HOARE LEA

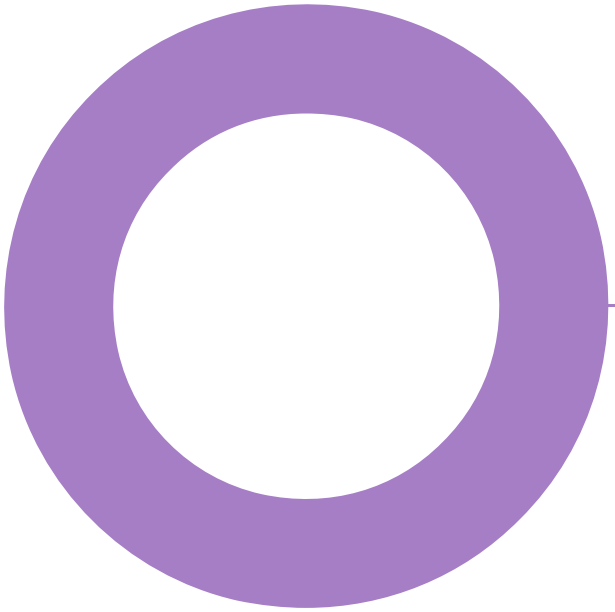
252 Grays Inn Road. London.

Talon Estates Ltd.

ACOUSTICS

NOISE ASSESSMENT FOR PLANNING

REVISION 03 – 25.03.2019



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	12.02.2019	Client issue	MB	JB	JB
02	21.03.2019	Updated scheme	MB	JB	JB
03	25.03.2019	Minor text amendment	MB		

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Contents.

Executive summary.

There are proposals to refurbish the existing office building at 252 Grays Inn Road. New items of building services equipment will be installed as part of the refurbishment.

An environmental sound survey has been undertaken to establish the existing acoustic environment at the site and surrounding buildings. Results from the survey have been used to derive plant noise emission limits in line with London Borough of Camden policy.

At this stage, space and cost allowance have been made for a limited number of condensing units, but there is no mechanical design in place. An assessment has been undertaken to set limiting noise levels to be observed in developing the design, and to identify additional noise control measures that are likely to be needed to achieve the noise limits in line with local policy.

The assessment concluded that, in addition to selecting low noise equipment, an acoustically rated louvre and localised plant room absorption are likely to be needed in order to achieve the noise limits.

Noise control measures will need to be developed further as the design is progressed. The need to provide such noise control measures can be enforced with a suitably worded planning condition attached any decision notice for the scheme.

On the basis of this assessment, noise should not pose an obstacle in the granting of planning permission.

1. Introduction.

There are proposals to refurbish the existing office building at 252 Grays Inn Road. New building services plant will be installed as part of the refurbishment. Noise from the new plant will need to be controlled to minimise disturbance at the neighbouring buildings, in line with London Borough of Camden policy.

An environmental survey has been undertaken to characterise the existing sound environment around the proposed development. Results from the survey have been used to derive limiting noise levels for any new building services plant.

At this stage, there is no information available regarding the new plant. Allowance is made within the cost plan for heat rejection plant, but there is no specific design is in place. An early stage assessment has been undertaken to set noise limits that will need to be observed in developing the mechanical design, as well as to identify any further noise control measures that may be necessary.

Recognising that the report is necessarily technical in nature, a glossary of acoustics terms is included in Appendix A.

1.1 Description of site and surroundings.

The site is located within a residential-led mixed use area on Grays Inn Road, London. There are residential buildings located to the north, south and west of the site. An aerial view of the site is presented in Figure 1.

