PREPARED: 11 March 2025

Project Jumper II

Plant Noise Impact Assessment

CONTENTS

LIST OF ATTACHMENTS

Project Ref:	AS13592	**Project Name:**	Project Jumper II
Report Ref:	AS13592.250127.R1	**Report Title:**	Plant Noise Impact Assessment
Client Name:	Reckitt Benckiser		
Project Manager:	Daniel Saunders		
Report Author:	Daniel Saunders		
Clarke Saunders Acoustics Winchester SO22 5BE	This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.		

1.0 EXECUTIVE SUMMARY

1.1 The proposed internal fit out of 6 Roundwood Avenue, Stockley Park, Hayes, Uxbridge, UB11 1EZ, requires an external plant noise assessment to aid in its associated planning application.

1.2 This report details the baseline survey and assessment methodologyfor the plant noise and how it may be perceived at nearby noise sensitive receptors.

1.3 It has been demonstrated that the sound levels from the plant as currently proposed is unlikely to cause an adverse impact on the receptors.

2.0 INTRODUCTION

2.1 Clarke Saunders Acoustics (CSA) has been commissioned by Reckitt Benckiser to provide acoustic design services for a fitout of Building 6 Roundood Avenue located in Stockley Park, Hayes, Uxbridge, UB11 1EZ (the Site).

2.2 CSA has undertaken an environmental noise survey and subsequent plant noise assessment to aid in the development's planning application.

2.3 The proposed development of the Site includes the installation of new external plant units, which may adversely affect nearby noise sensitive receptors.

2.4 A summary of acoustic terminology used in this report is presented in Appendix A.

3.0 SITE DESCRIPTION

3.1 The Site is located at 6 Roundwood Avenue in Stockley Park, a business estate under the jurisdiction of the London Borough of Hillingdon (LBH) that consists of various commercial buildings. As such, the Site is surrounded on all sides by offices and other commercial buildings. The nearest residential receptors have been identified as being located approximately 450m to the south of the Site, separated by a rail line that goes between Slough and Paddington Station.

3.2 The overall soundscape is determined by building services noise from nearby commercial buildings, as well as road traffic noise.

3.3 Please refer to the attached site plan AS13592/SP1.

4.0 PLANT SOUND EMISSIONS CRITERIA

4.1 The London Borough of Hillingdon requires plant noise emissions at residential receptors to be at least 10dB below the existing background levels, when assessed in accordance with BS4142:2014+A.1:2019 *Methods for rating and assessing industrial and commercial sound*.

4.2 Whilst the nearby commercial buildings are not noise sensitive receptors from a planning perspective in the same way as a residential dwelling, an additional external criterion is advised to maintain suitably low levels within the boundary of the site. External noise emissions therefore target a cumulative level of circa NR50, at a location 3 metres from its own building façade and a Rating Level $L_{Ar,Tr}$ 55dB at 1m from nearest commercial receptors. These noise levels are appropriate to reduce risk of noise intrusion from the mechanical plant.

5.0 ENVIRONMENTAL SOUND SURVEY

5.1 PROCEDURE AND EQUIPMENT

5.1.1 A survey of the existing noise levels was undertaken at one location on the roof of the Site, represented as LT1 in the attached site plan (AS13592/SP1).

5.1.2 Automated measurements of consecutive 5-minute L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} sound pressure levels were taken between 15:00 hours on Friday 11th October and 11:00 hours on Wednesday 16th October 2024. Measurements were conducted following procedures set out in BS7445:1991 *Description and measurement of environmental noise Part 2: Acquisition of data pertinent to land use*.

5.1.3 The following equipment was used during the course of the survey:

- 1 no. Rion sound level meter type NL32;
- 1 no. Rion sound level calibrator type NC74.

5.1.4 The field calibration of the sound level meter was verified before and after use. No significant calibration drift was detected.

5.1.5 The weather during the survey was generally dry with light winds. Brief periods of adverse weather occurred which have not been considered when calculating average sound levels; these periods are highlighted in red in the relevant time histories. Overall, conditions were suitable for the measurement of environmental noise.

5.2 RESULTS

5.2.1 Figures AS13592/TH1-TH5 show the L_{Aeq}, L_{Amax}, L_{A10} L_{A90} sound pressure levels as time histories at monitoring position LT1.

