

**The Co-operative PFS
Uxbridge Road
Uxbridge
UB10 0NZ**

**Plant Noise
Impact Assessment**

On behalf of

SHARKEY

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Executive Summary

Noise Solutions Ltd (NSL) has been commissioned by Sharkey to provide a noise impact assessment of noise emissions from new external AC and refrigeration plant serving the Co-operative Petrol Filling Station at Lees Corner in Uxbridge.

The results of the assessment demonstrate that cumulative plant noise emissions from the proposed external plant will comply with the proposed limits without the need for mitigation.

Therefore, noise from the proposed fixed plant should not be a reason for refusal of planning permission.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Sharkey to provide a noise impact assessment of noise emissions from new plant serving the Co-operative Petrol Station in Lees Corner, Uxbridge.
- 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. This report assesses the cumulative plant noise level at the nearest noise-sensitive receptors against the London Borough of Hillingdon's typical criteria.
- 1.4. A glossary of acoustic terminology is given in [Appendix A](#).

2.0 Details of development proposals

- 2.1. The Co-operative store is co-located with the Texaco petrol filling station on Uxbridge Way in Uxbridge.
- 2.2. It is proposed to replace the existing air conditioning and refrigeration plant serving the store. It is assumed that the new plant will be in the same location as the existing plant at the rear of the building on the north western side.
- 2.3. As the store operates 24 hours a day it is assumed that both the AC and refrigeration plant may be operating at any point during this time. It is likely, however, that both AC and refrigeration plant will operate at lower noise levels at night, when demands for cooling are lower.

3.0 Nearest noise sensitive receptors

- 3.1. The area surrounding the site is predominantly commercial in use. The nearest noise sensitive receptors to the plant are the commercial unit at 1-2 Lees Parade (receptor R1) approximately 3m from the plant location, and the flats above 3-4 Lees Parade (receptor R2) approximately 15m from the plant location but screened from the air conditioning units by the building geometry.
- 3.2. Receptor R1 is a commercial unit, whilst Receptor R2 is a residential unit.
- 3.3. [Appendix B](#) contains an aerial photograph showing the site and surrounding area.

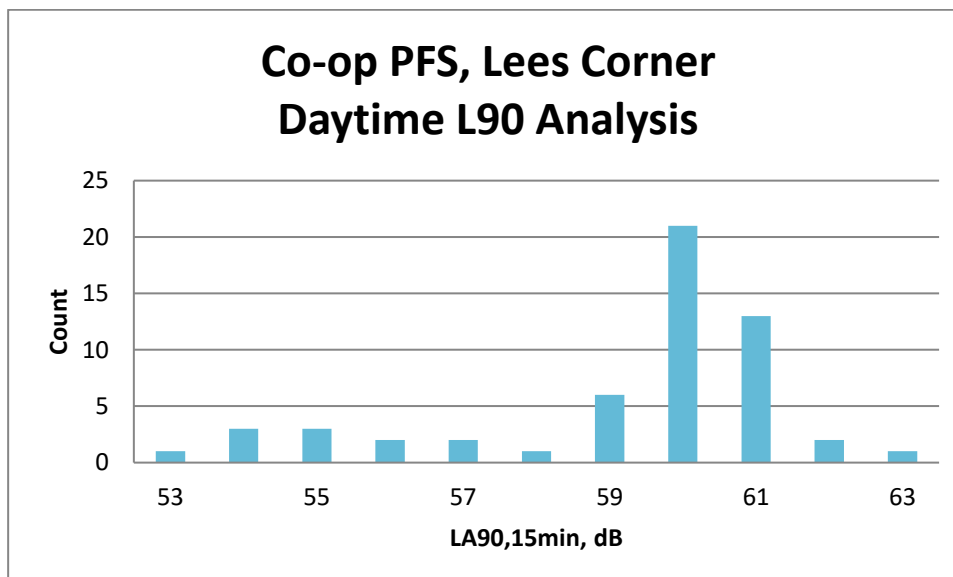
4.0 Existing noise climate

- 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 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 _{Aeq} (15mins)	L _{Amax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (07.00 – 23.00 hours)	67-82	78-110	71-74	53-63
Night-time (23.00 – 07.00 hours)	58-73	76-102	57-74	42-60

