

SHELL SERVICE STATION, 211 SHINFIELD ROAD, READING

NOISE ASSESSMENT OF PROPOSED JET WASH BAYS

On behalf of:

Motor Fuel Limited

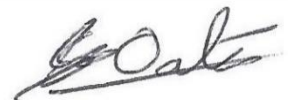
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CONTENTS

1.0	INTRODUCTION	1
2.0	GUIDANCE & CRITERIA	2
3.0	BACKGROUND NOISE SURVEY	5
4.0	NOISE ASSESSMENT	8
5.0	SUMMARY & CONCLUSION	10
	FIGURE 1: SITE LOCATION & NOISE SURVEY LOCATIONS	11
	FIGURE 2: PROPOSED SITE LAYOUT	12
	FIGURE 3: JET WASH BAY PROPOSALS & ELEVATIONS	13
	APPENDIX I: NOISE UNITS & INDICES	14
	APPENDIX II: NOISE SURVEY RESULTS	16

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 two new jet wash bays at Shell Service Station, 211 Shinfield Road, Reading.
- 1.2 The Service Station operates 24 hours a day seven days a week, with an automated car wash on the premises which we understand operates between 06:00 and 00:00 weekdays and weekends. The location of the service station is shown in Figure 1.
- 1.3 We understand that the proposed operating hours of the two new proposed jet wash bays are: 07:00-20:00 Mon-Sat and 10:00-20:00 on Sundays.
- 1.4 The nearest dwellings to the proposed jet wash bays are located on Shinfield Rise to the south-east of the service station as shown in Figure 1.
- 1.5 The layout of the development, including the proposed positions of the jet wash bays, is shown in Figure 2. The proposals include 2.8m high bay screens which will enclose the jet wash bays on three sides as shown in Figure 3.
- 1.6 The noise assessment has included:
- An inspection of the site and surrounding area;
 - Measurement of background noise levels during a representative period;
 - Calculation of car wash bay noise levels at the nearest dwellings; and,
 - Assessment of the potential noise impact on the nearest dwellings.
- 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 The National Planning Policy Framework (NPPF) February 2019 paragraph 180 states that *“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;”*
- 2.2 The Noise Policy Statement for England (NPSE) 2010, which is referred to in the NPPF, includes three aims:
- i. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - ii. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - iii. Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

BS 4142:2014+A1:2019

- 2.3 British Standard 4142:2014+A1:2019, *‘Methods for rating and assessing industrial and commercial sound’* is appropriate guidance for assessing the potential noise impact from commercial noise sources.
- 2.4 BS 4142 requires a ‘rating’ level ($L_{A,r,Tr}$) 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.

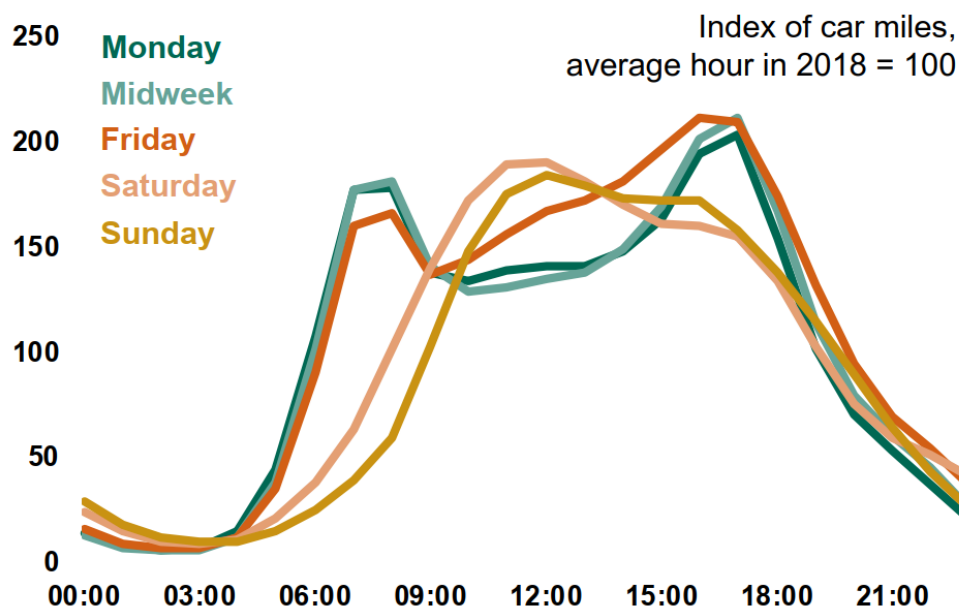
- 2.5 The rating level ($L_{Ar,Tr}$) is based on the 'specific' sound level ($L_{Aeq,Tr}$) attributed to the operating noise source, with 'character corrections' added for sound sources where 'certain acoustic features can increase the significance of impact'.
- 2.6 The character correction applied to 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.
- 2.7 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.
- 2.8 Regarding the outcome of the initial estimate, BS 4142 states that:
- Typically, the greater this difference, the greater the magnitude of impact;
 - A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
 - A difference of around +5dB 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.
- 2.9 BS 4142 states that all pertinent factors must be taken into account regarding the context in which the noise occurs, including:
- The absolute level of sound.
 - The character and level of the residual sound compared to the specific sound; and,
 - The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that ensure good internal and/or outdoor acoustic conditions such as acoustic screening.

