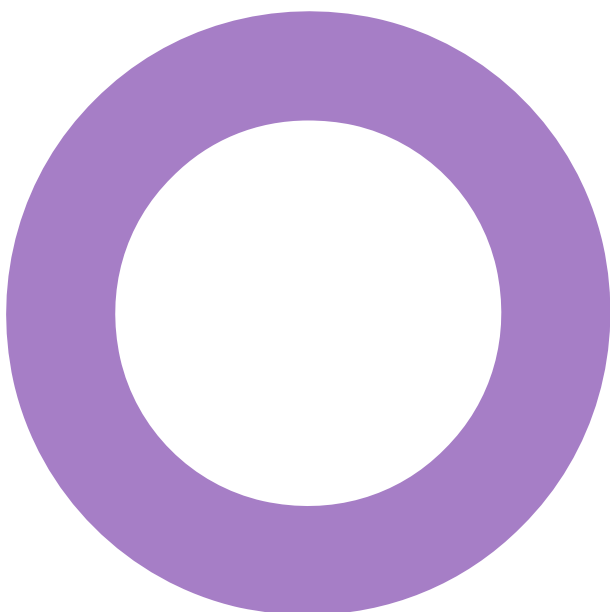


**Outram house, Great Ancoats
Street.
Manchester.**
Beech Design and Build Ltd.

ACOUSTICS

ACOUSTIC PLANNING REPORT

REVISION 1 – 02 MARCH 2018



Audit sheet.

Rev.	Date	Description	Prepared	Verified
1	02/03/2018	Acoustic planning report	LR	PM

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Executive summary

Hoare Lea LLP has been commissioned by Beech Design and Build Ltd to conduct a noise assessment for the Outram house development in Great Ancoats Street to assist the planning application. The proposed development consists of the conversion of an existing office building into residential dwellings.

An environmental sound survey has been carried out around the site between Thursday 22 February 2018 and Tuesday 27 February 2018. A noise egress assessment has been undertaken in accordance with BS4142:2014 and Manchester City Council requirements. Limits have been set based upon the data collected throughout the survey.

The representative background sound levels measured were $L_{A90,15min}$ 63dB during the daytime (07:00 - 23:00) and $L_{A90,15min}$ 41 dB during the night (23:00 to 07:00 hours).

Based on the above, Manchester City Council requirements and on guidance provided in BS4142, all plant, equipment and machinery associated with the development shall be controlled to ensure that the overall sound pressure level at 1 m from the façade of the nearest houses on Milbank Street does not exceed L_{Aeq} 47 dB during the daytime (07:00 - 23:00), L_{Aeq} 40 dB during the night (23:00 to 07:00 hours).

If the plant noise contains any tonal or impulsive characteristics, further corrections to these levels will be required.

An initial assessment of the building envelope sound insulation requirements has been carried out and minimum sound insulation performances for the building envelope elements have been given. Due to the high noise levels incident along the elevations facing Great Ancoats Street, high performance double glazing windows and a full mechanical ventilation scheme will be required to residential units on these elevations. For residences along the rear elevation, standard thermal double glazing and an acoustically rated passive ventilation strategy may be adopted.

1. Introduction

Hoare Lea LLP has been commissioned by Beech Design and Build Ltd to provide acoustic advice to assist the planning application for the proposed Outram House development at Great Ancoats Street, Manchester.

An environmental noise survey has been carried out around the site in order to determine the prevalent ambient and background sound levels in the area as well as determine the typical noise sources in the immediate vicinity of the site.

This report presents the results from the noise survey undertaken, and sets out plant noise limits determined in accordance with Manchester City Council requirements. An initial building envelope sound insulation assessment is also presented.

2. Site and development details

2.1 Site location

The proposed works the change of use development of Outram House, an existing office building, into a scheme of residential units. The development location is denoted in Figure 1 by the area shaded in red, with the nearest noise sensitive receivers indicated by the areas shaded in green. A number of active construction sites are located in the surrounding area, the closest of which is the Manchester Unity development site denoted by the area shaded in pink.



Figure 1: Annotated 3D rendered image showing development location and context (courtesy of Google Maps)

2.2 Surrounding area

The site is located within a predominantly residential area of Manchester city centre and is bonded to the north by Great Ancoats Street, a busy major dual carriage road.