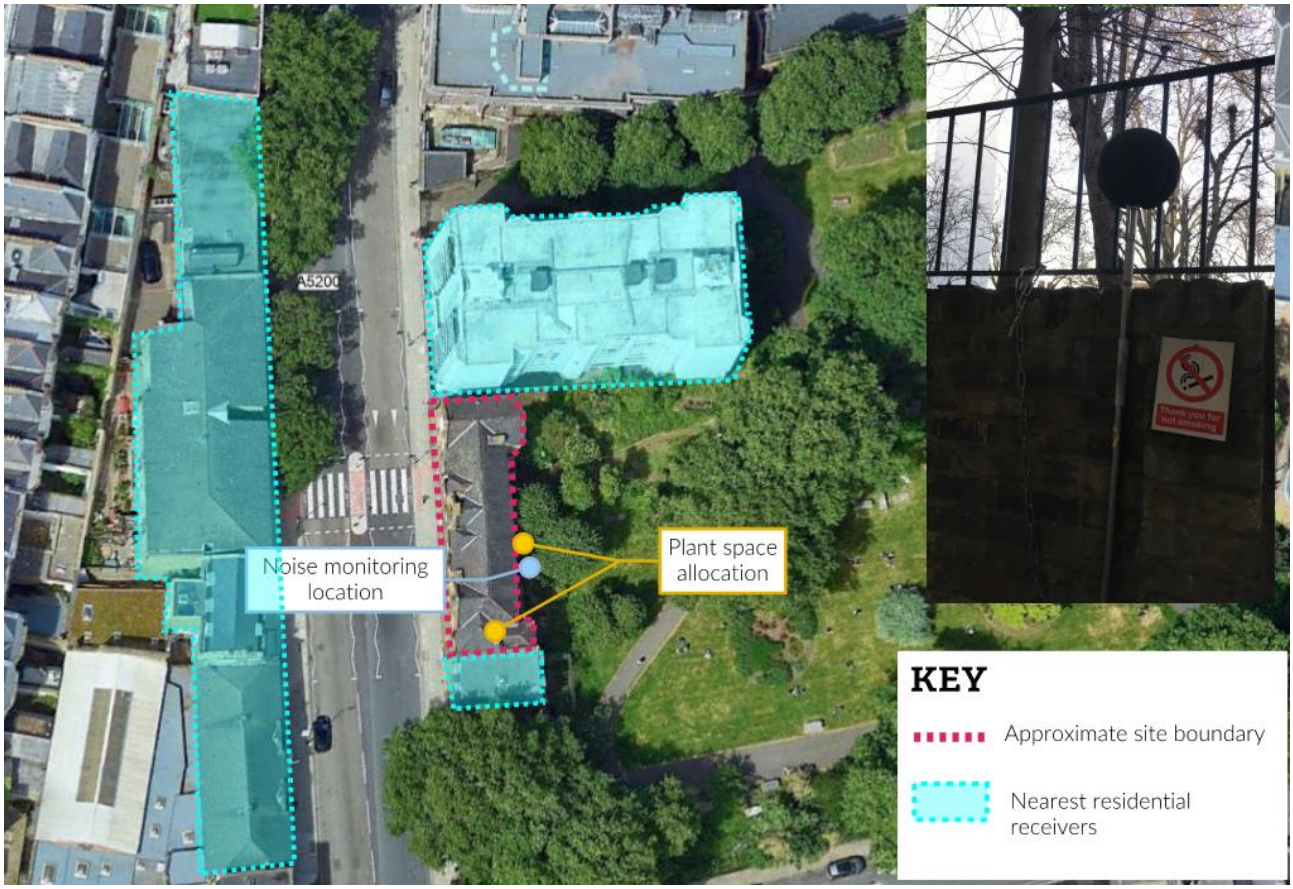


Figure 1 Aerial view of site. Source: Google Maps

The soundscape is typically characterised by sound generated by road traffic along Grays Inn Road, as well as contributions from existing items of building services plant associated with 252 Grays Inn Road.

2. Basis of assessment.

Appropriate, well established guidance on the assessment of noise and acoustic design relevant to 252 Grays Inn Road is available from a number of references; including, but not limited to, the following:

- London Borough of Camden policy
- National Planning Policy Framework (NPPF)
- British Standard 4142: 2014 "Methods for rating and assessing industrial and commercial noise"

2.1 Local policy.

London Borough of Camden (LBC) noise policy is set out within Appendix 3 of the Local Plan 2017. The document explains that noise is considered in terms of various 'effect levels' which align with the National Planning Policy Framework (NPPF) and National Planning Policy Guidance (NPPG) documents:

- NOEL – No observed effect level
- LOAEL – Lowest observed adverse effect level
- SOAEL – Significant observed adverse effect level

