess the impact, the 'Rating level' of the new noise source is compared with the existing 'Background level' and the following analysis made:

- 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 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.

- 2.1.8. BS 4142 requires separate analysis for day and night-time periods. For the assessment of noise impacts, BS 4142 advises evaluating the specific sound over an appropriate reference time interval (T_r) of:
- 1 h during the day (between 07:00 to 23:00 hours); and
 - 15 min during the night (between 23:00 to 07:00 hours).
- 2.1.9. Additionally, the assessment methodology now requires that the issue of uncertainty be taken into consideration. The document explains how to reduce the element of uncertainty through good practice but is unclear on how one determines a numerical value to place on uncertainty.

2.2. BS8233: 2014 – Guidance on sound insulation and noise reduction for buildings

- 2.2.1. BS8233:2014 provides guidance on sound reduction with buildings by providing appropriate levels of noise within dwellings, flats and rooms for residential use.
- 2.2.2. Section 7.2.2 'Internal ambient noise levels in dwellings' of BS8233:2014 states that the desired internal ambient noise levels do not exceed guideline values as shown in Table 4 below:

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Image 2:Table 4 BS8233:2014

- 2.2.3. Section 7.2.2, Note 7 also states that the guideline internal target levels (see table 4 above) may be relaxed by up to 5dB from those shown and still meet reasonable internal conditions to those deemed as necessary or desirable by the World Health Organization (WHO)
- 2.2.4. Paragraph 8.2 of BS8233:2014 refers to flanking transmission and the need to ensure care is taken at all stages to ensure the control of noise issues due to flanking transmission is controlled effectively. The three areas for consideration should include:
- a) Junction detail between the separating wall/ floor and the flanking wall;
 - b) Mass of flanking elements;
 - c) Transmission through floor voids, loft spaces, service ducts, mullions and similar paths
- 2.2.5. BS8233:2014 offers additional information on various building elements and the general anticipated effectiveness of these construction methods.

2.3. Noise Policy Statement for England (NPSE)

2.3.1. Noise Policy Statement for England¹ (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

2.3.2. NPSE describes the following levels at which noise impacts may be identified:

- **NOEL** – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **LOAEL** – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- **SOAEL** – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

2.3.3. According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

‘...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur.’

2.4. Guidelines for Community Noise (World Health Organisation [WHO])

2.4.1. Published in 1999, the World Health Organisation highlighted environmental noise as one of the largest contributors to health issues. Guidelines for Community Noise included guideline values based on L_{Aeq} values for daytime periods (07.00 to 23.00) and night-time periods (23.00 to 07.00).

2.4.2. Table 1 below is extracted from Guidelines for Community Noise (Table 4.1) and based on specific environments for residential purposes.

Specific Environment	Critical Health Effect(s)	L_{Aeq} [dB]	Time Base (hours)	$L_{Amax,fast}$ [dB]
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, Indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Table 1: Extract from Table 4.1: Guidelines for Community Noise

¹ Government Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. March 2010.

2.5. National Planning Policy Framework (NPPF) 2021

- 2.5.1. The National Planning Policy Framework (NPPF) July 2018 set out the Government's planning policies for England and how they are expected to be applied. It provides a framework within which the Local Authorities are to prepare local plans and use their planning powers to minimise the adverse impact of noise. It should contain the following in relation to noise impacts.
- 2.5.2. (Paragraph 174) 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 soil, air, water or noise pollution or land instability.....'
- 2.5.3. (Paragraph 185) 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 impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life'

2.6. Noise exposure hierarchy table

2.6.1. Table 1 below summarizes the noise exposure hierarchy based on the likely average response of those affected

Response	Examples of Outcomes	Increasing effect level	Action
No Observed Effect level (NOEL)			
Not Present	No effect	No observed effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there i	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Table 2: Noise Exposure Hierarchy

3. Environmental Noise Assessment and Survey

- 3.1. A noise survey was undertaken between 12.00 on the 25th November 2022 and 11.00 on the 28th November 2022.
- 3.2. Measurements were undertaken from two positions:
- MP1 – Located on the raised staging by the side of the railway sidings. Microphone position was elevated to above the wall height to ensure ‘line of sight’ with the second-floor bedroom.
 - MP2 – Situated in the centre of the ground floor reception room.
 - MP3 – Monitored sound level meter position on the pavement outside of MP2



Image 2: Measurement Positions



Image 3: MP1 towards Old Stationmasters House

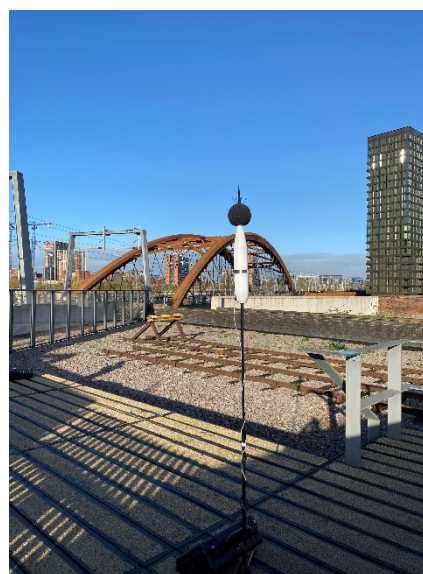


Image 4: MP1 towards railway tracks

- 3.3. Due to restrictions with available space, measurement positions were chosen to provide the best representative measurements for the location, given lack of space or ability to site these positions away from the façade, at room height in a safe and secure location.
- 3.4. Measurements were undertaken in accordance with the procedures outlined in BS 7445-1:2003² and BS 4142:2014. MP1 Measurements were made in ‘free field’ conditions (at least 3.5m away from the nearest vertical surface) and at a height of 1.8 m above ground level (see image 30. During all measurements the microphone was protected with a windshield.
- 3.5. The sound level meters were set to measure various noise parameters including L_{Aeq} , L_{90} , $L_{A,max}$ and $L_{C,peak}$ utilizing a fast time weighting.
- 3.6. During the survey set-up and observations following it was noted that the overall background noise levels consisted of multiple different sources including:
- Regular rail noise from passing passenger and freight trains.
 - Road traffic noise passing by on Liverpool Road and Water Street
 - Construction activity on the adjacent building site
- 3.7. The weather for the survey period was as follows:

Date	Weather	Temp (°C)	Wind (mph)
25th Nov	Bright with some cloud	6 - 12	6 - 10
26th Nov	Bright, some cloud cover, light rain in the evening	8 - 12	5 - 11
27th Nov	Bright, some cloud cover, light rain in the evening	7 - 12	4 – 7
28th Nov	Bright, some cloud cover	6 - 8	4

Table 3: Weather for survey period

- 3.8. The survey was conducted using the following equipment

Manufacturer	Equipment	Serial No.	Certificate No.	Calibration Date	Calibration Due Date
Cirrus	Sound Level Meter Type CR:811B	C17352FD	U41458	11/07/2022	11/07/2024
Cirrus	Calibrator CR:511E	036345	U41455	11/07/2022	11/07/2023
Svantek	Sound Level Meter Type 307a	116168	1502949-1	03/08/2022	03/08/2024

Table 4: Equipment used for survey

- 3.9. All equipment was calibrated at the start of the survey, as part of the set-up process and upon collection of the equipment at the conclusion of the survey. No noticeable drift or changes were noted based on the calibrated level of 94.0 dB at 1kHz

² British Standard 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures. BSI (2003)

4. Environmental Noise Survey and Results

- 4.1. The measurement results are summarised in Tables 5 and 6 below. The results are broken down into daytime (07.00 to 23.00hrs) and night-time (23.00 to 07.00hrs) periods. Single figure values with reference to a time interval of 1 hour for daytime and 15mins for night-time measurements

Date	Time Period	L _{Aeq,T} dB	L _{Amax,T} dB	L _{A90,T} dB
25.11.22	Day (12.00 to 23.00)	57 – 66 Average: 60	73 – 104 Average: 94	53 – 62 Average: 55
25.11 to 26.11.22	Night (23.00 to 07.00)	51 – 61 Average: 54	60 – 83 Average: 68	48 – 53 Average: 50
26.11.22	Day (07.00 to 23.00)	54 – 59 Average: 57	65 – 79 Average: 73	51 – 56 Average: 54
26.11 to 27.11.22	Night (23.00 to 07.00)	51 – 59 Average: 55	60 – 76 Average: 65	47 – 55 Average: 52
27.11.22	Day (07.00 to 23.00)	52 – 60 Average: 57	67 – 94 Average: 84	49 – 53 Average: 52
27.11 to 28.11.22	Night (23.00 to 07.00)	48 – 59 Average: 52	59 – 81 Average: 66	42 – 52 Average: 46
28.11.22	Day (07.00 to 11.00)	55 – 60 Average: 59	73 – 83 Average: 79	49 – 53 Average: 54