The nearest noise sensitive receivers have been identified as the residences on the James Brindley Basin complex immediately adjacent to Outram House to the south west. The Islington Wharf apartment complex lies approximately 35 m to the north west of the development, across Great Ancoats Street. The Quantum residential buildings lie approximately 35 m to the south-east of the site across Ashton Canal. These are indicated by the areas shaded in light green in Figure 1.

The closest residential facades facing onto the James Brindley Basin courtyard to the south west of Outram House have been considered as the nearest noise sensitive premises for the purposes of assessing plant noise from the site.

The future Oxygen Tower development is located at approximately 15 m to the north of the development. It is understood that high elevation residences will be built on that site, therefore offering screening from Store Street.

3. Planning Policy and Guidance

3.1 Manchester City Council criteria

Manchester City Council (MCC) provide guidance on the assessment of noise with regard to new developments in the 'Manchester City Council Planning and Noise Technical Guidance' document, dated 2015. This is summarised below.

3.1.1 Internal noise levels

MCC has adopted the following internal noise limits for residential properties:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 15 times)
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
- Gardens and terraces (daytime) 55 dB L_{Aeq}

These criteria have been adopted for the following reasons:

- BS 8233: 2014 recognises these levels as a good standard for resting/sleeping conditions.
- The WHO document 'Guidelines for Community Noise' recommends an internal L_{Aeq} of 30dB for optimal sleep conditions (and no more than 35dB for internal rooms during daytime).
- The performance of acoustic insulation schemes can often be below that specified, according to the quality of installation, materials, noise spectrum and deterioration / wear and tear of building elements. A high design specification introduces a 'safety margin' should building elements not perform as well as expected ('on-site' performance).
- Performance specification for glazing does not usually take into account the detrimental effect of vents on the sound insulation. Even 'acoustic' vents will reduce the performance of the facade insulation, as they will inherently contain a free open area for air exchange.
- There is a general increase in urban noise levels, which can in the future be reasonably accommodated by these standards.
- The standards support the Local Authority corporate objective to prevent ill-health and improve local people's health and well being

3.1.2 Noise from Fixed Plant / Equipment

With regard to the control of noise from fixed plant and equipment, MCC guidance states that 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.

4. Environmental noise survey

The environmental noise survey was carried out on site over a period of 6 days between Friday 23 February 2018 and Tuesday 27 February 2018. During this time, short-duration attended measurements and long-term unattended measurements were carried out. Full details of the method and equipment used, as well as weather information are provided in Appendix A.

The survey measurement positions and prevalent sound levels around the site are summarised in the annotated 3D rendered aerial photograph presented in Figure 2. The unattended measurement location (Position 1) is indicated by the purple marker, and the green markers denote the attended survey locations (Position 2 and 3).

