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The Co-operative store

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Plant Noise Impact Assessment

On behalf of

CDS

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Executive Summary

Noise Solutions Limited has been appointed to undertake a noise impact assessment of proposed replacement plant to be installed at the existing Co-operative store at Henley Road in Southwick Square, Southwick.

The assessment shows that noise from the proposed plant will comply with the local authority's usual requirements and should therefore be acceptable to them. Noise should not be a reason for refusal of planning permission.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned to undertake a noise impact assessment of proposed replacement plant serving the existing Co-operative store at Southwick Square, Southwick.

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. Plant noise levels have been predicted at the nearest noise-sensitive receptors and assessed against the local authority's usual requirements.

1.4. A glossary of acoustic terminology is given in **Appendix A**.

2.0 Details of development proposals

2.1. The Co-operative store occupies part of the ground floor of a parade of shops in a 'local centre' setting around Southwick Square. The site location is shown in **Appendix B**.

2.2. Replacement plant is to be installed, replacing the existing plant on the roof of a single storey extension at the rear (north side) of the building.

2.3. Plant is to comprise a refrigeration gas cooler and four air conditioning (AC) units. A refrigeration compressor pack will be installed internally and is excluded from this assessment.

2.4. 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.

2.5. Manufacturer noise levels for the plant are given in **Appendix D**. A plant layout is shown in **Appendix E**.

3.0 Nearest noise sensitive receptors

3.1. The nearest residential properties to the plant are the first and second floor dwellings above the parade of shops. Although these are set back from the rear elevation of the store such that screening of some plant is provided by the building structure, upper floor windows of the nearest property (Receptor R1) may have line of sight of the taller plant items at a distance of around 20m. As a robust assessment it is assumed that no screening is provided to the refrigeration equipment, although the AC plant is likely to be screened.

3.2. The rear of houses on Southdown Road (Receptor R2) will be around 38m from the plant. As a robust assessment it is assumed that no screening is provided to any plant from this receptor.

3.3. A parapet around the upper roof may provide some screening of the plant from receptor R1 although, as a robust assessment, it is assumed that the plant will be in full line of sight.

4.0 Existing noise climate

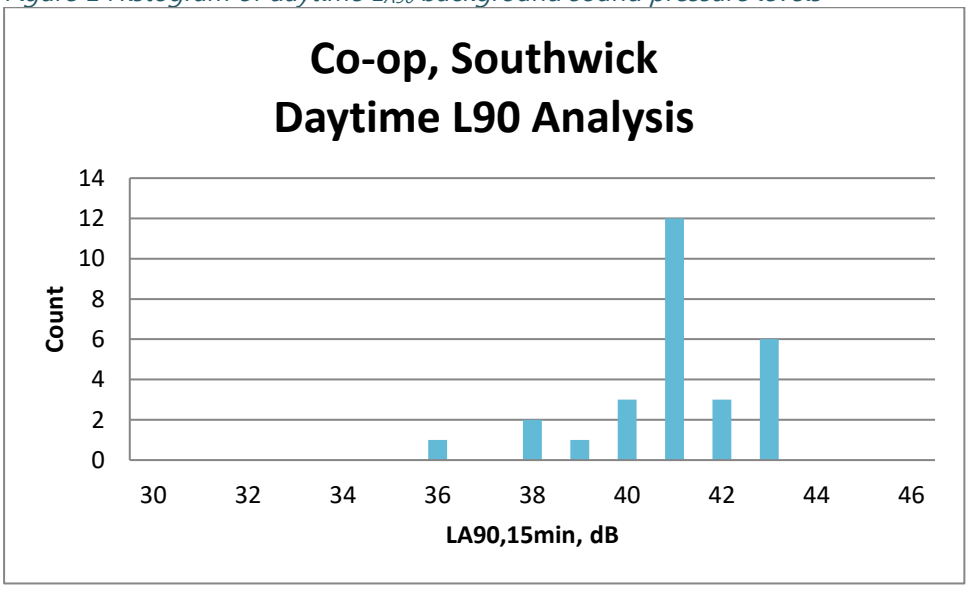
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1. 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)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	45-52	58-79	48-56	36-43
Night-time (23.00 – 07.00 hours)	36-45	40-67	36-48	32-41