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

3.0 BACKGROUND NOISE SURVEY

- 3.1 As discussed in the previous Section, the BS 4142 methodology for assessing noise impact relies on comparing the rating level of noise from the proposals to the representative background sound levels at, or representative of, the nearest dwellings.
- 3.2 Thus, the lower the background sound levels are the more onerous the assessment. Whilst BS 4142 does specifically clarify that the background sound level should be representative, and is not simply the lowest measured level; when selecting a day and time period to carry out the background noise survey, in this case we have selected a quieter day/time period as a robust basis for our assessment.
- 3.3 When operations are proposed for 7 days a week, generally the quieter time periods will occur during a Sunday. However, in this case, as the most significant contributions to the background noise climate are from road traffic noise on Shinfield Road and the surrounding road network; and the proposed operating hours are later on a Sunday morning than a Saturday morning; it is considered that the early Saturday morning background noise levels are likely to be quieter in this scenario.
- 3.4 The Department of Transport (DoT) generally publishes an annual report on road traffic use on the national road network, the most current publication of which is '*Road Traffic Estimates: Great Britain 2018*'.
- 3.5 The following graph below from the DoT publication shows how traffic mileage trends change throughout the daytime for different days based on the weekly averages.

Daily car traffic trends on all roads



- 3.6 This graph is based on data captured by DoT automated traffic counters across the national road network; therefore, it is based on a robust empirical dataset.
- 3.7 As can be seen in the graph, the typical traffic levels at 07:00 on a Saturday morning are significantly lower than the typical traffic levels at 10:00 on a Sunday morning. Thus, in this case an early Saturday morning is likely to form a quieter basis for the noise assessment than a later time on a Sunday morning.
- 3.8 During the months preceding the noise survey, the UK was under more stringent lockdown restrictions due to the COVID-19 pandemic. However, the most significant restrictions affecting travel had been lifted prior to the date of the noise survey and road traffic levels were noticeably closer to typical pre-lockdown levels.
- 3.9 Based on our observations; given the main noise source affecting the ambient noise climate in the area is road traffic noise; and the fact that there needs to be a significant change in traffic flow rates in order to see an appreciable reduction in road traffic noise levels, the pandemic is believed to have had a negligible effect of the ambient noise climate in the area during the noise survey.
- 3.10 A background noise survey was carried out from 07:00 on Saturday 18 July 2020 at a location representative of the nearest dwellings as shown in Figure 1.
- 3.11 As expected, the main noise source in the area was road traffic noise, with some noise from normal use of the service station facilities.
- 3.12 However, an hour into the noise survey, at just gone 08:00, the resident of the nearest dwelling began using a motorised hedge trimmer, which was paused out the noise survey as the sound levels were significantly higher than the background noise climate. Use of the trimmer stopped at around 09:00 for a few minutes before starting up again.
- 3.13 As the background sound levels measured during the brief break in the trimmer noise at approximately 09:00 were higher than had been measured earlier in the morning (due to a natural increase in the traffic flow rates as the morning progressed), and it was not clear how long the trimmer would be continuing for; the data measured during the early morning was considered a sufficient basis for the assessment.

- 3.14 The measurements were taken in 15-minute periods in 'free-field' conditions and at a microphone height of approximately 1.4m above the ground. Calibration checks were carried out both before and after the noise survey with no variance in calibration level.
- 3.15 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.
- 3.16 The results of the background noise survey can be seen in full in Appendix II and a summary of the levels prior to 08:00 is shown in Table 1.

