The Co-operative

New Lodge
Laithes Lane
Barnsley
S71 3TY

Plant Noise Impact Assessment

On behalf of

space. engineering services

Project Reference: 88947 | Revision: 00 | Date: 20th November 2019

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Document Information

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1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Space Engineering to undertake a noise impact assessment for new external plant serving an existing Co-operative store located at New Lodge in Barnsley.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed using the typical requirements of Barnsley Metropolitan Borough Council.

1.4. A glossary of acoustic terminology is given in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The Co-operative store occupies the majority of a single storey building near the junction of Wakefield Road and Laithes Lane, Barnsley. The remainder of the building is occupied by other retail units.

2.2. The existing Air Conditioning (AC) and refrigeration on the roof of the store will be replaced with new plant. In addition, the existing refrigeration condensing unit will be relocated to the rooftop plant area

2.3. The proposed AC plant will operate only during the store opening hours. The refrigeration plant will operate continuously 24 hours each day.

2.4. **Appendix C** contains a table with the manufacturer's published sound pressure levels for the proposed plant.

3.0 Nearest noise sensitive receptors

3.1. The store is situated within a local retail area.

3.2. The nearest noise-sensitive residential property to the plant is the house immediately to the east, on the north side of Regent Crescent (Receptor R1). The nearest windows of this property are approximately 12m from the plant but screened from it by the building geometry.

3.3. The nearest residential windows with a potential view of the plant are in the houses on the junction of Regent Crescent and Wakefield Road (Receptor R2), which are approximately 19m from the plant.

3.4. An aerial photograph showing the site and surrounding area, the nearest noise sensitive properties and noise monitoring location used in this assessment is presented in **Appendix B**.

4.0 Existing noise climate

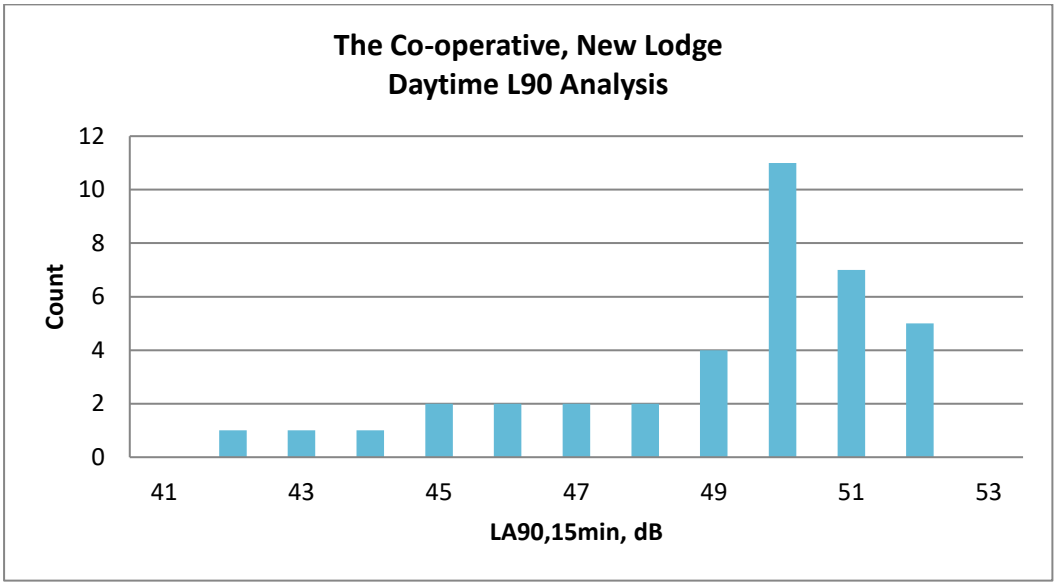
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

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 D**.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{AFmax(15min)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	52-61	67-86	54-64	42-52
Night-time (23.00 – 07.00 hours)	44-58	60-78	45-61	39-49

