

**The Co-operative
Former Red Dragon**
Prince Charles Road
Wrexham
LL13 8TG

**Plant Noise
Impact Assessment Report**

On behalf of



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Executive Summary

Noise Solutions Limited has carried out a noise impact assessment for new plant to be installed at the proposed Co-operative food store on the former Red Dragon restaurant site on Prince Charles Road in Wrexham.

The assessment shows that the noise level of the new plant at the nearest residential premises, assessed using the methodology prescribed in BS 4142:2014 is below proposed criteria without the need for mitigation measures and therefore should be acceptable to the local authority.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by RPM consult to undertake a noise impact assessment for new plant serving the proposed Co-operative store to be located on the site of the former Red Dragon restaurant on Prince Charles Road in Wrexham.
- 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. The cumulative noise level from the new plant has been predicted at the nearest residential premises and assessed against the local authority's guidance and recognised standards.
- 1.4. A glossary of acoustic terminology is given in [Appendix A](#).

2.0 Details of development proposals

- 2.1. The proposed Co-operative store will occupy the vacant Red Dragon restaurant which is a two-storey standalone building on the east side of Prince Charles Road in Wrexham.
- 2.2. The new plant is comprised of 3no. air conditioning (AC) units, 1no. gas cooler and 1no. refrigeration pack. Plant is proposed to be installed on the ground floor at the rear of the store along the east elevation within the service yard.
- 2.3. The proposed refrigeration plant will potentially operate 24 hours a day, although it should be noted that these units operate as required to meet demand and that store demands for cooling are generally reduced at night. The AC units will operate only during store opening hours.
- 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 area surrounding the site is predominantly residential in use. The nearest noise sensitive property to the proposed plant area will be the residential bungalow at 81 Bryn Hafod (Receptor R1), to the east of the site and approximately 17m from the plant area.
- 3.2. [Appendix B](#) contains an aerial photograph showing the site and surrounding area.

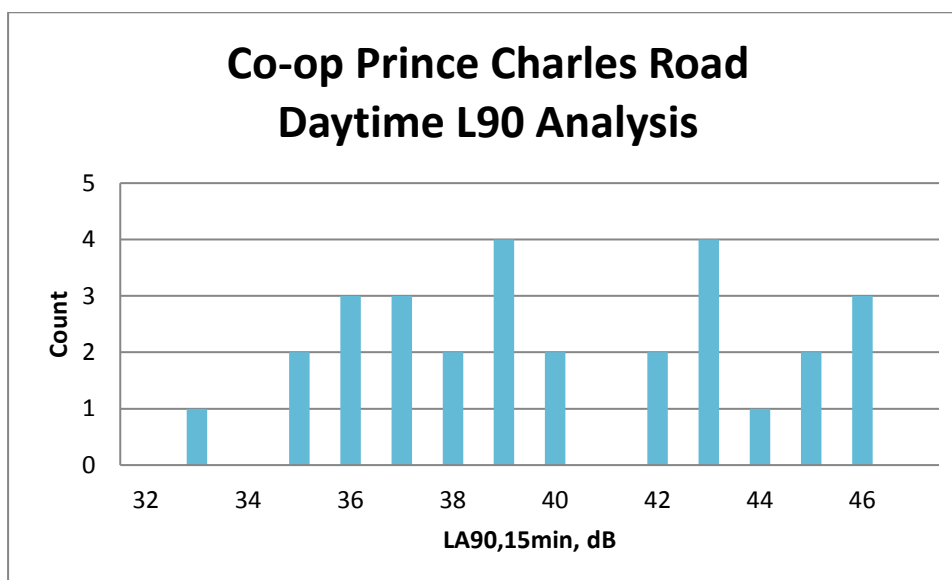
4.0 Existing noise climate

- 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 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 _{Amax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (07.00 – 23.00 hours)	48-60	70-81	35-52	33-46
Night-time (23.00 – 07.00 hours)	32-63	38-94	31-44	29-41