Assessment is made relative to the following context descriptors:

- Green – where noise is considered to be acceptable
- Amber – where noise is observed to have an adverse effect level, but may be acceptable when assessed in the context of other merits of the development
- Red – where noise is observed to have a significant adverse effect

For new noise generating development, assessment should be made with reference to the methodology set out within BS 4142: 2014. The following thresholds are set:

- LOAEL (Green): Noise 'Rating level' to be 10 dB below the existing background. An additional criterion applies at night that no events exceed 57 dB L_{Amax}
- LOAEL to SOAEL (amber): Noise rating level to be between 9 dB below and 5 dB above background, or noise events between 57 dB and 88 dB L_{Amax} at night
- SOAEL (red): Noise rating level is greater than 5 dB above background, and / or events exceed 88 dB L_{Amax} at night

It is understood that, as standard, LBC require plant noise emissions to be controlled to at least 10 dB below the existing background sound levels.

3. Environmental sound survey.

An environmental survey was undertaken between Monday 28th January and Thursday 31st January 2019 to establish the local sound environment at the site and surrounding buildings.

The survey comprised long term monitoring at a fixed location within the rear courtyard at 252 Grays Inn Road (see Figure 1 for approximate location).

Full details of the survey, and results, are included in Appendix B.

3.1 Plant noise emission limits.

Noise emission limits have been derived for new building services plant associated with the development, in accordance with LBC policy. The limits have been set following a statistical analysis of the measured sound levels, based upon the 90th percentile of measured L_{A90} values, and are presented in Table 1 below.

Table 1 Plant noise emission limits

Period	Typical minimum background sound levels, dB L_{A90}	Limiting Plant noise rating level, dB $L_{Aeq,T}$
Daytime (07:00 – 23:00)	45	35
Night (23:00 – 07:00)	42	32

4. Plant noise assessment.

At this stage, there is no information available regarding plant selections. Allowance has been made within the space and cost plans for heat rejection plant (in the form of condensing units), but there is no specific design in place.

An assessment has been undertaken to set limiting sound power levels that will need to be observed by the mechanical engineer as the design is developed, and to identify noise mitigation measures that are likely to be required within the design. To enable the assessment, it has been assumed that there will be one condensing unit per floor; resulting in five units within the courtyard plant space.

Consideration has been given to the use of a 300mm deep acoustically rated louvre as a 'lid' to the plant enclosure. Walls to the enclosure will be of solid construction, with the exception of the wall between plant area and courtyard space which will be louvred.

To minimise reverberant build-up within the plant space, it is recommended that allowance is made for acoustically absorbing wall panels. These would typically take the form of a perforated metal casing with mineral wool insulation behind (typically 50mm thickness). Absorption should be allowed to at least three sides of the enclosure.

The assessment for courtyard plant is summarised below:

Table 2 Summary of plant noise assessment – courtyard plant

Calculation step	dB(A)	Notes
Sound power level of unit, L_w	74	Limiting level set to achieve noise emissions requirement
Correction for number of units, dB	+7	Based upon 5no. units, 10log(N)
Correction for plant room reverberation time (T)	-7	Based upon T=0.2 seconds, 10log(T)
Correction for plant room volume (V)	+0	Based upon V=30m^3,-10log(V)+14
Reverberant sound pressure level in plant room, dB L_p	74	
Inside to outside correction, dB	+4	$L_{w,out} = L_{p,in}$ + 10log(S) - 6
Sound power level out of louvre, L_w	78	
Acoustic louvre insertion loss, dB	-13	See Appendix C.
Distance attenuation, dB	-25	Based upon BS 12354-4
Screening losses, dB	-5	Assuming a partial line of sight break provided by building 'edge'. This is considered conservative.
Sound pressure level at nearest noise sensitive receptor, dB	35	

Calculation step	dB(A)	Notes
Noise emission limit, dB	35	Plant noise limit achieved

On the basis of this assessment, the noise limit could be achieved provided the following mitigation measures can be incorporated within the design:

- Each condensing unit to be selected with a limiting sound power level of 74 dB L_{wA}, assuming 5no. units,
- 300mm acoustic louvre to the enclosure lid,
- Sound absorbing panels within the plant room to control reverberant noise build-up,
- All equipment will also need to be provided with suitable anti-vibration mounting.

