Tesco Express
Shelton Street
Camden
WC2H 9HJ

Plant Noise Impact Assessment Report

On behalf of

TESCO

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Document Information

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For and on behalf of Noise Solutions Ltd				

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01	08/03/2019	Amended Local Council Criteria	DAM	JS

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1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Tesco Stores Ltd to undertake a noise assessment for new plant serving a proposed Tesco Express to be located at premises on Shelton Street,Camden..

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

1.3. Cumulative plant noise emissions for the proposed plant have been predicted at the nearest noise-sensitive receptors and assessed using the local authority's typical requirements and nationally-recognised guidance.

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. The Tesco Express Store is proposed to occupy the ground floor of premises on Shelton Street at its corner with Endell Street.

2.2. To facilitate this, new refrigeration plant will be installed on site within a dedicated plant room with louvres facing onto Shelton Street. Plant will comprise a Gas Cooler and Air Conditioning (AC) units. A compressor pack will be installed within an internal area.

2.3. The proposed gas cooler will operate continuously but with a reduced load during the night time period. The AC plant will operate only during store opening hours.

2.4. Noise data for the proposed plant is presented in **Appendix D**. The location of the proposed plant is shown in **Appendix B.**

3.0 Nearest noise-sensitive receptors

3.1. The premises are part of a retail, commercial and residential development. The nearest residential premises are the flats immediately above the retail unit (R1) and flats opposite the unit on Shelton Street (R2).

3.2. **Appendix B** contains an aerial photograph showing the site and surrounding area.

4.0 Existing noise climate

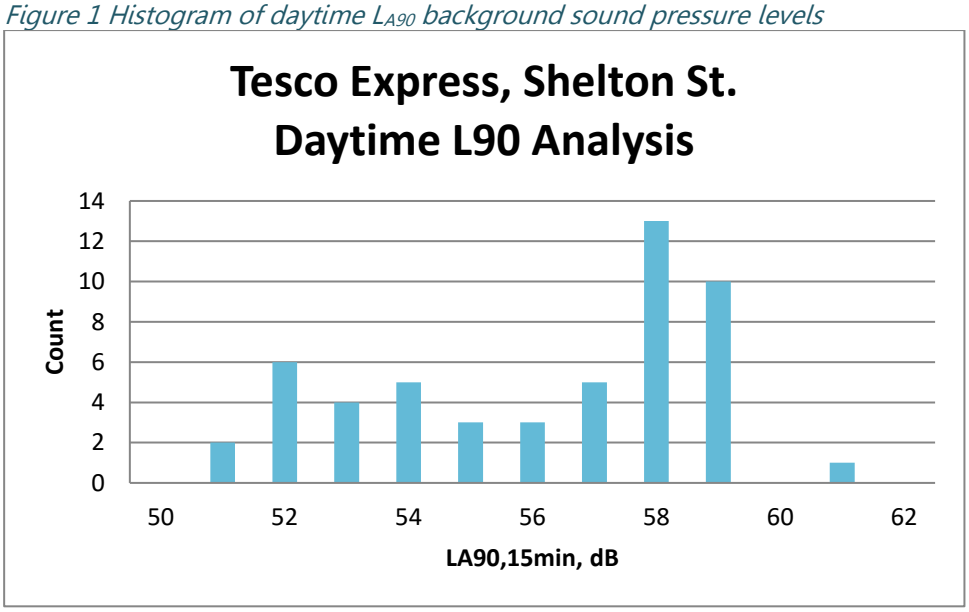
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

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 C**.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(5mins)}$	$L_{Amax(5mins)}$	$L_{A10(5mins)}$	$L_{A90(5mins)}$
Daytime (07.00 – 23.00 hours)	63-71	77-97	67-73	51-61
Night-time (23.00 – 07.00 hours)	55-69	72-91	57-72	47-54

