

BP CHATBURN ROAD, CLITHEREOE - PROPOSED 24 HOUR OPENING:

NOISE ASSESSMENT

On behalf of:

Motor Fuel Limited


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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 proposed planning application to allow 24-hour trading the at BP Fuel Station on Chatburn Road, Clitheroe.
- 1.2 The BP fuel Station is located off Chatburn Road adjacent to a roundabout as indicated in Figure 1. The site comprises 4 twin-pump islands (i.e. 8 fuel pumps) under a canopy. The shop building is located towards the eastern side of the site.
- 1.3 We understand that the current opening hours are 06:30-23:00 daily. The proposed change is for the fuel pumps to be operated 24-hours a day.
- 1.4 The closest residential properties are located on the opposite side of Chatburn Road, numbers 1, 3a and 5a.
- 1.5 The noise assessment has included:
- An inspection of the site and surrounding area.
 - Measurement of source noise levels of the filling station activity.
 - Assessment of projected customer numbers, provided by the applicant, based on actual customer data for an existing 24-hour operation at a comparable filling station.
 - Measurement of ambient and background noise levels during representative periods of the night-time.
 - Assessment of the potential noise impact in accordance with BS 4142:2014.
- 1.6 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 ACOUSTIC CRITERIA

2.1 The *National Planning Policy Framework (NPPF)* February 2019 states at paragraph 170 that “*Planning policies and decisions should contribute to and enhance the natural and local environment by: ... e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... noise pollution ...*”. However, there is as yet no specific guidance on numerical acoustic assessment/design criteria relevant to this development in the NPPF or accompanying technical guidance.

BS 4142: 2014

2.2 Applicable guidance to this assessment is set out in British Standard 4142: 2014 ‘*Methods for rating and assessing industrial and commercial sound*’, which provides methods for rating and assessing noise of an industrial and/or commercial nature.

2.3 BS 4142: 2014 requires the ‘rating’ noise level for the operation to be compared with the L_{A90} ‘background’ noise level in the absence of the operational noise.

2.4 With regard to the background noise level, BS 4142: 2014 states that “*it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.*”

2.5 The rating level is derived from the ‘specific’ L_{Aeq} noise level attributable to the operation, corrected as necessary for the ‘residual’ noise level, with an ‘acoustic feature’ penalty added for any noise sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.

2.6 BS 4142: 2014 stipulates that impacts should be assessed over a reference time interval 15-minutes during the night-time (23:00-07:00).

2.7 An initial estimate of the impact of the operation is determined by subtracting the background level from the rating level. BS 4142: 2014 states that:

- Typically, the greater this difference, the greater the magnitude of the 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
- 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 does not exceed the background noise level, this is an indication of the specific noise source having a low impact, depending on the context.

2.8 The initial estimate of the impact should to be modified due to the context in which the noise occurs, BS 4142: 2014 states that all pertinent factors should be taken into account, including:

- The absolute level of noise, 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. This is especially true at night”*.
- The character and level of the residual noise.
- The sensitivity of the receptor and whether dwellings... will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
 - i) façade insulation treatment,
 - ii) ventilation and/or cooling, and
 - iii) acoustic screening.

3.0 NOISE SURVEY

- 3.1 A site inspection and noise survey were carried out during the evening and night-time of Wednesday 3 July 2019 (into Thursday 4 July 2019).
- 3.2 The noise survey was comprised of a set of specific activity noise measurements during the later existing opening hours, and also a survey of prevailing background and ambient noise levels during part of the proposed extended night-time operational period.

Specific Activity Noise Measurements

- 3.3 Specific noise measurements of forecourt activity were undertaken over the period 22:00-23:00 on Wednesday 3 July 2019.
- 3.4 While it was possible to get reliable measurements of the fuel pump noise, there was unavoidable interference from passing vehicle noise etc. which prohibited measurement of vehicle activity. Therefore, we have used noise levels of vehicle activity measured at a similar site as these are generally consistent and used the fuel pump levels measured at the BP Chatburn Road Station.
- 3.5 The forecourt activity noise levels are presented in Table 1, corrected to a reference distance of 5m.

