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76 SOUTHAMPTON ROW
CAMDEN, LONDON

NOISE IMPACT ASSESSMENT

Technical Report: R4430-1 Rev 3

Date: 13th March 2013

For: Greggs of London
Gould Road
Twickenham
Middlesex
TW2 6RT

24 Acoustics Document Control Sheet

Project Title: 76 Southampton Row, Camden, London – Noise Impact Assessment

Report Ref: R4430-1 Rev 3

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1.0 INTRODUCTION

1.1 24 Acoustics Ltd has been instructed by Greggs of London to undertake a plant noise impact assessment at 76 Southampton Row, Camden, London.

1.2 This report presents the results of the assessment, following site visits and a background noise survey undertaken between 16th and 19th October 2012.

1.3 All noise levels in this report are presented in dB relative to 20µPa.

2.0 SITE DESCRIPTION

2.1 76 Southampton Row is located in a retail and commercial area with ambient noise levels controlled by local road traffic, commercial activities and existing plant units. Existing plant is, however, the dominant source of ambient noise levels in the nearby area.

2.2 As part of proposed works to install a Greggs bakery in the ground and basement floor of 76 Southampton Row it is proposed to fit air conditioning plant for the purpose of heating and cooling and air extraction/ventilation plant for the bakery and staff areas. The condenser units will be located externally in the rear covered yard area at basement level. The extraction/ventilation systems will vent via a duct through the roof above the basement level covered yard area.

2.3 It is understood that the nearest residential properties are located on the basement, ground and first floor levels of the adjoining property to the north at distances of approximately 4.5m, 4m and 6.5m respectively from the nearest proposed plant. In addition, there is a residential property at ground floor level at the rear of Old Gloucester Street at a distance of approximately 7.5m away from the proposed plant. Ducting for the extraction and condenser units is proposed to run through the structure of the building. The condenser units are to be mounted on anti vibration mounts at basement level. Additionally kitchen extract/ventilation fans will vent above the basement level rear roof but below the rear parapet wall which separates the properties at Old Gloucester Street. The roof over the rear covered yard is made from a timber construction and provides significant acoustic screening to the condenser units at all of the identified residential properties. The parapet wall provides some acoustic screening and visual screening from the proposed extract vent to the nearest residential properties on Old Gloucester Street.

2.4 Figures 1 and 2 show the site layout, proposed location of the condenser units, proposed location of the extract and the nearest residential windows.

3.0 CRITERIA

National Planning Policy Framework (NPPF)

3.1 The National Planning Policy Framework (NPPF) [Reference 1] was published by the Department for Communities and Local Government in draft format in July 2011 and in its final form on 27th March 2012, and is now effective. This document is intended to replace specific guidance contained within the planning policy guidance and statement documents which are currently in force. This document therefore supersedes PPG 24 [Reference 2] which previously provided guidance on noise relating to planning and new development. For noise the NPPF policy states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions, while recognising that many developments will create some noise; and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

3.2 The NPPF also refers to the Noise Policy Statement for England (NPSE) [Reference 3] which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development' which is supported by the following aims.

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life;
- Where possible, contribute to the improvement of health and quality of life.

3.3 The NPSE defines the concept of a 'significant observed adverse effect level' (SOAEL) as 'the level above which significant adverse effects on health and quality of life occur'. The following guidance is provided within the NPSE:

> *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

3.4 The NPPF and NPSE documents do not refer to specific noise criteria. When considering the impact of noise from new plant 24 Acoustics considers that the spirit of the requirements of the NPPF and NPSE will be complied with if criteria from British Standard 4142:1997 [Reference 4] are adopted.

BS 4142

3.5 BS 4142 [Reference 4] provides a method for rating the effects of industrial noise on mixed residential and industrial areas. The standard advocates a comparison between the typical measured L_{A90} background noise level and L_{Aeq} noise level from the source being considered. For rating purposes if the noise source is tonal, intermittent or otherwise distinctive in character, a rating correction of +5 dB is applied. The standard states that a difference between the rating noise level and the background level of +10 dB indicates that 'complaints are likely', a difference of +5 dB is of 'marginal significance' and a difference of –10 dB is a 'positive indication that complaints are unlikely'.

