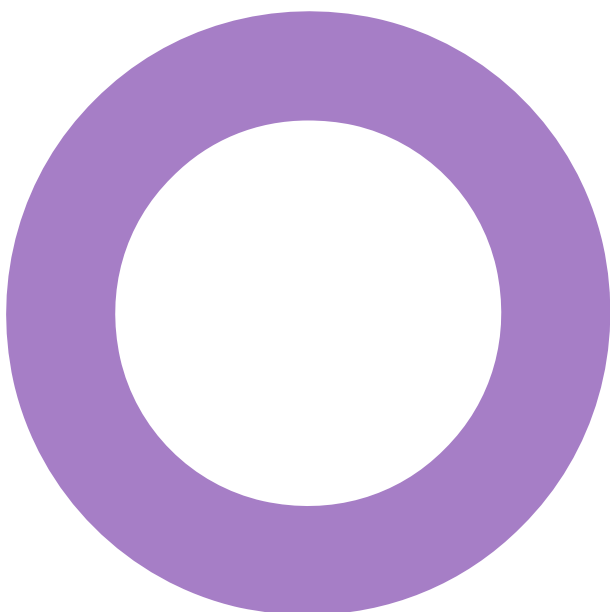


**Proposed Hotel Development,
Hosier Street.
Reading.
Inception (Reading) Sarl.**

ACOUSTICS

ACOUSTIC PLANNING REPORT

REVISION 03 – 15 NOVEMBER 2018



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	16/10/2018	Initial issue	LR	PM	PM
02	22/10/2018	Minor updates following team comments	LR	PM	PM
03	15/11/2018	Minor updates following design revision	LR	PM	PM

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Project number: 10-10530

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Executive summary

Hoare Lea Acoustics have been appointed to provide acoustic advice for the planning application for a proposed hotel development site at 18-20 Hosier Street, Reading, RG1 7JL.

An environmental sound survey has been carried out and a noise egress assessment undertaken in accordance with the requirements of Reading Borough Council (RBC) and BS4142:2014 guidance. The survey was carried out between Friday 23 March 2018 and Monday 26 March 2018, and between 4 October 2018 and 8 October 2018.

A noise egress assessment has been undertaken in accordance with BS4142:2014 and in line with RBC requirements, based on the results of the sound survey. Limits have been set based upon the data collected throughout the survey. If the plant contains any tonal characteristics a further correction will be required.

An initial assessment of the building envelope sound insulation requirements in line with BS8233:2014 has been carried out and minimum sound insulation performances for the building envelope elements have been provided. The proposed triple glazing and full-house mechanical ventilation strategy is appropriate for the proposed scheme.

1. Introduction

Hoare Lea has been appointed to provide acoustic advice for a proposed development to be located at 18-20 Hosier Street, Reading, for the purposes of assisting the planning application. The proposed development will comprise the demolition of existing unoccupied buildings on site and the erection of a part 7, part 8 storey building for use as a hotel, with Restaurant/Bar use on ground floor.

An environmental sound survey has been carried out on site in June and in October 2018. The aim of the survey is to determine the existing sound levels around the site, with the purpose of establishing the prevalent ambient, maximum and minimum 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 findings of the sound survey and sets out the permissible maximum plant noise egress limits in accordance with the Reading Borough Council's requirements. An initial building envelope sound insulation assessment is also presented.

2. Site and development details

2.1 Site location

The site is located on Hosier Street, a cul-de-sac in the city centre of Reading. The proposed site is immediately adjacent to the existing Broad Street Mall complex. St Mary's Butts, a busy thoroughfare through the city centre, lies approximately 45 m to the east. The location of the site is indicated in Figure 1 by the area shaded in yellow.