Table 5: Free field external noise levels at MP1

Date	Time Period	L _{Aeq,30mins} dB	L _{Amax,30mins} dB
25.11.22	Day (12.00 to 23.00) ³	39 – 51 Average: 43	48 – 79 Average: 67
25.11 to 26.11.22	Night (23.00 to 07.00)	34 – 40 Average: 38	46 – 62 Average: 54
26.11.22	Day (07.00 to 23.00)	36 – 44 Average: 40	48 – 71 Average: 59
26.11 to 27.11.22	Night (23.00 to 07.00)	34 – 44 Average: 40	46 – 71 Average: 61
27.11.22	Day (07.00 to 23.00)	33 – 48 Average: 40	46 – 76 Average: 65
27.11 to 28.11.22	Night (23.00 to 07.00)	32 – 41 Average: 34	45 – 72 Average: 48
28.11.22	Day (07.00 to 11.00)	39 – 48 Average: 42	51 – 72 Average: 64

Table 6: Noise levels within room at MP2

- 4.2. The raw data and charts of the noise data collected are shown in Appendix A

³ Excludes one anomalous reading around 6pm measuring L_{Aeq} 81dB

5. Assessment and Analysis

5.1. Rail Noise - 2nd Floor

- 5.1.1. The 2nd floor glazing to the proposed bedrooms is in direct line of sight from the railway, any benefit from screening is negligible and is not included in calculations.
- 5.1.2. Based the elevated position and line of sight, rail noise is the dominant source.
- 5.1.3. Table 7 shows predicted sound level based on a 66 dB L_{Aeq} at MP1 (worst-case). This is calculated using the equation $L_2 = L_1 - 20\log(r_2/r_1)$, where $L_1 = MP1$, r_1 = known sound level to source and r_2 = source to receiver.

Element	Description	Unit
L_1	$L_{Aeq,T}$ at MP1	66 dB
r_1	Source to MP1	19 metres
r_2	Source to Receiver	35 metres
L_2	$L_{Aeq,T}$ at the facade	61 dB

Table 7: Facade correction based on propagation over distance

- 5.1.4. This is assumed to be the worst case for rail noise on the 2nd floor bedrooms and based upon the apparent sound reduction of the ground floor façade, a predicted, internal noise level of 39 dB $L_{Aeq,T}$ is expected to be achieved.
- 5.1.5. The background noise (L_{A90}) measured at MP1 is representative of the levels at the road levels.

5.2. Road Noise - Ground Floor

- 5.2.1. The ground floor is dominated by road noise. To assess impact noise levels, measurements were made within the corner room (Rm-S02) over a four-day period (see Table 6).
- 5.2.2. External noise levels were measured over a shorter duration, that encompassed a representative mix of noise sources, within the area (see Table 8 below)

Date	Time Period	$L_{Aeq,13min}$ dB	$L_{Amax,13min}$ dB
25.11.22	12.14 to 12.29	62 – 73 Average: 69	69 – 80 Average: 76

Table 8: Road traffic data

- 5.2.3. The apparent sound reduction offered by the existing façade based on worst case levels shown in Tables 7 and 8 would be:

	External dB	Internal dB	$R_{w,tr}$ dB
$L_{Aeq,T}$	73	51	22
L_{Amax}	80	79 ⁴	1 ⁵

Table 9: Sound reduction offered by ground floor facade

⁴ L_{Amax} noise levels are easily contaminated, as access to Rm-S02 was possible it is likely that this figure has been contaminated.

⁵ This figure should be the same or similar as the $R_{w,tr}$ for the $L_{Aeq,T}$ and is assumed to be different given the possibility of contamination (see footnote 4)

- 5.2.4. Additional glazing will be required to achieve the performance levels required for each type of space and assuming that the wall construction is both satisfactory and cannot be disturbed.

5.3. BS4142 Assessment for heat pump

Results	Value	Commentary
Measured Ambient Sound Level	62 dB $L_{Aeq,1 \text{ hour}}$	Assumed level with 61dB at façade and 56dB with both heat pumps running simultaneously
Residual Sound Level	61 dB $L_{Aeq,1 \text{ hour}}$	Calculated façade level based on measured levels at MP1
Typical Background Sound Level	53 dB $L_{Aeq,1 \text{ hour}}$	Logarithmic average over measurement period
Specific Sound Level	55 dB $L_{Aeq,1 \text{ hour}}$	Logarithmic subtraction of measured ambient sound and residual sound level. No correction for on-time included as this is an unknown variable that cannot be predicted
Acoustic Feature Correction	+3dB Intermittency	Added given the heat pump will work in cycles of operation
Rating Level	$(55 + 3)\text{dB} = 58 \text{ dB}$	Rail and road traffic may vary depending on a wide variety of circumstances
Background Sound Level	53 dB $L_{Aeq,1 \text{ hour}}$	Average levels based on representative period measured
Excess of rating over background sound level	$(58 - 53)\text{dB} = 5 \text{ dB}$	
Assessment	Adverse Impact	A difference of around +5 dB is an indication of an adverse impact being likely, based on context
Context	If positioned on the same elevation and location as the existing unit, the building acts as a natural barrier to the closest residential dwellings which are approximately 35 metres away and not in direct line of sight of the expected heat pump location	
Uncertainty	Some degree noted	The assessment is based upon calculated expectations of an operational unit, given the heat pump is not installed at the time of the site survey being carried out

5.4. Glazing

- 5.4.1. The current timber constructed sash windows are to be replaced with units provided by Mumford & Wood (<https://www.mumfordwood.com/>). The new units are timber frame sash windows with sealed glazing units (4mm Toughened Low E Glass / 6mm Air Space with Krypton gas / 4mm Toughened Low E Glass).
- 5.4.2. The new units are putty glazed and fitted with appropriate seals. The timber frame and seals are assumed to provide the same sound reduction values as the sealed glazing unit.

- 5.4.3. The glazing unit has been assessed to provide a sound reduction of R_w 33 dB (C: -2; C_{tr} -4 dB) using INSUL Sound Insulation Prediction software.
- 5.4.4. This shows an increase of 11 dB in sound reduction performance over the predicted sound reduction value of 22 dB for the original glazing.
- 5.4.5. Based on the worst case measured average levels for day and night-time periods the predicted internal $L_{Aeq,T}$ levels for these periods would be 32 dB and 29 dB respectively. These levels meet those required by BS8233 and Guidelines for Community Noise, without additional elements being required.
- 5.4.6. Whilst the windows may be openable by design, in doing so this will impact on the acoustic performance and levels within the rooms may exceed the required levels.

6. Assumptions and Uncertainty

- 6.1. The complex nature of the site with buildings and bridge structures (supporting elevated railway lines) makes this a complex site with large amounts of reflected noise.
- 6.2. The existing characteristics of noise from road and rail sources are outside of our influence and have not been included in any calculations.
- 6.3. Any suggestions for acoustic systems to improve performance to the existing structure are limited to internal application only, given the building is listed.
- 6.4. Measuring positions were chosen due to the lack of available space around the building to set up an unsupervised measuring position that would not be affected by façade reflections.
- 6.5. Given the listed nature of the building and security reasons, it was not possible to erect a temporary monitoring position through an open window sufficiently far enough from the façade to make this an effective proposition.
- 6.6. Façade corrections are based on a point source in free field conditions with no (or minimal) reduction offered by the barriers or structures to assume a worst-case scenario for the proposed 2nd floor bedrooms.
- 6.7. The heat pump assessment is based on the new unit being fitted in the same general location as the existing one and as shown on drawing STAT:01/4311 (see Appendix B)



Image 5: Existing heat pump location

- 6.8. Acoustic performance for any replacement glazing will need to be checked with the manufacturers own test data and in place of this INSUL has been used to predict sound reduction levels.