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

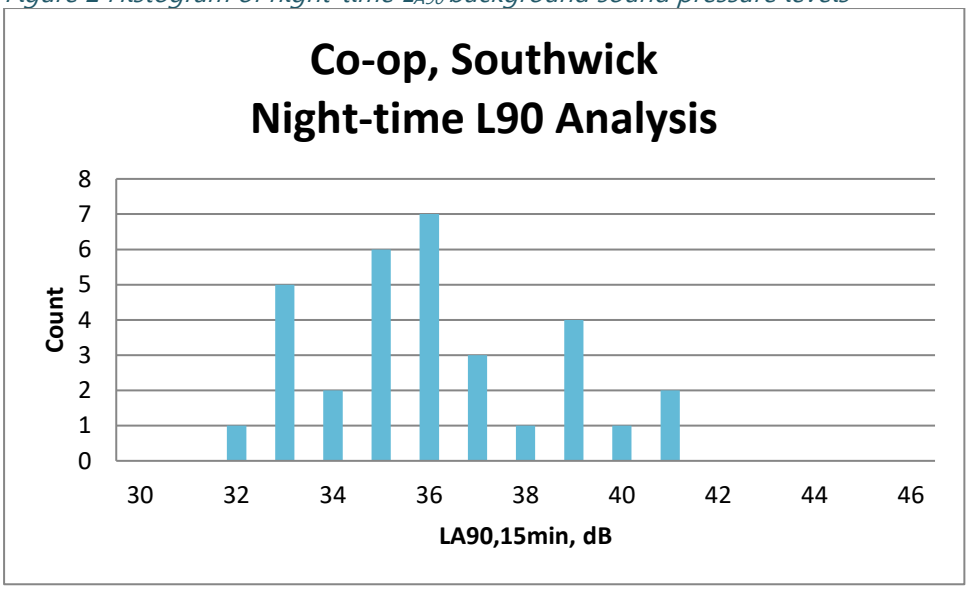


4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

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

dB, L_{A90} daytime period	
Mean	41
Mode	41
Median	41

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	
Mean	36
Mode	36
Median	6

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
- 33dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

Adur District Council

5.1. Policy 34 *Pollution and Contamination* in the Adur Local Plan 2017 (adopted December 2017) states that "where appropriate ... noise assessments will be required in conjunction with development proposals". Reference is also made to the Planning Noise Advice Document: Sussex, July 2015.

5.2. The *Planning Noise Advice Document for Sussex* contains the following paragraph in relation to Industrial and Commercial Noise Sources.

> *The starting point for designing any industrial/ commercial development should be to minimise noise "as far as reasonably practicable". The rating level of the plant/process, when measured in accordance with BS4142:2014, should, where practicable, be no greater than the existing background levels when measured in accordance with BS4142:2014. There may be instances, for specific sites, where a rating level below background is deemed appropriate. This can be determined through prior discussion with the Local Planning Authority or Local Environmental Health Department. For example, a rating level of 10 dBA below background may be required in certain instances if there are specific concerns such as the potential for noise creep. It is considered that meeting these criteria would avoid adverse noise impacts, in the interests of ensuring a good standard of amenity and protecting human health. Where these criteria are not attainable, the noise report should explain why, and how best practicable means will be implemented to control noise in order to satisfy the LPA that the development is acceptable*

5.3. As the proposed plant is to replace an existing installation, there is limited risk of noise creep and a limiting plant noise Rating level no louder than the prevailing background noise level is considered appropriate.

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

5.4. BS 4142:2014 +A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014[1] includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.5. 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

[1] For brevity, references to BS 4142 and BS 4142:2014 should be read as BS 4142:2014 + A1:2019

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.

5.6. 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.

5.7. 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."*

5.8. 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."*

5.9. 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.*

5.10. 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."*

5.11. 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."*

5.12. 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."

5.13. 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.

Proposed criteria

5.14. In accordance with Adur District Council's usual requirements, it is proposed that the rating level of the new plant is at or below the pre-existing representative background sound level.

5.15. The cumulative noise level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in Table 4.

Table 4 Proposed plant noise emissions level limits at noise sensitive residential receptors

Period	Cumulative plant rating noise level, dB $L_{Ar,Tr}$
Daytime (07.00 – 23.00 hours)	40
Night-time (23.00 – 07.00 hours)	33

5.16. The above limits have not been approved by the local authority at this stage.

6.0 Plant noise impact assessment

6.1. Plant noise levels at the nearest noise sensitive receptors have been predicted based on manufacturer's noise data for the proposed equipment. The assessment has taken into consideration distance attenuation and directivity.

