hepworth acoustics

CLEADON SERVICE STATION, SUNDERLAND
NOISE IMPACT ASSESSMENT OF PROPOSED NEW JET WASH BAYS

On behalf of:

Motor Fuel Limited

Report No: P22-051-R01v2
August 2022

CLEADON SERVICE STATION, SUNDERLAND
IMPACT ASSESSMENT OF PROPOSED NEW JET WASH BAYS

Report prepared by:
Hepworth Acoustics Ltd
21 Little Peter Street
Manchester
M15 4PS

On behalf of:
Motor Fuel Limited

Report prepared by: James Shaw MIOA – Senior Consultant	[redacted]
Report checked by: Thomas Bailess MEng MIOA – Principal Consultant	[redacted]

CONTENTS

1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by Motor Fuel Limited to carry out a noise impact assessment in connection with a planning application for a new jet wash bay alongside an existing bay at Jet Service Station, off Shield Road (A1018) in Cleadon near Sunderland.

1.2 Jet Service Station operates 06:00 – 23:00 seven days a week. The location of the service station is shown in Figure 1. The service station is bounded to the north by North Street with 'The Cottage Tavern' Public House and dwellings beyond. To the south are dwellings that front onto Shields Road itself. To the west is Shields Road with Cleadon Village pub and associated car park beyond. To the east are dwellings located off Front Street.

1.3 The nearest dwellings to the proposed jet wash bay are the dwellings south of the site that Front onto Shields Road as shown in Figure 1.

1.4 We understand the new jet wash bay is proposed to operate between 07:00 – 23:00 daily therefore we have assessed the potential noise impact on nearby dwellings during the early morning on a Sunday as this is likely to be the quietest time of the operating hours based on our experience.

1.5 The proposals include enclosing the jet wash bays with a 2.7m high clear screen to all sides except the western elevation which will be used for entry and egress of vehicles. As part of the proposals, the automatic carwash will be removed. The layout of the development, including the proposed positions of the new jet wash bay, is shown in Figure 2.

1.6 The noise assessment has included:

- An inspection of the site and surrounding area;
- Measurement of background noise levels during the morning on a Sunday;
- Assessment of the potential noise impact on the nearest dwellings; and,
- Recommendation of appropriate noise mitigation measures.

1.7 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 GUIDANCE & CRITERIA

2.1 British Standard 4142:2014+A1:2019, '*Methods for Rating and Assessing Industrial and Commercial Sound*' (referred hereafter as BS4142) is appropriate guidance for assessing the potential noise impact from commercial noise sources.

2.2 BS4142 requires a 'rating' level ($L_{Ar,Tr}$) calculated from the operation of the noise source to be compared with the background sound level (L_{A90}) which is measured in the absence of the noise source, evaluated over a 1-hour period for daytime operations and 15-minute period for night-time operations.

2.3 The rating level ($L_{Ar,\,Tr}$) is based on the 'specific' sound level ($L_{Aeq,Tr}$) attributed to the operating noise source, with 'character corrections' added for sound sources where 'certain acoustic features can increase the significance of impact'.

2.4 The character correction applied to the specific sound level in order to obtain the rating level can take into account tonality, intermittency, impulsivity, and characteristics otherwise distinctive against the prevailing noise climate in the area.

2.5 An initial estimate of the potential noise impact from the operating noise source is determined by comparing the difference between the background level and the rating level.

2.6 Regarding the outcome of the initial estimate, BS4142 states that:

- Typically, the greater this difference, the greater the magnitude of impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and,
- The lower the rating level is relative to the measured background level, the less likely it is that the operation will have an adverse impact or a significant adverse impact. Where the rating level is does not exceed the background sound level, this is an indication of the specific sound source having low impact, depending on the context.

2.7 The initial numerical assessment and the context are then both taken into account when determining the potential noise impact.

2.8 Where the initial estimate of the impact needs to be modified due to the context, BS4142 states that all pertinent factors should be taken into account in determining whether the initial estimate of the impact needs to be modified, including:

i. The absolute level of sound, including "where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds background"

ii. The character and level of the residual sound

iii. The sensitivity of the receptor and whether dwellings… will already incorporate design measures that secure good internal and/or outdoor acoustic conditions

3.0 NOISE SURVEY

3.1 Background noise measurements were taken between approximately 07:10 and 09:10 on Sunday 27th February 2022, at a location representative of the nearest dwellings to the south of the service station, as indicated in Figure 1.