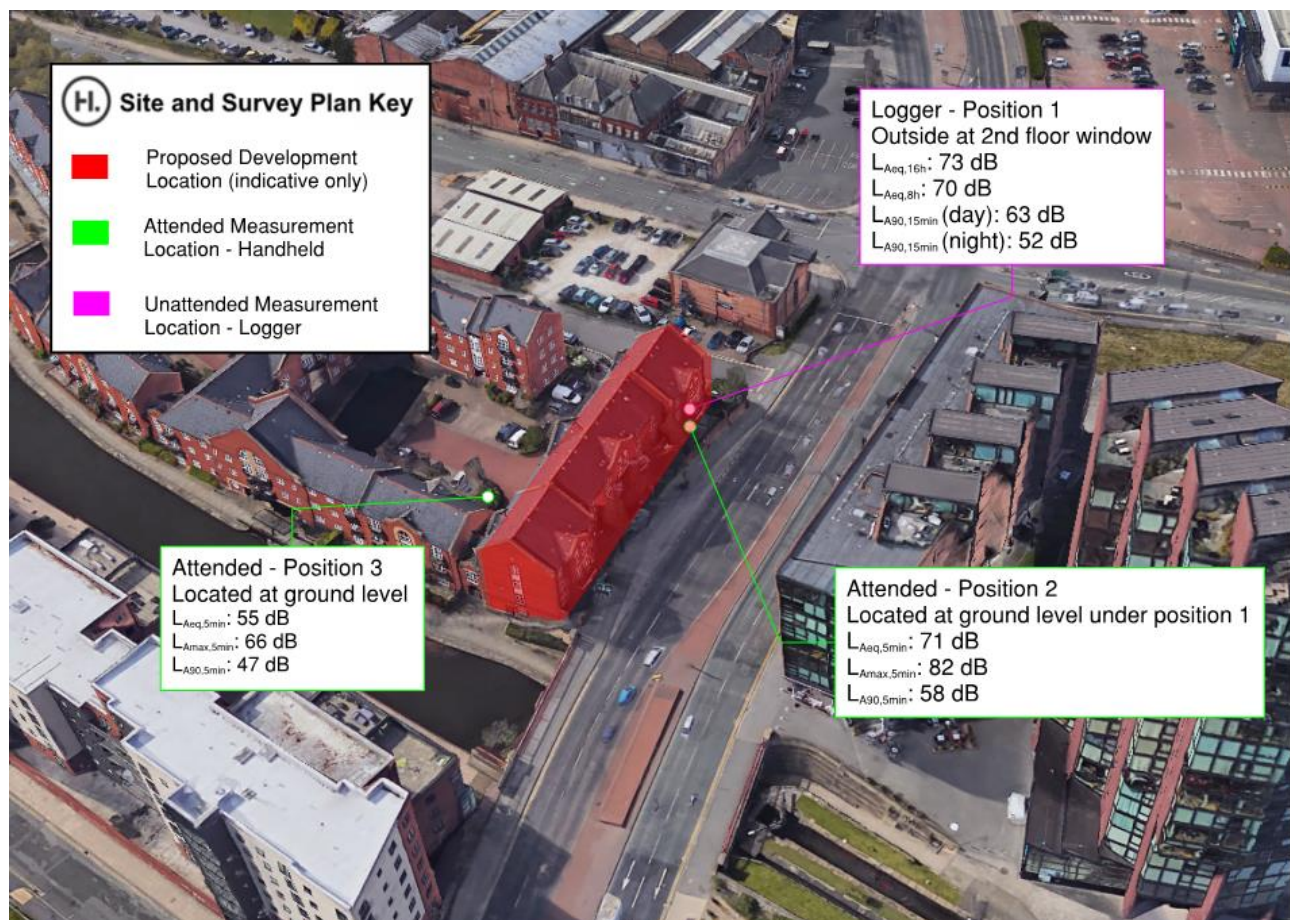


Figure 2: 3D rendered image indicating development location, measurement positions and representative ambient levels measured (courtesy of Google Maps)

4.1 Observations

The dominant noise source on site was noted to be traffic noise along Great Ancoats Street, with intermittent construction noise noted during the daytime. In the evening and night period the sound levels in the area are dominated by road traffic noise along Great Ancoats Street, with a constant flow of HGVs noted.

Other sources included road traffic from local network and local pedestrian activity.

4.2 Attended noise survey results

An attended noise survey was carried out at two locations, at the front and the rear of the development site on Tuesday 27 February 2018, over 5 minute periods. The purpose of these measurements was to determine the level difference between the incident noise levels along Great Ancoats Street and those within the James Brindley Basin. Noise loggers were set to measure continuously in 5 minute intervals for the duration of the attended survey and the measurements carried out were synchronised between the both positions. A summary of the results obtained from the attended noise survey are given in Table 1. Full results of the synchronised attended measurements are available on request.

Table 1 Summary of results obtained from attended survey

Start time	Total survey period	Prevalent sound levels at position 2			Prevalent sound levels at position 3		
		L _{Aeq,5min} (dB)	L _{Amax,5min} (dB)	L _{A90,5min} (dB)	L _{Aeq,5min} (dB)	L _{Amax,5min} (dB)	L _{A90,5min} (dB)
22:22	0h 50 min	71	82	58	55	66	47

4.3 Unattended noise survey results

The results of the unattended noise measurements are presented to follow. A graph of the unattended logging survey is provided in Appendix B. The ambient sound levels measured at the logging position are presented in Table 2.

Table 2 Ambient sound levels measured during the unattended survey

Date	Day time (07:00-23:00)	Night time (23:00 - 07:00)	
	L _{Aeq,16hr} (dB)	L _{Aeq,8hr} (dB)	15 th Highest L _{Amax,15min} (dB)
23/02/2018	73 ^[1]	70	84
24/02/2018	72	71	85
25/02/2018	72	68	85
26/02/2018	74	69	85
27/02/2018	75 ^[1]	-	-

[1] – Measurement not made over full period; these measurements were excluded from the average

The average daytime ambient noise levels measured during the unattended logging survey were L_{Aeq} 73 dB during the daytime period (07:00-23:00) and L_{Aeq} 70 dB during the night-time period (23:00-07:00).