5.2.2 The measured typical background and average noise levels are presented in Table 5.1.

Position	Monitoring Period	Average $L_{Aeq,T}$	Typical* Background $L_{A90, 5mins}$
LT1	07:00 – 23:00 hours	54dB	46dB
	23:00 – 07:00 hours	50dB	43dB

Table 5.1: Environmental noise survey results [dB ref. 20 µPa]
*The typical background is derived as the 10th percentile of the L_{A90} dataset

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5.3 PLANT NOISE CRITIERA

5.3.1 The resultant plan noise emissions criteria at the nearest residential receptors are shown in Table 5.2.

Position	Monitoring Period	Plant Noise Emissions Criteria $L_{Ar,Tr}$	
Residential	07:00 - 23:00 hours	36dB (non-tonal)	36dB (tonal)
	23:00 - 07:00 hours	33dB (non-tonal)	33dB (tonal)
Commercial	07:00 - 23:00 hours	55dB	
	23:00 - 07:00 hours	N/A	

Table 5.2: Plant noise emissions criteria [dB ref. 20 μPa]

6.0 ASSESSMENT

6.1 A number of new outdoor condensing units will be installed externally, at ground floor (north) adjacent to the MER and at roof level. Additionally, a new air source heat pump (ASHP) is to be installed at roof level.

6.2 The units to be installed are as follows:

- 8 no. Daikin RZAG35B condenser units (4 on the west side of the roof, 2 on the east side of the roof, and 2 at ground level (north) adjacent to the mechanical equipment room);
- 2 no. bespoke condenser units, ref. COND-00-02 A/B (roof level, adjacent to north staircore);
- 1 no. Mitsubishi CAHV-R450YA-HPB ASHP (east side of the roof).

6.3 Additionally, atmospheric noise emissions from new mechanical ventilation and extraction plant have been considered and ductborne attenuation will be specified in order that the cumulative noise levels do not exceed the targeted design criteria.

6.4 The following table summarises the manufacturer's given noise level data for the externally mounted cooling plant shown in this assessment.

UNIT	MANUFACTURER SOUND LEVEL, dB								Overall dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Daikin RZAG35B Condenser (L_p at 1m)	53	53	51	48	41	37	28	26	49
COND-00-02 (L_p at 10m)	No spectral data provided								42
Mitsubishi CAHV-R450YA-HPB (L_p at 1m)	66	73	69	67	61	59	61	52	69

Table 6.1: Source noise data for condenser

6.5 The nearest commercial receptors are office buildings located approximately 100 metres to the west and 20 metres to the east of the site.

6.6 A summary of the calculations to the nearest off-site receptors is given in Table 6.2 and Table 6.3 below.

	Plant Installation (to Western receptor)				
	4 RZAG35B Condensers (Rooftop, Western Side)	2 RZAG35B Condensers (Ground Level)	2 COND-00-02 Condensers (Roof level)	2 RZAG35B Condensers (Rooftop, Eastern Side)	CAHV-R450YA-HPB ASHP (Rooftop, Eastern Side)
L_p @ 1m	48dBA	48dBA	62dBA	48dBA	69dBA
Correction for number of units	4no., +6dB	2no., +3dB	2no., +3dB	2no., +3dB	1no., +0dB
Screening loss	No screening, -0dB	No screening, -0dB	No screening, -0dB	Line of sight screening, -5dB	Line of sight screening, -5dB
Distance propagation loss	80m, -38dB	125m, -42dB	125m, -42dB	160m, -44dB	160m, -44dB
Subtotal	16dBA	10dBA	23dBA	2dBA	20dBA
Cumulative sound pressure level at receptor	25dBA				

Table 6.2: Predicted plant sound level at the western receptor

	Plant Installation (to Eastern receptor)				
	4 RZAG35B Condensers (Rooftop, Western Side)	2 RZAG35B Condensers (Rooftop, Eastern Side)	CAHV-R450YA-HPB (Rooftop, Eastern Side)	2 COND-00-02 Condensers (Roof level)	2 RZAG35B Condensers (Ground Level)
L_p @ 1m	48dBA	48dBA	69dBA	62dBA	48dBA
Correction for number of units	4no., +6dB	2no., +3dB	1no., +0dB	2no., +3dB	2no., +3dB
Screening loss	Line of sight screening, -5dB	No screening, -0dB	No screening, -0dB	Line of sight, -5dB	Line of sight, -5dB
Distance propagation loss	80m, -38dB	19m, -26dB	19m, -26dB	62m, -36dB	62m, -36dB
Subtotal	11dBA	25dBA	43dBA	24dBA	10dBA
Cumulative sound pressure level at receptor	43dBA				

Table 6.3: Predicted plant sound level at the eastern receptor

6.7 The nearest residential receptors are located approximately 450 metres to the south of the site, beyond the railway line that goes between Paddington and Slough.

