

The Truck Stop, Pilsworth Road Heywood

**BS4142 Assessment Report
Report 28208.BS4142.01.RevA**

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28208.TH1-2	Environmental Noise Time History
28208.Daytime L90.TH1-2	Statistical analysis for representative daytime L_{A90}
28208.Night-time L90.TH1-2	Statistical analysis for representative night-time L_{A90}
Appendix A	Glossary of Acoustics Terminology

1.0 INTRODUCTION

KP Acoustics Ltd has been commissioned by Martin Brower UK&I, UK & Ireland Head Office, One Park Lane, Hemel Hempstead, Hertfordshire, HP2 4YJ, to undertake a noise impact assessment of an existing vehicle storage yard at The Truck Stop, Pilsworth Road, Heywood, OL10 2TA.

An environmental noise survey and manual noise measurements have been undertaken on site in order to prepare a noise impact assessment in accordance with BS4142:2014 '*Method for rating and assessing industrial and commercial sound*'.

This report presents the methodology and results from the environmental survey, followed by calculations in accordance with BS4142 to provide an indication of the noise impact from the vehicle storage yard on the closest noise sensitive receiver. Mitigation measures will be outlined as appropriate.

2.0 SITE SURVEYS

2.1 Site Description

As shown in Figure 2.1, the site is bounded by Pilsworth Road to the south, industrial buildings to the west, vacant land to the east and residential buildings across from a railway line to the north.



Figure 2.1 Site Location Plan (Image Source: Google Maps)

2.2 Environmental Noise Survey Procedure

Continuous automated monitoring was undertaken for the duration of the noise survey between 15:00 on 12/03/2024 and 14:00 on 14/03/2024 to capture a typical weekday period and then again between 12:00 on 17/05/2024 and 12:00 on 20/05/2024 to capture a typical weekend period.

The environmental noise measurement position and the closest noise sensitive receiver relative to the site are described within Table 2.1 and shown within Figure 2.2.

Icon	Descriptor	Location Description
1	Noise Measurement Position 1	The microphone was positioned within free-field conditions at 1.5 m above ground level, adjacent to railway.
A	Nearest noise sensitive receptor	Rear façade, 1 st Floor windows. Residential houses to the north (Shuttle Drive).

Table 2.1 Measurement position and description



Figure 2.2 Site measurement positions (Image Source: Google Maps)

The choice of the position was based both on accessibility and on collecting representative noise data in relation to the nearest noise sensitive receiver. The microphone was installed at a position considered to be representative of the worst-case background noise climate at the nearest noise sensitive receptor, but in the absence of any noise from the existing vehicle storage yard. It was noted that the measurement location was shielded from nearby noise sources, except the railway line, and is expected to experience a lower background sound level than that of the nearest receptors, which are more exposed to nearby noise sources.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure complied with ISO 1996-2:2017 Acoustics '*Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*'.

Initial inspection of the site revealed that the background noise profile at the monitoring location was typical of a suburban environment adjacent to industrial use, with the dominant source being distant road traffic noise from the surrounding roads and regular HGV pass-bys on nearby roads. The background noise profile at the nearest noise sensitive receptor was dominated by constant 'humming' from parked vehicles on the existing vehicle storage yard.

2.3 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed. The equipment used is described within Table 2.2.

Instrument	Manufacturer and Type	Serial Number
SLM4 Precision integrating sound level meter & analyser	NTi Audio, XL2-TA Calibration No: UCRT23/1957, UCRT23/1965 & UCRT23/1964 Calibration Dates: 20/07/2023 Calibration Due: 19/07/2025	A2A-09207-E0

Table 2.2 Measurement instrumentation

Measurement instrumentation		Serial no.	Date	Cert no.
Noise Kit 35	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21110-E0	04/08/2022	UK-22-080
	Free-field microphone NTI Acoustics MC230A	A23570		
	Preamp NTI Acoustics MA220	10995		
	NTI Audio External Weatherproof Shroud	-	-	-
Noise Kit 21	NTI Audio XL2 Class 1 Sound Level Meter	A2A-21099-E0	21/07/2022	UK-22-064
	Free-field microphone NTI Acoustics MC230A	A23571		
	Preamp NTI Acoustics MA220	10996		
	NTI Audio External Weatherproof Shroud	-	-	-
Larson Davis CAL200 Class 1 Calibrator – KP North		8932	19/07/2023	UCRT23/1949

Table 2.3 Measurement instrumentation

3.0 RESULTS

3.1 Environmental Noise Survey

The $L_{Aeq,15min}$, $L_{Amax,15min}$, $L_{A10,15min}$ and $L_{A90,15min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as a time history in Fig. 28208.TH1-2.

Representative background noise levels are shown in Table 3.1 for daytime and night-time.

It should be noted that the representative background noise level has been derived from the most commonly occurring $L_{A90,15min}$ levels measured during the environmental noise survey undertaken on site, as shown in 28208.Daytime L90.TH1-2 and 28208.Nighttime L90.TH1-2 attached.

Time Period	Representative background noise level L_{A90} dB(A)	
	Weekday	Weekend
Daytime (07:00-23:00)	47	44
Night-time (23:00-07:00)	43	42

Table 3.1 Representative background noise levels.

3.2 Manual Noise Measurements/Historical Data

There are two primary noise sources associated with the vehicle storage yard; noise from HGV movement/manoeuvring, and noise from chiller units running on an integrated diesel generator serving stationary (unhitched) trailers.

