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ASSESSMENT OF NOISE IMPACT FROM PROPOSED 24 HOUR FORECOURT TRADING AT MFG LEANDER LONDIS SERVICE STATION, HENLEY ROAD, READING

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 planning application for 24-hour forecourt trading at the MFG Leander Londis Service Station, Henley Road, Reading.

1.2 An aerial view of the site within the context of the local area is shown in Figure 1. The forecourt comprises four twin-pump islands under a canopy, accessible off the A4155, which is a busy road and the primary contribution to the noise climate in the area. The nearest dwellings are to the north, east and south, as highlighted in Figure 1.

1.3 We understand that the current forecourt trading hours are 07:00-22:00 daily. The proposals are for the forecourt to be open to trade 24-hours a day. We understand that the proposed extended forecourt trading will be for the fuel pumps only, i.e. the extended forecourt trading will not apply to any other forecourt facilities such as the car wash etc.

1.4 This noise impact assessment has included the following:

- An inspection of the site and immediate surrounding area;
- A baseline noise survey to quantify the existing prevailing noise climate in the area covering a full daytime and night-time period;
- Calculation of the potential forecourt activity noise levels at the nearest dwellings; and,
- Assessment of the potential noise impact at the nearest dwellings to BS 4142.

1.5 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 POLICY & GUIDANCE

National Planning Policy Framework (NPPF) July 2021

2.1 The National Planning Policy Framework (NPPF) July 2021 includes the following relevant paragraphs with respect to noise and planning:

Paragraph 174

> "*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 soil, air, water or noise pollution or land instability. …*"

Paragraph 185

> "*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*[65]*;*

British Standard 4142:2014+A1:2019

2.2 British Standard 4142:2014+A1:2019, '*Methods for rating and assessing industrial and commercial sound*', referred to hereafter as BS 4142, is appropriate guidance for assessing the potential noise impact from commercial noise sources, including mechanical and electrical plant such as fuel pumps.

2.3 BS 4142 requires a Rating Level ($L_{Ar,Tr}$), derived from the operation of the noise source being assessed, to be compared against the Background Sound Level ($L_{A90,T}$) 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.

2.4 The Rating Level ($L_{Ar,Tr}$) is based on the Specific Sound Level ($L_{Aeq,Tr}$) at the assessment location attributed to the operating noise source, with 'character corrections' added for noise sources where 'certain acoustic features can increase the significance of impact'.

2.5 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. The applicable character corrections apply depending on how perceptible the characteristics are anticipated to be at the assessment location within the context of the prevailing noise climate.

2.6 An initial estimate of the potential noise impact from the operating noise source is determined by comparing the difference between the Rating Level and the Background Sound Level.

2.7 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 Sound 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.

2.8 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.

2.9 BS 4142 requires that Background Sound Level "*values are reliable and suitably represent the particular circumstances and periods of interest… the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods*".

3.0 NOISE SURVEYS

Baseline Noise Survey

3.1 Automated noise monitoring was carried out at Location A (as indicated in Figure 1) representative of the nearest dwellings to the north of the service station between 10:00 on Monday 27 March and 11:30 on Tuesday 28 March 2023.

3.2 Attended synchronised supplementary measurements were also taken at satellite positions, Location B and Location C to gauge the difference in background noise levels between these locations and Location A.

3.3 The noise survey measurements were carried out in consecutive 15-minute periods at a microphone height of 1.4m above the ground in 'free-field' conditions. Calibration checks were carried out both before and after the noise survey, with no deviation in calibration level.

3.4 Weather conditions during the noise survey were suitable for sound pressure level measurements, being dry with low winds and moderate cloud coverage. The measurement microphone was also fitted with a windshield.

3.5 Full details of the equipment used for the noise survey, the weather conditions and the full noise survey results, are shown in Appendix II. A summary of the noise survey results is shown in Table 1.

Table 1: Summary of Baseline Noise Survey Results at Location A [dB]

Values	Daytime (07:00-23:00)		Night-time (23:00-07:00)	
	$L_{A90,T}$ 'Background'	$L_{Aeq,T}$ 'Residual'	$L_{A90,T}$ 'Background'	$L_{Aeq,T}$ 'Residual'
Range	34-51	41-58	33-48	38-61
Log-mean*/Mean#	44#	54*	37#	50*

3.6 The synchronised measurements at the satellite locations were as follows:

- Location B: 48 dB $L_{A90,T}$ (9dBA higher than at Location A) and 57 dB $L_{Aeq,T}$ (9dBA higher than Location A); and,
- Location C was 50 dB $L_{A90,T}$ (10dBA higher than at Location A) and 65 dB $L_{Aeq,T}$ (17dBA higher than Location A).