To achieve the noise limits at night, a further 3 dB reduction would be required. This can typically be achieved with a 'set back' mode programmed into the unit to run the units at a lower operational speed when the cooling requirements are lower.

There is also space provision for an additional two units at roof level to maximise future design flexibility. Assessment has been undertaken to the nearest noise sensitive window which will be the top floor windows of the residential building immediately to the south of 252 Grays Inn Road.

These units will benefit from significant screening between the plant and receiver; attributable to the pitched roof which will wholly screen the plant, in addition to being located a storey above the nearest noise sensitive window. The assessment for these units is summarised below:

Table 3 Summary of plant noise assessment – roof plant

Calculation step	Unit 1	Unit 2	Notes
Sound power level of unit, dB(A) L_w	74	74	Limiting level set to achieve noise emissions requirement
Distance attenuation, dB	-26 (approx. 7m)	-27 (approx. 8m)	Based upon hemispherical point source propagation
Screening losses, dB	-16*	-16*	ISO 9613-2 'double barrier' calculation.
Sound pressure level at nearest noise sensitive receptor, dB	32	31	
Sound pressure level due to all roof units, dB	35		
Noise emission limit, dB	35		Plant noise limit achieved

*The presented value is a 'single number' approximation of the overall effect. Full calculations accounted for the reductions in individual octave band values.

On the basis of this assessment, the noise limit could be achieved provided the following mitigation measures can be incorporated within the design:

- Each condensing unit to be selected with a limiting sound power level of 74 dB L_{wA}, assuming 2no. units,
- All equipment will also need to be provided with suitable anti-vibration mounting.

Due to increases in distance and screening attenuation between the two plant areas, the combined effect of both plant areas on noise levels to each receiver is negligible. On the basis of this assessment, noise from new building services plant can be controlled with appropriate design measures to achieve suitable limiting levels. Recognising that the mechanical design is subject to significant future development, the need to control noise from building services can be enforced with a suitably worded planning condition attached any decision notice for the scheme.

On the basis of this assessment, noise should not form an obstacle in the granting of planning permission.

5. Conclusion.

An environmental sound survey has been undertaken at 252 Grays Inn Road. Results from the survey have been used to set plant noise emission limits in line with London Borough of Camden policy.

There are proposals to install new condensing units within a rear courtyard of the building with a possibility of additional roof units. An initial assessment has identified that noise control measures will be required to achieve the noise emission limits.

As the design is developed, units will need to be selected with limited sound power levels, in combination with acoustically rated louvres and localised plant room absorption. The need to control noise can be enforced by condition.

Appendix A – Glossary of terms.

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

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

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

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

Background Noise Level L90
The L90, T is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and cannot be directly combined to other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

Appendix B - Noise survey details.

Methodology.

Long-term monitoring was undertaken at a fixed location between Monday 28th and Thursday 31st January 2019. A Class 1 sound level meter were used to record contiguous fifteen-minute measurements.

The monitoring position was located in a rear courtyard at 252 Grays Inn Road. The microphone was positioned such that it was elevated above the brick wall as shown in the inset below.

Weather conditions.

Weather conditions were considered appropriate for environmental sound measurement. A review of historic weather data for the area indicates that wind speeds were typically below 5ms^{-1} with no rainfall. There was a small period between 21:00 on 29th January and 03:00 on 30th January with some rainfall. Analysis of the results does not show a significant change in noise conditions during this period and therefore it is considered not to have affected results.

