

Tesco Express
Copthorne Bank Crawley
RH10 3QX

**Plant Noise
Impact Assessment**

On behalf of
TESCO

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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Tesco Stores Limited to provide a Noise Impact Assessment of new plant serving the proposed Tesco Express store on Copthorne Bank in Crawley, RH10 3QX.
- 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 receptors and assessed following Mid Sussex District Council's usual requirements.
- 1.4. To assist with the understanding of this report a glossary of acoustic terms can be found 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. It is understood that new plant will be installed at the south east corner at the rear of the store in an external plant area. A new gas cooler and three AC units are proposed to be installed in the external plant area at the rear of the store. The new refrigeration pack is proposed to be installed internally within the back of house area of the store.
- 2.2. The new plant will comprise refrigeration plant and air conditioning plant. Typically, refrigeration plant may operate at any time but would be expected to operate at reduced load when the store is closed, and in the night, when ambient temperatures are lower and demands placed upon the system are reduced. Air conditioning plant will only operate when the store is open.
- 2.3. To control noise to acceptable levels at the nearest noise-sensitive receptors, a 2m high tall U-shaped acoustic screen is required around the plant area.
- 2.4. Plant noise data is given in [Appendix D](#).

3.0 Nearest noise sensitive receptors

- 3.1. The area surrounding the site is predominantly residential properties. The nearest noise sensitive properties will be the houses on Meadow Approach (Reference R1) situated to the east of the site, at the side of the store, and the house to the rear of the store (Reference R2) at the end of Dawn Rise. The latter is screened from the AC units by the store building.

- 3.2. A site plan showing the site and surrounding area, the nearest noise sensitive properties and noise monitoring location used in this assessment is presented in [Appendix B](#).

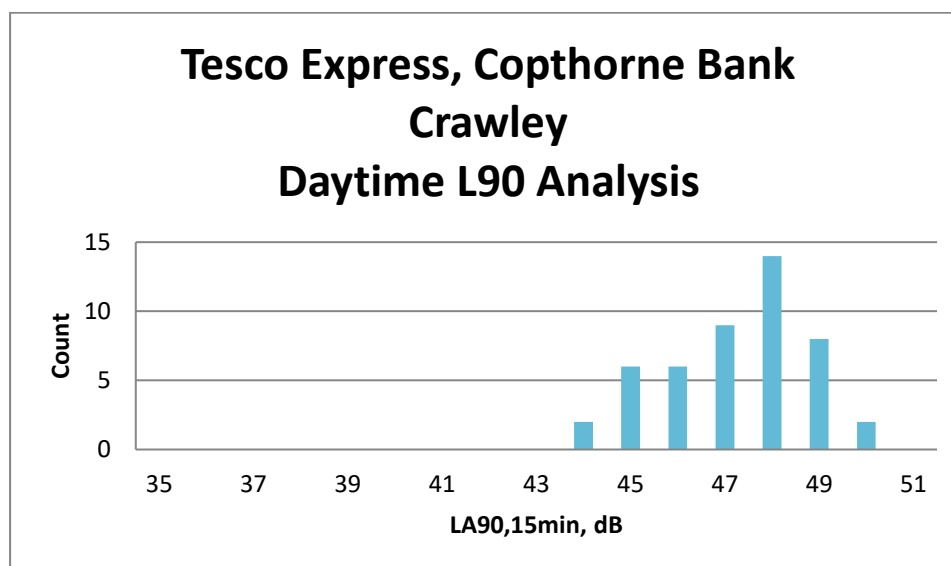
4.0 Existing noise climate

- 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 C](#).