The noise from the chillers is constant and the sound pressure level at 10 m, based on measurements undertaken on site, has been determined as below, both while running on the onboard diesel generator and while plugged into mains electricity.

Description	Sound Pressure Level (dB L_{eq}) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Chiller (diesel)	74	73	63	62	61	58	54	48	66
Chiller (electric)	60	58	68	59	56	53	49	40	63

Table 3.2 Manual noise measurements of chillers

Noise levels for HGV movements/manoeuvring have been derived based on historical library data at a distance of 5 m, as provided below.

Description	$L_{Aeq,T}$ at 5 m
HGV Pass-By	72 dB
HGV Manoeuvring	70 dB

Table 3.3 Historical library data for HGV movements

4.0 NOISE ASSESSMENT GUIDANCE

4.1 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'

British Standard BS4142:2014 '*Methods for rating and assessing industrial and commercial sound*' describes a method for rating and assessing sound of an industrial and/or commercial nature, which includes:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

This Standard compares the Rating Level due to the noise source/s under assessment for a one-hour period during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours) with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

It should be noted that the Rating Level is the Specific Sound Level in question ($L_{Aeq, Tr}$), including any relevant acoustic feature corrections, as follows:

- **Tonality** – '*For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible*'
- **Impulsivity** – '*A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible*'
- **Intermittency** – '*If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied*'

- **Other sound characteristics** – *‘Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied’*

Once the Rating Level has been obtained, the representative background sound level is subtracted from the Rating Level to obtain an initial estimate of the impact, as follows:

- Typically, the greater this difference, the greater the magnitude of the 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 could be an indication of an adverse impact, depending on the context
- The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context

NOTE: Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

The initial estimate of the impact may then be modified by taking consideration of the context in which the sound occurs.

5.0 BS4142 ASSESSMENT (PRE-MITIGATION)

5.1 Overview

The existing vehicle storage yard is predominantly used to store HGV's for short periods both before and after being filled with cold food goods, as a storage buffer to the main facility nearby. The cab of the HGV is rarely kept on-site, typically the HGV's arrive at the site, unload/load a trailer, and then immediately depart the site.

When trailers are stored with cold food onboard the chiller unit must be left running to maintain the internal temperature of the trailer, however the trailers with chillers operating are typically stored as far from the nearby receptors as possible in an attempt to reduce noise impact.

The layout of the site is shown in Figure 5.1 below, with the following zones:

- **Zone A:** Capacity for 11 trailers
- **Zone B:** Capacity for 16 trailers
- **Zone C:** Capacity for 16 trailers
- **Zone D:** Capacity for 14 trailers
- **Zone E:** Capacity for 14 trailers
- **Zone F:** Capacity for 19 trailers
- **Zone G:** Capacity for 18 trailers
- **Zone H:** Capacity for 29 trailers
- **Zone J:** Capacity for 46 trailers

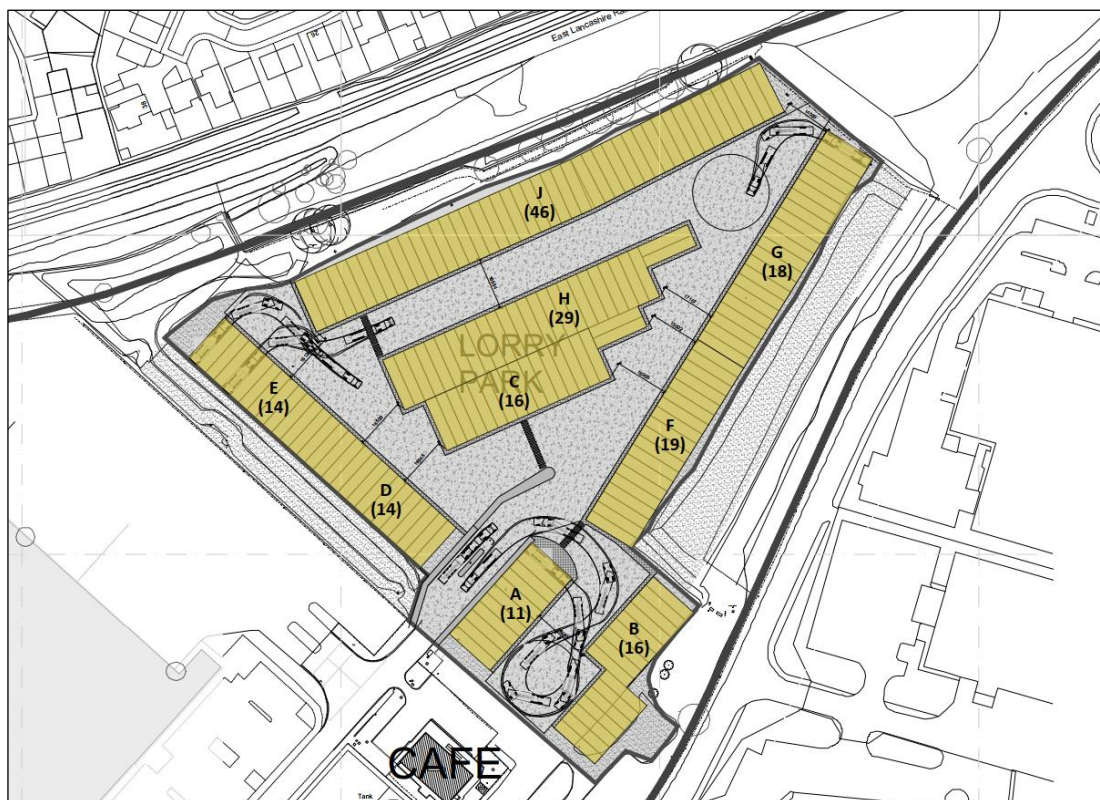


Figure 5.1 Existing site layout

Zones A, B, C, D & F are primarily used for trailers with chiller units running, with Zones E & G rarely used as an 'overflow' for trailers with chillers running. Zones J & H are used only for empty trailers generating no noise.

