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**Convenience Store**  
Land Off High Street  
Rocester  
Uttoxeter  
ST14 5JU

**Plant Noise  
Guidance Report**

On behalf of



Project Reference: 90461 | Revision: 01 | Date: 4<sup>th</sup> February 2022  
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## Document Information

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<b>For and on behalf of Noise Solutions Ltd</b>				

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01	1/03/2022	Updated plant location	DC	NAC

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## Executive Summary

Noise Solutions Limited has been appointed to set noise limits for new plant to be installed for the proposed convenience store sited on the land off High Street, Rocester.

It is understood that the plant serving the unit will be located within a service area to the southwest of the store.

Based on the information contained within this report, it is recommended that the following plant noise limits apply:

Plant	Period	Maximum plant noise emission level ( $L_{Aeq}$ )
Refrigeration plant (total)	Daytime (07.00 – 23.00 hours)	38dB at 10m
	Night-time (23.00 – 07.00 hours)	38dB at 10m
Air conditioning plant (total)*	Daytime (07.00 – 23.00 hours)	61dB at 1m

*\*Limits based on typical split AC units; refer to NSL for limits for VRF/VRV units*

Outline guidance is given in the report for plant noise emission limits and is to be confirmed when plant locations and types are finalised.

## 1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned to provide guidance on maximum noise emissions from new plant serving the proposed convenience store sited on the Land off High Street, Rocester.
- 1.2. This report contains recommendations based on project information available at the time of the assessment. NSL can provide further guidance on receipt of the selected plant details.
- 1.3. A glossary of acoustic terminology is given in [Appendix A](#).

## 2.0 Details of development proposals

- 2.1. The proposed store is to be located on the land off High Street, Rocester in Uttoxeter. The site location is shown in [Appendix B](#).
- 2.2. Plant is to be located on the roof of the store at first floor level.
- 2.3. Plant is to be selected but is likely to comprise air conditioning (AC) units, a refrigeration pack and an associated gas cooler. The AC units will operate only during the daytime; the refrigeration plant will operate at all times but may run at reduced duty at night when the store is closed, and cooling demands are lower.

## 3.0 Nearest noise sensitive receptors

- 3.1. The nearest residential properties to the plant are to the northeast of the site (Receptor R1) sited directly above 50 High Street. The closest windows are approximately 20m from the plant area. The next closest noise sensitive receptors are on Riversfield Drive, but directly south and west of the proposed plant location (Receptor R2 and R3 respectively). The closest windows at R2 are approximately 30m from the plant area. The closest windows at R3 are approximately 40m from the plant area.

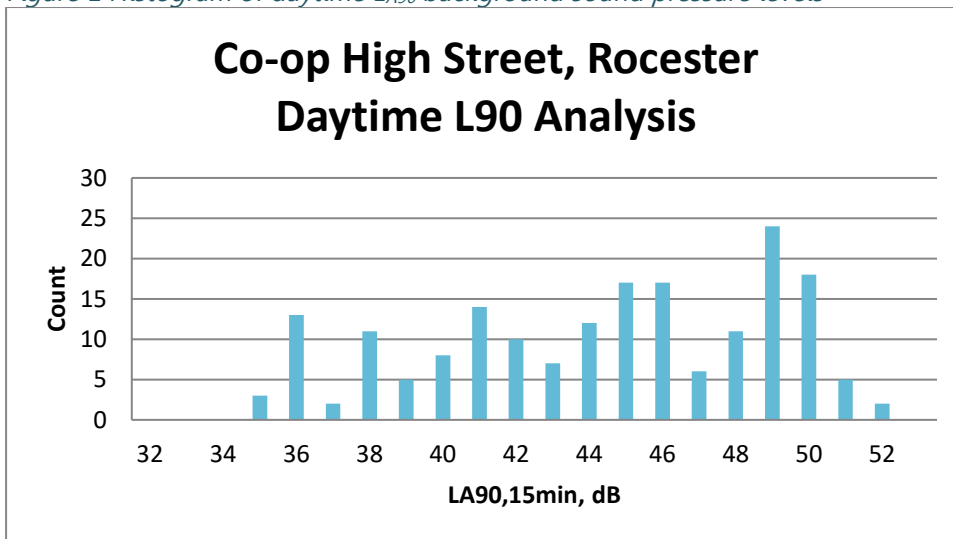
## 4.0 Existing noise climate

- 4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.
- 4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in [Appendix C](#).