7. Conclusions

- 7.1. AEI Acoustics Limited has been commissioned to undertake an environmental noise impact assessment to determine existing noise levels and the impact they may have on the proposed conversion of the Old Stationmasters House, Manchester in to holiday accommodation.
- 7.2. A noise survey was undertaken over a four-day period (25.11 to 28.11.2022) to monitor rail and road traffic noise, with a further 15-minute survey carried out to provide representative data for external road noise.
- 7.3. The assessment is based on representative evidence for existing noise sources which are not fixed or can be altered. Further restrictions include the listed status of the building and therefore no additions or alterations to the external façade or area have been considered or included.
- 7.4. The road traffic noise is the dominant source at ground level, and measured $L_{Aeq,15mins}$ 69 dB and $L_{Amax,15 mins}$ 76dB at 2.5m from the façade of the building (logarithmic averages).
- 7.5. The noise levels recorded internally, in room S02, recorded average sound levels of $L_{Aeq,30mins}$ 43 dB and $L_{Amax,30 mins}$ 67dB (worst case) over the four-day period (MP2).
- 7.6. Replacing the existing units with new timber frame sash windows that include a 14mm sealed unit (4mm toughened/6mm air space/ 4mm toughened glass) provides, a predicted internal sound level that meets the requirements of BS8233.
- 7.7. The L_{Amax} levels, at ground level, exceed those expected outside of a bedroom (BS8233) of 60 dBA with an open window. The nature of the site does not allow for this to be mitigated and therefore whilst windows may still be openable, other means of ventilation, to reduce overheating, may need to be explored.
- 7.8. Rail noise was measured at the closest 'safe' area to the façade which was approximately 17.5 metres from the façade on a railway siding (MP1). The sound level meter was positioned 3.5 metres from the closest reflective surface and positioned above the height of this feature, in line of sight of the 2nd floor façade.
- 7.9. The sound levels measured were, on average, around 60 dB $L_{Aeq,1 hour}$ and 94 dB $L_{Amax,1 hour}$. The background noise levels were measured at an average of 55 dB L_{A90} , around 5 dB lower than the ambient levels.
- 7.10. An expected sound level of 61 dB $L_{Aeq,1hour}$ at the 2nd floor facade has been calculated based on propagation over distance (rail source 19 metres from MP1)
- 7.11. Based on the assessed existing facade sound reduction value of 22 dB (see 5.2.3) this would give an internal noise level of 39 dB $L_{Aeq,1hour}$.
- 7.12. Installing new glazing as per section 7.7 above, are predicted to achieve the required performance criteria, for 2nd floor bedrooms
- 7.13. A logarithmic average of 86 dB $L_{Amax,1hour}$ has been utilized for the 2nd floor bedrooms assessment, for the night-time period, with a range of 59 dB $L_{Amax,1hour}$ to 104 dB $L_{Amax,1hour}$ being recorded.



8. APPENDICES

8.1. APPENDIX A – MEASUREMENT DETAILS

Date & Time	L _{Aeq,1hour} dB	L _A F _{max} dB	L ₉₀ dB	Date & Time	L _{Aeq,1hour} dB	L _A F _{max} dB	L ₉₀ dB
25/11/2022 12:39:33	60.99	95.51	61.5	27/11/2022 08:39:33	53.61	73.69	49.2
25/11/2022 13:39:33	59.87	75.62	56.6	27/11/2022 09:39:33	54.32	68.11	50.2
25/11/2022 14:39:33	59.25	77.79	55.9	27/11/2022 10:39:33	56.26	67.31	52.3
25/11/2022 15:39:33	58.96	75.01	55	27/11/2022 11:39:33	57.29	69.96	53.5
25/11/2022 16:39:33	59.47	78.74	55.4	27/11/2022 12:39:33	57.08	69.35	53
25/11/2022 17:39:33	58.84	75.51	54.7	27/11/2022 13:39:33	56.76	71.47	52.6
25/11/2022 18:39:33	58.9	79.22	54.7	27/11/2022 14:39:33	56.84	78.21	52.4
25/11/2022 19:39:33	58.18	72.71	54.2	27/11/2022 15:39:33	57.5	79.53	52.5
25/11/2022 20:39:33	56.97	77.96	52.6	27/11/2022 16:39:33	56.65	74.11	52.6
25/11/2022 21:39:33	57.23	77.98	53.3	27/11/2022 17:39:33	58.73	84.37	52.3
25/11/2022 22:39:33	65.65	104.06	53.5	27/11/2022 18:39:33	56.79	73.29	52.4
25/11/2022 23:39:33	59.36	83.13	53.3	27/11/2022 19:39:33	57.03	75.87	52.1
26/11/2022 00:39:33	57.57	76.7	52.4	27/11/2022 20:39:33	57.65	82.68	52.3
26/11/2022 01:39:33	55.57	77.6	50.9	27/11/2022 21:39:33	58.48	89.21	51.4
26/11/2022 02:39:33	57.07	78.25	50.7	27/11/2022 22:39:33	60.64	94.18	50.9
26/11/2022 03:39:33	54.5	71.73	49.1	27/11/2022 23:39:33	56.08	81	49.6
26/11/2022 04:39:33	53.26	61.78	48.4	28/11/2022 00:39:33	53.42	73.78	47.8
26/11/2022 05:39:33	51.67	62.44	47.6	28/11/2022 01:39:33	50.56	63.9	46
26/11/2022 06:39:33	52.59	69.57	49	28/11/2022 02:39:33	52.43	76.94	43.1
26/11/2022 07:39:33	54.03	65.15	50.6	28/11/2022 03:39:33	51.23	77.12	42.4
26/11/2022 08:39:33	55.03	68.55	51.6	28/11/2022 04:39:33	49.63	65.1	42.9
26/11/2022 09:39:33	55.79	69.24	52.6	28/11/2022 05:39:33	50.79	74.83	44.4
26/11/2022 10:39:33	56.83	66.79	53.9	28/11/2022 06:39:33	54.59	72.51	47.9
26/11/2022 11:39:33	56.88	73.55	53.8	28/11/2022 07:39:33	58.27	75.9	52.7
26/11/2022 12:39:33	57.47	67.06	54.5	28/11/2022 08:39:33	60.26	83.29	55.1
26/11/2022 13:39:33	57.81	71.78	54.2	28/11/2022 09:39:33	59.58	74.92	55.7
26/11/2022 14:39:33	57.44	67.48	53.9	28/11/2022 10:39:33	59.54	79.9	56.1
26/11/2022 15:39:33	57.7	65.37	54.1				
26/11/2022 16:39:33	57.04	78.25	53.7				
26/11/2022 17:39:33	57.52	75.46	54.5				
26/11/2022 18:39:33	57.14	71.48	54.4				
26/11/2022 19:39:33	57.95	75.53	54.6				
26/11/2022 20:39:33	58.3	79.39	54.8				
26/11/2022 21:39:33	58.77	70.15	55.7				
26/11/2022 22:39:33	58.75	71.22	55.7				
26/11/2022 23:39:33	58.53	72.29	55				
27/11/2022 00:39:33	58.72	71.01	55.1				
27/11/2022 01:39:33	57.94	74.19	53.8				
27/11/2022 02:39:33	56.65	70.77	52.9				
27/11/2022 03:39:33	56.74	76.27	52				
27/11/2022 04:39:33	55.4	63.46	51.1				
27/11/2022 05:39:33	53.49	63.76	47.7				
27/11/2022 06:39:33	51.85	68.76	47				
27/11/2022 07:39:33	52.35	68.88	48.7				