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



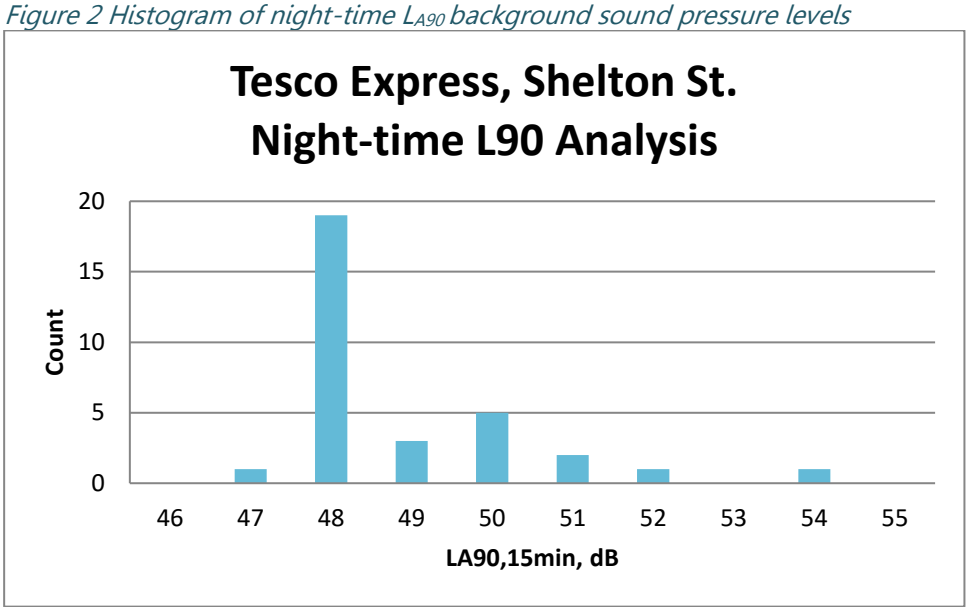
4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in table 2 below.

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

dB, L_{A90} daytime period	
Mean	56
Median	57
Mode	58

4.4. From the histogram analysis, 52dB has been selected to be a robust representation of the background noise level during the daytime period.

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



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

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

dB, L_{A90} night-time period	
Mean	49
Median	48
Mode	48

4.6. Again, from the histogram analysis, 48dB has been chosen to be representative of the background sound level during the night-time period.

5.0 Plant noise emission criteria

London Borough of Camden

5.1. The Camden Local Policy document dated 2016 states in Policy A1 *'Managing the impact of development'* that for noise and vibration:

> *"Noise and vibration can have a major effect on amenity. The World Health Organisation (WHO) for example states that excessive noise can seriously harm human health, disturb sleep and have cardiovascular and behavioural effects. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough.*
>
> *Where uses sensitive to noise are proposed close to an existing source of noise or when development that is likely to generate noise is proposed, the Council will require an acoustic report to accompany the application. Further detail can be found*

in Policy A4 - Noise and Vibration and our supplementary planning document Camden Planning Guidance 6: Amenity."

5.2. Policy A4 *'Noise and Vibration'* states under the section titled *'Plant and other noise generating equipment'* that:

> *"Planning conditions will be imposed to require that plant and equipment which may be a source of noise is kept working efficiently and within the required noise limits and time restrictions. Air conditioning will only be permitted where it is demonstrated that there is a clear need for it after other measures have been considered (Policy CC2 Adapting to climate change). Conditions may also be imposed to ensure that attenuation measures are kept in place and are effective throughout the life of the development."*

5.3. The policy document goes on to describe noise thresholds in Appendix 2 and states in the *'Industrial and Commercial Noise Sources'* section:

> *"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."*

5.4. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

Summary of proposed criteria

5.5. Table 5 below summarises the proposed plant noise level limits at the nearest premises to comply with LB Camden criteria.

Table 5 Proposed plant noise emissions level limits at nearest receptors

Period	Receptor
	Plant noise level, dB
Daytime (07.00 – 23.00 hours)	42
Night-time (23.00 – 07.00 hours)	38

6.0 Plant noise impact assessment

6.1. Noise emission from the new proposed plant has been predicted at the nearest receptors to the site based on the noise output information shown in **Appendix D**.

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 will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems.