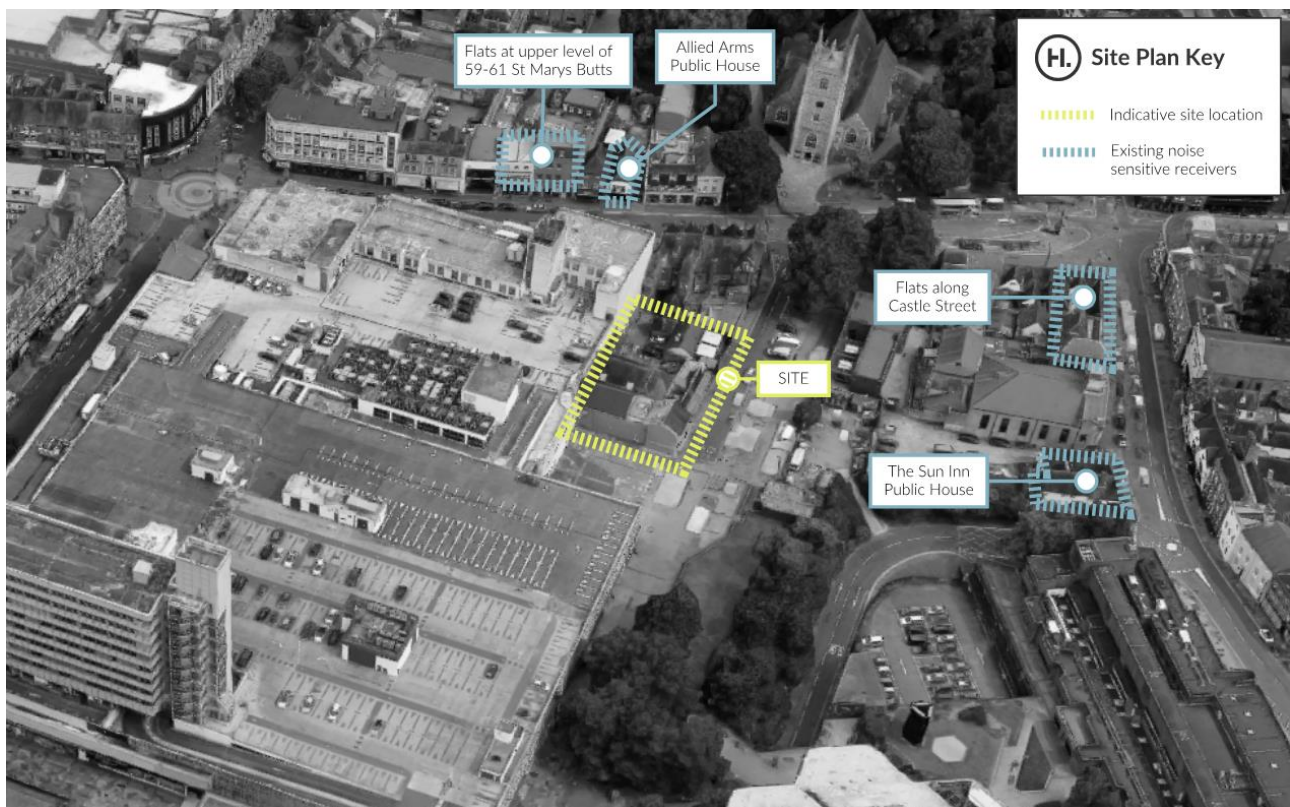


Figure 1 Annotated 3D rendered image showing development location and context (courtesy of Google Maps)

2.2 Surrounding area and nearest noise sensitive receptors

The immediate surroundings of the proposed site are predominantly commercial with a mix of residential use in the wider surrounding area. The nearest residences have been identified as apartments on the upper levels of 59-61 St Mary's Butts and the Allied Arms public house landlord residence approximately 50 m to the east, as well as flats along Castle Street and the Sun Inn public house landlord residence approximately 66 m to the south. These are indicated in Figure 1 by the areas shaded in blue.

2.3 Local noise climate

The sound levels around the site are currently dominated by road traffic and pedestrian activity along St Mary's Butts. The noise climate is quieter with increasing distance from St Mary's Butts along Hosier Street with pedestrian activity and occasional reversing and parking traffic understood to dominate the noise climate locally.

3. Acoustic criteria

3.1 External noise break-in

3.1.1 Local Authority requirements

Reading Borough Council (RBC) Sustainable Design and Construction SPD, adopted July 2011, states that noise should be mitigated within new developments, particularly where these are located near to busy roads, railway lines or other noise generating infrastructure, but does not provide specific criteria to be met. The following sections provide summaries on standard guidance for noise break-in control.

3.1.2 BS8233:2014

BS 8233: 2014 (BS8233) provides guidance for the control of noise in and around buildings, and suggests appropriate criteria and limits for different situations. The criteria and limits are primarily intended to guide the design of new or refurbished buildings undergoing a change of use.

Table 4 within BS 8233 provides desirable internal ambient noise levels for spaces in residential dwellings when they are unoccupied. This is reproduced below in Table 1.

Table 1 Indoor Ambient Noise Levels in Spaces for Dwellings

Activity	Location	Day (07.00 to 23.00)	Night (23.00 to 07.00)
Resting	Living room	35 dB LAeq, 16hour	-
Dining	Dining room / area	40 dB LAeq, 16hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16hour	30 dB LAeq, 8hour

Supplementary Note 2 and 4 to Table 4 within BS 8233 are copied below for reference:

'NOTE 2 - the levels shown in Table 4 are based on the existing guidelines issued by the WHO.

NOTE 4 - regular individual noise events (for example, schedule aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,T depending on the character and number of events per night.'

While the above guidance relates to living accommodation, Section 7.7.5.1 of BS 8233 states that hotel bedrooms should follow similar recommendations to those for living accommodation. An informative guidance annex based on reviewed design criteria adopted by hotel groups is provided within BS 8233, for reference. Table H.3, presenting the range of adopted internal noise levels is reproduced below in Table 2.

Table 2 Indoor ambient noise level ranges for hotel bedrooms

Period	Noise Level
Daytime (07:00 – 23:00)	30 – 40 dB $L_{Aeq,1hour}$
Night-time (23:00 – 07:00)	30 – 40 dB $L_{Aeq,1hour}$ 45 – 55 dB L_{Amax}

NOTE Some hotels may set lower noise levels, depending on location.

3.2 Plant noise emissions

3.2.1 Local Authority requirements

A new Local Plan has been submitted by Reading Council for approval in March 2018, containing the proposed policies to guide development up to 2036. This document consolidates previously adopted guidance as presented above and introduces new policies to be adopted. Although this document is currently undergoing consultation, draft policy EN 17 is understood to form the basis of currently enforced planning conditions, and is presented below:

‘Where noise generating equipment is proposed, the noise source rating level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor’.

Further to discussions with RBC Environmental Health Office (EHO) on 8 October 2018, it has been confirmed that the RBC requirements for control of plant noise egress are as follows:

“Assessment of noise from mechanical plant shall be carried out for in accordance with BS4141:2014 methodology, to establish the predicted noise rating level taking account of any characteristic factors like tonality or impulsiveness of the noise.

The predicted specific sound level ($L_{Aeq,Tr}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{A,r,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation.”

3.2.2 BS 4142:2014

The general principle of the BS 4142 assessment criteria is that noise nuisance can be avoided provided there is no significant change in the prevailing background noise conditions at any surrounding noise sensitive premises once the new equipment is operational.

