Report

External Plant Noise Impact Assessment

72-80 Leather Lane

Sweco Consulting Engineers Limited
3rd Floor Eldon House
2 Eldon Street
London, EC2M 7LS
+44 20 3002 1210

20/07/02021
Project Reference: 65207009
Document Reference: 65207009-SWE-ZZ-XX-RP-YA-0001-C02
Revision: C02
Prepared For: Built Services Design Associates

Status / Revisions

Rev.	Date	Reason for issue	Prepared	Reviewed	Approved
C01	06.07.2022	For information	Ramon Trigueros	James Williams	James Williams
C02	20.07.2022	Updated with the latest extract fan proposals	Ramon Trigueros	James Williams	James Williams

Certifying Body

Sweco are full members of the ANC:

Reg. Office Address:
Sweco UK Limited
Grove House
Mansion Gate Drive
Leeds, LS7 4DN
+44 113 262 0000

Reg. No.: 2888385
Reg. Office: Leeds

www.sweco.co.uk

Sweco UK Limited
3rd Floor Eldon House
2 Eldon Street
London, EC2M 7LS
+44 20 3002 1210

Ramon Trigueros
Senior Acoustic Consultant

ramon.trigueros@sweco.co.uk

Table of contents

1 Executive Summary

Sweco have been instructed by Built Services Design Associates to prepare an External Plant Noise Impact Assessment to assess on the noise impact for the proposed new extract fans at 72-80 Leather Lane, London, EC1N 7TR.

The key acoustic issues are summarised below:

External Building Services Noise

The noise levels at the nearest noise sensitive receptors due to the operation of the new extract fan are expected to be in line with the Local Authority requirements provided that the mitigation measures detailed in this report are included in the design.

2 Introduction

Sweco have been instructed by Built Services Design Associates to prepare an External Plant Noise Impact Assessment to determine the noise impact for the proposed external plant at 72-80 Leather Lane, London, EC1N 7TR.

Sweco (formerly MLM Consulting Engineers) previously carried out an acoustic design assessment for the wider development. The wider development is understood to comprise the refurbishment of the basement and ground floor levels, to form retail spaces and a new bike store and refuse room. The existing residential dwellings on the first floor will be converted into offices. Residential refurbishments are proposed on the 2nd, 4th and 5th floor, and the 3rd floor will be converted from the existing office use into residential dwellings. Proposals also include for the demolition of existing roof and erection of two storey rooftop extension in order to create 4 additional residential units (Class C3), infilling of existing lightwells, internal reconfiguration and shopfront restoration.

In addition to the proposals detailed above, a new extract fan will be installed in the basement of the existing building and one extract fan and one staircase pressurization fan (emergency fan) will be installed on the rooftop. This report details the external plant noise impact assessment for the proposed new plant units only.

It is understood that, with the exception of the emergency fan, the proposed extract fans assessed in this report will exclusively serve the future retail unit which will occupy the basement and ground floor levels of the existing building. It has been confirmed that the operational hours for the retail unit will be 8am to 7pm. It is understood that the extract fans will be operational during this period only.

The external plant noise limits used in this assessment were set out by Sweco for the external plant noise impact assessment of the wider development in accordance with the Local Authority requirements and the British Standard 4142:2014 Method for Rating and Assessing Industrial and Commercial Sound. These limits are based on achieving a rating level which is equal to or less than 10 dB below the measured background noise level at the nearest noise sensitive receptor, during a typical period. The measured background noise levels on site were taken from the planning stage Noise Assessment Report written by Cole Jarman, report reference 16/0440/R1.

This Report firstly defines appropriate acoustic design standards. It goes on to set out the measured acoustic data and presents the Assessment of potential noise impacts in relation to the development. Whilst every effort has been made to ensure that this Report is easily understood, it is technical in nature; a Glossary of Terms in Appendix A is included to assist the reader.

3 Guidance & Assessment Criteria

3.1 Summary of Standards and Guidances

A summary of the relevant policy, standards and guidance documents used to inform the noise impact assessment of the scheme is provided below. Further details are provided in Appendix B.

