294-295 HIGH HOLBORN

NOISE AND VIBRATION IMPACT ASSESSMENT

CHH LONDON LTD

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REVISION 01

Revision History		Date	Prepared by	Checked by
R00	Initial draft for comment	20/02/2017	Kial Jackson BSc MIET AMIOA Jacob Perry BMus AMIOA	Jason Clouston BEng MSc MIOA
R01	Final for planning	09/03/2017	Kial Jackson BSc MIET AMIOA Jacob Perry BMus AMIOA	Jason Clouston BEng MSc MIOA

CONTENTS

1 INTRODUCTION

1.1 Proposals are in place for the construction of a 9-storey mixed-use building at 294-295 High Holborn. The building is to comprise of retail and office floor space from the basement to second floor level and residential units from the third to eighth floor level.

1.2 This report is intended for submission in support of the proposed development and demonstrates how the Local Authority's noise and vibration requirements have been considered within the design.

1.3 To assess the impact of noise associated with the development, noise and vibration surveys have been undertaken. The measurement data has then been used to determine the level of noise intrusion into the building and noise emitted from the proposed building services plant. Chapter 3 of this report describes the external noise survey while the noise and vibration intrusion assessments are presented in Chapters 4 and 5 respectively. The noise emission assessment within Chapter 6 provides details regarding plant associated with the development, noise limits at the nearby noise sensitive receivers and potential attenuation measures.

1.4 The measurement data from the noise survey are presented in Appendix A, and a glossary of terminology used in this report is included in Appendix B.

2 CRITERIA AND GUIDANCE

2.1 INTRODUCTION

2.1.1 The site falls within the jurisdiction of the London Borough of Camden ("the council") who have issued their *Camden Development Policies, 2010-2025*("CDP"). The CDP sets out a series of criteria which would normally be considered during planning applications, with Policy DP28 specifically addressing the issues of noise and vibration.

2.1.2 As of June 2016, the council have submitted their draft *Local Plan* for examination which, once finalised, will replace the CDP document. Policy A4 is the council's incoming policy regarding noise and vibration and reads:

> *"Policy A4 Noise and vibration*
>
> *The Council will seek to ensure that noise and vibration is controlled and*
>
> *managed.*
>
> *Development should have regard to Camden's Noise and Vibration Thresholds. We will not grant planning permission for:*
>
> *a. development likely to generate unacceptable noise and vibration impacts; or*
>
> *b. development sensitive to noise in locations which experience high levels of noise, unless appropriate attenuation measures can be provided and will not harm the continued operation of existing uses.*
>
> *We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity. We will also seek to minimise the impact on local amenity from deliveries and from the demolition and construction phases of development."*

2.1.3 It should be noted that the noise thresholds within Policy DP28 are based on guidance from PPG 24 which has since been superseded by the *National Planning Policy Framework (NPPF)* in 2012. This is reflected within Policy A4 which updates the council's thresholds and evaluates the noise impact in terms of various "effect levels" as described in the NPPF.

NOEL – No Observed Effect Level

The level below which there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

The level above which there are detectable adverse effects on health and quality of life.

SOAEL – Significant Observed Adverse Effect Level

The level above which significant adverse effects on health and quality of life are detectable.

2.1.4 The council have then assigned their thresholds with a colour, the definitions of which are provided below:

Green – where noise is considered to be at an acceptable level.

Amber – where noise is observed to have an adverse effect level but which may be considered acceptable.

Red – where noise is observed to have a significant adverse effect.

2.1.5 As Policy A4 is based on more recent government guidance and reflects the direction of the council's strategy to control noise and vibration within the borough, it has been given consideration within the design of this development.

2.2 VIBRATION

2.2.1 The council have established a set of tactile vibration limits for various building types which, if exceeded, could result in planning permission being refused. These limits are presented as VDV (Vibration Dose Values) and are in-line with guidance from BS 6472-1: 2008 *Guide to evaluation of human exposure to vibration in buildings* and apply to vibration from railways, roads, leisure and entertainment premises and/or plant or machinery.

2.2.2 Table 2.1 presents the limits considered applicable to this development.

Vibration description and location of measurement	Period	Vibration levels (Vibration Dose Levels)
Vibration inside dwellings	Day (07:00-23:00)	0.2 to 0.4 VDV $ms^{-1.75}$
	Night (23:00-07:00)	0.13 VDV $ms^{-1.75}$
Vibration inside offices	Day, evening and night (00:00-24:00)	0.4 VDV $ms^{-1.75}$

Table 2.1 Vibration levels at which planning permission will not normally be granted.

2.3 BUILDING SERVICES NOISE EMISSION

2.3.1 It is expected that the council will impose conditions upon the level of noise emitted from fixed building services plant. Table 2.2 presents the thresholds the council have set down in Policy A4.

Assessment Location	Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Garden used for main amenity (free field) and outside living or dining or bedroom window (façade)	Day (07:00-23:00)	"Rating level" 10 dB* below background	"Rating level" between 9 dB below and 5 dB above background	"Rating level" 5 dB above background
Outside bedroom window (façade)	Night (23:00-07:00)	"Rating level" 10 dB* below background and no events exceeding 57 dB L_{Amax}	"Rating level" between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L_{Amax}	"Rating level" 5 dB above background and/or events exceeding 88 dB L_{Amax}

* 10 dB should be increased to 15 dB if the noise contains audible tonal elements
** levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises

Table 2.2 Noise levels from plant and machinery above which the council will not grant planning permission

2.3.2 The methodology set down in BS 4142: 2014 *Methods for rating and assessing industrial and commercial sound* has been adopted to establish the *rating level* of the plant associated with the development.

2.3.3 Ensuring that the *rating level* of plant associated with the development falls within the LOAEL / Green category is expected to satisfy the council's requirements.

Environmental Protection Act 1990

2.3.4 In addition to meeting the council's requirements, it must also be considered that there is always the potential that neighbours may take direct noise nuisance action under the provisions of the Environmental Protection Act 1990, if they believe they have been subjected to noise nuisance. Usually if any Conditions to Planning concerning noise emission are complied with, the risk of such action is satisfactorily minimised.

2.4 EXTERNAL NOISE INGRESS THRESHOLDS

2.4.1 The council define both residential properties and offices as *noise sensitive development* requiring *appropriate attenuation measures.* Retail spaces within the building are not considered noise sensitive and as such are not believed to be subject to the council's thresholds.

Residential

2.4.2 Table 2.3 presents the council's Noise Thresholds for residential developments in areas of existing noise.

Assessment location	Design period	Noise level		
		LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Noise at 1 metre from noise sensitive façade/free field	Day (07:00 - 23:00)	<50 dB $L_{Aeq,16hr*}$	50 dB to 72 dB $L_{Aeq,16hr*}$	>72 dB $L_{Aeq,16hr*}$
	Night (23:00 - 07:00)	<45 dB $L_{Aeq,8hr*}$ <40 dB $L_{night**}$	45 dB to 62 dB $L_{Aeq,8hr}$ > 40dB $L_{night**}$	>62 dB $L_{Aeq,8hr*}$
Inside a bedroom	Day (07:00 - 23:00)	<35 dB $L_{Aeq,16hr}$	35 dB to 45 dB $L_{Aeq,16hr}$	>45 dB $L_{Aeq,16hr}$
	Night (23:00 – 07:00)	<30 dB $L_{Aeq,8hr}$ 42 dB L_{AFmax}	30 dB to 40 dB $L_{Aeq,16hr}$ 40 dB to 73 dB L_{AFmax}	>40 dB $L_{Aeq,8hr}$ >73 dB L_{AFmax}
Outdoor living space (free field)	Day (07:00 – 23:00)	<50 dB $L_{Aeq,16hr}$	50 dB to 55 dB $L_{Aeq,16hr}$	>55 dB $L_{Aeq,16hr}$

*$L_{Aeq,T}$ values specified for outside a bedroom window are façade levels
**L_{night} values specified for outside a bedroom window are free field levels

Table 2.3 Noise levels applicable to noise sensitive residential development proposed in areas of existing noise

2.4.3 While external noise levels along High Holborn are expected to fall within the council's amber and red categories it is believed that achieving the LOAEL / Green noise levels within the residential spaces will demonstrate that the "*appropriate attenuation"* required by Policy A4 has been achieved.

Office spaces

2.4.4 In the absence of objective criteria from the council and following advice presented within BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*, guidance has been taken from the British Council for Offices (BCO) whom have issued their *Guide to specification 2014.*

2.4.5 The BCO Guide recommends that the level of external noise intrusion, averaged over a typical working day of eight hours, should be controlled to a level of NR38 $L_{eq,8hr}$ with maximum noise levels not regularly exceeding 55dB L_{AFmax}.

Consolidated External Noise Ingress Criteria

2.4.6 Based on the available guidance the following internal acoustic criteria for the development, set down in Table 2.4, have been established.

Area	Noise limit
Residential	
Bedrooms	≤ 30 dB $L_{Aeq,8hr}$ (23:00 – 07:00) ≤ 42 dB L_{AFmax}* (23:00 – 07:00) ≤ 35 dB $L_{Aeq,16hr}$ (07:00 – 23:00)
Living rooms	≤ 35 dB $L_{Aeq,16hr}$ (07:00 – 23:00)
Commercial	
Offices	NR 38 $L_{eq,8hr}$ 55 dB L_{AFmax}*

**not to be regularly exceeded, criterion does not apply to genuinely infrequent or unpredictable events such as car alarms.*

Table 2.4 Internal ambient noise level criteria

2.4.7 It is believed that complying with these criteria will satisfy the requirements the Local Authority, BS 8233, and the BCO.

3 EXTERNAL NOISE SURVEY

3.1 SITE DESCRIPTION

3.1.1 The site is situated between two commercial developments, on the southern side of High Holborn in Central London. The proposed development will front directly onto High Holborn and stretch back to the private gardens of Lincoln's Inn at the rear.

3.2 MEASUREMENT METHODOLOGY

3.2.1 Continuous unattended noise level measurements were conducted to the front and rear of the proposed development in free-field conditions. At the front measurement position the microphone was extended about 1 metre above the site hoarding to overlook High Holborn. To the rear the microphone was placed 4 metres from the wall to the rear of the site and a metre from the boundary with the rear courtyard of 296 High Holborn. Noise levels measured at these locations are considered representative of the prevailing background noise at the neighbouring properties.

3.2.2 Photographs of the measurement positions are provided in Figures 3.1 and 3.2 and superimposed on a satellite image of the area in Figure 3.3.

Figure 3.1 Front measurement position

Figure 3.2 Rear measurement position

3.2.3 Measurements were undertaken between 12:00 on Wednesday 25th January and 12:50 on Thursday 26th January 2017. Statistical and spectral data were recorded continuously throughout the measurement period in 10-minute samples.

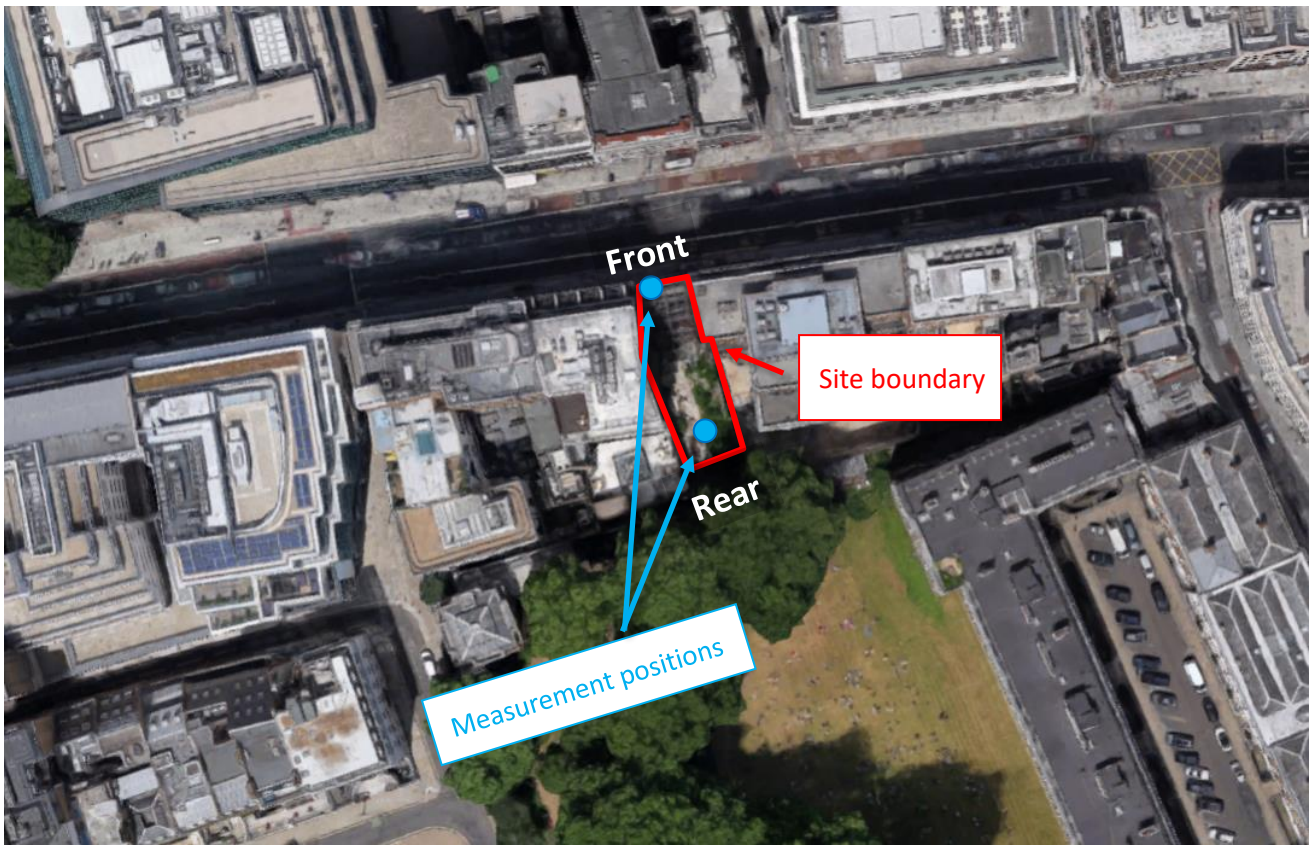
3.2.4 The following equipment was used for the noise survey:

Equipment	Type	Serial No.	Location
Norsonic 131	Precision sound analyser	1312766	Front
Norsonic 1227	Microphone	170606	
Norsonic 1207	Preamplifier	12160	
Norsonic 1218	Microphone protection system	12182561	
Norsonic 131	Precision sound analyser	1313605	Rear
Norsonic 1227	Microphone	170634	
Norsonic 1207	Preamplifier	20032	
Norsonic 1218	Microphone protection system	12182517	
Brüel & Kjær 4231	Calibrator	2291098	N/A

Table 3.1 Noise measurement equipment

3.2.5 The calibration of the measurement systems was checked prior to and on completion of the measurement period in accordance with recommended practice. No significant drift in calibration occurred during the measurement period. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.

3.2.6 The weather throughout the measurement was generally clear and dry with a light breeze. The survey results are not expected to have been adversely affected by the weather conditions.



Satellite image courtesy of Google

Figure 3.3 Satellite image showing the measurement locations

3.3 MEASUREMENT RESULTS

3.3.1 The full measurement results are presented in Appendix A. Graphs showing the noise level histories for the measurements are presented in Figures 3.4 and 3.5.