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



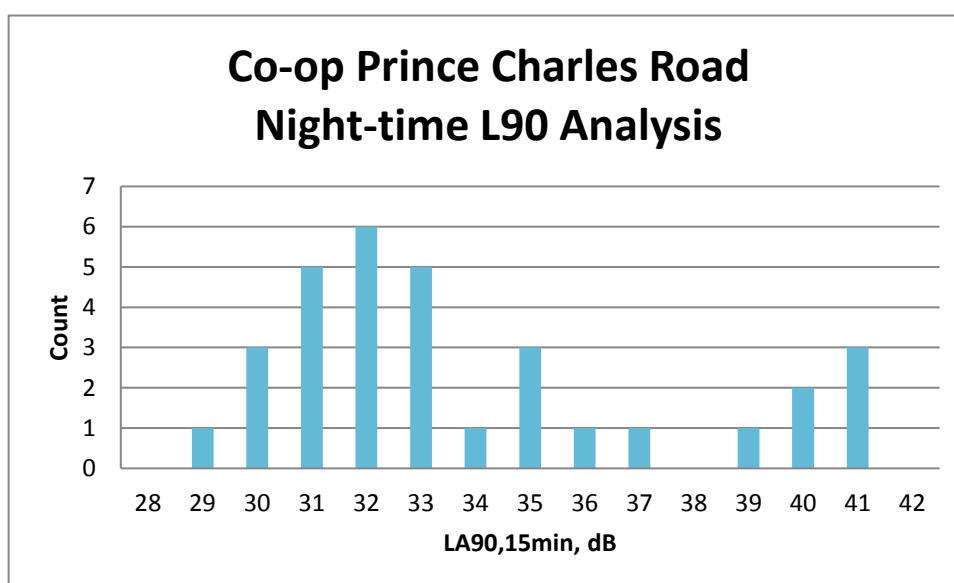
- 4.3. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

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

dB, L_{A90} daytime period	
Mean	40
Median	39
Mode	43

- 4.4. The mean, median and modal values all range from 39dB L_{A90} to 43dB L_{A90} . From review of the graph in Figure 1, 37dB L_{A90} has been considered as representative of the typical background sound level during the daytime period.

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} daytime period	
Mean	34
Median	33
Mode	32

- 4.6. The mean, median and modal values range from 32dB L_{A90} to 34dB L_{A90} , the lowest of these, 32 dB L_{A90} has been selected to be representative of the background sound level during the night-time period.

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

- 37dB L₉₀ during the daytime period; and
- 32dB L₉₀ during the night-time period

5.0 Plant noise design criteria

Wrexham County Borough Council

5.1. Wrexham County Borough Council were contacted in order to clarify their fixed plant noise criteria. Nick Minshall¹, a Pollution Control Officer indicated that the site will mostly likely be given the following condition:

"The rating level of any noise generated by air handling plant associated with the development shall not exceed the pre-existing background level by more than 5dB(A) at any time. The noise levels shall be determined at nearby noise sensitive premises, and measurements and assessment shall be made in accordance with BS4142:2014 Methods for rating and assessing industrial and commercial sound."

BS 4142:2014 'Methods for Rating and Measuring Industrial and Commercial Sound;

5.2. British Standard (BS) 4142:2014 describes a method for rating and assessing sound of an industrial 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, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

5.3. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.

¹ Email correspondence on Monday 5th November 2018

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- 5.4. The procedure contained in BS 4142 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.
- 5.5. 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.
- 5.6. 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."*
- 5.7. 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."*
- 5.8. The background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: *"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."*
- 5.9. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:
- a) Typically, the greater this difference, the greater the magnitude of the impact.*
 - b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
 - c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
 - d) 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.*
- 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."*

5.10. 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."*

5.11. 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."

5.12. BS 4142 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.

Planning Policy Wales and TAN 11

5.13. Planning Policy Wales (PPW) sets out the land use planning policies for the Welsh Government.

5.14. Paragraph 13.15.1 of the PPW states that: *"Noise can be a material planning consideration, for example in proposals to use or develop land near an existing source of noise or where a proposed new development is likely to generate noise. Local planning authorities should make a careful assessment of likely noise levels and have regard to any relevant Noise Action Plan before determining such planning applications and in some circumstances it will be necessary for a technical noise assessment to be provided by the developer."*

5.15. PPW refers to *Technical Advice Note (Wales) 11 – Noise* (TAN 11) for specific guidance regarding noise assessments. TAN 11 was updated by a Policy Clarification Letter CL-01-15 to refer to the latest British Standards BS4142: 2014 and BS8233: 2014.