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



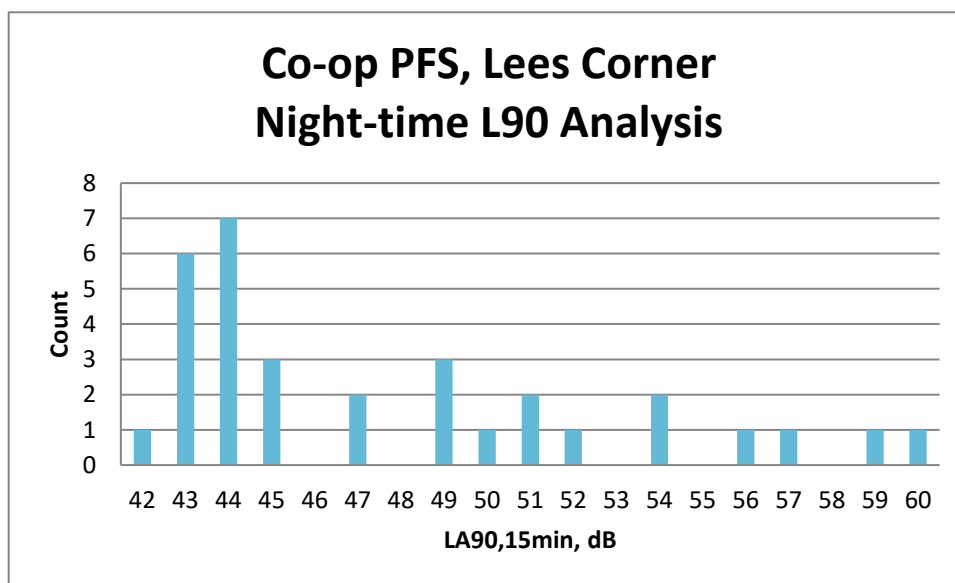
- 4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

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

dB, L_{A90} daytime period	
Mean	59
Median	60
Mode	60

- 4.4. The mean, median and modal values range from 59-60dB L_{A90} . From reviewing the above histogram, 59 dB was selected to be representative of the background sound level in this area.

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



- 4.5. 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	48
Median	45
Mode	44

- 4.6. The mean median and modal values range from 44-48 dB(A), however in order to be robust, 43 dB(A) has been selected to be representative of the background sound level in this area during the night-time.
- 4.7. Therefore, the following values are considered as representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 59dB L₉₀ during the daytime period; and
- 43dB L₉₀ during the night-time period

5.0 Plant noise design criteria

London Borough of Hillingdon

- 5.1. The following is taken from the London Borough of Hillingdon, Noise Supplementary Planning document

British Standard 4142:1997 gives advice on measuring and assessing the noise from machinery or plant, and is relevant if surrounding residential areas might be affected. Developments with a BS4142 assessment of marginal significance or above would not ordinarily be permitted. Consequently, the development should be controlled such that the rating level of the noise from the proposed development determined according to BS4142 is at least 5 dB below the background noise level L_{A90,T}. Ideally, the assessment of noise should give a positive indication that complaints are unlikely.

- 5.2. British Standard 4142:1997 has since been superseded by BS4142:2014, and therefore this standard has been used in this assessment.