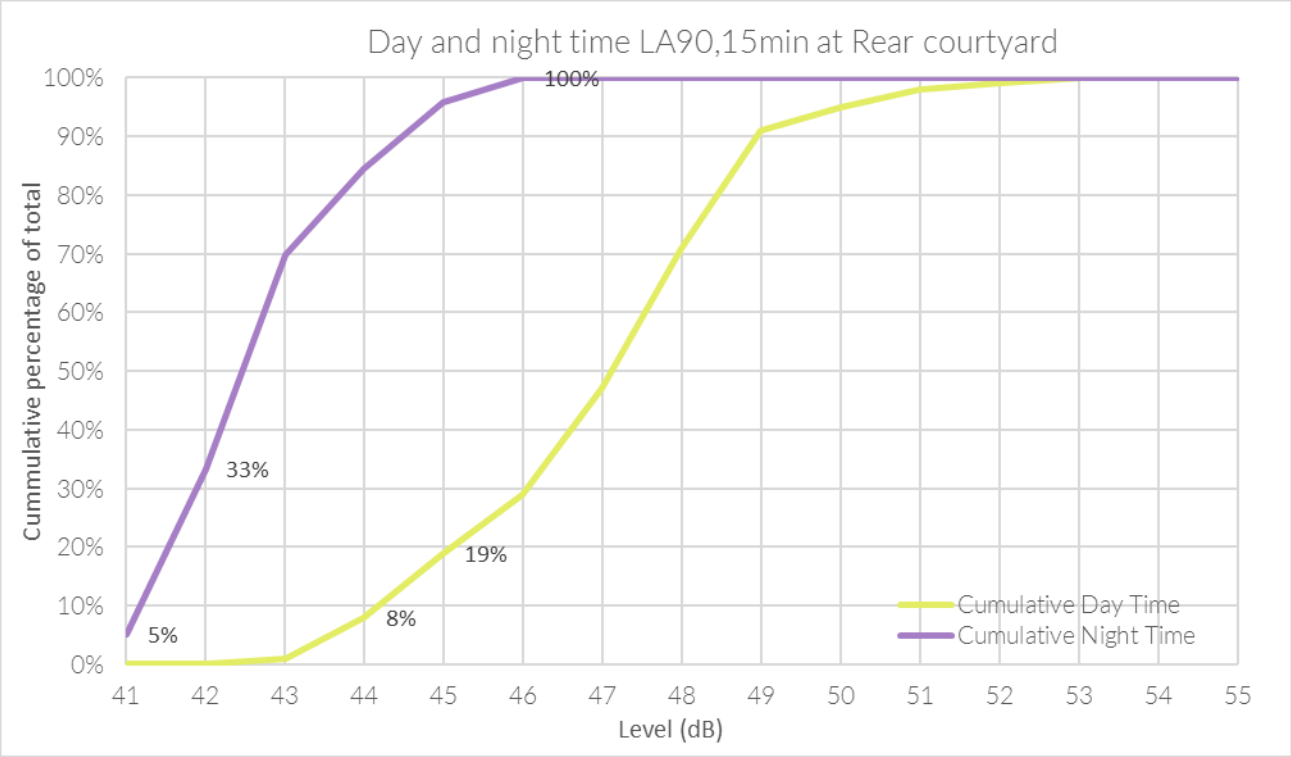
Equipment.

Details of the equipment used throughout the survey are below. All equipment held a valid calibration certificate at the time of the survey. Equipment was checked for sensitivity at set up and on completion of the survey and found to be within acceptable limits.

Instrumentation Description	Type Number	Manufacturer	Date of Expiration Of Calibration	Calibration Certificate Number
Sound Level Meter	NL-31, SN: 00431026	Rion	18/07/2020	UCRT18/1730
½" Microphone	UC-53A SN:311039	Rion	18/07/2020	UCRT18/1730
Pre-amp	NH-21, SN:21973	Rion	18/07/2020	UCRT18/1730
Acoustic Calibrator	NC-74, SN: 35173596	Rion	21/01/2020	UCRT19/1091

Results.

A graph showing measured results is presented overleaf. The graph below provides a statistical analysis of the measured background sound levels (L_{A90}). Limits have been set based upon the 90th percentile of measured values.