The vehicle storage yard is in use 24/7 and from analysis of the provided log, there are between 15 – 55 loaded trailers with chillers running at any one time, peaking at around midnight. The total anticipated HGV movements in any 1 hour period ranges from between 0 (none) – 25, with peaks at both midnight and 07:00 hours.

To facilitate a worst-case assessment, all assessment herein considers a worst-case night-time period with **58 chiller units running** and **25 HGV movements per hour**.

There shall be two parts to the assessment of noise at the nearest receptor, to be considered cumulatively but calculated separately:

- **Assessment Part A** – Noise from HGV movements
- **Assessment Part B** – Noise from stationary chiller units

5.2 Calculations

Assessment Part A – Noise from HGV Movements

The noise level at the nearest receptor resulting from HGV movements has been calculated using the noise levels shown in Table 3.3, and corrected due to different acoustic propagation features such as distance, reflective surfaces, screening elements, etc.

The calculation has considered the number of events, duration of event and distance per zone as shown below.

Zone	Events per Hour	Duration (seconds)		Distance (m)		Specific Sound Level at Receptor (L _{Aeq,T})
		HGV Pass-by	HGV Manoeuvre	HGV Pass-by	HGV Manoeuvre	
A	3	30	120	170	195	31 dB
B	4	30	120	170	195	33 dB
C	4	30	120	145	135	35 dB
D	3	30	120	85	130	36 dB
E	1	30	120	85	95	33 dB
F	5	30	120	140	135	36 dB
G	1	30	120	115	95	32 dB
H	2	30	120	85	100	35 dB
J	2	30	120	85	100	35 dB
Total	25					44 dB

Table 5.1 Assessment Part A – Noise resulting from HGV movements

Assessment Part B – Noise from Stationary Chiller Units

The calculation of the noise level at the nearest receptor resulting from the stationary chiller units has been calculated using the noise levels shown in Table 3.2, and corrected due to different acoustic propagation features such as distance, reflective surfaces, screening elements, etc.

The number of units in any zone has been weighted towards the zones furthest from the receptor (e.g. more units in Zone A & B) as this is how the units are managed on-site to reduce noise impact.

From measurements undertaken on-site and further acoustic screening calculations undertaken, it has been determined that facing the chiller unit (located at the front of the trailer) away from the receptor is likely to result in at least 6 dB reduction in noise level at the receptor, this has been included in the calculation of noise levels from zones where the chillers face away from receptors (Zone A & Zone C).

The calculation has considered the number of units and distance per zone as shown below.

Zone	Total Units Running	Distance (m)	Specific Sound Level at Receptor ($L_{Aeq,T}$)
A	8	177	44 dB
B	12	209	51 dB
C	12	117	50 dB
D	8	137	52 dB
E	2	102	49 dB
F	14	149	54 dB
G	2	106	48 dB
Total	58		59 dB

Table 5.2 Assessment Part B – Noise resulting from stationary chiller units

5.3 BS4142 Assessment

The 'Rating Level' of the existing vehicle storage yard has been assessed following the guidelines of BS4142 for the worst-case night-time period, with a subsequent conclusion taking into consideration the above context. The full BS4142 assessment is presented in Table 5.3.

BS4142 Assessment		
Source:	HGV movements & chiller units	
Operating Period:	24 / 7	
Reference time interval (T_r):	15 minutes (night-time)	
Receiver:	Receptor A - Residential houses to the north (Shuttle Drive).	
Element	Level (dB)	Comment
Specific Sound Level	59 dB $L_{Aeq,15min}$	Calculated specific sound level at the receptor based on calculations undertaken above (59 dB + 44 dB).
Acoustic Feature Correction	+ 6 dB	Tonality from chiller units subjectively perceptible at the receptor.
Rating Level	65 dB $L_{Ar,15min}$	Rating Level = Specific Sound Level + Acoustic Feature Corrections
Background Sound level	42 dB $L_{A90,15min}$	Sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T . Derived using the most common occurring levels $L_{A90, 5min}$ during the environmental noise survey undertaken on site
Excess of rating over background sound level	+ 23 dB	Assessment indicates significant adverse impact
Uncertainty of the assessment	Not significant	The excess of the rating level over the background sound level is large and in this instance the uncertainty of any measurement does not have any significance to the outcome of the assessment.

Table 5.3 BS4142 assessment

As shown in Table 5.3, the existing vehicle storage yard is indicated to have a **significant adverse impact** at the nearest noise sensitive receptor without further mitigation. The context of the site must be considered (i.e. existing industrial/commercial use with similar uses adjacent and nearby), however the excess of the rating level over the background level in this case is significant and cannot be dismissed.

6.0 NOISE CONTROL MEASURES

In order to reduce noise emissions from the vehicle storage yard, it is proposed to run the chiller units via electricity rather than the onboard diesel generators and to locate trailers as far as possible from the nearby receptors.

Since it is not feasible to route mains electricity to the site, it is proposed to utilise an external generator that can be located far from the nearest receptor and acoustically treated such that noise emissions are appropriately controlled.