Local Authority Requirements

3.6 The Local Planning Authority, Camden Borough Council, advises that noise arising from fixed plant should be assessed in line with the Camden Local Development Framework (LDF) Developmental Policies. The LDF Developmental Policies directs the reader to the council Unitary Development Plan (UDP) [Reference 5] when assessing noise from plant or machinery. This policy provides noise limits for plant and machinery at the nearest sensitive façade specified for daytime, evening and night time periods. Table E of Appendix 1 of the UDP outlines the requirements for noise from proposed plant.

3.7 For noise from plant which does not have a distinctive tonal or impulsive nature the local authority's requirement is to set a level 5 dB below the background noise level (L_{A90}) 1 metre from the nearest sensitive facade. For noise which does have a distinctive tonal or impulsive nature the plant noise level must be set 10 dB below the background noise level (L_{A90}) 1 metre from the nearest sensitive façade. The daytime period is assessed between 0700-1900 hours, evening period between 1900-2300 hours and night time period between 2300-0700 hours.

4.0 NOISE MEASUREMENTS AND RESULTS

4.1 Background noise measurements were undertaken between 16th and 19th October 2012 at ground floor level at the rear of 76 Southampton Row. The monitoring location is shown in Figure 1.

4.2 The sound level meter was set up to monitor noise levels continuously and store data in five minute samples (using fast time weighting) in terms of the overall A-weighted L_{eq} and L_{90} sound pressure levels. Measurements were taken in free field conditions at a height of approximately 2m above ground floor level at the rear. An environmental wind shield was fitted.

4.3 The following instrumentation was used during the survey:

- Rion NL31 (Type 1) precision grade sound level meter;
- Brüel and Kjær Type 4231 acoustic calibrator.

4.4 Calibration was checked before and on completion of the measurements and no drift was recorded. Weather conditions during the survey were mostly fine and dry. It is therefore considered that weather conditions did not affect the noise measurements. Noise measurements were made in accordance with BS 7445: 1991 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use' [Reference 6].

Results

4.5 The results of the environmental survey are presented Table 1 below showing the average ($L_{Aeq,\ 1hour}$ daytime and evening, $L_{Aeq,\ 5min}$ night-time) and minimum background ($L_{A90,\ 1hour}$ daytime and evening, $L_{A90,\ 5min}$ night-time) values and in graphical format in Appendix B.

Date	Daytime		Evening		Night-time	
	Average $L_{Aeq, 1hour}$	Minimum $L_{A90, 1hour}$	Average $L_{Aeq, 1 hour}$	Minimum $L_{A90, 1 hour}$	Average $L_{Aeq, 5min}$	Minimum $L_{A90, 5min}$
16/10/2012	-	-	53.1	51.7	54.1	51.2
17/10/2012	54.1	50.2	54.5	51.5	50.9	49.3
18/10/2012	54.3	48.6	56.9	54.5	51.6	49.6
19/10/2012	51.3	48.9	-	-	-	-
Noise Level	**53**	**49**	**55**	**52**	**52**	**49**

Table 1: Summary of Environmental Noise Survey Results

Assessment

4.6 The Local Planning Authority requires a noise level from plant, that does not have a distinctive tonal or impulsive nature, to be set 5 dB below the background noise level (L_{A90}) 1 metre from the nearest sensitive façade. Minimum background noise levels have been used to set the plant noise limit as shown in Table 1. Noise from the plant should therefore not exceed the following level at the nearest noise sensitive window:

07:00 - 19:00 hours	44 dB $L_{Aeq, 1 hour}$
19:00 - 23:00 hours	47 dB $L_{Aeq, 1 hour}$
23:00 - 07:00 hours	44 dB $L_{Aeq, 5 min}$

5.0 PLANT NOISE ASSESSMENT

5.1 The proposed plant will comprise two Mitsubishi outdoor units (model: PUHZ-RP140VKA/YKA and PUHZ-RP71VHA4) installed in the rear basement level covered yard area. The fresh air/kitchen extraction system will vent at the rear above the covered yard area as shown in Figure 1.