Forecourt Activity Noise Levels

3.7 Noise measurements were taken on site of the fuel pumps being operated by customers and the fuel pump noise levels were found to be 74 dB $L_{Aeq,T}$ at 1m, with a fuel pump operation lasting for approximately 60 seconds.

3.8 Due to the considerable noise from passing vehicles on the main road, it was not possible to obtain reliable measurements of vehicle movements around the forecourt at this site, however we have relied upon measurements of vehicle movements taken at other sites as follows: 73 dB L_{AE} at 5m for activity associated with a vehicle arriving, parking, opening the door and then closing the door; and 73 dB L_{AE} at 5m for activity associated with a vehicle door being opened, closed, the ignition starting and the vehicle departing.

3.9 The results of the background noise survey, as well as the source noise levels above have been used as the basis for the noise impact assessment as described in Section 4.

4.0 NOISE IMPACT ASSESSMENT

Noise Calculations

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.

4.2 This has been undertaken based on a projection of anticipated customer numbers over the relevant night-time period, assuming that up to two customers will use the filling station within the 15-minute night-time assessment period. Based on observations taken during Monday evening, eight customers per hour during the night-time hours is likely to be an overestimation and hence a robust basis for assessment.

4.3 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 will operate for 60 seconds, the vehicle door will again be opened/closed and the vehicle will depart. The resulting noise levels taking into account distance attenuation to the nearest dwellings, as well as nominal acoustic screening of 10dBA provided by the Service Station building and canopy itself for Location A only, have been taken into account in our calculations. The resulting Specific Sound Levels are shown in Table 2 overleaf.

BS 4142 Assessment

4.4 The corrections for discernible acoustic characteristics from the noise emissions are evaluated based on their perceptibility at the assessment locations within the context of the residual sound levels. The character of noise associated with vehicles arriving etc. is considered to be consistent with the prevailing road traffic noise climate.

4.5 Whilst the fuel pumps do have some tonal characteristics in the 630Hz octave band at very close quarters, given how low the Specific Sound Levels are compared to the residual noise climate (>15dB lower than the average residual noise levels during the night-time) we would not anticipate any noticeable tonal characteristics to be apparent at the assessment location which was consistent with our observations at the assessment locations during the attended portions of the noise survey. Nevertheless, operation of the fuel pumps during the night-time may result in noticeable on/off conditions although at a low level; on this basis a +3dB character correction has been included to account for intermittency.

4.6 Based on the results of the baseline noise survey summarised in Table 1, we have adopted a representative Background Sound Level 37 dB $L_{A90,T}$ for the night-time at Location A and have applied the difference corrections based on the synchronised measurements to obtain the representative Background Sound Level for Location B and Location C which are more exposed to road traffic noise.

4.7 The results of the BS 4142 numerical assessment are shown in Table 2.

Table 2: BS 4142 Numerical Assessment - Night-time [dB]

Description	A	B	C
Specific sound level [$L_{Aeq,T}$]	32	43	38
Character correction	+3	+3	+3
Rating level [$L_{Ar,Tr}$]	35	46	41
Background sound level [$L_{A90,T}$]	37	46	47
Excess of rating over background	-2	0	-6
Potential impact	'Low'	'Low'	'Low'

4.8 The initial BS 4142 numerical assessment shown in Table 2 indicates that only a 'low' noise impact is likely, which is the lowest BS 4142 categorisation of noise impact.

Context

4.9 BS 4142 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.

4.10 Table 3 shows the Specific Sound Level within the context of the average residual noise levels.

Table 3: Comparison of Predicted Forecourt Noise & Residual Sound Levels - Night-time [dB]

Description	A	B	C
Specific sound level [$L_{Aeq,T}$]	32	43	38
Residual sound levels [$L_{Aeq,T}$]	50	58	66
Difference	-18	-15	-28

4.11 It is also contextually relevant that the dwelling at Location B is positioned side-on with gable end facing the forecourt, such that there are no windows opening into habitable rooms overlooking the forecourt at Location B.