Where the assessment indicates that the noise rating level of new plant would be 10 dB or greater above the background noise level, the standard judges that sound to be of significant adverse impact. A difference of 5dB is considered to result in adverse impact. Where the rating noise level of the plant is equal to or below background noise, there is likely to be low impact.

As such, noise egress from any plant, machinery and operational noise associated with the development should not cause disturbance at the nearby houses, and the rating level of noise shall not exceed the existing background noise level at the nearest noise sensitive receivers.

Further corrections should be applied if the plant noise contains tonal, intermittent and/or impulsive characteristics. The magnitude of these corrections is dependent upon the subjective perceptibility of the tones/impulses present.

4. Environmental sound survey

An environmental sound survey was carried out around the site at positions L1 and L2 over a period of 6 days between 13 June 2018 and 18 June 2018. During this time, long-term unattended measurements were carried out over 15 minute intervals.

Further measurements over 1 minute intervals were carried out closer to the proposed site location at position L3 in order to determine the worst-case night time maximum noise events over a period of 4 days between 4 October 2018 and 8 October 2018.

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.

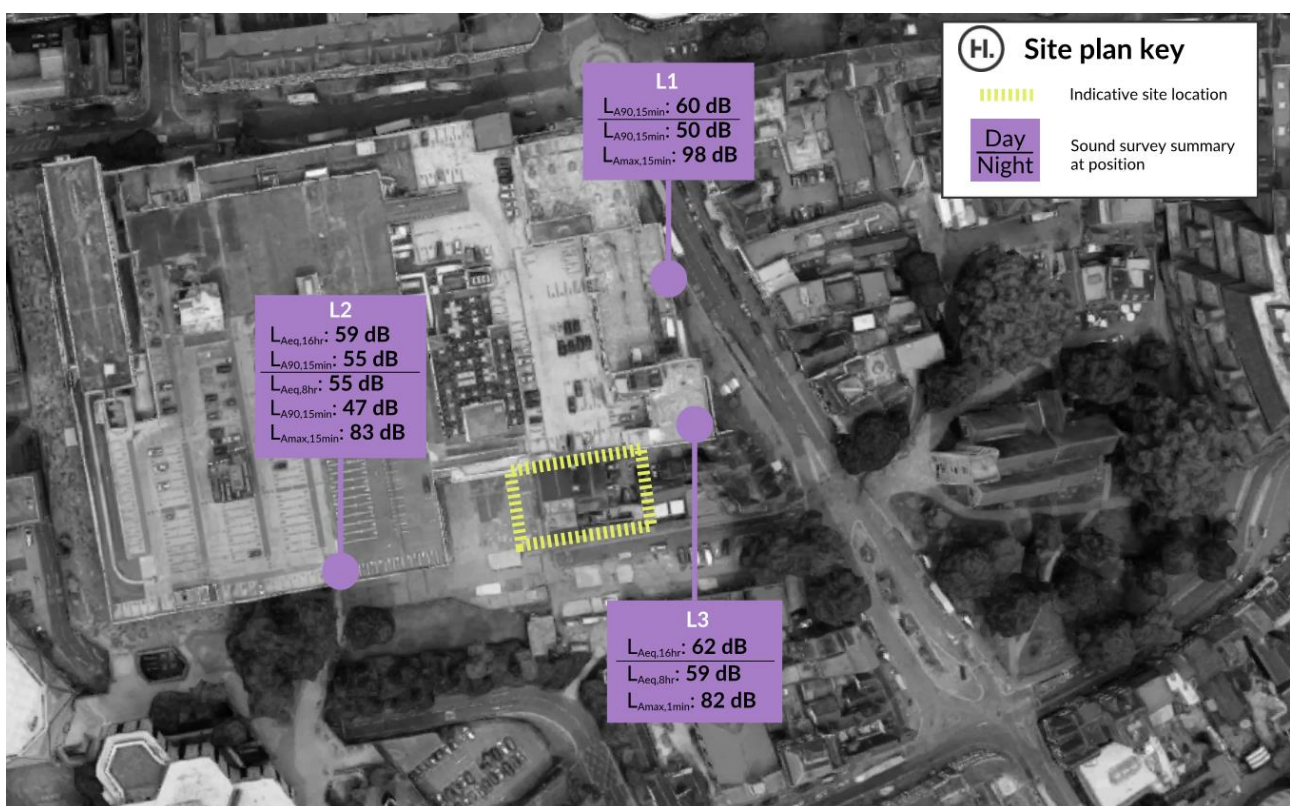


Figure 2 Aerial photograph indicating unattended measurement positions and survey summary (courtesy of Google Earth)

4.1 Observations

The dominant noise sources comprised road traffic and pedestrian activity along St Mary's Butts at positions L1 and L3. Other less dominant sources included the Minster of St Mary the Virgin Bell, which is understood to chime periodically during the week, and distant road traffic from the surrounding road network.

The dominant noise sources at position L2 were road traffic from the surrounding road network including an unnamed slip road directly to the south, St Mary's Butts to the East and the inner city ring road to the west. Less dominant sources included pedestrian activity along Queen's Walk, a pedestrian road.

4.2 Results

The results of the unattended noise measurements are presented to follow. Graphs of the unattended logging surveys are provided in Appendix B.

4.2.1 June 2018 measurements

The ambient sound levels, along with the typical night time maximum noise event levels, measured at position L1 and L2 are presented in Table 3 and Table 4 respectively.

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 Table 5. The statistical analysis associated with these two values is presented in Appendix C.