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

Period	L _{Aeq,15 mins}	L _{A90,15 mins}
Morning (07:00-08:00)	52-55	40-44

4.0 NOISE ASSESSMENT

Jet Wash Bay Noise Levels

- 4.1 Peak numbers of anticipated jet wash bay customers for service stations are generally between four to five per hour, but to provide a robust assessment we have based our assessment on a total of eight customers using the jet wash bays in a single 1-hour assessment period.
- 4.2 We understand that the proposals are to install two Istobal compact jet wash bay systems, model no. 4CA2000. We have attended another similar MFG service station where these new Istobal systems have been installed, to carry out detailed measurements of source noise levels. 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 measurements were consistent across multiple wash cycles on different vehicles. The measured noise level was 96 dB L_{AE} .
- 4.3 We have carried out calculations accounting for the number of customers over the 1-hour daytime assessment period and distance attenuation to the nearest dwellings, using the following equation:

$$L_s = L_{AE} + 10 \log_{10} \left(\frac{N}{T_0} \right) - 20 \log_{10} \left(\frac{r}{r_0} \right)$$

Where L_s is the specific sound level, L_{AE} is the A-weighted sound exposure level, N is the number of events during the reference period, T_0 is the reference period in seconds, r is the distance to the nearest dwellings and r_0 is the reference distance the L_{AE} was measured at.

- 4.4 We have calculated the likely noise levels within the garden of the nearest dwelling and at the most exposed elevation. In order to obtain the specific sound levels, we have also accounted for the acoustic screening provided by the 2.8m jet wash bay screens with octave band barrier calculations using the ISO 9613 methodology. However, we have not taken into account any screening effect from the existing garden wall. The resulting specific sound levels including the effects of acoustic screening from the jet wash bay screens are presented in Table 2.

Representative Background Sound Level

- 4.5 We have adopted the arithmetic mean of the measured background sound levels of 42 dB $L_{A90,1hr}$, as representative of the background sound level at the nearest dwellings between 07:00 and 08:00 on a Saturday morning.

Initial BS 4142 Numerical Assessment

- 4.6 In terms of applicable character corrections, the noise source is neither impulsive nor tonal. However, to account for the intermittent nature of the noise, we have included a +3dB character correction.
- 4.7 The results of the initial BS 4142 assessment are shown in Table 2.

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

Description	At Elevation	Within Garden
Specific sound level ($L_s = L_{Aeq,Tr}$)	38	43
Character correction	+3	+3
Rating level ($L_{Ar,Tr}$)	41	46
Background sound level ($L_{A90,T}$)	42	42
Excess of rating over background	-1	4
Impact	Low	Possible low/adverse impact but not significant adverse impact

- 4.8 The outcome of the initial BS 4142 assessment shown in Table 2 indicates that there is a low likelihood of adverse impact at the nearest dwellings from the jet wash bay proposals at the nearest elevation and a possible low/adverse (but not significant) impact within the garden.

Context

- 4.9 As the service station already has an automated car wash operating on site as an established part of the existing business, the noise assessment has been based on real world measurements of the same jet wash noise equipment which is to be installed at this site, and the assessment has been based on robust assumptions including background sound data from a quieter early Saturday morning period; it is considered that there is a low likelihood of adverse impact and no unacceptable noise impact is anticipated.

Recommendations

- 4.10 Nevertheless, to ensure that the jet wash bay screens provide adequate acoustic screening, we recommend ensuring that the screens have a minimum mass per unit area of 10 kg/m², and are constructed with no holes or gaps.

5.0 SUMMARY & CONCLUSION

- 5.1 Hepworth Acoustics Ltd was commissioned by Motor Fuel Limited to carry out a noise impact assessment in connection with a planning application for two new jet wash bays at Shell Service Station, 211 Shinfield Road, Reading.
- 5.2 The assessment has included measurement of background sound levels at a location representative of the nearest dwellings during a quiet morning period during the proposed jet wash bay operating hours.
- 5.3 The potential noise impact from the jet wash bays has been assessed based on the BS 4142:2014+A1:2019 methodology.
- 5.4 The assessment demonstrates that there would be no unacceptable noise impact on the nearest dwellings.
- 5.5 We have recommended a minimum mass per unit area for the construction of the jet wash bay acoustic screens to ensure their effectiveness.