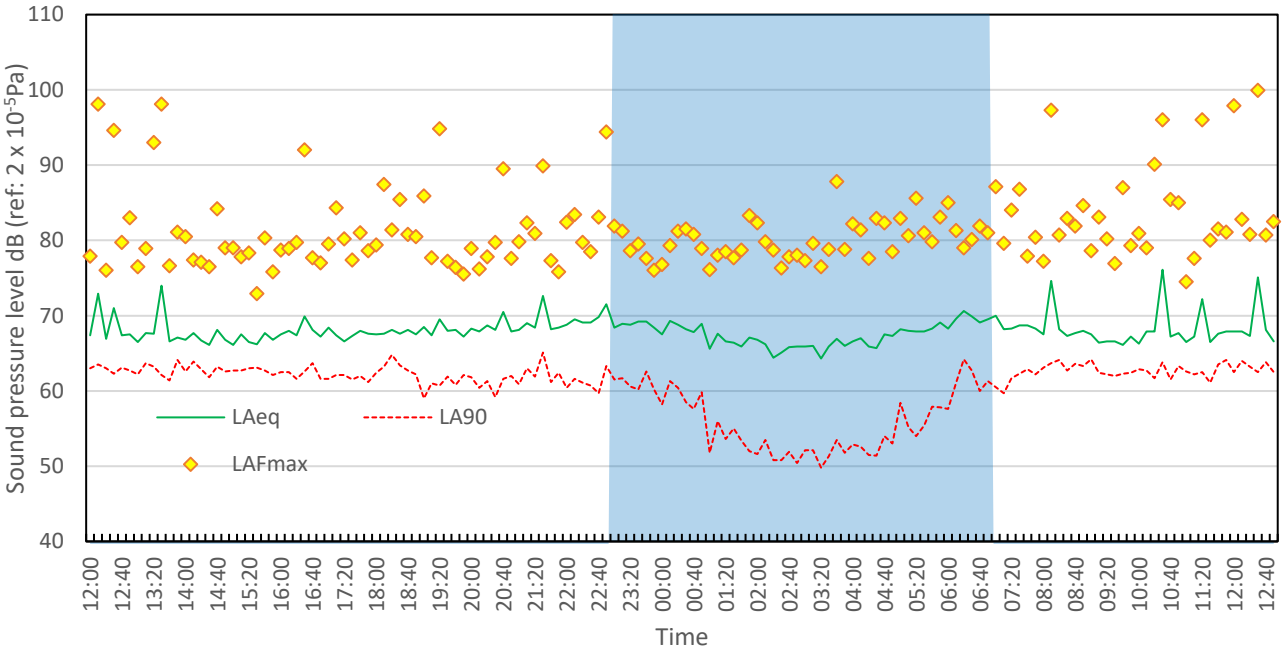


Figure 3.4 Noise level history of measurements to the front of the site

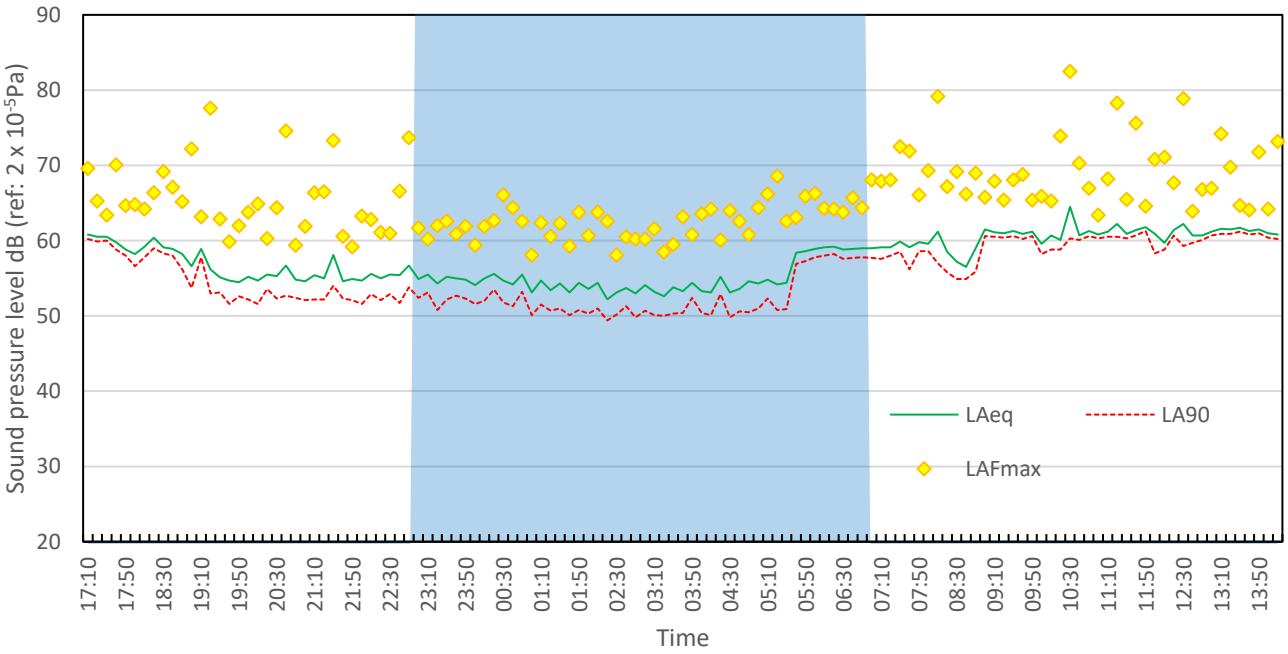


Figure 3.5 Noise level history of measurements to the rear of the site

3.3.2 The lowest measured background noise levels typically expected to occur during the daytime, evening, and night-time periods are set down in Table 3.2.

Time Period	Lowest background noise level ($L_{A90,10min}$)	
	Front	Rear
Daytime (07:00-19:00)	60 dB	55 dB
Evening (19:00-23:00)	59 dB	52 dB
Night-time (23:00-07:00)	50 dB	49 dB

All values are sound pressure levels in dB re: $2x10^{-5}$Pa

Table 3.2 Summary of lowest background noise levels

3.4 COMMENTARY

3.4.1 The primary noise source at the site was road traffic travelling along High Holborn which comprised of buses, cars, emergency vehicles, light and heavy goods vehicles, and the occasional motorbike. High Holborn is a major artery through Central London and as such, the volume of traffic is consistently high, only reducing slightly during the early hours of the morning.

3.4.2 There is a westbound bus stop located directly in front of the site receiving buses every few minutes throughout the day and approximately every 10-20 minutes throughout the night. The low frequency noise generated by these large vehicles is expected to be a source of noise which will need to be carefully considered within the façade design.

4 NOISE INTRUSION ASSESSMENT

4.1 REFERENCE NOISE LEVELS

4.1.1 Reference noise spectra for use in façade calculations have been determined from the measurement data with consideration given to the anticipated shielding provided by the new building. Table 4.1 presents the various spectra used for the facades while the classification of the facades are detailed in Figure 4.1.

	Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Front Facade								
Daytime $L_{eq,16hr\ (residential)}$ / $L_{eq,8hr\ (office)}$	73	67	66	63	67	65	55	47
Night time $L_{eq,8hr\ (residential)}$	72	66	65	64	66	63	55	46
Daytime L_{AFmax}	92	87	85	82	92	93	87	83
Night time L_{AFmax}	92	85	82	80	79	79	78	73
Side facades								
Daytime $L_{eq,16hr\ (residential)}$ / $L_{eq,8hr\ (office)}$	79	75	71	69	66	60	53	48
Night time $L_{eq,8hr\ (residential)}$	75	73	69	65	63	57	50	45
Daytime L_{AFmax}	83	79	75	73	77	74	67	58
Night time L_{AFmax}	81	74	67	64	62	62	58	50
Rear facade								
Daytime $L_{eq,16hr\ (residential)}$ / $L_{eq,8hr\ (office)}$	69	65	61	59	56	50	43	38
Night time $L_{eq,8hr\ (residential)}$	65	63	59	55	53	47	40	35
Daytime L_{AFmax}	83	79	75	73	77	74	67	58
Night time L_{AFmax}	81	74	67	64	62	62	58	50

All values are sound pressure levels in dB re: $2x10^{-5}$Pa

Table 4.1 Reference external noise levels used for the façade sound insulation assessment

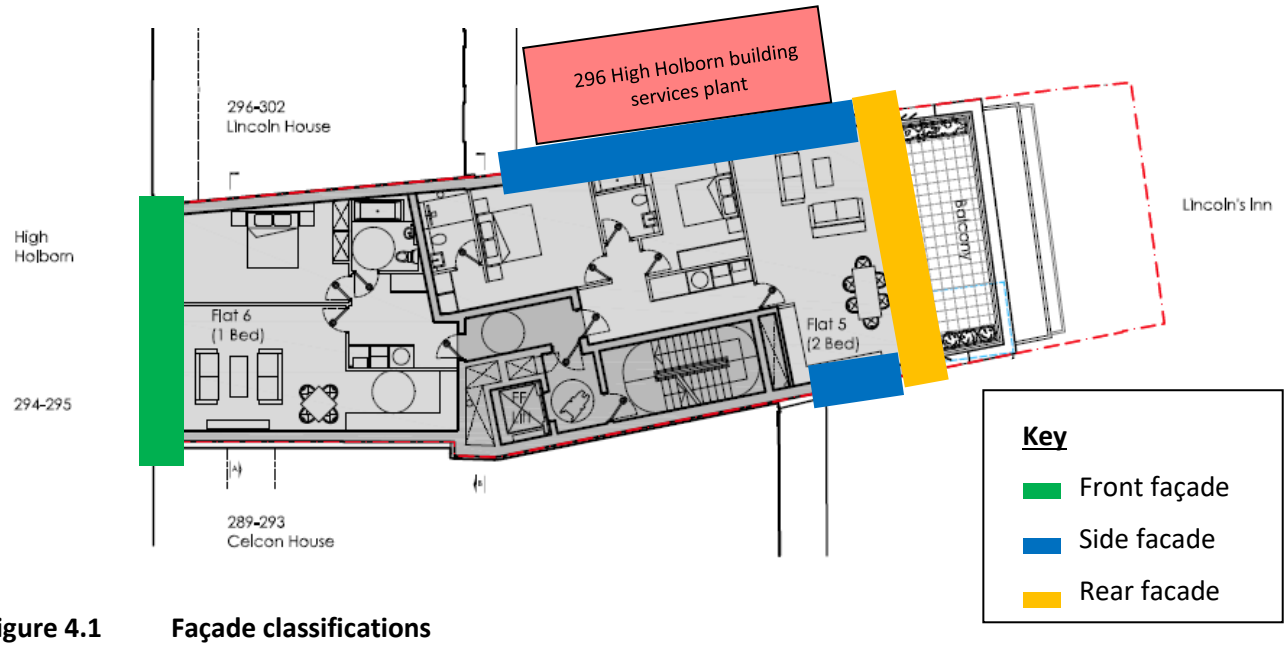


Figure 4.1 Façade classifications

4.2 RECOMMENDED FAÇADE CONSTRUCTIONS

4.2.1 The level of external noise intrusion within a space is determined by the sound insulation performance provided by the building envelope, the volume and reverberation time of the internal space, and the influence of any opening (e.g. for ventilation).

4.2.2 It is understood that MVHR ventilation systems are to be used throughout the building and so trickle ventilators have not been included in the assessment.

4.2.3 Based on achieving the internal ambient noise criteria in Table 2.4, the required sound insulation performances of the various façade elements have been establishing based on the latest drawings. The recommended minimum sound reduction indices are presented in Table 4.2.

	Frequency (Hz)					
	125	250	500	1k	2k	4k
External walls	36	46	51	53	50	60
Front and side facade						
Residential areas	33	38	40	42	47	51
Office / retail areas	26	28	38	47	43	51
Rear facade						
All glazing	20	19	29	38	36	45

All values are sound reduction indices measured in accordance with BS EN ISO 10140-2

Table 4.2 Required façade sound reduction indices

4.2.4 A rendered or fair-faced masonry construction supplemented by an internal lining comprising of two layers of 15mm dense plasterboard set back from the masonry lining and mineral wool within the cavity could be expected to achieve the necessary sound insulation performance for the external walls.

4.2.5 The required performance for glazing to residential areas in the front and side facades could be achieved by either a double or triple glazing unit. A suitable double glazing configuration would require two panes of laminated glass 12.8mm and 8.8mm thick with a 20mm air gap.

4.2.6 The minimum sound insulation performance for windows to offices in the front and side facades could be achieved with a double glazing unit consisting of 6 mm glass and 11mm laminated glass separated by a 12mm airgap.

4.2.7 A standard double glazing configuration comprising of two panes of 6mm glass and a 12mm airgap would be expected to achieve the minimum sound insulation performance required of glazing in the rear façade.

4.2.8 It should be noted that alternative constructions and glazing configurations may also be acceptable.

5 VIBRATION INTRUSION ASSESSMENT

5.1 MEASUREMENT METHODOLOGY

5.1.1 In order to assess the impact of vibration on future occupants, a vibration survey has been carried out.

5.1.2 The following equipment was used:

Equipment	Type	Serial No.	Date of last calibration
Norsonic 133	3 channel vibration meter	1332707	18/02/2016
MMF KS823B	Tri-axial accelerometer	10074	21/06/2016
MMF-729	Weighted mounting plate	N/A	N/A

Table 5.1 Vibration measurement equipment

5.1.3 The exact subsurface geology at the site is not known, but consists of an underground concrete structure (basement) with plasterboard partitions to the front, and a combination of concrete slab and made ground (loose soil and other debris) to the rear. This is shown in Figure 5.1.

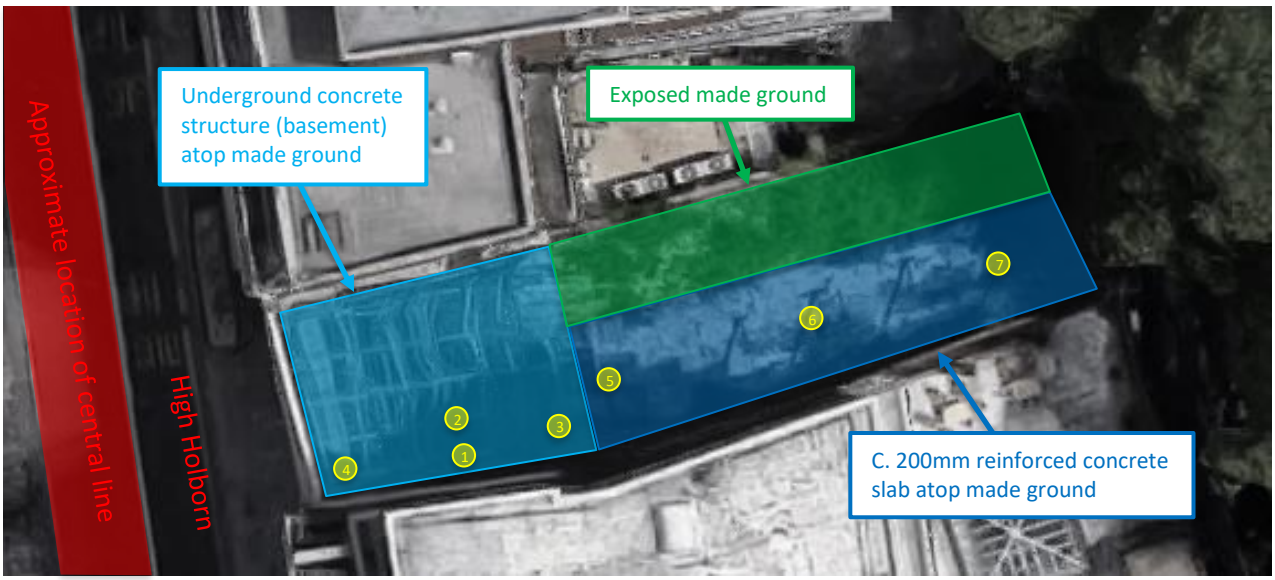


Figure 5.1 Layout of surface materials

5.1.4 Raw acceleration data was recorded with a sample rate of 2.7kHz, over a continuous 30 second period. The following weightings were then applied to the raw data, allowing the VDV and A_w over each 30 second period to be calculated.

