4193

Rating Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997

Site Name:	Upper Shoreham Road Exp
Site Address:	The Green Jacket Public House, 225 Upper Shoreham Road, Shoreham by Sea, West Sussex, BN43 6BE.
Customer Name:	Tesco Stores Ltd
Customer Address:	Tesco House, Delamare Road, Cheshunt, Hertfordshire, EN8 9SL.

Quietly confident

KR Associates (UK) Ltd

Unit 2, Vancouver Wharf,

Hazel Road, Southampton SO19 7BN.

Report Reference:	KR02633
Report Version:	V1.1
Version Date:	15 June 2012
Test Date:	23 April 2012
Consultant:	Chris Matheson

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1 EXECUTIVE SUMMARY

1.1 Introduction

KR Associates (UK) Ltd have been instructed by Tesco Stores Ltd to undertake an environmental noise assessment at The Green Jacket Public House, 225 Upper Shoreham Road, Shoreham by Sea, West Sussex to determine if noise from the proposed plant will adversely affect nearby residential properties using the assessment method set out in section 9 of BS4142:1997.

1.2 Scope of Report

The report details the method used as defined in BS 4142:1997 for rating the noise of an industrial nature from an existing or proposed source. This is based on the margin by which it exceeds a background noise level with an appropriate allowance for the acoustic features present in the noise, determining if complaints are likely to be received.

1.3 Summary of Results

1.3.1 Rating Levels

BS4142:1997 - Section 8 Rating Noise Levels	**07:00 – 23:00**	**23:00 – 07:00**
	$L_{Aeq,1\ hours}$ 39 dB	$L_{Aeq,5\ minutes}$ 22 dB

1.3.2 Background Noise Levels

The Background Noise Levels were corrected from the measurement position to the assessment position using the noise map shown in section 9.

BS4142:1997 - Section 7 Background Noise Levels	**07:00 – 23:00**	**23:00 – 07:00**
	$L_{A90,16\ hours}$ 46 dB	$L_{A90,8\ hours}$ 33 dB

1.3.3 BS4142:1997 Assessment

BS4142:1997 - Section 9 Assessment Likelihood of Complaints	**07:00 – 23:00**	**23:00 – 07:00**
	-7 dB	-11 dB
	below 'Marginal Significance'	below 'Complaints Unlikely'

1.4 Conclusions

KR Associates (UK) Ltd has undertaken an environmental noise survey in accordance with British Standard 4142:1997 and has concluded that the resultant levels are unlikely to give rise to complaints from the local residents.

2 TEST PROCEDURE

2.1 Scope

This report is based on the test procedure which sets out the method for determining the level of a noise of an industrial nature, and assessing whether or not it is likely to give rise to complaints from persons living in the vicinity in accordance with BS 4142:1997. The procedure is concerned with the rating of a noise of an industrial nature, based on the margin by which it exceeds the background noise levels with an appropriate allowance for the acoustic features present in the noise. As this margin increases, so does the likelihood of complaints.

2.2 Test Procedure

The tests were undertaken in accordance with the appropriate KR Associates (UK) Ltd test procedure and the appropriate test data recorded.

2.2.1 Key Positions

2.2.1.1 Source Position

The location of the source is established i.e. the position where the existing or proposed source is to be located.

2.2.1.2 Assessment Position

The assessment position is established as the position at which the assessment under BS4142:1997 is to be carried out which is always external and usually adjacent to the nearest residential facade.

2.2.2 Background Noise Levels

The background levels are measured where possible at the assessment position or at an equivalent position which is representative of the assessment position.

2.2.3 Specific Noise Levels

The specific noise levels are measured on the parallelepiped measurement surface 1m from the units to establish the sound power levels of the combined compressor condenser unit. The specific noise levels at the assessment position were then calculated using ISO 9613:1996.

2.2.4 Character Correction

Where suitable a Character Correction of +5 dB is included within the calculation of the Rating Level if the source has certain characteristics.

2.2.5 Rating Level

The Rating Level is calculated by adding the Specific Noise Level to the Character Correction where appropriate.

2.2.6 Assessment Level

An assessment level is calculated by subtracting the numerical value of the background noise levels from the rating level.

2.2.7 Conclusion

Section 9 of BS4142:1997 details the likelihood of complaints from a range of assessment level where the greater the assessment level the greater the chance that complaints will be received.

> *"Complaint Likely – Assessment of around +10 dB*
> *Complaints Marginal – Assessment of around +5 dB*
> *Complaints Unlikely – Assessment of around -10 dB or less"*

3 CALCULATION OF LEVELS AT ASSESSMENT POSITION

3.1 Source Directivity (D_c)

A correction is made to account for the location of the source and the effect of additional reflective surfaces excluding the ground and is contained within section 6 of ISO 9613-Part 2:1996.

Number of Surfaces	Correction in dB (D_c)
No Reflective Surfaces	+0 dB
1 Reflective Surface	+3 dB
2 Reflective Surfaces	+6 dB
3 Reflective Surfaces	+9 dB

Unit Description	Correction in dB (D_c)
Searle - MGA124 EC	+3 dB
Mitsubishi Heavy - FDC 100 VN	+3 dB
Mitsubishi Heavy - FDC 100 VN	+3 dB
Mitsubishi Heavy - SRK 25 ZG	+3 dB

3.2 Geometric Divergence (A_{div})

A correction for the distance between the source and assessment position using the following formula defined in section 7.1 of ISO 9613-Part 2:1996.

Formula	Symbols
$A_{div} = 20 . Log_{10} (d/d_0) +11$	A_{div} = Reduction due to Geometric Divergence (dB) d = Distance from source to receiver (m) d_0 = reference distance (1m)

Unit Description	Correction in dB (A_{div})
Searle - MGA124 EC	-37 dB (20.2 m)
Mitsubishi Heavy - FDC 100 VN	-37 dB (20.3 m)
Mitsubishi Heavy - FDC 100 VN	-37 dB (20.3 m)
Mitsubishi Heavy - SRK 25 ZG	-37 dB (20.3 m)

3.3 Ground Absorption (A_{gr})

A correction is made for the effect of the ground between the source and receiver depending on whether it is considered hard or soft ground.

Type of ground	Correction in dB (A_{gr})
Hard Ground	+ 3 dB
Soft Ground	+ 0 dB

Unit Description	Correction in dB (A_{gr})
Searle - MGA124 EC	+3 dB
Mitsubishi Heavy - FDC 100 VN	+3 dB
Mitsubishi Heavy - FDC 100 VN	+3 dB
Mitsubishi Heavy - SRK 25 ZG	+3 dB
Ground Absorption A_{gr} (dB)	

3.4 Atmospheric Absorption (A_{atm})

As the source was less than 100m from the receiver position (assessment position) no correction was made for atmospheric absorption.