Table 3 Ambient and maximum sound levels measured during the unattended survey at position L1

Date	Day time (07:00-23:00)	Night time (23:00 - 07:00)	
	L _{Aeq,16hr} (dB)	L _{Aeq,8hr} (dB)	L _{AFmax,15min} (dB)
Wednesday 13/06/2018	68 ^[1]	63	78 to 85
Thursday 14/06/2018	68	64	79 to 86
Friday 15/06/2018	68	69	84 to 94
Saturday 16/06/2018	68	70	83 to 89
Sunday 17/06/2018	64	62	76 to 82

^[1] – Measurement not made over full 16 hour daytime period

Table 4 Ambient and maximum sound levels measured during the unattended survey at position L2

Date	Day time (07:00-23:00)	Night time (23:00 - 07:00)	
	L _{Aeq,16hr} (dB)	L _{Aeq,8hr} (dB)	L _{AFmax,15min} (dB)
Wednesday 13/06/2018	58 ^[1]	55	65 to 76
Thursday 14/06/2018	59	52	65 to 81
Friday 15/06/2018	58	52	67 to 77
Saturday 16/06/2018	59	53	69 to 79
Sunday 17/06/2018	58	53	65 to 78

^[1] – Measurement not made over full 16 hour daytime period

Table 5 Statistically representative background sound levels measured during the unattended survey at positions L1 and L2

Position	Typical background level L _{A90,15min} , dB	
	Daytime (07:00-23:00)	Night (23:00-07:00)
L1 – St Mary's Butts	60	50
L2 – Queen's Way	55	47

4.2.2 October 2018 measurements

The 1 minute interval results obtained at position L3 have been processed to provide ambient sound levels for the daytime and night periods. These are presented in Table 6, along with the third highest 1 minute maximum noise event measured during each night.

Table 6 Ambient and maximum sound levels measured during the unattended survey at position L3

Date	Day time (07:00-23:00)	Night time (23:00 - 07:00)	
	L _{Aeq,16hr} (dB)	L _{Aeq,8hr} (dB)	L _{AFmax,1min} exceeded no more than 3 times (dB)
Thursday 04/10/2018	62 ^[1]	56	76
Friday 05/10/2018	62	59	82
Saturday 06/10/2018	61	59	78
Sunday 07/10/2018	61	54	75
Monday 08/10/2018	62 ^[1]	-	-

^[1] – Measurement not made over full 16 hour daytime period

5. Building Envelope Design

5.1 Basis of building envelope design

5.1.1 Basis of initial assessment criteria

The survey results indicate that night time individual maximum noise events from activity along St Mary's Butts would drive the façade sound insulation requirements at the proposed hotel elevations in order to comply with the criteria presented in Section 3.1.

Of these, the proposed hotel operator noise break-in criteria follow BS 8233 guidance, with the exception of maximum noise event control during the night time period. For this, the proposed hotel operator brand standards require that maximum individual noise events be controlled to no more than L_{AFmax} 42 dB within the proposed bedrooms, not to be exceeded more than two times per night period (23:00 – 07:00). This represents a stricter control of noise break-in than that advised under standard BS 8233 guidance. In order to account for the operator brand standards, the initial assessment of the required building envelope sound insulation performance has therefore been based on achieving compliance with this criterion.

5.1.2 External noise levels at the proposed hotel facades

A study of the measured night time maximum noise levels recorded during the two surveys carried out on site yields a variation in the registered maximum noise levels in line with expectations across the site (i.e. higher noise levels above St Mary's Butts and quiet noise levels with increased distance and screening from the main road).

Although the surveys at all three positions were not all carried out during the same period, they are consistent with expectations for activity noise levels along a lively city centre street. Of the positions used, shorter time resolution measurements commensurate with the proposed hotel operator brand requirements were taken at position L3, which is deemed to be representative of the worst-case elevations of the proposed development.

As night time maximum noise levels vary throughout the week, typically ranging from L_{AFmax,1min} 75 to 82 dB, L_{AFmax,1min} 82 dB has been considered to provide a robust basis for the worst-case maximum noise event occurring during the night period.

5.2 Initial building envelope assessment

An initial building envelope sound insulation assessment of the current proposals has been undertaken. The geometries and volumes used in the assessment were informed by the following drawings, received from Corstorphine+Wright Architects (C+W) via email on 29/10/2018:

- General Arrangement drawings: 18370-0310-P02, 18370-0311-P02, 18370-0312-P02, 18370-13-P00, 18370-14-P02, 18370-0315-P02, 18370-0316-P02, 18370-0317-P02, 18370-0338-P02;
- Elevation drawings: 18370-0340-P03, 18370-0341-P03, 18370-0342-P04, 18370-0343-P03.

The solid elements of the building envelope are understood to comprise an internally drylined masonry system. For the purposes of determining the building envelope requirements, calculations have assumed a minimum sound insulation performance of at least R_w 58 dB for these elements,

A sealed facade is proposed with full-house mechanical ventilation understood to be provided throughout the scheme.

5.2.1 Minimum recommended sound insulation performances

Considering the above, the minimum sound insulation performance requirements for the building envelope elements are presented in Table 7.

Table 7 Recommended performance of façade elements.

Room	Minimum recommended sound insulation performance, R_w (R_w+C_{tr}) (dB)	
	Glazing	External wall elements
Typical Bedrooms	41 (37)	58 (53)

High performance laminated double glazing systems with the appropriate sound reduction ratings would be anticipated to meet the requirements. The recommended ratings should be achieved by the glazing system as a whole and includes the frames and associated window furniture.

5.2.2 Initial assessment against building envelope proposals

Following discussions with C+W, it is understood that a masonry system comprising an outer leaf of brick with an SFS system inner leaf comprising a cement particle board layer and double plasterboard internal linings with mineral wool insulation within the stud cavities is proposed. The roof construction to the top floor bedrooms is understood to comprise a profiled deck concrete slab construction with thermal insulation above and suspended plasterboard ceilings below.