- BS 4142:2014 “Method for Rating and Assessing Industrial and Commercial Sound”
- Local Authority Acoustic Requirements – Camden Council.

3.2 Local Authority Requirements – Planning Condition 7

“The external noise level emitted from plant, machinery or equipment with specified noise mitigation at the development hereby approved shall be lower than the lowest existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.”

4 Proposed Development

4.1 Site Description

The site is located to the south of Hatton Wall and east of Leather Lane. It falls within the jurisdiction of Camden Council. The surrounding area is a mixture of residential and commercial premises.

The location of the proposed development site is identified in Figure 1.

Figure 1: Site Location (red line)

The nearest/worst-affected existing noise-sensitive receptors are expected to be the residential properties on Leather Lane, opposite the proposed development, as well as residential properties in the courtyard to the southeast.

4.2 Proposed Development

The proposed development comprises the installation of a new extract fan in the basement of the existing building. The outlet ductwork will terminate at the eastern façade of the existing building at ground floor level. An extract fan and a staircase pressurization fan (emergency fan) are also proposed on the rooftop.

The figures below show the layout for the proposed extract fans and the emergency fan.

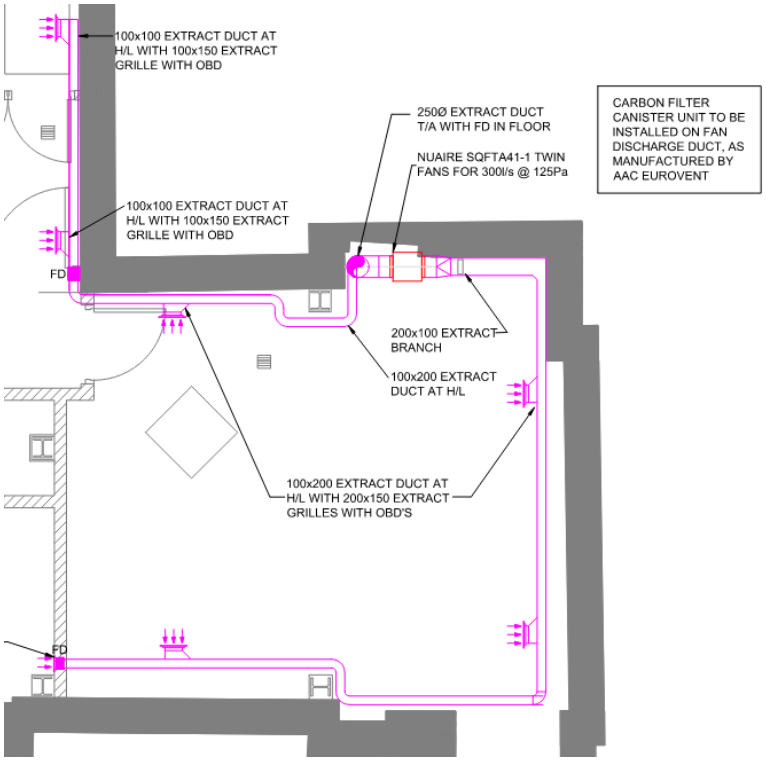