	X	Y	Z
BS 6841:1987 frequency weighting based on geocentric coordinates	W_d	W_d	W_b

Table 5.2 BS 6481:1987 frequency weightings used in this report

5.1.5 Measurements were taken in 7 different locations around the site, which were selected to represent the different surface materials present, and to establish any variation in vibration levels around the site. These locations are shown on Figure 5.1, and are as follows:

1. Edge of basement slab, mounted on weighted mounting plate, supported with spikes
2. Approximate centre of basement slab, mounted on weighted mounting plate, supported with spikes
3. Edge of basement slab, mounted on weighted mounting plate, supported with spikes
4. Buried in made ground through hole in basement slab, mounted on weighted mounting plate
5. Edge of ground slab, mounted on weighted mounting plate, supported with spikes
6. Approximate centre of ground slab, mounted on weighted mounting plate, supported with spikes
7. Edge of ground slab, mounted on weighted mounting plate, supported with spikes

It should be noted that the slab measured at locations 1 & 2 was a different, slightly thicker slab to that measured at location 3.

5.1.6 Measurements at each location were attended, and the location changed after at least 10 train passbys were heard, which is believed to have provided a representative statistical distribution.

5.2 MEASUREMENT RESULTS

5.2.1 Measured train passbys have been grouped into two categories, thought to represent east-bound and west-bound central line trains between Holborn and Chancery Lane station. One of these categories would be expected to contain notably lower acceleration measurements than the other when unweighted (owing to increased distance between track and measurement location) and this was used to differentiate the two into *High level* and *Low level* passbys. It should also be noted that a few particularly large HGVs moving along High Holborn also caused an increase in measured acceleration.

5.2.2 The full measurement data is available on request. Table 5.2 summarises the results:

Location	Duration of measurement (min:sec)	High level passbys		Low level passbys		Typical 30 second VDV ($ms^{-1.75}$)		
		Number	Typical A_w (mms^{-2})	Number	Typical A_w (mms^{-2})	High level train passbys	Low level train passbys	No train passbys
1	50:00	17	1.611	19	0.714	0.006	0.003	0.001
2	52:30	20	2.446	14	1.085	0.010	0.004	0.002
3	49:00	20	1.215	18	0.714	0.005	0.003	0.001
4	30:00	12	4.652	12	2.298	0.019	0.010	0.002
5	30:00	15	1.491	10	1.267	0.005	0.004	0.004
6	32:00	13	1.709	12	1.628	0.006	0.006	0.004
7	30:00	11	1.790	13	1.359	0.006	0.005	0.003

Typical A_w and VDV values presented as triaxial magnitudes

Table 5.2 Summary of acceleration data from vibration survey

5.3 CALCULATION OF VIBRATION DOSE VALUES

5.3.1 It is believed that the VDV criteria from the council should be considered as measured values within the building once it is constructed. Since the weight of the new building will reduce this value, this should be taken into account when making the assessment. For this reason, measurements made using the "buried transducer" method (location 4) have been discounted from the assessment. As the proposed structure is to be relatively lightweight, no correction has been applied to the remaining measurements, which would be expected to give a suitably worst-case result.

5.3.2 The exact frequency of central line trains varies throughout the day. Based on data from the TFL website, the following timetables have been assumed:

Time period	Average passbys per hour (1 way)	Total passbys for period (1 way)
Peak (06:30 – 09:30 & 16:00 – 19:00)	30	180
Off peak (06:00 – 06:30, 09:30 – 16:00, 19:00 – 00:30)	25	313
Night tube (00:30 – 06:00)	10	55

Table 5.3 Assumed number of passbys (1 way)

5.3.3 Table 5.2 gives a total number of passbys between 07:00 – 23:00 as 428 per direction, and 120 per direction over 23:00 – 07:00.

5.3.4 As noted in 5.3.1, the measured peaks can be grouped into two groups based on acceleration, and it is assumed that this corresponds to the two central line tracks under High Holborn. The daytime and night-time VDV can therefore be calculated by considering the 30 second VDV for high level, low level, and the absence of passbys, and weighting these according to the number of passbys in Table 5.2.

5.3.5 First, the VDV for high level, low level, and no passby is obtained. The formula used is the same as that presented in BS 6472-1:2008, and is as follows:

$$VDV_{b/d,day} = \left(\frac{t_{day}}{t_\tau}\right)^{0.25} \times VDV_{b/d,\tau}$$

Where t_τ is 30 seconds, and t_{day} is the duration of exposure per day in seconds

5.3.6 These three values can then be combined to create a final VDV for each location, using the following formula from BS 6472-1:2008:

$$VDV_{b/d,day/night} = \left(\sum_{n=1}^{n=N} VDV_{b/d,t_n}^4\right)^{0.25}$$

5.3.7 Calculations for day and night VDV have been made for each measurement location being assessed, assuming the following:

- Daytime: 428 *high level* 30 second VDVs, 428 *low level* 30 second VDVs, and 1064 *no passby* 30 second VDVs
- Night-time: 120 *high level* 30 second VDVs, 120 *low level* 30 second VDVs, and 720 *no passby* 30 second VDVs

5.3.8 The results are presented in Table 5.4 as tri-axial magnitudes:

Location	Daytime $VDV_{b/d,16hr}$	Night-time $VDV_{b/d,8hr}$	Whole-day $VDV_{b/d,24hr}$
1	0.029 $ms^{-1.75}$	0.021 $ms^{-1.75}$	0.030 $ms^{-1.75}$
2	0.046 $ms^{-1.75}$	0.034 $ms^{-1.75}$	0.049 $ms^{-1.75}$
3	0.022 $ms^{-1.75}$	0.016 $ms^{-1.75}$	0.023 $ms^{-1.75}$
5	0.028 $ms^{-1.75}$	0.022 $ms^{-1.75}$	0.031 $ms^{-1.75}$
6	0.034 $ms^{-1.75}$	0.026 $ms^{-1.75}$	0.037 $ms^{-1.75}$
7	0.031 $ms^{-1.75}$	0.024 $ms^{-1.75}$	0.034 $ms^{-1.75}$

Table 5.4 Calculated VDVs for each measurement position

5.4 CONCLUSION

5.4.1 The results show that even the worst-case measurement location, with no corrections to account for the weight of the building, would still meet the VDV criteria from the council. These values would also suggest that adverse comment is not expected according to the guidance in BS 6472-1:2008.

6 NOISE EMISSION ASSESSMENT

6.1 CRITERIA

6.1.1 The council have set down objective noise limits for building services plant which have been presented within this document in Table 2.2

6.1.2 The *rating level* of plant noise should be 10 dB below the measured background noise level unless it contains distinguishable acoustic characteristics. Should audible tonal elements be considered present, then a more onerous limit of 15 dB below the background level would be applied.

6.2 ASSESSMENT METHODOLOGY

6.2.1 *BS 4142: 2014* provides guidance on the assessment of the impact of a noise source. The standard presents a methodology for comparing the noise level of the new source (the *specific sound level*) with that of the existing background noise level in the area in the absence of the new source (the *background sound level*).

6.2.2 The methodology requires consideration to be given to all aspects of the assessment process and also accounts for unusual acoustic features such as tonal, impulsive, or intermittency characteristics of the noise by the addition of various decibel corrections to the *specific sound level*. The corrected *specific sound level* is known as the *rating level*.

6.2.3 The *rating level* is then arithmetically subtracted from the *background sound level*. The greater the positive difference between the *rating level* and the *background sound level*, 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 upon the context.
- A difference of around + 5 dB or more is likely to be an indication of an adverse impact, depending upon the context.
- Where the *rating level* does not exceed the *background sound level*, this is an indication of a low impact, depending upon the context.

6.3 BACKGROUND SOUND LEVELS

6.3.1 The council have not provided a preferred evaluation period with which to establish the noise emission limits but BS 4142 recommends a period of 1 hour during the day and 5 minutes at night. This assessment has been conducted with 10 minute samples and any difference between the $L_{A90,5min}$ and $L_{A90,10min}$ is expected to be negligible. However, the $L_{A90,10min}$ can be expected to be lower than the $L_{A90,1hr}$ and by using this value a more conservative noise limit is expected.

6.4 BUILDING SERVICES EQUIPMENT

6.4.1 All external plant items are expected to be housed on the rooftop of the building behind a 2.2-metre-high, solid and imperforate screen with a minimum mass of 10kgm^{-2}. Table 6.1 details the preliminary plant selections and their assumed noise emission levels.

Plant item	No.	Manufacturer	Model	Noise level
VRF condensing units	4	Daikin	REYQ16T	64 dB L_{pA} at 1 metre
VRF condensing units	10	Daikin	ERLQ016CW1	56 dB L_{pA} at 1 metre
Air handling unit (office space)	1	Fläkt Woods	eQ Prime	Inlet – 61 dB L_{wa} Outlet – 71 dB L_{wa} Breakout – 53 dB L_{wa}
Air handling unit (retail space)	1	Fläkt Woods	eQ Prime	Inlet – 65 dB L_{wa} Outlet – 76 dB L_{wa} Breakout – 56 dB L_{wa}
Extract fan	1	Nuair	AVT6-R	Outlet – 65 dB L_{wA}

Table 6.1 Proposed building services plant items

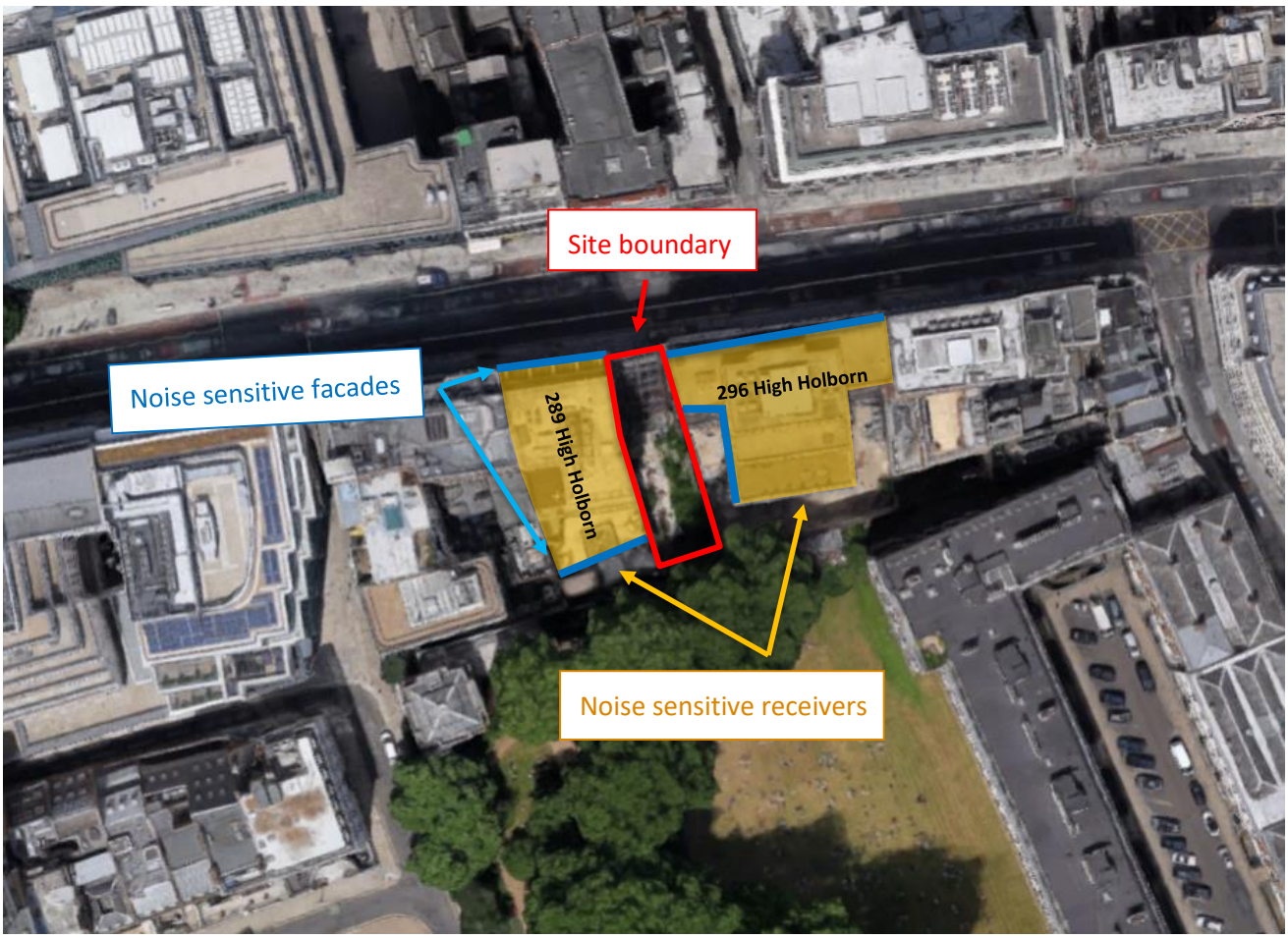
6.4.2 The condensing units serving the office spaces (REYQ16T) are to be operated under Low Noise Mode 1 (82% duty when cooling and 70% when heating) which is expected to reduce the level of noise from each unit by 6 dB. This has been confirmed as achievable by the manufacturer, Daikin.

6.4.3 Proprietary acoustic attenuators are to be fitted to the exhausts of the air handling units so that the noise emitted from each outlet is controlled to 55 dB L_{pA} at 1 metre. The exhaust of the extract fan is also to be fitted with an attenuator limiting it to 65 dB L_{pA} at one metre.

6.4.4 All of the proposed plant items are expected to produce a smooth broadband sound with no readily identifiable tonal features. As such, a noise limit of 10 dB below the background is to be applied in line with the council's guidance.

6.5 NEAREST NOISE-SENSITIVE RECEIVERS

6.5.1 The noise sensitive properties closest to the site have been identified as the commercial developments at 289 and 296 High Holborn standing at 9 and 8 storeys respectively. The location of these buildings is presented in Figure 6.2, highlighting their noise-sensitive facades.



Satellite image courtesy of Google

Figure 6.1 Nearest noise-sensitive properties likely to be most affected by plant noise

6.5.2 Considering the background levels presented in Table 6.2 and the council's requirements, the following noise limits are proposed at each of the noise sensitive receivers. These are presented as free-field values.