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	L <sub>Aeq</sub> (15mins)	L <sub>Amax</sub> (15mins)	L <sub>A10</sub> (15mins)	L <sub>A90</sub> (15mins)
Daytime (07.00 – 23.00 hours)	43-66	59-92	40-69	35-52
Night-time (23.00 – 07.00 hours)	35-57	41-78	36-60	33-50

Figure 1 Histogram of daytime L<sub>A90</sub> background sound pressure levels

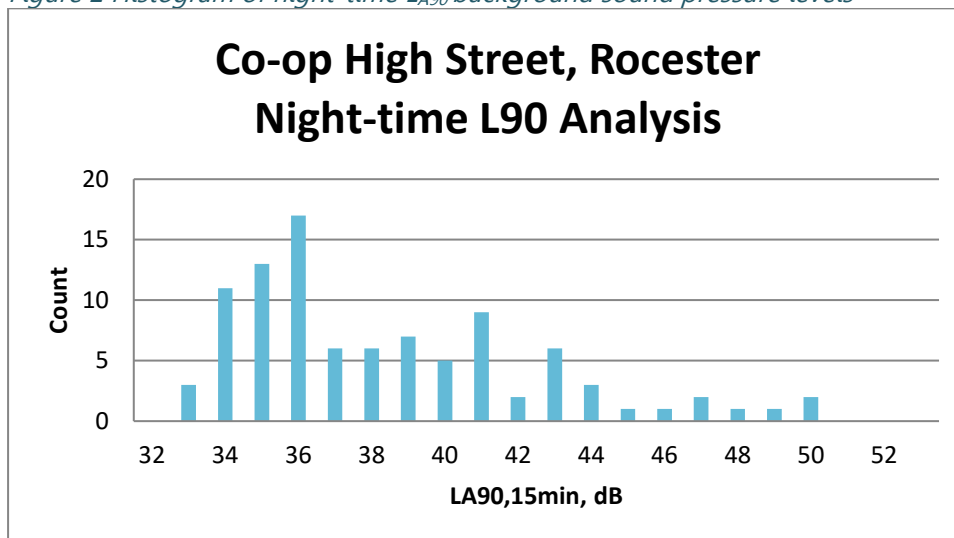


4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

Table 2 Statistical analysis of L<sub>A90,15min</sub> levels during the daytime period

dB, L <sub>A90</sub> daytime period	
<b>Mean</b>	44
<b>Mode</b>	49
<b>Median</b>	45

Figure 2 Histogram of night-time  $L_{A90}$  background sound pressure levels



4.4. Additional statistical analysis has been undertaken. As shown in Table 3, the mean, median, and modal values have been calculated:

Table 3 Statistical analysis of  $L_{A90,15min}$  levels during the night-time period

dB, $L_{A90}$ night-time period	
<b>Mean</b>	38
<b>Mode</b>	36
<b>Median</b>	37

4.5. Based on the histogram analyses above, the following values have been considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 40dB  $L_{A90}$  during the daytime period; and
- 35dB  $L_{A90}$  during the night-time period

4.6. The above values have been selected to be representative of periods when road traffic was at a minimum and background sound levels are therefore due to more-distant noise sources also affecting the residential property closest to the plant area.

## 5.0 Plant noise design criteria

### East Staffordshire Borough Council

- 5.1. East Staffordshire Borough Council's Design Guide Supplementary Planning Document (June 2008) states:

*"...Noise is an important environmental consideration and is even more important where residential areas are close by. Steps should be taken to reduce the amount of noise nuisance created by the development, through technical specifications and/or the layout of the site and landscape noise buffers."*

- 5.2. In the absence of any further guidance, it is robust to design plant noise to have "low impact" when assessed using the method described in BS 4142:2014.