Provided that the generator is installed approximately 200 m from the nearest receptor, the generator(s) shall be designed to achieve a noise level no greater than **60 dBA at 10 m** from the generator, with the exhaust facing away from the receptor. Should more than one generator be utilised, this limit would apply cumulatively.

For reference, this is anticipated to result in a noise level of no greater than 33 dBA at the nearest noise sensitive receptor.

It would also be good practice (but not required as part of this mitigation scheme) to erect a relatively small acoustic screen/fence to fully break line of sight between the generator and the residential receptors to the north. The barrier may be constructed from any material that is impermeable with a surface mass of at least 10 kg/m².

7.0 BS4142 ASSESSMENT (POST-MITIGATION)

Provided that the mitigation measures set out in Section 6.0 are implemented, a revised BS4142 assessment has been carried out, as shown below.

BS4142 Assessment		
Source:	HGV movements & generator	
Operating Period:	24 / 7	
Reference time interval (T_r):	15 minutes (night-time)	
Receiver:	Receptor A - Residential houses to the north (Shuttle Drive).	
Element	Level (dB)	Comment
Specific Sound Level	53 dB $L_{Aeq,15min}$	Calculated specific sound level at the receptor based on measurements undertaken of the processing operation.
Acoustic Feature Correction	+ 6 dB	Tonality from chiller units subjectively perceptible at the receptor.
Rating Level	59 dB $L_{Ar,15min}$	Rating Level = Specific Sound Level + Acoustic Feature Corrections
Background Sound level	42 dB $L_{A90,15min}$	Sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T . Derived using the most common occurring levels $L_{A90, 5min}$ during the environmental noise survey undertaken on site
Excess of rating over background sound level	+ 17 dB	Assessment indicates significant adverse impact
Uncertainty of the assessment	Not significant	The excess of the rating level over the background sound level is large and in this instance the uncertainty of any measurement does not have any significance to the outcome of the assessment.

Table 7.1 BS4142 assessment

The Rating Level would be 17 dB above the background sound level at 1m from the façade of the closest residential dwelling during the worst-case period which is an indication of a significant adverse impact. However, as stated in BS4142, context should be taken into consideration when assessing adverse impact.

The site is an existing industrial use, situated within a much larger industrial estate. Although the use of the site technically has not changed by using the site for vehicle storage, complaints have primarily arisen because of the introduction of the chiller units that run continuously at

a level 23 dB above the existing background. Although a decrease of 6 dB in the overall noise level may seem insignificant compared to the overall exceedance, it should be noted that the use of electric power eliminates the low rumble associated with the onboard diesel generators. Nonetheless, the exceedance of 17 dB is still considered to be indicative of a significant adverse impact.

8.0 CONCLUSION

An environmental noise survey, manual noise measurements and a BS4142 assessment have been carried out for the existing vehicle storage yard at The Truck Stop, Pilsworth Road, Heywood, OL10 2TA.

An initial assessment of the current operation indicated a significant adverse impact at the nearest noise sensitive receptor, therefore mitigation measures have been proposed to reduce noise emissions.

A subsequent assessment has been undertaken considering the proposed mitigation measures. This assessment has indicated a significant improvement, although a significant adverse impact is still shown at the nearby receptors.

The Truck Stop, Pilsworth Rd, Heywood - Position 1
Environmental Time History
12/03/2024 to 14/03/2024