BS 4142:2014

- 5.3. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' 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". The standard has been referenced as appropriate for the assessment of noise from plant.
- 5.4. The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level". Specifically, "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 3 dB can be applied."
- 5.5. The likely effects of sound on people are assessed by subtracting the background noise level from the rating level. BS 4142:2014 states the following:
- *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.*

Noise limits at commercial premises

- 5.6. BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' gives guidance on suitable noise levels in non-domestic buildings in various uses. For 'study and work requiring concentration' in executive offices or meeting rooms and training rooms, suitable levels range from 35-45dB(A).
- 5.7. BS 8233:2014 also gives guidance on the sound insulation provided by building facades. It is stated that 'If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15dB'. Given the external plant already installed in the area (much of which will be serving office air conditioning and cooling), it is likely that windows will remain closed, resulting in a sound insulation much greater than 15dB. Nevertheless, to ensure a robust assessment and assumed sound insulation of 15dB will be used in this assessment.
- 5.8. To control noise from the new plant such that internal sound levels are in line with the guidance in BS 8233:2014, it is proposed to limit plant noise at the office windows to 50dB(A).

Proposed criteria

- 5.9. Based on The London Borough of Hillingdon's criteria, the BS 4142:2014 rating level of the plant, 1m from the façade of the nearest noise sensitive residential receptor, must be at least 5 dBA below the existing representative background sound level.
- 5.10. In addition, it is recommended that plant noise levels are no higher than 50 dBA outside the nearest commercial premises window, during the daytime.
- 5.11. Table 4 below presents the proposed plant noise rating level at the nearest residences.

Table 4 Proposed plant noise rating level at noise sensitive residential receptors

Period	Cumulative plant noise level, dB(A) at R1 (1-2 Lees Parade)	Cumulative plant rating level, dB(A) at R2 (Regency House)
Daytime (07.00 – 23.00 hours)	50	54
Night-time (23.00 – 07.00 hours)	-	38

6.0 Plant noise impact assessment

- 6.1. The impact of the external plant has been assessed at the nearest and most affected receptor, R1. All the plant will run 24 hours a day, however it has been taken into account that the unit will run at a reduced level at night.
- 6.2. Table 6, below, summarises the results of the plant noise impact assessment. A series of calculations can be found in [Appendix F](#).

Table 6 Plant noise impact assessment

Receptor	Period	Predicted noise rating levels at receptor window, L_{Aeq} (dB)	Plant noise criterion at receptor window (dB)	Difference (dB)
R1. Commercial property	Daytime (07.00 - 23.00 hours)	45	50	-5
R2. Residential property	Daytime (07.00 - 23.00 hours)	38	54	-16
R2. Residential property	Night-time (23.00 – 07.00 hours)	36	38	-2

- 6.3. The predictions demonstrate that cumulative noise emissions from the proposed equipment will comply with the proposed limits without the need for any mitigation.
- 6.4. As BS4142:2014 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 windows. The impact on all other nearby residential windows will be lower due to distance attenuation.

-
- The site is located within a mixed-use area. There are other commercial uses within the vicinity of the site, which are likely to have fixed building services plant. There is an existing AC unit near to receptor R1.
 - The proposal is to replace existing plant.
 - It should be noted that the above assessment is based on the worst case in terms of plant noise emissions. Predictions are based on the plant operating simultaneously at maximum daytime and night-time duty. As the systems are inverter driven, this situation will not typically occur except for in very high ambient temperatures (i.e. peak summer conditions). It must be noted that background noise levels will typically be higher during the times when the plant is likely to operate at a higher duty. Therefore, the assessment is considered robust.
- 6.5. Where possible uncertainty in this assessment has been minimised by taking the following steps:
- The measurement of the background sound levels was undertaken at a representative location. The location was carefully selected to ensure there was no additional benefit from screening/distance to local noise sources when compared to the nearest receptors.
 - The meter and calibrator used have a traceable laboratory calibration and 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.
- 6.6. All reasonable steps have been taken to robustly assess noise from the proposed plant. In support of the above assessment, noise from fixed plant can be considered of 'low impact' in accordance with BS4142:2014. Given the results of the above assessment, noise from fixed plant should be considered acceptable by the London Borough of Hillingdon.