4.12 Given the 'low' impact indicated by the BS 4142 numerical assessment, as well as the low Specific sound levels compared with the existing residential night-time noise climate and the lower sensitivity at Location B where there are no windows to habitable rooms overlooking the forecourt, extended night-time forecourt trading noise is not anticipated to result in any unacceptable or adverse noise impact.

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 24-hour forecourt trading at the MFG Leander Londis Service Station, Henley Road, Reading.

5.2 A baseline noise survey was carried out at a location representative of the nearest dwellings, to quantify the existing prevailing noise climate in the area during.

5.3 The potential noise exposure from forecourt trading operations during the night-time has been calculated based on fuel pump noise levels measured at the service station, along with vehicle movement activity from our noise data library and assessed in line with BS 4142.

5.4 Based on the outcome of the assessment, a 'low' impact categorisation in accordance with BS 4142 has been demonstrated and the scheme avoids giving rise to any adverse/significant adverse noise impacts in line with NPPF. Therefore, there is no reason with respect to noise why the proposed extension of forecourt trading hours should not be granted planning permission, in line with relevant guidelines and policy.

Do not scale from this figure

Key:

X Noise survey locations

Nearest dwellings

N

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Title: Figure 1: Aerial View & Noise Survey Locations

Project: P23-148

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 pressure values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that the human response to sound most closely follows a logarithmic relationship. 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 (at the threshold of hearing) to 120 dB (at the threshold of pain).

Due to the logarithmic nature of decibels, when two sounds of the same level are combined together, the total sound level is (under normal circumstances) 3 dB higher than each of the individual sound levels e.g. 60 dB plus 60 dB = 63 dB. In terms of perceived 'loudness', a 3 dB(A) variation in sound level is a relatively small (but nevertheless just noticeable) change. An increase in sound level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in sound 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' the frequency spectrum appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using a mathematical filter called the 'A' weighting, which is built into sound level meters. Sound 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 Relevant Sound 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 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 various indices used in this report, along with other relevant terms are described below.

L_p This is the 'Sound Pressure Level' which is a logarithmic ratio between a squared sound pressure quantity and the squared human threshold of hearing.

L_{pA} This is the A-weighted 'Sound Pressure Level', which is the Sound Pressure Level (L_p) adjusted to account for the average human hearing response at difference frequencies for a given sound pressure range.

$L_{Aeq,T}$ This is the A-weighted 'Equivalent Continuous Sound Level' which is an average of the total sound pressure measured over a specified time period. In other words, $L_{Aeq,T}$ is the level of a steady sound which has the same total (A-weighted) sound pressure as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for most forms of environmental noise.

L_{Amax} This is the 'Maximum A-weighted Sound Level' that was measured during the monitoring period. L_{Amax} used in this report refers throughout to L_{Amax} measured using the fast time weighting of the sound level meter, $L_{Amax,f}$.

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

$L_{Ar,Tr}$ This is an A-weighted value most commonly used in BS 4142 assessments, which is the sound level of the noise source under assessment, at the assessment location, evaluated over the reference assessment period (T_r) and includes numerical adjustments for the characteristic features of the sound.