3.5 Barrier Effect (A_{bar})

A correction is made for any barrier in the direct line of site between the source and the assessment position and is detailed in section 22 ‘Barriers’ in ‘Calculation of Road Traffic Noise’ (chart 9 and 9a)

Formula	Symbols	
$A_{bar} = -15.4 - 8.26x - 2.787x^2 - 0.831x^3 - 0.198x^4 + 0.1539x^5 + 0.12248x^6 + 0.02175x^7$ Valid for $-3 \le x \le 1.2$, where $x=\log10(\delta)$	δ = Path difference (m)	
Notes:	Shadow Zone (No line of sight)	Illuminated Zone (Line of sight)
	For $x < -3$ $A_{bar} = -5$ For $x > 1.2$ $A_{bar} = -30$	For $x < -4$ $A_{bar} = -5$ For $x > 0$ $A_{bar} = 0$

Unit Description	Correction in dB (Adiv)
Searle - MGA124 EC	-5 dB (δ = 0.0 m)
Mitsubishi Heavy - FDC 100 VN	-5 dB (δ = 0.0 m)
Mitsubishi Heavy - FDC 100 VN	-5 dB (δ = 0.0 m)
Mitsubishi Heavy - SRK 25 ZG	-5 dB (δ = 0.0 m)
Barrier Correction A_{bar} (dB)	

3.6 Summary of Corrections

Source	Period	Sound Power Level (L_w)	Source Directivity (D_c)	Geometric Divergence (A_{div})	Ground Absorption (A_{gr})	Barrier Correction (A_{bar})	Specific Noise Level Assessment Position
Searle - MGA124 EC	Day	64.0 dB	+3 dB	-37.1 dB	+3 dB	-5.2 dB	27.7 dB
	Night	58.5 dB					22.2 dB
Mitsubishi Heavy - FDC 100 VN	Day	71.1 dB	+3 dB	-37.1 dB	+3 dB	-5.0 dB	35.0 dB
	Night	-- dB					-- dB
Mitsubishi Heavy - FDC 100 VN	Day	71.1 dB	+3 dB	-37.1 dB	+3 dB	-5.1 dB	34.9 dB
	Night	-- dB					-- dB
Mitsubishi Heavy - SRK 25 ZG	Day	62.5 dB	+3 dB	-37.2 dB	+3 dB	-5.0 dB	26.3 dB
	Night	-- dB					-- dB

4 ASSESSMENTS

4.1 Day Time (07:00 to 23:00)

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Rating Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997 Day Time (07:00 – 23:00)

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Source	Operating Times		Source Position
Searle - MGA124 EC	Continuously		Within a dedicated area at the rear of the store
Mitsubishi Heavy - FDC 100 VN	07:00-23:00		
Mitsubishi Heavy - FDC 100 VN	07:00-23:00		
Mitsubishi Heavy - SRK 25 ZG	07:00-23:00		
Assessment Position	1m from the residential property adjacent to the store within Upper Shoreham Road		
Background Position	Eastern Avenue		
Distance	20 m from the edge of the source to the assessment position (direct line of site)		
Item	Calculation	Clause	Commentary
Specific Noise Level	39 dB	6.3	Specific noise level was calculated from measurements made at 1m ISO 9613:1996[3]
Acoustic feature correction	+0 dB	8.2.	Reference section 8.2 of BS4142:1997.
Rating Level	39 dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level
Background Noise Level	46 dB	7.1.	The background noise level was measured at an equivalent position.
Assessment Level	-7 dB	9	The background level is subtracted from the rating level. (Numerical values)
Conclusion BS 4142:1997[1]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less		
Assessment	**-7 dB**		
Conclusion	**The assessment level is below 'Marginal Significance'**		
Test Laboratory:	4193		
Report Reference:	KR02633		
Test Date:	23 April 2012		
Approval Date:	27 April 2012		

4.2 Night Time (23:00 to 07:00)

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Rating Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997 Night Time (23:00 – 07:00)

Quietly confident

Source	Operating Times		Source Position
Searle - MGA124 EC	Continuously		Within a dedicated area at the rear of the store
Mitsubishi Heavy - FDC 100 VN	07:00-23:00		
Mitsubishi Heavy - FDC 100 VN	07:00-23:00		
Mitsubishi Heavy - SRK 25 ZG	07:00-23:00		
Assessment Position	1m from the residential property adjacent to the store within Upper Shoreham Road		
Background Position	Eastern Avenue		
Distance	20 m from the edge of the source to the assessment position (direct line of site)		
Item	Calculation	Clause	Commentary
Specific Noise Level	22 dB	6.3	Specific noise level was calculated from measurements made at 1m ISO 9613:1996[3]
Acoustic feature correction	+0 dB	8.2.	Reference section 8.2 of BS4142:1997.
Rating Level	22 dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level
Background Noise Level	33 dB	7.1.	The background noise level was measured at an equivalent position.
Assessment Level	-11 dB	9	The background level is subtracted from the rating level. (Numerical values)
Conclusion BS 4142:1997[1]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less		
Assessment	**-11 dB**		
Conclusion	**The assessment level is below 'Complaints Unlikely'**		
Test Laboratory:	4193		
Report Reference:	KR02633		
Test Date:	23 April 2012		
Approval Date:	27 April 2012		

5 CONCLUSIONS

KR Associates (UK) Ltd has undertaken an environmental noise survey in accordance with British Standard 4142:1997 and has concluded that the resultant levels are unlikely to give rise to complaints from the local residents.

The impact on nearby residential properties from the noise generated by the plant is assessed, in accordance with section 9 of BS4142:1997:

- Day time (07:00 – 23:00) impact -7 dB gives an assessment of below 'Marginal Significance'
- Night time (23:00 – 07:00) impact -11 dB gives an assessment of below 'Complaints Unlikely'

5.1.1 Character Correction

The character correction detailed in section 8 of BS4142:1997 has not been applied due to:

- As the plant equipment / configuration proposed would be practically inaudible at the assessment position, the features listed in section 8.2 of BS4142:1997 could not be determined.
- The plant equipment / configuration proposed does not exhibit any of the features listed in section 8.2 of BS4142:1997.