7.0 Summary

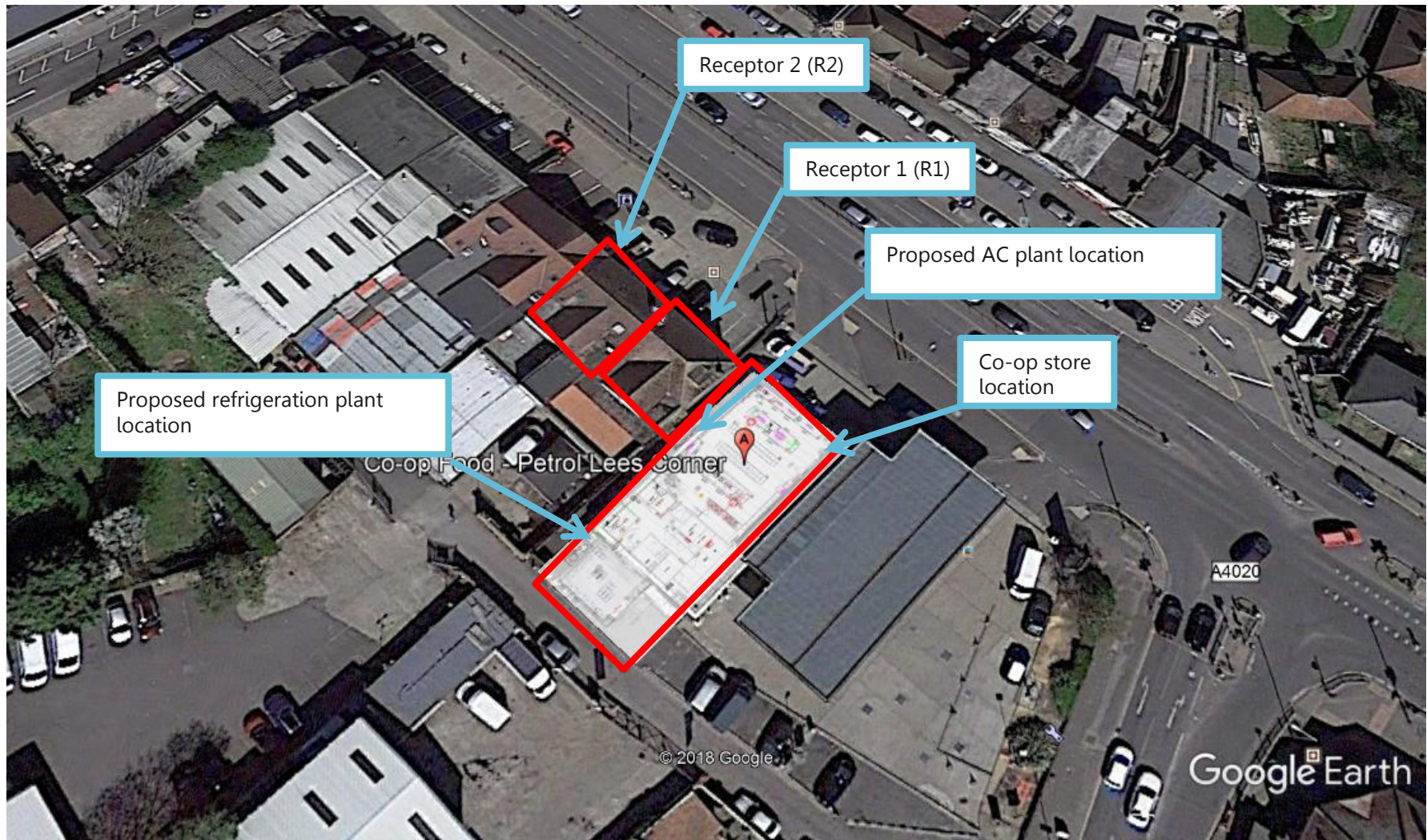
- 7.1. Noise Solutions Ltd (NSL) has been commissioned by Sharkey to provide a noise impact assessment for new plant serving the proposed Co-operative petrol filling station at Lees Corner, Uxbridge.
- 7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the plant location.