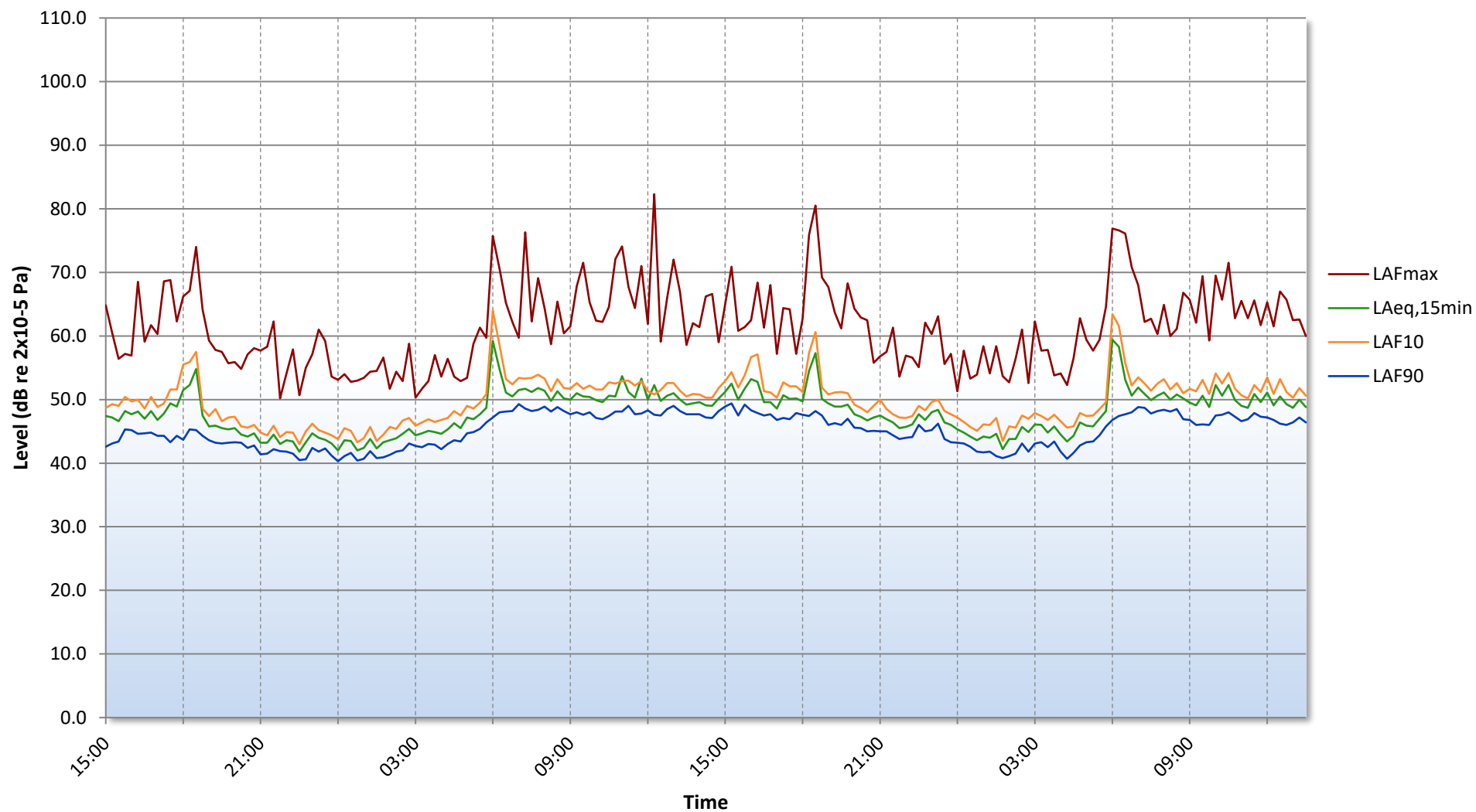


Figure 28208.TH1

The Truck Stop, Pilsworth Road (Weekend) - Position 2
Environmental Time History
17/05/2024 to 20/05/2024

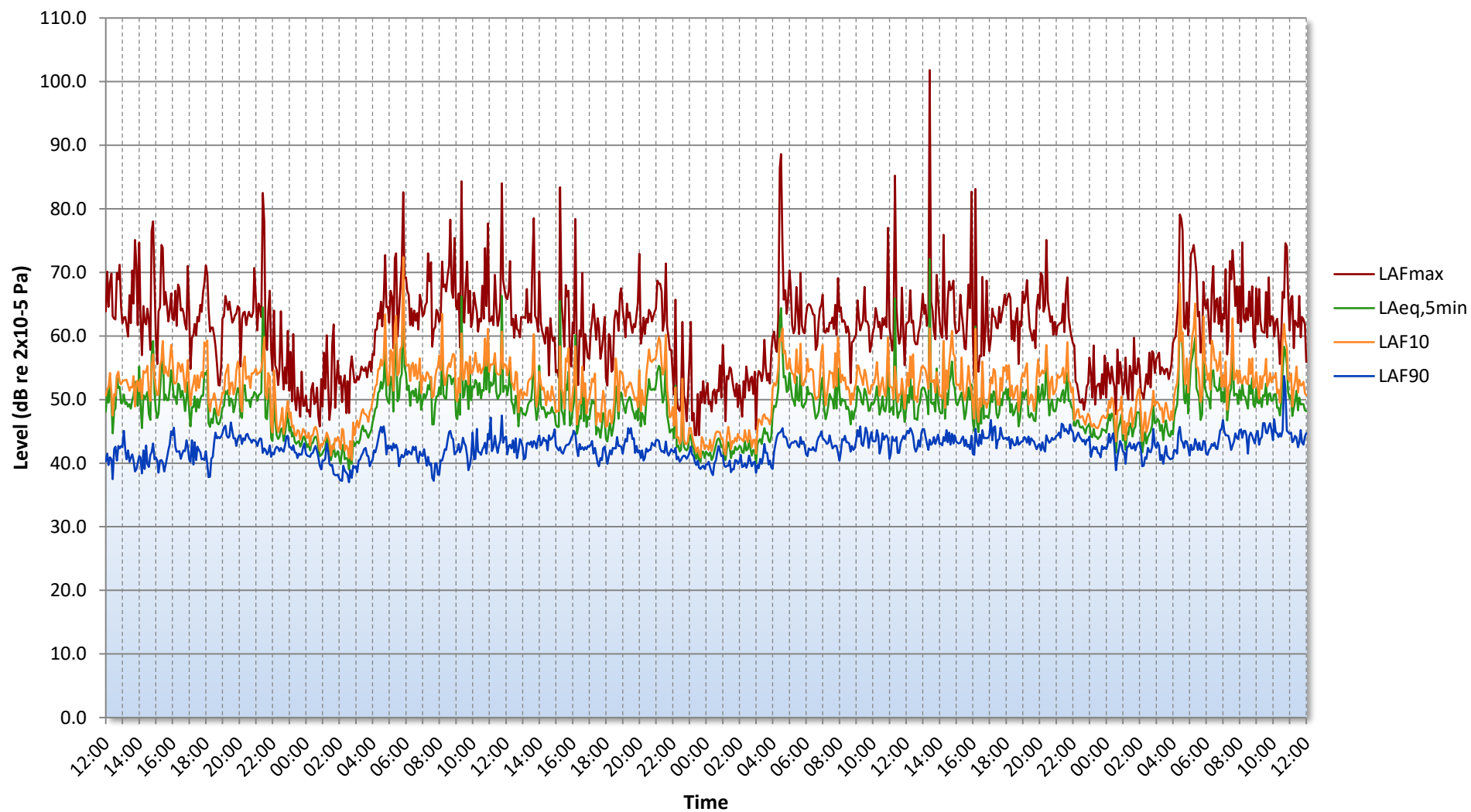


Figure 28208.TH2

The Truck Stop, Pilsworth Rd, Heywood - Position 1
Representative Daytime Background Noise Level
12/03/2024 to 14/03/2024