In line with BS 4142:2014, for the purpose of analysis and establishing representative background sound levels during the periods of interest, typical levels have been quantified using statistical analysis from the continuous logging measurements. These are presented in Appendix C.

From the analysis carried out, the representative background sound levels measured during the survey were respectively L_{A90,15min} 63 dB during the daytime period, and L_{A90,15min} 52 dB during the night-time period.

5. Building Envelope Design

5.1 Basis of external noise levels at rear of site

The prevalent ambient and maximum sound levels at the rear elevations of Outram House facing the James Brindley Basin were determined on the basis of the relative level difference established from the results of the attended synchronised survey. The average ambient sound level drop-off from the front to the rear of the site was determined to be 17 dB, and average maximum sound level drop-off was found to be 16 dB.

5.2 External Incident Noise Levels

On the basis of the environmental survey results and the analysis discussed above, the typical measured external ambient sound levels are provided in Table 4 below along with the maximum sound levels not typically exceeded for more than 15 times during the night (23:00 – 07:00).

Table 3: Measured external noise levels for outline façade analysis.

Location	Period	Sound Levels
Measurement Position 1 (North East Façade)	Daytime	$L_{Aeq,1hour}$ 73 dB
	Night-time	$L_{Aeq,1hour}$ 70 dB $L_{Amax(fast)}$ 85 dB (typical)
Measurement Position 3 (South West Façade)	Daytime	$L_{Aeq,1hour}$ 56 dB
	Night-time	$L_{Aeq,1hour}$ 53 dB $L_{Amax(fast)}$ 69 dB (typical)

5.3 Facades, Glazing and Ventilation

An initial façade sound insulation assessment has been undertaken to give indicative performance parameters for the building envelope design based on the proposed drawings received, Great Ancoats Street Proposed Plans 072_202, dated from February 2018.

During the daytime, external intrusive noise is to be limited to $L_{Aeq,1hour}$ 35 dB, and for night-time external intrusive noise is to be limited to $L_{Aeq,1hour}$ 30 dB. It is also considered that a maximum sound level of L_{AFmax} 45 dB should not be exceeded more than 15 times per night.

The existing solid elements of the building envelope are understood to be comprised of internally lined masonry. For the purposes of determining the building envelope requirements, calculations have assumed a minimum sound insulation performance of at least R_w 58 dB (based on masonry cavity wall construction) for these elements and would need to be confirmed as the design progresses.

Due to the constant high noise levels along the Great Ancoats Street at all times of the day and night, to achieve the internal levels set above full-house mechanical ventilation will be required along the Outram House elevations fronting onto Great Ancoats Street. At the rear of the site where elevations are shielded from traffic noise, acoustically passive ventilation may be acceptable. A marked-up drawing of a typical floor layout is presented in Figure 3 indicating the recommended ventilation strategy along the site elevations.

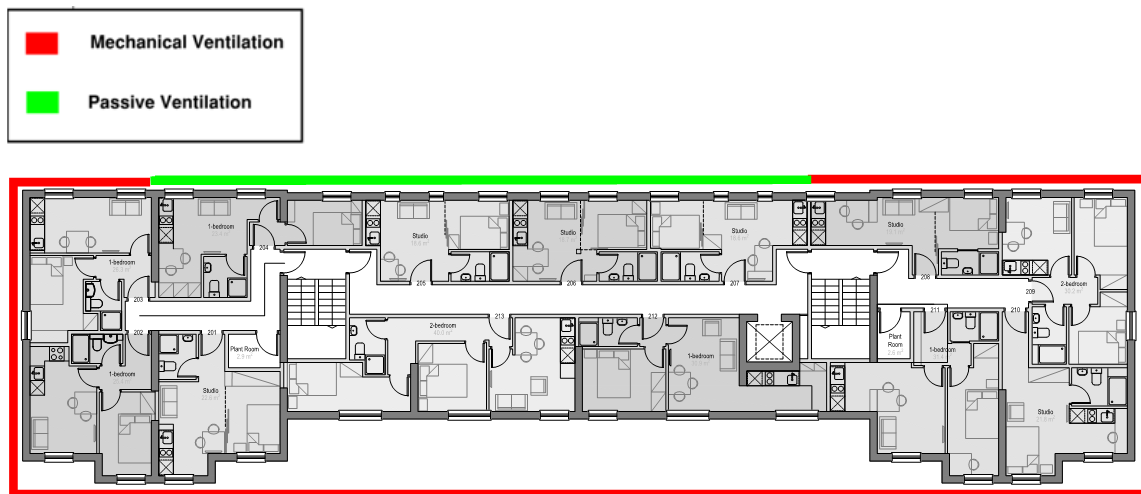


Figure 3: Ventilation strategy options

The proposed building envelope performances based on the ventilation strategy shown in Figure 3 above are presented in Table 4.