Figure 2: Proposed Layout – Basement

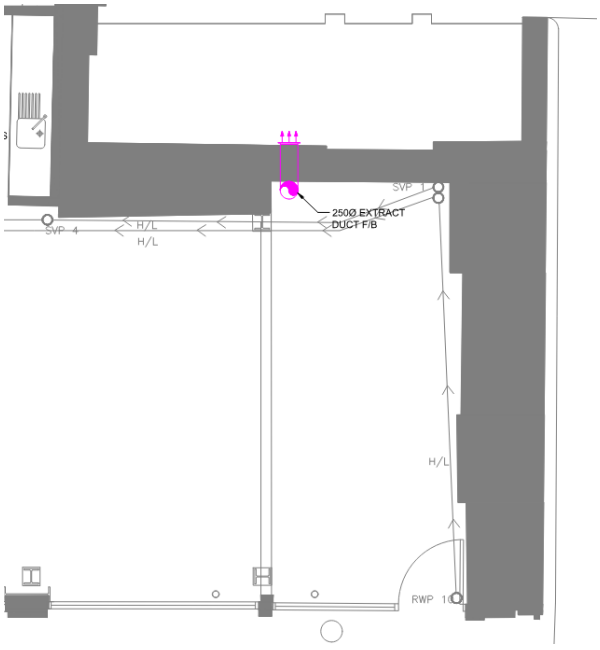

Figure 3: Proposed Layout – Ground Floor (Basement Extract Fan Termination)

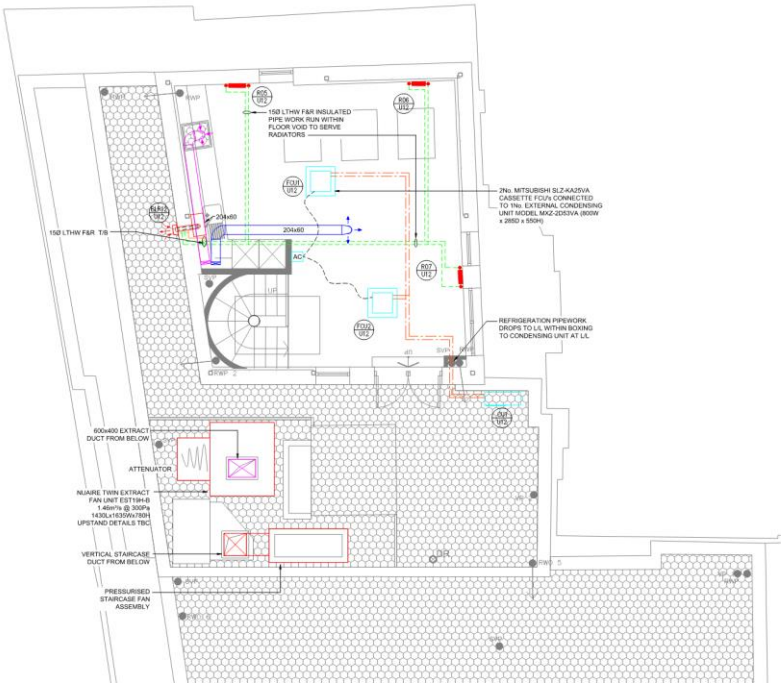

Figure 4: Proposed Layout – Rooftop Extract Fan

5 Building Services External Noise Emissions

5.1 External Plant Noise Limits (at Nearest Noise Sensitive Receptor)

The noise criteria set out in Table 1 are proposed in accordance with the local authority criteria.

Table 1: Proposed Plant Noise Rating Limits

Location	Operating Period	Measured Background Noise Level $L_{A90,T}$	Proposed "Rating Level" At the Nearest Noise Sensitive Receptor $L_{Ar,T}$
NNSR (1m from nearest window)	Retail unit operational hours (08:00-19:00)	49	39

The above limits apply to the total sound emission level from all static plant and processes within the proposed development. Individual plant items may need to be designed to a lower limit such that the overall total achieves the stated criteria above. Should the proposed plant items be found to be tonal, or impulsive in nature (so as to attract attention), a penalty correction would likely be applied to the plant rating level.

Compliance with the above limiting noise levels would result in a low impact at existing receptors.

5.2 Nearest Noise Sensitive Receptors

The worst affected receptors due to the operation of the proposed new extract fan are expected to be the windows at the facades marked up in the picture below.