3.2 The measurements were taken in 15-minute periods in 'free-field' conditions and at a microphone height of approximately 1.5 m above the ground. Calibration checks were carried out both before and after the measurement periods with no variance in levels.

3.3 Weather conditions during the noise survey were suitable for sound level measurements. Full details of the weather conditions and the monitoring equipment used can be seen in Appendix II.

3.4 The results of the background noise survey can be seen in full in Appendix II and a summary is shown in Table 1.

Table 1: Summary of Range of Measured Background Noise Levels (dB)

Location	$L_{Aeq,15\ min}$	$L_{A90,15\ min}$
1.	60-64	45-53

3.5 The main contribution to the noise climate during the background noise survey was road traffic noise from Shields Road and infrequent use of the petrol forecourt.

4.0 NOISE ASSESSMENT

Jet Wash Noise Levels

4.1 We have been advised that typically the existing car wash is used 5-10 times per day. As there is currently no data available regarding estimated jet wash customer numbers for the new bay, we are informed by the Client that usage is expected to be similar. Nevertheless, for a robust assessment we have assumed two uses per hour of each bay, for a total of four uses across both bays per hour.

4.2 The existing jet wash bay was not in operation during our site visit, however staff confirmed that each wash cycle takes approximately 5-6 minutes, so it is assumed for assessment purposes that each jet wash bay is likely to operate for up to 12 minutes per hour (two washes per hour). We have assumed that both bays are in use simultaneously to consider the worst-case scenario.

4.3 It should be noted that these estimates are high customer numbers to account for a worst-case and real-world numbers are likely to be lower, especially on a Sunday morning.

4.4 We have recently attended another similar MFG service station where a newly installed MFG jet wash bay system has been installed, the purpose of the visit was to carry out detailed measurements of source noise levels.

4.5 Noise measurements were taken at a reference distance of 5m from the centre of the bay during an entire jet wash process. The results of the noise measurements were consistent across multiple wash cycles on different vehicles. The measured noise level was 96 dB L_{AE} at 5m.

4.6 This sound exposure level (96 dB L_{AE} at 5m) has been time corrected to account for four jet wash uses across both bays over the one hour assessment period.

4.7 The daytime noise level at 5m for four jet wash uses over a one hour period is 66 dB $L_{Aeq,1hr}$. Taking into account the distance attenuation between the jet wash bays and the nearest dwelling, the resulting daytime noise levels are 60 dB $L_{Aeq,1hr}$.

4.8 The jet wash bay should be constructed with screens around three sides of the bay and extended to the south to shield the dwelling to the adjacent as shown in Figure 2.

4.9 On the basis that the construction of the bay screens are sealed, extend fully to the ground, have a surface mass of at least 10 kg/m^2 and are a height of at least 2.7m, we have used details of the

relative heights of the jet wash source noise, the 2.7m high screening and the height of the gable end first-floor windows of the nearest dwelling to calculate the potential noise screening reduction using the Fresnel number method. As jet wash noise does not have any significant low frequency noise associated with it, we have taken the screening attenuation as the Fresnel attenuation value at 1khz frequency of 17 dB, as shown in Appendix III.

4.10 The resulting jet wash noise levels at the nearest dwellings are 43 dB $L_{Aeq,1hr}$.

4.11 The mode (most common) of the measured background noise levels is 47 dB L_{A90}, which has therefore been adopted as the typical background noise level for the assessment

4.12 In terms of applicable character corrections, the noise source is neither impulsive nor tonal. However, due to the intermittent nature of the noise, we have included a +3 dB character correction to account for this.

4.13 The results of the initial BS 4142:2014 assessment is shown in Table 2.

Table 2: Initial BS 4142 Assessment at Nearest Dwellings (dB)

Description	Assessment
Specific source level at assessment location ($L_{Aeq,T}$)	43
Character correction	+3
Rating level ($L_{Ar,T}$)	46
Background level ($L_{A90,T}$)	47
Excess of rating level over background level	-1
Likelihood of impact	Initial assessment indicates a likelihood of low adverse impact

4.14 The outcome of the initial BS 4142:2014 assessment shown in Table 2 indicates that the noise impact resulting from use of the proposed jet wash bays during the daytime is likely to be within suitable limits.

Context:

Relevant factors to be considered:

Specific Sound Level v Residual Sound Level – The specific sound level of 43 dB L_{Aeq} from the proposed use of the jet wash bays is more than 10 dB(A) lower than the existing (residual) L_{Aeq} noise levels due to road traffic noise from Shield Road. This indicates low impact.