6.3. The noise assessment includes for the installation of an attenuation package to the external louvres as shown in Table 6:

Table 6 Attenuator Selections

Location	Notes	Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Intake Louvre	900 mm long, 40 % FA	4	7	13	22	30	27	25	18
Discharge Louvre	900 mm long, 40 % FA	4	7	13	22	30	27	25	18

6.4. Table 7 below, summarises the assessment of predicted noise levels. The full calculation is presented in **Appendix E**

Table 7 Assessment of predicted noise levels at the nearest noise sensitive receptors

Location	Period	Predicted Level L_{Aeq} (dB)	Limit	Difference
R1	Daytime	34	42	-8
	Night time	34	38	-4
R2	Daytime	37	42	-5
	Night time	37	38	-1

Daytime 07.00h – 23.00h; Night time 23.00h – 07.00h

6.5. External noise level predictions demonstrate that cumulative noise emissions from the proposed plant will meet the proposed criteria given in Table 5 of this report and hence should therefore be acceptable to Camden Council.

Context and assessment of uncertainties

6.6. 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 were 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.

Vibration isolation

6.7. To reduce the risk of structure borne noise entering the flats above the store, all plant should be isolated from the structure by suitable anti-vibration mounts offering >95% efficiency.

7.0 Structure-borne transmission (roll cage movements)

7.1. The movement of roll cages through retail premises can be a significant source of structure-borne noise transmission. Vibrational energy from roll cage movements can transmit through

the structure and reradiate as noise within adjoined premises. Structure-borne sound transmission from cage movements cannot be treated through the installation of acoustic ceilings; a resilient floor treatment is required to minimise transmission into the building structure.

7.2. Within the sales floor and back-of house (i.e. all areas where roll cages are normally used) it is recommended that a floating floor should be installed. This could comprise one of the following options;

- a) Screed floor: Screed cast onto resilient layer. The resilient layer should either have a ΔL_w of not less than 30dB or have a natural frequency of not more than 24 Hz. The resilient layer should be at least 15mm thick and the floating floor must be isolated from the surrounding walls to ensure flanking transmission will not occur. The floor finish must be smooth with no ridges or steps.

- b) Timber floor: Timber board or timber board on battens supported above resilient layer. The resilient layer should either have a ΔL_w of not less than 30dB or have a natural frequency of not more than 24 Hz. The resilient layer should be at least 15mm thick and the floating floor must be isolated from the surrounding walls to ensure flanking transmission will not occur. There must be no rigid fixings through the timber floor finish into the resilient layer. The floor finish must be smooth with no ridges or steps.

8.0 Summary

8.1. Noise Solutions Ltd (NSL) has been commissioned by Tesco Stores Ltd to undertake a noise assessment for new plant at a proposed Tesco Express at Shelton Street, Camden.

8.2. An environmental sound survey was undertaken at the site to establish the typical background sound levels around the site.

8.3. The cumulative plant noise emission levels for the proposed plant (with attenuation package) have been predicted at the most affected noise sensitive receptors and assessed against the requirements of the London Borough of Camden Council and other guidance.