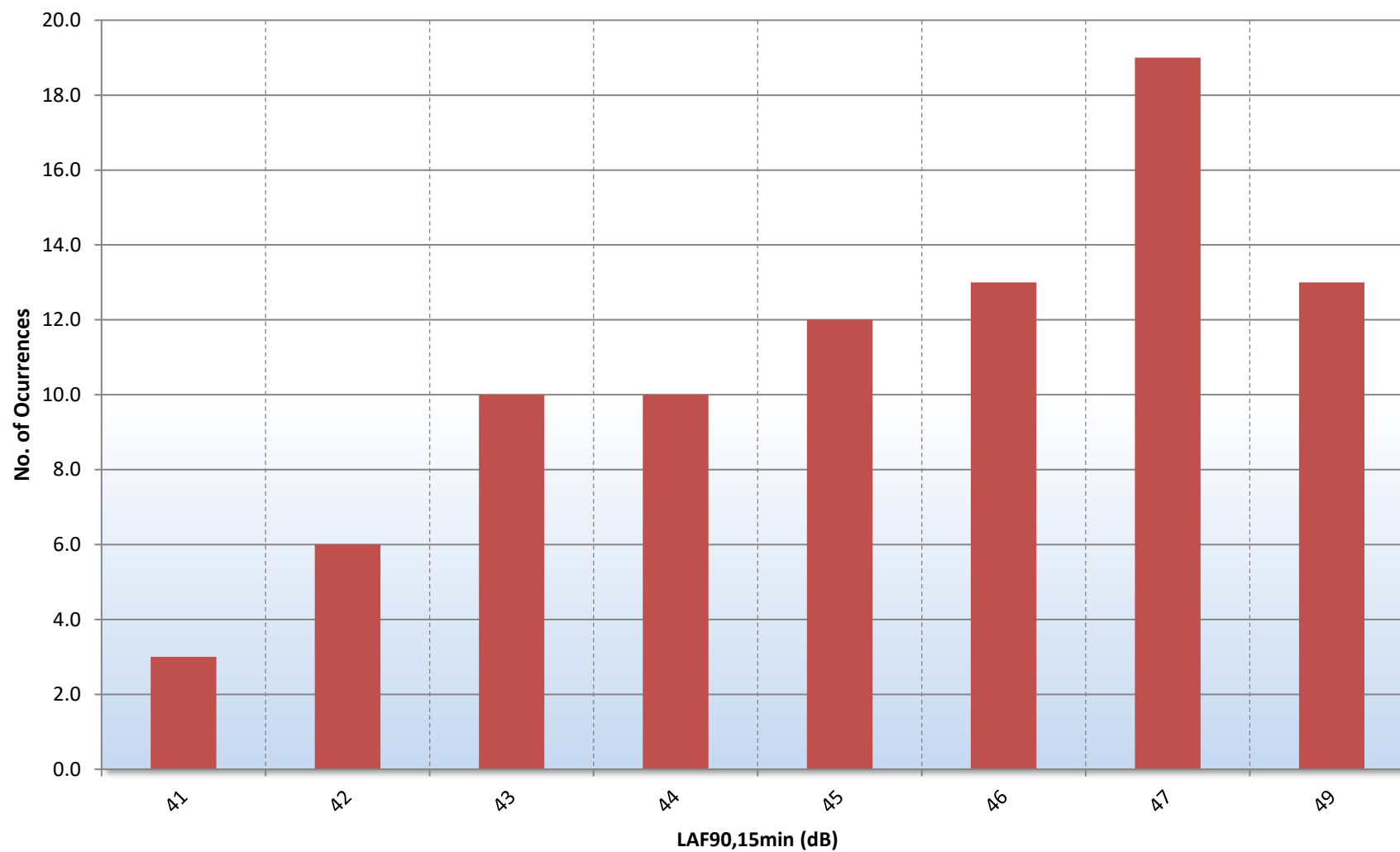


Figure 28208.Daytime L90.TH1

The Truck Stop, Pilsworth Rd, Heywood - Position 1
Representative Night-time Background Noise Level
12/03/2024 to 14/03/2024