Table 1 : Summary of Forecourt Activity Noise Levels (dB)

Activity	Noise Levels at 5m		
	L _{AE} (SEL _A)*	L _{Amax} **	L _{A90} ***
Vehicle Arriving, Park, Door Open & Close	73	62-80	-
Vehicle Door Open & Close, Ignition, Depart	73	65-78	-
Fuel Pump	-	-	54

* Logarithmic Mean

** Range

*** Arithmetic Mean

- 3.6 The fuel pump noise levels are based on the L_{A90} measurement index, as this assists with minimising the influence of residual noise in the measurement of the steady fuel pump noise.
- 3.7 The fuel pump noise levels presented in Table 1 correspond well with the previous measurements undertaken by Hepworth Acoustics for similar activity at other filling station forecourts.

Background/Ambient Noise Survey

- 3.9 Attended background and ambient noise levels were measured between 23:14 on Wednesday 3 and 01:03 on Thursday 4 July 2019.
- 3.10 The measurements were taken at the location indicated in Figure 1 which is considered representative of the noise levels at the nearest dwellings.
- 3.11 The measurements were taken over 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 measurement periods with no variance in levels observed.
- 3.12 Weather conditions during the noise survey were suitable for sound level measurements. Full details of the weather conditions and the equipment used can be seen in Appendix II.
- 3.13 The measured noise levels were dominated by general road traffic noise from the roundabout and Chatburn Road.
- 3.14 The results of the background/ambient noise survey are summarised in Table 2 below.

Table 2 : Summary of Background/Ambient Noise Survey Results (dB)

Period	$L_{Amax,T}^*$	$L_{Aeq,T}^{**}$	$L_{A90,T}^{***}$
23:00-00:00	74-81	57	34
00:00-01:00	70-80	55	32

* Range

** Logarithmic Mean

*** Arithmetic Mean

4.0 NOISE IMPACT ASSESSMENT

- 4.1 Calculations of the potential impact of specific noise generated by the proposed use of the forecourt over the night-time period have been undertaken in accordance with BS 4142: 2014.
- 4.2 This has been undertaken based on a projection of anticipated customer numbers over the relevant night-time period, assuming that 2 customers will use the filling station within the 15-minute assessment period. For assessment purposes, it has been taken that, for each projected customer, the vehicle will arrive, a door will be opened/closed, a fuel pump in operation for 90-seconds, the vehicle door will again be opened/closed and the vehicle will depart.
- 4.3 In order to minimise any potential noise impact from use of the fuel pumps and associated forecourt activity we recommend that during the proposed extended night-time opening hours use of the fuel pumps is restricted to the two innermost pump islands towards the East side of the filling station next to the shop. We have based our calculation and assessment on this arrangement with only the two pump islands furthest from the nearest dwellings in use.
- 4.4 Distance attenuation has been accounted for with each element of noise generation to the nearest dwellings and an overall specific noise level at the nearest dwellings has been calculated based on the above parameters.
- 4.5 In accordance with BS 4142: 2014, relevant 'acoustic feature' penalties have been added to the overall specific noise level to determine the rating level at each location. A correction of +3dB has been added to account for an impulsive element of any vehicle activity noise and a further +3dB has been added to account for the intermittent nature of all associated noise.
- 4.6 The predicted rating level has been compared to the representative background noise levels for the 15-minute assessment period in accordance with BS 4142: 2014, as set out in Table 3 overleaf.

Table 3 : BS 4142 Initial Assessment (dB)

Description	Nearest Residential Location
Specific Source Level at the Nearest Dwellings ($L_{Aeq,15\text{ mins}}$)	38
Character Correction	+6
Rating Level ($L_{AR,15\text{ mins}}$)	44
Background Level ($L_{A90,T}$)	32
Excess of Rating Over Background Level	12
Likelihood of Impact	Initial assessment indicates potential significant adverse impact

- 4.7 The initial assessment shown in Table 3 above indicates that the specific noise source may have an 'significant adverse impact', **depending on the context**.
- 4.8 As stated in Section 2.0, the initial estimate of the impact needs to be modified due to the context. BS 4142: 2014 states that all pertinent factors should be taken into account, which include the absolute level of the noise and the character and level of the residual noise.
- 4.9 BS 4142: 2014 also states that at night absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background level.
- 4.10 It is therefore of great significance that the specific noise level is 17dB lower than the existing L_{Aeq} residual ambient noise level. Consequently, extended night-time operational noise will not give rise to any increase in the prevailing ambient noise.
- 4.11 It is also of note that the character of the residual noise is due to road traffic, which bears some similarities with the forecourt vehicular activity noise.
- 4.12 The above described relationship between the predicted L_{Aeq} and corresponding prevailing levels are summarised in Table 4 below.