While not fully finalised at this stage, these systems are expected to achieve the minimum sound insulation performance stated in Table 7.

It is understood that due to high thermal requirements for the bedroom windows, triple glazing solutions such as Abbey Glass Premierfon are currently proposed throughout the proposed bedrooms within the scheme. Manufacturer test data for this product indicates a sound insulation performance of R_w 47 dB, which is compliant with the sound insulation performance requirement set out in Table 7.

On the basis of the above, the proposed building envelope is capable of controlling external noise break-in to the proposed bedrooms throughout the proposed hotel scheme.

6. Building services plant noise

6.1 Basis of plant noise limits

The representative background sound levels measured during the June 2018 survey are considered representative of the levels prevalent outside the nearest proposed residential elevations immediately to the north and west of the development site at all times of the day.

The measurements taken at position L1 are considered representative of the levels prevalent outside the proposed residential elevations along St Mary's Butts to the north whilst the measurements taken at position L2 are deemed representative of the levels prevalent outside the proposed residential elevations to the west of the development site.

6.2 Plant noise limits

Based on the criteria set out in Section 3, the survey results and the discussion above, the cumulative maximum sound pressure levels for fixed plant, equipment and machinery associated with the development shall not exceed the levels presented in Table 8 at 1 m from the nearest noise sensitive premises.

These maximum limits are also recommended to be achieved at the proposed dwelling facades within this scheme.

Table 8 Maximum permissible sound pressure levels at 1m from the nearest noise sensitive premises

Time of day	Permissible sound rating level at 1m from the nearest noise sensitive premises (L _{Ar,15min} dB)*	
	Daytime (07:00 to 23:00)	Night (23:00 to 07:00)
Residential elevations along St Mary's Butts	50	40
Other residential elevations	45	37

*If plant noise contains any tonal or impulsive characteristics, a further correction shall be applied to the levels set out above, see Section 3.2 for details.

6.3 Attenuation measures.

At this stage, the design is not sufficiently advanced to specify specific attenuation measures and these 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.

Appendix A: Survey and equipment details

Unattended noise measurements were carried out between 12:15 hrs on 13 June 2018 and 13:00 hrs on 18 June 2018, and between 15:50 on 4 October 2018 and 16:30 on 8 October 2018.

Prior to commencement of the unattended survey at positions L1 and L2, a subjective assessment of the noise climate was undertaken and compared to that of the immediate vicinity of the surrounding residential premises to the east and south. The chosen logger positions were deemed to be representative of the noise levels at the nearest noise sensitive premises.

The microphones were fitted with a windshield and installed approximately 1 m away from the facade. The meters were calibrated before and after the survey and no significant drift was noted. Photographs showing unattended monitoring positions L1 and L2 are presented in Figure A1 and A2 respectively. The measurement locations are indicated as positions L1 and L2 in Figure 2.



Figure A1 Unattended measurement in position L1



Figure A2 Unattended measurement in position L2

Prior to commencement of the unattended survey at positions L3, a subjective assessment of the noise climate was undertaken and compared to that of the immediate vicinity of the proposed worst-case elevations within the proposed development. The chosen logger position was deemed to be representative of the noise levels at the worst affected hotel elevations.

The microphone was fitted with a windshield and installed on the south east rooftop of the existing Broad Street Mall complex. The meter was calibrated before and after the survey and no significant drift was noted. A photograph showing unattended monitoring position L3 is presented in Figure A3. The measurement location is indicated as positions L3 in Figure 2.



Figure A3 Unattended measurement in position L3

Equipment details

Table B1 summarises the details of the equipment used during the environmental noise survey. All equipment used was within dates of calibration and calibration certificates are available on request.