5.2 The manufacturer's stated plant noise levels are detailed in Table 2 below:

Model	Sound Power Level (dB) per Octave Band Frequency, Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi PUHZ-RP71VHA4 (Heating)	65	63	58	52	51	47	40	36	56
Mitsubishi PUHZ-RP140VKA/YKA (Heating)	67	64	63	57	54	50	44	37	60
K 315L Extract Fan – without silencer (Outlet)	88	83	80	72	70	69	62	58	77

Table 2: Plant sound power levels

5.3 The proposed extraction fan unit will be fitted with a single 600mm attenuator and will vent above the rear covered yard area. The manufacturer's acoustic performance data of the attenuator is shown below in Table 3.

Model	Sound Reduction Index (dB) per Octave Band Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
600mm Attenuator	8	8	15	20	31	17	14	11

Table 3: Silencer acoustic performance data

5.4 Calculations have been undertaken to determine the noise level at the nearest noise sensitive receptors. The proposed condenser units operate in two modes, heating and cooling, the heating mode presents the highest level and has therefore been used in the calculations to provide a worst case scenario prediction. Calculations were completed using single octave data as shown in full in Appendix C.

5.5 Calculations indicate that, with the proposed plant installed, the noise level at the basement floor adjoining property would be 36 dB L_{Aeq}. Calculations indicate that, with the proposed plant installed, the noise level at the ground floor adjoining property would be 43 dB L_{Aeq}. Calculations indicate that, with the proposed plant installed, the noise level at the first floor adjoining property would be 39 dB L_{Aeq}. Calculations indicate that, with the proposed plant installed, the noise level at the rear of Old Gloucester Street would be 32 dB L_{Aeq}. Noise levels from the proposed plant at all of the identified nearest residential properties are below the established limits, as described in Section 4.6.

6.0 CONCLUSIONS

6.1 An assessment of background noise levels has been carried out at 76 Southampton Row, Camden, London under the requirements of the Local Planning Authority, Camden Borough Council.

6.2 Based upon the survey results and Local Planning Authority guidance, limiting criteria applicable to noise from the installation of external plant have been established. In addition, calculations have been undertaken which demonstrate that noise from the proposed plant and extraction system will not exceed the established noise limits at the nearest residential receptors.