6 APPENDIX A - REQUIRED INFORMATION SUMMARY

(BS 4142:1997 – Information to be Reported)

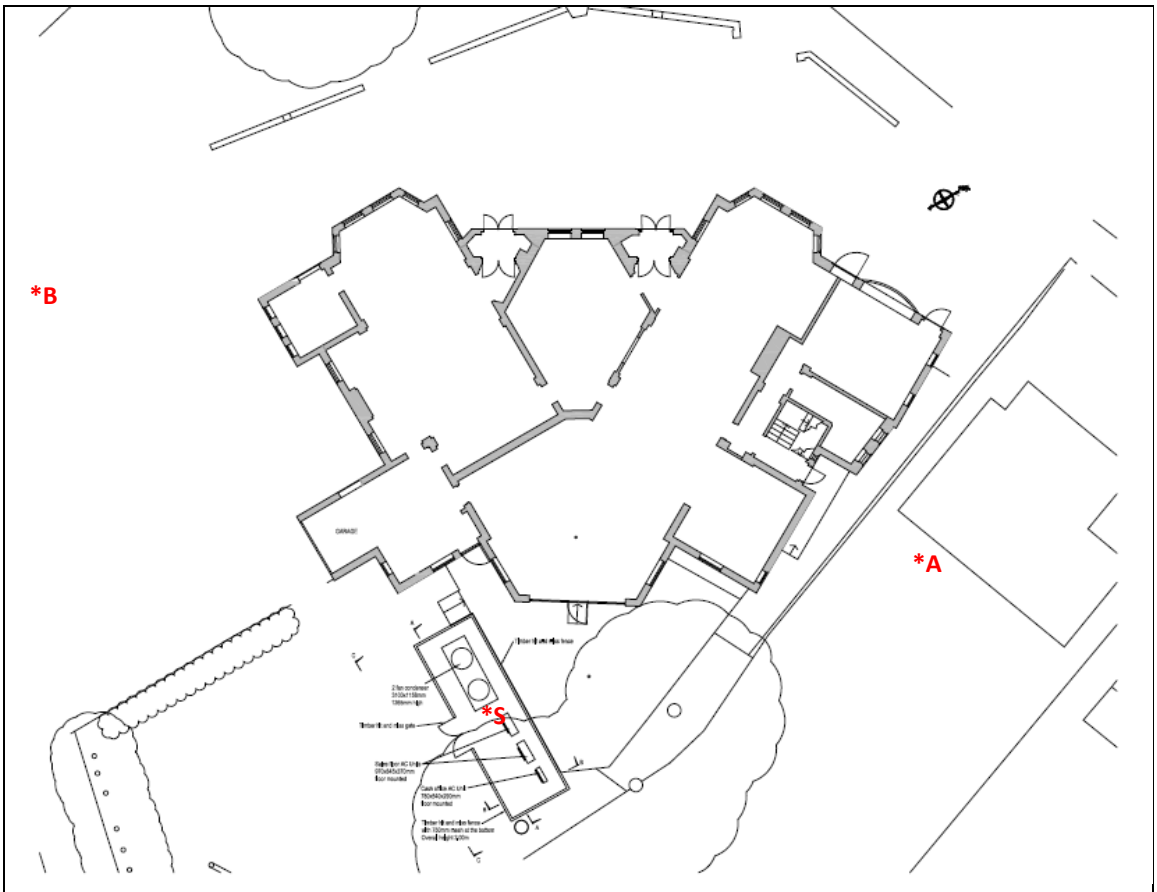
Ref	Item	Description		
a)	**Source Under Investigation**			
1)	Description of Source	Type	Manufacturer	Model
	Searle - MGA124 EC	2 Fan Condenser	Searle	MGA124 EC
	Mitsubishi Heavy - FDC 100 VN	Sales Floor AC	Mitsubishi Heavy	FDC 100 VN
	Mitsubishi Heavy - FDC 100 VN	Sales Floor AC	Mitsubishi Heavy	FDC 100 VN
	Mitsubishi Heavy - SRK 25 ZG	Cash Office AC	Mitsubishi Heavy	SRK 25 ZG
2) 3) 4)	Source	Source Location	Hours of Operation	Mode of Operation
	Searle - MGA124 EC	Within a dedicated area at the rear of the store	Continuously	Continuously
	Mitsubishi Heavy - FDC 100 VN		07:00-23:00	Continuously
	Mitsubishi Heavy - FDC 100 VN		07:00-23:00	Continuously
	Mitsubishi Heavy - SRK 25 ZG		07:00-23:00	Continuously
	Description of Premises	The building is a former public house located on the corner of Upper Shoreham Road and Eastern Avenue. The plant is to be located within the service yard of the store. The surrounding area consists mostly of residential properties.		
b)	**Subjective Impression of Source at Assessment Position**			
1)	Dominance	The proposed sources will not be the dominant sources at the assessment position		
	Audibility	The proposed sources are unlikely to be audible or perceivable at the assessment position		
2)	Residual Noise Sources	The residual noise is largely due to road traffic noise.		
c)	**Relative Positions**			
1)	Assessment Position	1m from the residential property adjacent to the store within Upper Shoreham Road		
2)	Source Measurement	Sound pressure levels measured on a parallelepiped measurement surface 1m from the unit		
	Justification	Source has yet to be installed		
3)	Background Measurement	Measured within Eastern Avenue		
	Justification	No access available at assessment position		
4)	Topography, reflective surfaces etc.	The surfaces between the plant area and assessment position have been assumed to be hard and reflective.		
5)	Relative Distances	The plant area is approximately 20m from the nearest residential.		

Ref	Item	Description		
d)	**Noise Measurement Equipment**			
		Sound Level Meter	Microphone	Calibrator
1)	Type	NL - 32	UC - 53A	NC - 74
2)	Manufacturer	Rion	Rion	Rion
3)	Serial Number	503258	316663	35084143
4)	Verification Test Details Calibration Certificate	05442	05442	AC/10/161/01
	Verification Date	09 September 2010	09 September 2010	16 July 2011
e)	**Operational Test**			
1)	Ref. Level of Calibrator	94 dB@1000Hz		
2)	Meter Reading Before	94 dB		
	Meter Reading After	94 dB		
f)	**Weather Conditions**			
1)	Wind Speed	3.0 ms^{-1}		
	Wind Direction	North Easterly		
2)	Temperature Inversion (Calm Night / No cloud)	Not Present		
3)	Precipitation	No Precipitation		
4)	Fog	None		
g)	**Date and Time of Measurements**			
1)	Source Measurements	07:00 on 01 July 2008 to 08:00 on 01 July 2008		
	Background Measurements	17:00 on 23 April 2012 to 13:00 on 25 April 2012		
h)	**Specific Noise Levels**			
1)	Measured Noise Levels	Day Time (07:00 – 23:00)	Night Time (23:00 to 07:00)	
		Not Applicable	Not Applicable	
2)	Residual Noise Level	Not Applicable	Not Applicable	
	Method of Determination	Not Applicable		
3)	Specific Noise Level	LAeq,1 hour 39 dB	LAeq,5 minutes 22 dB	
	Method of Determination	Calculated using the supplied manufacturers Sound Power Levels		
4)	Justification of Methods	As the source has yet to be installed the Sound Power Levels supplied by the manufacturer were used to calculate the Specific Noise Levels at the assessment position		
5)	Correction Applied	Not Applicable	Not Applicable	