Proposed criteria

5.16. It is considered appropriate that the cumulative noise emitted by the proposed plant should be controlled to a level that is no higher than 5dB above the representative L_{A90} background sound level at the nearest residential property.

5.17. The cumulative noise level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in the table below:

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

Period	Cumulative plant rating noise level, dB(A)
Daytime (07.00 – 23.00 hours)	42
Night-time (23.00 – 07.00 hours)	37

6.0 Plant noise assessment

- 6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted. The assessment has taken into consideration distance attenuation, screening correction and directivity.
- 6.2. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. To be robust, however, a +3dB feature correction as advised in BS 4142:2014 has been applied for the possible presence of "...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...".
- 6.3. Table 5 summaries the results of the assessment. The full set of calculations can be found in [Appendix E](#).

Table 5 Assessment of predicted noise levels at nearby receptor

Receptor	Period	Predicted plant level (dB LAeq)	Proposed criterion (dB LAeq)	Excess (dB)
R1	Daytime (07.00 – 23.00 hours)	38	42	-4
	Night-time (23.00 – 07.00 hours)	33	37	-4

- 6.4. The predicted plant sound levels at the receptors meet the proposed criteria without the need for mitigation measures.

Context and uncertainties

- 6.5. As BS 4142:2014 advises, the estimated 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.

6.6. 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.

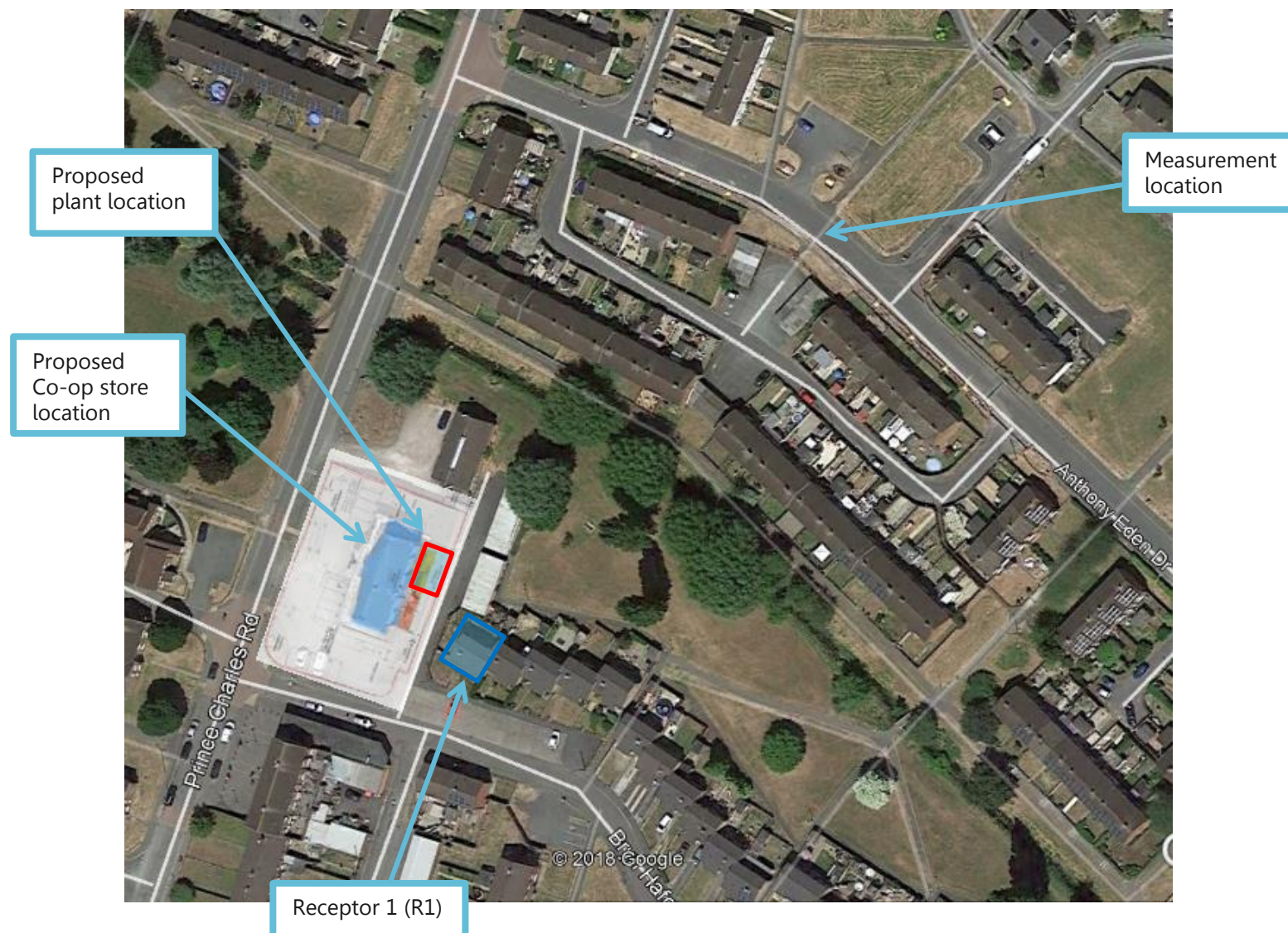
7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned by RPM Consult to undertake a noise impact assessment of new plant serving the proposed Co-operative store to be located on site of the former Red Dragon restaurant on Prince Charles Road in Wrexham.
- 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. The assessment shows that the noise level of the plant, at the nearest noise-sensitive residential window, is no higher than the existing background sound level and should therefore be acceptable to the local authority.