The character of noise from the jet wash will be comparable to that of the prevailing noise sources, i.e. road traffic and an existing jet wash bay.

Recommendations

4.15 As our assessment has included acoustic screening proposed by the proposed jet wash bays screens, we recommend that the screening is extended as shown in Figure 2, constructed of a solid material with a minimum area density of 10 kg/m^2 with no holes or gaps and a minimum height of 2.7 m, to ensure that the jet wash noise levels are in line with those predicted in the assessment.

4.16 Nevertheless, in order to minimise noise, we would make the following recommendations:

- Car radios should be turned off during hand usage of the jet wash.
- Idling of vehicles should be kept to a minimum. Engines should be turned off when stationary.

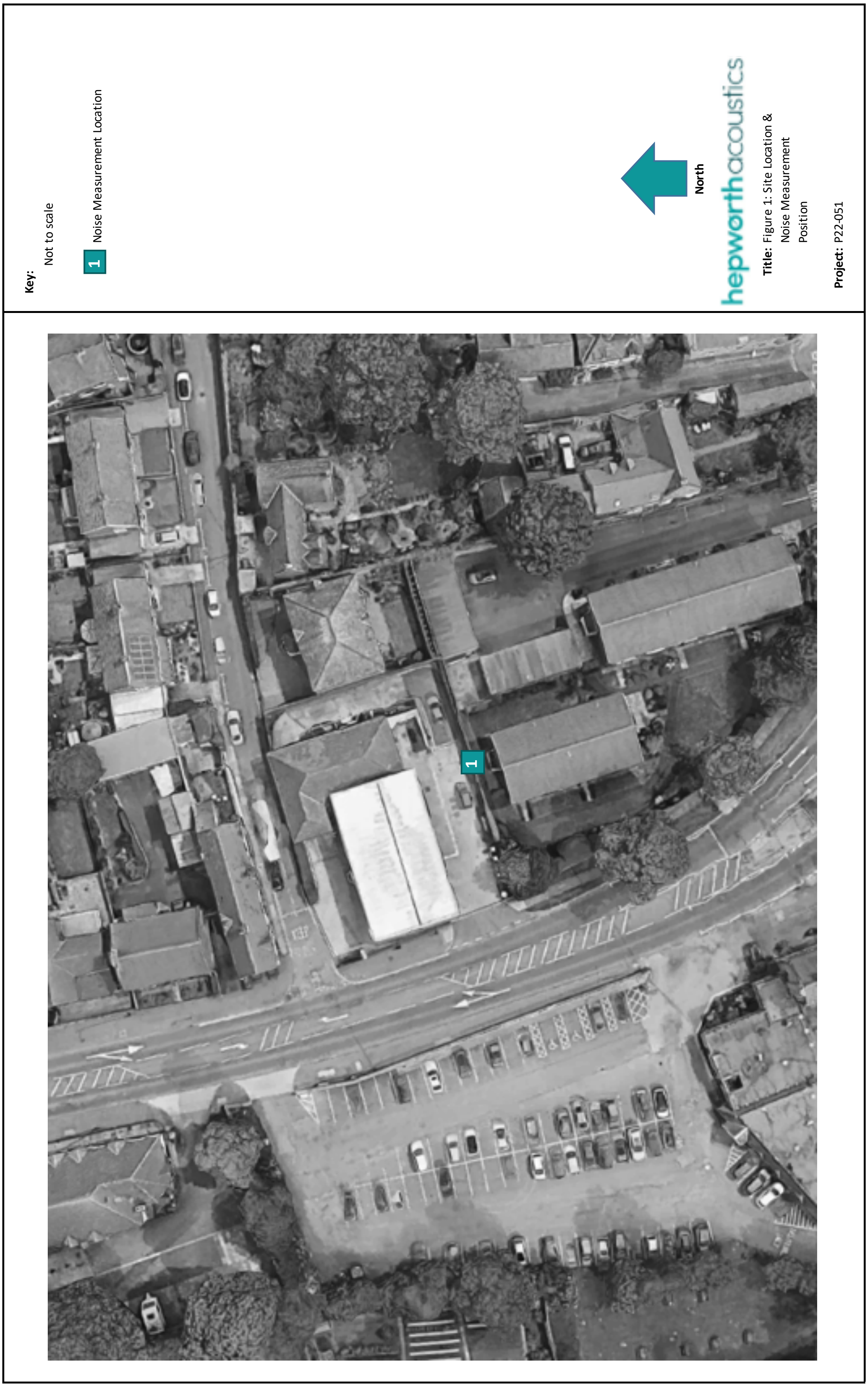
5.0 SUMMARY

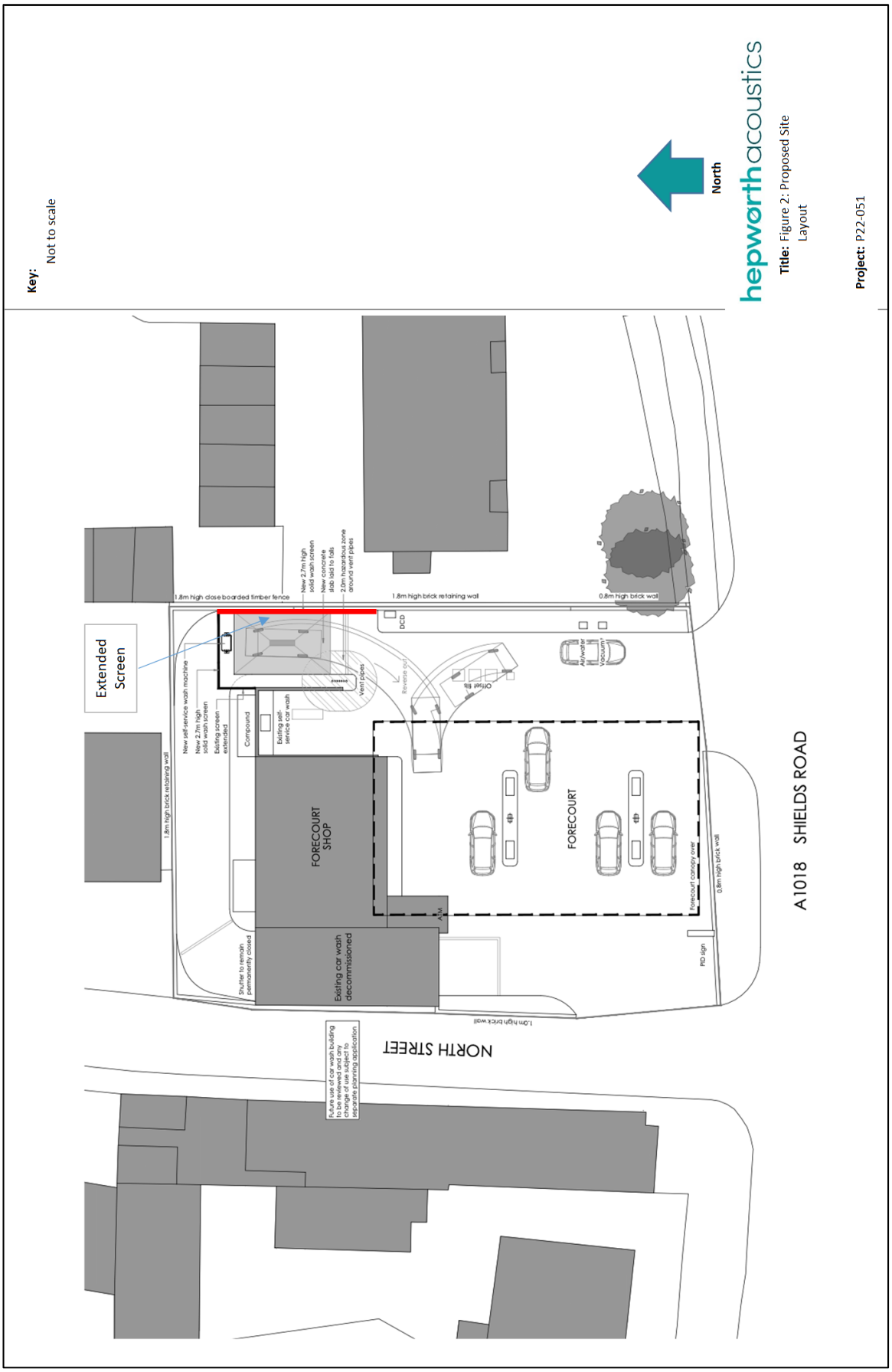
5.1 Hepworth Acoustics Ltd was commissioned by Motor Fuel Ltd to carry out a noise impact assessment in connection with a planning application for a new jet wash bay at Jet Service Station in Cleadon near Sunderland.

5.2 The assessment has included measurement of background sound levels at a location representative of the nearest dwelling.