Ref	Item	Description	
i)	**Measurement Time Interval**		
1)	Source Measurements	T_m = In accordance with the requirements of BS ISO 13487:2003	
	Background Measurements	Day Time (07:00 – 23:00)	Night Time (23:00 to 07:00)
		T = 16 hours Quietest Measurement	T= 8 hours Quietest Measurement
j)	**Reference Time Interval**		
		T_r = 1 hour	T_r = 5 minutes
k)	**Rating Level**		
1)	Specific Noise Level	$L_{Aeq,1\ hour}$ 39 dB	$L_{Aeq,5\ min}$ 22 dB
2)	Character Correction	+0 dB	+0 dB
	Justification	Source does not contain the appropriate characteristics	
3)	Rating Level	$L_{Aeq,1\ hour}$ 39 dB	$L_{Aeq,5\ min}$ 22 dB
l)	**Background Levels**		
		$L_{A90,16\ hour}$ 46 dB	$L_{A90,\ 8\ hour}$ 33 dB
2)	Equivalent Measurement Position Justification	No access available at assessment position	
m)	**Excess of Rating over Background Level**		
1)	Assessment	-7 dB	-11 dB
2)	Conclusion	below 'Marginal Significance'	below 'Complaints Unlikely'

7 APPENDIX B – SITE LAYOUT / PHOTOGRAPHS

7.1 Location Map



North Direction	* S Source Location	* A Assessment Position	*B Background Position
Measured at the Assessment Position (Source not present or turned Off)			No
Measured at an equivalent position (BS 4142:1997 Section 7.1.1.)			Yes

8 APPENDIX C - BACKGROUND NOISE LEVELS

8.1 07:00 Monday 23rd April 2012 to 07:00 Tuesday 24th April 2012

Time	L_{Max}	Minimum 5 minute			1 Hour			Day and Night		
		$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$
07:00 – 08:00	--	--	--	--	--	--	--	--	--	--
08:00 – 09:00	--	--	--	--	--	--	--			
09:00 – 10:00	--	--	--	--	--	--	--			
10:00 – 11:00	--	--	--	--	--	--	--			
11:00 – 12:00	--	--	--	--	--	--	--			
12:00 – 13:00	--	--	--	--	--	--	--			
13:00 – 14:00	--	--	--	--	--	--	--			
14:00 – 15:00	--	--	--	--	--	--	--			
15:00 – 16:00	--	--	--	--	--	--	--			
16:00 – 17:00	--	--	--	--	--	--	--			
17:00 – 18:00	85.3	61.6	64.2	53.7	65.1	66.9	56.5			
18:00 – 19:00	80.7	61.7	63.7	50.3	63.4	65.7	53.5			
19:00 – 20:00	83.5	60.7	62.5	51.2	62.0	64.4	53.1			
20:00 – 21:00	92.3	57.4	59.6	48.4	63.3	62.5	50.7			
21:00 – 22:00	79.2	55.4	56.5	46.5	58.8	60.3	48.6			
22:00 – 23:00	77.8	54.6	55.9	42.4	59.2	60.1	44.7			
23:00 – 00:00	72.6	47.5	47.0	38.5	55.9	57.9	41.9	58.1	59.1	36.1
00:00 – 01:00	82.2	46.1	45.1	32.8	56.8	52.5	37.5			
01:00 – 02:00	80.9	44.0	44.7	30.3	54.8	49.7	33.4			
02:00 – 03:00	79.7	37.4	40.0	27.1	55.1	47.5	30.2			
03:00 – 04:00	78.2	41.0	43.7	27.4	53.6	51.5	34.9			
04:00 – 05:00	81.7	52.0	49.2	37.5	57.6	56.5	40.9			
05:00 – 06:00	80.8	55.0	55.3	45.9	58.9	59.9	48.1			
06:00 – 07:00	80.2	59.5	61.6	51.6	63.1	65.9	53.1			
	dB t = 1 hr	dB, t = 5 minutes			dB, t = 1 hour			dB, 07:00 – 23:00 t = 16 hours 23:00 – 07:00 t = 8 hours		

Sound Pressure Levels, dB. Reference level of 2×10^{-5} Nm^{-2}

8.2 07:00 Tuesday 24th April 2012 to 07:00 Wednesday 25th April 2012

Time	L_{Max}	Minimum 5 minute			1 Hour			Day and Night		
		$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$
07:00 – 08:00	81.6	62.7	65.0	55.9	65.5	68.1	57.8	64	65.1	52.2
08:00 – 09:00	85.4	65.0	67.0	59.6	66.8	68.3	60.3			
09:00 – 10:00	81.4	62.5	64.5	56.8	65.1	67.0	58.4			
10:00 – 11:00	84.7	62.2	64.5	57.3	64.2	65.8	58.2			
11:00 – 12:00	82.9	62.3	64.5	56.2	64.6	66.5	57.4			
12:00 – 13:00	96.6	62.4	64.7	56.5	66.6	66.4	57.6			
13:00 – 14:00	83.7	62.7	65.1	54.0	64.7	66.3	56.0			
14:00 – 15:00	81.4	61.9	64.2	54.0	64.1	65.9	55.9			
15:00 – 16:00	82.1	61.6	64.1	54.3	64.0	65.7	56.5			
16:00 – 17:00	84.5	62.2	64.6	53.8	63.7	65.8	55.8			
17:00 – 18:00	80.1	62.3	64.6	56.5	63.7	65.7	57.3			
18:00 – 19:00	85.9	61.3	64.0	52.4	63.3	65.0	55.1			
19:00 – 20:00	87.0	60.0	62.3	49.7	62.4	64.1	52.7			
20:00 – 21:00	82.9	58.0	59.4	47.7	60.0	61.8	48.9			
21:00 – 22:00	77.3	57.0	58.4	45.2	58.6	60.8	47.0			
22:00 – 23:00	76.5	54.1	55.0	40.3	57.0	58.7	43.5			
23:00 – 00:00	78.8	48.4	41.7	32.0	53.2	54.4	34.2	58.1	59	34.5
00:00 – 01:00	77.5	44.2	44.6	31.0	54.9	50.3	32.1			
01:00 – 02:00	79.8	34.3	36.0	31.8	53.9	47.0	33.2			
02:00 – 03:00	72.6	40.7	40.0	34.6	46.7	43.1	35.7			
03:00 – 04:00	75.7	40.3	41.0	37.5	51.6	50.6	38.5			
04:00 – 05:00	80.3	48.8	48.5	39.6	56.5	55.0	41.1			
05:00 – 06:00	80.3	55.1	57.1	44.3	60.0	61.7	48.0			
06:00 – 07:00	80.8	59.9	62.2	52.1	64.4	67.8	53.8			
	dB t = 1 hr	dB, t = 5 minutes			dB, t = 1 hour			dB, 07:00 – 23:00 t = 16 hours 23:00 – 07:00 t = 8 hours		