6.8 A summary of the calculations to these receptors is found in Table 6.4 below.

	Plant Installation (to residential receptors)				
	4 RZAG35B Condensers (Rooftop, Western Side)	2 RZAG35B Condensers (Rooftop, Eastern Side)	CAHV-R450YA-HPB (Rooftop, Eastern Side)	2 COND-00-02 Condensers (Roof level)	2 RZAG35B Condensers (Ground Level)
L_p @ 1m	48dBA	48dBA	69dBA	62dBA	48dBA
Correction for number of units	4no., +6dB	2no., +3dB	1no., +0dB	2no., +3dB	2no., +3dB
Screening loss	Line of sight screening -5dB	No screening, -0dB	No screening, -0dB	Line of sight, -5dB	Line of sight, -5dB

	Plant Installation (to residential receptors)				
	4 RZAG35B Condensers (Rooftop, Western Side)	2 RZAG35B Condensers (Rooftop, Eastern Side)	CAHV-R450YA-HPB (Rooftop, Eastern Side)	2 COND-00-02 Condensers (Roof level)	2 RZAG35B Condensers (Ground Level)
Distance propagation loss	450m, -53dB	450m, -53dB	450m, -53dB	450m, -53dB	450m, -53dB
Subtotal	0dBA	0dBA	16dBA	7dBA	0dBA
Cumulative sound pressure level at receptor	17dBA				

Table 6.4: Predicted plant sound level at residential receptors

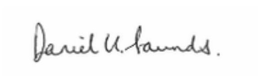
6.9 The calculations have shown that the resultant external sound levels from additional cooling plant are not high at adjacent receptors and achieve the targeted design criteria without the need for further mitigation measures.

6.10 Attenuation for the external ventilation has been specified during the Stage 4 design such that it will not significantly contribute to the overall plant sound emissions.