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



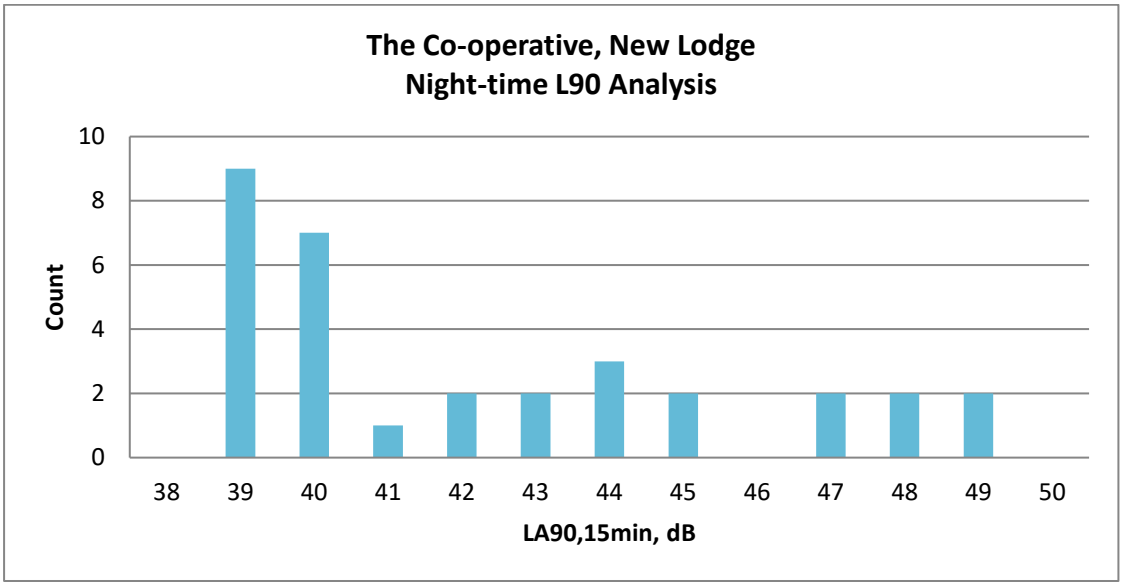
4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

Table 2 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
mean	49
modal	50
median	50

4.4. From the histogram analysis, 47dB has been selected to be a robust representation of the background noise level during the daytime period.

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



4.5. Further statistical analysis has been carried out on the data and the mean and median values are shown in table 3 below.

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

dB, L_{A90} night-time period	
mean	42
modal	39
median	41

4.6. Again from the histogram analysis, 39dB has been chosen to be representative of the background sound level during the night-time period.

4.7. Therefore, the following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 47dB L_{A90} during the daytime period; and
- 39B L_{A90} during the night-time period.

5.0 Plant noise design criteria

National Planning Policy Framework

5.1. A new edition of NPPF was published in February 2019 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with a revision in July 2018 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2019 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the February 2019 edition.

5.2. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."*

5.3. The NPPF goes on to state in Paragraph 180:

" planning policies and decisions 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 quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason ...

5.4. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.5. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

5.6. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".*

[1] National Planning Policy Framework, DCLG, March 2012

[2] Noise Policy Statement for England, DEFRA, March 2010

5.7. Paragraph 117 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land"*.

Barnsley Metropolitan Borough Council

5.8. Barnsley Metropolitan Borough Council's local plan was adopted in January 2019. The document requires noise from new developments to be assessed but does not refer to assessment methods or specific noise targets. A review of recent planning decisions for similar plant installations indicates that each case is judged individually and there are no "standard" noise requirements applied across the Borough.

5.9. It is therefore appropriate to assess noise from the proposed plant using the method described in BS 4142:2014.

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

5.10. 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"*.

5.11. 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.

5.12. 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.

5.13. 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."*

5.14. 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."*

5.15. 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.*

5.16. 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.*"

5.17. 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."*

5.18. 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."