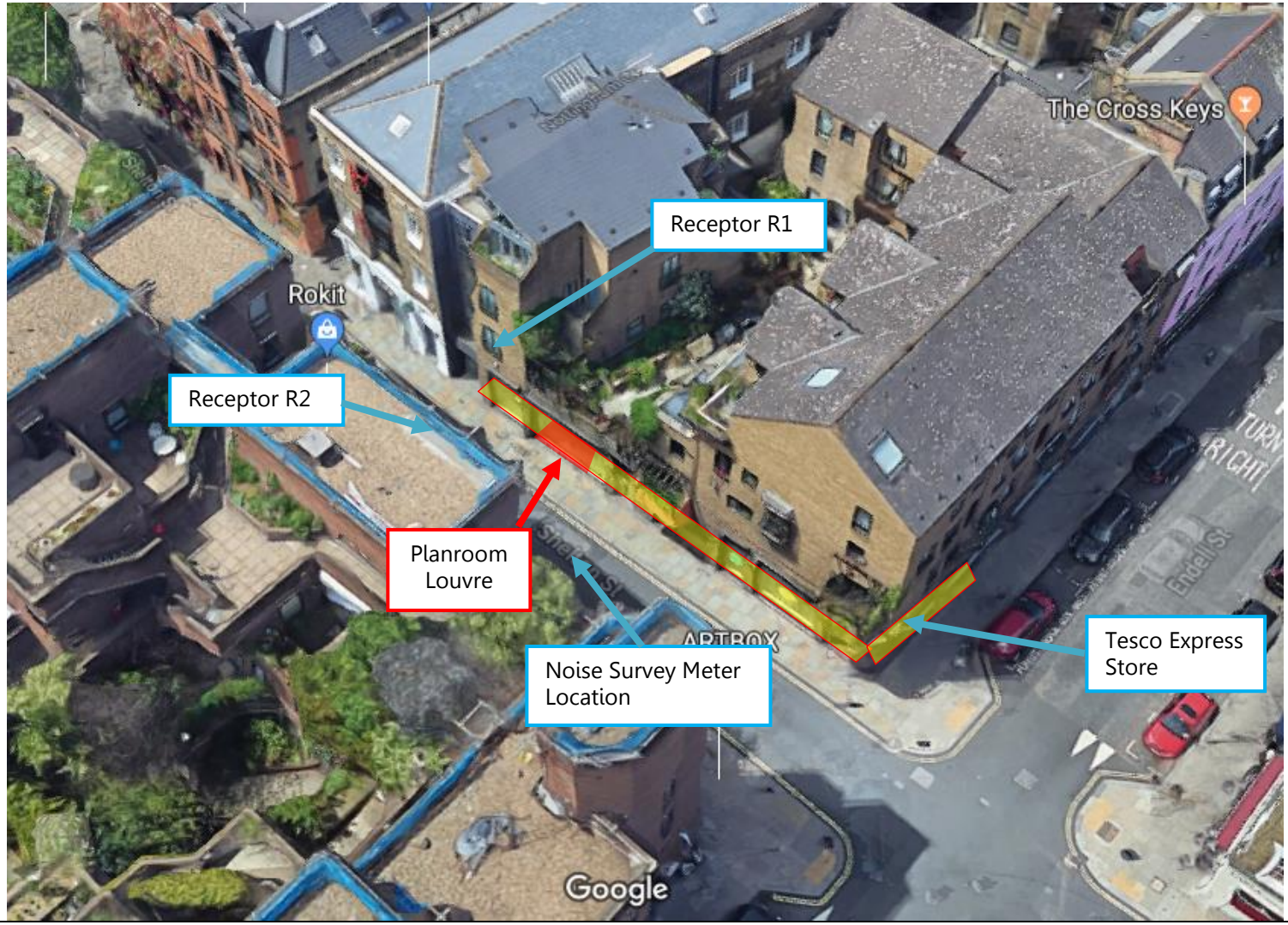
8.4. The results of the assessment demonstrate that cumulative noise levels at the most affected noise sensitive windows should be acceptable to the local planning authority during both the daytime and night-time periods.

8.5. Additional advice has been provided with respect to control of plant vibration and store trolley movements.

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 (LAeq,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 log10 (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 Leq 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 exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B Aerial photograph site showing areas of interest



Appendix C Environmental noise survey

Details of sound surveys

C.1 Measurements of the existing background sound levels were undertaken between 14.00 hours on Monday 26th November and 10.30 hours on Tuesday 27th November 2018.

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 Shelton Street (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.

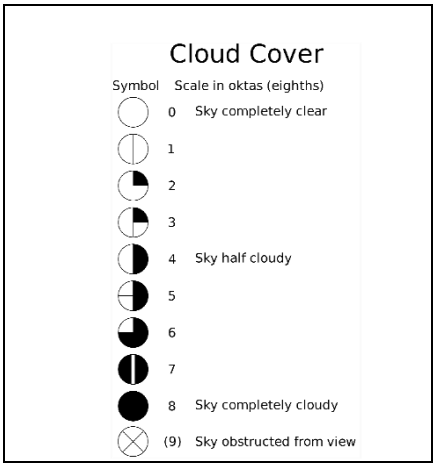
Equipment

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 (+/-0.2 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