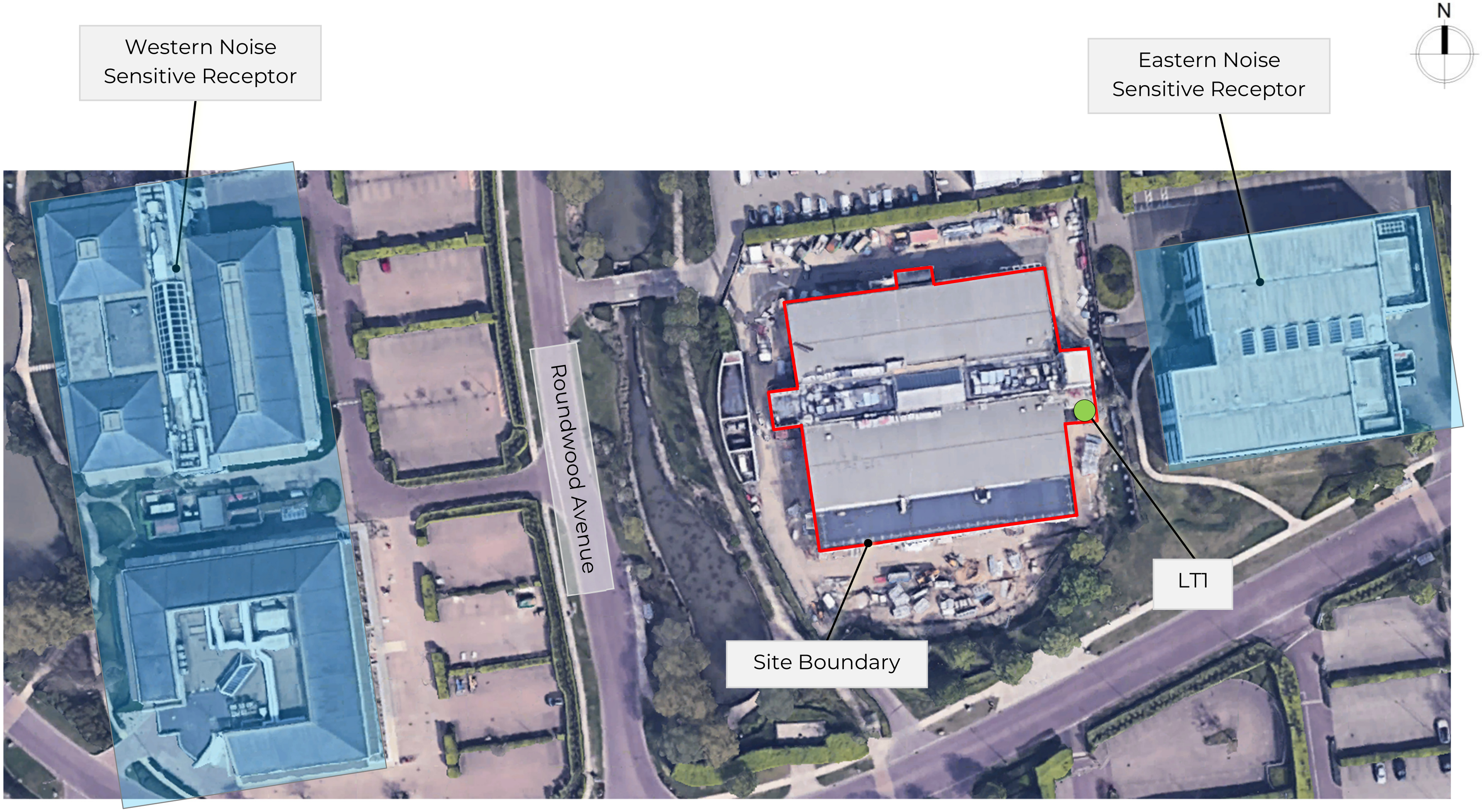
7.0 CONCLUSION

7.1 Clarke Saunders Acoustics has undertaken a plant noise emissions assessment to aid in the planning application for the proposed CAT A fit out of 6 Roundwood Avenue, Stockley Park, Hayes, Uxbridge, UB11 1EZ.

7.2 It has been demonstrated that noise emissions from new external plant installations achieve local authority requirements at residential receptors and are unlikely to have adverse impact on the nearest commercial receptors, and as such no further mitigation measures are required.



Daniel Saunders MIOA
CLARKE SAUNDERS ACOUSTICS


N
Western Noise Sensitive Receptor
Eastern Noise Sensitive Receptor
Roundwood Avenue
LT1
Site Boundary

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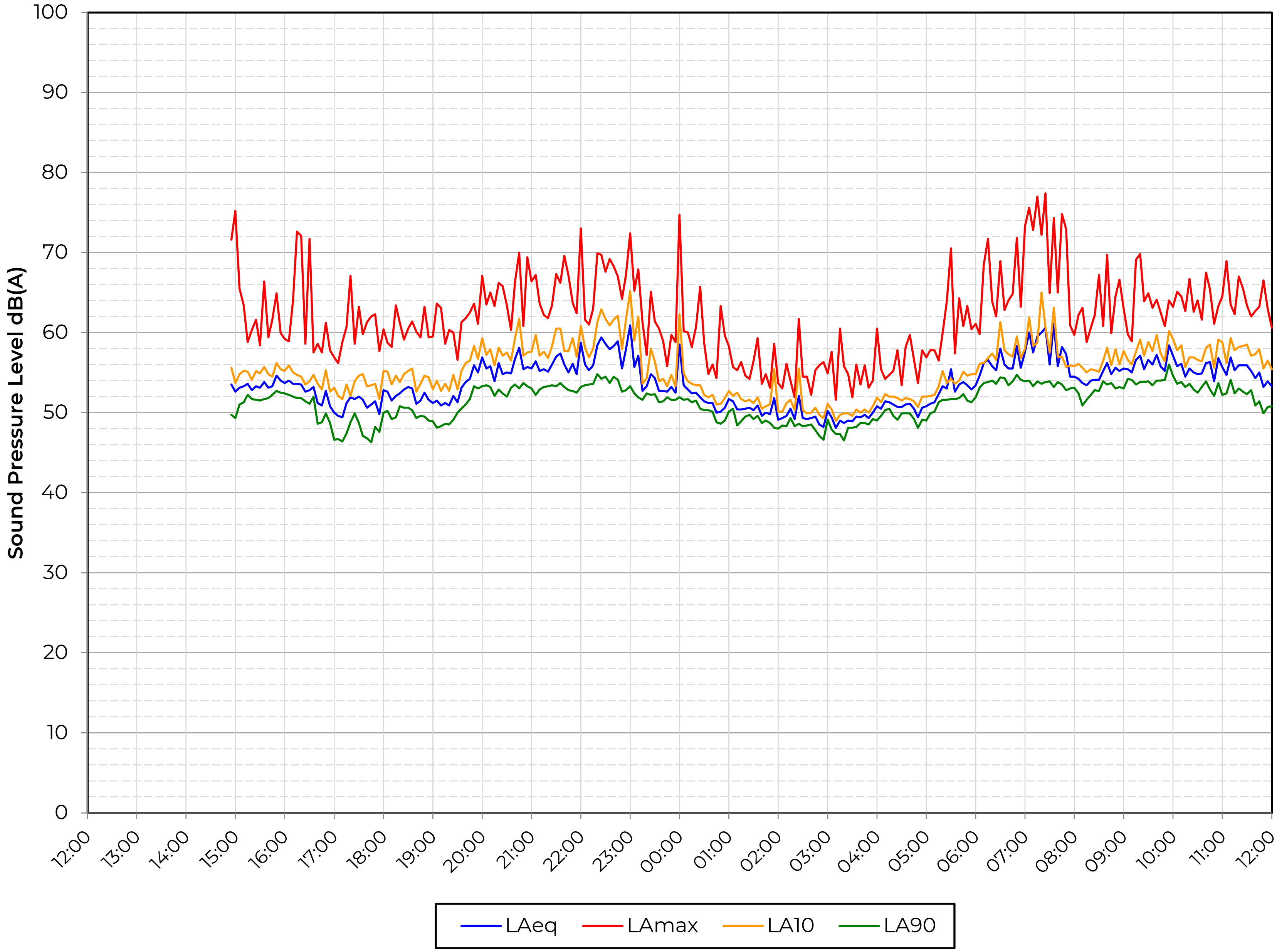
Project Jumper NDA