Time Period	Noise emission limit	
	Noise sensitive facades facing High Holborn	Noise sensitive facades facing Lincoln's Inn
Daytime (07:00-19:00)	50 dB $L_{Aeq,1hr}$	45 dB $L_{Aeq,1hr}$
Evening (19:00-23:00)	49 dB $L_{Aeq,1hr}$	52 dB $L_{Aeq,1hr}$
Night-time (23:00-07:00)	40 dB $L_{Aeq,5min}$	39 dB $L_{Aeq,5min}$

Table 6.2 Noise emission limit for all building services plant operating simultaneously

6.6 PREDICTED NOISE EMISSION LEVELS

6.6.1 Plant items on the rooftop 294-295 High Holborn will be situated above the nearby noise sensitive facades and as such will benefit from some shielding by the building itself. The closest windows at 289 High Holborn are believed to be a metre below the rooftop plant area while those at 296 High Holborn are some 4 metres below.

6.6.2 Considering the proposals outlined in Section 6.4 the *specific sound levels* at each of the noise sensitive facades have been calculated and are presented in Table 6.3. They are based on all of the plant operating at full duty with corrections owing to geometric spreading.

Noise sensitive receiver	Noise level	
	Front façades (High Holborn)	Rear façades (Lincoln's Inn)
289 High Holborn	35 dB L_{pA}	38 dB L_{pA}
296 High Holborn	38 dB L_{pA}	39 dB L_{pA}

Table 6.3 Predicted noise levels without attenuation measures

6.6.3 As previously stated in 6.4.4, the equipment is not expected to contain any unusual acoustic features and as such no correction has been applied to the *rating level*.

6.6.4 If louvres are required within the surrounding screen for air circulation then they should be acoustically rated so as to achieve the noise limits. The minimum sound insertion losses required are provided in Table 6.5 below and are believed to be achievable with a louvre c 150mm deep.

	Frequency (Hz)					
	125	250	500	1000	2000	4000
Acoustic louvres surrounding the plant area	6	9	14	20	20	20

All values are insertion losses in dB re: $2x10^{-5}$Pa

Table 6.5 Acoustic louvre specification

6.7 CONCLUSION

6.7.1 An external noise survey has established the prevailing background levels at the proposed development site with the data used to establish noise limits in line with guidance provided by the council.

6.7.2 Based on the attenuation measures incorporated within the design of the plant area, the council's noise limits at each of the neighbouring noise-sensitive properties are expected to be readily achieved. It is believed that this assessment represents a worst-case scenario and the plant will typically operate below its maximum duty. As such, the levels experienced at the neighbouring properties are expected to be even lower than those calculated.

APPENDIX A - NOISE LEVEL DATA

The measured noise level data are presented in the tables in this appendix. The full set of data are available in electronic form on request.

All values are sound pressure levels in dB re: $2x10^{-5}$Pa.

Table A1: Statistical measurement data at the front measurement position

Date & Time	L_{Aeq}	L_{AFmax}	L_{AFmin}	L_{A10}	L_{A90}
25/01/2017 12:00	67.4	77.9	59.5	70.2	63.0
25/01/2017 12:10	72.9	98.1	60.5	70.8	63.5
25/01/2017 12:20	66.9	76.0	60.5	69.0	63.0
25/01/2017 12:30	71.0	94.6	60.1	69.5	62.3
25/01/2017 12:40	67.4	79.7	60.8	69.8	63.1
25/01/2017 12:50	67.5	83.0	60.5	69.6	62.7
25/01/2017 13:00	66.5	76.5	59.3	69.4	62.2
25/01/2017 13:10	67.7	78.9	61.1	70.2	63.7
25/01/2017 13:20	67.6	93.0	60.1	68.7	63.2
25/01/2017 13:30	74.0	98.1	59.6	70.4	62.1
25/01/2017 13:40	66.6	76.6	58.5	69.7	61.4
25/01/2017 13:50	67.1	81.1	62.2	68.9	64.1
25/01/2017 14:00	66.8	80.5	59.7	69.1	62.6
25/01/2017 14:10	67.7	77.4	61.9	70.1	63.9
25/01/2017 14:20	66.7	77.1	61.2	69.1	62.9
25/01/2017 14:30	66.1	76.5	59.7	68.9	61.8
25/01/2017 14:40	68.1	84.2	60.6	70.1	63.2
25/01/2017 14:50	66.8	79.0	59.9	69.2	62.6
25/01/2017 15:00	66.1	79.0	60.3	68.3	62.7
25/01/2017 15:10	67.5	77.8	60.2	70.3	62.7
25/01/2017 15:20	66.5	78.3	60.6	68.7	63.0
25/01/2017 15:30	66.2	72.9	60.9	68.5	63.1
25/01/2017 15:40	67.7	80.3	58.3	70.3	62.7
25/01/2017 15:50	66.8	75.8	57.7	69.4	62.1
25/01/2017 16:00	67.5	78.7	57.3	70.0	62.5
25/01/2017 16:10	68.0	78.9	59.1	70.8	62.5
25/01/2017 16:20	67.4	79.7	58.4	70.4	61.6
25/01/2017 16:30	69.9	92.0	56.1	71.9	62.6
25/01/2017 16:40	68.1	77.7	61.1	70.9	63.7
25/01/2017 16:50	67.2	77.0	57.0	70.3	61.6
25/01/2017 17:00	68.4	79.5	56.8	71.5	61.6
25/01/2017 17:10	67.4	84.3	57.1	70.1	62.1
25/01/2017 17:20	66.6	80.2	58.5	68.9	62.1
25/01/2017 17:30	67.3	77.4	58.7	70.6	61.5
25/01/2017 17:40	68.0	81.0	57.8	71.1	62.0
25/01/2017 17:50	67.6	78.6	58.2	71.0	61.2
25/01/2017 18:00	67.5	79.4	58.7	69.7	62.4
25/01/2017 18:10	67.6	87.4	61.0	69.6	63.2
25/01/2017 18:20	68.1	81.4	62.9	70.6	64.8
25/01/2017 18:30	67.6	85.4	58.6	69.6	63.4
25/01/2017 18:40	68.1	80.8	57.3	70.3	62.7
25/01/2017 18:50	67.5	80.5	57.6	70.3	62.2
25/01/2017 19:00	68.5	85.9	56.0	71.5	59.0
25/01/2017 19:10	67.4	77.7	57.1	70.2	61.0
25/01/2017 19:20	69.5	94.8	56.2	71.8	60.7
25/01/2017 19:30	68.0	77.2	54.5	71.2	61.9
25/01/2017 19:40	68.1	76.4	55.4	71.1	60.8
25/01/2017 19:50	67.2	75.5	57.3	70.0	62.1
25/01/2017 20:00	68.3	78.9	56.0	71.5	61.8
25/01/2017 20:10	67.9	76.2	55.2	71.0	60.4
25/01/2017 20:20	68.7	77.8	53.6	71.8	61.3
25/01/2017 20:30	68.1	79.7	53.7	71.4	59.2
25/01/2017 20:40	70.5	89.5	54.6	71.6	61.6
25/01/2017 20:50	67.9	77.6	55.7	71.0	62.0
25/01/2017 21:00	68.1	79.8	55.4	71.2	60.9
25/01/2017 21:10	69.0	82.3	55.4	72.0	63.0
25/01/2017 21:20	68.4	80.9	57.2	71.3	61.9
25/01/2017 21:30	72.6	89.9	60.6	74.7	65.1
25/01/2017 21:40	68.2	77.3	54.4	70.9	61.2
25/01/2017 21:50	68.4	75.8	55.3	71.6	62.4
25/01/2017 22:00	68.8	82.4	55.6	72.2	60.4
25/01/2017 22:10	69.5	83.4	53.3	72.6	61.6
25/01/2017 22:20	69.1	79.7	54.0	72.2	61.1
25/01/2017 22:30	69.1	78.5	53.0	72.3	60.7
25/01/2017 22:40	69.8	83.1	53.9	72.8	59.7
25/01/2017 22:50	71.5	94.4	55.8	72.7	63.3
25/01/2017 23:00	68.4	81.9	56.2	71.5	61.5
25/01/2017 23:10	68.9	81.2	57.1	72.1	61.7
25/01/2017 23:20	68.8	78.6	55.5	72.0	60.6
25/01/2017 23:30	69.2	79.5	53.9	72.5	60.2
25/01/2017 23:40	69.2	77.6	55.3	72.0	62.6
25/01/2017 23:50	68.4	76.0	55.6	71.8	60.2
26/01/2017 00:00	67.5	76.8	51.0	71.0	58.2
26/01/2017 00:10	69.3	79.3	52.6	72.4	61.3
26/01/2017 00:20	68.8	81.2	56.3	72.2	60.4

Date & Time	L_{Aeq}	L_{AFmax}	L_{AFmin}	L_{A10}	L_{A90}
26/01/2017 00:30	68.2	81.5	50.8	71.4	58.5
26/01/2017 00:40	67.8	80.8	53.1	71.4	57.6
26/01/2017 00:50	68.9	78.9	49.8	72.3	59.8
26/01/2017 01:00	65.6	76.1	48.0	70.4	51.8
26/01/2017 01:10	67.6	78.0	48.8	71.4	56.0
26/01/2017 01:20	66.6	78.5	48.4	71.1	53.6
26/01/2017 01:30	66.4	77.7	49.3	70.7	55.0
26/01/2017 01:40	65.9	78.7	47.2	70.4	53.4
26/01/2017 01:50	67.1	83.3	48.3	71.2	52.0
26/01/2017 02:00	66.8	82.3	46.5	71.1	51.6
26/01/2017 02:10	66.2	79.8	49.1	70.1	53.5
26/01/2017 02:20	64.4	78.7	47.0	69.3	50.8
26/01/2017 02:30	65.1	76.3	47.8	70.0	50.8
26/01/2017 02:40	65.8	77.8	48.0	70.0	51.9
26/01/2017 02:50	65.9	78.0	47.3	70.6	50.4
26/01/2017 03:00	65.9	77.3	47.5	70.5	52.1
26/01/2017 03:10	66.0	79.6	49.4	70.2	52.1
26/01/2017 03:20	64.3	76.5	47.4	69.2	49.8
26/01/2017 03:30	65.9	78.8	48.1	70.6	51.3
26/01/2017 03:40	66.9	87.8	49.5	71.0	53.5
26/01/2017 03:50	66.0	78.8	47.3	70.5	51.8
26/01/2017 04:00	66.6	82.2	49.6	71.1	52.9
26/01/2017 04:10	67.0	81.4	47.7	71.6	52.6
26/01/2017 04:20	65.9	77.6	48.8	70.5	51.5
26/01/2017 04:30	65.7	82.9	48.0	69.7	51.4
26/01/2017 04:40	67.5	82.3	49.6	71.8	54.0
26/01/2017 04:50	67.3	78.5	48.3	71.8	53.0
26/01/2017 05:00	68.2	82.9	50.2	71.9	58.4
26/01/2017 05:10	68.0	80.6	51.0	72.3	55.2
26/01/2017 05:20	67.9	85.6	49.2	71.8	54.0
26/01/2017 05:30	67.9	81.0	48.7	72.1	55.4
26/01/2017 05:40	68.3	79.8	51.5	71.9	57.9
26/01/2017 05:50	69.1	83.1	51.8	72.6	57.8
26/01/2017 06:00	68.3	85.0	51.9	71.7	57.6
26/01/2017 06:10	69.6	81.3	54.3	73.0	61.1
26/01/2017 06:20	70.6	79.0	59.3	73.7	64.2
26/01/2017 06:30	69.9	80.1	54.2	73.3	62.7
26/01/2017 06:40	69.1	81.9	53.2	72.4	60.0
26/01/2017 06:50	69.5	81.0	55.8	72.5	61.3
26/01/2017 07:00	70.0	87.1	54.0	72.8	60.5
26/01/2017 07:10	68.2	79.6	53.9	71.5	59.7
26/01/2017 07:20	68.3	84.0	56.3	71.2	61.7
26/01/2017 07:30	68.7	86.8	59.2	70.7	62.3
26/01/2017 07:40	68.7	77.9	58.7	71.8	62.9
26/01/2017 07:50	68.3	80.4	59.2	70.7	62.2
26/01/2017 08:00	67.5	77.2	58.8	70.2	63.1
26/01/2017 08:10	74.6	97.3	60.4	72.2	63.7
26/01/2017 08:20	68.2	80.7	61.3	70.9	64.1
26/01/2017 08:30	67.3	82.9	60.0	69.9	62.7
26/01/2017 08:40	67.7	81.9	61.1	70.1	63.6
26/01/2017 08:50	68.0	84.6	60.5	70.7	63.3
26/01/2017 09:00	67.5	78.6	61.1	69.2	64.2
26/01/2017 09:10	66.4	83.1	60.6	68.7	62.4
26/01/2017 09:20	66.6	80.2	60.4	69.2	62.2
26/01/2017 09:30	66.6	76.9	59.5	69.1	62.0
26/01/2017 09:40	66.1	87.0	59.8	68.0	62.3
26/01/2017 09:50	67.2	79.3	59.7	69.1	62.4
26/01/2017 10:00	66.3	80.9	60.8	68.2	62.9
26/01/2017 10:10	67.9	79.0	60.8	71.2	62.7
26/01/2017 10:20	67.9	90.1	59.0	70.2	61.7
26/01/2017 10:30	76.1	96.0	61.3	73.1	63.8
26/01/2017 10:40	67.2	85.4	59.2	69.6	61.5
26/01/2017 10:50	67.7	85.0	61.3	70.3	63.3
26/01/2017 11:00	66.5	74.5	60.4	69.1	62.6
26/01/2017 11:10	67.2	77.6	58.5	70.2	62.2
26/01/2017 11:20	72.2	96.0	59.7	71.3	62.5
26/01/2017 11:30	66.5	80.0	59.0	69.2	61.1
26/01/2017 11:40	67.6	81.5	61.6	70.2	63.5
26/01/2017 11:50	67.9	81.1	59.6	70.4	64.1
26/01/2017 12:00	67.9	97.9	59.0	68.6	62.5
26/01/2017 12:10	67.9	82.8	61.1	70.0	64.0
26/01/2017 12:20	67.3	80.8	60.3	69.7	63.2
26/01/2017 12:30	75.1	99.9	60.0	71.7	62.5
26/01/2017 12:40	68.1	80.7	61.4	70.4	63.8
26/01/2017 12:50	66.6	82.5	61.3	68.5	62.5