-
- 7.3. An assessment of predicted noise levels has demonstrated that plant noise emissions will comply with London Borough of Hillingdon typical planning criteria, inclusive of the insertion losses stated above. Plant noise has been determined to be “low impact” when assessed in accordance with BS4142:2014.
- 7.4. Given the results of the above assessment, noise from the fixed plant should not be grounds for refusal of planning permission.

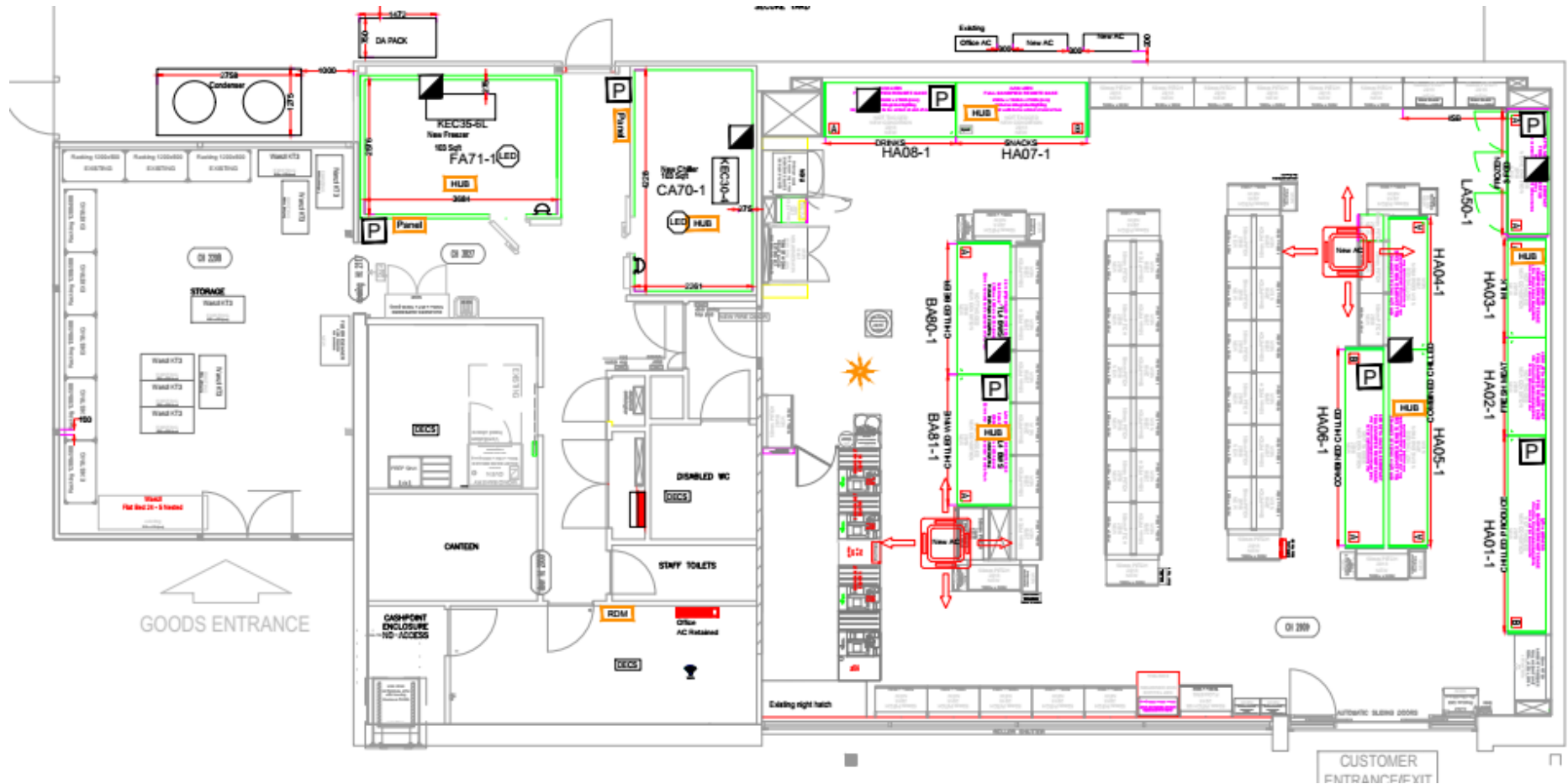
Appendix A Acoustic terminology

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 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



Photograph 1 Courtesy of Google Earth



Appendix D Manufacturer plant noise emissions

Plant item	Make/Model	Quantity	Period	Sound Pressure Level	
				dBA	Distance (m)
Condenser	Rivacold/RRCO28004S AM I AXI	1	Daytime	35	10
			Night-time	26	10
Pack	HUBBARD/ HT/LT Housed Pack	1	All hours	35	10
AC	Mitsubishi/PUZ-ZM125YKA	2	All hours	52	1

Appendix E Environmental sound survey

Details of environmental sound survey

- E.1 Measurements of the existing background sound levels were undertaken from 12.45 hours on Tuesday 17th April 2018 to 10.15 hours on Wednesday 18th April 2018.
- E.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

- E.3 The sound level meter was positioned on a lamppost on Lees Road, a location deemed to be representative of the background sound level outside the Co-op. The approximate location of the microphone is indicated on the aerial photograph in [Appendix B](#).

Equipment

- E.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.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-31 / 00593605	09/03/2018	TCRT18/1206
Condenser microphone	Rion UC-53A / 316131		
Preamplifier	Rion NH-21 / 30365		
Calibrator	Rion NC-74 / 35094453	09/03/2018	TCRT18/1141