Table B1 Equipment used during environmental noise survey

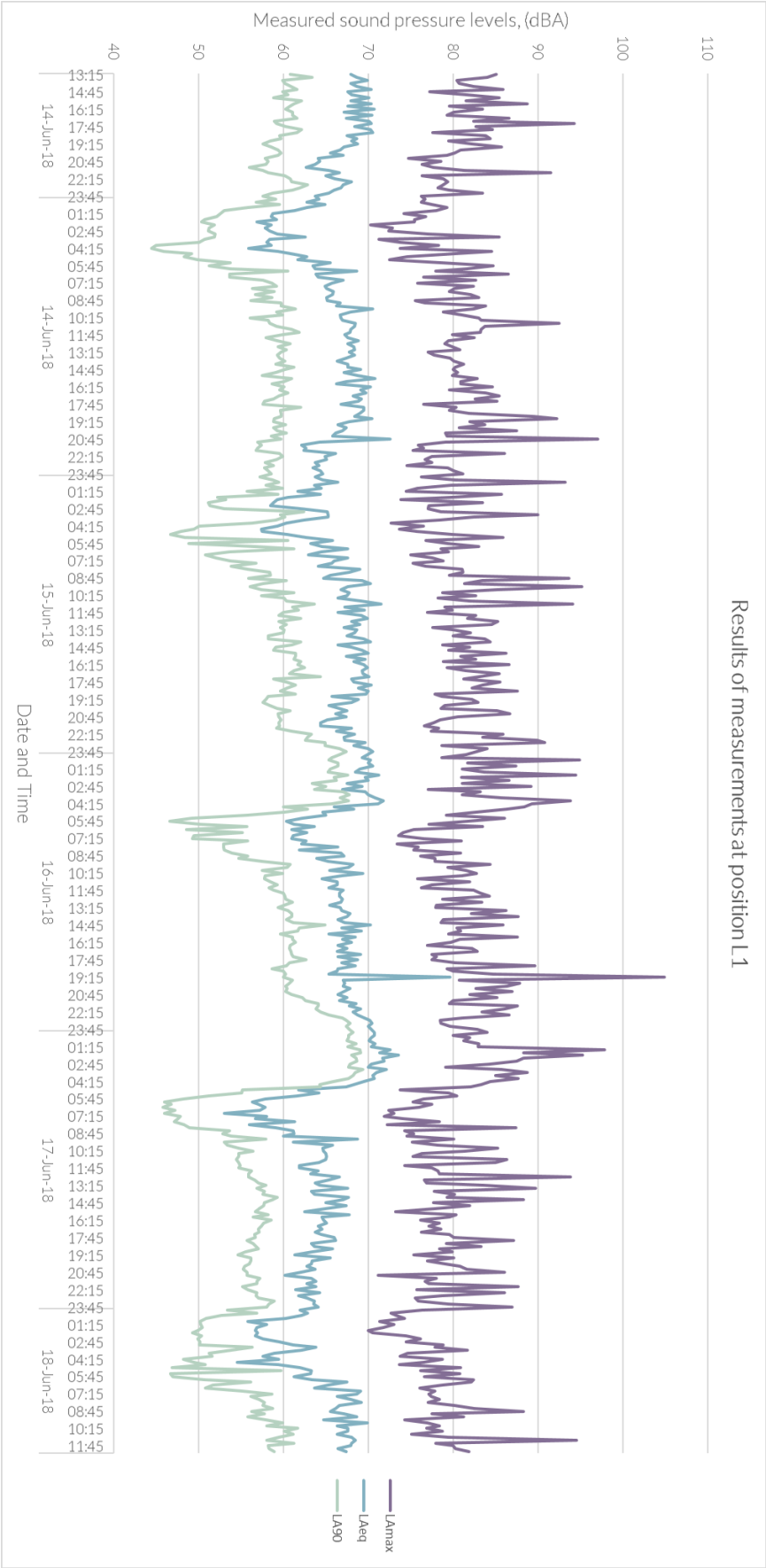
Location	Description	Serial Number	Calibration Date
L1	Rion - Sound Level Meter: NA-28 Rion - Microphone: UC-59 Rion - Pre-amplifier: NH23	01260203 00286 60106	24/07/2017
L2	Rion - Sound Level Meter: NL-52 Rion - Microphone: UC-59 Rion - Pre-amplifier: NH25	00832244 05471 32272	11/10/2017
L3	Rion - Sound Level Meter: NL-52 Rion - Microphone: UC-59 Rion - Pre-amplifier: NH25	00732162 05354 32190	20/11/2017