Table A2: Statistical measurement data at the rear measurement position

Date & Time	L_{Aeq}	L_{AFmax}	L_{AFmin}	L_{A10}	L_{A90}
25/01/2017 17:10	60.8	69.6	59.3	61.3	60.2
25/01/2017 17:20	60.5	65.3	59.2	61.0	59.9
25/01/2017 17:30	60.5	63.4	59.2	61.2	60.0
25/01/2017 17:40	59.8	70.1	57.6	60.7	58.8
25/01/2017 17:50	58.8	64.7	57.1	59.7	58.0
25/01/2017 18:00	58.2	64.8	54.7	59.1	56.6
25/01/2017 18:10	59.2	64.2	55.9	60.7	57.8
25/01/2017 18:20	60.4	66.4	57.5	61.3	59.0
25/01/2017 18:30	59.1	69.2	57.5	59.7	58.3
25/01/2017 18:40	58.9	67.1	56.8	59.6	58.0
25/01/2017 18:50	58.2	65.2	54.0	59.2	56.2
25/01/2017 19:00	56.6	72.2	51.3	58.3	53.7
25/01/2017 19:10	58.9	63.2	55.2	59.8	57.8
25/01/2017 19:20	56.2	77.6	51.0	57.3	53.0
25/01/2017 19:30	55.1	62.9	51.1	56.5	53.1
25/01/2017 19:40	54.7	59.9	49.0	56.3	51.6
25/01/2017 19:50	54.5	62.0	50.7	56.0	52.6
25/01/2017 20:00	55.2	63.8	50.0	57.4	52.2
25/01/2017 20:10	54.7	64.9	49.6	56.5	51.6
25/01/2017 20:20	55.5	60.3	49.7	56.9	53.6
25/01/2017 20:30	55.3	64.4	50.0	57.2	52.3
25/01/2017 20:40	56.7	74.6	50.6	56.4	52.7
25/01/2017 20:50	54.8	59.4	50.3	56.5	52.4
25/01/2017 21:00	54.6	61.9	49.7	56.2	52.1
25/01/2017 21:10	55.4	66.4	49.8	57.2	52.2
25/01/2017 21:20	55.0	66.5	50.0	56.6	52.2
25/01/2017 21:30	58.1	73.3	51.9	60.0	54.0
25/01/2017 21:40	54.6	60.6	49.6	56.2	52.3
25/01/2017 21:50	54.9	59.2	49.8	56.9	52.1
25/01/2017 22:00	54.7	63.3	49.7	56.8	51.6
25/01/2017 22:10	55.6	62.8	49.5	57.4	52.9
25/01/2017 22:20	55.0	61.1	50.1	57.0	52.1
25/01/2017 22:30	55.5	61.0	51.5	57.3	52.9
25/01/2017 22:40	55.4	66.6	50.0	57.4	51.7
25/01/2017 22:50	56.7	73.7	51.5	57.7	53.8
25/01/2017 23:00	54.9	61.7	49.9	56.7	52.4
25/01/2017 23:10	55.5	60.2	50.5	57.2	53.1
25/01/2017 23:20	54.3	62.0	48.5	56.3	50.8
25/01/2017 23:30	55.2	62.6	49.6	57.2	52.2
25/01/2017 23:40	55.0	60.9	49.8	56.8	52.7
25/01/2017 23:50	54.8	61.9	50.0	56.8	52.3
26/01/2017 00:00	54.1	59.4	48.5	56.1	51.6
26/01/2017 00:10	55.0	61.9	49.5	56.8	52.0
26/01/2017 00:20	55.6	62.7	51.5	57.3	53.5
26/01/2017 00:30	54.7	66.1	49.7	56.5	51.8
26/01/2017 00:40	54.2	64.4	49.6	56.1	51.3
26/01/2017 00:50	55.5	62.6	51.1	57.3	53.2
26/01/2017 01:00	53.1	58.1	49.1	55.3	50.1
26/01/2017 01:10	54.7	62.4	49.3	56.7	51.5
26/01/2017 01:20	53.4	60.6	49.2	55.7	50.7
26/01/2017 01:30	54.3	62.3	49.6	56.4	51.0
26/01/2017 01:40	53.1	59.3	49.1	55.6	50.1
26/01/2017 01:50	54.4	63.8	49.4	56.4	50.8
26/01/2017 02:00	53.6	60.7	48.9	56.0	50.3
26/01/2017 02:10	54.4	63.8	49.3	56.4	51.0
26/01/2017 02:20	52.2	62.6	47.6	54.6	49.4
26/01/2017 02:30	53.1	58.1	49.0	55.3	50.2
26/01/2017 02:40	53.7	60.5	48.7	55.7	51.3
26/01/2017 02:50	53.0	60.2	48.3	55.7	49.8
26/01/2017 03:00	54.1	60.2	49.2	56.3	50.7
26/01/2017 03:10	53.2	61.6	48.9	55.6	50.1
26/01/2017 03:20	52.6	58.5	49.1	54.8	50.0
26/01/2017 03:30	53.8	59.5	48.7	55.9	50.3
26/01/2017 03:40	53.3	63.2	49.2	55.7	50.4
26/01/2017 03:50	54.4	60.8	50.7	56.2	52.4

Date & Time	L_{Aeq}	L_{AFmax}	L_{AFmin}	L_{A10}	L_{A90}
26/01/2017 04:00	53.3	63.6	49.0	55.6	50.4
26/01/2017 04:10	53.1	64.2	48.9	55.8	50.1
26/01/2017 04:20	55.2	60.1	51.2	56.9	52.9
26/01/2017 04:30	53.1	64.0	47.5	55.4	49.8
26/01/2017 04:40	53.6	62.6	49.1	56.0	50.6
26/01/2017 04:50	54.6	60.8	49.1	56.9	50.5
26/01/2017 05:00	54.3	64.4	49.5	56.6	51.0
26/01/2017 05:10	54.8	66.2	50.2	57.3	52.3
26/01/2017 05:20	54.2	68.6	49.5	56.5	50.8
26/01/2017 05:30	54.4	62.6	48.9	56.8	50.9
26/01/2017 05:40	58.4	63.1	53.1	59.5	56.9
26/01/2017 05:50	58.6	65.9	56.4	59.8	57.3
26/01/2017 06:00	58.9	66.3	56.9	59.9	57.8
26/01/2017 06:10	59.1	64.3	56.9	60.0	58.0
26/01/2017 06:20	59.2	64.2	57.3	60.3	58.2
26/01/2017 06:30	58.8	63.8	56.4	60.0	57.6
26/01/2017 06:40	58.9	65.7	56.4	60.0	57.7
26/01/2017 06:50	59.0	64.4	56.9	60.1	57.8
26/01/2017 07:00	59.0	68.1	56.6	60.1	57.7
26/01/2017 07:10	59.1	67.9	56.7	59.8	57.6
26/01/2017 07:20	59.1	68.1	57.2	60.0	58.0
26/01/2017 07:30	59.9	72.5	57.3	60.6	58.5
26/01/2017 07:40	59.1	71.9	54.9	59.8	56.2
26/01/2017 07:50	59.8	66.1	55.5	60.8	58.6
26/01/2017 08:00	59.6	69.3	57.5	60.4	58.6
26/01/2017 08:10	61.2	79.2	55.6	61.7	57.0
26/01/2017 08:20	58.5	67.2	54.4	60.0	55.8
26/01/2017 08:30	57.2	69.2	54.0	58.3	54.9
26/01/2017 08:40	56.5	66.2	53.6	58.2	54.9
26/01/2017 08:50	59.0	69.0	54.7	61.2	55.9
26/01/2017 09:00	61.5	65.8	59.7	62.3	60.6
26/01/2017 09:10	61.1	67.9	59.6	61.7	60.5
26/01/2017 09:20	61.0	65.4	59.6	61.5	60.4
26/01/2017 09:30	61.3	68.1	59.5	61.8	60.6
26/01/2017 09:40	60.9	68.8	59.3	61.4	60.2
26/01/2017 09:50	61.2	65.4	59.7	61.7	60.6
26/01/2017 10:00	59.6	65.9	57.2	61.0	58.2
26/01/2017 10:10	60.7	65.3	57.6	61.5	58.8
26/01/2017 10:20	60.1	73.9	57.9	61.3	58.8
26/01/2017 10:30	64.5	82.5	58.9	62.9	60.3
26/01/2017 10:40	60.7	70.3	59.0	61.2	60.1
26/01/2017 10:50	61.3	67.0	59.8	61.9	60.6
26/01/2017 11:00	60.8	63.4	59.5	61.3	60.3
26/01/2017 11:10	61.2	68.2	59.5	61.7	60.5
26/01/2017 11:20	62.2	78.3	59.6	62.0	60.5
26/01/2017 11:30	60.9	65.5	59.6	61.4	60.3
26/01/2017 11:40	61.4	75.6	59.8	61.8	60.7
26/01/2017 11:50	61.8	64.6	60.5	62.3	61.3
26/01/2017 12:00	60.9	70.8	57.5	62.0	58.3
26/01/2017 12:10	59.7	71.1	57.7	60.4	58.8
26/01/2017 12:20	61.4	67.7	60.0	61.8	60.7
26/01/2017 12:30	62.2	78.9	58.2	61.4	59.3
26/01/2017 12:40	60.7	63.9	58.7	61.4	59.7
26/01/2017 12:50	60.7	66.8	59.2	61.1	60.1
26/01/2017 13:00	61.2	67.0	59.5	61.7	60.7
26/01/2017 13:10	61.6	74.2	59.9	62.2	60.9
26/01/2017 13:20	61.5	69.8	60.0	62.0	60.9
26/01/2017 13:30	61.7	64.7	60.0	62.2	61.2
26/01/2017 13:40	61.3	64.1	60.0	61.7	60.8
26/01/2017 13:50	61.5	71.8	60.2	61.9	61.0
26/01/2017 14:00	61.0	64.2	59.5	61.6	60.4
26/01/2017 14:10	60.8	73.2	57.5	61.2	60.2