6.2. The proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. To provide a robust assessment, a 3dB acoustic feature correction as described in BS 4142:2014+A1:2019 for the possible presence of "...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment..." has been applied.

6.3. Table 5 summarises the results of the assessment at the most affected properties. All other nearby receptors benefit from increased distance and / or screening to the plant such that resulting noise levels will be lower than at the receptors considered. The full set of calculations can be found in **Appendix F**.

Table 5 Plant noise levels at receptors

Receptor	Period	Predicted rating level at receptor, dB $L_{Ar,Tr}$	Criterion, dB	Difference, dB
R1	Daytime (07.00 – 23.00 hours)	34	40	-6
	Night-time (23.00 – 07.00 hours)	21	33	-12
R2	Daytime (07.00 – 23.00 hours)	32	40	-8
	Night-time (23.00 – 07.00 hours)	18	33	-15

Assessment of uncertainties

6.4. Where possible uncertainty in this assessment has been minimised by taking the following steps:

- The measurement of the background sound levels was undertaken over a period including the quietest times of the day and night.
- The sound level meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.

- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

- Care was taken to ensure that the measurement position was representative of the noise climate outside the nearby residential dwellings and not at a position where higher noise levels are present.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment of replacement plant serving the existing Co-operative store at Southwick Square, Southwick.

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 plant area.

7.3. Plant noise levels have been predicted at the nearest noise-sensitive receptors. The assessment shows that noise from the proposed plant will comply with the local authority's usual requirements and other recognised guidance and should therefore be acceptable.

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 Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing environmental sound levels were undertaken between 16.15 hours on Thursday 20th February and 07.15 hours on Friday 21st February 2025.

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 along Southdown Road. 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.

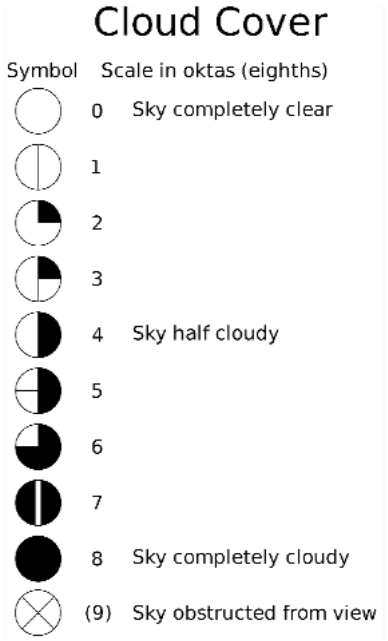
C.4 The survey location was chosen such that the lowest background noise levels were similar to those at the nearest residential receptors but exclude any potential effect of noise from existing plant serving the store.

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.