Sound Pressure Levels, dB. Reference level of 2×10^{-5} Nm^{-2}

8.3 07:00 Wednesday 25th April 2012 to 07:00 Thursday 26th April 2012

Time	L_{Max}	Minimum 5 minute			1 Hour			Day and Night		
		$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A10,t}$	$L_{A90,t}$
07:00 – 08:00	82.2	65.4	69.2	55.6	67.4	70.8	57.9			
08:00 – 09:00	83.6	67.5	68.7	60.3	68.2	70.3	61.6			
09:00 – 10:00	84.7	65.0	68.0	57.0	67.1	69.9	59.0			
10:00 – 11:00	80.4	64.2	66.6	56.4	66.3	68.5	58.4			
11:00 – 12:00	81.4	63.6	65.8	56.4	65.3	67.1	57.1			
12:00 – 13:00	87.4	62.8	65.1	56.1	65.3	66.6	57.4			
13:00 – 14:00	--	--	--	--	--	--	--			
14:00 – 15:00	--	--	--	--	--	--	--	--	--	--
15:00 – 16:00	--	--	--	--	--	--	--			
16:00 – 17:00	--	--	--	--	--	--	--			
17:00 – 18:00	--	--	--	--	--	--	--			
18:00 – 19:00	--	--	--	--	--	--	--			
19:00 – 20:00	--	--	--	--	--	--	--			
20:00 – 21:00	--	--	--	--	--	--	--			
21:00 – 22:00	--	--	--	--	--	--	--			
22:00 – 23:00	--	--	--	--	--	--	--			
23:00 – 00:00	--	--	--	--	--	--	--			
00:00 – 01:00	--	--	--	--	--	--	--			
01:00 – 02:00	--	--	--	--	--	--	--			
02:00 – 03:00	--	--	--	--	--	--	--			
03:00 – 04:00	--	--	--	--	--	--	--	--	--	--
04:00 – 05:00	--	--	--	--	--	--	--			
05:00 – 06:00	--	--	--	--	--	--	--			
06:00 – 07:00	--	--	--	--	--	--	--			
	dB t = 1 hr	dB, t = 5 minutes			dB, t = 1 hour			dB, 07:00 – 23:00 t = 16 hours 23:00 – 07:00 t = 8 hours		

Sound Pressure Levels, dB. Reference level of 2×10^{-5} Nm^{-2}

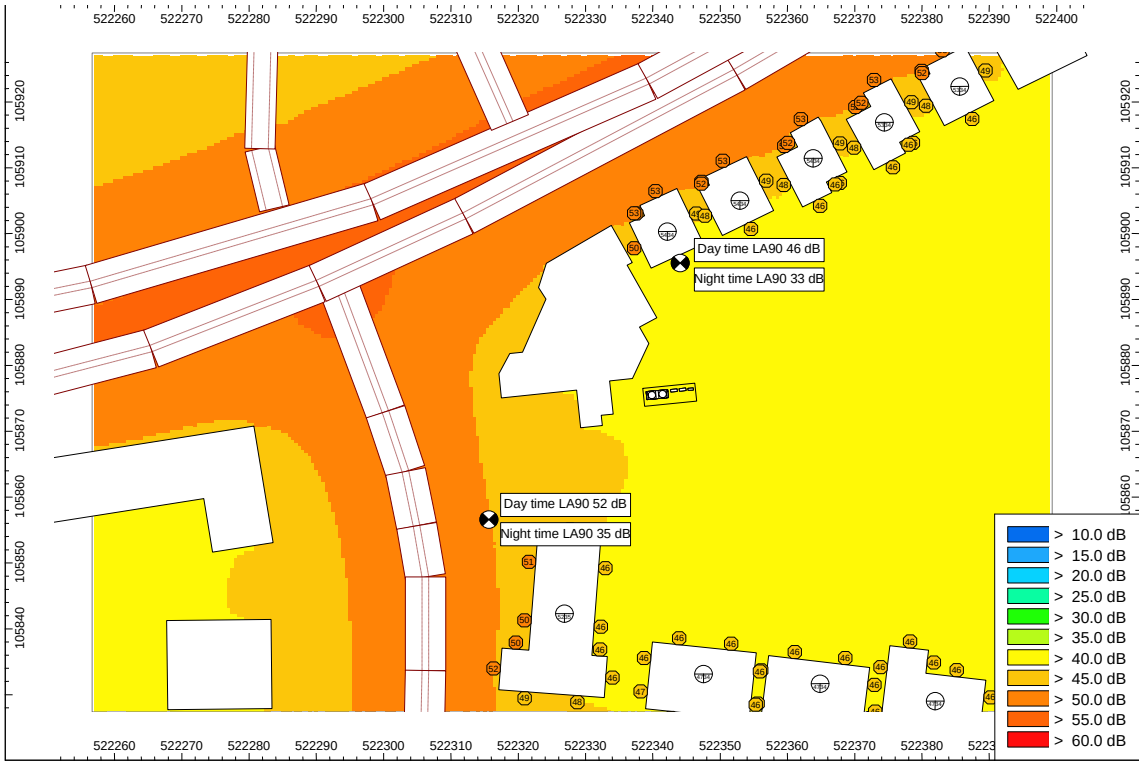
8.4 Minimum Levels Table

Time	L_{Max}	Minimum 5 minute		Minimum 1 hour		Minimum Day and Night	
		$L_{Aeq,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A90,t}$	$L_{Aeq,t}$	$L_{A90,t}$
07:00 – 23:00	96.6	54.1	40.3	57.0	43.5	64.0	52.2
23:00 – 07:00	82.2	34.3	27.1	46.7	30.2	58.1	34.5
	dB t = 1 hr	dB, t = 5 minutes		dB, t = 1 hour		dB, 07:00 – 23:00 t = 16 hours 23:00 – 07:00 t = 8 hours	