REFERENCES

1. Department for Communities and Local Government. The National Planning Policy Framework (NPPF), 2012.

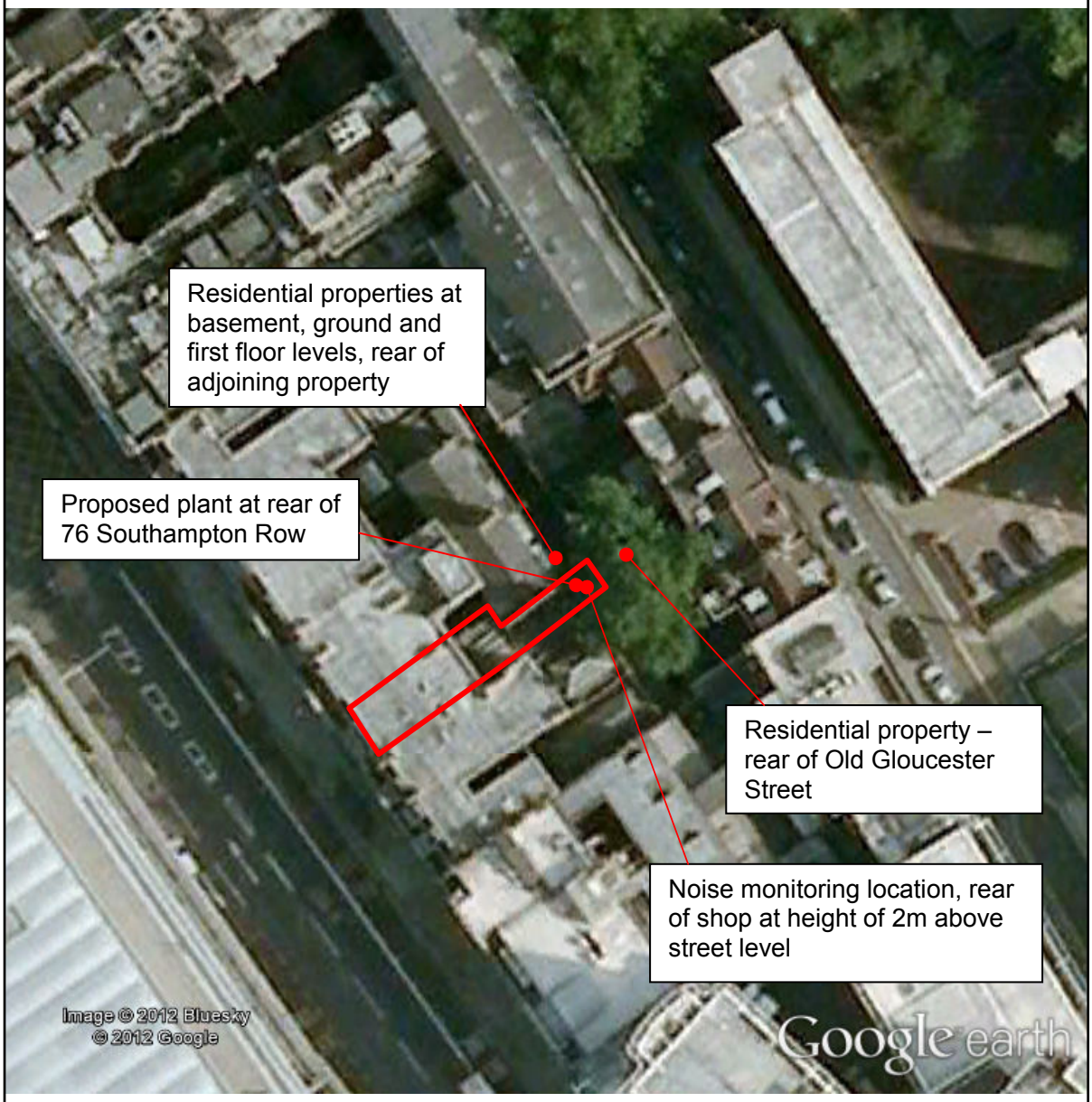
2. Department of the Environment. Planning Policy Guidance (PPG) 24, Planning and Noise, September 1994.