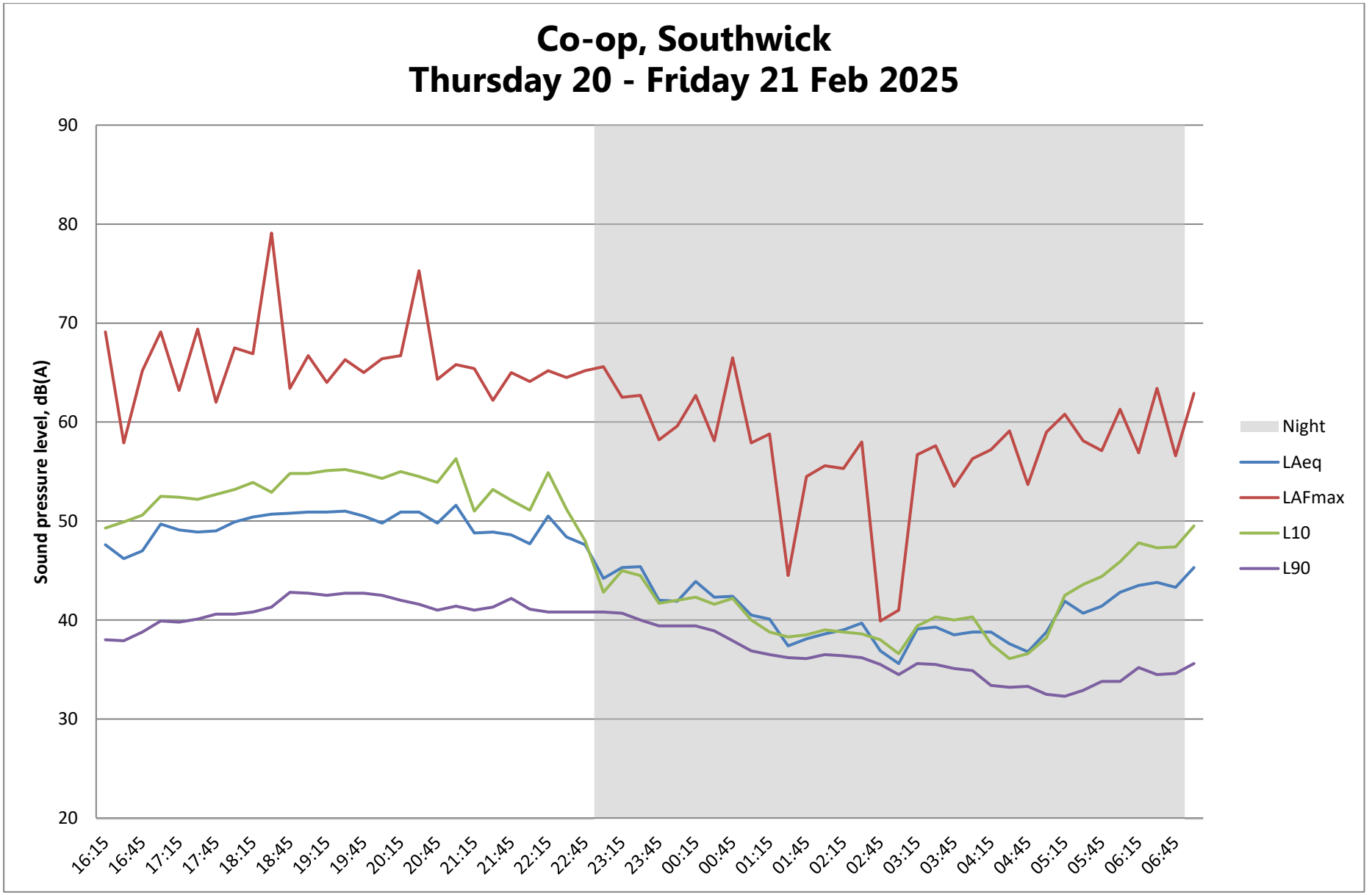
Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 971A / 124660	01/06/2023	1505421-1
Condenser microphone	ACO Pacific 7052E / 81197		
Preamplifier	Svantek SV18A / 130661		
Calibrator	Svantek SV33B / 125546	04/06/2024	1508883-1

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	16.15 20/2/25 - 07.15 21/2/25	Temperature (°C)	11	12
		Precipitation:	No	No
		Cloud cover (oktas – see guide)	8	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Damp	No
		Wind Speed (m/s)	3	3
		Wind Direction	S	S
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

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 observed to be due to local and distant traffic. The results of the survey are presented in a time history graph overleaf.

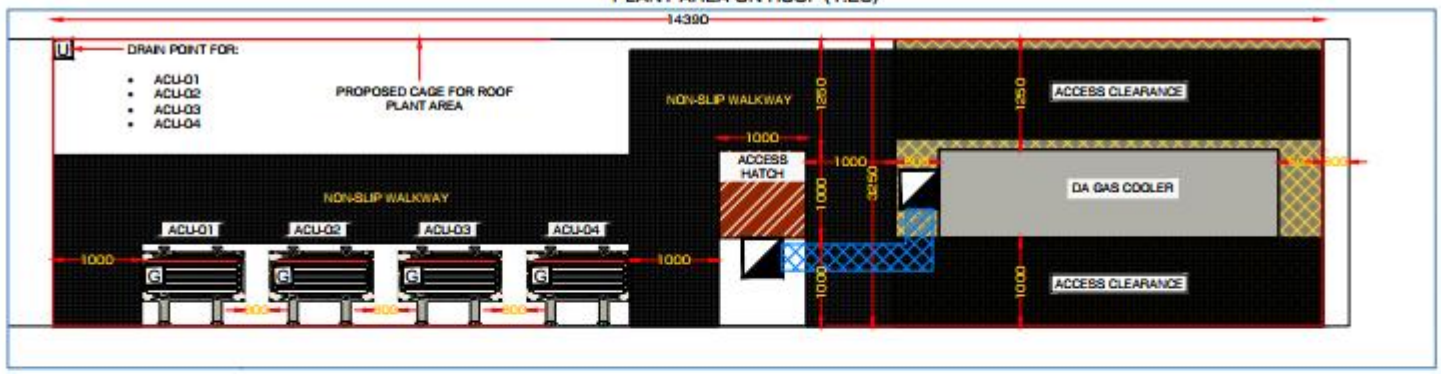

Co-op, Southwick
Thursday 20 - Friday 21 Feb 2025
Sound pressure level, dB(A)
90
80
70
60
50
40
30
20
16:15
16:45
17:15
17:45
18:15
18:45
19:15
19:45
20:15
20:45
21:15
21:45
22:15
22:45
23:15
23:45
00:15
00:45
01:15
01:45
02:15
02:45
03:15
03:45
04:15
04:45
05:15
05:45
06:15
06:45
Night
LAeq
LAFmax
L10
L90