5.19. 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.

Summary of criteria

5.20. In the absence of defined local authority requirements, it is considered appropriate that the rating noise level due to the new plant should not exceed the existing representative background sound level at the nearest residential windows. According to the method described

in BS 4142:2014 this would result in, at worst, a "low impact". The limits are therefore as shown in Table 4:

Table 4 Plant noise emissions limits at receptor

Receptor	Period	Cumulative plant rating level, dB(A)
R1 (Residential)	Daytime (07.00 – 23.00 hours)	47
	Night-time (23.00 – 07.00 hours)	39

6.0 Plant noise impact assessment

6.1. The cumulative plant noise level at the most affected noise sensitive receptor has been predicted based on manufacturer's noise data for the existing and proposed equipment. The assessment has taken into consideration distance attenuation and directivity.

6.2. The plant noise emission limits are inclusive of a minimum 10dB noise reduction between the plant and the house at R1 due to the store building envelope.

6.3. The predictions have been based on all plant operating at maximum duty during the daytime period and the refrigeration plant only operating during the night-time period.

6.4. It should be noted that all proposed plant is high-quality and no impulsive characteristics are anticipated provided the equipment is well maintained. All plant items are inverter driven, which means the fans gently ramp to cope with system demands. As a result, the plant items are not considered to operate intermittently. Although 1/3-octave band data is not available from the unit manufacturers to assess tonality, experience of comparable plant operating at other Co-operative sites indicates that no tonal components are present. In any case, in order to be robust, a +3dB feature correction has been applied to noise level predictions at residential receptors.

6.5. Table 5, below, summarises the cumulative noise levels of the proposed external plant at the nearest noise-sensitive windows. All other nearby receptors benefit from increased distance/screening to the plant. The full set of calculations can be found in **Appendix E**.

Table 5 Assessment of noise levels at nearby receptor due to existing plant

Receptor	Period	Predicted plant rating level at receptor, L_{Aeq} (dB)	Existing background sound level (dB)	Difference (dB)
R1	Daytime period (07.00 – 23.00 hours)	31	47	-16
	Night-time period (23.00 – 07.00 hours)	28	39	-11
R2	Daytime period (07.00 – 23.00 hours)	37	47	-10
	Night-time period (23.00 – 07.00 hours)	34	39	-5

6.6. The above assessment demonstrates that cumulative plant noise levels will meet the proposed noise limits at the nearest residential properties.

Context and uncertainties

6.7. As BS 4142:2014 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:

- The assessment is undertaken at the nearest residential window. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- The assessment has been made with all plant operating at maximum capacity, as this is not always the case, the assessment is an absolute worst case scenario.

6.8. Where possible uncertainty in the above assessments has been minimised by taking the following steps:

- The meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
- Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.
- Care was taken to ensure that the measurement positions were representative of the noise climate outside the nearby residential dwellings and not in positions where higher noise levels were present.

6.9. Taking into account the context of the site and development proposals, noise from fixed plant is significantly below the level at which a 'low impact' in accordance with BS 4142:2014 could be expected.

Vibration isolation

6.10. To reduce the possibility of vibration and structure borne noise entering the structure and re-radiating within the building, all plant should be mounted on anti-vibration mounts providing an isolation efficiency of at least 95%.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Space Engineering to undertake a noise impact assessment for new external plant serving an existing Co-operative store located at New Lodge in Barnsley.

7.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

7.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed using the typical requirements of Barnsley Metropolitan Borough Council.