Table 10: MP1 1 hour measurement data

Date & Time	L _{Aeq,30min} dB	L _{Afmax} dB	L ₉₀ dB	Date & Time	L _{Aeq,30min} dB	L _{Afmax} dB	L ₉₀ dB
25/11/2022 12:39:33	59.14	69.84	61.5	26/11/2022 10:39:33	56.93	66.79	53.9
25/11/2022 13:09:33	60.22	75.62	56.7	26/11/2022 11:09:33	57.14	73.55	54
25/11/2022 13:39:33	59.57	67.58	56.5	26/11/2022 11:39:33	56.61	69.3	53.7
25/11/2022 14:09:33	59.23	73.01	55.9	26/11/2022 12:09:33	57.45	66.58	54.6
25/11/2022 14:39:33	59.26	77.79	55.8	26/11/2022 12:39:33	57.5	67.06	54.4
25/11/2022 15:09:33	59.04	75.01	54.9	26/11/2022 13:09:33	57.7	71.78	54.1
25/11/2022 15:39:33	58.88	70.42	55	26/11/2022 13:39:33	57.92	71.02	54.3
25/11/2022 16:09:33	59.78	76.59	55.5	26/11/2022 14:09:33	57.58	67.48	53.9
25/11/2022 16:39:33	59.14	78.74	55.3	26/11/2022 14:39:33	57.29	65.05	54
25/11/2022 17:09:33	59.28	75.51	54.8	26/11/2022 15:09:33	57.61	65.16	54.4
25/11/2022 17:39:33	58.34	73.02	54.6	26/11/2022 15:39:33	57.78	65.37	53.9
25/11/2022 18:09:33	58.51	74.69	54.8	26/11/2022 16:09:33	57.45	70.43	53.6
25/11/2022 18:39:33	59.27	79.22	54.7	26/11/2022 16:39:33	56.6	78.25	53.7
25/11/2022 19:09:33	58.46	72.71	54.5	26/11/2022 17:09:33	57.2	65.54	54.4
25/11/2022 19:39:33	57.87	71.07	54	26/11/2022 17:39:33	57.81	75.46	54.5
25/11/2022 20:09:33	57.76	77.96	52.7	26/11/2022 18:09:33	56.87	68.16	54.5
25/11/2022 20:39:33	56.02	66.1	52.6	26/11/2022 18:39:33	57.39	71.48	54.3
25/11/2022 21:09:33	57.49	77.98	53.2	26/11/2022 19:09:33	58.26	75.53	55.1
25/11/2022 21:39:33	56.96	77.76	53.5	26/11/2022 19:39:33	57.61	74.22	54.1
25/11/2022 22:09:33	58.25	73.08	53.9	26/11/2022 20:09:33	58.06	79.39	54.6
25/11/2022 22:39:33	68.24	104.06	53.1	26/11/2022 20:39:33	58.52	76.86	55.1
25/11/2022 23:09:33	59.58	83.13	53.6	26/11/2022 21:09:33	58.81	67.69	55.8
25/11/2022 23:39:33	59.14	78.53	53	26/11/2022 21:39:33	58.73	70.15	55.6
26/11/2022 00:09:33	58.41	76.7	52.6	26/11/2022 22:09:33	58.65	69.57	55.7
26/11/2022 00:39:33	56.55	67.65	52.2	26/11/2022 22:39:33	58.84	71.22	55.7
26/11/2022 01:09:33	55.32	64.25	50.9	26/11/2022 23:09:33	58.51	66.09	54.9
26/11/2022 01:39:33	55.81	77.6	50.9	26/11/2022 23:39:33	58.55	72.29	55.2
26/11/2022 02:09:33	55.19	66.59	51.3	27/11/2022 00:09:33	58.73	71.01	55.4
26/11/2022 02:39:33	58.38	78.25	50.1	27/11/2022 00:39:33	58.71	68.58	54.7
26/11/2022 03:09:33	54.63	64.11	49.9	27/11/2022 01:09:33	58.37	74.19	54
26/11/2022 03:39:33	54.36	71.73	48.5	27/11/2022 01:39:33	57.45	67.57	53.6
26/11/2022 04:09:33	53.35	60.83	48.4	27/11/2022 02:09:33	56.56	70.77	52.9
26/11/2022 04:39:33	53.17	61.78	48.5	27/11/2022 02:39:33	56.73	63.55	52.9
26/11/2022 05:09:33	51.8	62.44	47.6	27/11/2022 03:09:33	57.52	76.27	52.4
26/11/2022 05:39:33	51.53	61.29	47.5	27/11/2022 03:39:33	55.79	63.67	51.6
26/11/2022 06:09:33	52.27	69.57	48.6	27/11/2022 04:09:33	55.35	62.28	51.6
26/11/2022 06:39:33	52.89	63.26	49.5	27/11/2022 04:39:33	55.45	63.46	50.5
26/11/2022 07:09:33	54.15	65.07	50.8	27/11/2022 05:09:33	54.28	63.76	48.5
26/11/2022 07:39:33	53.9	65.15	50.3	27/11/2022 05:39:33	52.51	63.7	46.9
26/11/2022 08:09:33	54.65	66.35	51.2	27/11/2022 06:09:33	52.31	68.76	47.2
26/11/2022 08:39:33	55.39	68.55	52.4	27/11/2022 06:39:33	51.34	61.9	46.9
26/11/2022 09:09:33	55.72	69.05	52.4	27/11/2022 07:09:33	52.19	62.9	48.3
26/11/2022 09:39:33	55.87	69.24	52.8	27/11/2022 07:39:33	52.5	68.88	49.1
26/11/2022 10:09:33	56.72	66.76	54	27/11/2022 08:09:33	54.06	73.69	49.3

Table 11: MP1 30 minute measurement data

Date & Time	L _{Aeq,30min} dB	L _{Afmax} dB	L ₉₀ dB	Date & Time	L _{Aeq,30min} dB	L _{Afmax} dB	L ₉₀ dB
27/11/2022 08:39:33	53.11	70.65	49	28/11/2022 06:39:33	55.82	71.98	49.6
27/11/2022 09:09:33	53.9	67.59	49.8	28/11/2022 07:09:33	56.71	70.06	52.1
27/11/2022 09:39:33	54.7	68.11	51	28/11/2022 07:39:33	59.41	75.9	53.4
27/11/2022 10:09:33	56.26	67.31	52	28/11/2022 08:09:33	61.22	83.29	55
27/11/2022 10:39:33	56.26	64.4	52.8	28/11/2022 08:39:33	59.02	76.66	55.2
27/11/2022 11:09:33	57.44	67.41	53.8	28/11/2022 09:09:33	59.57	70.24	55.3
27/11/2022 11:39:33	57.13	69.96	53.2	28/11/2022 09:39:33	59.6	74.92	56.7
27/11/2022 12:09:33	56.87	69.35	52.9	28/11/2022 10:09:33	60.13	79.9	56.4
27/11/2022 12:39:33	57.28	69.09	53	28/11/2022 10:39:33	58.83	69.89	55.8
27/11/2022 13:09:33	56.57	66.09	52.7				
27/11/2022 13:39:33	56.94	71.47	52.6				
27/11/2022 14:09:33	56.66	78.21	52.6				
27/11/2022 14:39:33	57.01	68.36	52.3				
27/11/2022 15:09:33	57.58	79.53	52.3				
27/11/2022 15:39:33	57.42	74.26	52.6				
27/11/2022 16:09:33	56.69	67.72	52.7				
27/11/2022 16:39:33	56.61	74.11	52.5				
27/11/2022 17:09:33	56.73	67.42	52.5				
27/11/2022 17:39:33	60.1	84.37	52.1				
27/11/2022 18:09:33	56.61	70.49	52.4				
27/11/2022 18:39:33	56.97	73.29	52.4				
27/11/2022 19:09:33	57.06	71.6	51.9				
27/11/2022 19:39:33	57	75.87	52.2				
27/11/2022 20:09:33	55.45	65.78	52.4				
27/11/2022 20:39:33	59.1	82.68	52.3				
27/11/2022 21:09:33	57.11	77.43	51.4				
27/11/2022 21:39:33	59.52	89.21	51.4				
27/11/2022 22:09:33	61.18	94.18	51.1				
27/11/2022 22:39:33	60.02	92.78	50.7				
27/11/2022 23:09:33	57.48	81	50				
27/11/2022 23:39:33	53.99	66.7	49.3				
28/11/2022 00:09:33	54.06	70.83	48.2				
28/11/2022 00:39:33	52.69	73.78	47.4				
28/11/2022 01:09:33	50.5	59.78	46.3				
28/11/2022 01:39:33	50.61	63.9	45.8				
28/11/2022 02:09:33	49.4	67.37	44.1				
28/11/2022 02:39:33	54.19	76.94	42.1				
28/11/2022 03:09:33	52.68	77.12	42.7				
28/11/2022 03:39:33	49.03	64.13	42.1				
28/11/2022 04:09:33	48.89	65.1	42.2				
28/11/2022 04:39:33	50.26	64.87	43.9				
28/11/2022 05:09:33	51.39	74.83	43.7				
28/11/2022 05:39:33	50.1	65.5	45.1				
28/11/2022 06:09:33	52.88	72.51	47				