Table 4: Recommended performance of façade elements.

Elevations (see Figure 3)	Room	Glazing	Ventilators
South West (Courtyard)	Bedrooms (Studio)	R_w 32 dB	$D_{n,e,w}$ 32 dB
	Bedrooms (flats)	R_w 32 dB	$D_{n,e,w}$ 34 dB
	Living Rooms (flats)	R_w 32 dB	$D_{n,e,w}$ 32 dB
All other elevations (Great Ancoats Street)	Bedrooms (Studio)	R_w 48 dB	Mechanical
	Bedrooms (flats)	R_w 48 dB	Mechanical
	Living Rooms (flats)	R_w 44 dB	Mechanical

The above indicative sound insulation ratings are driven by the night maximum noise levels and has been calculated to achieve the internal noise level criteria set in Section 3.1.1. The ventilator performances quoted have been determined on the assumption of one ventilator required per room and this will need to be considered further as the design progresses. These performances could typically be achieved by acoustically rated ventilators.

Example glazing configurations capable of achieving the minimum recommended sound insulation performances are provided below. It is worth noting that this are indicative and there are many other construction build-ups that could be considered:

- R_w 32 dB glazing systems may be achieved with a double glazing system comprising, 6mm glass - 12mm air gap - 6mm glass
- R_w 44 dB glazing systems may be achieved with a double glazing system comprising, 10mm glass - 20mm air gap – 8.8mm acoustic laminate mm glass
- R_w 48 dB glazing systems may be achieved with a double glazing system comprising, 12.8mm acoustic laminate glass - 24mm air gap – 14.8mm acoustic laminate glass

A more detailed façade sound insulation assessment is recommended once the building envelope design progresses to ensure these are met.

6. External plant noise limits

6.1 Basis of plant noise limits

The representative background sound levels at the front of the site have been determined through a statistic study of the background sound level distribution in accordance with BS4142:2014 guidance.

In order to determine the minimum background sound levels directly outside the nearest residential windows facing James Brindley Basin, the relative difference between the synchronised attended measurements was used. The median background sound level drop-off from the front to the rear of the site was determined to be 11 dB. On this basis the representative background sound level directly outside the nearest James Brindley Basin windows has been determined to be $L_{A90,15min}$ 52 dB during the daytime (07:00 – 23:00) and $L_{A90,15min}$ 41dB during the night (23:00 – 07:00).

6.2 Plant noise limits for normal operating plant

Based on the above and the results of the noise survey, the overall maximum sound pressure levels for fixed plant, equipment and machinery associated with the development shall not exceed the levels presented in Table 5 at 1 m from the nearest noise sensitive premises.

Table 5 Maximum plant sound pressure level at 1 m from the nearest noise sensitive premises

Time of day	Maximum plant noise level at 1m from the nearest noise sensitive receptor window ($L_{Aeq,T}$, dB) *
Daytime (07:00 to 23:00 hrs)	47
Night-time (23:00 to 07:00 hrs)	36

*If plant noise contains any tonal characteristics further corrections shall be applied

6.3 Plant noise assessment

At this stage, the design is not sufficiently advanced to specify specific attenuation measures and will need to be assessed in detail as the design progresses. However, all noise generating plant and equipment associated with the development will be designed to ensure that the noise egress limits specified above are achieved. The specific attenuation measures will depend on the type and location of the plant items but typical measures to be considered include in-duct attenuation, acoustic screening or enclosures, low noise equipment, acoustic lagging, and acoustically rated louvres.

7. Conclusion

An environmental noise survey has been carried out in and around the proposed Outram house development in Great Ancoats Street Manchester.