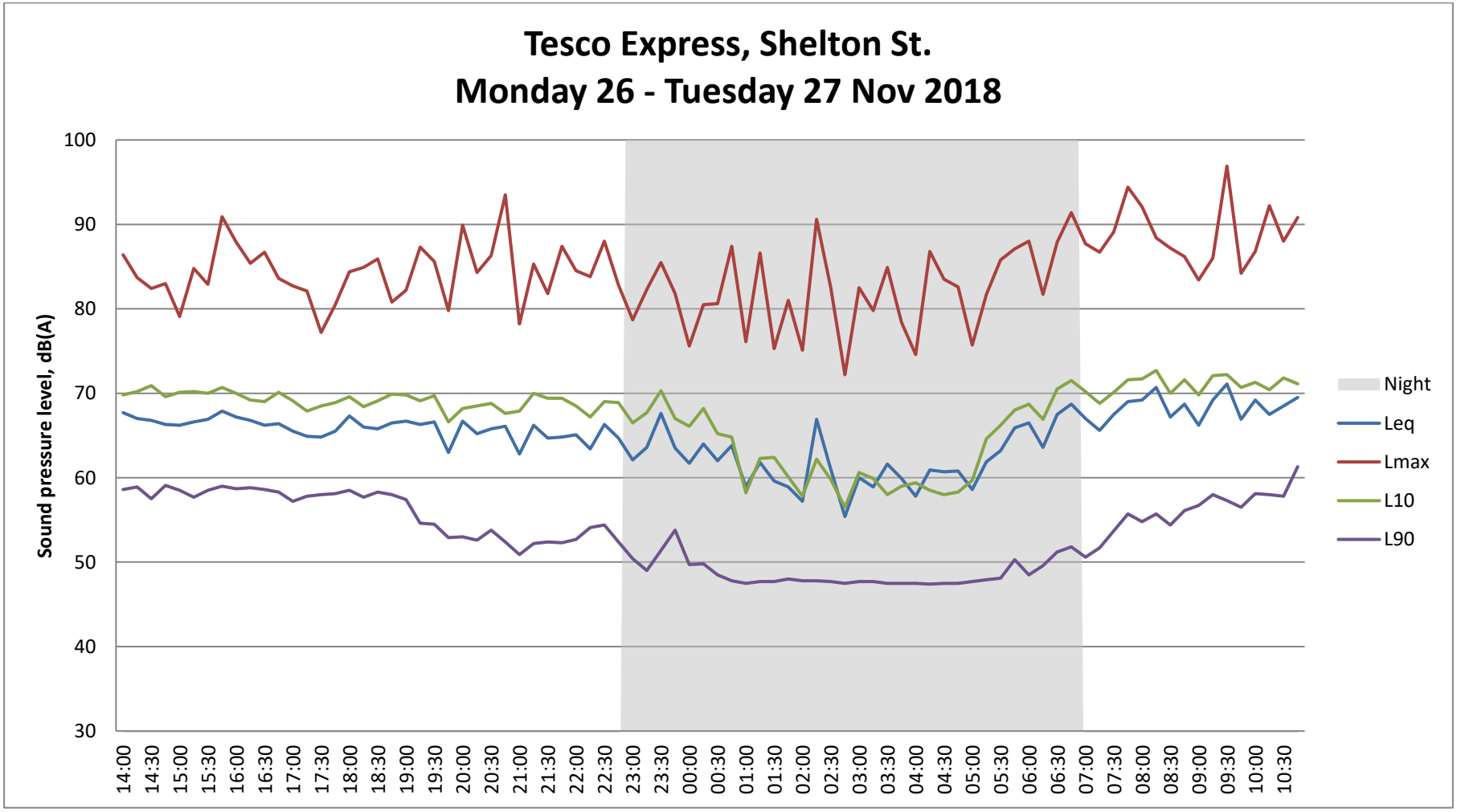
Weather conditions

C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were 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	1400h 26/11/2018 – 1030h 27/11/2018	Temperature	11.1	10.5
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	8	7
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	yes
		Wind Speed (m/s)	1.15	2.0
		Wind Direction	-	-
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

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 proposed plant will operate. The noise climate during the survey period was dominated by local traffic and loud music being played nearby. The results of the survey are presented in a time history graph overleaf.