Table 12: MP1 30 mins measurement data continued

Start Time	Duration (h:m:s)	L _{Aeq,30min} dB	L _A F _{max} dB	Date & Time	Duration (h:m:s)	L _{Aeq,30min} dB	L _A F _{max} dB
25/11/2022 12:04:13	00:25:47	51.2	73.9	26/11/2022 13:30:00	00:30:00	40.9	49.9
25/11/2022 12:30:00	00:30:00	41.6	55.5	26/11/2022 14:00:00	00:30:00	40.6	52.8
25/11/2022 13:00:00	00:30:00	40.3	50.1	26/11/2022 14:30:00	00:30:00	40.7	50.0
25/11/2022 13:30:00	00:30:00	39.6	48.5	26/11/2022 15:00:00	00:30:00	40.7	48.8
25/11/2022 14:00:00	00:30:00	40.9	51.2	26/11/2022 15:30:00	00:30:00	40.9	52.2
25/11/2022 14:30:00	00:30:00	44.1	71.0	26/11/2022 16:00:00	00:30:00	40.6	61.7
25/11/2022 15:00:00	00:30:00	40.9	50.0	26/11/2022 16:30:00	00:30:00	39.2	52.1
25/11/2022 15:30:00	00:30:00	41.1	49.5	26/11/2022 17:00:00	00:30:00	40.4	55.7
25/11/2022 16:00:00	00:30:00	41.4	54.0	26/11/2022 17:30:00	00:30:00	39.2	53.6
25/11/2022 16:30:00	00:30:00	41.1	60.6	26/11/2022 18:00:00	00:30:00	40.3	56.3
25/11/2022 17:00:00	00:30:00	40.7	52.4	26/11/2022 18:30:00	00:30:00	41.2	53.6
25/11/2022 17:30:00	00:30:00	80.5	84.5	26/11/2022 19:00:00	00:30:00	40.7	51.9
25/11/2022 18:00:00	00:30:00	41.7	53.0	26/11/2022 19:30:00	00:30:00	43.6	71.0
25/11/2022 18:30:00	00:30:00	41.0	57.6	26/11/2022 20:00:00	00:30:00	41.0	67.4
25/11/2022 19:00:00	00:30:00	41.1	57.7	26/11/2022 20:30:00	00:30:00	41.0	52.7
25/11/2022 19:30:00	00:30:00	41.8	66.8	26/11/2022 21:00:00	00:30:00	40.4	52.3
25/11/2022 20:00:00	00:30:00	38.7	50.6	26/11/2022 21:30:00	00:30:00	41.4	63.2
25/11/2022 20:30:00	00:30:00	38.7	50.0	26/11/2022 22:00:00	00:30:00	39.4	48.2
25/11/2022 21:00:00	00:30:00	39.1	48.4	26/11/2022 22:30:00	00:30:00	40.5	53.8
25/11/2022 21:30:00	00:30:00	39.8	55.3	26/11/2022 23:00:00	00:30:00	40.8	53.9
25/11/2022 22:00:00	00:30:00	49.4	79.1	26/11/2022 23:30:00	00:30:00	40.7	50.1
25/11/2022 22:30:00	00:30:00	39.9	51.8	27/11/2022 00:00:00	00:30:00	40.2	52.6
25/11/2022 23:00:00	00:30:00	40.2	49.2	27/11/2022 00:30:00	00:30:00	40.4	51.9
25/11/2022 23:30:00	00:30:00	40.2	55.3	27/11/2022 01:00:00	00:30:00	39.9	47.9
26/11/2022 00:00:00	00:30:00	39.8	50.3	27/11/2022 01:30:00	00:30:00	39.6	53.6
26/11/2022 00:30:00	00:30:00	39.2	50.1	27/11/2022 02:00:00	00:30:00	38.8	47.1
26/11/2022 01:00:00	00:30:00	39.2	58.9	27/11/2022 02:30:00	00:30:00	39.9	57.2
26/11/2022 01:30:00	00:30:00	39.6	61.7	27/11/2022 03:00:00	00:30:00	38.8	49.3
26/11/2022 02:00:00	00:30:00	38.4	52.3	27/11/2022 03:30:00	00:30:00	37.9	47.0
26/11/2022 02:30:00	00:30:00	38.1	46.8	27/11/2022 04:00:00	00:30:00	43.9	71.4
26/11/2022 03:00:00	00:30:00	38.2	48.5	27/11/2022 04:30:00	00:30:00	38.2	49.4
26/11/2022 03:30:00	00:30:00	38.0	56.5	27/11/2022 05:00:00	00:30:00	35.9	47.6
26/11/2022 04:00:00	00:30:00	36.3	46.5	27/11/2022 05:30:00	00:30:00	34.1	45.8
26/11/2022 04:30:00	00:30:00	35.2	45.9	27/11/2022 06:00:00	00:30:00	34.7	51.6
26/11/2022 05:00:00	00:30:00	34.8	47.7	27/11/2022 06:30:00	00:30:00	34.4	50.1
26/11/2022 05:30:00	00:30:00	33.8	46.2	27/11/2022 07:00:00	00:30:00	33.3	46.9
26/11/2022 06:00:00	00:30:00	35.0	53.6	27/11/2022 07:30:00	00:30:00	36.5	52.3
26/11/2022 06:30:00	00:30:00	35.8	48.1	27/11/2022 08:00:00	00:30:00	41.1	71.1
26/11/2022 07:00:00	00:30:00	36.1	52.8	27/11/2022 08:30:00	00:30:00	34.4	46.1
26/11/2022 07:30:00	00:30:00	36.0	49.8	27/11/2022 09:00:00	00:30:00	36.7	52.7
26/11/2022 08:00:00	00:30:00	36.2	48.6	27/11/2022 09:30:00	00:30:00	37.5	51.2
26/11/2022 08:30:00	00:30:00	38.2	56.8	27/11/2022 10:00:00	00:30:00	38.5	47.2
26/11/2022 09:00:00	00:30:00	37.2	48.8	27/11/2022 10:30:00	00:30:00	39.4	51.3
26/11/2022 09:30:00	00:30:00	38.0	54.0	27/11/2022 11:00:00	00:30:00	39.6	48.5
26/11/2022 10:00:00	00:30:00	38.8	56.9	27/11/2022 11:30:00	00:30:00	39.7	57.8
26/11/2022 10:30:00	00:30:00	39.4	50.4	27/11/2022 12:00:00	00:30:00	39.8	50.8
26/11/2022 11:00:00	00:30:00	39.4	60.3	27/11/2022 12:30:00	00:30:00	40.1	51.7
26/11/2022 11:30:00	00:30:00	39.9	51.4	27/11/2022 13:00:00	00:30:00	39.9	56.1
26/11/2022 12:00:00	00:30:00	39.6	50.9	27/11/2022 13:30:00	00:30:00	40.1	60.4
26/11/2022 12:30:00	00:30:00	40.7	52.5	27/11/2022 14:00:00	00:30:00	40.9	49.9
26/11/2022 13:00:00	00:30:00	40.8	56.1	27/11/2022 14:30:00	00:30:00	42.6	69.2

Table 13: MP2 30 minute measurement data

Start Time	Duration (h:m:s)	L _{Aeq30min} dB	L _{AFmax} dB	Date & Time	Duration (h:m:s)	L _{Aeq,30min} dB	L _{AFmax} dB
27/11/2022 15:00:00	00:30:00	42.6	69.2	28/11/2022 01:00:00	00:30:00	34.7	46.8
27/11/2022 15:30:00	00:30:00	41.2	64.5	28/11/2022 01:30:00	00:30:00	33.9	49.1
27/11/2022 16:00:00	00:30:00	39.5	49.3	28/11/2022 02:00:00	00:30:00	32.6	46.5
27/11/2022 16:30:00	00:30:00	40.0	51.9	28/11/2022 02:30:00	00:30:00	33.2	49.3
27/11/2022 17:00:00	00:30:00	39.3	50.9	28/11/2022 03:00:00	00:30:00	33.3	45.4
27/11/2022 17:30:00	00:30:00	40.1	60.6	28/11/2022 03:30:00	00:30:00	33.7	46.3
27/11/2022 18:00:00	00:30:00	39.2	48.8	28/11/2022 04:00:00	00:30:00	32.3	45.7
27/11/2022 18:30:00	00:30:00	39.6	56.1	28/11/2022 04:30:00	00:30:00	33.5	50.9
27/11/2022 19:00:00	00:30:00	39.5	48.7	28/11/2022 05:00:00	00:30:00	40.7	71.8
27/11/2022 19:30:00	00:30:00	42.5	71.2	28/11/2022 05:30:00	00:30:00	33.4	46.5
27/11/2022 20:00:00	00:30:00	39.1	60.3	28/11/2022 06:00:00	00:30:00	33.6	46.7
27/11/2022 20:30:00	00:30:00	38.9	61.0	28/11/2022 06:30:00	00:30:00	36.0	50.4
27/11/2022 21:00:00	00:30:00	39.9	61.6	28/11/2022 07:00:00	00:30:00	39.1	52.1
27/11/2022 21:30:00	00:30:00	37.5	56.8	28/11/2022 07:30:00	00:30:00	39.8	53.3
27/11/2022 22:00:00	00:30:00	44.5	71.7	28/11/2022 08:00:00	00:30:00	41.7	63.2
27/11/2022 22:30:00	00:30:00	48.3	75.6	28/11/2022 08:30:00	00:30:00	42.1	58.5
27/11/2022 23:00:00	00:30:00	37.2	48.5	28/11/2022 09:00:00	00:30:00	41.0	52.8
27/11/2022 23:30:00	00:30:00	36.9	48.3	28/11/2022 09:30:00	00:30:00	41.1	54.3
28/11/2022 00:00:00	00:30:00	36.8	52.3	28/11/2022 10:00:00	00:30:00	40.4	52.5
28/11/2022 00:30:00	00:30:00	35.7	48.2	28/11/2022 10:30:00	00:30:00	39.9	50.6