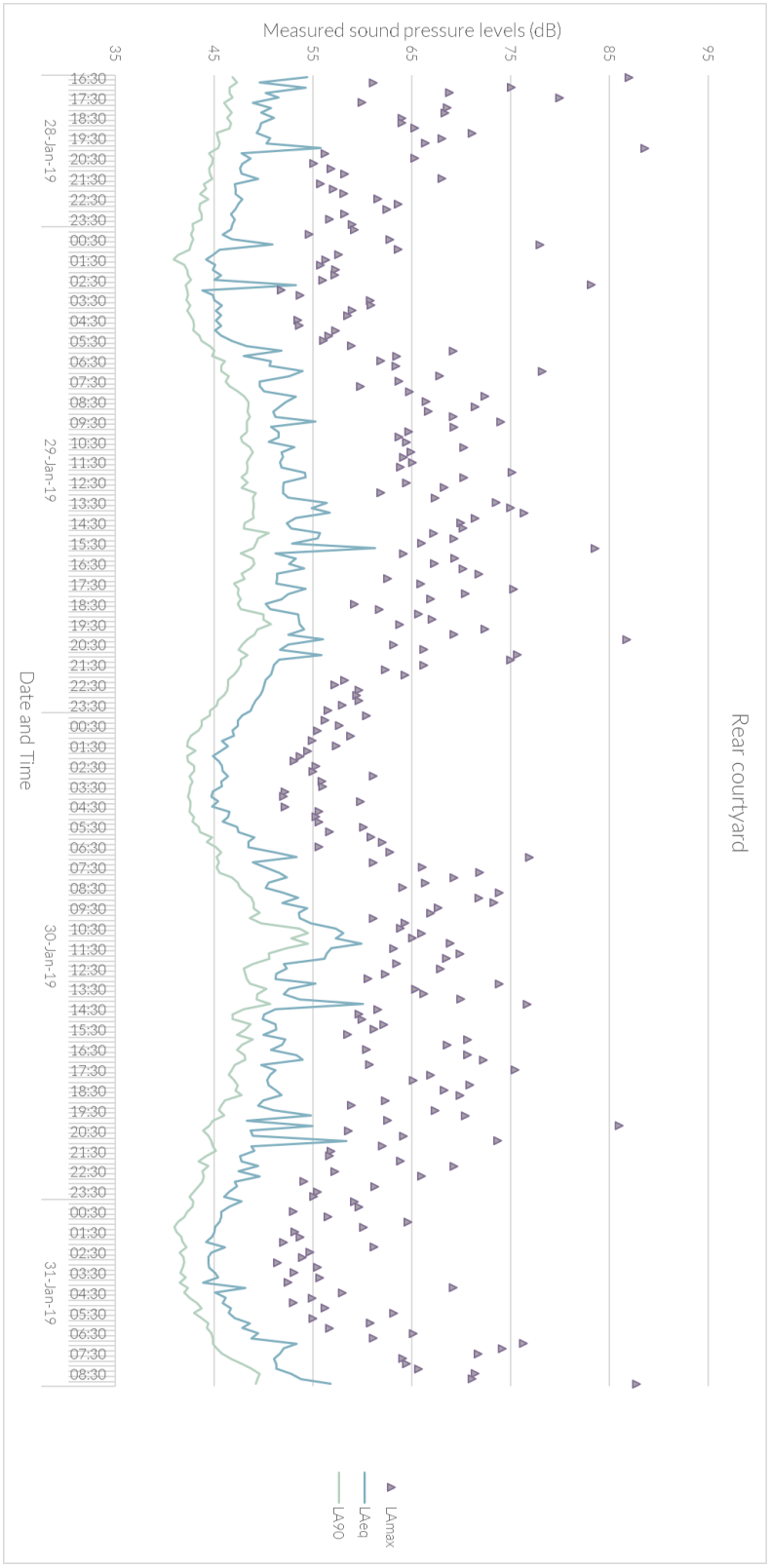


Figure 2 Graph of long term measurement results

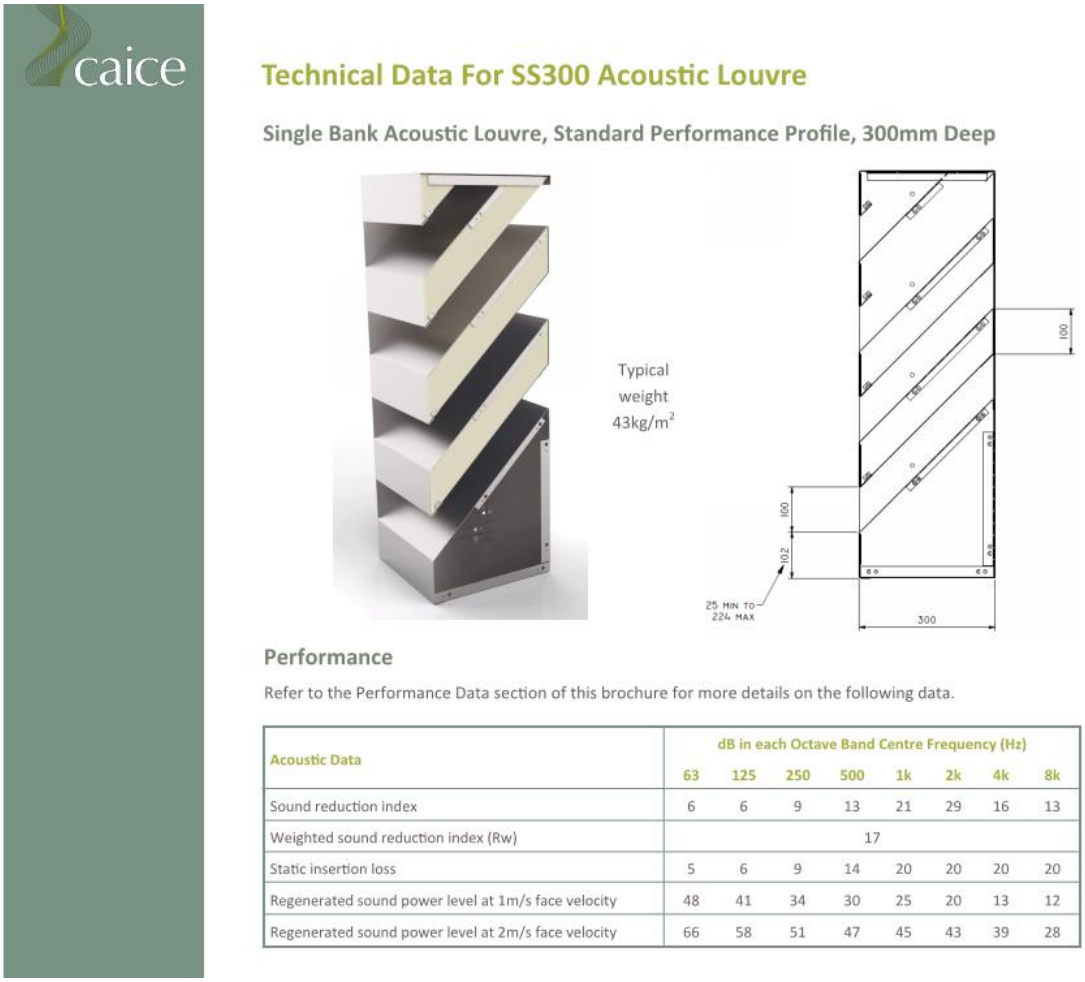
Appendix C – Acoustic louvre details.

The following has been used to determine the effectiveness of an acoustic louvre for the proposed condensing units. The table below presents a 'typical' measured spectrum for several condensing units at a distance of 3m. The insertion loss figures are taken from Caice literature, and used to derive a 'dBA' correction for use in the assessment. Other manufacturers and louvres are available, provided they meet the required insertion loss figures.

Table 4 Calculation of louvre insertion loss

Calculation step	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	dBA
Typical spectrum, dB	74	67	63	61	60	52	45	35	64
Insertion loss, dB	-5	-6	-9	-14	-20	-20	-20	-20	
After attenuation	69	61	4	47	40	32	25	15	51
dBA reduction									13

An extract from the manufacturer's datasheet is shown below:



caice

Technical Data For SS300 Acoustic Louvre

Single Bank Acoustic Louvre, Standard Performance Profile, 300mm Deep

Typical weight 43kg/m²

Performance

Refer to the Performance Data section of this brochure for more details on the following data.

Acoustic Data	dB in each Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Sound reduction index	6	6	9	13	21	29	16	13
Weighted sound reduction index (Rw)	17							
Static insertion loss	5	6	9	14	20	20	20	20
Regenerated sound power level at 1m/s face velocity	48	41	34	30	25	20	13	12
Regenerated sound power level at 2m/s face velocity	66	58	51	47	45	43	39	28

Figure 3 Extract from Caice datasheet

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