Position LT1



Fri 11 Oct to Sat 12 Oct

Figure AS13592/TH1

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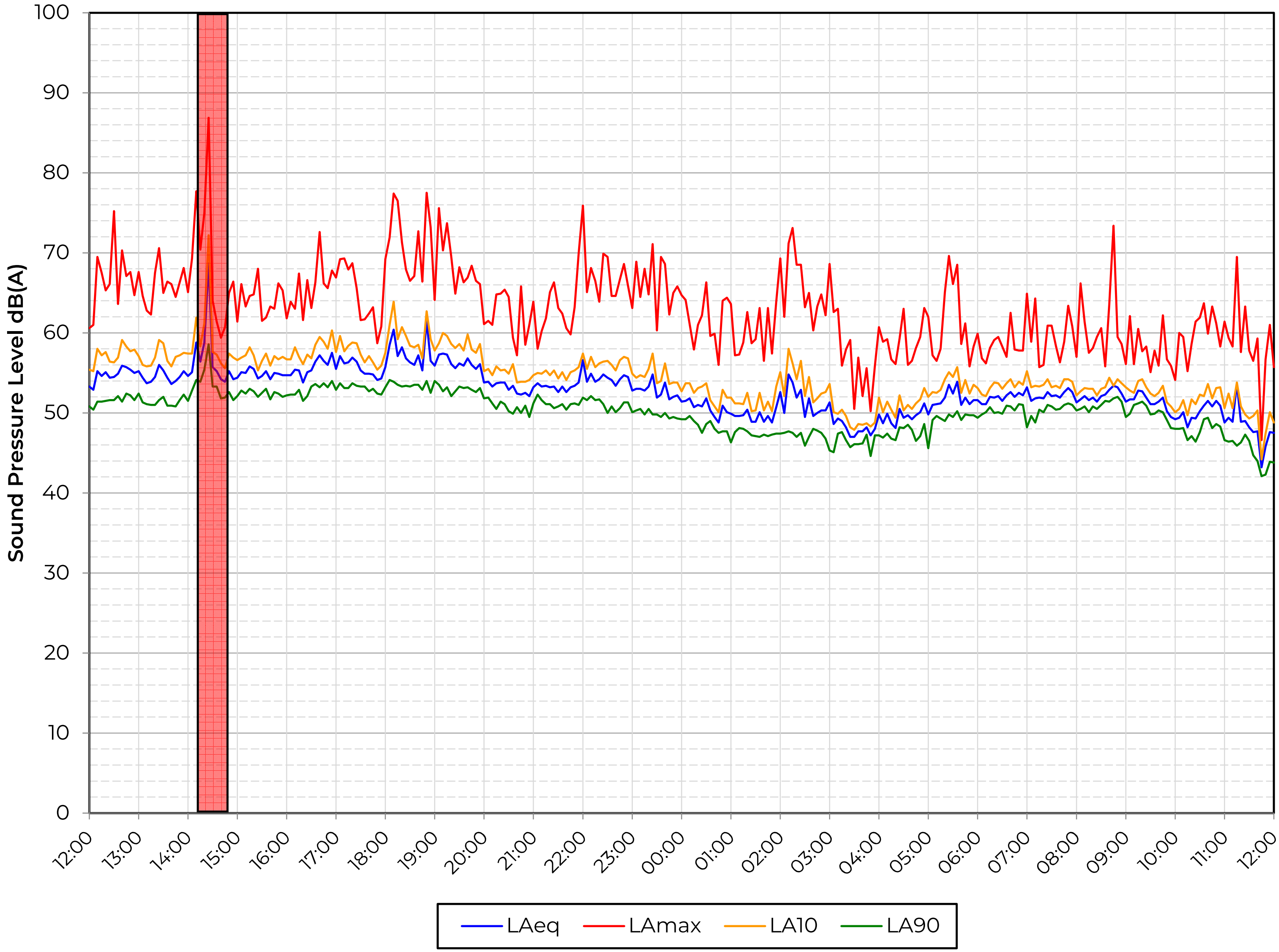
Project Jumper NDA