5.3 The potential noise from use of the proposed jet wash bays has been calculated and the potential noise impact from the jet wash bays has been assessed based on the methodology of BS 4142:2014+A1:2019.

5.4 Taking into account the proposals for acoustic jet wash bay screens including the extension of the southern screen, the assessment demonstrates that there would be no unacceptable noise impact on the amenity of the nearest residents.


Key:
Not to scale
1 Noise Measurement Location
North
Title: Figure 1: Site Location & Noise Measurement Position
Project: P22-051
1


Key:
Not to scale
North
hepworthacoustics
Title: Figure 2: Proposed Site Layout
Project: P22-051
Extended Screen
1.8m high close boarded timber fence
New 2.7m high solid wash screen
New concrete slab laid to falls
20m hazardous zone around vent pipes
1.8m high brick retaining wall
0.8m high brick wall
DCD
Air/water
Vacuum
Offset fills
Reverse out
Vent pipes
New self-service wash machine
New 2.7m high solid wash screen
Existing screen extended
Compound
Existing self-service car wash
1.8m high brick retaining wall
FORECOURT SHOP
FORECOURT
Forecourt canopy over
0.8m high brick wall
Pylon
Existing car wash decommissioned
Shutter to remain permanently closed
PID sign
1.0m high brick wall
NORTH STREET
Future use of car wash building to be reviewed and any change of use subject to separate planning application
A1018 SHIELDS ROAD

Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

$L_{Aeq,T}$ This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, $L_{Aeq,T}$ is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{AFmax} This is the maximum A–weighted noise level that was recorded during the measurement period in terms of 'Fast' time weighting.

$L_{A90,T}$ This is the A–weighted noise level exceeded for 90% of the time period. $L_{A90,T}$ is used as a measure of background noise.

L_{AE} This is the A–weighted 'Sound Exposure Level' which is used for measuring discrete noise events. Essentially it is a measure of the sound energy of the whole noise event normalised to a period of 1 second. The SEL value can be used to calculate the actual L_{Aeq} value for a given time period if the number of noise events is known.

Appendix II: Noise Survey Results

Date(s):	Sunday 27th February 2022
Equipment	B&K 2250 'Class 1' sound analyser (serial no. 3011706) with tripod and associated calibrator
Weather	Dry, cold ~3-5C, clear skies and calm wind speed <3 m/s

All levels in dB(A)

Location 1:

Time		Measured Noise Levels (dB)			Comments
Start	End	L_{AFmax}	$L_{Aeq,T}$	$L_{A90,T}$	
07:09	07:24	74.9	60.4	46.6	Vehicles on Shields Road.
07:24	07:39	72.7	60.7	45.2	Vehicles on Shields Road.
07:39	07:54	74.3	62.3	47.1	Vehicles on Shields Road. Car on forecourt
07:54	08:09	72.8	62.1	48.6	Vehicles on Shields Road.
08:09	08:24	76.5	62.0	47.5	Vehicles on Shields Road. Car on forecourt
08:24	08:39	75.0	62.5	47.4	Vehicles on Shields Road.
08:39	08:54	77.5	63.0	51.0	Vehicles on Shields Road. Cars on forecourt
08:54	09:09	72.7	64.0	53.4	Vehicles on Shields Road. Cars on forecourt

Appendix III: Barrier Calculation

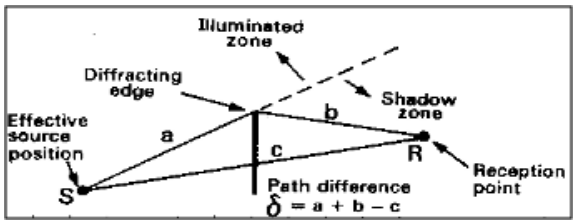
Barrier Attenuation	h (Source)	h(Reciever)	h(Barrier)	d(S-B) m	d(B-R) m	d(S-B-R)
	1.0	4.0	2.7	2	10	11.8

a	b	c	Path Diff	Log (Path Diff)
2.50	10.08	12.18	0.40720	-3.90E-01

Frequency (Hz)	250	h(S)-H(R)	h(S)-H(R)/SBR	Theta	h(min shadow)	Zone
Speed (c)	344	3	0.254237288	0.248963	1.457627119	Shadow

			Barrier Correction dB(A)
CRTN			-13
Fresnel	At Frequency (Hz)		-12
Octave Band		63	-8
		125	-10
		250	-12
		500	-14
		1000	-17
		2000	-20
		4000	-23
		8000	-26

BS5228



Minimum mass kg/m^2	4.6