Table 4 : Comparison of Predicted Forecourt Noise and Prevailing Ambient Noise

Description	Nearest Residential Location
Specific Sound Level at the Nearest Dwelling ($L_{Aeq,15\text{ mins}}$)	38
Residual Level ($L_{Aeq,T}$)	56
Difference	-17

- 4.13 It is also considered prudent to consider L_{Amax} noise levels for transient events, e.g. from car doors being closed. Based on the worst-case forecourt activity noise levels, it is anticipated that L_{Amax} levels during forecourt activity will be typically up to 56dB at the nearest dwellings. This is well within the range of the measured prevailing L_{Amax} levels measured during the ambient/background noise survey. This is illustrated in Table 5 below.

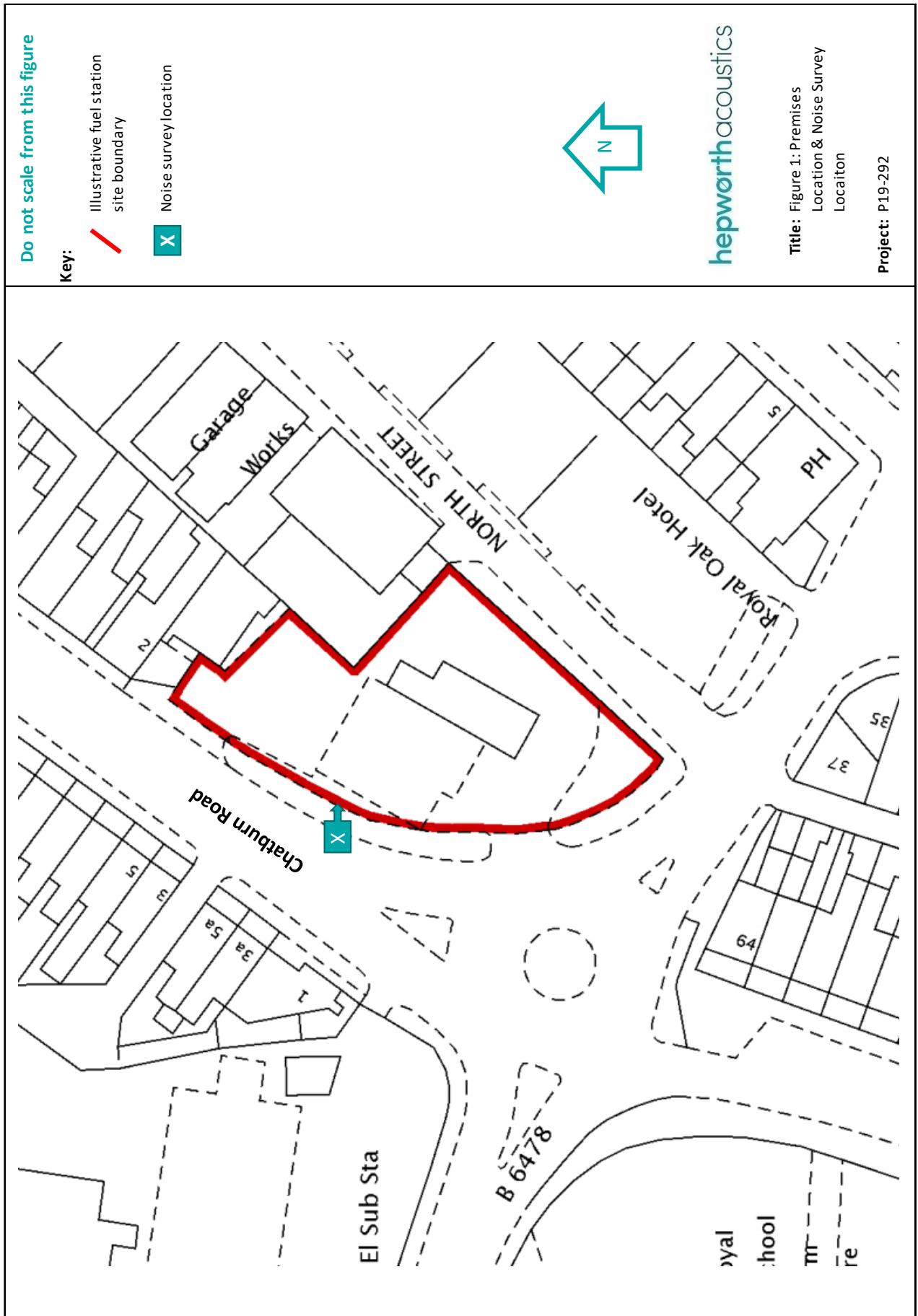
Table 5 : Comparison of Predicted Forecourt Transient Noise and Prevailing Maximum Noise Levels