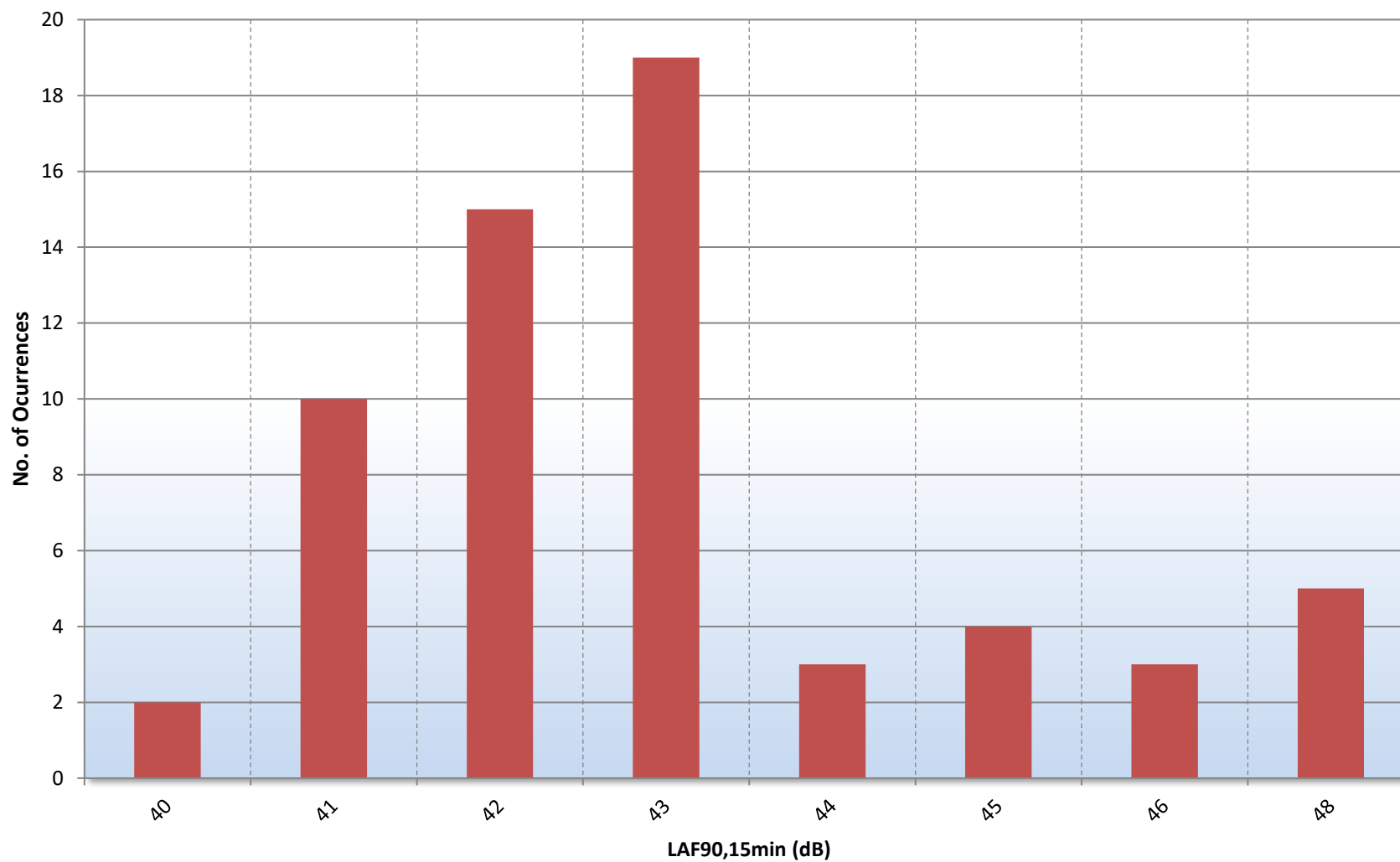


Figure 28208.Night-time L90.TH1

The Truck Stop, Pilsworth Road (Weekend) - Position 2
Representative Daytime Background Noise Level
17/05/2024 to 20/05/2024