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	L _{Aeq} (15mins)	L _{AFmax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (07.00 – 23.00 hours)	49-60	65-85	50-59	44-50
Night-time (23.00 – 07.00 hours)	40-54	54-76	41-56	36-48

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

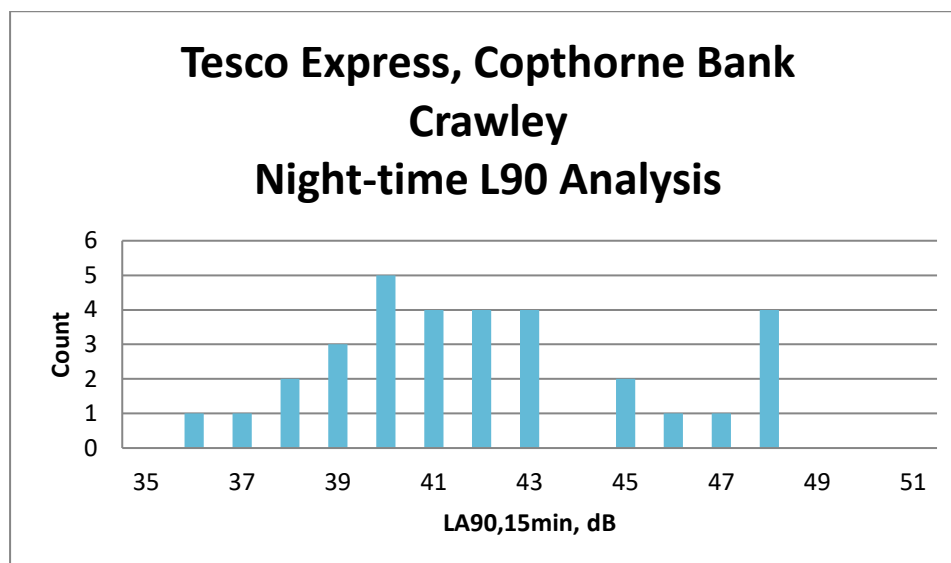


- 4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in Table 2 below.

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

dB, L _{A90} daytime period	
mean	47
modal	48
median	48

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



- 4.4. 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	40
median	41

- 4.5. The following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:
- 44dB L_{A90} during the daytime period; and
 - 36dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

National Planning Policy Framework

- 5.1. A new edition of the NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF¹) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The December 2023 revised edition contains

¹ National Planning Policy Framework, DCLG, March 2012

no new directions or guidance with respect to noise. The paragraph references quoted below relate to the December 2023 edition.

- 5.2. Paragraph 180 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing 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 instability."*

- 5.3. The NPPF goes on to state in Paragraph 191:

"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 (NPSE²).

- 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"*.

Paragraph 123 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"*.

Mid Sussex District Council

- 5.7. For new plant installations Mid Sussex District Council typically seeks to impose the following Condition:

² Noise Policy Statement for England, DEFRA, March 2010

"Noise from the plant/machinery hereby permitted shall be at least 5dB below the background noise level (LA90,T) at the nearest residential boundary. All measurements shall be defined and derived in accordance with BS4142:2014+A1:2019."

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

- 5.8. 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 includes "sound from fixed plant installations which comprise mechanical and electrical plant and equipment".
- 5.9. The procedure contained in BS 4142:2014+A1:2019 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.
- 5.10. 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.
- 5.11. 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."
- 5.12. 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."
- 5.13. 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.

- 5.14. 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."
- 5.15. 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."
- 5.16. 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."

- 5.17. BS 4142:2014+A1:2019 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

- 5.18. It is proposed that the BS 4142:2014 rating level due to the new plant, at the nearest residential windows, is no higher than 5dB below the representative background sound level.
- 5.19. 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 Plant noise emissions limits at the nearest noise sensitive receptor

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	39
Night-time (23.00 – 07.00 hours)	31

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

6.0 Plant noise impact assessment

- 6.1. The cumulative plant noise level at the most affected noise sensitive receptors has been predicted based on manufacturer's noise data for the proposed equipment. The assessment has taken into consideration distance attenuation and directivity, and screening provided by the proposed acoustic barrier and/or the store building, as appropriate.
- 6.2. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics providing it is well maintained. The proposed plant is inverter driven and, therefore, will gently ramp up and down depending on the demands placed upon the system. However, a penalty of 3dB as described 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 summarises the results of the assessment at the most affected properties. All other nearby receptors benefit from increased distance/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 E](#).