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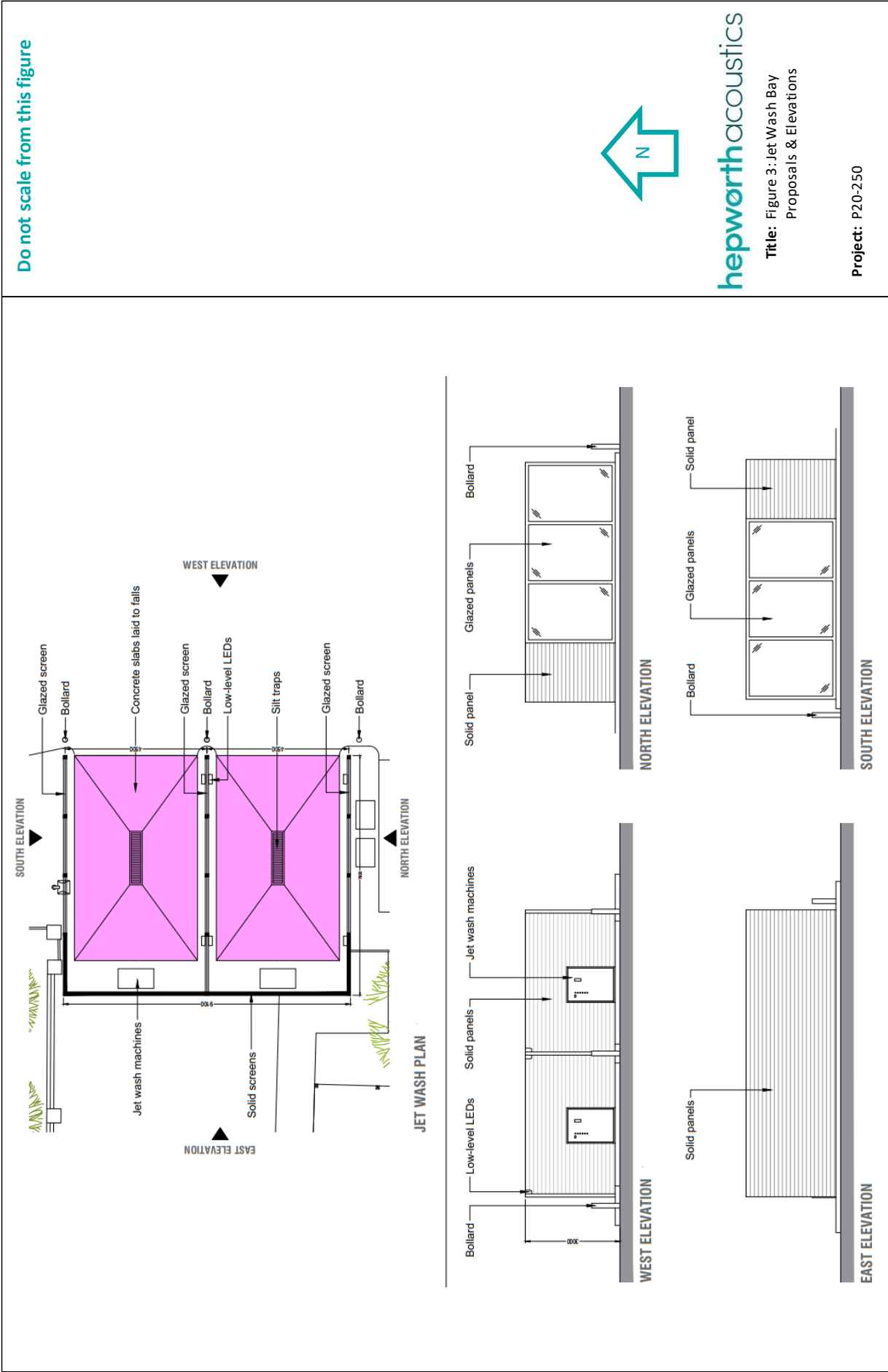


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Title: Figure 2: Proposed Site
Layout

Project: P20-250





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} 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} 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_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.
- L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.
- L_{AE} This is the A-weighted 'Sound Exposure Level' (sometimes denoted as 'SEL') 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 L_{AE} 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: Morning: Saturday 18 July 2020

Equipment: Brüel & Kjær 2260 'Type 1' sound level meter (S/N: 2467014) with field calibrator and tripod

Weather: Morning: Dry, ~14°C with low winds <3m/s and moderate/high cloud coverage

Location A: At the Rear of the site, next to the nearest dwellings

Time		Measured Noise Levels (dB)			Comments
Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
07:00	07:15	72.6	52.7	44.4	Road traffic noise from Shinfield Road (A327) and the surrounding road network. Some occasional brief noise from use of the air compressor. Occasional noise from vehicles on the forecourt refuelling. Some bird noise. Some occasional distant aircraft noise.
07:15	07:30	71.1	52.4	40.2	Road traffic noise from Shinfield Road (A327) and the surrounding road network. Occasional noise from vehicles on the forecourt refuelling. Some bird noise.
07:30	07:45	69.0	54.5	41.0	Road traffic noise from Shinfield Road (A327) and the surrounding road network. Occasional noise from vehicles on the forecourt refuelling. Some bird noise. Brief noise from use of the LPG tank. Brief noise from HGV parking on site.
07:45	08:01	70.3	51.9	44.2	Road traffic noise from Shinfield Road (A327) and the surrounding road network. Occasional noise from vehicles on the forecourt. Some bird noise. Some occasional distant aircraft noise.
08:54	08:59	75.1	57.4	45.8	Road traffic noise from Shinfield Road (A327) and the surrounding road network. Some occasional brief noise from use of the air compressor. Occasional noise from vehicles on the forecourt. Some bird noise. Trimmer started up again at 08:58.