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 C Manufacturers' noise data

Plant item	Make/Model	Quantity	Period	Sound Pressure Level	
				dBA	Distance (m)
Air Conditioner	Mitsubishi / PUZ-ZM140YKA	3	Daytime period (07:00 – 23:00 hours)	52	1
			Night-time period (23:00 – 07:00 hours)	-	-
Condenser	Kelvion Gas Cooler / GF-SA103F4H-063	1	Daytime period (07:00 – 23:00 hours)	30	10
			Night-time period (23:00 – 07:00 hours)	30	10
Pack	Hubbard	1	Daytime period (07:00 – 23:00 hours)	30	10
			Night-time period (23:00 – 07:00 hours)	30	10

Note 1: The AC units will be switched off during the night-time period.

Appendix D Environmental sound survey

Details of environmental sound surveys

- D.1 Measurements of the existing background sound levels were undertaken from 17.15 hours on Wednesday 17th October to 09.45 on Thursday 18th October 2018.
- 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 fifteen-minute sample periods for the duration of the survey.

Measurement position

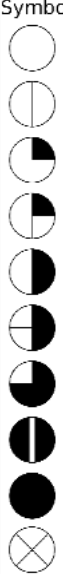
- D.3 The representative measurement position was located on a lamppost on Anthony Eden Drive (location indicated on the site plan in [Appendix B](#)). In accordance with BS 7445-2:21991 'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use', 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.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-31 / 00593603	02/05/2018	TCRT18/1382
Condenser microphone	Rion UC-53A / 316133		
Preamplifier	Rion NH-21 / 30367		
Calibrator	Rion NC-74 / 35094453	09/03/2018	TCRT18/1141