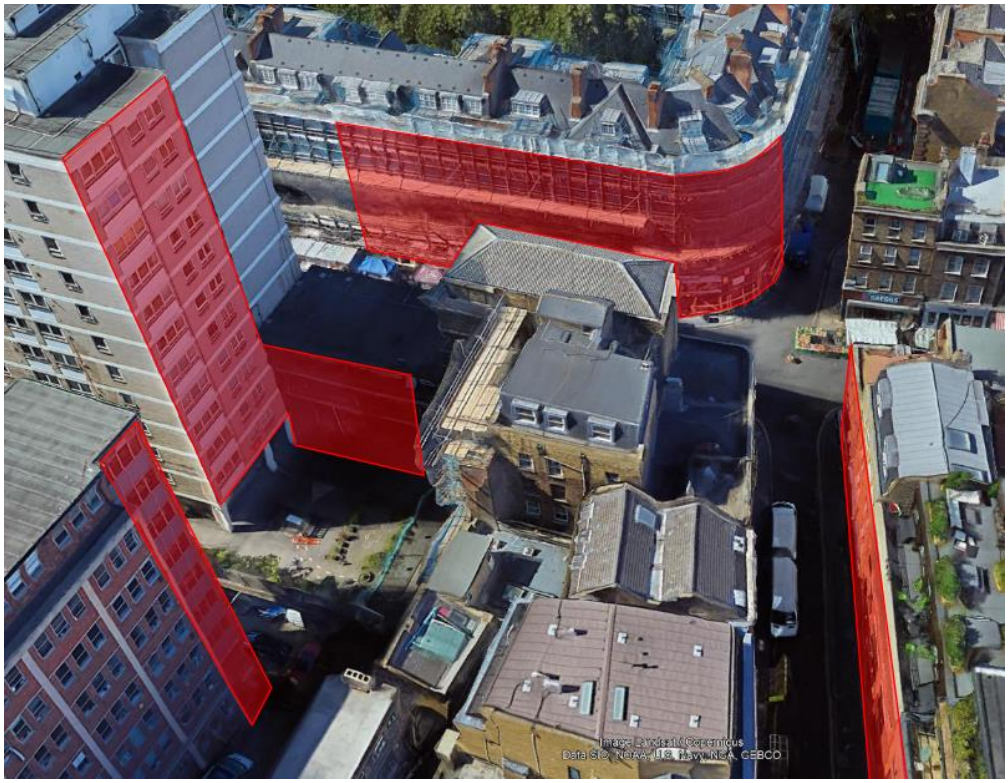

Figure 5: Worst Affected Receptor Locations (Red areas)

5.3 Proposed Plant

5.3.1 Plant Noise Levels

The Table below sets out details for the proposed plant. The sound level data for the proposed extract fans has been taken from the unit specifications brochures available in the manufacturer website.

Table 2: Proposed Plant Levels

Reference	Description	Sound Power Level (dB) at Octave Band Centre Frequency, Hz							
		63	125	250	500	1000	2000	4000	8000
Extract Fan Nuaire SQFTA41-1	Outlet	87	94	74	68	74	75	70	64
Extract Fan S&P 5137835200 - CVAT-12000/560 N	Induct Outlet	69	68	66	68	69	70	66	62
	Breakout	71	68	64	48	47	50	49	40

Table 2: Proposed Plant Levels									
Reference	**Description**	**Sound Power Level (dB) at Octave Band Centre Frequency, Hz**							
		63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
ECOWATT 3KW	SPL@3m	39							
Smoke Shaft Extract Unit – GroupSCS - EV/EU/63 (Fire Mode)	Induct Outlet	106	109	106	101	96	94	92	89
	Breakout	96	88	80	76	71	67	73	65
	SPL@3m (Outlet)	83							
	SPL@3m (Breakout)	60							

5.3.2 Assessment Assumptions

The following assumptions have been made for this assessment:

- The duct length between the basement extract fan and the façade termination is approximately 3m.

5.3.3 Plant Locations

The main plant areas which will cause noise are listed below:

- Basement: Extract fan. The extract fan will be ducted to the eastern façade at ground floor level. The proposed layout for the extract fan is shown in Figures 2 and 3 in Section 4.2 of this report.
- Rooftop: Extract fans. The rooftop plant layout comprises the proposed extract fans as shown in Figure 6 Section 4.2 of this report.