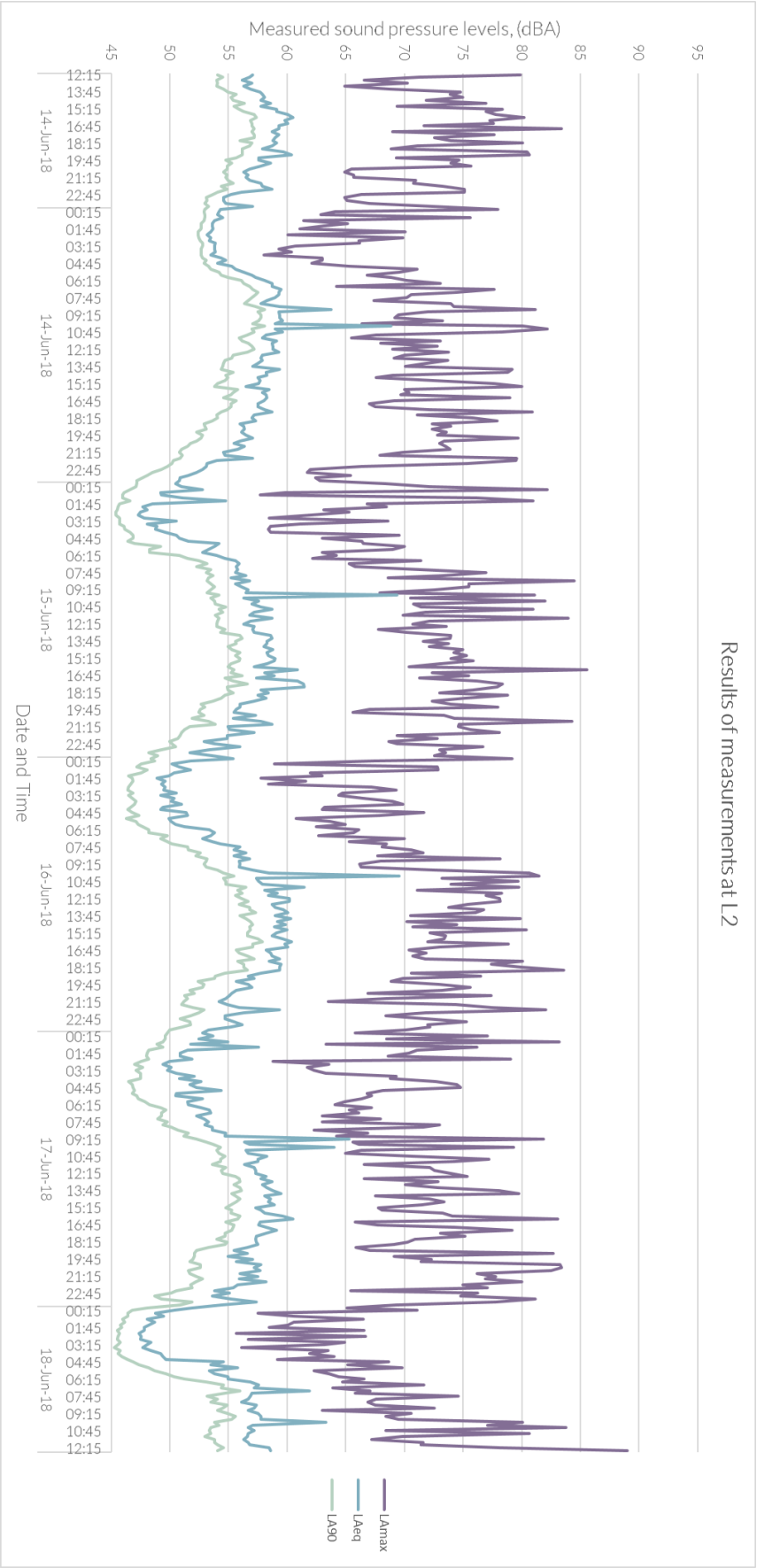
Weather information

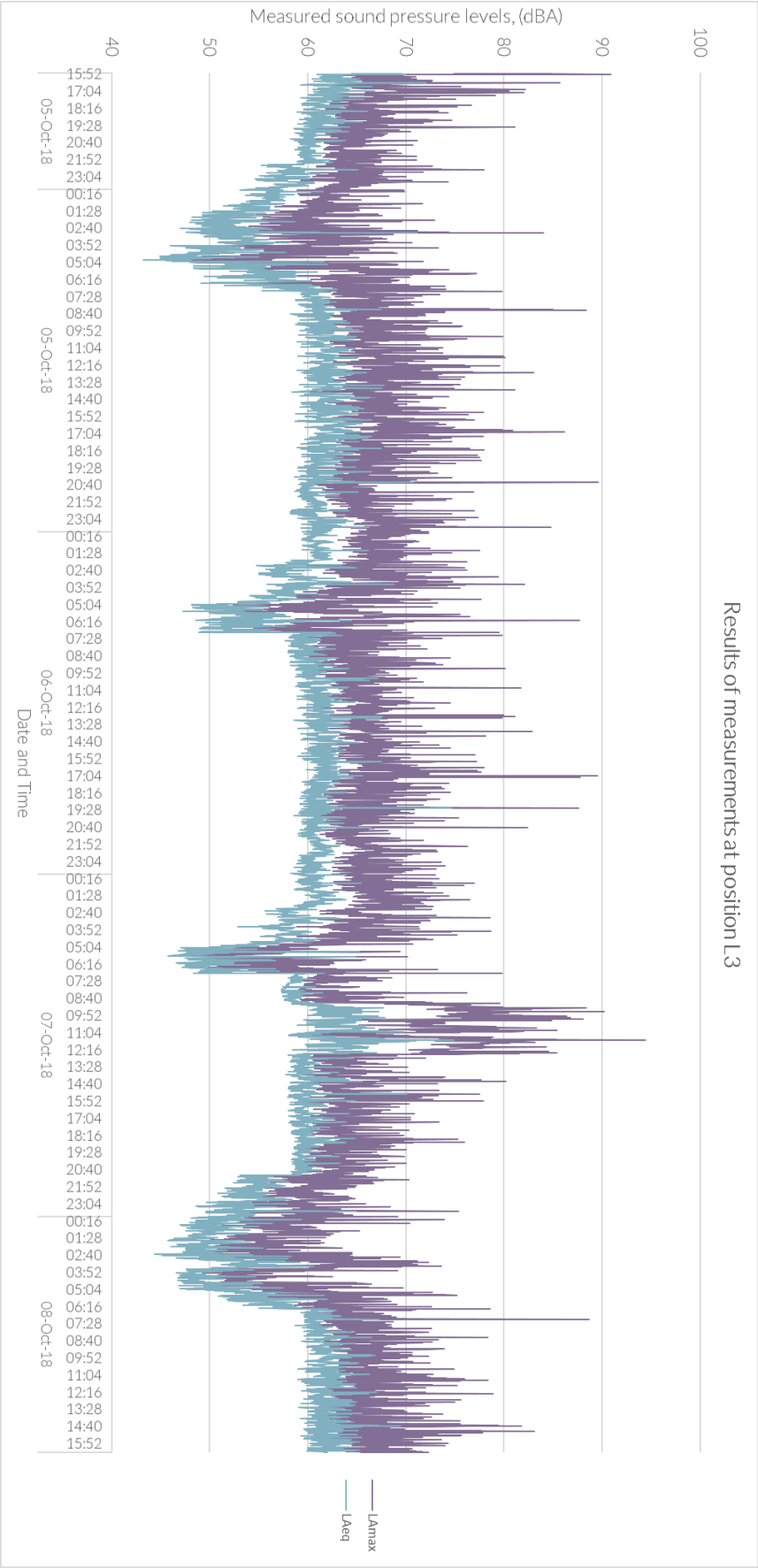
Weather reports for the area during the June 2018 survey indicate that temperatures ranged between 6°C to 23 °C. There was no rain over the measurement period and wind speeds were consistently low. This is not expected to contribute adversely, therefore the measured data is considered suitable as being representative of typical conditions.

Weather reports for the area during the October 2018 survey indicate that temperatures ranged between 6°C to 23°C. The weather was mostly dry apart from brief showers on 6 October and wind speeds were consistently low. This is not expected to contribute adversely, therefore the measured data is considered suitable as being representative of typical conditions.