Appendix D Manufacturer plant noise levels

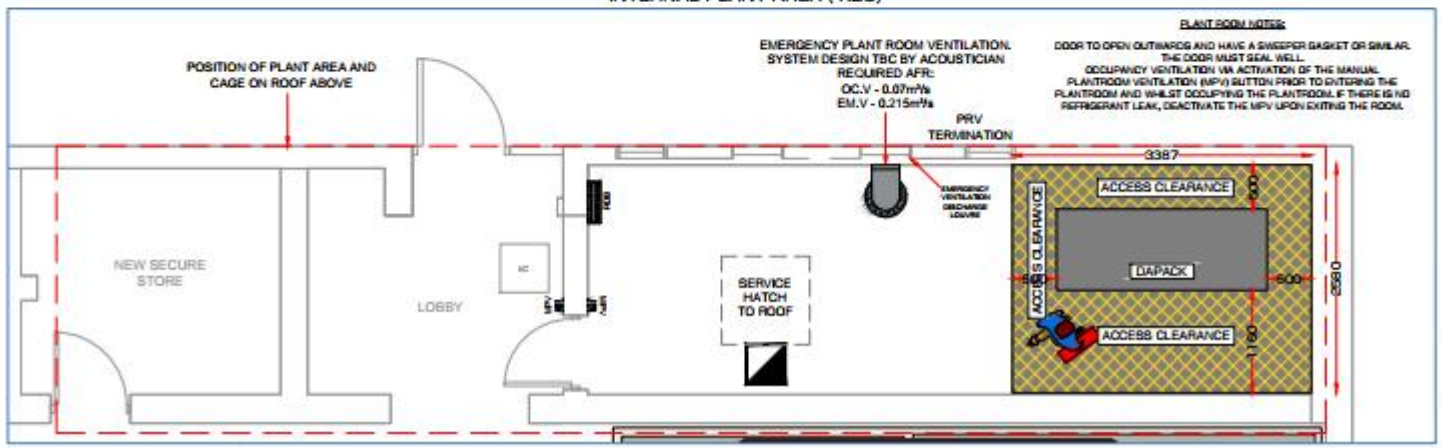
Plant Item	Make/Model	Quantity	Operating period	Sound pressure level (dBA)
AC1-4	Mitsubishi PUZ-ZM140YDA	4	Daytime only	51dBA at 1m
Gas cooler	GFVA1.2-133AMg-EC63.H3	1	24hr	24dBA at 10m

Appendix E Proposed plant layout

PLANT AREA ON ROOF (1:25)



INTERNAL PLANT AREA (1:25)



Appendix F Calculations

Receptor R1 – Daytime

Plant	Plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	24	10	20	-6	0	0	3	21
AC1	51	1	20	-26	0	0	3	28
AC2	51	1	20	-26	0	0	3	28
AC3	51	1	20	-26	0	0	3	28
AC5	51	1	20	-26	0	0	3	28
							Cumulative	**34**

Receptor R1 – Night-time

Plant	Plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	24	10	20	-6	0	0	3	21
							Cumulative	**21**

Receptor R2 – Daytime

Plant	Plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	24	10	38	-12	3	0	3	18
AC1	51	1	38	-32	3	0	3	25
AC2	51	1	38	-32	3	0	3	25
AC3	51	1	38	-32	3	0	3	25
AC5	51	1	38	-32	3	0	3	25
							Cumulative	**32**

Receptor R2 – Night-time

Plant	Plant noise level at source		DISTANCE		Directivity (dB)	Screening (dB)	BS 4142:2014 feature correction	Plant rating noise level at receptor (dBA)
	L_p (dBA)	Distance (m)	Distance (m)	Correction (dB)				
Gas cooler	24	10	38	-12	3	0	3	18
							Cumulative	**18**