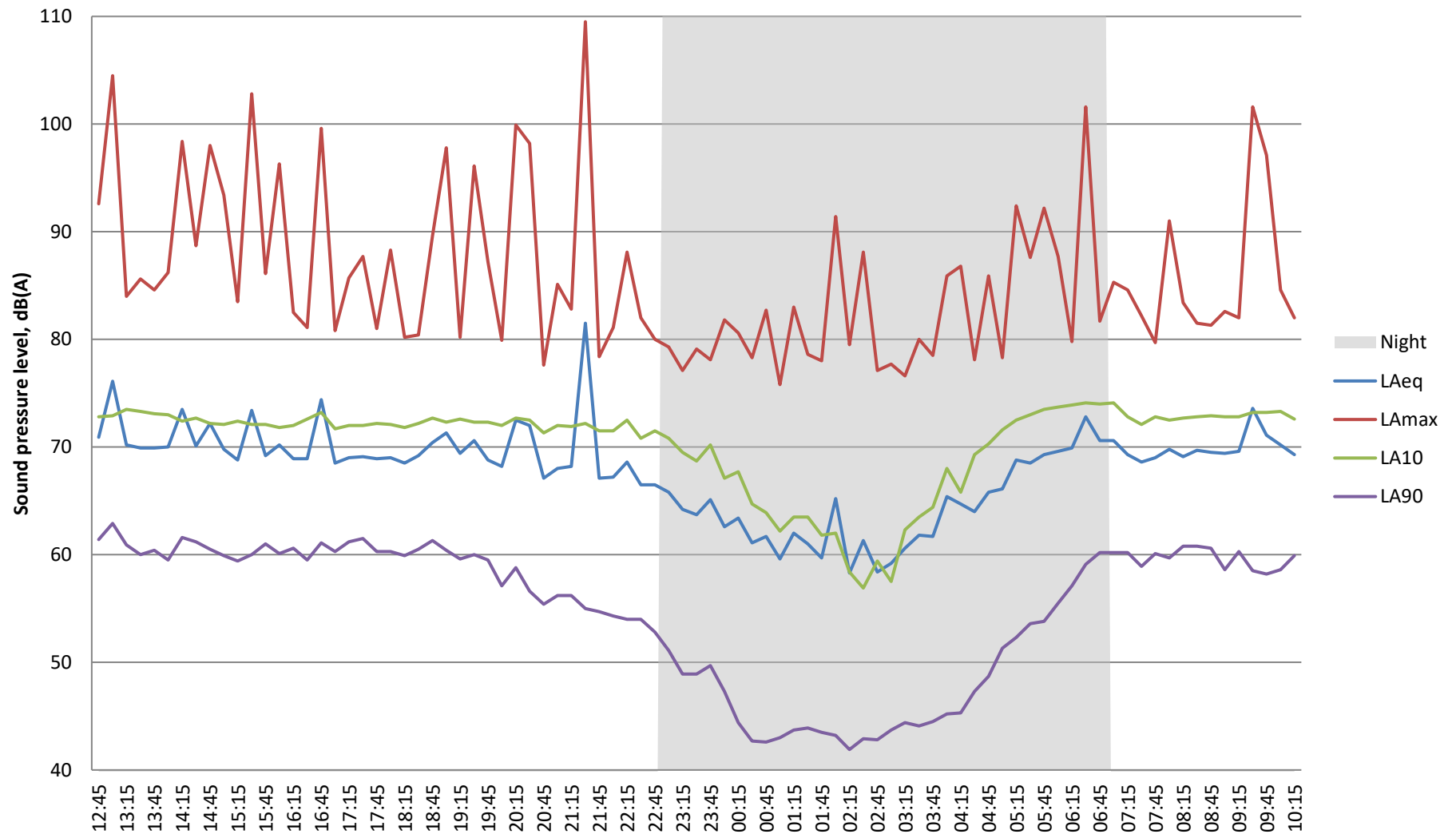
- E.5 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Time/Date	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	17/04/2018 - 18/04/2018	Temperature (°C)	18.5	19.5
Cloud Cover Symbol Scale in oktas (eighths)  0 Sky completely clear  1  2  3  4 Sky half cloudy  5  6  7  8 Sky completely cloudy  (9) Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas – see guide)	4	0
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	8	<0.5
		Wind Direction	S	S
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

- 7.5. 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 local road traffic noise. The results of the survey are presented in a time history graph overleaf.

Co-op PFS, Lees Corner Tuesday 17 - Wednesday 18 Apr 2018



Plant	Maximum plant noise level at source		DISTANCE		DIRECTIVITY	SCREENING	BS4142 FEATURE		RESULTANT AT RECEPTOR (dB)	
	Noise level (dBA)	Distance (m)	Distance (m)	Correction (dB)	Correction (dB)	Correction (dB)	Applicable (Y/N)	Correction (dB)		
Pack	35	10	19	-6	3	0	y	3	35	
Condenser	35	10	22	-7	3	0	y	3	34	
AC	52	1	15	-24	3	-10	y	3	24	
AC	52	1	15	-24	3	-10	y	3	24	
									CUMULATIVE	38

Receptor R2 Night-time

Plant	Maximum plant noise level at source		DISTANCE		DIRECTIVITY	SCREENING	BS4142 FEATURE		RESULTANT AT RECEPTOR (dB)	
	Noise level (dBA)	Distance (m)	Distance (m)	Correction (dB)	Correction (dB)	Correction (dB)	Applicable (Y/N)	Correction (dB)		
Pack	35	10	19	-6	3	0	y	3	35	
Condenser	26	10	22	-7	3	0	y	3	25	
AC	52	1	15	-24	3	-10	y	3	24	
AC	52	1	15	-24	3	-10	y	3	24	
									CUMULATIVE	36