Based on the survey results and the guidance in BS 4142:2014, plant noise limits have been set to ensure that the cumulative plant noise egress levels at 1 m from the nearest worst affected noise sensitive façade does not exceed L_{Aeq} 47 dB during the daytime (07:00 – 23:00) and L_{Aeq} 36 dB during the night (23:00 – 07:00). If the plant contains any tonal characteristics a further correction will be required.

Intrusive noise calculations have been carried out in order to determine initial sound insulation requirements for the building façade elements. Minimum glazing sound insulation performances have been advised to meet the MCC internal noise level requirements; these should be achievable with high performance double glazed configurations. Mechanical ventilation will be required for most of the proposed elevations. Acoustically rated passive ventilation would also be suitable for some of the extent of the rear elevation to achieve the internal noise criteria.

Appendix A: Test details

Attended measurements

A Bruel and Kjaer 2250 Sound Level Meter and a Rion NL-52 Sound Level Meter were used to carry out the synchronised attended survey over 5 minute intervals on Tuesday 27 february 2018 between 22:30 and 23:30. Measurement positions are labelled as position 2 and position 3 in Figure 2.

Measurement position 2 was located directly underneath the unattended logging position 1. At both attended positions the microphone was set up on a tripod no less than 1.2 m above the ground and approximately 1 m from the building facade. The microphone was fitted with a windshield. The meters were calibrated before and after the survey and no significant drift was noted.

Unattended measurements

Unattended noise monitoring equipment was installed at the position 1 indicated by the purple marker in Figure 2. The position was chosen to capture the existing noise climate experienced at the site and nearby noise sensitive premises during the daytime (07:00 - 23:00) and night-time (23:00 – 07:00).

A Rion NL-31 Sound Level Meter was set to record a continuous series of broadband and octave-band sound pressure levels at 15 minute intervals between 11:15 on Friday 23 February 2018 and 09:30 on Monday 27 February 2018. It was set up approximately 6 m above ground level and at least 1m away from facade surface. The microphone was fitted with a windshield. The meter was calibrated before and after the survey and no significant drift was noted.

Equipment Details

Table summarises the details of the equipment used during the environmental noise survey. All equipment used were within dates of calibration and calibration certificates are available on request.