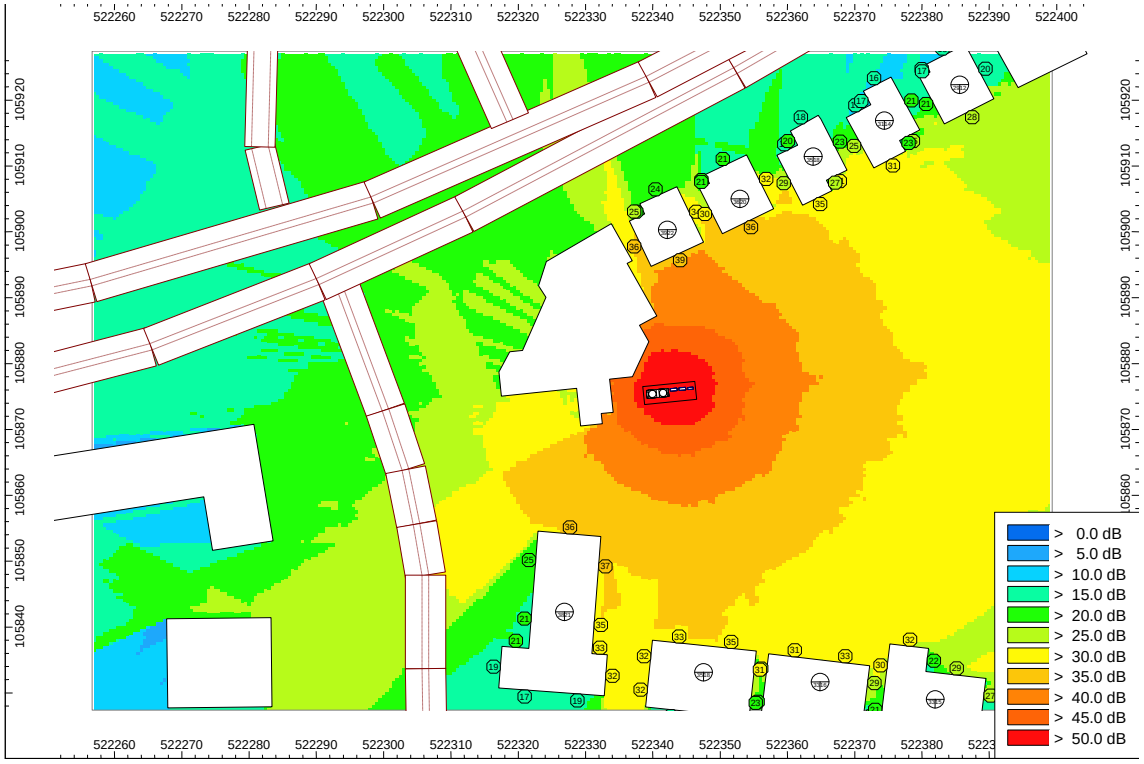
Sound Pressure Levels, dB. Reference level of 2×10^{-5} Nm^{-2}

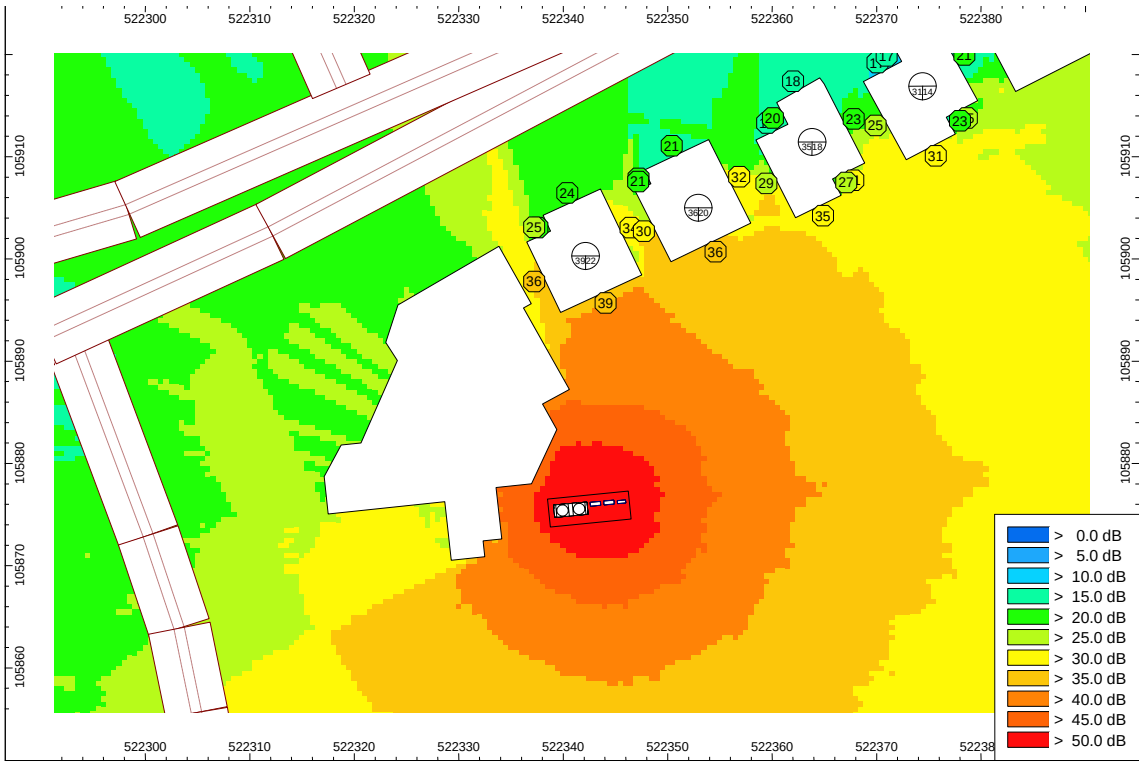
9 APPENDIX D – NOISE MAPS

9.1 Background Correction



9.2 Source Levels




522300
522310
522320
522330
522340
522350
522360
522370
522380
105910
105900
105890
105880
105870
105860
> 0.0 dB
> 5.0 dB
> 10.0 dB
> 15.0 dB
> 20.0 dB
> 25.0 dB
> 30.0 dB
> 35.0 dB
> 40.0 dB
> 45.0 dB
> 50.0 dB