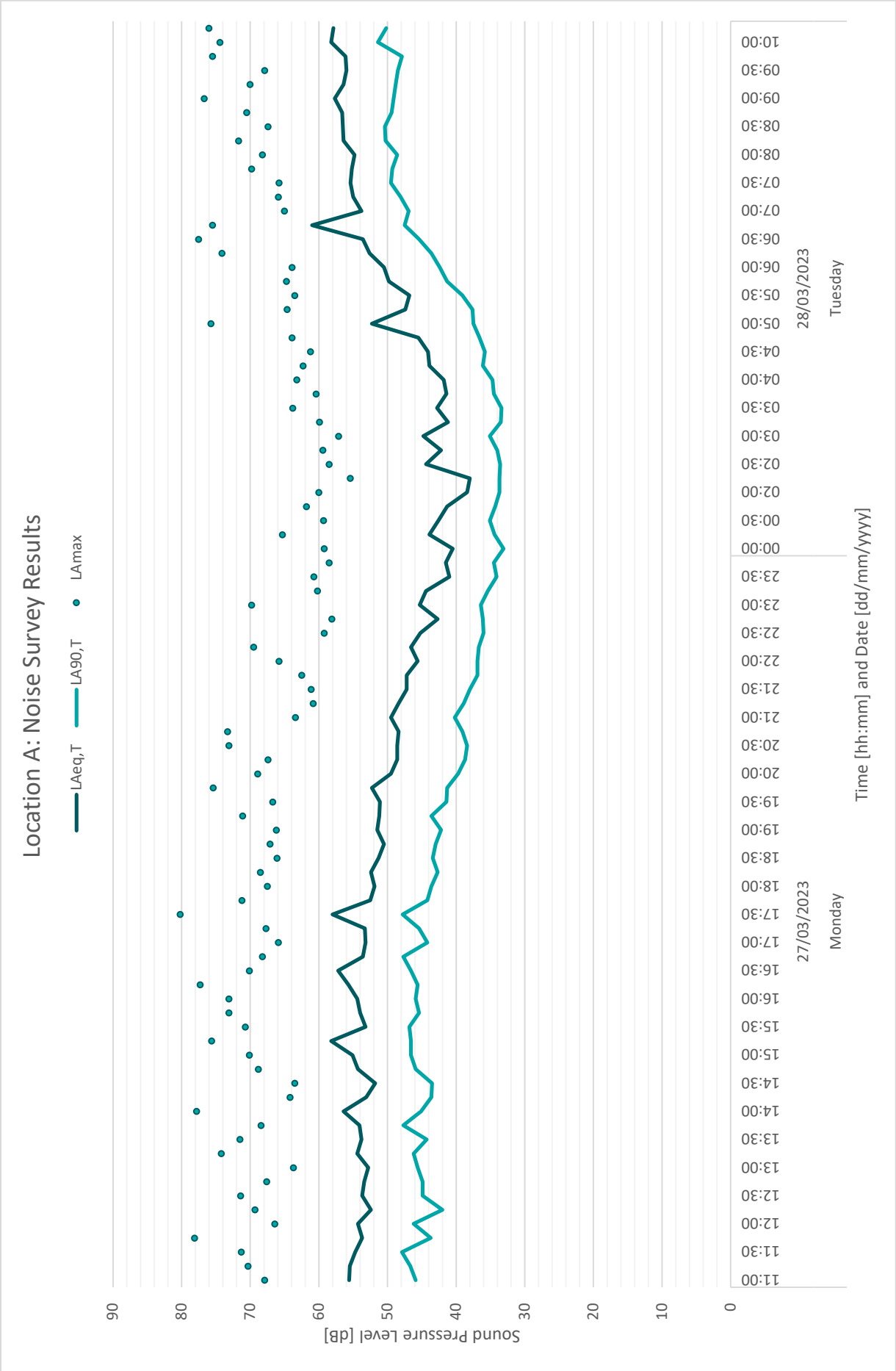
Appendix II: Noise Survey Results

Dates	Monday 27 to Tuesday 28 March 2023
Equipment	NTi Audio XL2-TA 'Class 1' sound analyser (S/N: A2A-20259-E0) Rion NA-28 'Class 1' sound analyser (S/N: 00960036) NTi Audio CAL200 'Class 1' sound calibrator (S/N: 19360) Rion NC-74 'Class 1' sound calibrator (S/N: 00430648) Kestrel 2500 portable weather meter (S/N: 2556870) Associated environmental outdoor monitoring kit and tripods
Weather	Monday daytime: Dry, ~9°C with low winds <3 m.s^{-1} and moderate cloud coverage Monday night: Dry, ~5°C with low winds <4 m.s^{-1} and moderate cloud coverage Tuesday morning: Dry, ~7°C with low winds <3 m.s^{-1} and heavy cloud coverage

Please see the results of the noise survey in the Table below and Graph overleaf.

Monday 28 March 2023: Synchronised Supplementary Attended Noise Survey Results

Location	Time (*T*) [hh:mm]		Measured Sound Levels [dB]			Comments
	Start	End	$L_{A90,T}$	$L_{Aeq,T}$	L_{Amax}	
B	20:15	20:30	47.7	57.1	79.7	Road traffic noise. Some forecourt activity but not discretely measurable within the context of the prevailing noise climate.
C	20:45	21:00	49.5	65.2	84.4	Road traffic noise. Some forecourt activity but not discretely measurable within the context of the prevailing noise climate.


Location A: Noise Survey Results
LAeq,T
LA90,T
LAmax
Sound Pressure Level [dB]
90
80
70
60
50
40
30
20
10
0
11:00
11:30
12:00
12:30
13:00
13:30
14:00
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