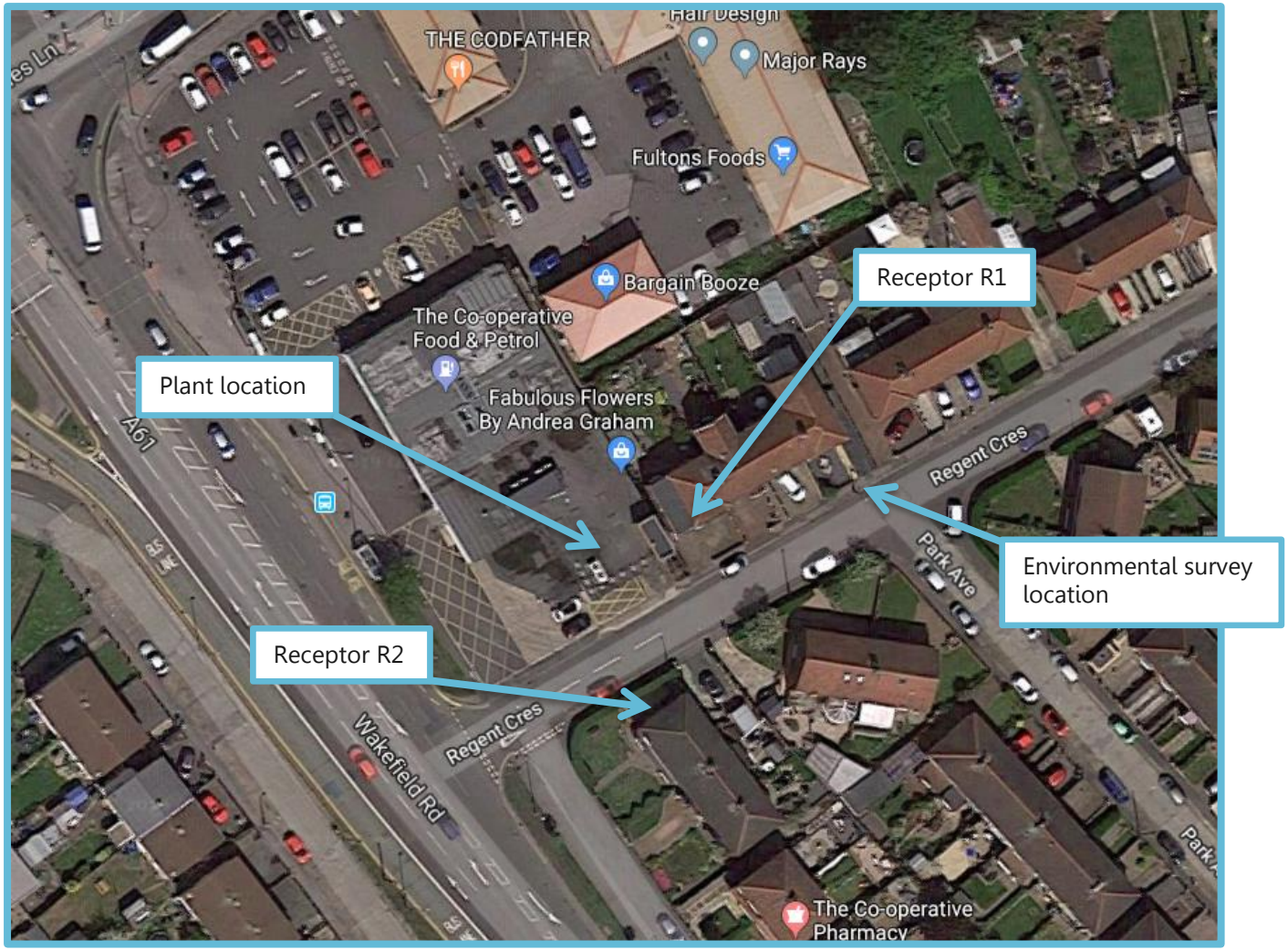
7.4. Cumulative plant noise emissions have been predicted below the level at which a "low impact" would be expected, according to BS 4142:2014, at the nearest noise sensitive receptor.

7.5. The assessment has demonstrated compliance with national and local policies. Therefore, noise from the proposals should not be a reason for refusal of planning permission.