5.4 Required Mitigation Measures

5.4.1 Extract Fan Silencers

The proposed extract fans require silencers to the atmospheric side. The minimum insertion loss specifications for the required attenuators are detailed in the table below.

Table 3 - Attenuator Insertion Loss Requirements - Atmosphere side								
Description	**Minimum Sound Static Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Basement Extract Fan	8	8	12	17	28	22	14	13

Table 3 - Attenuator Insertion Loss Requirements - Atmosphere side								
Description	**Minimum Sound Static Insertion Loss (dB) at Octave Band Centre Frequencies (Hz)**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Rooftop Extract Fan	2	4	6	10	14	10	7	8
Smoke Shaft Extract Fan	4	6	11	17	17	14	12	11

The silencers for the proposed extract fans should be specified to achieve the minimum insertion losses detailed in the table above.

5.5 Plant Noise Predictions

5.5.1 Typical Operation

Predictions have been undertaken to determine the expected plant noise level at the NNSRs. The likely effect of the proposed noise sources has been predicted using the Cadna/A suite of noise modelling software. This software utilises standard acoustic principles (ISO9613:2) in conjunction with approved prediction methodologies and is a tried and tested method for accurately predicting and assessing the impact of noise from a variety of sources.

The table below summarises the predicted specific noise levels due to the proposed new extract fans.

Table 5: Predicted Specific Plant Noise Levels – Typical Operation	
Location	**Predicted Specific Noise Levels dB $L_{Aeq,T}$**
NNSR (Worst affected window)	33

By assessing in accordance with BS4142:2014 against the typical background levels, the assessment is as follows:

Table 6 – BS4142 Assessment - Worst Affected Receptor			
Results	**Sound Levels**	**Relevant BS4142 clause**	**Commentary**
Predicted Specific Sound level	$L_{Aeq,\ 60\ mins}$ = 33 dB	7.3.4; 7.3.5; Table 5 above.	
Acoustic feature correction	0 dB	9.2	No feature correction deemed necessary
Rating level	33 + 0 = 33 dB	9.2	

Table 6 – BS4142 Assessment - Worst Affected Receptor			
Results	**Sound Levels**	**Relevant BS4142 clause**	**Commentary**
Background sound level	$L_{A90(60\ mins)}$ 49 dB	8	Background sound levels are relatively variable but are typically at this level
Excess of rating over background sound level	(33 – 49) = -16 dB	10	Below the background indicates low impact
Assessment indicates likelihood of low impact			
Uncertainty of the assessment	Not significant	10	Predicted plant noise levels significantly lower than the measured background noise levels during the extract fan operational hours.

The assessment above shows that the plant rating level is at least 16 dB below the existing background noise levels at the NNSRs. This is an indication of a low impact in accordance with BS4142 and is compliant with the Local Authority requirement (Planning Condition 7).

5.5.2 Emergency Condition

The table below summarises the predicted specific noise levels during emergency conditions. This includes the plant assessed under typical conditions above, and also the proposed staircase pressurisation fan.

To avoid significant adverse impact, a plant noise level at the receptors of 10dB above the typical background noise level during the daytime period is targeted (59 dBA). This is generally accepted as the noise limit for emergency plant, however is higher than the limiting criteria set out in the planning conditions, and therefore we recommend that this approach is reviewed and signed off by the Local Authority before the design is finalised.

Table 7: Predicted Specific Plant Noise Levels - Emergency	
Location	**Predicted Specific Noise Levels dB $L_{Aeq,T}$**
NNSR (Worst affected window)	56

As shown above, the predicted specific emergency plant noise level at the nearest residential receptor is below the proposed rating limit . This is deemed to be acceptable provided all testing of the emergency equipment occurs during the daytime period only. Local Authority sign-off is required for this element of the assessment.

6 Conclusion

Sweco have been instructed by Built Services Design Associates to prepare an External Plant Noise Impact Assessment to assess on the noise impact for the proposed new extract fans at 72-80 Leather Lane, London, EC1N 7TR.