### BS 4142:2014 Methods for rating and assessing industrial and commercial sound

- 5.1. BS 4142:2014 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.
- 5.2. The procedure contained in BS 4142:2014 is to quantify the *"specific sound level"*, which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.
- 5.3. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.
- 5.4. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."*
- 5.5. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: *"Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."*
- 5.6. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:



- *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 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 sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
- 5.7. The standard does state that "*adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*"
- 5.8. The standard goes on to note that: "*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 the background. This is especially true at night.*"
- 5.9. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:
- "An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*
- 5.10. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

## **6.0 Outline guidance - plant noise limits**

- 6.1. Plant details are to be finalised.
- 6.2. Taking account of the distance between the plant and the nearest receptors, the proposed plant should not exceed the following limits in order to demonstrate compliance with the criteria detailed in Table 2:

Table 3 Guidance on maximum refrigeration plant noise emission limits

Plant	Period	Maximum plant noise emission level (L <sub>Aeq</sub> )
Refrigeration plant (total)	Daytime (07.00 – 23.00 hours)	38dB at 10m
	Night-time (23.00 – 07.00 hours)	38dB at 10m
Air conditioning plant (total)*	Daytime (07.00 – 23.00 hours)	61dB at 1m

*\*Limits based on typical split AC units; refer to NSL for limits for VRF/VRV units*

- 6.3. The following should be taken into account during the design of the ACs and refrigeration system;
- NSL should be consulted once the exact plant layout/selection is confirmed to ensure noise requirements can be achieved.
  - The local authority is anticipated to require details of the proposed plant and a noise impact assessment report as part of the planning application.

## 7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned to provide guidance on maximum noise emissions from new plant serving the proposed convenience store sited on the land off High Street, Rocester.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.
- 7.3. Guidance on the maximum noise emissions from the proposed plant has been provided. NSL should be consulted once the final layout/selections have been confirmed.

## Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ( $L_{Aeq,T}$ ).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds $s_1$ and $s_2$ is given by $20 \log_{10} (s_1/s_2)$ . The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$ . The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), $L_{Ax}$	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. $L_{max}$ is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall $L_{eq}$ noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. $L_{10}$ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A-weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

### Appendix B Photograph of site showing areas of interest



## Appendix C Environmental sound survey

### Details of environmental sound survey

- C.1 Measurements of the existing background sound levels were undertaken between 14.15 hours on Friday 14 January and 12.30 hours on Monday 17 January 2022.
- C.2 The sound level meter was programmed to record the A-weighted  $L_{eq}$ ,  $L_{90}$ ,  $L_{10}$  and  $L_{max}$  noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

### Measurement position

- C.3 The sound level meter was positioned on a lamppost on Riversfield Drive. The approximate location of the microphone is indicated on the aerial photograph in [Appendix B](#). In accordance with BS 7445-2:1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use*', the measurements were undertaken under free-field conditions.
- C.4 The survey location was chosen such that the lowest background noise levels were similar to those at the nearest residential receptors (R1 and R2) but exclude any potential effect of noise from existing plant serving the store.

### Equipment

- C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	07/06/2021	1500431
Condenser microphone	Rion UC-59 /08290		
Preamplifier	Rion NH-25 / 54080		
Calibrator	Rion NC-74 /34235932	23/09/2021	1500910-1

- C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise

measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Time/Date	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	14.15 14 Jan - 12.30 17 Jan 2022	Temperature (°C)	4	7
<p><b>Cloud Cover</b></p> <p>Symbol    Scale in oktas (eighths)</p> <p>0    Sky completely clear</p> <p>1</p> <p>2</p> <p>3</p> <p>4    Sky half cloudy</p> <p>5</p> <p>6</p> <p>7</p> <p>8    Sky completely cloudy</p> <p>(9) Sky obstructed from view</p>		Precipitation:	No	No
		Cloud cover (oktas – see guide)	1	0
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Damp	Damp/Wet
		Wind Speed (m/s)	<1	1.9
		Wind Direction	S	SW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	n/a	n/a

## Results

- C.7 The results of the survey are considered to be representative of the background sound pressure levels at the façades of the most affected noise sensitive receptors to the plant area during the quietest times at which the plant will operate. The noise climate at the measurement position was dominated by distant road traffic to the west (B5030). The results of the survey are presented in a time history graph overleaf.



### Co-op High Street, Rocester Friday 14 - Monday 17 Jan 2022