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 s1 and s2 is given by 20 $\log_{10}$ (s1/s2). 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 20µPa. 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 Manufacturer plant noise emissions

Proposed plant

Plant Item	Make/Model	Quantity	Sound pressure level (dBA)
Gas cooler	Kelvion/GF-SA103F4H-063M043	1	30 at 10m
Condensing unit	Hubbard/HZF06-3A3-05	1	36 at 10m
AC Units	Mitsubishi/PUZ-ZM125YKA	3	52 at 1m

Appendix D Environmental sound survey

Details of sound surveys

D.1 Measurements of the existing background sound levels were undertaken from 17.00 hours on Monday 11th November to 10.30 hours on Tuesday 12th November 2019.

D.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 15-minute sample periods for the duration of the noise survey.

Measurement position

D.3 The measurement position was located on a lamppost along Regent Crescent near to the store (location indicated on the site plan 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.

Equipment

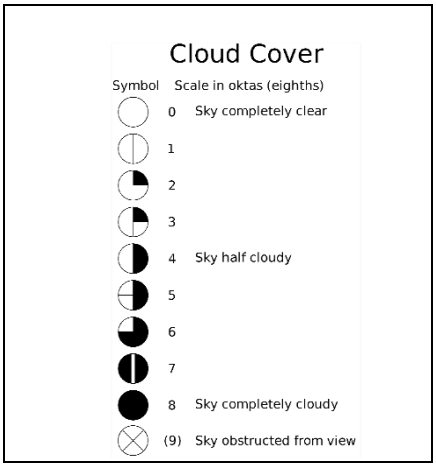
D.4 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 949 / 12262	12/04/2019	TCRT19/1290
Condenser microphone	MCE212 / 42528		
Preamplifier	Svantek SV12L / 13163		
Calibrator	Svantek SV 30A / 10847	11/04/2019	TCRT19/1284