Table 5 Assessment of predicted rating level at the nearest noise sensitive receptors

Receptor	Period	Predicted rating level at receptor, $L_{A,r,Tr}$ (dB)	Criterion (dB)	Difference
R1	Daytime (07.00 - 23.00 hours)	39	39	0
R1	Night-time (23.00 - 07.00 hours)	28	31	-3
R2	Daytime (07.00 - 23.00 hours)	35	39	-4
R2	Night-time (23.00 - 07.00 hours)	24	31	-7

- 6.4. The noise level predictions demonstrate that cumulative noise emissions from the replacement plant will comply with the proposed limits at the nearest noise sensitive properties providing the specified acoustic mitigation is installed.

Context and uncertainties

- 6.5. 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 Recommendations

- 7.1. To ensure the new proposed plant is compliant with Mid Sussex District Council's criteria a 2m tall U-shaped acoustic screen would need to be installed surrounding the plant area.

8.0 Summary

- 8.1. Noise Solutions Ltd (NSL) has been commissioned by Tesco Stores Limited to provide a Noise Impact Assessment of new plant serving the Proposed Tesco store on Copthorne Bank in Crawley, RH10 3QX.
- 8.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at locations representative of the noise climate outside the nearest noise sensitive receptors to the proposed plant area.
- 8.3. The cumulative plant noise emission levels for the new proposed plant have been predicted at the most affected noise sensitive receptor locations and determined to be in compliance with Mid Sussex District Council's usual requirements providing the recommended acoustic screening is installed surrounding the plant area. Therefore, the plant 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 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 Aerial photograph site showing areas of interest



Appendix C Environmental sound survey

Details of sound surveys

- C.1 Measurements of the existing background sound levels were undertaken between 14.30 hours on Wednesday 29th May and 10.15 hours on Thursday 30th May 2024.
- 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 15-minute sample periods for the duration of the noise survey.

Measurement position

- C.3 The representative measurement position was located on a lamppost on Meadow Approach (location indicated on the site plan in [Appendix B](#)).
- C.4 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

- 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 (± 0.3 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 977D / 99070	11/05/2023	Factory conformation certificate
Condenser microphone	ACO Pacific 7052E / 81197		
Preamplifier	Svantek SV18A / 130661		
Calibrator	Rion NC-74 / 35094453	06/09/2023	1503192-1

Weather Conditions

- C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were generally appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