3. Department for Environment, Food and Rural Affairs. Noise Policy Statement for England (NPSE), 2010

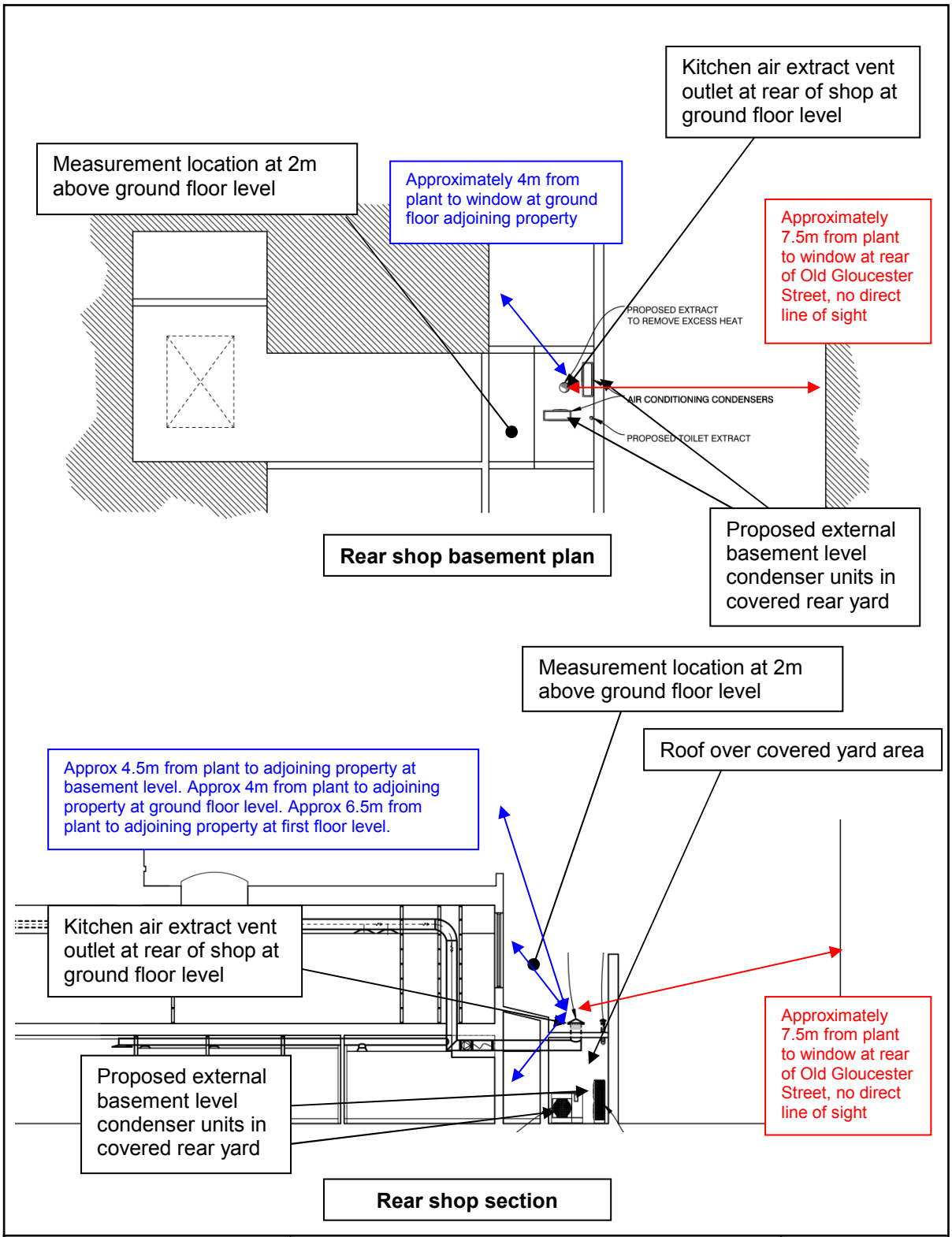
4. British Standards Institution. British Standard 4142. Method for Rating Industrial noise affecting mixed residential and industrial areas, 1997.