The noise levels at the nearest noise sensitive receptors due to the operation of the proposed plant detailed in this report are expected to be at least 10dB below the existing background noise levels provided that the mitigation measures detailed in this report are included in the design. Therefore, compliance with the Planning Condition 7 requirements is expected.

Appendix A - Glossary of Acoustic Terminology

Wording	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascal's) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.

Wording	Description
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.
Insertion Loss	The sound level reduction at a given location due to the insertion of a noise control device, expressed in decibels. The difference, in decibels, between the sound pressure level before and after the effect of a sound-attenuating device.
R_w	Sound Reduction Index: laboratory measurement that characterises the sound insulating properties of a material or building element in a stated frequency band. It is calculated through the following formula: R = L1 – L2 + 10 log (S/A), where L1 is the average sound pressure level in the source room, L2 is the average sound pressure level in the receiving room, S is the area of the test specimen in m^2 and A is the equivalent sound absorption area of the receiving room). The w weighting is used to provide a single-number quantity for the sound reduction performance of a material or building element, and it is calculated in line with BS EN ISO 717-1.
D_{nTw}	Standardized Level Difference: in-situ sound insulation measurement between two rooms, which includes the effects of flanking transmission, different room sizes and other on-site considerations (differing from a laboratory measurement). This index corrects the measured level difference between rooms to a standardized reverberation time of 0.5 seconds. This RT value is often cited as approximately average for a medium sized, carpeted and furnished living room. The level difference per each frequency band is calculated using the following formula: D_{nT} = D + 10 log (T/T0), where D is the level difference (L1-L2), T is the reverberation time in the receiving room and T0 is the reference reverberation time (0.5 seconds for habitable rooms). The w weighting is used to provide a single-number quantity for the sound reduction performance of a material or building element, and it is calculated in line with BS EN ISO 717-1.
C_{tr}	Spectrum adaption term for an urban traffic noise spectrum, which is usually added to R_w or D_{nTw} values in order to characterise their sound insulation performance taking into account low frequency noise. This C_{tr} adaption term is calculated using the BS EN ISO 717-1.
L_i	Impact Sound Pressure Level: average sound pressure level in a one-third octave band in the receiving room when the floor under test is excited by the standardized impact sound source; it is expressed in decibels.

Wording	Description
L'_{nTw}	Weighted Standardized Impact Sound Pressure Level: in-situ impact sound pressure level in a stated frequency band, corrected for the standardized reverberation time of 0.5 seconds for a medium sized, carpeted and furnished living room. It is calculated using the following formula: $L_{nT} = L_i$ - 10 log (T/T0), where Li is the impact sound pressure level, T is the reverberation time in the receiving room and T0 is the reference reverberation time (0.5 seconds for habitable rooms). The w weighting is used to provide a single-number quantity for the impact sound pressure level of a floor, calculated in line with BS EN ISO 717-2. The L_{nTw} is the equivalent index for laboratory measurements.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB.

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible).

Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence

of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins\ dB}$. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms

Appendix B - Policy and Assessment Methodology

British Standard BS 4142:2014

BS 4142 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142 for assessing the effect of sound is to compare the measured or predicted sound level from the source in question, the LAeq,T 'specific sound level', with the LA90,T background sound level at the assessment location.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the LAr,Tr 'rating sound level'. A correction to include consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS 4142 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

Table B1: Classification of Industrial/Commercial Noise Impacts

Difference Between Rating Sound Level and Background Sound Level (dB)	Impact Category (depending on the context)
+ 10 dB or more	Significant adverse impact
+ 5 dB	Adverse impact
Equal or less than	Low impact

For the daytime, the assessment is typically carried out over a reference time period of one hour, but at night-time it is carried out over a 15-minute period. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating sound level does not exceed the background sound level, this is an indication of the specific sound source having a low impact and would therefore be classified as a No Observed Adverse Effect Level.