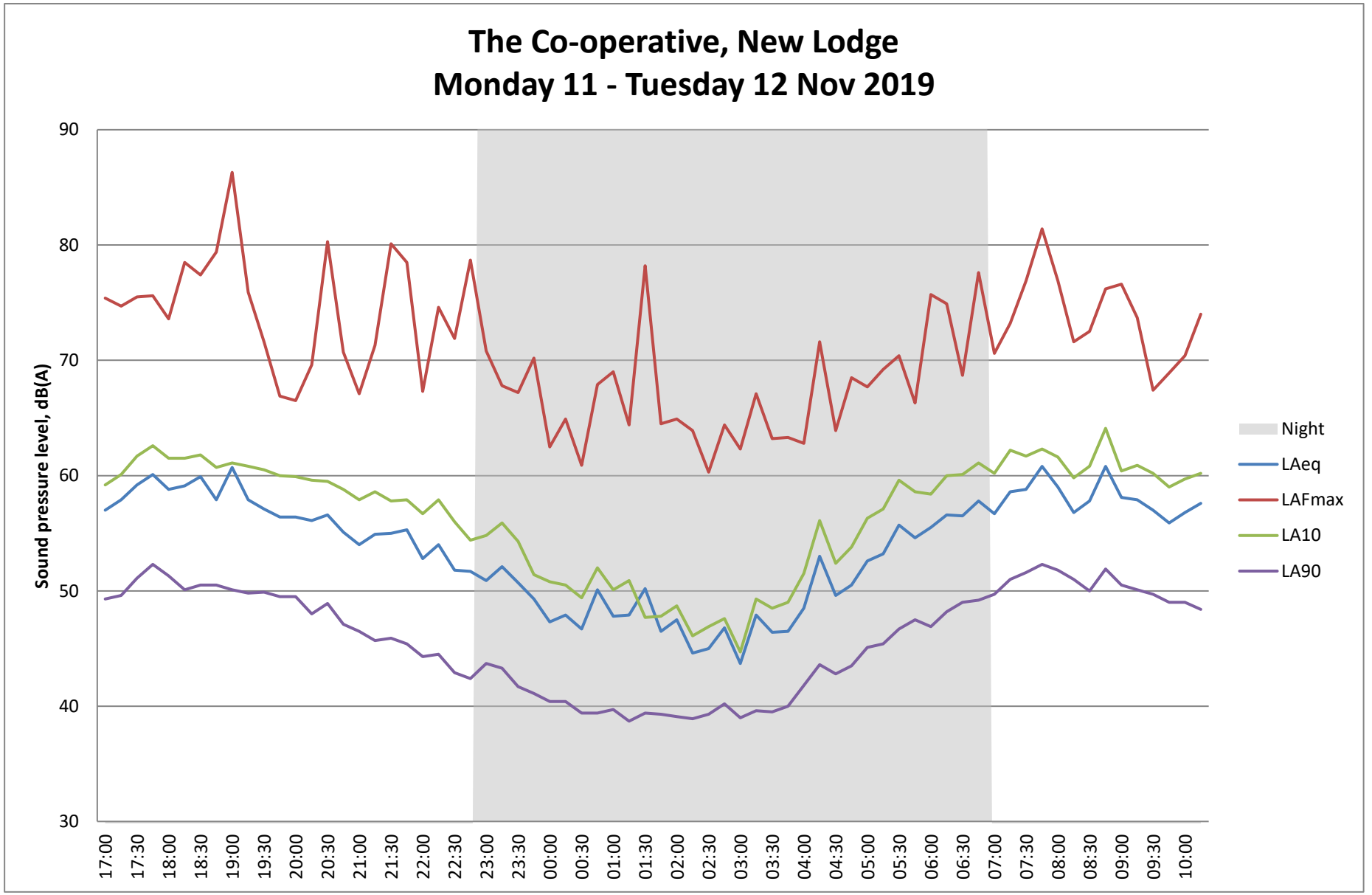
Weather conditions

D.5 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	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	17.00 11 Nov – 10.30 12 Nov 2019	Temperature (°C)	6	8
		Precipitation:	Light shower	No
		Cloud cover (oktas - see guide)	8	2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Wet	Wet
		Wind Speed (m/s)	3	2
		Wind Direction	Westerly	Westerly
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.6 The results of the environmental survey are considered to be representative of the background sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the plant will operate. The noise climate during the survey period was dominated by local road traffic. The results of the survey are presented in a time history graph overleaf.


The Co-operative, New Lodge
Monday 11 - Tuesday 12 Nov 2019
Sound pressure level, dB(A)
90
80
70
60
50
40
30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
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03:30
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04:30
05:00
05:30
06:00
06:30
07:00
07:30
08:00
08:30
09:00
09:30
10:00
Night
LAeq
LAFmax
LA10
LA90

Appendix E Noise level predictions at Receptors

Receptor 1 - Proposed Daytime

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	Lp (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	30	10	12	-2	0	-10	3	21
Condensing unit	36	10	12	-2	0	-10	3	27
AC	52	1	12	-22	0	-10	3	23
AC	52	1	12	-22	0	-10	3	23
AC	52	1	12	-22	0	-10	3	23
							Cumulative rating level (day)	**31**

Receptor 1 – Proposed Night-time

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	Lp (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	30	10	12	-2	0	-10	3	21
Condensing unit	36	10	12	-2	0	-10	3	27
							Cumulative rating level (night)	**28**

Receptor 2- Proposed Daytime

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	Lp (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	30	10	19	-6	0	0	3	27
Condensing unit	36	10	19	-6	0	0	3	33
AC	52	1	19	-26	0	0	3	29
AC	52	1	19	-26	0	0	3	29
AC	52	1	19	-26	0	0	3	29
Cumulative rating level (day)								**37**

Receptor 1 – Proposed Night-time

Plant	Maximum plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	Lp (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	30	10	19	-6	0	0	3	27
Condensing unit	36	10	19	-6	0	0	3	33
Cumulative rating level (night)								**34**

Appendix F Plant layout