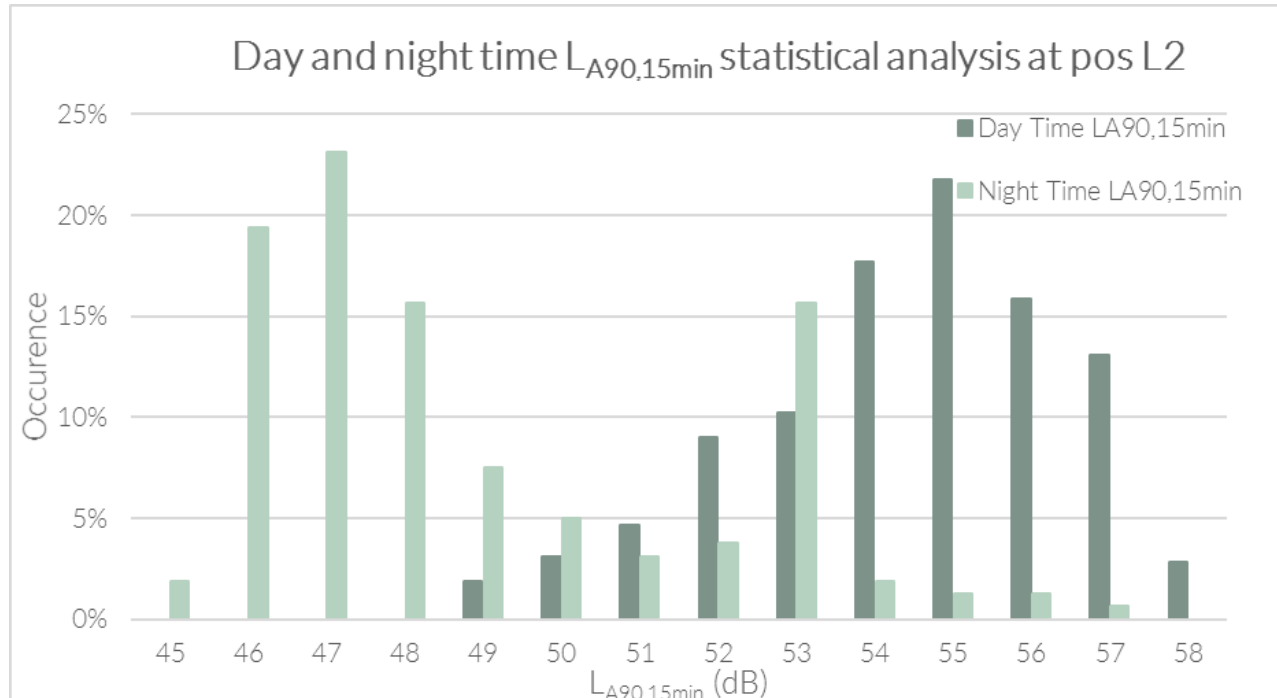
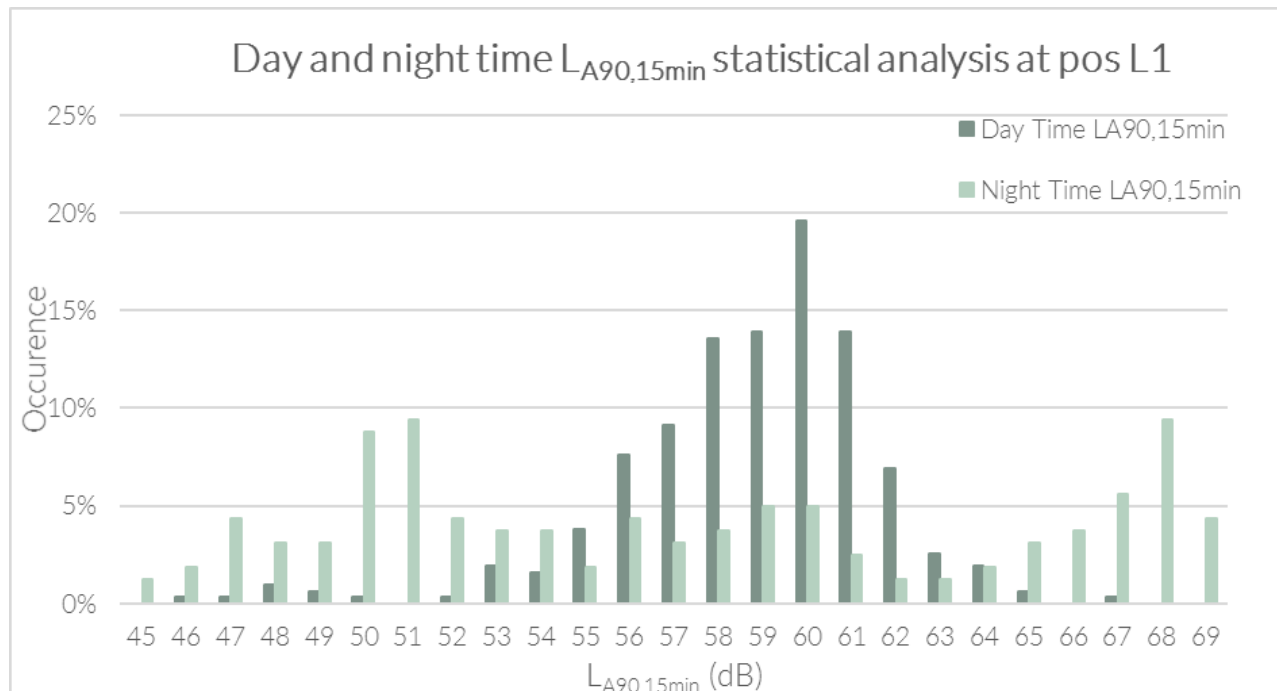
Appendix B: Time History graphs of unattended measurements







Appendix C: Statistical analysis of background sound levels





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