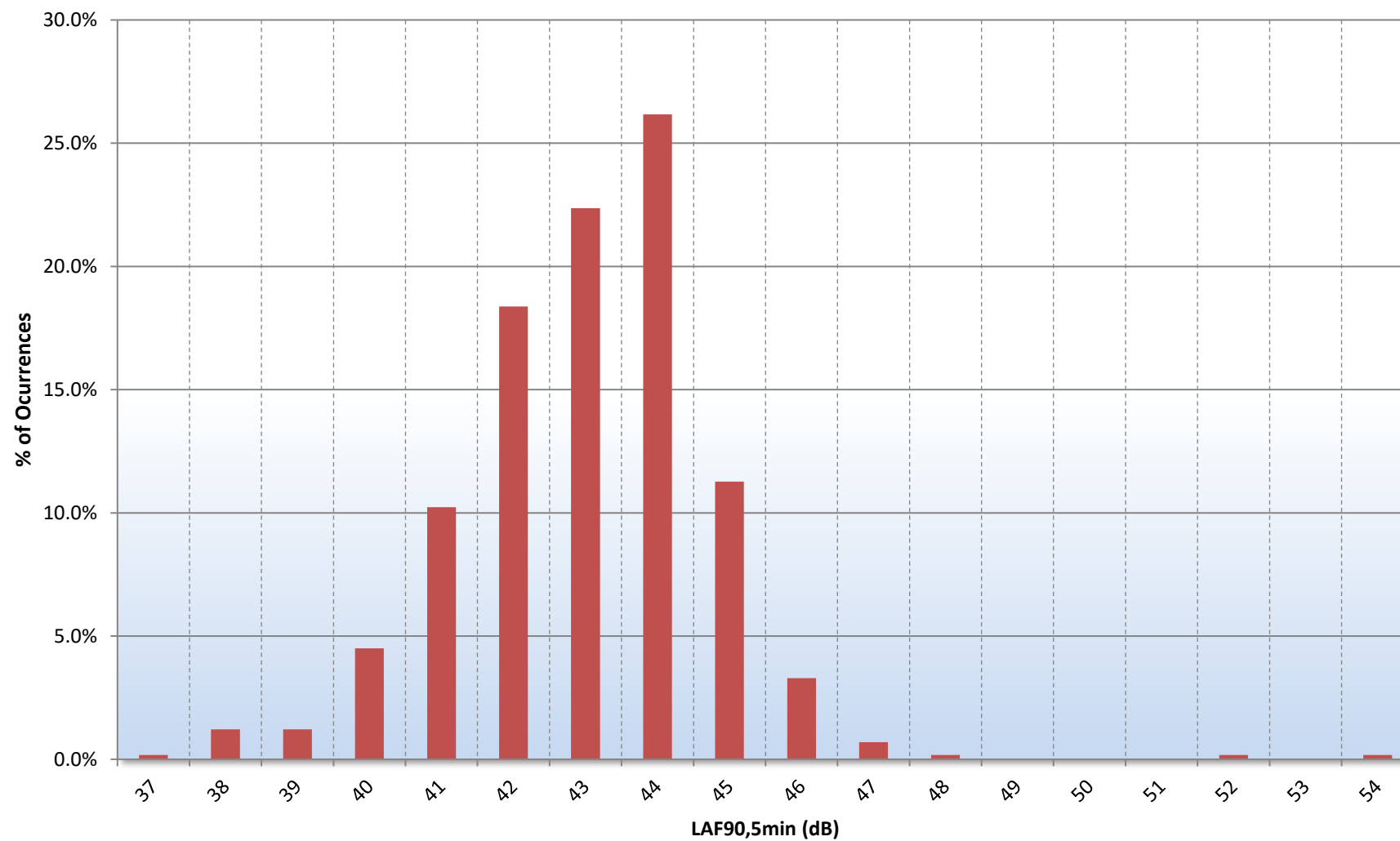


Figure 28208.Daytime L90.TH2

The Truck Stop, Pilsworth Road (Weekend) - Position 2
Representative Night-time Background Noise Level
17/05/2024 to 20/05/2024

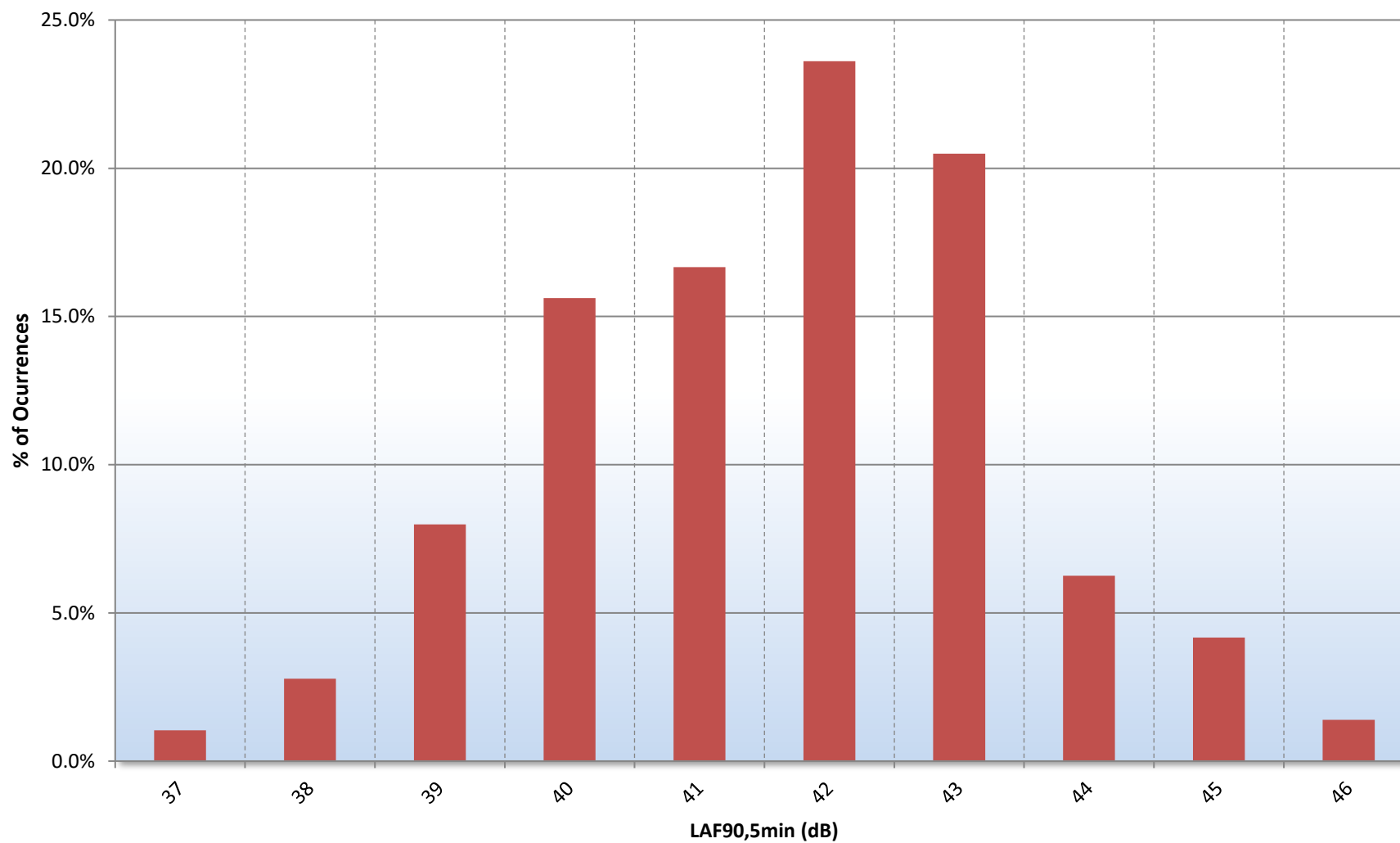


Figure 28208.Night-time L90.TH2

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.