10 Appendix E – Source Sound Power Levels

10.1 Source 1 (Searle - MGA124 EC)

10.1.1 Day Time Levels

British Standard 13487:2003																			
Day Time 07:00 – 23:00																			
Manufacturer/Model:						Searle MGA124 EC													
1/3rd Octave Band Centre Frequency (Hz)																			
50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1650	**2000**	2500	3150	**4000**	5000
76	71	69	66	66	62	60	60	60	60	58	57	57	54	51	48	45	44	42	42	40
78			70			65			64			60			51			47		
Sound Power Level: Grade 2 (Engineering Grade)						**$L_{W(A)}$ 64 dB** t = 10 minutes Reference 1 x 10^{-12} watts														

10.1.2 Night Time Levels

British Standard 13487:2003																			
Night Time 23:00 – 07:00																			
Manufacturer/Model:						Searle MGA124 EC													
1/3rd Octave Band Centre Frequency (Hz)																			
50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1650	**2000**	2500	3150	**4000**	5000
64	62	64	63	58	56	55	55	55	53	54	52	50	46	44	41	39	37	34	36	32
68			65			60			58			52			44			39		
Sound Power Level: Grade 2 (Engineering Grade)						**$L_{W(A)}$ 59 dB** t = 10 minutes Reference 1 x 10^{-12} watts														

10.2 Source 2 (Mitsubishi Heavy - FDC 100 VN)

10.2.1 Day Time Levels

British Standard 13487:2003																				
Day Time 07:00 – 23:00																				
Manufacturer/Model:	Mitsubishi Heavy FDC 100 VN																			
1/3rd Octave Band Centre Frequency (Hz)																				
50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1650	**2000**	2500	3150	**4000**	5000
84	82	79	81	73	68	69	62	63	61	58	58	63	62	60	59	63	61	56	56	55
	85			81			70			63			65			63			58	
Sound Power Level: Grade 2 (Engineering Grade)													**$L_{W(A)}$ 71 dB** t = 10 minutes Reference 1 x 10^{-12} watts							

10.3 Source 3 (Mitsubishi Heavy - FDC 100 VN)

10.3.1 Day Time Levels

British Standard 13487:2003																				
Day Time 07:00 – 23:00																				
Manufacturer/Model:	Mitsubishi Heavy FDC 100 VN																			
1/3rd Octave Band Centre Frequency (Hz)																				
50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1650	**2000**	2500	3150	**4000**	5000
84	82	79	81	73	68	69	62	63	61	58	58	63	62	60	59	63	61	56	56	55
	85			81			70			63			65			63			58	
Sound Power Level: Grade 2 (Engineering Grade)													**$L_{W(A)}$ 71 dB** t = 10 minutes Reference 1 x 10^{-12} watts							

10.4 Source 4 (Mitsubishi Heavy - SRK 25 ZG)

10.4.1 Day Time Levels

British Standard 13487:2003																			
Day Time 07:00 – 23:00																			
Manufacturer/Model:						Mitsubishi Heavy SRK 25 ZG													
1/3rd Octave Band Centre Frequency (Hz)																			
50	**63**	80	100	**125**	160	200	**250**	315	400	**500**	630	800	**1000**	1250	1650	**2000**	2500	3150	**4000**	5000
77	79	73	72	71	68	62	57	56	54	50	50	53	54	51	50	51	49	48	47	45
78			73			63			55			55			53			50		
Sound Power Level: Grade 2 (Engineering Grade)						**$L_{W(A)}$ 63 dB** t = 10 minutes Reference 1 x 10^{-12} watts													

11 APPENDIX F – SITE SPECIFIC CRITERIA

11.1 Relative Criteria to Background Noise Levels

11.1.1.1 BS 4142 Scope

BS 4142 in section 6.3.6 recommends the following:

> *"Determine the specific noise level by calculation alone...if the source is not yet in operation. In such cases, report the method of calculation in detail and give the reason for using it"*

11.1.1.2 Integrated Pollution Prevention and Control (IPPC) – H3 Part 2

This document states in Section 2.5.1 'Methodology' that:

> *"For industrial noise it is preferable to use those principles of ISO 9613 -2 1996...."*

11.1.1.3 Relevance of Guidance

It is therefore considered appropriate to calculate the resultant noise levels from the installation of the plant using the relevant methods defined in ISO 9613:Part 2 which states in the scope:

> *"This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources."*

The standard uses well defined calculations to take account of a variety of influences including source location, distance from the source to the receiver, atmospheric absorption and the effect of the ground and barriers.

11.1.2 British Standard 4142

This standard compares the proposed source levels against the underlying background noise levels and gives an indication on the likelihood of complaints.

11.1.2.1 Background Noise Levels

These are established as the underlying noise levels against which the assessment of the specific source can be made and are measured at the assessment position or an equivalent position where it is not appropriate to measure the noise levels at the assessment position.

11.1.2.2 Assessment Position

This is located externally at the nearest noise sensitive facade.

11.1.2.3 Rating Noise Level

The Rating Noise Level is calculated at the assessment position using the source sound power levels and includes where necessary a character correction.

11.1.2.4 British Standard 7445 – Part 2

Section 4.1.3 'Tonal Adjustment' (note 1) provides some useful guidance regarding the addition of a tonal / character correction.

> *"..a prominent tonal component may be detected in one third octave spectra if the level of a one-third octave band exceeds the level of the adjacent bands by more than 5 dB...*

11.1.2.5 BS4142 Conclusion

This establishes the difference between the specific noise level and the background noise level and gives an indication of the likelihood that the proposed plant will give rise to complaints. These are defined within three distinct categories.

> *"Assess the likelihood of complaints by subtracting the measured background noise level from the rating level. The greater this difference the greater the likelihood of complaints.*
>
> - *A difference of around +10 dB or more indicates that complaints are likely.*
> - *A difference of around +5dB is of marginal significance.*
> - *If the rating level is more than 10 dB below the measured background level then there is a positive indication that complaints are unlikely."*

11.1.2.6 BS4142 – Complaints Unlikely

Though a -10 dB criterion under BS4142 gives a conclusion of 'complaints unlikely', care needs to be taken when setting this criteria when the background noise level is very low as detailed in the scope of this standard.

> *"The method is not suitable for assessing the noise....when the background and rating noise are both very low.*
>
> *Note. For the purposes of this standard, background noise levels below 30dB and rating levels below 35 dB are considered to be very low."*

11.1.3 Criteria

With regard to the guidance within BS4142, it is considered the following are the appropriate criteria against which the plant noise emissions should be assessed to ensure they do not have an adverse effect on local amenity.

The criteria level is set at the level defined as *'Complaints Marginal'* within BS4142. The criteria level has been set above the minimum perceptible change in level (3dB) and well below the level which will have an adverse impact on amenity.