Table A3: Frequency measurement data at the front measurement position

Date & Time	L_{eq}								L_{Fmax}							
	Frequency (Hz)								Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
25/01/2017 12:00	73.1	65.8	62.7	63.0	63.1	60.8	54.5	49.9	84.3	76.1	72.1	74.9	72.8	74.0	67.5	71.4
25/01/2017 12:10	73.6	66.9	64.5	63.2	68.2	67.1	64.8	57.7	87.0	81.4	82.7	76.5	93.9	92.5	91.5	86.4
25/01/2017 12:20	71.9	67.5	64.3	62.6	62.2	60.3	54.5	46.4	84.4	76.2	73.7	73.8	72.0	70.2	66.9	65.8
25/01/2017 12:30	71.9	65.3	62.4	62.7	66.4	65.5	62.1	56.1	81.2	78.5	71.9	75.2	89.7	90.4	87.7	83.9
25/01/2017 12:40	72.9	67.2	64.5	63.5	62.6	60.6	55.1	51.8	85.3	87.4	81.7	78.8	73.0	73.2	77.4	72.2
25/01/2017 12:50	73.6	70.0	66.7	64.3	62.5	60.0	53.9	47.1	87.5	86.6	85.6	81.8	81.4	76.4	66.5	71.0
25/01/2017 13:00	73.2	65.8	63.0	62.6	62.1	59.7	54.3	47.2	89.0	78.2	75.6	72.5	72.2	71.3	69.9	69.9
25/01/2017 13:10	72.9	66.7	64.4	63.7	63.3	60.6	54.9	52.5	91.4	77.6	75.0	71.6	74.3	69.9	68.1	79.9
25/01/2017 13:20	73.2	65.2	62.7	62.6	62.1	60.9	59.0	54.1	84.2	77.7	72.9	71.0	79.1	86.9	89.1	85.3
25/01/2017 13:30	72.6	65.9	63.2	63.2	70.2	69.6	55.8	45.7	84.4	77.8	77.0	78.2	96.4	96.4	79.1	62.8
25/01/2017 13:40	72.8	66.7	63.2	62.6	62.3	59.5	53.6	46.1	87.0	79.8	78.6	70.4	71.1	71.8	66.8	65.5
25/01/2017 13:50	73.3	67.0	63.9	63.2	62.8	60.2	54.5	47.7	88.5	82.5	80.8	79.4	79.2	73.1	67.6	68.7
25/01/2017 14:00	74.3	67.6	64.5	62.9	62.3	59.7	53.7	46.4	91.5	82.7	78.2	77.0	76.4	76.1	64.9	65.5
25/01/2017 14:10	73.0	66.0	63.4	63.3	63.6	60.9	55.4	48.2	83.5	76.4	74.6	75.7	73.7	74.0	69.1	67.5
25/01/2017 14:20	73.3	65.7	63.5	62.4	62.3	59.8	54.4	50.9	87.2	80.5	73.6	71.4	71.9	70.8	71.9	76.9
25/01/2017 14:30	72.8	66.1	63.1	62.0	61.6	59.4	53.7	47.8	88.4	81.2	80.2	72.2	73.0	71.3	72.5	68.2
25/01/2017 14:40	72.3	65.7	62.9	62.8	63.8	62.1	56.5	46.5	86.5	77.6	74.4	78.2	80.7	79.0	76.3	69.3
25/01/2017 14:50	73.3	66.2	62.9	62.6	62.6	59.8	54.2	47.4	85.9	80.3	77.4	77.2	74.1	73.4	69.0	66.1
25/01/2017 15:00	73.3	66.8	62.7	62.0	61.7	59.0	53.7	47.9	89.3	79.9	74.8	70.6	69.1	70.7	77.4	69.1
25/01/2017 15:10	73.8	65.8	64.0	63.5	63.3	60.4	54.7	47.5	92.5	76.8	79.6	73.3	73.0	72.5	68.1	70.2
25/01/2017 15:20	72.6	66.5	62.9	62.2	62.0	59.2	54.3	52.8	84.0	78.9	74.4	69.6	71.5	67.0	73.5	77.5
25/01/2017 15:30	73.2	67.2	63.1	62.1	61.7	59.2	54.3	46.6	87.6	79.3	74.1	73.0	69.1	68.0	71.0	60.5
25/01/2017 15:40	73.6	67.9	65.5	63.5	63.5	60.6	54.6	47.6	89.9	83.0	81.7	78.8	75.8	76.1	69.9	66.2
25/01/2017 15:50	72.3	66.1	63.4	62.4	62.8	59.9	54.1	47.6	85.0	79.4	73.9	70.0	72.8	70.2	68.6	68.7
25/01/2017 16:00	72.8	67.2	64.6	63.4	63.5	60.3	54.5	47.8	84.7	87.3	83.1	77.4	75.4	73.1	73.5	72.3
25/01/2017 16:10	73.6	66.3	63.7	63.8	64.3	60.8	54.1	46.7	87.3	75.8	76.6	75.9	75.3	72.7	67.3	64.3
25/01/2017 16:20	72.1	67.8	65.5	63.8	63.5	59.9	53.0	44.6	84.7	86.1	85.7	78.6	72.2	72.4	71.1	64.9
25/01/2017 16:30	74.0	69.3	65.5	64.0	65.6	64.0	58.2	50.4	88.0	84.2	79.8	75.8	86.8	89.7	81.5	76.7
25/01/2017 16:40	73.3	66.6	65.5	63.6	64.1	61.2	55.2	47.3	89.4	76.8	77.0	74.0	72.2	73.6	69.9	62.6
25/01/2017 16:50	72.0	67.9	63.7	63.1	63.3	59.9	53.1	48.9	86.0	84.3	77.6	74.1	71.6	73.4	70.9	76.3
25/01/2017 17:00	73.4	67.8	65.9	64.2	64.5	61.2	54.9	46.8	84.2	86.8	85.2	77.2	76.3	72.5	71.6	64.0
25/01/2017 17:10	72.1	65.8	62.9	63.4	63.8	60.1	53.0	45.6	84.5	78.1	72.7	82.5	82.4	73.8	67.8	66.6
25/01/2017 17:20	73.4	69.2	64.2	62.6	62.1	59.3	53.5	46.6	87.4	93.7	83.5	78.3	71.4	72.9	73.1	70.2
25/01/2017 17:30	72.4	67.8	64.2	63.0	63.2	60.3	53.5	44.7	87.5	82.2	75.8	75.3	73.5	72.0	68.6	60.1
25/01/2017 17:40	72.0	69.2	67.5	64.5	63.6	60.5	53.9	46.1	91.7	88.4	89.7	82.0	75.1	73.1	70.5	67.0
25/01/2017 17:50	71.4	67.4	63.6	63.2	63.6	60.6	54.2	52.5	84.2	87.0	78.9	72.7	72.3	70.4	76.3	70.9
25/01/2017 18:00	71.7	66.2	66.1	63.8	63.3	60.1	53.6	48.4	83.5	80.5	86.4	77.5	74.0	70.8	70.9	74.0
25/01/2017 18:10	74.7	70.1	67.4	63.0	61.9	59.5	56.4	59.0	87.8	85.1	89.8	73.0	70.6	68.4	85.8	87.3
25/01/2017 18:20	73.5	67.5	64.0	63.7	63.8	60.9	57.4	52.1	84.2	81.4	79.7	78.1	78.0	69.9	74.4	82.0
25/01/2017 18:30	74.0	67.8	64.6	63.3	63.5	60.0	55.8	49.7	84.8	80.1	79.0	78.7	83.3	78.7	78.7	74.9
25/01/2017 18:40	72.4	69.6	65.7	64.2	63.9	60.4	56.0	47.3	89.1	90.8	84.7	82.4	79.4	73.2	76.9	69.6
25/01/2017 18:50	71.4	66.0	63.6	63.1	63.8	60.2	55.1	45.8	85.9	78.7	74.7	72.5	73.5	76.7	75.8	65.1
25/01/2017 19:00	70.7	70.0	66.4	65.1	64.4	60.8	53.6	44.9	81.9	91.6	87.1	86.8	80.7	78.2	67.2	66.9
25/01/2017 19:10	72.9	68.5	64.0	63.2	63.7	60.1	52.9	46.3	87.0	90.7	77.1	73.1	74.2	71.4	65.1	66.6
25/01/2017 19:20	70.6	66.6	65.2	65.7	65.4	63.0	56.4	47.0	83.4	84.3	91.5	93.2	88.2	88.8	84.6	74.3
25/01/2017 19:30	71.6	68.2	64.0	63.8	64.3	60.8	53.3	44.6	88.8	87.6	80.2	76.7	73.5	71.3	63.7	63.1
25/01/2017 19:40	72.4	68.2	64.8	63.6	64.1	61.2	54.5	47.0	84.1	86.6	79.7	74.5	72.1	71.7	70.4	66.0
25/01/2017 19:50	71.8	65.1	62.7	62.7	63.6	60.2	53.4	46.7	86.0	78.7	75.7	74.3	71.8	71.6	66.6	70.3
25/01/2017 20:00	71.6	65.3	63.3	63.7	65.0	61.2	54.0	45.5	85.7	79.6	75.2	75.1	77.4	74.0	74.8	64.0
25/01/2017 20:10	72.4	65.1	63.2	62.7	64.7	61.1	52.5	43.4	87.4	77.1	81.3	70.3	71.9	69.7	65.7	59.1
25/01/2017 20:20	72.0	64.8	63.8	63.5	65.3	61.9	55.1	47.5	91.0	77.3	77.8	72.7	73.8	72.3	72.3	68.3
25/01/2017 20:30	71.2	65.5	64.3	63.4	64.6	60.9	53.3	50.9	86.6	83.1	81.9	77.0	77.2	74.1	70.0	73.1
25/01/2017 20:40	71.8	66.3	64.0	63.6	66.6	65.1	57.2	46.8	86.2	82.8	79.3	75.9	83.7	86.8	79.7	70.5
25/01/2017 20:50	71.3	64.5	62.9	63.4	64.4	60.7	53.2	54.2	84.4	77.3	75.5	76.2	73.8	72.4	71.7	73.3
25/01/2017 21:00	70.6	65.0	63.1	63.6	64.8	61.0	53.3	44.4	86.4	83.5	78.3	76.3	78.0	71.7	70.5	64.8
25/01/2017 21:10	72.0	64.4	63.2	64.8	65.8	61.8	53.6	44.9	89.3	78.3	78.1	80.0	81.2	76.5	69.5	64.2
25/01/2017 21:20	71.5	64.8	62.6	63.5	65.1	61.6	53.3	44.9	86.2	75.7	74.5	75.8	78.4	76.3	66.6	64.4
25/01/2017 21:30	73.5	66.3	64.0	70.6	68.8	63.6	56.1	46.3	88.4	83.9	73.7	90.5	84.1	76.8	72.4	60.3
25/01/2017 21:40	71.1	65.1	63.0	63.5	65.0	61.1	52.5	44.8	89.9	79.3	74.1	73.2	74.1	73.0	66.3	61.7
25/01/2017 21:50	73.3	65.6	63.6	63.5	65.2	61.4	52.8	45.1	92.8	77.3	74.6	71.0	72.7	70.1	67.2	66.2
25/01/2017 22:00	72.2	65.1	63.7	63.9	65.6	61.8	53.3	44.2	84.9	80.6	77.0	76.7	78.1	77.4	71.6	62.4
25/01/2017 22:10	72.5	66.0	65.3	64.9	66.1	62.6	54.6	46.4	89.1	79.9	82.7	75.9	77.7	80.2	69.5	66.3
25/01/2017 22:20	71.0	66.1	63.3	63.9	66.0	62.1	54.2	44.3	84.3	79.0	73.4	72.9	74.5	71.4	76.3	64.4
25/01/2017 22:30	73.6	65.7	63.7	64.2	66.0	62.1	53.7	45.2	94.5	78.5	73.5	74.6	74.7	72.6	70.3	65.2
25/01/2017 22:40	71.5	65.3	63.9	64.5	66.9	62.7	54.4	47.3	85.2	76.2	78.9	77.2	81.1	76.1	71.4	68.7
25/01/2017 22:50	73.2	65.4	64.0	64.4	68.5	64.9	58.3	49.1	93.5	79.0	79.8	84.5	92.1	89.1	84.5	76.2
25/01/2017 23:00	71.8	65.8	63.9	63.5	65.4	61.2	52.0	45.6	84.2	84.7	79.5	81.3	76.7	73.8	70.4	67.8
25/01/2017 23:10	73.5	65.7	63.5	63.7	65.6	62.2	53.8	45.3	88.0	78.5	75.4	74.9	75.5	76.5	73.3	69.4
25/01/2017 23:20	71.4	63.9	62.6	63.5	65.9	61.7	52.9	44.1	83.9	75.2	70.8	73.6	77.1	70.7	75.1	67.9
25/01/2017 23:30	71.6	65.8	64.3	64.3	66.0	62.3	54.5	46.2	85.0	84.7	81.7	75.9	74.6	75.8	73.3	64.6
25/01/2017 23:40	72.8	65.6	64.5	64.2	66.0	62.3	53.7	44.9	87.8	76.4	83.7	75.1	73.9	72.2	69.2	66.6
25/01/2017 23:50	70.6	63.5	62.6	63.1	65.5	61.3	52.7	45.4	84.2	75.4	76.3	73.0	74.4	71.0	73.0	70.1
26/01/2017 00:00	70.3	64.6	62.8	62.2	64.4	60.6	51.1	41.6	86.6	83.3	80.1	76.3	73.6	70.9	62.7	57.9
26/01/2017 00:10	71.7	64.2	63.3	64.1	66.4	62.4	53.3	43.8	91.7	74.8	78.9	76.4	77.5	74.0	69.5	64.4
26/01/2017 00:20	70.8	64.4	63.1	63.6	65.9	61.7	52.9	44.4	89.1	80.1	79.3	78.0	75.3	77.3	73.1	66.5
26/01/2017 00:30	70.6	65.0	63.0	63.1	65.0	61.2	53.9	46.9	87.3	81.7	76.5	77.9	77.6	76.9	76.3	72.0

Date & Time	L_{eq}								L_{Fmax}							
	Frequency (Hz)								Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
26/01/2017 00:40	70.0	64.8	63.2	63.1	64.6	60.7	52.1	45.7	84.3	76.7	76.7	77.3	75.6	74.4	67.8	73.8
26/01/2017 00:50	70.3	64.0	63.4	64.0	65.9	61.9	53.2	43.4	85.3	78.1	77.0	75.9	74.0	75.1	68.9	62.2
26/01/2017 01:00	65.8	61.0	59.4	60.3	62.9	58.4	48.2	37.7	81.3	74.1	70.0	74.1	72.7	68.9	62.2	55.9
26/01/2017 01:10	69.8	63.0	61.9	62.5	64.7	60.4	52.3	43.0	88.5	78.5	74.9	78.1	75.0	72.0	74.0	64.6
26/01/2017 01:20	67.7	62.6	59.8	61.1	63.8	59.6	50.0	40.6	83.8	81.7	70.8	75.9	75.4	70.1	66.2	61.2
26/01/2017 01:30	69.4	65.3	63.3	61.6	63.3	59.0	49.4	39.4	84.8	86.1	82.3	76.7	73.7	70.1	64.0	57.8
26/01/2017 01:40	67.1	60.5	60.1	60.8	63.0	58.9	49.5	40.7	83.9	77.4	72.4	74.4	73.6	73.8	67.6	62.1
26/01/2017 01:50	67.9	61.9	60.1	61.3	64.3	60.5	50.5	41.0	83.8	77.3	71.8	74.7	79.8	79.0	68.3	59.0
26/01/2017 02:00	69.8	63.6	61.1	61.5	63.8	59.4	50.2	53.0	84.8	81.2	75.3	75.9	74.5	70.3	66.1	82.8
26/01/2017 02:10	71.1	62.2	60.8	61.1	63.2	59.2	49.8	40.2	87.9	76.0	76.5	75.8	76.6	73.5	67.6	62.1
26/01/2017 02:20	67.9	61.9	59.2	59.4	61.3	57.4	48.0	38.6	87.7	77.1	76.5	75.5	74.1	71.9	65.7	59.9
26/01/2017 02:30	66.8	60.5	59.0	59.7	62.3	58.0	47.7	38.7	87.7	75.4	71.0	74.2	73.4	70.2	65.8	60.9
26/01/2017 02:40	66.9	60.9	60.3	60.2	63.0	58.8	48.5	38.3	83.7	77.8	79.5	76.0	76.0	72.3	65.3	58.3
26/01/2017 02:50	68.8	62.3	61.0	61.0	62.9	58.9	49.5	40.4	86.8	76.6	77.7	74.9	74.6	72.7	66.6	61.5
26/01/2017 03:00	66.0	61.5	60.0	60.2	63.1	59.2	49.3	39.3	83.1	79.1	72.9	71.9	74.3	72.8	65.1	56.4
26/01/2017 03:10	68.8	62.7	62.1	60.8	62.8	59.1	50.5	41.5	87.6	76.1	82.1	75.9	74.7	74.3	67.4	60.1
26/01/2017 03:20	66.5	60.9	58.7	59.1	61.6	57.0	46.7	37.3	83.1	75.8	73.6	75.7	73.8	68.8	63.2	56.9
26/01/2017 03:30	67.8	61.6	59.8	60.8	62.9	59.0	49.8	40.7	84.3	75.1	74.9	72.9	75.0	74.9	67.7	62.6
26/01/2017 03:40	65.4	60.6	60.0	60.8	63.7	60.0	54.4	51.0	80.4	75.9	71.6	74.1	78.1	80.2	83.8	82.0
26/01/2017 03:50	69.1	62.5	59.7	60.5	63.2	59.1	50.2	40.1	91.7	77.1	74.2	73.3	75.8	73.5	69.0	59.7
26/01/2017 04:00	68.3	62.2	60.4	61.9	63.6	59.2	50.2	41.0	83.9	74.2	74.9	80.6	79.2	73.1	66.1	60.2
26/01/2017 04:10	68.7	62.0	60.8	61.8	64.1	59.9	50.5	41.5	87.7	74.4	74.6	79.6	78.3	74.7	67.7	60.3
26/01/2017 04:20	70.0	64.3	61.2	60.6	62.9	59.0	49.7	40.6	89.6	84.0	78.3	73.4	75.5	72.7	65.1	57.7
26/01/2017 04:30	68.0	62.5	60.8	60.4	62.8	58.8	49.0	40.1	86.1	82.1	77.8	75.2	80.4	77.6	67.4	62.0
26/01/2017 04:40	69.8	62.7	61.5	62.8	64.0	60.9	53.0	45.0	89.4	77.4	76.7	79.3	75.5	79.0	71.3	64.3
26/01/2017 04:50	69.1	62.6	62.0	62.6	64.3	60.1	51.0	42.2	87.7	76.0	76.1	74.5	76.5	72.6	66.7	60.4
26/01/2017 05:00	70.3	64.5	63.3	63.8	64.9	61.2	52.7	44.5	89.3	78.3	78.4	80.3	78.6	77.0	71.2	67.1
26/01/2017 05:10	72.1	65.4	64.8	63.3	64.4	61.0	53.4	43.9	91.5	83.2	87.3	77.9	76.3	77.6	77.4	65.7
26/01/2017 05:20	70.1	64.1	62.7	62.7	64.3	61.3	54.5	45.6	91.7	77.8	75.2	74.6	76.1	82.5	78.9	68.4
26/01/2017 05:30	70.3	63.8	62.9	63.2	64.7	60.6	52.7	44.5	85.7	75.6	76.9	74.9	75.8	77.0	72.7	64.4
26/01/2017 05:40	70.9	64.3	63.0	63.3	65.2	61.4	52.9	43.9	86.0	77.0	77.1	78.3	76.6	72.9	66.1	60.0
26/01/2017 05:50	71.4	64.1	62.7	63.6	66.0	62.2	55.6	49.0	88.4	76.1	74.6	80.0	78.2	77.4	75.3	71.5
26/01/2017 06:00	70.5	64.1	63.3	63.3	64.8	61.8	54.8	46.6	84.6	78.4	78.1	78.9	78.7	79.4	80.1	72.7
26/01/2017 06:10	73.0	66.3	64.8	64.3	66.7	62.5	53.9	45.7	93.0	82.5	81.1	80.2	77.3	72.8	69.4	65.9
26/01/2017 06:20	72.1	66.0	64.9	64.9	67.1	64.4	56.3	46.7	85.6	80.6	81.1	76.0	75.7	73.5	69.0	64.9
26/01/2017 06:30	72.5	67.6	65.1	64.4	66.4	63.6	55.8	46.8	86.9	87.1	78.8	75.1	78.5	75.7	68.8	66.0
26/01/2017 06:40	72.0	66.1	64.3	64.3	66.0	62.0	53.7	44.7	87.9	78.9	81.7	78.9	75.6	75.6	75.6	66.0
26/01/2017 06:50	72.1	66.6	64.8	64.6	66.2	62.6	54.7	45.2	85.8	81.4	76.6	78.3	78.5	77.2	71.6	59.1
26/01/2017 07:00	72.9	66.7	64.5	64.6	66.1	63.2	58.7	52.0	87.5	81.5	77.5	81.0	81.9	80.7	81.0	72.6
26/01/2017 07:10	73.4	66.5	63.7	64.0	64.5	61.3	54.1	45.8	89.0	77.5	74.9	77.8	74.9	73.7	68.5	61.8
26/01/2017 07:20	73.1	66.9	65.1	64.2	64.3	61.1	55.3	47.9	88.1	84.2	82.4	81.1	80.1	75.0	76.5	70.3
26/01/2017 07:30	72.1	69.4	67.3	67.3	63.3	60.2	55.3	51.4	85.7	88.3	89.2	89.9	77.4	72.1	74.6	74.7
26/01/2017 07:40	73.6	68.3	65.2	64.2	64.5	62.0	56.1	49.3	86.0	82.6	78.2	75.9	74.4	74.7	72.2	72.6
26/01/2017 07:50	74.0	67.7	64.9	64.1	64.1	61.4	55.5	49.3	88.7	82.1	78.0	79.2	78.5	74.0	69.6	73.3
26/01/2017 08:00	73.2	66.9	64.0	62.9	63.2	61.0	55.0	49.1	86.6	77.2	75.2	71.6	73.4	73.3	68.6	72.5
26/01/2017 08:10	72.7	67.4	64.2	64.2	71.0	68.5	65.7	56.5	84.5	78.2	77.1	84.9	95.3	91.9	90.1	84.6
26/01/2017 08:20	73.1	67.2	64.6	63.4	63.7	62.1	56.2	48.7	85.4	83.6	81.5	74.3	79.4	76.4	75.2	69.3
26/01/2017 08:30	72.7	67.9	64.0	63.1	62.9	60.6	54.7	47.2	86.1	86.5	76.4	82.8	77.7	75.6	75.6	68.4
26/01/2017 08:40	72.3	69.8	65.8	63.5	63.2	60.7	54.4	46.2	83.5	90.9	85.6	78.7	75.4	74.6	73.6	67.1
26/01/2017 08:50	73.0	68.5	65.2	64.2	63.3	61.3	55.5	48.5	85.8	86.9	78.5	87.7	78.9	75.7	70.8	70.0
26/01/2017 09:00	72.1	65.9	63.0	63.1	63.4	61.1	54.8	46.4	86.2	80.4	73.2	76.9	75.0	74.2	73.0	71.3
26/01/2017 09:10	72.8	66.7	63.4	62.0	62.0	59.8	53.6	47.0	88.4	75.4	76.9	74.1	82.3	73.8	68.9	72.5
26/01/2017 09:20	74.8	67.3	63.3	62.5	62.4	59.4	53.2	45.5	94.5	84.7	79.3	77.1	75.3	74.4	71.0	65.0
26/01/2017 09:30	73.7	67.4	63.3	62.5	62.4	59.4	53.5	47.5	86.7	83.4	75.0	71.7	72.8	72.0	67.0	73.3
26/01/2017 09:40	73.8	66.8	63.5	62.2	61.8	58.9	52.9	45.9	86.8	78.3	74.8	78.2	86.1	78.5	71.4	73.1
26/01/2017 09:50	72.6	67.1	65.3	63.4	62.8	60.0	53.4	47.1	85.4	79.2	83.7	77.1	75.7	74.2	66.6	69.8
26/01/2017 10:00	72.2	66.7	64.2	62.2	61.7	59.5	53.8	46.1	86.7	78.9	83.1	75.6	74.8	74.8	69.5	65.2
26/01/2017 10:10	72.9	66.3	68.6	63.1	63.5	60.9	54.6	46.6	86.7	77.9	82.5	74.4	75.9	72.2	74.7	68.3
26/01/2017 10:20	74.2	68.6	66.0	63.7	63.1	61.3	55.0	46.5	85.4	87.4	89.1	88.7	83.1	82.8	78.7	71.8
26/01/2017 10:30	72.5	66.9	64.6	63.6	72.5	71.6	55.8	49.9	82.0	75.5	82.1	83.5	93.1	93.1	77.8	76.2
26/01/2017 10:40	72.6	66.4	63.1	62.8	62.7	60.4	57.0	45.8	85.4	75.1	72.6	77.3	73.9	77.0	83.4	63.9
26/01/2017 10:50	73.5	67.2	64.0	63.4	63.5	61.0	54.7	46.8	85.6	81.9	83.5	81.1	81.2	77.1	72.0	68.1
26/01/2017 11:00	74.2	66.8	62.9	62.3	62.1	59.8	53.9	47.5	85.2	76.2	74.0	71.3	69.8	71.5	70.4	75.6
26/01/2017 11:10	73.7	66.4	63.5	63.1	63.0	60.3	53.5	45.5	89.8	76.8	73.8	74.5	73.9	72.3	64.7	61.5
26/01/2017 11:20	74.2	66.6	64.0	63.2	68.2	67.0	61.3	53.0	92.0	76.1	78.9	80.3	90.8	92.7	85.3	78.3
26/01/2017 11:30	72.0	67.0	64.5	62.5	62.2	59.4	53.7	47.1	87.0	81.2	81.0	76.0	75.3	73.8	68.4	68.3
26/01/2017 11:40	72.6	67.3	64.0	64.4	63.0	60.6	54.3	46.9	84.2	80.9	77.0	80.8	74.5	78.3	72.7	67.3
26/01/2017 11:50	72.8	67.1	63.5	63.7	63.8	61.0	55.1	50.5	87.2	78.2	75.1	76.3	77.7	78.7	69.1	78.4
26/01/2017 12:00	72.5	66.7	62.9	62.3	62.7	62.8	56.6	49.8	85.8	81.9	82.2	81.6	90.7	95.2	87.7	82.4
26/01/2017 12:10	75.3	70.4	66.2	63.9	63.3	60.6	55.5	46.8	91.5	92.4	86.4	79.9	78.4	76.7	75.0	64.7
26/01/2017 12:20	73.3	70.9	66.8	63.6	62.6	59.7	53.6	47.5	84.5	88.5	84.1	79.1	75.2	73.5	70.1	66.6
26/01/2017 12:30	73.3	69.9	67.4	66.2	70.9	69.3	65.8	57.3	86.4	90.0	88.2	86.9	96.1	93.6	92.3	85.9
26/01/2017 12:40	73.7	67.5	64.7	63.8	63.6	61.5	55.5	48.4	89.3	80.6	78.1	76.6	76.4	74.8	70.9	72.1
26/01/2017 12:50	73.0	66.4	62.9	63.2	62.3	59.2	54.0	48.5	85.4	77.4	79.0	79.8	78.7	76.2	75.6	76.9