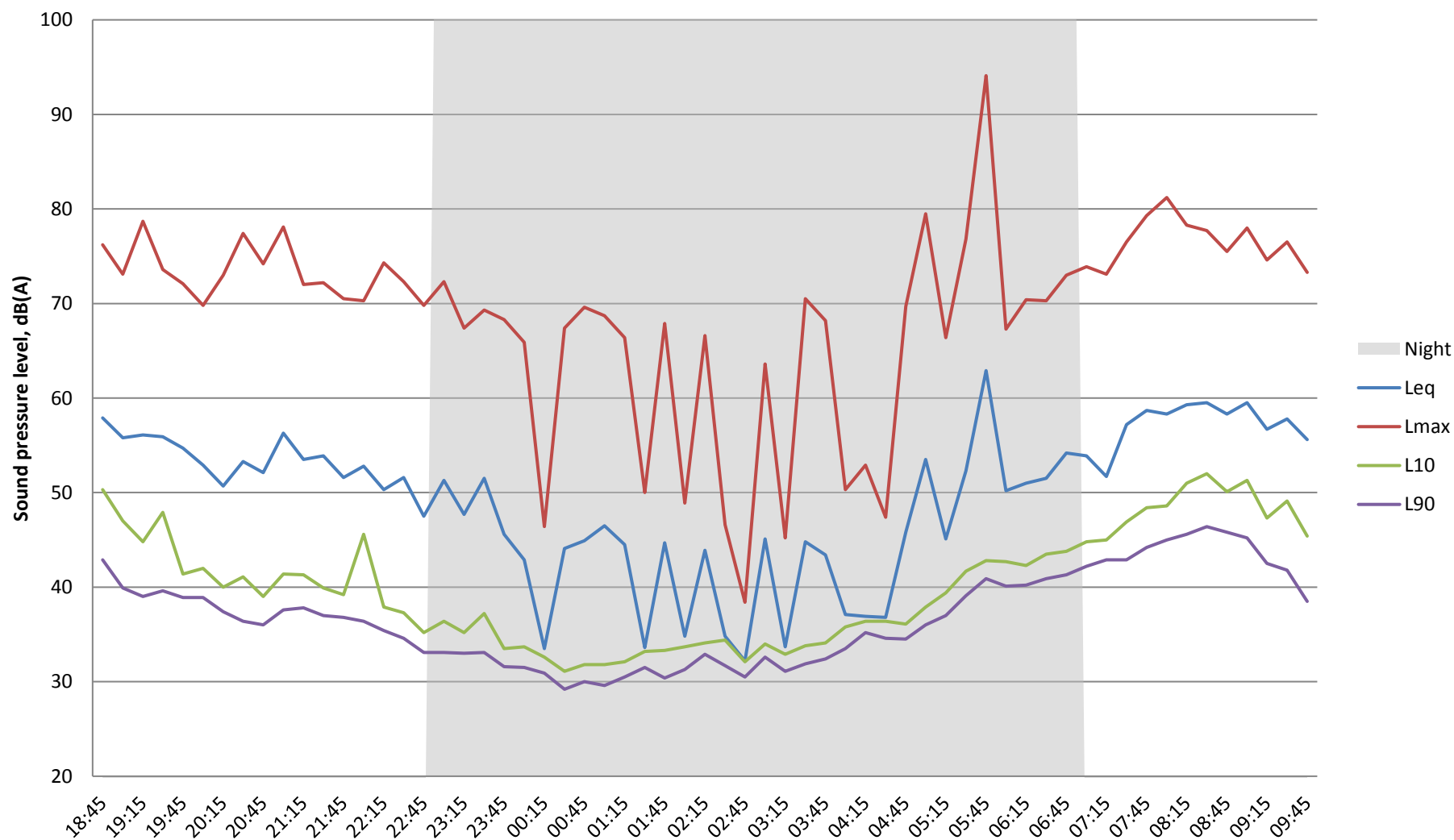
- D.5 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Time/Date	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	17.15 17/10/2018 – 09.45 18/10/2018	Temperature (°C)	15	9
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)	2	1
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	N/A	N/A
		Wind Direction	N/A	N/A
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

- D.6 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 traffic noise. The results of the survey are presented in a time history graph overleaf.

Co-op Prince Charles Road Wednesday 17 - Thursday 18 Oct 2018



Appendix E Noise predictions

Receptor R1, Daytime period

Plant item	Manufacturer noise data		Distance correction		Directivity correction (dB)	Screening correction (dB)	BS4142 feature correction (dB)	Resultant at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Correction (dB)				
AC1	52	1	20	-26	+3	0	+3	32
AC2	52	1	21	-26	+3	0	+3	32
AC3	52	1	22	-27	+3	0	+3	31
Condenser	30	10	17	-5	+3	0	+3	31
Pack	30	10	21	-6	0	0	+3	27
							Cumulative (dB)	38

Receptor R1, Night-time period

Plant item	Manufacturer noise data		Distance correction		Directivity correction (dB)	Screening correction (dB)	BS4142 feature correction (dB)	Resultant at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Correction (dB)				
Condenser	30	10	17	-5	+3	0	+3	31
Pack	30	10	21	-6	0	0	+3	27
							Cumulative (dB)	33