Table A1 Equipment used during environmental noise survey

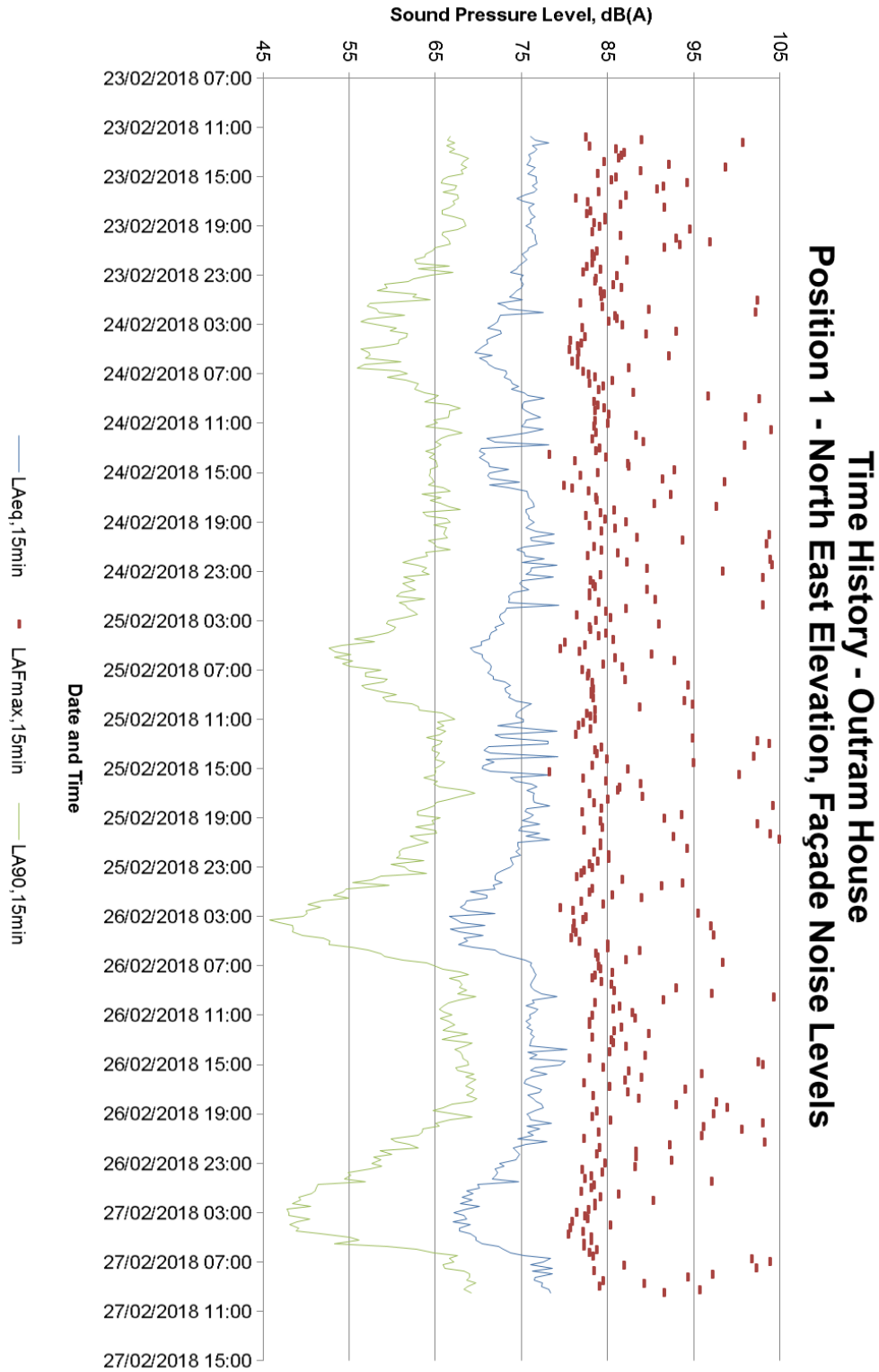
Item	Description	Serial number	Calibration date
Attended Sound Level Meter Position 2	B&K - Sound Level Meter: 2250 B&K - Pre-amplifier: ZC0032 B&K - Microphone: 4189	3003815 19781 2887159	12/10/2017
Attended Sound Level Meter Position 3	Rion - Sound Level Meter: NL-52 Rion - Microphone: UC-59 Rion Pre-Amplifier NH-25	00732162 05354 32190	20/11/2017
Unattended Sound Level Meter Position 1	Rion - Sound Level Meter: NL-31 Rion - Microphone: UC-53A Rion Pre-Amplifier NH-21	00610338 320324 36703	24/11/2017

Weather Conditions

Weather reports for the area indicate that temperatures ranged between 2°C to 7°C. Wind speeds were low and no significant periods of rain occurred. This is not expected to contribute adversely, therefore the unattended measured data is considered suitable as being representative of typical conditions.

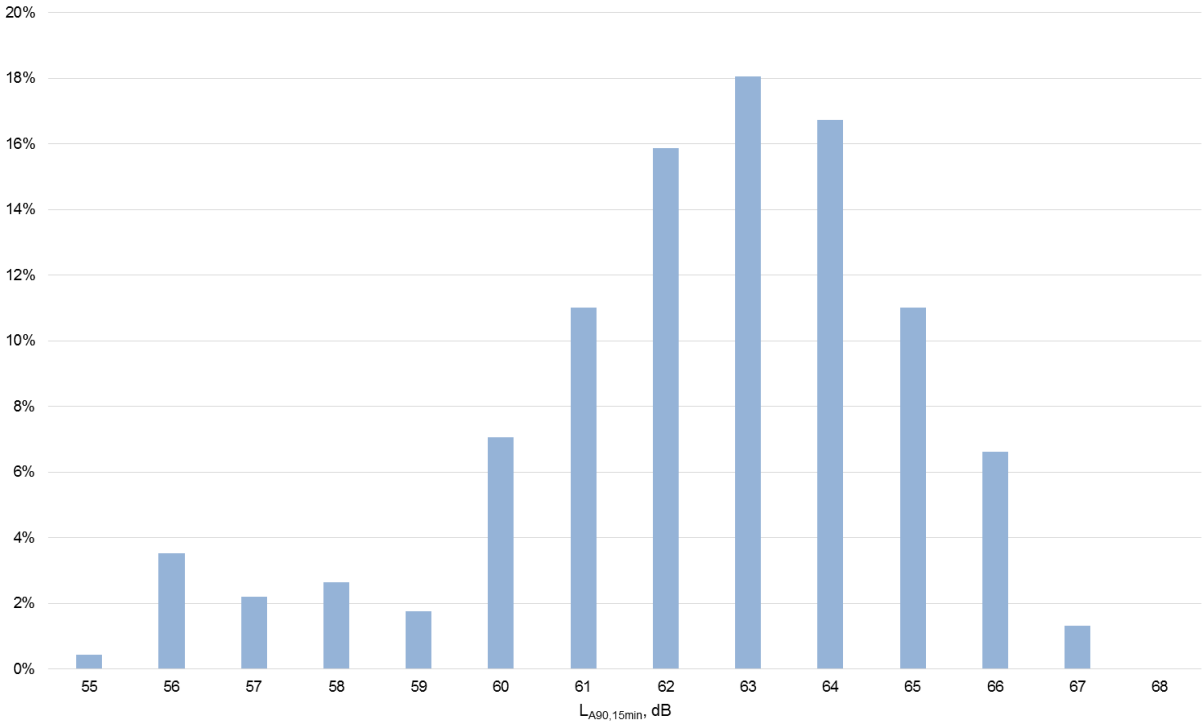
Temperatures ranged between -4°C to 0°C during the attended measurement survey, with wet road conditions noted; however, as the attended measurements were undertaken purely to establish the relative level difference between the rear and front elevations of the Outram House site, the levels recorded are considered valid for their intended purpose.