Tesco Express, Shelton St.
Monday 26 - Tuesday 27 Nov 2018
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
14:00
14:30
15:00
15:30
16:00
16:30
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07:00
07:30
08:00
08:30
09:00
09:30
10:00
10:30
Night
Leq
Lmax
L10
L90

Appendix D Plant information and manufacturers' noise data

Description	Model / Model	Quantity	Notes.	Sound power level level (dB) at octave band centre frequencies (Hz)								$L_{Aeq,T}$ (dB)
				63	125	250	500	1k	2k	4k	8k	
Fan	Elta SCD/630	3	In-duct L_w	76	81	81	82	81	77	73	69	85
Refrigeration condenser	Kelvion RF/MB102	1	L_w	72	72	70	71	72	66	61	54	75
Shop floor AC	Mitsubishi /PUHZ-ZRP125	2	L_w	70	63	60	58	55	50	46	38	60
Manager's office AC	Mitsubishi /PUHZ-ZRP35	1	L_w	66	58	53	52	48	45	40	39	54

Appendix E Plant noise calculations

Decription	Notes	Leq (dB)								LAeq (dB)
		63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Reverberant level in plant room	Rev Lp	77	81	81	81	78	72	68	64	82
Intake										
Opening area (m2)	6	8	8	8	8	8	8	8	8	
SRI of opening / attenuator	I.L	-4	-7	-13	-22	-30	-27	-25	-18	
Inside-outside correction		-6	-6	-6	-6	-6	-6	-6	-6	
Lw of opening	Lw	75	76	70	61	50	47	45	48	65
R1										
Directivity correction	(4000,0deg x 1500,135deg)	-2	-6	-8	-8	-8	-8	-8	-8	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (d = /m)	0.5	-8	-10	-12	-15	-18	-21	-24	-27	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		0	0	0	0	0	0	0	0	
Resultant at receptor R1	Lp @ R1	47	43	32	20	6	1	-4	-4	29
R2										
Directivity correction	(4000,30deg x 1500,0deg)	3	4	5	6	6	6	6	6	
Distance correction (m)	18	-33	-33	-33	-33	-33	-33	-33	-33	
Screening (d = /m)	0	-5	-5	-5	-5	-5	-5	-5	-5	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		0	0	0	0	0	0	0	0	
Resultant at receptor R2	Lp @ R2	40	42	37	28	17	15	13	15	32

Discharge										
Sound power	Lw	82	86	86	87	86	82	78	74	90
End reflection	6	-1	0	0	0	0	0	0	0	
SRI of opening	I.L	-4	-7	-13	-22	-30	-27	-25	-18	
Lw of opening		77	79	73	65	56	55	53	56	69
R1										
Directivity correction	(4000,0deg x 1500,135deg)	-2	-6	-8	-8	-8	-8	-8	-8	
Distance correction (m)	3	-18	-18	-18	-18	-18	-18	-18	-18	
Screening (d = /m)	0.5	-8	-10	-12	-15	-18	-21	-24	-27	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		0	0	0	0	0	0	0	0	
Resultant at receptor R1	Lp @ R1	50	46	36	25	13	9	4	4	33
R2										
Directivity correction	(4000,30deg x 1500,0deg)	3	4	5	6	6	6	6	6	
Distance correction (m)	18	-33	-33	-33	-33	-33	-33	-33	-33	
Screening (d = /m)	0	-5	-5	-5	-5	-5	-5	-5	-5	
Surface Directivity		0	0	0	0	0	0	0	0	
BS4142		0	0	0	0	0	0	0	0	
Resultant at receptor R2	Lp @ R2	42	45	40	33	24	23	20	23	36

Appendix F Plant noise summary

SUMMARY	Leq (dB)								LAeq (dB)
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Receptor R1									
Intake	47	43	32	20	6	1	-4	-4	29
Discharge	50	46	36	25	13	9	4	4	33
Cumulative	52	48	37	26	14	9	4	4	**34**
Receptor R2									
Intake	40	42	37	28	17	15	13	15	32
Discharge	42	45	40	33	24	23	20	23	36
Cumulative	44	47	42	34	24	23	21	24	**37**

Location	Period	Predicted Level LAeq (dB)	Limit *(see 5.29 above)*	Difference
R1	Daytime	34	42	-8
	Night time	34	38	-4
R2	Daytime	37	42	-5
	Night time	37	38	-1

Daytime 07.00h - 23.00h; Night time 23.00h-07.00h

ATTENUATOR SELECTIONS	Notes	Octave Band Centre Frequency (Hz)								PD (Pa)
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Intake Louvre	900 mm long, 40 % FA	4	7	13	22	30	27	25	18	4
Discharge Louvre	900 mm long, 40 % FA	4	7	13	22	30	27	25	18	8

Appendix G Proposed plantroom design