Table A4: Frequency measurement data at the rear measurement position

Date & Time	L_{eq}								L_{Fmax}							
	Frequency (Hz)								Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
25/01/2017 17:10	72.3	65.9	61.8	58.9	55.7	50.3	43.4	38.7	79.0	75.1	71.7	70.8	65.8	59.9	54.6	56.2
25/01/2017 17:20	72.5	66.5	61.3	58.6	55.4	50.0	43.4	38.6	79.0	78.0	68.1	62.8	58.6	55.3	51.5	47.4
25/01/2017 17:30	71.7	65.5	61.1	58.6	55.5	50.1	43.4	38.3	82.0	74.6	65.9	60.9	58.2	59.6	52.1	45.4
25/01/2017 17:40	70.4	66.8	60.5	58.1	54.5	49.1	42.3	36.7	84.9	75.3	75.3	70.7	63.9	64.5	63.6	61.2
25/01/2017 17:50	69.4	63.1	59.0	57.2	53.8	48.3	41.6	35.3	77.1	75.8	66.2	61.5	58.3	56.1	61.5	44.9
25/01/2017 18:00	68.4	66.0	58.7	56.3	52.8	47.6	40.7	34.0	76.3	71.4	70.4	62.8	57.6	58.5	59.8	56.3
25/01/2017 18:10	70.3	64.4	60.6	57.1	53.8	48.7	42.1	39.4	77.7	74.5	72.6	60.8	60.3	57.6	56.1	60.3
25/01/2017 18:20	72.3	66.2	61.6	58.3	55.3	49.8	44.7	37.8	79.0	71.2	67.6	65.3	62.6	56.3	61.4	52.5
25/01/2017 18:30	71.1	65.1	60.0	57.2	54.1	48.3	41.8	36.7	79.9	71.6	69.0	63.7	67.3	62.0	52.4	44.3
25/01/2017 18:40	69.0	65.9	59.5	57.1	53.7	48.1	41.2	34.5	76.7	79.9	71.7	67.4	62.6	54.5	50.5	50.6
25/01/2017 18:50	67.8	65.4	58.5	56.5	53.1	47.6	41.2	33.5	77.7	70.8	64.0	62.1	56.8	57.5	61.3	49.2
25/01/2017 19:00	66.5	62.5	57.7	54.7	51.2	46.1	39.0	36.9	75.6	79.8	75.4	72.4	67.0	63.5	51.5	56.1
25/01/2017 19:10	71.1	66.7	60.2	56.8	53.5	48.0	40.6	35.9	79.3	78.5	65.4	60.7	58.3	55.6	46.0	39.5
25/01/2017 19:20	65.4	61.6	56.5	54.2	51.1	47.2	39.2	27.9	75.3	72.4	76.3	77.1	71.6	71.9	64.9	51.5
25/01/2017 19:30	63.6	62.9	55.0	52.8	50.0	45.5	38.2	30.0	76.8	78.6	65.1	60.4	57.2	55.5	53.8	48.1
25/01/2017 19:40	64.6	60.9	55.0	52.5	49.6	45.2	37.0	26.8	75.4	76.0	63.8	57.0	57.6	52.0	47.4	44.4
25/01/2017 19:50	64.0	61.7	54.5	52.4	49.4	44.7	36.8	26.4	74.8	68.3	62.1	57.7	54.9	59.0	52.7	44.5
25/01/2017 20:00	64.0	63.3	55.3	53.0	50.1	45.2	37.4	25.7	76.2	72.1	67.0	63.0	57.4	58.0	60.3	42.5
25/01/2017 20:10	64.5	64.2	54.2	52.1	49.7	45.0	36.1	25.7	77.3	70.0	61.7	56.7	59.0	62.6	53.0	48.1
25/01/2017 20:20	64.3	63.6	55.1	53.0	50.7	45.8	37.7	27.2	80.4	69.2	61.0	57.4	56.6	52.0	52.1	45.8
25/01/2017 20:30	63.8	63.6	55.2	53.0	50.2	45.5	37.1	27.4	77.3	70.2	66.6	63.6	63.2	54.5	55.6	42.6
25/01/2017 20:40	64.0	60.2	54.7	52.6	51.8	50.2	42.1	27.4	77.1	73.3	65.0	59.5	69.2	71.0	64.5	47.0
25/01/2017 20:50	64.0	63.8	54.4	52.5	49.8	44.9	36.7	29.5	77.0	69.1	61.1	58.0	55.4	51.4	51.7	49.1
25/01/2017 21:00	62.9	59.5	54.2	52.4	50.0	45.0	36.3	24.8	79.0	70.1	61.5	58.2	59.1	53.6	51.2	39.7
25/01/2017 21:10	64.2	64.5	54.3	52.8	50.7	45.6	36.8	25.7	80.7	70.3	62.8	64.5	65.0	60.8	54.0	47.8
25/01/2017 21:20	63.4	61.2	54.2	52.5	50.5	45.9	37.1	25.5	76.9	69.6	60.2	64.5	63.7	61.2	51.8	41.6
25/01/2017 21:30	65.3	63.4	54.9	56.6	53.7	47.5	39.0	26.2	80.2	71.3	61.2	73.5	69.3	60.8	57.0	40.8
25/01/2017 21:40	63.2	59.3	54.3	52.3	50.1	44.9	36.2	27.0	79.2	71.1	61.6	58.2	59.2	51.6	45.5	43.2
25/01/2017 21:50	64.8	63.0	54.8	52.2	50.1	45.2	36.2	25.8	82.9	70.0	62.5	57.7	55.4	51.4	47.6	42.2
25/01/2017 22:00	63.6	59.2	54.2	52.4	50.3	45.4	36.2	24.8	75.8	70.7	62.7	60.5	59.0	56.2	49.3	40.0
25/01/2017 22:10	64.6	62.7	55.5	53.1	50.9	46.2	37.5	26.2	81.0	68.7	66.8	61.6	57.9	57.1	49.3	43.1
25/01/2017 22:20	62.6	60.2	54.4	52.6	50.7	45.6	36.8	24.4	74.5	71.8	61.0	57.1	57.6	51.4	57.5	39.1
25/01/2017 22:30	64.9	63.7	54.8	52.9	50.8	45.8	36.7	25.1	80.5	70.0	66.5	59.4	56.2	53.0	49.3	38.5
25/01/2017 22:40	63.4	58.7	54.6	52.9	51.3	46.2	36.9	26.1	77.6	67.8	63.7	62.0	64.4	58.6	50.0	43.3
25/01/2017 22:50	64.9	63.1	54.8	53.0	52.8	48.2	40.6	27.4	83.0	70.7	64.1	62.9	71.7	68.2	62.9	49.3
25/01/2017 23:00	63.7	59.4	54.4	52.5	50.7	45.5	35.7	25.7	77.3	72.4	67.5	59.9	57.6	52.2	45.2	46.4
25/01/2017 23:10	64.9	63.3	55.0	52.8	50.8	46.2	36.9	25.4	78.7	67.9	62.3	58.6	56.7	54.2	49.1	40.3
25/01/2017 23:20	63.1	57.7	53.7	51.8	50.3	45.2	35.3	23.9	75.1	64.3	59.6	58.1	59.8	52.9	51.4	44.3
25/01/2017 23:30	63.6	62.0	54.7	52.7	50.7	45.9	36.9	25.7	75.5	73.1	66.3	58.7	56.8	56.1	50.3	37.8
25/01/2017 23:40	64.5	58.8	54.3	52.6	50.6	45.8	36.7	24.8	77.8	67.5	63.6	59.2	56.8	52.3	53.0	40.9
25/01/2017 23:50	62.8	62.7	54.1	52.2	50.4	45.2	36.1	25.4	75.5	68.6	60.0	56.4	56.5	56.7	54.1	44.4
26/01/2017 00:00	62.7	58.4	54.0	51.7	49.7	44.7	35.5	25.5	78.3	69.2	62.9	58.2	57.5	52.9	45.6	44.0
26/01/2017 00:10	64.0	63.1	54.1	52.1	50.7	45.6	36.3	24.9	79.5	69.3	61.3	58.8	59.5	54.4	49.0	43.7
26/01/2017 00:20	63.0	63.9	54.9	53.1	51.1	45.8	36.8	25.8	78.3	71.5	62.5	62.8	56.7	58.0	53.5	42.9
26/01/2017 00:30	62.8	61.1	54.2	52.4	50.2	45.2	37.2	27.3	77.3	71.9	61.7	64.1	63.5	58.6	56.9	50.6
26/01/2017 00:40	62.1	59.6	54.0	52.1	49.7	44.7	36.0	25.0	74.7	69.8	63.1	65.0	60.4	57.7	49.5	41.4
26/01/2017 00:50	63.2	65.6	54.5	52.6	50.7	45.7	36.8	25.1	75.4	70.2	62.5	59.0	58.3	56.8	50.0	43.2
26/01/2017 01:00	59.2	58.1	52.6	51.1	48.7	43.1	33.6	23.0	71.1	67.8	58.7	56.3	55.0	51.8	46.0	40.2
26/01/2017 01:10	62.1	64.5	54.0	52.1	49.9	44.7	35.9	25.2	76.4	69.7	61.2	60.0	57.2	55.1	53.3	41.8
26/01/2017 01:20	60.3	57.5	52.8	51.3	49.2	43.8	34.5	23.5	72.6	68.5	58.0	58.8	57.0	50.7	51.2	39.8
26/01/2017 01:30	61.7	63.1	54.7	52.1	49.2	43.8	34.9	24.1	75.5	78.0	68.1	61.2	57.3	50.8	43.1	37.4
26/01/2017 01:40	59.5	57.7	52.8	51.3	48.7	43.0	33.6	23.1	73.4	68.1	58.4	57.2	56.7	52.2	46.1	38.3
26/01/2017 01:50	61.3	64.6	53.5	51.8	49.6	44.3	34.5	24.0	76.3	69.5	59.9	57.3	61.1	58.3	46.5	38.7
26/01/2017 02:00	61.6	58.4	53.3	51.7	49.2	43.5	34.1	27.6	76.7	70.5	61.6	59.2	56.6	51.9	50.1	50.9
26/01/2017 02:10	63.0	64.4	53.9	51.9	49.4	44.1	34.8	24.4	77.3	69.5	62.5	60.8	60.2	55.5	49.2	41.7
26/01/2017 02:20	60.0	56.8	52.5	50.5	47.5	42.0	33.3	24.2	79.0	66.8	64.1	61.6	56.7	53.8	49.5	43.1
26/01/2017 02:30	59.8	61.4	52.8	51.1	48.4	42.6	33.2	23.5	74.7	67.9	59.1	56.1	55.4	50.1	42.4	36.9
26/01/2017 02:40	60.1	63.1	53.4	51.5	48.9	43.4	34.1	23.6	72.6	67.8	61.9	57.6	58.3	51.9	43.6	37.3
26/01/2017 02:50	60.6	57.6	53.0	51.1	48.5	43.1	33.8	23.3	75.4	64.0	64.3	59.3	56.2	52.4	44.8	39.2
26/01/2017 03:00	60.2	65.0	53.3	51.5	49.0	43.6	34.3	23.6	74.1	74.6	59.9	56.8	55.8	51.7	44.2	36.7
26/01/2017 03:10	61.1	58.6	53.5	51.3	48.4	43.1	34.0	23.1	77.8	67.7	64.7	58.4	56.7	53.8	44.7	36.8
26/01/2017 03:20	60.1	59.7	52.5	50.7	47.8	42.0	32.8	22.7	74.5	69.3	60.0	57.5	56.7	50.7	42.4	38.3
26/01/2017 03:30	61.3	64.9	53.1	51.3	48.7	43.2	34.1	24.0	76.6	69.6	60.1	56.8	56.7	53.8	49.0	39.0
26/01/2017 03:40	60.0	58.3	52.7	51.1	49.0	43.7	35.7	26.5	71.2	65.4	60.4	60.7	60.1	57.5	58.0	52.9
26/01/2017 03:50	63.2	67.0	53.4	51.4	48.9	43.2	34.3	23.9	80.6	70.9	60.3	57.5	58.2	53.3	47.5	36.8
26/01/2017 04:00	61.9	58.4	52.8	51.4	48.9	43.2	34.1	23.0	72.7	64.3	59.7	62.2	60.6	53.8	47.1	37.2
26/01/2017 04:10	60.5	57.9	52.2	51.0	48.8	43.3	33.8	22.8	77.2	65.3	60.7	62.5	60.9	53.0	50.2	39.2
26/01/2017 04:20	62.9	67.3	54.6	52.4	49.6	44.2	35.7	26.2	79.5	72.5	62.3	58.5	55.8	52.7	46.1	43.2
26/01/2017 04:30	60.8	61.5	53.1	50.7	48.4	43.1	35.0	27.7	76.7	69.4	65.7	58.7	61.9	57.1	51.6	44.8
26/01/2017 04:40	60.9	57.5	53.0	51.6	49.1	44.2	35.9	25.9	79.0	67.7	62.0	60.7	56.9	57.6	49.5	40.3
26/01/2017 04:50	61.9	64.3	53.9	52.1	49.7	44.2	35.5	25.9	78.6	69.6	61.4	58.8	58.5	52.4	45.8	39.9
26/01/2017 05:00	62.1	58.6	53.9	52.2	49.8	44.6	35.5	25.2	74.7	67.0	63.8	62.6	59.5	61.2	48.5	40.5
26/01/2017 05:10	63.7	62.7	55.0	52.5	49.8	45.1	37.3	26.4	82.5	72.5	70.7	64.5	57.4	63.2	58.7	43.7
26/01/2017 05:20	62.3	58.1	53.7	52.1	49.6	45.0	37.5	26.1	81.7	69.1	62.7	59.3	58.3	65.8	61.1	47.6
26/01/2017 05:30	62.4	61.3	54.0	52.3	49.9	44.5	36.3	26.5	77.4	68.0	62.2	59.0	56.5	58.7	52.2	41.0
26/01/2017 05:40	66.4	65.2	59.0	56.1	53.5	48.2	40.9	36.6	78.1	72.9	64.9	62.0	59.2	53.9	49.4	49.1