Table 14: MP2 30 minute measurement data continued

Start Date	Start Time	L _{Aeq13min} dB	L _{AFmax} dB	Start Date	Start Time	L _{Aeq13min} dB	L _{AFmax} dB
25/11/2022	12:14:22	70.3	76.1	25/11/2022	12:20:52	63.6	68.7
25/11/2022	12:14:52	67	74.8	25/11/2022	12:21:22	69	76.6
25/11/2022	12:15:22	73.2	80.3	25/11/2022	12:21:52	66.3	73.3
25/11/2022	12:15:52	69.1	74.2	25/11/2022	12:22:22	68.8	76.2
25/11/2022	12:16:22	69.1	74.3	25/11/2022	12:22:52	69.2	76
25/11/2022	12:16:52	70.8	77.9	25/11/2022	12:23:22	64.8	71.6
25/11/2022	12:17:22	68.6	74.2	25/11/2022	12:23:52	66.7	75
25/11/2022	12:17:52	68.6	75	25/11/2022	12:24:22	68.8	75
25/11/2022	12:18:22	69.8	74.3	25/11/2022	12:24:52	61.5	69.4
25/11/2022	12:18:52	70	79	25/11/2022	12:25:22	68.2	74
25/11/2022	12:19:22	70.7	80.1	25/11/2022	12:25:52	70.9	76.6
25/11/2022	12:19:52	69.8	75.1	25/11/2022	12:26:22	68.3	74.8
25/11/2022	12:20:22	66.9	73.1	25/11/2022	12:26:52	66.9	77.2