5. Camden Borough Council Unitary Development Plan, 2006

6. British Standards Institution. British Standard 7445: 1991 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use'



Project: 76 Southampton Row, Camden	**Title:** Ariel image of site and nearest receptors.	
DWG No: Figure 1	**Scale:** N.T.S.	**Rev:** A
Date: March 2013	**Drawn By:** JE	**Job No:** 4430-1



Project: 76 Southampton Row, Camden	**Title:** Site Layout and Measurement Position	
DWG No: Figure 2	**Scale:** N.T.S.	**Rev:** A
Date: March 2013	**Drawn By:** JE	**Job No:** 4430-1

APPENDIX A: ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 [1] as the " value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

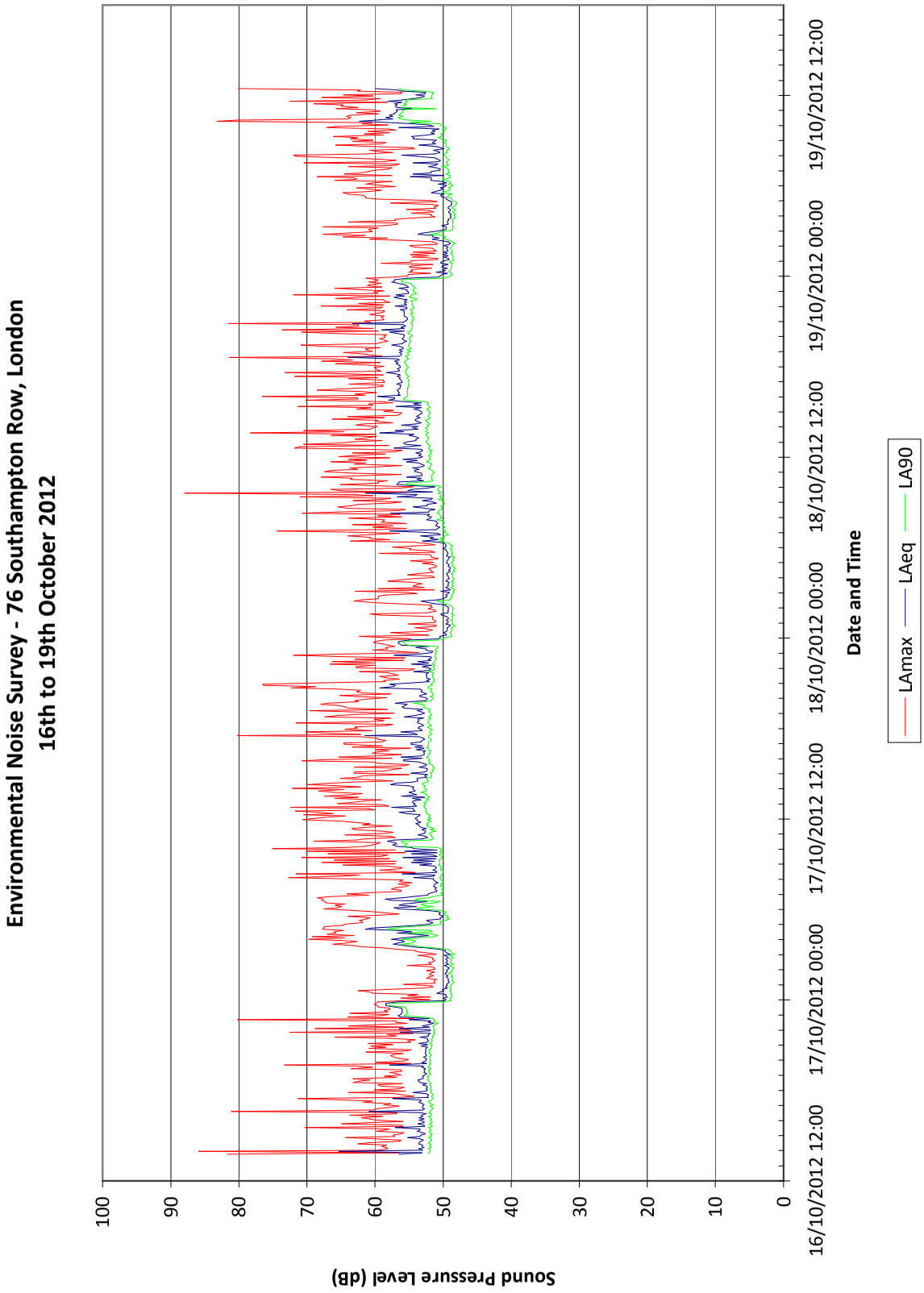
iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B: MEASURED NOISE LEVEL



APPENDIX C1: CALCULATED NOISE LEVELS – BASEMENT FLOOR ADJOINING PROPERTY

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
1) Mitsubishi PUHZ-RP71VHA4	65.0	63.0	58.0	52.0	51.0	47.0	40.0	36.0	**56**	Max heating condition
2) Mitsubishi PUHZ-RP140VKA/YKA	67.0	64.0	63.0	57.0	54.0	50.0	44.0	37.0	**60**	Max heating condition
Lp,rev Reverberant level in covered yard										
1) Mitsubishi PUHZ-RP71VHA4	65.5	63.5	58.5	52.5	51.5	47.5	40.5	36.5		Absorption values for masonry walls and floor with
2) Mitsubishi PUHZ-RP140VKA/YKA	67.6	64.6	63.6	57.6	54.6	50.6	44.6	37.6		timber ceiling in covered yard area
Lp,rev Total noise level in closed yard										
1) & 2)	69.7	67.1	64.8	58.8	56.3	52.3	46.0	40.1		
Attenuation from timber roof										
SRI for timber roof	14.0	18.0	22.0	25.0	21.0	26.0	35.0	35.0		
Yard roof external Lw										
1) & 2)	57.7	51.1	44.8	35.8	37.3	28.3	13.0	7.1		Noise level from surface of coverd yard roof
Distance correction from roof to window										
1) & 2)	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0		Distance to nearest window = 4.5m
Screening and other losses										
1) & 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		None
Noise level at sensitive receptor										
1) & 2)	36.6	30.0	23.7	14.7	16.2	7.2	-8.1	-14.0	**21**	Noise level at receptor window from condenser units only