Date & Time	L_{eq}								L_{Fmax}							
	Frequency (Hz)								Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
26/01/2017 05:50	66.7	64.1	58.9	56.2	53.9	48.9	42.1	37.3	79.6	69.8	62.9	59.6	61.6	62.0	58.0	44.5
26/01/2017 06:00	67.1	66.3	59.6	56.4	54.0	49.2	42.1	37.4	80.0	69.5	65.8	63.2	60.7	60.2	55.1	47.1
26/01/2017 06:10	67.6	66.3	59.9	56.5	54.3	48.9	41.3	36.8	81.3	70.9	65.9	61.9	60.6	55.4	51.1	41.7
26/01/2017 06:20	67.2	65.1	59.7	56.6	54.4	50.1	42.6	36.7	78.4	71.3	66.1	63.0	60.6	58.5	49.7	44.3
26/01/2017 06:30	67.2	64.0	59.3	56.4	54.0	49.4	41.9	36.3	77.1	79.0	65.5	61.7	61.3	57.8	49.8	41.5
26/01/2017 06:40	67.4	67.2	59.6	56.4	54.0	48.7	41.1	36.0	78.3	71.0	64.7	64.1	60.1	57.9	55.1	46.5
26/01/2017 06:50	67.3	64.4	60.0	56.7	54.2	48.9	41.4	35.7	76.7	72.6	66.6	64.2	61.7	60.1	50.7	41.3
26/01/2017 07:00	67.6	64.8	59.7	56.7	54.1	49.0	41.9	35.9	81.4	72.2	65.8	64.3	63.5	61.5	58.1	46.2
26/01/2017 07:10	67.9	64.7	59.7	57.1	54.1	48.7	41.1	34.6	81.8	79.1	69.7	67.0	63.6	57.1	49.1	41.1
26/01/2017 07:20	68.5	65.2	60.4	57.1	53.7	48.4	41.5	37.0	77.0	73.8	71.8	66.0	61.7	57.2	52.1	48.7
26/01/2017 07:30	68.5	67.1	61.2	58.4	54.2	48.8	41.8	35.9	76.5	79.0	75.7	75.4	61.2	56.4	53.7	49.8
26/01/2017 07:40	67.6	64.0	59.9	57.7	53.8	48.2	40.7	36.2	79.8	74.8	74.4	72.7	67.4	61.1	57.4	52.5
26/01/2017 07:50	69.1	66.8	60.9	57.9	54.4	49.1	42.1	36.8	81.4	73.1	70.3	66.4	61.7	55.3	54.5	50.2
26/01/2017 08:00	68.8	65.3	60.4	57.6	54.3	49.6	43.7	37.3	79.4	74.7	66.7	67.4	66.5	59.6	53.8	46.2
26/01/2017 08:10	68.0	64.3	59.6	57.2	56.8	53.9	48.5	37.8	76.3	76.0	71.1	69.8	78.1	72.9	68.9	58.4
26/01/2017 08:20	67.6	66.2	59.3	56.3	53.1	48.6	41.3	33.8	74.9	78.4	71.7	66.2	63.2	58.5	53.7	49.4
26/01/2017 08:30	66.0	62.0	58.2	55.6	51.7	46.8	39.2	29.3	76.7	76.2	72.8	69.5	63.7	59.9	58.5	53.8
26/01/2017 08:40	65.6	62.2	57.6	54.5	51.1	46.5	39.2	32.3	77.3	77.9	70.6	64.4	57.3	57.9	55.7	55.6
26/01/2017 08:50	68.9	65.8	60.1	57.0	53.7	48.7	41.7	35.6	77.9	75.4	66.5	68.0	66.9	60.7	60.4	49.9
26/01/2017 09:00	72.5	66.2	62.3	59.1	55.8	52.3	48.3	37.1	79.2	71.0	67.9	66.5	60.0	62.5	57.9	50.3
26/01/2017 09:10	73.3	67.5	62.4	59.3	55.8	50.1	43.3	39.0	78.3	71.1	67.4	66.5	66.5	59.8	59.6	55.2
26/01/2017 09:20	73.5	67.6	62.2	59.0	55.7	49.9	43.1	38.5	83.2	73.1	66.2	62.7	63.1	55.0	53.1	46.1
26/01/2017 09:30	72.2	69.0	62.3	59.2	56.1	50.4	43.6	38.8	78.8	77.0	73.4	66.7	64.1	64.5	53.6	49.8
26/01/2017 09:40	71.7	67.9	61.4	58.9	55.7	50.2	43.8	37.9	78.4	72.5	65.1	65.2	66.5	59.8	56.8	47.2
26/01/2017 09:50	71.0	68.2	61.6	59.3	56.0	50.6	44.2	38.7	78.8	72.1	69.5	65.4	59.8	54.8	47.3	45.3
26/01/2017 10:00	69.1	66.0	59.9	57.7	54.5	49.2	43.0	38.6	74.9	73.8	69.0	62.4	62.4	57.3	51.4	44.5
26/01/2017 10:10	72.2	67.7	61.7	58.7	55.3	49.8	43.1	38.3	78.1	75.2	67.1	61.3	58.2	54.9	61.3	52.2
26/01/2017 10:20	72.9	65.7	61.6	58.1	54.6	49.3	42.5	39.0	79.7	75.8	74.3	72.5	66.0	66.7	61.5	52.1
26/01/2017 10:30	72.3	66.6	62.3	59.0	60.2	58.5	43.9	39.3	78.9	70.8	67.3	68.0	80.0	80.9	60.3	51.5
26/01/2017 10:40	72.3	66.7	62.1	58.7	55.4	50.0	44.4	38.7	77.9	70.8	65.4	61.2	59.4	62.7	67.1	46.5
26/01/2017 10:50	72.3	68.3	62.6	59.2	56.0	50.6	43.5	39.1	78.4	73.2	68.2	65.2	62.2	58.3	55.1	46.8
26/01/2017 11:00	71.9	67.3	61.9	58.8	55.6	50.2	43.4	39.9	78.2	71.7	65.2	61.5	59.1	56.6	51.9	47.6
26/01/2017 11:10	71.6	68.3	61.9	59.2	55.9	50.6	43.6	39.3	79.9	72.7	70.0	67.5	63.5	59.6	52.9	47.0
26/01/2017 11:20	70.9	67.2	61.8	59.4	57.5	53.6	47.0	39.7	82.0	78.5	68.3	66.6	74.7	73.9	67.5	54.2
26/01/2017 11:30	69.9	67.0	61.5	59.0	55.8	50.6	43.7	39.1	76.0	71.8	66.2	63.7	62.9	57.6	53.9	43.8
26/01/2017 11:40	71.0	66.8	61.6	59.8	56.3	51.3	44.6	38.7	77.4	72.8	73.9	75.6	71.5	64.9	55.2	48.3
26/01/2017 11:50	71.3	68.4	61.9	59.9	56.7	51.9	46.0	41.7	77.5	72.2	67.7	64.5	60.4	57.3	52.2	49.2
26/01/2017 12:00	70.3	65.9	60.9	59.1	55.9	51.1	45.2	40.6	76.4	71.8	65.6	61.8	65.4	67.0	63.8	53.7
26/01/2017 12:10	69.7	65.5	60.5	57.8	54.4	49.4	42.7	39.0	80.1	81.2	76.7	67.3	62.4	57.8	59.1	54.2
26/01/2017 12:20	73.5	68.7	62.7	59.5	55.8	50.3	43.1	38.8	79.2	77.5	71.1	67.5	60.4	57.8	51.3	46.0
26/01/2017 12:30	72.6	65.9	62.1	59.0	57.4	54.3	48.0	39.3	78.6	78.5	74.3	76.0	77.7	76.6	69.1	56.8
26/01/2017 12:40	72.7	65.8	62.0	58.7	55.4	50.1	43.1	38.0	84.0	71.7	65.5	61.2	59.1	56.8	55.0	52.6
26/01/2017 12:50	73.2	66.3	61.9	58.7	55.5	49.6	42.6	37.9	81.2	70.4	66.6	64.6	64.2	60.0	57.3	45.0
26/01/2017 13:00	73.3	66.9	62.4	59.3	56.1	50.1	42.9	38.2	80.8	70.7	65.8	61.7	65.9	56.0	51.9	44.6
26/01/2017 13:10	73.4	68.0	62.7	59.7	56.4	50.6	44.5	39.7	79.5	74.2	69.5	73.2	69.7	66.1	64.8	48.0
26/01/2017 13:20	73.0	67.6	62.8	59.5	56.3	50.5	43.5	38.7	78.9	75.5	67.8	62.8	61.9	65.6	61.7	52.9
26/01/2017 13:30	72.9	68.6	63.0	59.7	56.6	50.8	43.5	38.0	79.2	72.9	67.5	65.4	59.1	54.3	48.7	41.3
26/01/2017 13:40	71.9	67.9	62.6	59.5	56.1	50.2	43.1	38.6	77.6	72.5	65.8	62.7	59.2	54.4	50.1	46.1
26/01/2017 13:50	72.2	68.5	62.6	59.5	56.2	50.5	43.4	38.4	78.1	72.9	67.7	70.5	66.4	63.3	60.4	51.7
26/01/2017 14:00	71.6	67.2	62.1	59.1	55.7	50.1	43.0	38.1	79.3	80.0	67.8	62.6	59.2	55.3	49.8	48.4
26/01/2017 14:10	71.3	67.3	61.6	59.0	55.6	50.1	44.1	39.1	77.2	72.1	70.0	66.4	64.1	67.5	68.2	63.3

APPENDIX B - TERMINOLOGY

This appendix provides an explanation of some of the acoustics terms used in this report.

	The human ear does not sense all frequencies of sound equally. Our sensitivity is at a maximum at around 2 kHz and steadily decreases above and below. Below 20 Hz and above about 20 kHz we can't hear at all.
A-weighting L_A or L_{pA}, L_{WA},	Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level L_p becomes L_{pA} (or L_A) and the Sound Power Level L_W becomes L_{WA}.
L_p	*The instantaneous sound pressure level* (L_p)
L_{pA} (or L_A)	*The A-weighted instantaneous sound pressure level* (L_{pA} or L_A)
	This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125 s (FAST time constant) or the previous 1 s (SLOW time constant).
L_{AF}, L_{AS}	The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
L_{max}	*The maximum instantaneous sound pressure level* (L_{max}),
L_{Amax}	*The A-weighted maximum instantaneous sound pressure level* (L_{Amax})
L_{AFmax}	*The A-weighted maximum instantaneous sound pressure level with a FAST time constant* (L_{AFmax}).
L_{min} , L_{Fmin}	The opposite of the L_{max} is the *minimum instantaneous sound pressure level* or L_{min} etc. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{N,T}$	*The percentage exceedance sound pressure level* ($L_{N,T}$),
$L_{AN,T}$ $L_{AFN,T}$ $_N$ = %age value, 0-100 $_T$ = measurement time eg. L_{A90}, L_{A10}, $L_{AF90,\ 5\ min}$	*The A-weighted percentage exceedance sound pressure level* ($L_{AN,T}$), *the A-weighted percentage exceedance sound pressure level with a FAST time constant* ($L_{AFN,T}$).
	This is the sound pressure level exceeded for *N*% of time period *T*. eg. If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr}$ = x dB. L_{A0} (the level exceeded for 0 % of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100 % of the time) is equivalent to the L_{Amin}.
	It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.
$L_{eq,T}$	The *equivalent continuous sound pressure level over period T* ($L_{eq,T}$),
$L_{Aeq,T}$ $_T$ = measurement time eg. $L_{Aeq,5min}$	*The A-weighted equivalent continuous sound pressure level over period T* ($L_{Aeq,T}$).
	This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value.
	The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation

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