Position LT1



Sat 12 Oct to Sun 13 Oct

Figure AS13592/TH2

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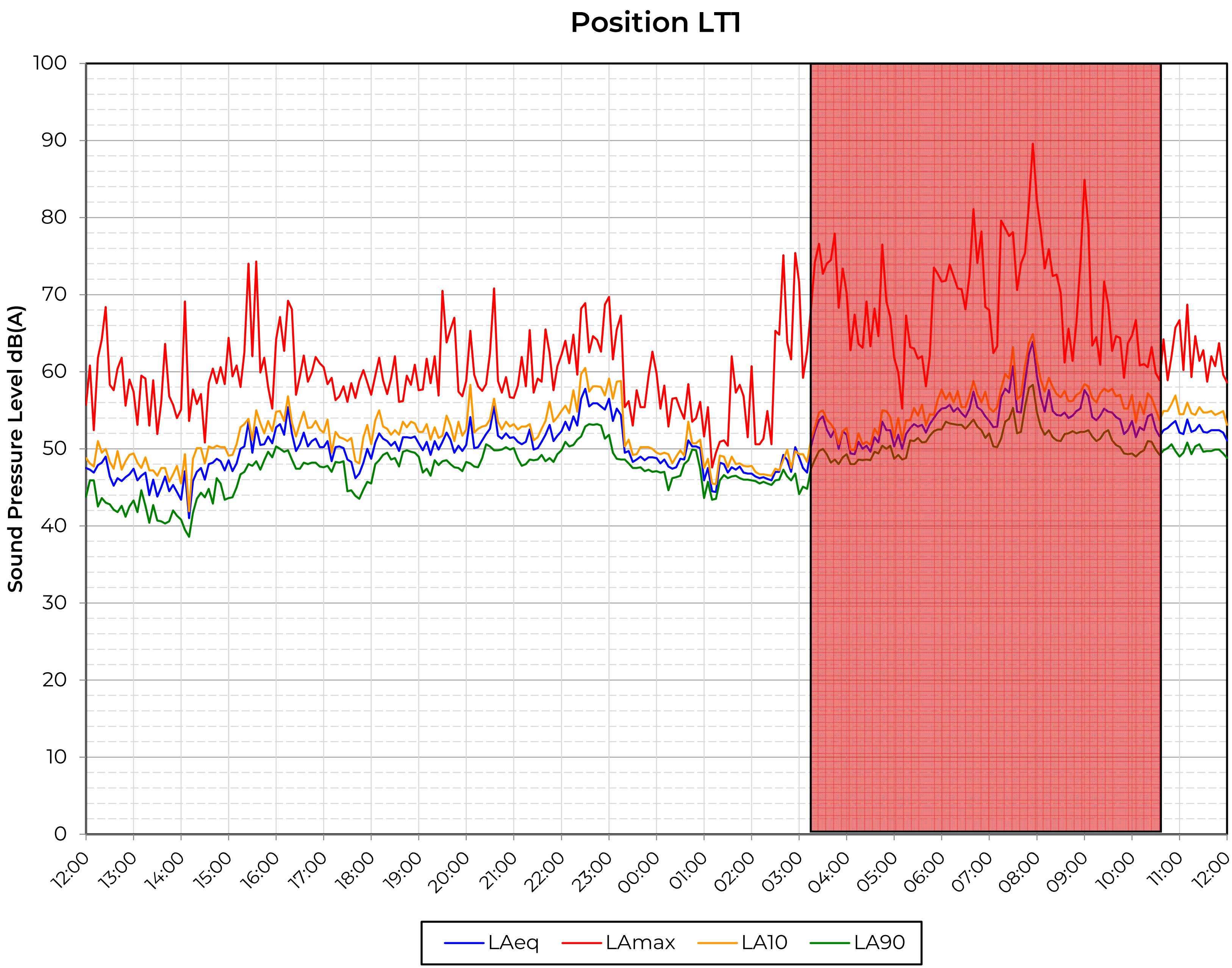
Project Jumper NDA