Description	Nearest Residential Location
Predicted Forecourt Transient Noise Levels at the Nearest Dwellings ($L_{Amax,T}$)	56
Prevailing Maximum Noise Levels ($L_{Amax,T}$)	81
Difference	-25

- 4.14 It is hence illustrated that, notwithstanding the initial estimate of the impact in accordance with BS 4142: 2014, the existing ambient noise, attributable mostly to road traffic on the roundabout and Chatburn Road, is of a relatively significant level, to the extent that it substantially dilutes the potential impact of the proposed forecourt activity.
- 4.15 In simpler terms, it is considered that the proposed activity noise will not be distinctly noticeable or likely to attract attention in the presence of the existing noise climate in the vicinity of the site.
- 4.16 In view of all of the above, it is considered that the noise impact of the proposed 24-hour operation of the service station will not lead to any appreciable loss of amenity at neighbouring residences by way of noise in the context of the existing prevailing noise climate.

5.0 SUMMARY & CONCLUSION

- 5.1 The potential noise impact associated with the proposed 24-hour opening the at BP Fuel Station on Chatburn Road, Clitheroe, has been assessed.
- 5.2 The assessment has included a noise survey at the site to determine the existing noise climate and measure noise from activity associated with forecourt activity at the station.
- 5.3 The assessment has been undertaken in accordance with the guidelines set out in British Standard 4142: 2014 *'Methods for rating and assessing industrial and commercial sound'*, and has been based on the results of the noise survey.
- 5.4 It has been demonstrated that the proposed extension of operational hours is unlikely to result in a significant noise impact in the context of the existing prevailing noise climate in the area and hence it is not anticipated that the proposals would result in harm to the amenity of neighbouring residents by way of noise.



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.

SEL 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: Wednesday 3/Thursday 4 July 2019

Equipment: Brüel & Kjær 2260 'Type 1' sound level meter (S/N: 2467016) with calibrator and tripod

Weather: Dry, mild 12°C with low winds <3m/s and moderate cloud coverage

Ambient Noise Survey Results

Time		Measured Noise Levels (dB)			Comments
Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
23:14	23:30	74.4	56.7	35.2	Road traffic noise. Some bird noise. Some distant aircraft noise. Occasional noise from pedestrians.
23:30	23:45	81.4	56.4	33.6	Road traffic noise. Some bird noise. Some distant aircraft noise. Occasional noise from pedestrians.
23:46	00:01	77.2	56.7	33.0	Road traffic noise. Some bird noise. Some distant aircraft noise.
00:03	00:18	80.4	56.4	32.6	Road traffic noise. Some bird noise. Some distant aircraft noise. Occasional noise from pedestrians.
00:18	00:33	79.6	56.1	32.4	Road traffic noise. Some bird noise. Some distant aircraft noise. Occasional noise from pedestrians.
00:33	00:48	70.4	49.3	32.2	Road traffic noise. Some bird noise. Occasional noise from pedestrians.
00:48	01:03	76.7	52.8	32.2	Road traffic noise. Some bird noise. Some distant aircraft noise. Occasional noise from pedestrians.