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
3) K315L Extract fan unit	88.2	83.2	79.7	72.2	70.0	68.8	62.0	58.1	**77**	Unweighted manufacturers data
Distance Loss										
3) K315L Extract fan unit	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0	-21.0		Distance to nearest window = 4.5m
Screening and other losses										
3) K315L Extract fan unit	-13.0	-14.0	-21.0	-26.0	-38.0	-25.0	-22.0	-19.0		600mm attenuator, screening from ground floor roof
Noise level at sensitive receptor										
3) K315L Extract fan unit	54.2	48.1	37.6	25.2	11.0	22.8	19.0	18.1	**36**	Noise level at receptor window from air extract fan

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Combined level from all plant										
1) & 2) & 3)	54.3	48.2	37.8	25.6	17.4	22.9	19.0	18.1	**36**	Total noise level from plant at residential window

APPENDIX C2: CALCULATED NOISE LEVELS – GROUND FLOOR ADJOINING PROPERTY

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
1) Mitsubishi PUHZ-RP71VHA4	65.0	63.0	58.0	52.0	51.0	47.0	40.0	36.0	**56**	Max heating condition
2) Mitsubishi PUHZ-RP140VKA/YKA	67.0	64.0	63.0	57.0	54.0	50.0	44.0	37.0	**60**	Max heating condition
Lp,rev Reverberant level in covered yard										
1) Mitsubishi PUHZ-RP71VHA4	65.5	63.5	58.5	52.5	51.5	47.5	40.5	36.5		Absorption values for masonry walls and floor with
2) Mitsubishi PUHZ-RP140VKA/YKA	67.6	64.6	63.6	57.6	54.6	50.6	44.6	37.6		timber ceiling in covered yard area
Lp,rev Total noise level in closed yard										
1) & 2)	69.7	67.1	64.8	58.8	56.3	52.3	46.0	40.1		
Attenuation from timber roof										
SRI for timber roof	14.0	18.0	22.0	25.0	21.0	26.0	35.0	35.0		
Yard roof external Lw										
1) & 2)	57.7	51.1	44.8	35.8	37.3	28.3	13.0	7.1		Noise level from surface of coverd yard roof
Distance correction from roof to window										
1) & 2)	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0		Distance to nearest window = 4m
Screening and other losses										
1) & 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		None
Noise level at sensitive receptor										
1) & 2)	37.6	31.0	24.7	15.7	17.2	8.2	-7.1	-13.0	**22**	Noise level at receptor window from condenser units only

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
3) K315L Extract fan unit	88.2	83.2	79.7	72.2	70.0	68.8	62.0	58.1	**77**	Unweighted manufacturers data
Distance Loss										
3) K315L Extract fan unit	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0		Distance to nearest window = 4m
Screening and other losses										
3) K315L Extract fan unit	-8.0	-8.0	-15.0	-20.0	-31.0	-17.0	-14.0	-11.0		600mm attenuator
Noise level at sensitive receptor										
3) K315L Extract fan unit	60.2	55.2	44.7	32.2	19.0	31.8	28.0	27.1	**43**	Noise level at receptor window from air extract fan

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Combined level from all plant										
1) & 2) & 3)	60.2	55.2	44.7	32.3	21.2	31.8	28.0	27.1	**43**	Total noise level from plant at residential window

APPENDIX C3: CALCULATED NOISE LEVELS – FIRST FLOOR ADJOINING PROPERTY

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
1) Mitsubishi PUHZ-RP71VHA4	65.0	63.0	58.0	52.0	51.0	47.0	40.0	36.0	**56**	Max heating condition
2) Mitsubishi PUHZ-RP140VKA/YKA	67.0	64.0	63.0	57.0	54.0	50.0	44.0	37.0	**60**	Max heating condition
Lp,rev Reverberant level in covered yard										
1) Mitsubishi PUHZ-RP71VHA4	65.5	63.5	58.5	52.5	51.5	47.5	40.5	36.5		Absorption values for masonry walls and floor with
2) Mitsubishi PUHZ-RP140VKA/YKA	67.6	64.6	63.6	57.6	54.6	50.6	44.6	37.6		timber ceiling in covered yard area
Lp,rev Total noise level in closed yard										
1) & 2)	69.7	67.1	64.8	58.8	56.3	52.3	46.0	40.1		
Attenuation from timber roof										
SRI for timber roof	14.0	18.0	22.0	25.0	21.0	26.0	35.0	35.0		
Yard roof external Lw										
1) & 2)	57.7	51.1	44.8	35.8	37.3	28.3	13.0	7.1		Noise level from surface of coverd yard roof
Distance correction from roof to window										
1) & 2)	-24.2	-24.2	-24.2	-24.2	-24.2	-24.2	-24.2	-24.2		Distance to window from roof = 6.5m
Screening and other losses										
1) & 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		None
Noise level at sensitive receptor										
1) & 2)	33.4	26.8	20.5	11.5	13.0	4.0	-11.3	-17.2	**18**	Noise level at receptor window from condenser units only