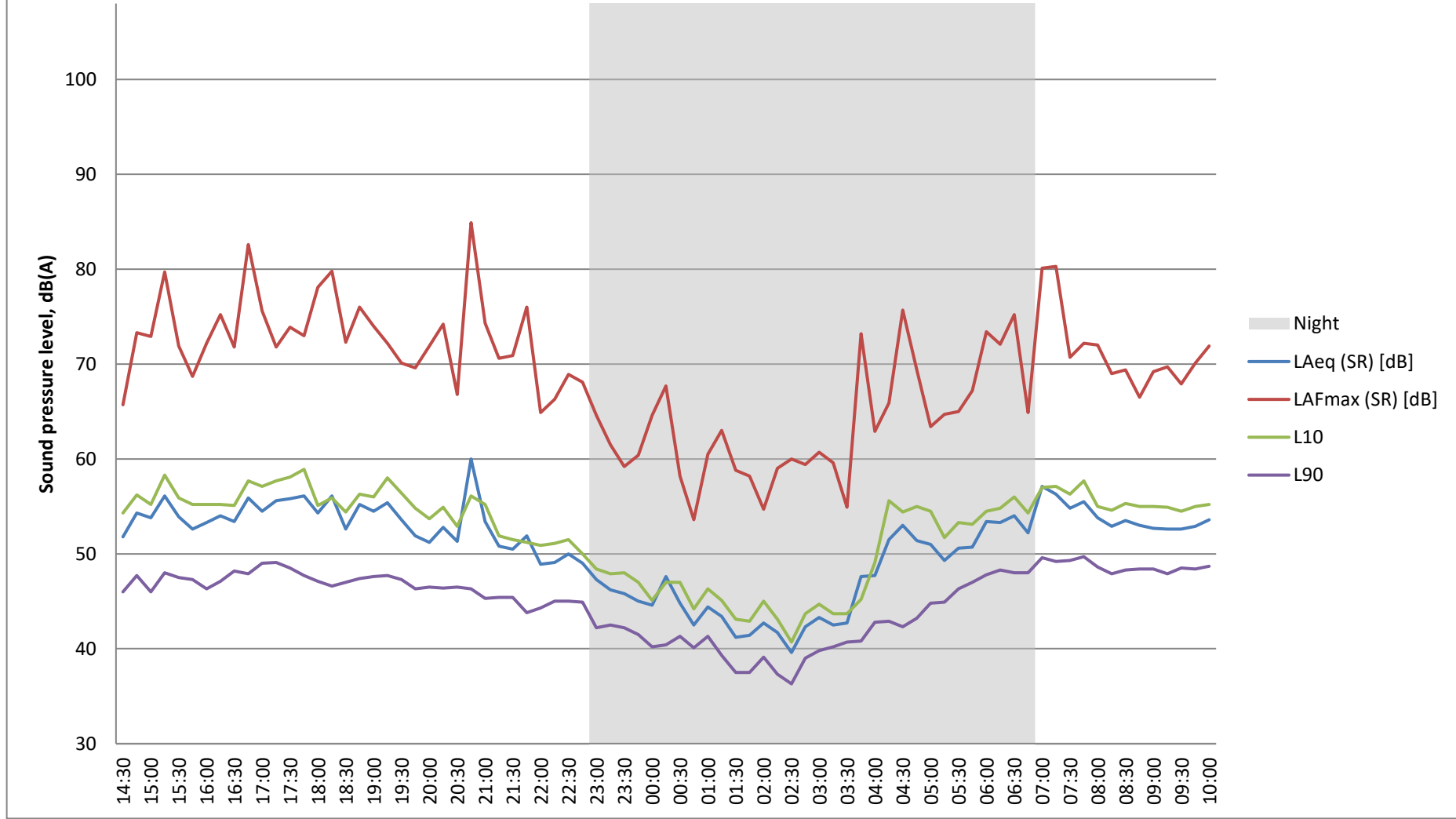
Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
As indicated on Appendix B	14.30 29 May - 10.15 30 May 2024	Temperature (°C)	21	15
Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas - see guide)	7	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	1.1	2.8
		Wind Direction (From)	N	N
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	N/A	N/A

Results

- C.7 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 traffic noise, trains and pedestrian. The most dominant noise source upon set up of the sound level meter was local traffic noise. Upon collection of the sound level meter the most dominant noise sources were local traffic noise and distant traffic noise. The results of the survey are presented in a time history graph overleaf.

Tesco Express, Copthorne Bank Crawley

Wednesday 29 - Thursday 30 May 2024



Appendix D Plant noise data

Plant	Unit/Model	No. of units	Description	Level (dBA)
Gas cooler	Typical Tesco	1	Sound pressure level at 10m (day)	40
			Sound pressure level at 10m (night)	30
AC1,2	Typical Tesco shop floor	2	Sound pressure level at 1m	51
AC3	Typical Tesco office	1	Sound pressure level at 1m	47

Appendix E Plant noise calculations

Receptor R1

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor, dB L _{Ar,Tr}
	dBA	at (m)						
Gas cooler	40	10	10	0	3	-8*	3	38
AC 1	51	1	10	-20	3	-9*	3	28
AC 2	51	1	10	-20	3	-9*	3	28
AC 3	47	1	10	-20	3	-6*	3	27
Cumulative rating level (daytime – all plant running)								39
Cumulative rating level (night-time – AC off)								28

*Screening provided by specified acoustic barrier

Receptor R2

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor, dB L _{Ar,Tr}
	dBA	at (m)						
Gas cooler	40	10	10	0	0	-9*	3	34
AC 1	51	1	13	-22	0	-5**	3	27
AC 2	51	1	14	-23	0	-5**	3	26
AC 3	47	1	13	-22	0	-5**	3	23
Cumulative rating level (daytime – all plant running)								35
Cumulative rating level (night-time – AC off)								24

*Screening provided by specified acoustic barrier

**Screening provided by store building