Appendix B: Unattended measurement results

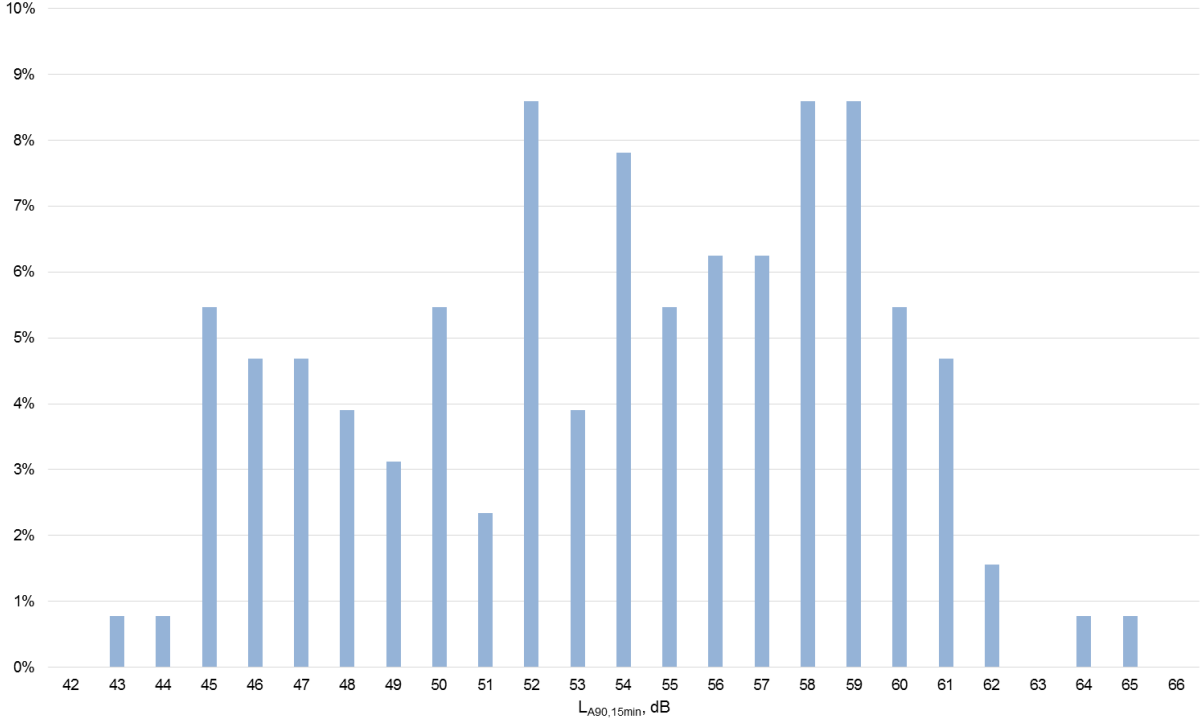


Appendix C: Statistical analysis of background sound level- L_{A90} ,dB

Position 1 - Night-time L_{A90} ,15min Statistical Analysis



Position 1 - Night-time L_{A90} ,15min Statistical Analysis





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