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
3) K315L Extract fan unit	88.2	83.2	79.7	72.2	70.0	68.8	62.0	58.1	**77**	Unweighted manufacturers data
Distance Loss										
3) K315L Extract fan unit	-24.2	-24.2	-24.2	-24.2	-24.2	-24.2	-24.2	-24.2		Distance to nearest window = 6.5m
Screening and other losses										
3) K315L Extract fan unit	-8.0	-8.0	-15.0	-20.0	-31.0	-17.0	-14.0	-11.0		600mm attenuator
Noise level at sensitive receptor										
3) K315L Extract fan unit	56.0	50.9	40.4	28.0	14.8	27.6	23.8	22.9	**39**	Noise level at receptor window from air extract fan

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Combined level from all plant										
1) & 2) & 3)	56.0	51.0	40.5	28.1	17.0	27.6	23.8	22.9	**39**	Total noise level from plant at residential window

APPENDIX C4: CALCULATED NOISE LEVELS – REAR OF OLD GLOUCESTER STREET

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
1) Mitsubishi PUHZ-RP71VHA4	65.0	63.0	58.0	52.0	51.0	47.0	40.0	36.0	**56**	Max heating condition
2) Mitsubishi PUHZ-RP140VKA/YKA	67.0	64.0	63.0	57.0	54.0	50.0	44.0	37.0	**60**	Max heating condition
Lp,rev Reverberant level in covered yard										
1) Mitsubishi PUHZ-RP71VHA4	65.5	63.5	58.5	52.5	51.5	47.5	40.5	36.5		Absorption values for masonry walls and floor with
2) Mitsubishi PUHZ-RP140VKA/YKA	67.6	64.6	63.6	57.6	54.6	50.6	44.6	37.6		timber ceiling in covered yard area
Lp,rev Total noise level in closed yard										
1) & 2) condenser units	69.7	67.1	64.8	58.8	56.3	52.3	46.0	40.1		
Attenuation from timber roof										
SRI for timber roof	14.0	18.0	22.0	25.0	21.0	26.0	35.0	35.0		
Yard roof external Lw										
1) & 2) condenser units	57.7	51.1	44.8	35.8	37.3	28.3	13.0	7.1		Noise level from surface of coverd yard roof
Distance correction from roof to window										
1) & 2) condenser units	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5		Distance to window from roof = 7.5m
Screening and other losses										
1) & 2) condenser units	-5.0	-6.0	-6.0	-6.0	-7.0	-8.0	-8.0	-8.0		Screening from parapet wall, path diff = 0.02m
Noise level at sensitive receptor										
1) & 2) condenser units	37.2	31.6	25.3	16.3	18.8	10.8	-4.5	-10.4	**23**	Noise level at receptor window from condenser units only

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
3) K315L Extract fan unit	88.2	83.2	79.7	72.2	70.0	68.8	62.0	58.1	**77**	Unweighted manufacturers data
Distance Loss										
3) K315L Extract fan unit	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5		Distance to nearest window = 7.5m
Screening and other losses										
3) K315L Extract fan unit	-13.0	-14.0	-21.0	-26.0	-38.0	-25.0	-22.0	-19.0		600mm attenuator & screening from parapet wall
Noise level at sensitive receptor										
3) K315L Extract fan unit	49.7	43.7	33.2	20.8	6.5	18.3	14.6	13.7	**31**	Noise level at receptor window from air extract fan

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Combined level from all plant										
1) & 2) & 3)	50.0	44.0	33.8	22.1	19.0	19.0	14.6	13.7	**32**	Total noise level from plant at residential window