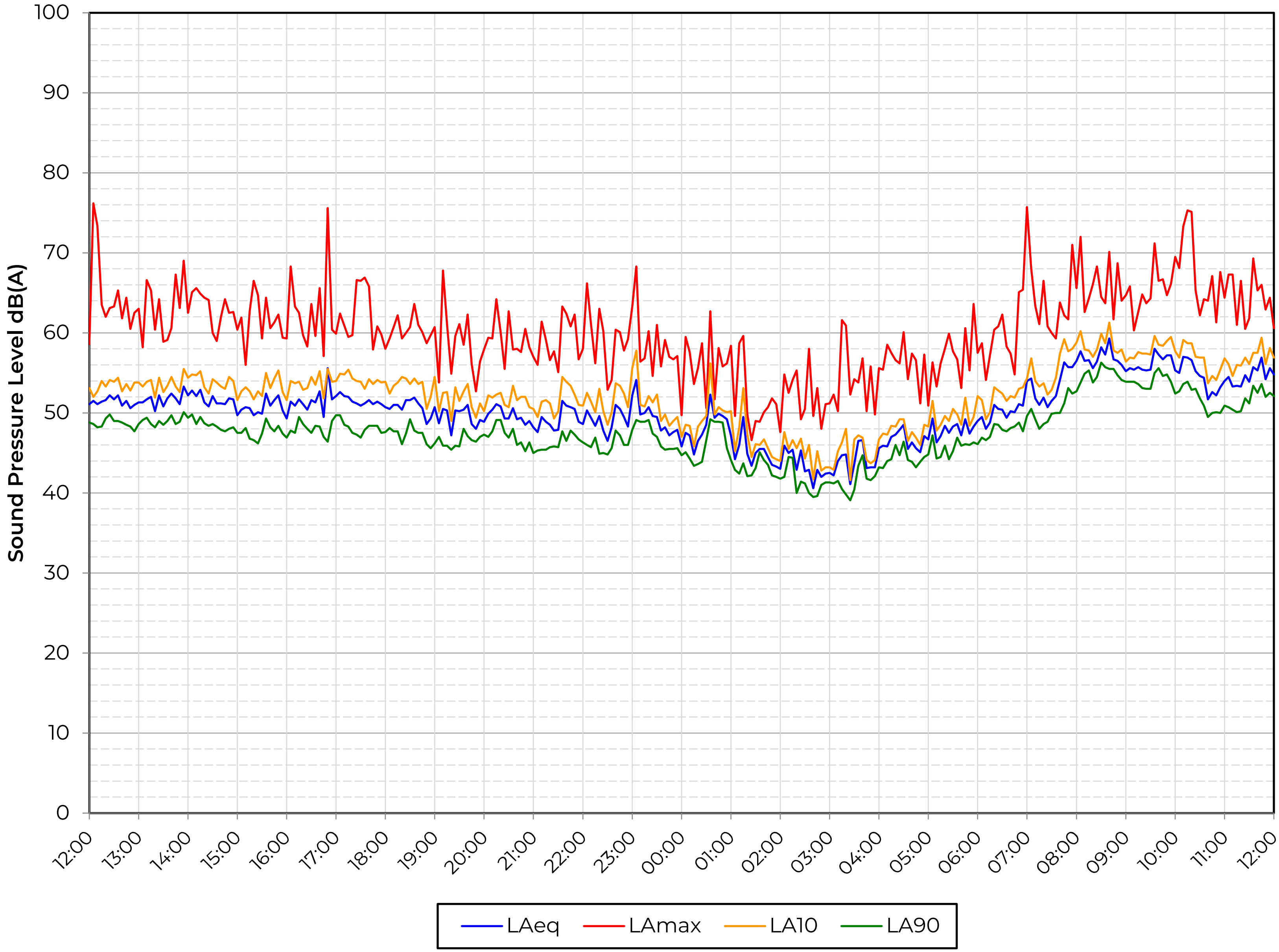


Sun 13 Oct to Mon 14 Oct

Figure AS13592/TH3

Project Jumper NDA

Position LT1



Mon 14 Oct to Tue 15 Oct

Figure AS13592/TH4

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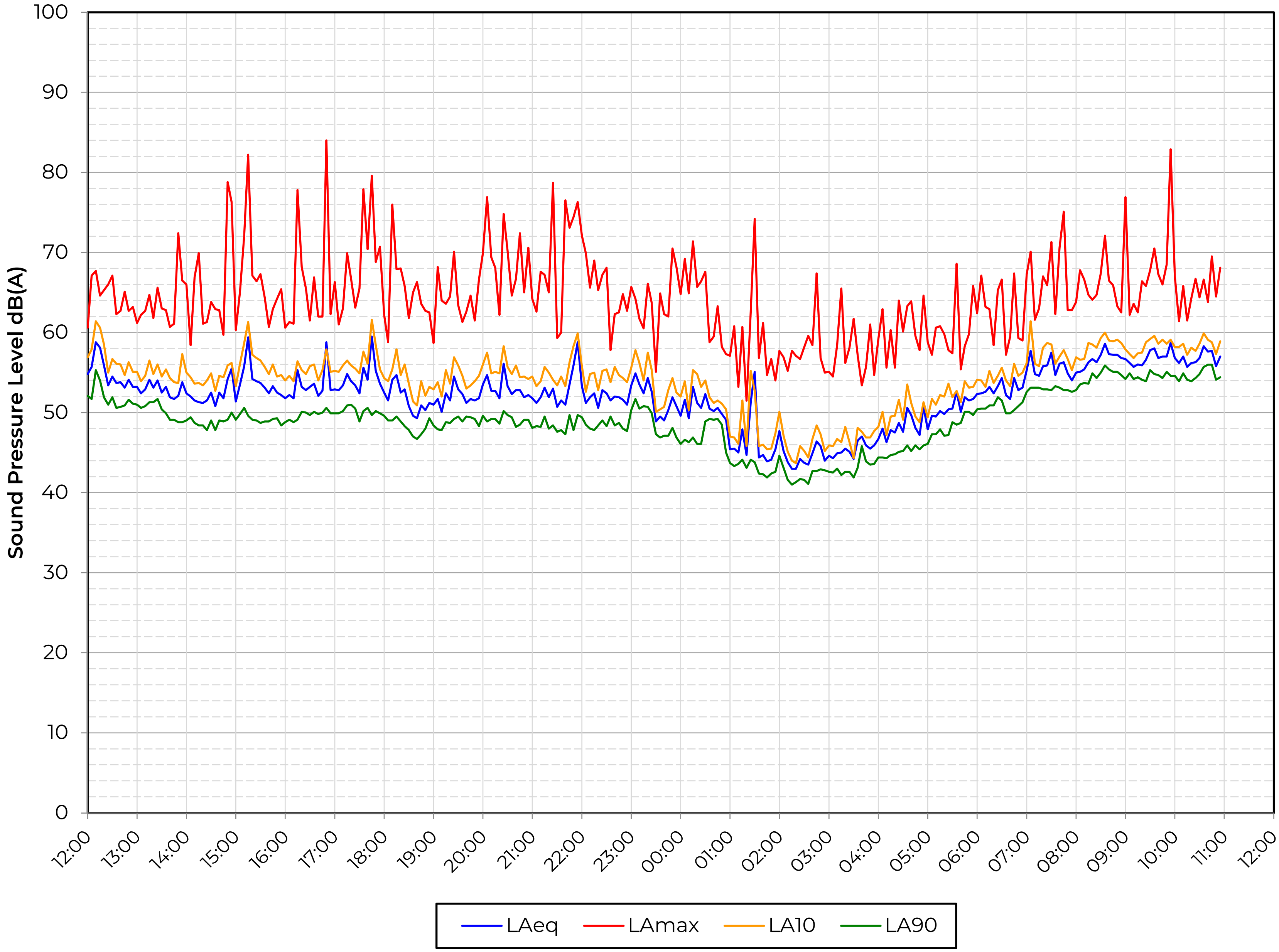
Project Jumper NDA

Position LT1



Tue 15 Oct to Wed 16 Oct

Figure AS13592/TH5

Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.
L_{eq} :	A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.
NR	*Noise Rating*. A single figure noise level rating that takes into account the frequency content of an acoustic environment.
R	*Sound Reduction Index*. Effectively the Level Difference of a building element when measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010 and corrected for its size and the reverberant characteristics of the receive room.
D	The sound insulation performance of a construction is described in terms of the difference in sound level on either side of the construction in the presence of a sound source on one side and the reverberant characteristics of the adjoining 'receive' space. D is the arithmetic Level Difference in decibels between the

source and receive sound levels when filtered into frequency bands.

D_{nT}	*Weighted Standardised Level Difference*. As defined in BS EN ISO 717-1, representing the Weighted Level Difference, when standardised for reference receiving room reverberant characteristics.
$D_{n,e}$	Normalised sound insulation of small building elements of fixed dimensions, such as vents, measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-2:2010.
$D_{n,f}$	Flanking sound insulation of lightweight elements, such as curtain wall mullions, measured in an accredited laboratory test suite in accordance with the procedures laid down in ISO 10848-2:2006
R_w D_w $D_{nT,w}$ $D_{n,e,w}$ $D_{n,f,w}$	Value of parameter, determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1 to provide a single-figure value.
C, C_{tr}	Spectral adaptation terms to be added to a single number quantity such as DnT,w, to take account of the sound insulation within frequency ranges of particular interest.
$L'_{nT,w}$	*Weighted Standardised Impact Sound Pressure Level* as defined in BS EN ISO 717-2, representing the level of sound pressure when measured within a space where the floor above is under excitation from a calibrated tapping machine, standardised for the receiving room reverberant characteristics.
ΔL_w	Change in impact sound pressure level when a floor is fitted with a 'soft' or resilient covering, as measured in an accredited laboratory test suite in accordance with the procedures laid down in BS EN ISO 10140-3:2010.

Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band.

In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.