Table 15: Wandering Road Noise Measurements

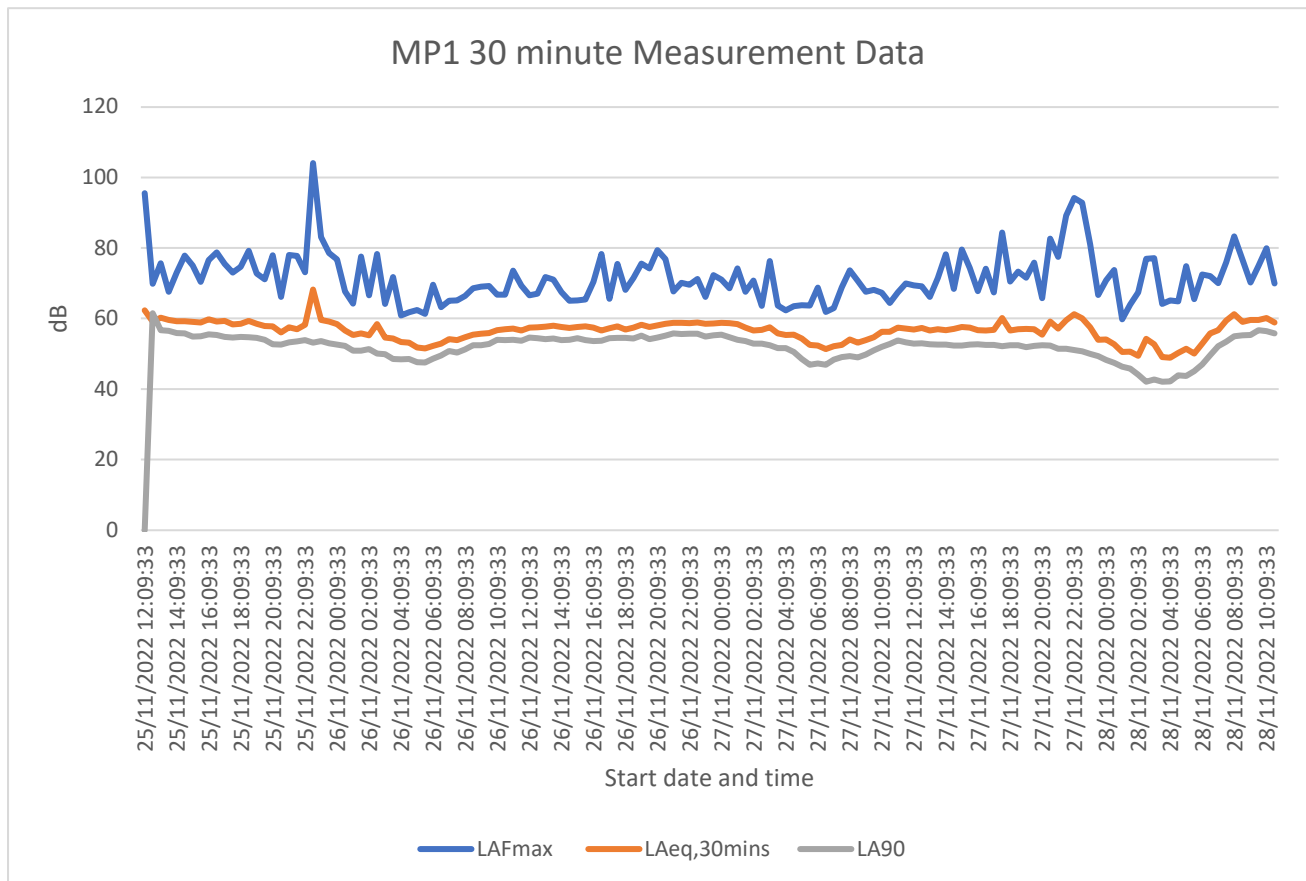


Chart 1: MP1 30 minute data graph

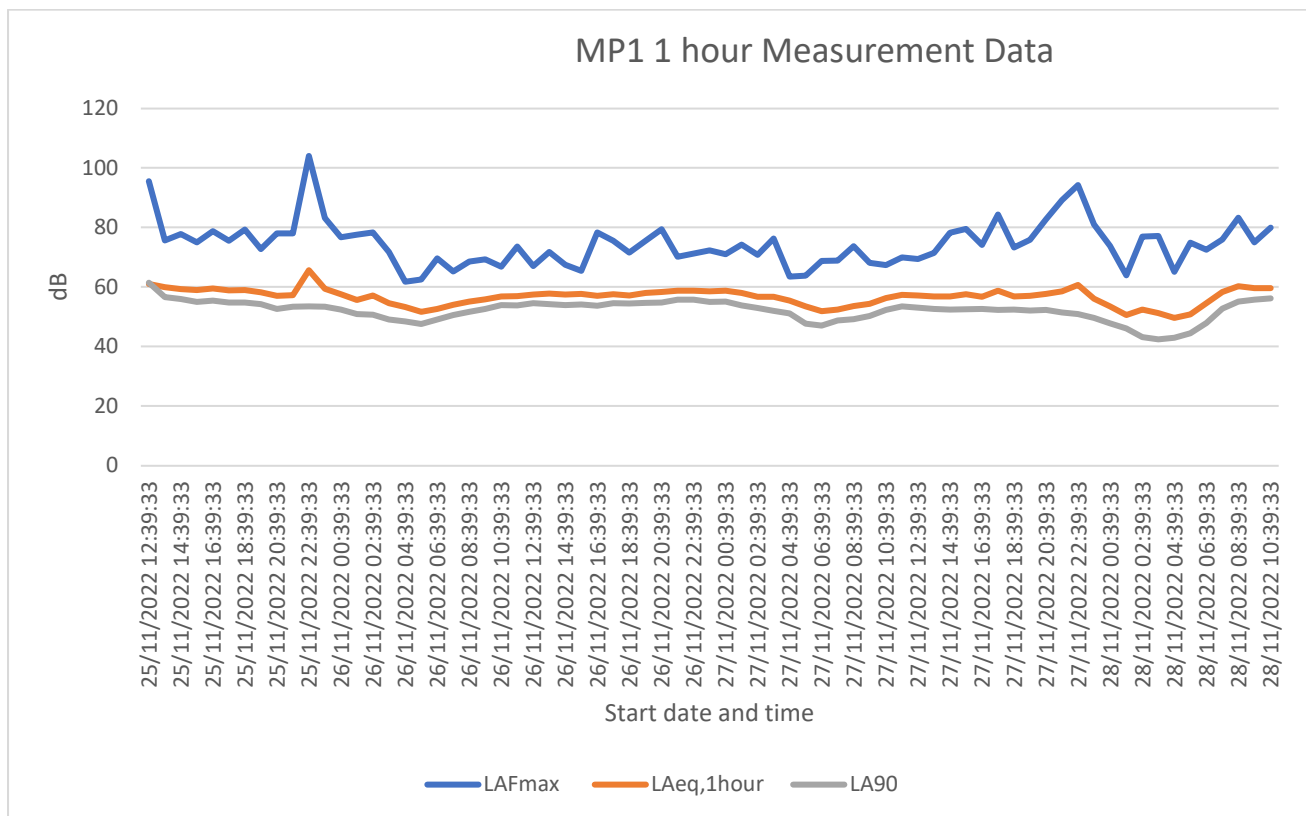


Chart 2: MP1 1 hour data graph

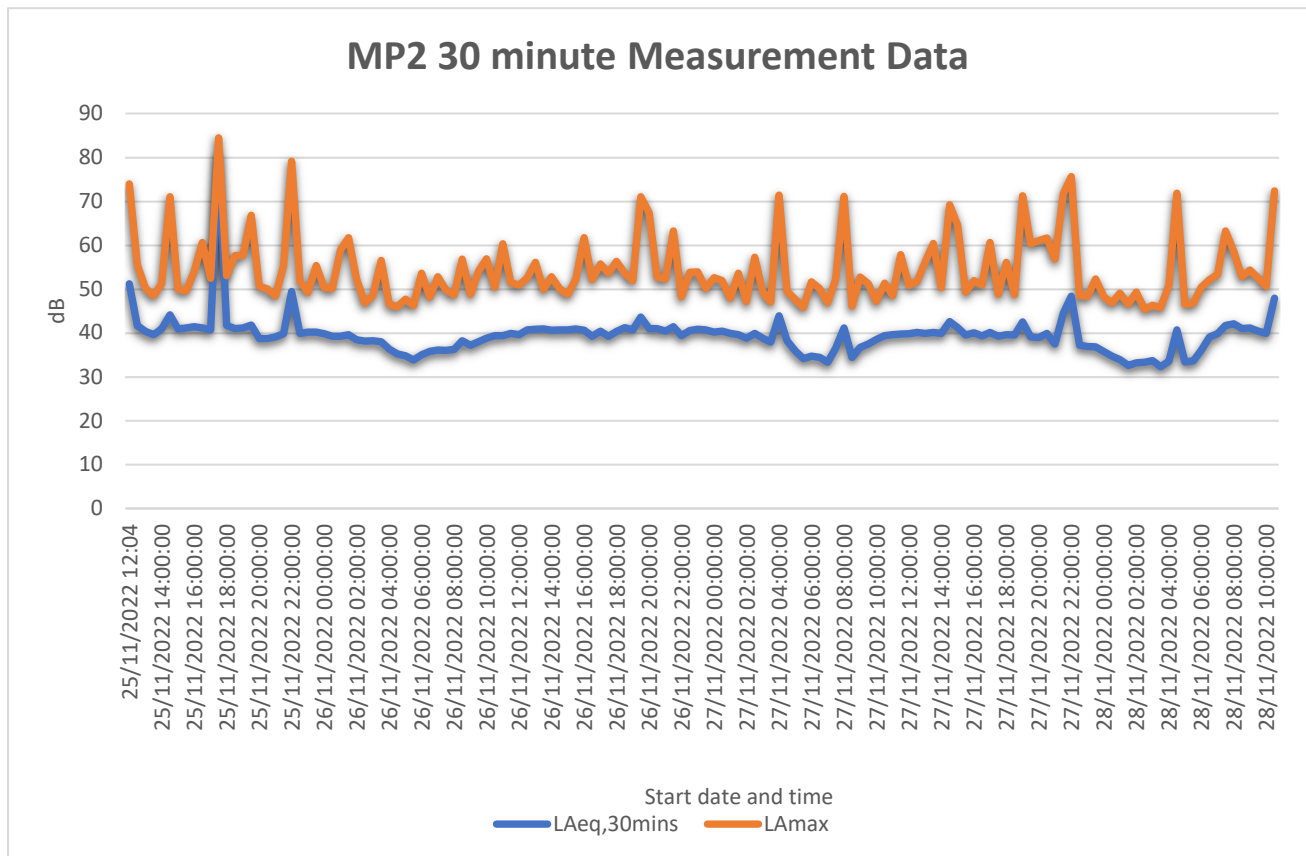


Chart 3: MP2 Measurement data graph

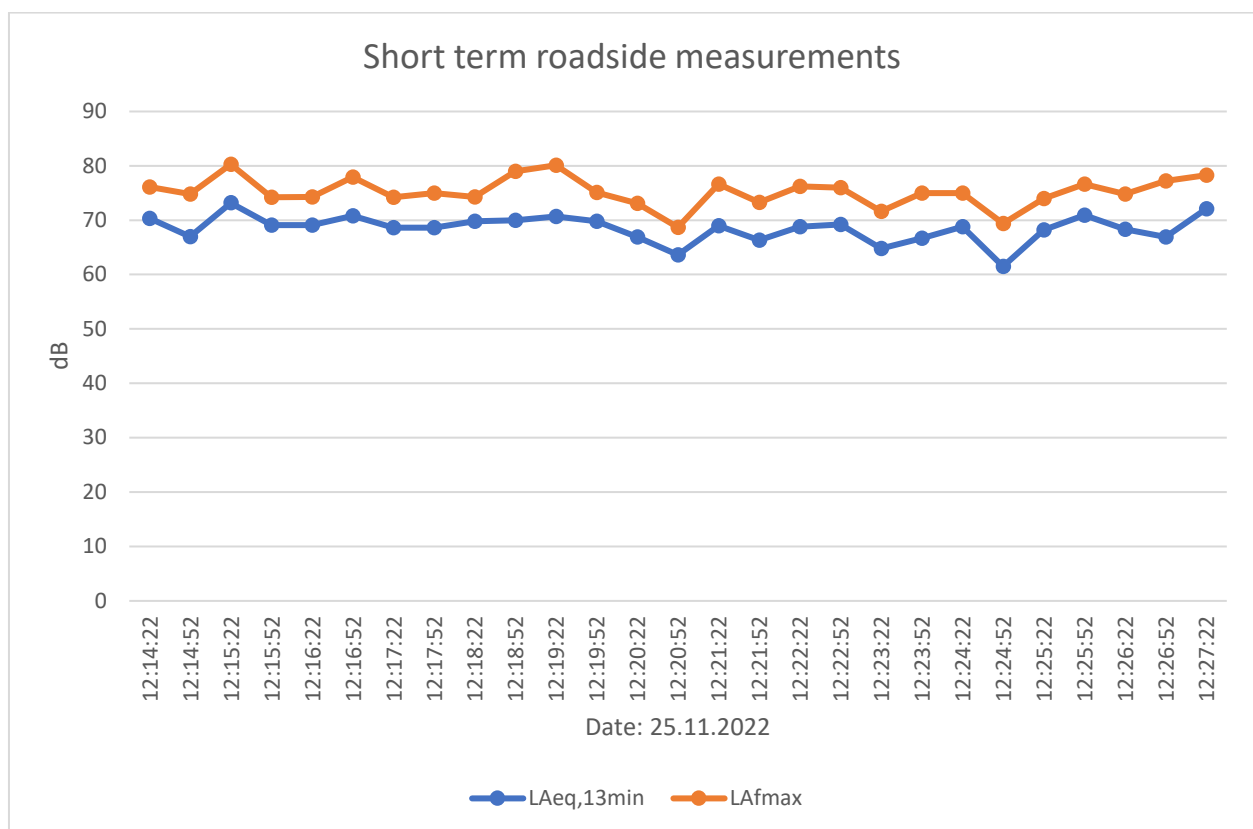
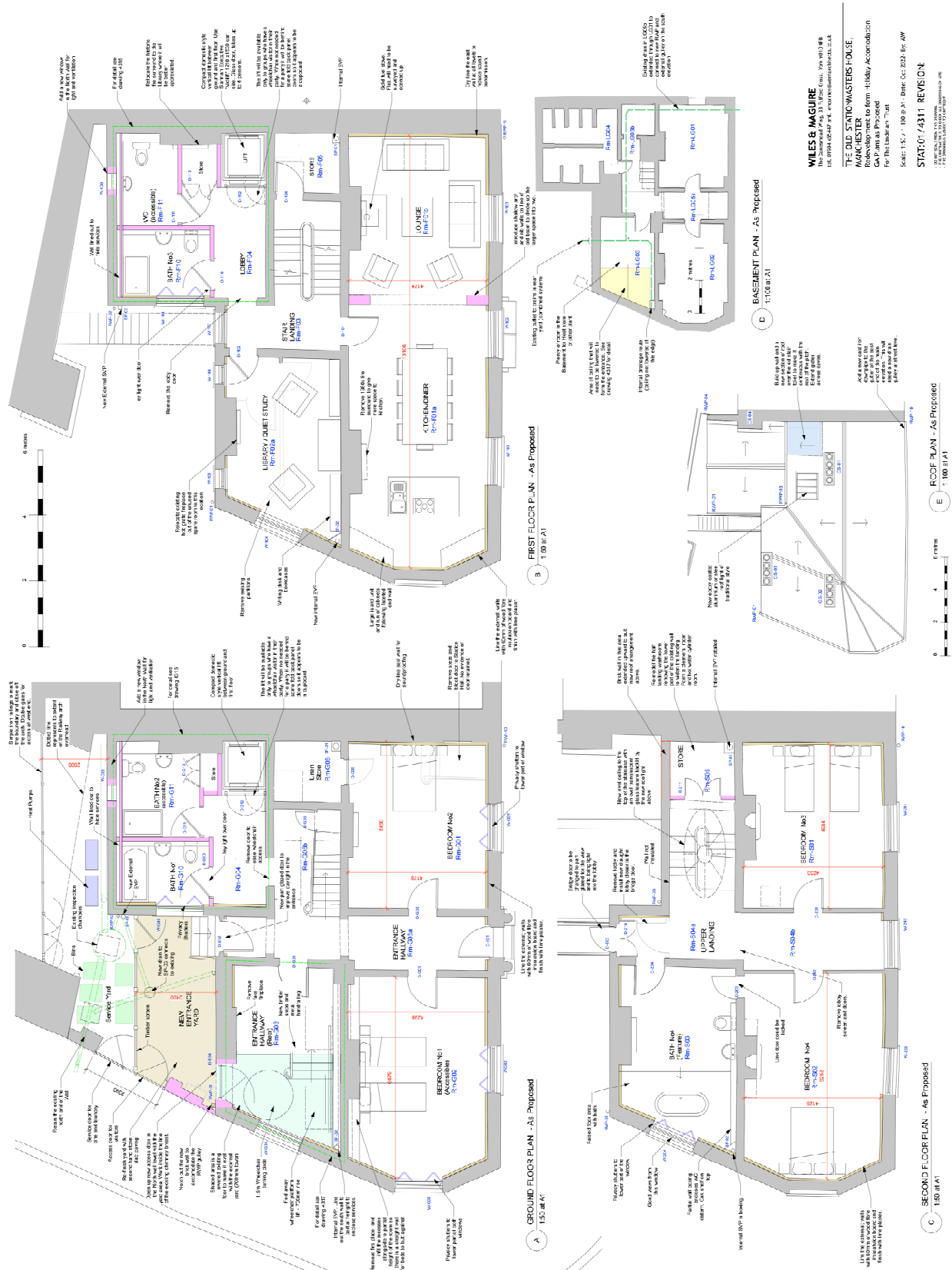