Assessment Period	BS4142[1] Assessment
Day Time – 07:00 to 23:00 hours	+5 dB
Night Time – 23:00 to 07:00 hours	+5 dB

11.2 Absolute Criteria

11.2.1 Guidelines for Community Noise (WHO)

11.2.1.1 World Health Organisation

At the beginning of the document published by the World Health Organisation entitled "Criteria for Community Noise" ("WHO") there is the following statement.

> *"This document is not a formal publication of the World Health Organisation and all rights are reserved by the Organisation. This document may, however, be freely reviewed, abstracted, reproduced or translated in part, but not for sale or for use in conjunction with commercial purposes."*

The document goes on to state:

> *"The authors alone are responsible for the views expressed in this document."*

It is important to understand, that the 'WHO document' does not represent the views of the WHO itself. Moreover, the document makes clear that the guideline values it contains are targets to be achieved in the long term, and are not to be applied as standards in decision-making on individual development proposals (see e.g. Executive Summary, page xviii "Implementation third bullet point; page 38 final paragraph of section 4.1; and page 67 final two paragraphs).

11.2.1.2 Table of Levels

Specific Environment	Critical health effect(s)	L_{Aeq} (dB)	Time Base (Hours)	$L_{AMax, fast}$ (dB)
Outdoor living Area	Serious Annoyance, daytime and evening	55	16	-
Outside Bedrooms	Sleep disturbance, window open (Outdoor Values)	45	8	60
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside Bedrooms	Sleep disturbance, night time	30	8	45

11.2.2 Night Noise Guidelines (WHO/EU)

11.2.2.1 Scope of Document

The work of the original WHO document detailed above was extended by a joint report published in 2007 by the World Health Organisation and the European Union.

> *"The goal of the NNGL project was to provide and expand scientific advice to the European Commission and its Member States in developing future legislation in the area of night noise exposure, control and surveillance. The key objective of the project was to reach a consensus of experts and key stakeholders on the following subjects:*
>
> *a) Guideline values for night noise to protect the public from adverse health effects....."*

Section 7 of the final implementation report details the levels for which there are no observed effects:

> *"...the observed effects thresholds are provided: the level above which an effect starts to occur or shows itself to be dependent on the exposure level."*

11.2.2.2 Table of Levels

	Effect	Indicator	Threshold , dB
Biological Effects	EEG awakening	$L_{Amax,inside}$	35
	Motility, onset of motility	$L_{Amax,inside}$	32
	Changes in duration of various stages of sleep, in sleep structure and fragmentation of sleep	$L_{Amax,inside}$	35
Sleep Quality	Waking up in the night and/or too early in the morning	$L_{Amax,inside}$	42
	Increased average motility when sleeping	$L_{Night,outside}$	42
Well Being	Self-reported sleep disturbance	$L_{Night,outside}$	42
	Use of somnifacient drugs	$L_{Night,outside}$	40
Medical Conditions	Environmental insomnia	$L_{Night,outside}$	42

12 APPENDIX G - OTHER ASSESSMENTS (NONE UKAS)

The following assessments are undertaken in line with the other site specific criteria detailed within appendix F above and do not fall within the UKAS scope of accreditation for KR Associates (UK) Ltd.

12.1 Absolute Assessment – Criteria for Community Noise

12.1.1 07:00 to 23:00 – Day Time

Searle - MGA124 EC			
Mitsubishi Heavy - FDC 100 VN			
Mitsubishi Heavy - FDC 100 VN			
Mitsubishi Heavy - SRK 25 ZG			
Assessment Position	1m from the residential property adjacent to the store within Upper Shoreham Road		
Item	$L_{Aeq,16\ hours}$		Commentary
Sound Pressure Level 1m from residential facade	39 dB		Noise levels calculated at a position 1m from the nearest residential façade.
Outdoor Living Area Serious Annoyance	45 dB	--	Absolute Criteria.
Dwellings, Indoors	--	50 dB	Absolute External Criteria. Criteria converted from internal to external i.e. +15 dB
Compliance with Criteria	Yes	Yes	The calculated levels fall below the absolute criteria levels contained within Criteria for Community Noise
Conclusion		**Complies With Criteria**	

12.1.2 23:00 to 07:00 – Night Time

Searle - MGA124 EC			
Mitsubishi Heavy - FDC 100 VN			
Mitsubishi Heavy - FDC 100 VN			
Mitsubishi Heavy - SRK 25 ZG			
Assessment Position	1m from the residential property adjacent to the store within Upper Shoreham Road		
Item	$L_{Aeq,8\ hours}$	$L_{AMax.fast}$	Commentary
Sound Pressure Level 1m from residential facade	22 dB	43 dB	Noise levels calculated at a position 1m from the nearest residential façade.
Sleep disturbance windows open (Outdoor Values)	45 dB	60 dB	Absolute Criteria.
Compliance with Criteria	Yes	Yes	The calculated levels fall below the absolute criteria levels contained within Criteria for Community Noise
Conclusion		**Complies With Criteria**	

12.2 Absolute Assessment – Night Noise Guidelines

12.2.1 23:00 to 07:00 – Night Time

Searle - MGA124 EC			
Mitsubishi Heavy - FDC 100 VN			
Mitsubishi Heavy - FDC 100 VN			
Mitsubishi Heavy - SRK 25 ZG			
Assessment Position	1m from the residential property adjacent to the store within Upper Shoreham Road		
Item	$L_{Aeq,8\ hours}$	$L_{AMax.fast}$	Commentary
Sound Pressure Level 1m from residential facade	22 dB	27 dB	Noise levels calculated at a position 1m from the nearest residential façade.
Well Being (Lowest)	40 dB	--	Absolute Criteria. Use of somnifacient drugs
Biological Effects (Lowest)	--	47	Absolute Criteria. Motility, onset of Motility. Corrected to External criteria +15 dB
Compliance with Criteria	Yes	Yes	The calculated levels fall below the absolute criteria levels contained within Night Noise Guidelines
Conclusion		**Complies With Criteria**	

13 REFERENCES

13.1 BS 4142:1997

Method for rating industrial noise affecting mixed residential and industrial areas

13.2 BS ISO 13487:2003

Heat Exchangers – Forced air convection air cooled refrigerant condensers and dry coolers – Sound measurement

13.3 BS ISO 9613 – Part 1:1993

Acoustics – Attenuation of sound propagation outdoors.

Part 1 - Part 1: Calculation of the absorption of sound by the atmosphere

13.4 ISO 9613 – Part 2:1996

Acoustics – Attenuation of sound during propagation outdoors.

Part 2 – General method of calculation

13.5 Calculation of Road Traffic Noise

Procedures for calculating noise from road traffic

*End of Report *