Chart 4: Roadside measurement data graph

8.2. APPENDIX B – DRAWINGS



8.3. APPENDIX C – INSUL CALCULATIONS

Sound Insulation Prediction (v9.0.24)

Program copyright Marshall Day Acoustics 2017

Margin of error is generally within $R_w \pm 3$ dB

AEI Acoustics Limited - Key No. 6571

Job Name:

Job No.:

Date: 15/12/2022

File Name: insul

Initials: JamesHendley

Notes:

 **R_w 33 dB**

C -2 dB

Ctr -4 dB

Mass-air-mass resonant frequency = 347 Hz

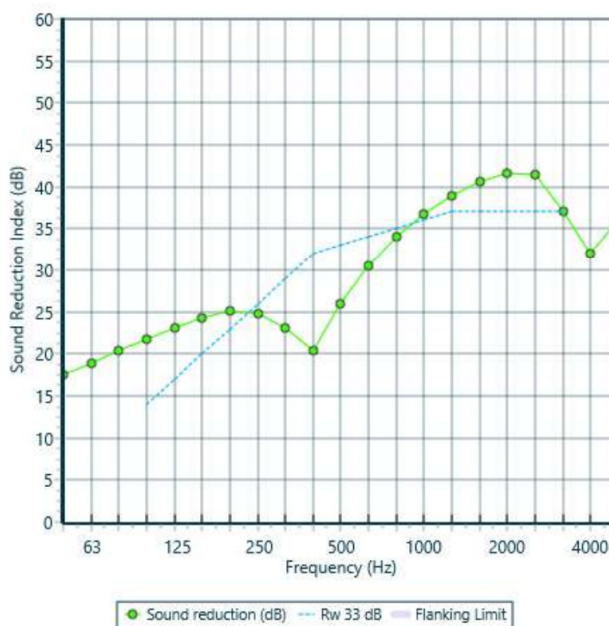
Panel Size = 2.0 m x 1.5 m

Partition surface mass = 20 kg/m²System descriptionPane 1 : 1 x 4 mm Glass (ρ :2430 kg/m³, E :52GPa, η :0.02, ρ_s :9.72 kg/m², f_0 :3498 Hz)

air: 6 mm (Timber sash)

Pane 2 : 1 x 4 mm Glass (ρ :2430 kg/m³, E :52GPa, η :0.02, ρ_s :9.72 kg/m², f_0 :3498 Hz)

freq.(Hz)	R(dB)	R(dB)
50	18	
63	19	19
80	20	
100	22	
125	23	23
160	24	
200	25	
250	25	24
315	23	
400	20	
500	26	24
630	31	
800	34	
1000	37	36
1250	39	
1600	41	
2000	42	41
2500	42	
3150	37	
4000	32	34
5000	36	



9. GLOSSARY OF TERMS

Background Noise (L_{90})

This is a statistical parameter often used to identify levels of background noise based on the noise levels measured and exceeded for 90% of the time.

Decibel (dB)

this is the main unit used to measure sound. They are a logarithmic unit used to express the magnitude of sound, changes in sound levels and a measure of sound insulation.

dB (A)

This is the measure of sound that has been adjusted using the A-weighted spectrum that modifies the measured data to compensate for the sensitivity of the human ear.

dB (C)

This is the measure of sound that has been adjusted using the C-weighted spectrum that modifies the measured data to compensate for very loud noises and aircraft.

Equivalent Continuous Noise Level (L_{Aeq})

The average of the total sound energy measured over a specified time period, normally A-weighted.

Fast (F) Time Weighting

An averaging time used in sound level meters, as defined in BS EN ISO 61672-1

Internal Ambient Noise Level (IANL)

Used in BB93 to provide overall noise levels within a room or space that includes all contributing sources such as external, plant and ventilation.

Octave Band

The frequency range divided into bands that allow for a manageable method of analysing data. Human hearing ranges from 20Hz to 20kHz.

One Third Octave Bands

These are octave bands that have been further divided into 3 separate bands. For example 125Hz octave band divides into one third octave bands of 100Hz, 125Hz and 160Hz

Reverberation Time

Often shown as RT and is the time taken for the sound to decay by 60 decibels once the noise source has been turned off (this may be referred to as the T60).

Reverberation is frequency dependent and is measured over octave or one third octave bands.

Reverberation occurs when sound energy can reflect off of hard surfaces within a room that causes multiple reflections to be heard, from the same source.

T_{mf} refers to the mid-frequency octave or one third octave bands only and is used within BB93

Sound Reduction Index (SRI)

Used to determine the effectiveness of a partition or material in reducing sound between two rooms (noise source and receiver). The SRI also takes into account the absorption of a room in calculating the final single figure value.

Weighted, Standardized Level Difference: ($D_{nT,w}$)

A single value for the airborne sound insulation performance of a partition.

Weighted, Standardized Impact Sound Pressure Level (L'_{nTw})

A single figure value for the impact sound insulation performance of a floor.

Weighted Sound Reduction Index (R_w)

this is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions.