NoiseAssess

Acoustics, Noise and Vibration Consultants

Project:	**Proposed Lidl Food Store** **Holbeach Road, Spalding**
Scope of Report	**Assessment of noise from proposed external plant, deliveries and customer vehicle movements in the car park**
Client:	Lidl UK GmbH
Report Reference:	12265.01.v2 August 2017
Prepared by:	Richard Housley BSc (Hons) MIOA
Checked by:	Matthew Gascoigne BSc (Hons) CEng MICE MIOA

NoiseAssess Ltd 33 Main Street, Stanton by Dale, Ilkeston DE7 4QH

Tel: 0115 930 5298, Email: richard@noiseassess.co.uk

Also at: 9 Rochester Road, Sheffield S10 4JP

Website: noiseassess.co.uk

Registered in England No. 07352339
Registered office 8 Church St, Nottingham NG5 8FB

CONTENTS

		PAGE
1.0	INTRODUCTION	3
2.0	PLANNING POLICY AND CRITERIA	4
3.0	BASELINE SURVEY	12
4.0	NOISE IMPACT ASSESSMENT	14
5.0	CONCLUSIONS	31
6.0	REFERENCES	32
FIGURE 1.	LOCATION OF SITE, NOISE SURVEY & RECEPTORS	33
FIGURE 2.	PROPOSED SITE PLAN & RECEPTORS	34
FIGURE 3.	ELEVATIONS	35
FIGURE 4.	ACOUSTIC BARRIERS	36
APPENDIX A1:	ACOUSTIC TERMINOLOGY	37
APPENDIX A2:	EXISTING NOISE LEVELS – SURVEY RESULTS	39

1.0 INTRODUCTION

1.1 This noise assessment has been commissioned by Lidl UK GmbH to assist with a planning application for a new Lidl foodstore off Holbeach Road, Spalding.

1.2 The site of the proposed store is bordered by Holbeach Road to the south and Roman Bank to the northwest. The site was previously a hospital but has been cleared of any buildings. The closest residential properties include: houses fronting onto Roman Bank and Crown Drive to the north / northeast; three storey blocks of flats to the northwest on the opposite side of Roman Bank and houses off Holbeach Road and Castle Close to the south / southwest. There is a convenience store and fast-food takeaway on Holbeach Road to the east. Land between the rear of the store and takeaway on Holbeach Road and the rear of houses off Crown Drive is currently a field. The site location is shown on Figure 1.

1.3 Plans show a new store building to the north of the site with car parking to the south. The vehicle entrance to the site is to be off Holbeach Road. There is to be a delivery bay with a loading dock at the west end of the store building. External plant will be in a compound to the west of the delivery day ramp. The proposed site layout is shown in Figure 2 and the elevations in Figure 3.

1.4 For the purposes of this assessment consideration has been given to the store being open for any period between 07:00-23:00 hrs. The proposed delivery hours have not yet been decided and are to be informed by the outcome of this noise assessment.

1.5 This report relates to the potential impact of the operational noise arising from external plant, deliveries and customer vehicle movements in the car park.

2.0 PLANNING POLICY AND CRITERIA

National Planning Policy

2.1 PPG24[1] which was previously referred to in relation to planning noise issues is no longer current following the publishing of the NPPF[2] and the NPPG[3]. There are no noise criteria figures quoted in the NPPF / NPPG and it has been left to local authorities to agree their own criteria.

2.2 Paragraph 109 of the NPPF states that "*The planning system should contribute to and enhance the natural and local environment by"…"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*".

2.3 Paragraph 123 states that "*Planning policies and decisions should aim to:*

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts [as defined in the Noise Policy Statement (2010)] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason"*

2.4 Paragraph 123 quoted from above refers to the NPSE[4] which sets out the Government's long term "Noise Policy Vision" as follows:

- *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."*

2.5 The NPSE states that the above long term vision is supported by the following "Noise Policy Aims":

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

2.6 The Explanatory Note to the NPSE gives further information on the meaning of the terms "significant adverse" and "adverse" in the above aims by using the following terms drawn from toxicology.

"NOEL - No Observed Effect Level
This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL - Lowest Observed Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.
Extending these concepts for the purposes of the NPSE leads to the concept of a significant observed adverse effect level.

SOAEL - Significant Observed Adverse Effect Level
This is the level above which significant effects on health and quality of life occur."

2.7 The NPSE does not quantify the above measures. In fact the explanatory note to the NPSE states that *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".*

2.8 The explanatory note to the NPSE indicates that the adoption of the policy should mean that noise is properly taken into account at the appropriate time and that opportunities for cost effective management are not missed through considering too late in the planning / design process. In addition the policy is intended to enable noise to be considered alongside other relevant issues rather than in isolation with adequate weight being given to the wider benefits of a development when assessing noise implications.

2.9 The NPPG also refers to the above terminology and states that:

Local planning authorities' plan-making and decision taking should take into account the acoustic environment and is doing so consider:

- *Whether or not a significant adverse effect is occurring or likely to occur;*
- *Whether or not an adverse effect is occurring or likely to occur; and*
- *Whether or not a good standard of amenity can be achieved."*

2.10 The following table is given in the NPPG to summarise the noise exposure hierarchy, based on likely average response.

Table 1: NPPG Noise Exposure Hierarchy Table

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behavior or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.11 The NPPG goes on to say that the noise impact depends not only on the absolute level of the noise but also on other factors such as the time of day it occurs; the intermittency and frequency of events and the spectral content of the noise. The NPPG recommends that consideration be given as to whether internal effects can be completely removed by closing windows and states that in that case alternative means of ventilation may be required. It also advises that the acoustic environment in external amenity areas be considered in the design.

2.12 When talking about noise mitigation the NPPG states that:

"In general, for noise making developments, there are four broad types of noise mitigation which can be considered:

- **engineering:** reducing the noise generated at source and/or containing the noise generated;
- **layout:** where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;
- **using planning conditions/obligations** to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and;
- **mitigating** the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building."

For noise sensitive developments mitigation measures can include avoiding noisy locations; designing the development to reduce the impact of noise from the local environment; including noise barriers; and, optimising the sound insulation provided by the building envelope."

2.13 The above is a summary of planning documents and is not intended to be exhaustive. Further information is available in the original documents.

Local Planning Policy

2.14 The South Holland Local Plan (2006) sets out (Policy SG13) that planning permission will only be granted for proposals which do not cause unacceptable levels of pollution of the surrounding area by noise. Furthermore, the Council state (Policy SG14) they will take in to considering when assessing the design and layout of new development the effect of said development on the amenity of nearby residents in terms of among other provisions noise. Finally, Policy SG17 states the Council will grant planning permission for development which would not cause material harm to residential amenity taking into account potential noise nuisance including that associated with vehicular activity.

Noise Criteria for Proposed Mechanical Services Plant and Servicing Noise

2.15 Industrial / commercial noise (including noise from mechanical services plant) is normally assessed using BS4142[5].

2.16 The scope of BS4142 is given in the extract below.

"1.1 This standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) Sound from industrial and manufacturing processes;

b) Sound from fixed installations which comprise mechanical and electrical plant and equipment;

c) Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and

d) 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.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident."

2.17 The standard compares sound from industrial / commercial sources with the background sound level. The standard states in Clause 9.1 that "Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level". Such features are taken into account by adding a correction to the specific sound level depending on the extent to which the distinguishing acoustic characteristics will attract attention. The standard states the following in Clause 9.2:

"Tonality: For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone that is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible".

"Impulsivity: A correction of up to 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB 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."

"Other sound characteristics: Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied."

"Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it may be appropriate to apply a single correction. Where both features are likely to affect perception of response, the correction ought normally to be applied in a linear fashion."

"Intermittency: When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied".

Note: Although not clear in the standard it appears from the examples given that the intermittency penalty is for use when the specific sound source is intermittent but not particularly impulsive. Therefore it has been assumed that impulsive and intermittency penalties would not generally be both applied in a linear fashion.

2.18 BS4142 provides guidance on the assessment of impacts in Clause 11.

"11 Assessment of the impacts

COMMENTARY ON CLAUSE 11.

The significance of sound of an industrial / commercial nature depends upon both the margin by which the rating of the specific sound source exceeds the background sound level and the context in which the sound occurs. 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.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5dB 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".

2.19 BS4142 recommends that the specific sound level during daytime periods 07:00 - 23:00 hrs should be determined over a reference time interval of 1 hour and during night-time periods 23:00 - 07:00 hrs over a reference time interval of 15 minutes.

Assessment in Context

2.20 BS4142 recommends that the industrial sound should also be assessed in context. Therefore, the sound levels have been assessed in the context of the character of the area; the existing ambient noise levels and the criteria given in BS8233[6].

2.21 The BS8233 recommendations for indoor ambient noise levels are given below.

Table 2: BS8233 recommendations for indoor ambient noise levels

Activity	Location	07:00 to 23:00 hrs	23:00 to 07:00 hrs
Resting	Living room	35 $dBL_{Aeq,16hour}$	-
Dining	Dining room/area	40 $dBL_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 $dBL_{Aeq,16hour}$	30 $dBL_{Aeq,8hour}$

2.22 Paragraph 7.7.3.2 of BS8233 recommends that for traditional external amenity areas such as gardens and patios, it is desirable that during the daytime the external noise level does not exceed 50 $dBL_{Aeq,T}$ with an upper guideline value of 55 $dBL_{Aeq,T}$ which would be acceptable in noisier environments. The time period is not stated but is assumed to be 16 hours (07:00 hours to 23:00 hrs) as in the previous version of BS8233.

3.0 BASELINE SURVEY

3.1 A survey of the current noise levels at the site was carried out from 12:00 hrs on Friday 28 July to 13:00 hrs on Monday 31 July 2017.

3.2 Noise levels were measured in the northwest corner of the site, to the southeast of 37 Roman Bank and approximately 27m from the near kerb of Roman Bank. The microphone was in freefield conditions and at a height of 1.5m above ground level. The survey location is marked MP1 on Figure 1.

3.3 Noise levels were measured using an unattended auto-logging Rion NL:31 sound level meter (s/n 583265). The sound level meter was calibrated using a portable Norsonic 1251 calibrator (s/n 30901) at the start and finish of the survey periods with no variation in the calibration level.

- Noise levels were measured using 5 minute sample periods.
- The noise survey measured broad band noise levels only.

3.4 Weather conditions when the site was visited to install and then retrieve the sound level meter were dry with low wind speeds (<5m/s). From the weather forecast it is understood that the weather conditions were generally similar during the survey period although there were some occasional brief heavy showers.

3.5 The results of the noise survey are presented in full in Appendix A2 and summarised below. The $dBL_{Aeq,5min}$ ambient noise levels have been logarithmically averaged and the $dBL_{A90,5min}$ background values have been arithmetically averaged to derive the 1 hour daytime, 16 hour daytime, 15 minute night-time and 8 hour night-time noise levels. Where sufficient data is available the mode of the 1-hour daytime and 15-minute night-time dBL_{A90} values has also been given.

Table 3. Location MP1: Summary of free field daytime noise levels.

Day	Period	dBL_{Aeq}		dBL_{A90}		
		Average	Range	Average	Range	Mode
Fri	12:00-23:00 hrs	52	49-54	50	46-51	50
Sat	07:00-23:00 hrs	50	47-52	47	44-49	46
Sun	07:00-23:00 hrs	55	46-64	47	42-50	48
Mon	07:00-13:00 hrs	53	50-57	48	47-49	48

Table 4. Location MP1: Summary of free field night-time noise levels.

Day	Period	dBL_{Aeq}		dBL_{A90}		
		Average	Range	Average	Range	Mode
Fri – Sat	23:00-07:00 hrs	46	42-49	43	40-46	42
Sat – Sun	23:00-07:00 hrs	47	39-54	42	36-51	41
Sun – Mon	23:00-07:00 hrs	48	42-60	42	40-47	41

3.6 During the two site visits to install and retrieve the auto-logging sound level meter the main noise source was road traffic.

4.0 NOISE IMPACT ASSESSMENT

Criteria and Methodology

4.1 The potential noise impact of external mechanical services plant and deliveries has been assessed in accordance with BS4142[5] and assessed in the context of the existing ambient noise levels and BS8233[6].

4.2 Noise from customer vehicle movements in the car park has been assessed in terms of the potential increase in the existing ambient noise levels. For the purposes of this assessment any increase in ambient noise level greater than 3 dB(A) has been considered significant.

4.3 The assessment has used the lowest measured daytime and night-time ambient and background noise levels. Because the lowest ambient and background noise levels have been used the assessment may be considered to be conservative.

Closest noise sensitive properties

4.4 The impact of noise has been assessed for the receptors summarised below and shown on Figures 1 and 2.

R1: 37 Roman Bank
R2: 2nd floor flats on west side of Roman Bank
R3: 1-6 Castle Close

External plant

Proposed external plant

4.5 External plant is to be located in a compound to the west of the delivery ramp as shown on Figure 2.

4.6 Calculations of mechanical services noise have been based on the manufacturer's noise data for the proposed plant as provided by the client and summarised below.

Table 5. Manufacturer's noise data for external plant

Item	No. Units.	Noise level
Guntner GFW 090.1/3-E(J)-F4/04/6P	2	37 dB(A) at 10m
Dimplex heat pump	2	45 dB(A) at 10m 41 dB(A) at 10m in night-mode
Mitsubishi FDC280KXRE6	1	59 dB(A) at 1m

4.7 It is understood that:

- The Guntner GFW 090.1/3-E(J)-F4/04/6P dry coolers and Dimplex heat pumps will run intermittently 24 hours a day, 7 days a week.
- The Mitsubishi FDC280KXERE6 VRF air conditioning unit will operate during store opening hours only.

Control of noise from external plant

4.8 It is recommended that the Dimplex heat pumps be set to run in night mode 23:00-07:00 hours.

4.9 2.5m high acoustic barriers should be installed around the plant compound as shown on Figure 4.

4.10 The acoustic barriers should have a minimum mass of 10 kg/m^2 and may comprise 20mm thick weather-treated, close-boarded timber fencing with cover strips to seal the gaps between panels and gravel boards to seal the gap at the base. A masonry wall with no gaps can also be used. Alternative constructions can be used if checked with an acoustic consultant.

4.11 To reduce the reflection of noise from hard finishes an absorbent lining should be used on the inside of the acoustic barriers. The absorbent lining could be formed with mineral wool covered with perforated metal sheeting with a minimum 30% open area. Alternatively, proprietary panels could be used such as:

- 'Tilon' noise absorptive panels (https://tilontest.files.wordpress.com/2014/11/tenb45a2.pdf) or
- 'Prosonic' external acoustic panels (http://www.customaudiodesigns.co.uk/prosonic-external-acoustic-panels.htm).

4.12 It is the Client's responsibility to check with the manufacturer that products chosen are suitable for the proposed use in other respects. The sound insulation performance of the proposed construction will be dependent upon correct installation and workmanship.

4.13 The recommendations are given for acoustic reasons only and advice on other matters should be obtained from other specialists. The safety implications of the installation of the recommended products / material should be checked by the Client before use and appropriate systems of work put in place.

Calculation of noise from external plant

4.14 The calculated noise levels due to external plant at the closest noise sensitive properties at R1 and R2 are given below. Daytime noise has been calculated for a ground floor window at R1 and a 2nd floor window at R2. Night-time noise has been calculated for a 1st floor window at R1 and a 2nd floor window at R2. Plant noise has not been calculated / assessed for R3 as noise levels will be lower than at R1 and R2. The calculations include corrections for the number of plant items, attenuation due to distance and acoustic screening. The calculations assume that the measures to control noise from external plant as detailed above are in place.

Table 6. R1: Calculation of daytime noise from external plant

	Guntner GFW 090.1/3-E(J)-F4/04/6P dry coolers	Dimplex Heat Pumps	Mitsubishi FDC280KXRE6
Source noise level, dB(A)	37	45	59
Source noise measurement distance, m	10	10	1
Number of units	2	2	1
Correction for number of units, dB(A)	3	3	0
Distance, m	25	25	25
Distance correction, dB(A)	-8	-8	-28
Acoustic screening, dB(A)	-8	-7	-10
Noise level at house, $dBL_{Aeq,1hr}$	**24**	**33**	**21**
Total noise level at house, $dBL_{Aeq,1hr}$		**34**	

Table 7. R2: Calculation of daytime noise from external plant

	Guntner GFW 090.1/3-E(J)-F4/04/6P dry coolers	Dimplex Heat Pumps	Mitsubishi FDC280KXRE6
Source noise level, dB(A)	37	45	59
Source noise measurement distance, m	10	10	1
Number of units	1	1	1
Correction for number of units, dB(A)	0	0	0
Distance, m	45	45	45
Distance correction, dB(A)	-13	-13	-33
Acoustic screening, dB(A)	-7	-6	-10
Noise level at house, $dBL_{Aeq,1hr}$	**17**	**26**	**16**
Total noise level at house, $dBL_{Aeq,1hr}$		**27**	

Table 8. R1: Calculation of night-time noise from external plant

	Guntner GFW 090.1/3-E(J)-F4/04/6P dry coolers	Dimplex Heat Pumps
Source noise level, dB(A)	37	41
Source noise measurement distance, m	10	10
Number of units	2	2
Correction for number of units, dB(A)	3	3
Distance, m	25	25
Distance correction, dB(A)	-8	-8
Acoustic screening, dB(A)	-5	-5
Noise level at receptor, $dBL_{Aeq,15min}$	**27**	**31**
Total noise level at receptor, $dBL_{Aeq,15min}$	**32**	

Table 9. R2: Calculation of night-time noise from external plant

	Guntner GFW 090.1/3-E(J)-F4/04/6P dry coolers	Dimplex Heat Pumps
Source noise level, dB(A)	37	45
Source noise measurement distance, m	10	10
Number of units	1	1
Correction for number of units, dB(A)	0	0
Distance, m	45	45
Distance correction, dB(A)	-13	-13
Acoustic screening, dB(A)	-7	-6
Noise level at receptor, $dBL_{Aeq,15min}$	**17**	**26**
Total noise level at receptor, $dBL_{Aeq,15min}$	**27**	

BS4142 Assessment of plant noise

4.15 The BS4142 assessment of plant noise at the nearest residential receivers is shown below.

- A 2dB tonal penalty and a 3dB impulsive/intermittency penalty have been added as a precaution.
- The assessment has used the lowest 1 hour daytime background noise level ($dBL_{A90,1hr}$) and the lowest 15 minute night-time background noise level ($dBL_{A90,15min}$).

Table 10. BS4142 assessment – daytime plant noise.

Receiver	R1	R2
Specific noise level, $dBL_{A\,eq}$	34	27
Tonal Penalty, dB	2	2
Impulsive/Intermittency penalty, dB	3	3
Rating, dB	39	32
Background noise level, $dBL_{A\,90}$	42	42
Rating - background, dB	**-3**	**-10**

4.16 The rating level of noise from external plant will be between 3 and 10 dB below the lowest daytime (07:00-23:00 hrs) background noise level $dBL_{A90,1hr}$. The rating level normally indicates a very low impact depending on the context.

Table 11. BS4142 assessment - night time plant noise.

Receiver	R1	R2
Specific noise level, $dBL_{A\,eq}$	32	27
Tonal Penalty, dB	2	2
Impulsive/Intermittency penalty, dB	3	3
Rating, dB	37	32
Background noise level, $dBL_{A\,90}$	36	36
Rating - background, dB	**1**	**-4**

4.17 The rating level of noise from external plant will be between 4 dB below and 1 dB above the lowest night-time (23:00-07:00 hrs) background noise level $dBL_{A90,15min}$. The rating level normally indicates a low impact depending on the context.

Plant noise considered in context

4.18 BS4142 recommends that the noise also be judged in context. The noise from external plant has been considered:

- In the context of the existing lowest ambient 1 hour daytime noise levels and the lowest measured 15 minute night-time ambient noise level.
- In the context of the BS8233 upper limit for private garden areas (daytime only).
- In the context of the BS8233 internal day and night-time noise criteria.

Table 12. Noise from external plant at closest dwellings assessed in context

	R1		R2	
	Daytime	Night-time	Daytime	Night-time
Comparison with existing ambient				
Cumulative noise from development at receptor, $dBL_{Aeq,T}$	34	32	27	27
Existing ambient noise level, $dBL_{Aeq,T}$	46	39	46	39
Existing ambient + noise source, dB(A)	46	40	46	39
Increase, dB(A)	0	1	0	0
Difference, level at receptor-existing ambient, dB(A)	**-12**	**-7**	**-19**	**-12**
Comparison with BS8233 criteria for gardens				
Cumulative noise from development at receptor, $dBL_{Aeq,T}$	34	-	27	-
BS8233 upper limit for private gardens	55	-	55	-
Difference between level at receptor & upper limit, dB(A)	**-21**	**-**	**-28**	**-**
Comparison with BS8233 internal noise criterion				
Cumulative noise from development at receptor, $dBL_{Aeq,T}$	34	32	27	27
Attenuation due to a partially open window, dB(A)	10	10	10	10
Internal noise level, $dBL_{Aeq,T}$	24	22	17	17
BS8233 internal noise criterion, $dBL_{Aeq,T}$	35	30	35	30
Difference, level at receptor-BS8233 criterion, dB(A)	**-11**	**-8**	**-18**	**-13**

4.19 Noise from the external plant is well below the existing ambient noise levels and would not be expected to result in any increase in ambient noise levels.

4.20 Noise from external plant during the daytime period is well below the BS8233 upper noise limit for private garden areas.

4.21 Noise from external plant would generate internal noise levels well below the internal criterion of BS8233 in residential properties with open windows.

4.22 Therefore, in the light of the context of the BS4142 assessment it is considered that noise from the external plant will have a low impact on the closest residential properties.

Delivery Noise

Delivery operations data

4.23 Deliveries to the new store will be via the loading dock at the west end of the store building as shown on Figure 2.

4.24 The assessment of noise due to delivery vehicle movements and unloading has been based on noise measurements taken during deliveries to another Lidl store as summarised below.

Table 13. Noise source levels for delivery vehicle movements and unloading

Operation	Freefield noise level at 10m dB, SEL
1. HGV drive into site	79
2. HGV reverse, stop to open doors and reverse into loading bay	86
3. Unloading: each trip into / out of trailer	68
4. Drive forward and close rear doors	79
5. Drive away	79

4.25 The assessment has therefore been based on there being no more than 1 delivery within a 1 hour period. Delivery restrictions have not yet been determined and a decision on delivery times is to be informed by this noise assessment.

Control of noise from deliveries

4.26 The following acoustic barriers should be installed to control noise from deliveries:

- A 2.5m high acoustic barrier along the west side of the delivery bay ramp.
- A 1.8m high acoustic barrier along the boundary between the store site and 1-6 Castle Close and 23a & 27 Holbeach Road.

The locations of the acoustic barriers are shown on Figure 4.

4.27 The acoustic barriers should have a minimum mass of 10 kg/m^2 and may comprise 20mm thick weather-treated, close-boarded timber fencing with cover strips to seal the gaps between panels and gravel boards to seal the gap at the base. A masonry wall with no gaps can also be used. Alternative constructions can be used if checked with an acoustic consultant.

4.28 It is the Client's responsibility to check with the manufacturer that products chosen are suitable for the proposed use in other respects. The sound insulation performance of the proposed construction will be dependent upon correct installation and workmanship.

4.29 The recommendations are given for acoustic reasons only and advice on other matters should be obtained from other specialists. The safety implications of the installation of the recommended products / material should be checked by the Client before use and appropriate systems of work put in place.

Calculation of noise from deliveries

4.30 The noise from the delivery vehicle movements and unloading has been calculated from SEL values using the following formula:

$L_{Aeq\ (T)}$ = SEL + 10 log N - 10 log T

where $L_{Aeq\ (T)}$ = Equivalent continuous sound pressure level over time period T
SEL = 'Single Event Level', i.e. the 1 second L_{Aeq} which has the same total A-weighted energy as the entire event
N = Number of events in time period T
T = Time period in seconds

4.31 Noise has been calculated for receptor positions R1, R2 and R3. Daytime noise has been calculated for ground floor windows at R1 and R3 and a 2nd floor window at R2. Night-time noise has been calculated for 1st floor windows at R1 and R3 and a 2nd floor window at R2. The calculations include corrections for the number of movements and attenuation due to distance. The operation numbers refer to the operations detailed in Table 13. The daytime calculation has been based on one complete delivery within a 1 hour period including 24 cages. For the assessment of night-time deliveries it has been assumed that the vehicle would arrive, reverse to the bay and partly unload within the 15-minute reference period.

Table 14. Daytime delivery noise at R1

Operation	**1**	**2**	**3**	**4**	**5**
SEL at 10m, dB(A)	79	86	68	79	79
No. of operations	1	1	24	1	1
Correction for no. of operations, dB(A)	0.0	0.0	13.8	0.0	0.0
Reference period, mins	60	60	60	60	60
Correction for reference period, dB(A)	-35.6	-35.6	-35.6	-35.6	-35.6
Distance, m	50	40	25	40	45
Distance correction, dB(A)	-14	-12	-8	-12	-13.1
Barrier correction, dB(A)	-8	-9	-9	-9	-8
Total: each item noise at house dBL$_{Aeq}$	**21.4**	**29.4**	**29.2**	**22.4**	**22.3**
Total noise at house dBL$_{Aeq}$	**33.4**				

1. Forward arrival; 2. Reverse, stop to open doors and reverse; 3. Unloading;
4. Move forward after delivery and stop to close doors; 5. Depart

Table 15. Daytime delivery noise at R2

Operation	**1**	**2**	**3**	**4**	**5**
SEL at 10m, dB(A)	79	86	68	79	79
No. of operations	1	1	24	1	1
Correction for no. of operations, dB(A)	0.0	0.0	13.8	0.0	0.0
Reference period, mins	60	60	60	60	60
Correction for reference period, dB(A)	-35.6	-35.6	-35.6	-35.6	-35.6
Distance, m	57	56	52	55	55
Distance correction, dB(A)	-15.1	-15	-14.3	-14.8	-14.8
Barrier correction, dB(A)	0	0	-11	0	0
Total: each item noise at house dBL$_{Aeq}$	**28.3**	**35.4**	**20.9**	**28.6**	**28.6**
Total noise at house dBL$_{Aeq}$	**37.6**				

1. Forward arrival; 2. Reverse, stop to open doors and reverse; 3. Unloading;
4. Move forward after delivery and stop to close doors; 5. Depart

Table 16. Daytime delivery noise at R3

Operation	1	2	3	4	5
SEL at 10m, dB(A)	79	86	68	79	79
No. of operations	1	1	24	1	1
Correction for no. of operations, dB(A)	0.0	0.0	13.8	0.0	0.0
Reference period, mins	60	60	60	60	60
Correction for reference period, dB(A)	-35.6	-35.6	-35.6	-35.6	-35.6
Distance, m	25	30	65	45	42
Distance correction, dB(A)	-8	-9.5	-16.3	-13.1	-12.5
Barrier correction, dB(A)	-5	-5	-5	-5	-5
Total: each item noise at house dBL$_{Aeq}$	**30.4**	**35.9**	**24.9**	**25.3**	**25.9**
Total noise at house dBL$_{Aeq}$			**37.8**		

1. Forward arrival; 2. Reverse, stop to open doors and reverse; 3. Unloading;
4. Move forward after delivery and stop to close doors; 5. Depart

Table 17. Night-time delivery noise at R1

Operation	1	2	3
SEL at 10m, dB(A)	79	86	68
No. of operations	1	1	10
Correction for no. of operations, dB(A)	0.0	0.0	10.0
Reference period, mins	15	15	15
Correction for reference period, dB(A)	-29.5	-29.5	-29.5
Distance, m	50	40	25
Distance correction, dB(A)	-14	-12	-8
Barrier correction, dB(A)	-5	-6	-8
Total: each item noise at house dBL$_{Aeq}$	**30.5**	**38.5**	**32.5**
Total noise at house dBL$_{Aeq}$		**40.0**	

1. Forward arrival; 2. Reverse, stop to open doors and reverse; 3. Unloading

Table 18. Night-time delivery noise at R2

Operation	1	2	3
SEL at 10m, dB(A)	79	86	68
No. of operations	1	1	10
Correction for no. of operations, dB(A)	0.0	0.0	10.0
Reference period, mins	15	15	15
Correction for reference period, dB(A)	-29.5	-29.5	-29.5
Distance, m	57	56	52
Distance correction, dB(A)	-15.1	-15	-14.3
Barrier correction, dB(A)	0	0	-11
Total: each item noise at house dBL_{Aeq}	**34.4**	**41.5**	**23.2**
Total noise at house dBL_{Aeq}	**42.3**		

1. Forward arrival; 2. Reverse, stop to open doors and reverse; 3. Unloading

Table 19. Night-time delivery noise at R3

Operation	1	2	3
SEL at 10m, dB(A)	79	86	68
No. of operations	1	1	10
Correction for no. of operations, dB(A)	0.0	0.0	10.0
Reference period, mins	15	15	15
Correction for reference period, dB(A)	-29.5	-29.5	-29.5
Distance, m	25	30	65
Distance correction, dB(A)	-8	-9.5	-16.3
Barrier correction, dB(A)	0	0	-5
Total: each item noise at house dBL_{Aeq}	**41.5**	**47.0**	**27.2**
Total noise at house dBL_{Aeq}	**48.1**		

1. Forward arrival; 2. Reverse, stop to open doors and reverse; 3. Unloading

BS4142 assessment of delivery noise

4.32 The BS4142 assessment of delivery noise at the nearest residential receptor is shown below.

- A 2dB tonal penalty and a 3dB impulsive/intermittency penalty have been added as a precaution.
- The assessment has used the lowest 1 hour daytime background noise level ($dBL_{A90,1hr}$) and the lowest 15 minute night-time background noise level ($dBL_{A90,15min}$).

Table 20. BS4142 assessment daytime delivery noise

Receiver	R1	R2	R3
Specific noise level, $dBL_{A\,eq}$	33	38	38
Tonal Penalty, dB	2	2	2
Impulsive/Intermittency penalty, dB	3	3	3
Rating, dB	38	43	43
Background noise level, $dBL_{A\,90}$	42	42	42
Rating - background, dB	**-4**	**1**	**1**

4.33 The rating level of noise from daytime deliveries will be between 4 dB below and 1 dB above the lowest daytime (07:00-23:00 hrs) background noise level $dBL_{A90,1hr}$. The rating level normally indicates a low impact depending on the context.

Table 21. BS4142 assessment night-time delivery noise

Receiver	R1	R2	R3
Specific noise level, $dBL_{A\,eq}$	40	42	48
Tonal Penalty, dB	2	2	2
Impulsive/Intermittency penalty, dB	3	3	3
Rating, dB	45	47	53
Background noise level, $dBL_{A\,90}$	36	36	36
Rating - background, dB	**9**	**11**	**17**

4.34 The rating level of noise from night-time deliveries will be between 9 dB and 17 dB above the lowest night-time (23:00-07:00 hrs) background noise level $dBL_{A90,15min}$. The rating level normally indicates a significant adverse impact depending on the context.

Assessment of delivery noise in context

4.35 BS4142 recommends that the noise also be judged in context. The noise from deliveries has been considered:

- In the context of the existing lowest ambient 1 hour daytime noise levels and the lowest measured 15 minute night-time ambient noise level.
- In the context of the BS8233 upper limit for private garden areas (daytime only).
- In the context of the BS8233 internal day and night-time noise criteria.

Table 22. Noise from deliveries at closest dwellings assessed in context

	R1		R2		R3	
	Day	Night	Day	Night	Day	Night
Comparison with existing ambient						
Cumulative noise from development at receptor, $dBL_{Aeq,T}$	33	40	38	42	38	48
Existing ambient noise level, $dBL_{Aeq,T}$	46	39	46	39	46	39
Existing ambient + noise source, dB(A)	46	43	47	44	47	49
Increase, dB(A)	0	4	1	5	1	10
Difference, level at receptor-existing ambient, dB(A)	**-13**	**1**	**-8**	**3**	**-8**	**9**
Comparison with BS8233 criteria for gardens						
Cumulative noise from development at receptor, $dBL_{Aeq,T}$	33	-	38	-	38	-
BS8233 upper limit for private gardens	55	-	55	-	55	-
Difference between level at receptor & upper limit, dB(A)	**-22**	**-**	**-17**	**-**	**-17**	**-**
Comparison with BS8233 internal noise criterion						
Cumulative noise from development at receptor, $dBL_{Aeq,T}$	33	40	38	42	38	48
Attenuation due to a partially open window, dB(A)	10	10	10	10	10	10
Internal noise level, $dBL_{Aeq,T}$	23	30	28	32	28	38
BS8233 internal noise criterion, $dBL_{Aeq,T}$	35	30	35	30	35	30
Difference, level at receptor-BS8233 criterion, dB(A)	**-12**	**0**	**-7**	**2**	**-7**	**8**

4.36 Comparison with ambient noise levels:

- Noise due to daytime deliveries will be well below the lowest existing ambient noise levels and would not result in any increase in daytime ambient noise levels.
- Noise due to night-time deliveries is above the lowest night-time ambient noise levels and would result in an increase of up to 9 dB(A) which is normally considered to be significant.

4.37 Noise from daytime deliveries is well below the BS8233 upper noise limit for private garden areas.

4.38 Comparison with BS8233 internal noise criterion:

- Noise from daytime deliveries would generate internal noise levels well below the daytime internal criterion of BS8233 in residential properties with open windows.
- Noise from night-time deliveries would generate internal noise levels above the night-time internal criterion of BS8233 in residential properties with open windows.

Summary of delivery noise assessment

4.39 Noise due to deliveries during the daytime, 07:00-23:00 hrs, is expected to result in a low noise impact at the closest residential properties.

4.40 The assessment indicates that noise due to deliveries during the night-time, 23:00-07:00 hrs, is likely to result in a significant adverse impact at the closest residential properties.

4.41 The assessment indicates that deliveries to the store may be permitted during the daytime 07:00-23:00 hrs 7 days a week (and including Bank Holidays) but not during the night-time, 23:00-07:00 hrs

Customer vehicle movements in the car park

Customer vehicle movement data

4.42 Noise from the car park has been based on an SEL of 68 dB(A) at a distance of 10m for a car movement.

4.43 Data provided for another Lidl store indicates that the peak hour there may be 2.85 vehicle movements per parking bay (source data for Lidl, Wallasey). The calculated impact of noise from the use of the car park is based on the equal use of each parking space in the car park.

4.44 The plans show the store to have 148 external parking bays.

Calculation of noise from customer vehicle movements in the car park

4.45 Noise from customer vehicle movements in the car park has been calculated for R3.

4.46 The calculated noise level due to customer vehicle movements in the car park is given below. The calculations include corrections for the number of movements, attenuation due to distance and acoustic screening due to the 1.8m acoustic fence recommended to control noise from deliveries. Noise has been calculated separately for vehicle movements associated with the 63 parking bays to the southwest of the store building (A) and the 85 parking bays to the southeast of the store building (B) and then summed.

Table 23. Calculation of daytime 1 hour noise levels at R3 due to peak customer vehicle movements in the car park.

	A	B
Movement SEL at 10m, dB(A)	68	68
No. parking bays	63	85
No. movments per bay per hour	2.85	2.85
Total no. of movements per hour	180	242
Correction for no. of operations, dB(A)	22.6	23.8
Reference period, mins	60	60
Correction for reference period, dB(A)	-35.6	-35.6
Distance, m	29	60
Distance correction, dB(A)	-9.2	-15.6
Barrier correction	-5	-5
Movement noise at dwelling dB $L_{aeq,1hr}$	40.8	35.6
Total movement noise at dwelling dB $L_{aeq,1hr}$	**41.9**	

4.47 The highest noise levels due to customer vehicle movements in the car park at the closest residential property will be 42 $dBL_{Aeq,1hr}$.

4.48 The lowest daytime ambient noise level is 46 $dBL_{Aeq(1hr)}$. The calculated noise level due to the peak period of customer vehicle movements in the car park is 4 dB(A) below the lowest daytime ambient noise level. Noise due to customer vehicle movements in the car park will therefore not result in any significant increase in ambient noise levels.

5.0 CONCLUSIONS

5.1 Recommendations have been made for acoustic barriers to control noise from external plant and deliveries including:

- 2.5m high acoustic barriers around all four sides of the plant compound
- A 2.5m acoustic barrier along the west side of the delivery bay ramp.
- A 1.8m high acoustic barrier along the boundary between the store site and 1-6 Castle Close and 23a & 27 Holbeach Road.

Specifications have been provided for the acoustic barriers.
The acoustic barriers are sown on Figure 4.

5.2 With the recommended acoustic barriers in place noise from external plant will have a low noise impact.

5.3 With the recommended acoustic barriers in place noise from deliveries will have a low noise impact if they are restricted to the daytime 07:00-23:00 hrs (7 days a week & Bank Holidays) only.

5.4 The potential noise from customer cars has been assessed and has been found to be low in comparison with current ambient noise levels.

6.0 REFERENCES

1. PPG24: Planning Policy Guidance 24, Department of the Environment, 1994.

2. Department for Communities and Local Government, March 2012. National Planning Policy Framework.

3. Department for Communities and Local Government, Planning Practice Guidance on noise (2014). Obtained from: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/ accessed 17/10/2015.

4. Noise Policy Statement for England (NPSE), DEFRA, March 2010.

5. BS4142: British Standard 4142:2014, Methods for rating and assessing industrial and commercial sound.

6. BS8233: British Standard 8233, Guidance on sound insulation and noise reduction for buildings, BSI 2014.

FIGURE 1. LOCATION OF SITE, NOISE SURVEY & RECEPTORS



FIGURE 2. PROPOSED SITE PLAN & RECEPTORS

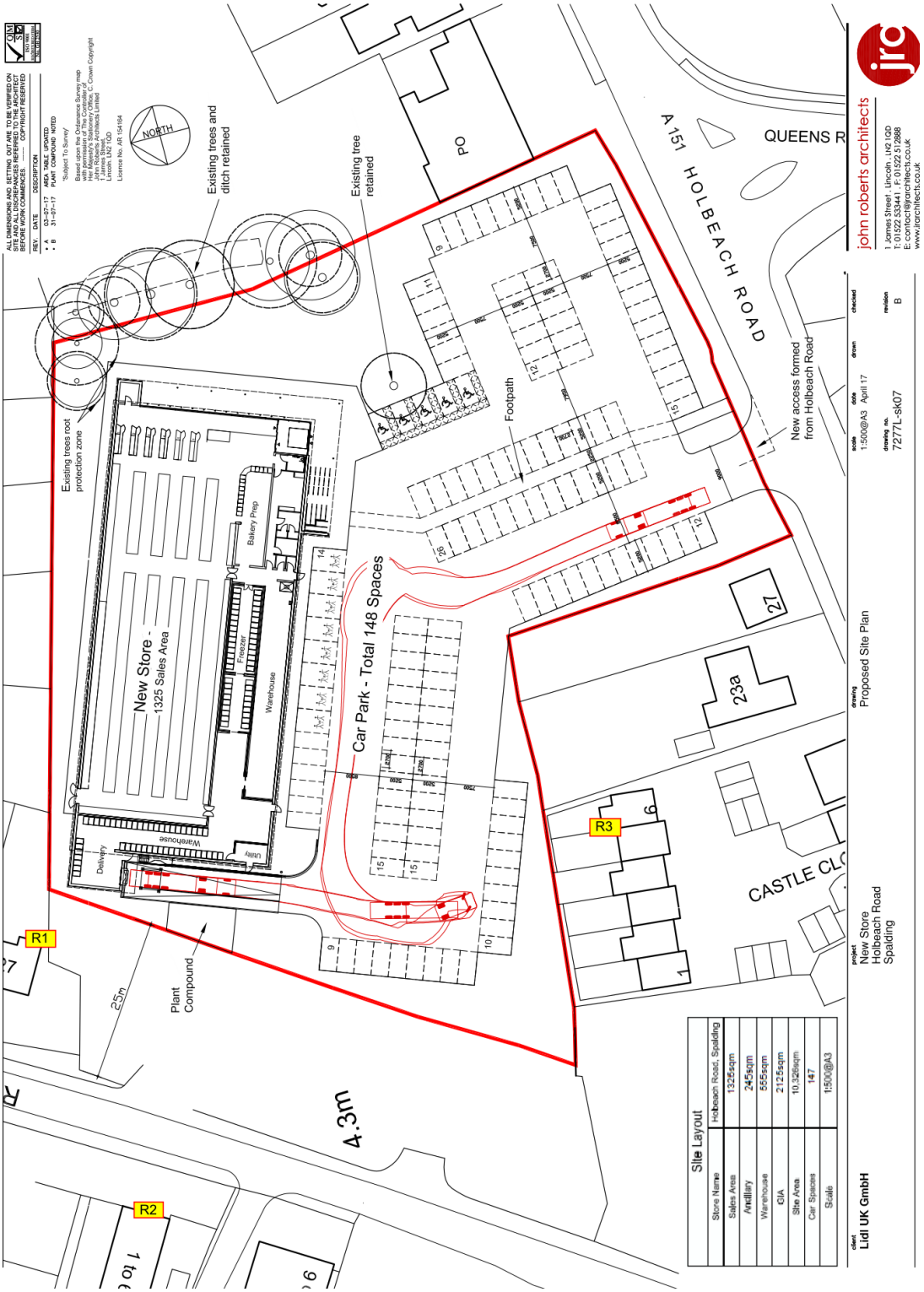


FIGURE 3. ELEVATIONS

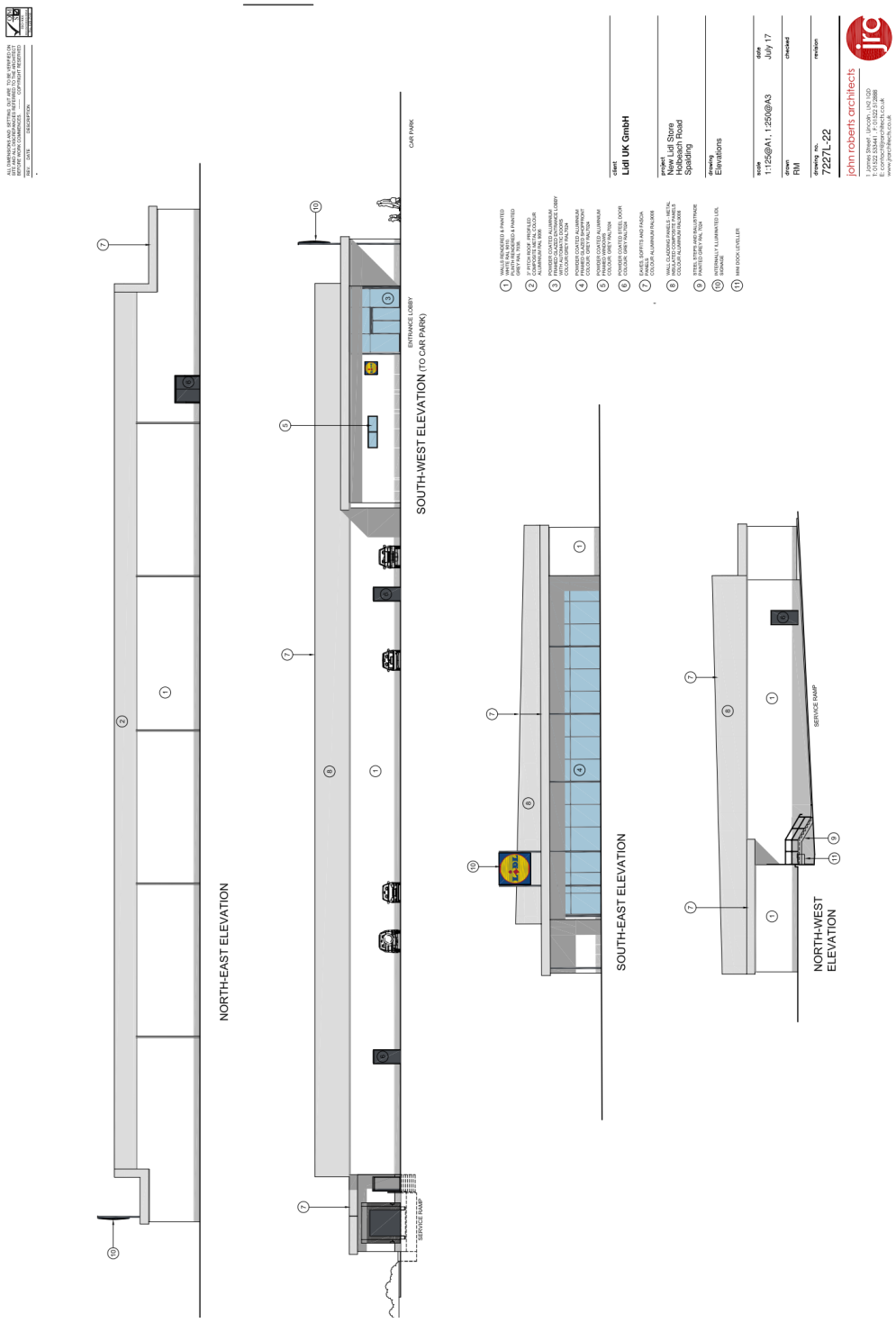
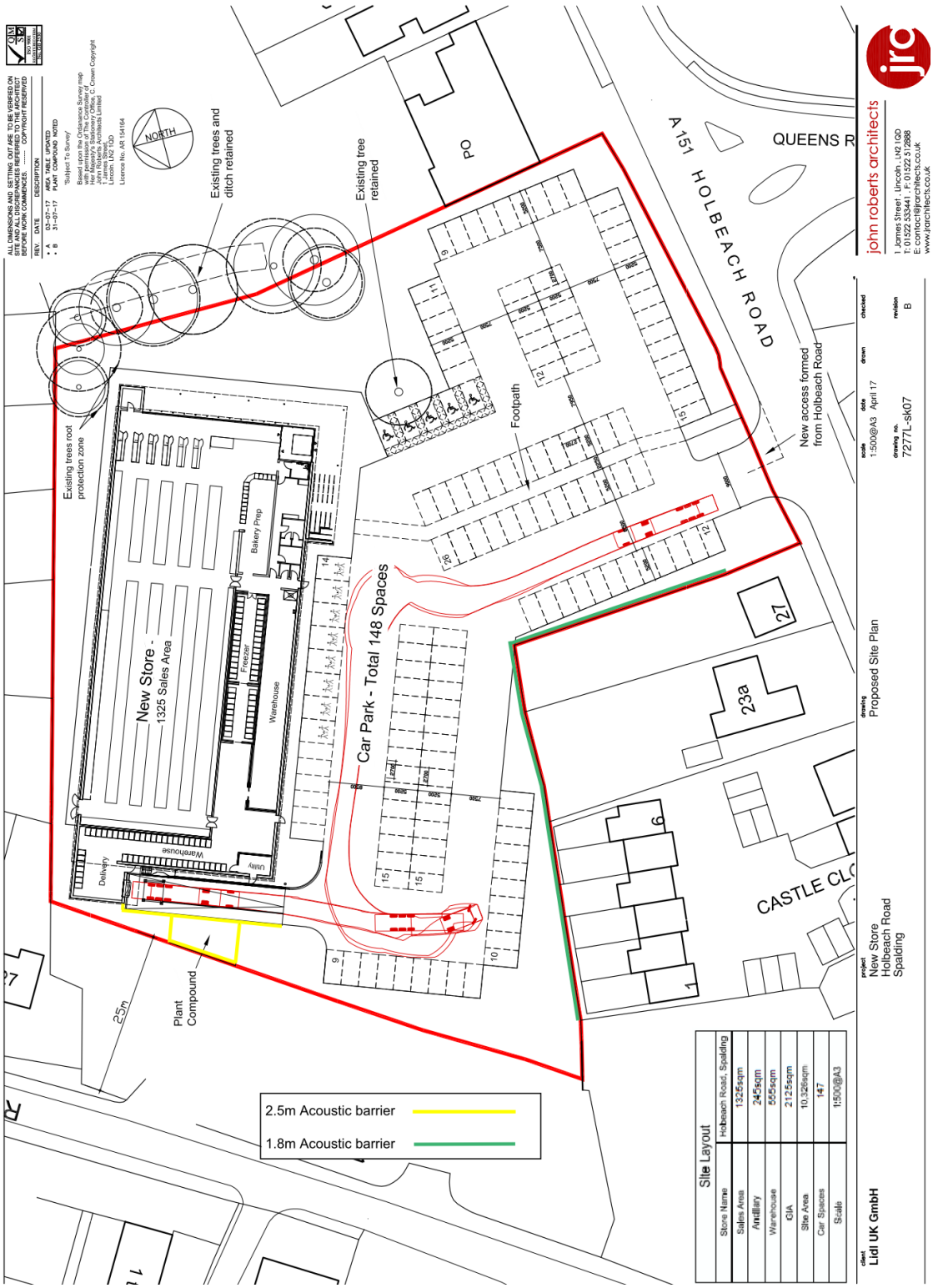


FIGURE 4. ACOUSTIC BARRIERS



APPENDIX A1: ACOUSTIC TERMINOLOGY

Ambient noise	The sound pressure level at a given location (i.e. sound from all sources) usually measured using the L_{Aeq} parameter.
A-weighting	A weighting applied to the frequencies which make up a sound pressure level to mimic the response of the human ear which is less responsive to low frequency sounds as it is to high frequency sounds. The resultant level after application of the weighting is called the 'A-weighted sound pressure level' and is denoted by dB(A) or by using a subscript A (e.g. dBL_{Aeq}).
Background noise	The noise measured in the absence of the noise under investigation usually using the statistical parameter L_{90} which represents the quietest parts of the measurement period.
Broadband sound	Sound which contains all the frequencies.
Decibel (dB)	A logarithmic measurement scale used for sound pressure levels. This scale is used because the simple use of sound pressures would be unwieldy as the range of pressures to which the human ear responds is very large. The normal threshold of hearing at 1kHz is 0dB. A level of $120dBL_{Aeq}$ is very loud (L signifies level and the A and eq are explained under A-weighting and L_{eq}). Some night club dance floors can have sound levels of around 110 dBL_{Aeq}. In the workplace the wearing of hearing protection is compulsory for staff who experience a noise level of over $85dBL_{Aeq}$ averaged over an 8-hour day and is normally used when the levels are over $80dBL_{Aeq}$ averaged over the 8-hour day. Noise intrusion levels into bedrooms (e.g. from traffic noise) are often controlled to below $30dBL_{Aeq}$ in the design of new properties (standards sometimes vary between authorities). Noise levels of below $20dBL_{Aeq}$ are very quiet and would normally only be achieved in a well designed recording studio. Although noise calculations are normally carried out using figures to 1 decimal place the results are often presented to the nearest dB as changes of a fraction of a dB are not normally perceptible even in controlled conditions.
Facade noise level	Noise level including a contribution from the reflection from a building facade, usually measured at 1m from the facade.
Free field	Noise levels with no contribution from reflections from nearby structures.
Hertz	The units used for frequency denoted by Hz, i.e. the number of cycles of pressure fluctuation per second. K used in front of Hz represents 1000 (1kHz = 1000Hz). High frequency sounds (e.g. 8kHz) are high pitched and low frequency sounds (e.g. 63Hz) are the bass notes.

L_{eq}	A parameter used to denote the 'equivalent continuous sound pressure level'. This is the sound pressure level of a continuous sound that would contain the same energy as the varying sound being measured or investigated. L_{Aeq} is the parameter used to denote the 'A-weighted equivalent continuous sound pressure level' (see A-weighting).
L_{10}	A statistical parameter often used for the measurement of road traffic noise. It is the level exceeded for 10% of the time period being considered. If A-weighted a subscript A is included and the time period can also be included in subscript, e.g. $L_{A10,\ 1hour}$.
L_{90}	A statistical parameter often used for the measurement of background noise levels. It is the level exceeded for 90% of the time period being considered. If A-weighted a subscript A is included and the time period can also be included in subscript, e.g. $L_{A90,\ 5min}$.
L_{max}	The maximum noise level which occurred during the monitoring period. $L_{Amax,f}$ denotes the maximum A-weighted sound pressure level using the fast time constant of 125ms.
Loudness	Although a 3dB increase is equivalent to a doubling of the sound power level of a sound source this increase is the minimum perceptible under normal conditions. It takes a 10dB change in noise level for it to sound roughly twice (or half) as loud subjectively.
Rating Level	A term used in BS4142. The 'Specific Noise Level' plus a 5dB weighting if the noise has certain characteristic features which may make it more disturbing.
Residual noise	The ambient noise remaining when the specific noise source being investigating is not contributing to the noise level at that location (normally measured using the L_{Aeq} parameter).
Specific Noise Level	A term used in BS4142. The L_{Aeq} noise level produced at the assessment position by the noise source being investigated over the reference time period (1-hour in the day and 5-mins at night).
SEL	Single Event Level. The total sound energy of a noise event (e.g. a train pass-by) compressed into 1 second. i.e. . the 1 second L_{Aeq} which has the same total A-weighted energy as the entire event.

APPENDIX A2: EXISTING NOISE LEVELS – SURVEY RESULTS

Daytime Noise Measurements

Table A2.1: Daytime Noise Survey Data
Friday 28 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
28/07/2017	12:00:00	01:00:00	52.5	77.1	50.0
28/07/2017	13:00:00	01:00:00	52.5	66.3	50.2
28/07/2017	14:00:00	01:00:00	53.4	67.1	51.2
28/07/2017	15:00:00	01:00:00	53.7	70.3	51.1
28/07/2017	16:00:00	01:00:00	52.8	65.7	50.9
28/07/2017	17:00:00	01:00:00	53.1	68.7	50.8
28/07/2017	18:00:00	01:00:00	52.7	71.5	49.6
28/07/2017	19:00:00	01:00:00	51.9	69.5	49.6
28/07/2017	20:00:00	01:00:00	50.7	71.4	48.1
28/07/2017	21:00:00	01:00:00	49.7	60.8	47.7
28/07/2017	22:00:00	01:00:00	48.6	61.3	46.2
AVERAGE			52.2	-	49.6
HIGHEST			53.7	77.1	51.2
LOWEST			48.6	60.8	46.2
MODE			-	-	50.0

Table A2.2: Daytime Noise Survey Data
Saturday 29 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
29/07/2017	07:00:00	01:00:00	48.3	64.9	45.2
29/07/2017	08:00:00	01:00:00	49.2	69.8	46.0
29/07/2017	09:00:00	01:00:00	51.5	71.8	47.3
29/07/2017	10:00:00	01:00:00	51.7	70.8	48.6
29/07/2017	11:00:00	01:00:00	51.8	71.9	48.6
29/07/2017	12:00:00	01:00:00	51.5	69.5	47.6
29/07/2017	13:00:00	01:00:00	51.2	70.3	47.4
29/07/2017	14:00:00	01:00:00	49.7	74.7	46.9
29/07/2017	15:00:00	01:00:00	52.0	75.3	46.9
29/07/2017	16:00:00	01:00:00	50.2	71.8	46.4
29/07/2017	17:00:00	01:00:00	50.2	70.6	46.5
29/07/2017	18:00:00	01:00:00	49.3	65.5	46.2
29/07/2017	19:00:00	01:00:00	48.3	68.6	44.9
29/07/2017	20:00:00	01:00:00	48.3	61.5	46.2
29/07/2017	21:00:00	01:00:00	47.9	63.2	45.5
29/07/2017	22:00:00	01:00:00	46.8	61.5	44.2
AVERAGE			50.1	-	46.5
HIGHEST			52.0	75.3	48.6
LOWEST			46.8	61.5	44.2
MODE			-	-	46.0

Table A2.3: Daytime Noise Survey Data
Sunday 30 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
30/07/2017	07:00:00	01:00:00	63.7	95.4	42.4
30/07/2017	08:00:00	01:00:00	46.9	70.2	43.1
30/07/2017	09:00:00	01:00:00	52.0	71.0	47.1
30/07/2017	10:00:00	01:00:00	52.9	73.0	47.0
30/07/2017	11:00:00	01:00:00	50.3	70.7	47.1
30/07/2017	12:00:00	01:00:00	50.4	68.5	47.6
30/07/2017	13:00:00	01:00:00	57.4	87.0	49.0
30/07/2017	14:00:00	01:00:00	59.8	89.5	50.0
30/07/2017	15:00:00	01:00:00	50.5	68.7	47.7
30/07/2017	16:00:00	01:00:00	49.9	67.9	47.6
30/07/2017	17:00:00	01:00:00	52.1	70.5	47.9
30/07/2017	18:00:00	01:00:00	51.5	74.8	47.9
30/07/2017	19:00:00	01:00:00	49.3	71.1	46.4
30/07/2017	20:00:00	01:00:00	48.2	62.4	45.5
30/07/2017	21:00:00	01:00:00	47.6	60.2	45.2
30/07/2017	22:00:00	01:00:00	45.7	61.4	42.6
AVERAGE			55.1	-	46.5
HIGHEST			63.7	95.4	50.0
LOWEST			45.7	60.2	42.4
MODE			-	-	48.0

Table A2.4: Daytime Noise Survey Data
Monday 31 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
31/07/2017	07:00:00	01:00:00	50.1	66.1	47.2
31/07/2017	08:00:00	01:00:00	51.9	71.4	48.5
31/07/2017	09:00:00	01:00:00	49.8	63.2	47.6
31/07/2017	10:00:00	01:00:00	57.0	80.5	47.8
31/07/2017	11:00:00	01:00:00	50.8	68.6	48.4
31/07/2017	12:00:00	01:00:00	51.0	67.4	48.4
AVERAGE			52.6	-	48.0
HIGHEST			57.0	80.5	48.5
LOWEST			49.8	63.2	47.2
MODE			-	-	48.0

Night-time noise measurements

Table A2.5: Night time Noise Survey Data
Friday 28 Jul 2017 to Saturday 29 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
28/07/2017	23:00:00	0:15:00	48.5	57.9	46.0
28/07/2017	23:15:00	0:15:00	47.1	59.1	44.7
28/07/2017	23:30:00	0:15:00	47.0	57.1	44.6
28/07/2017	23:45:00	0:15:00	46.8	56.7	44.6
29/07/2017	00:00:00	0:15:00	47.3	61.4	44.5
29/07/2017	00:15:00	0:15:00	46.7	59.7	44.0
29/07/2017	00:30:00	0:15:00	45.8	56.4	43.3
29/07/2017	00:45:00	0:15:00	45.6	55.8	42.7
29/07/2017	01:00:00	0:15:00	44.3	51.3	42.1
29/07/2017	01:15:00	0:15:00	43.6	57.7	41.7
29/07/2017	01:30:00	0:15:00	44.0	56.4	41.9
29/07/2017	01:45:00	0:15:00	44.6	56.5	42.5
29/07/2017	02:00:00	0:15:00	44.5	55.4	41.9
29/07/2017	02:15:00	0:15:00	44.3	55.5	41.9
29/07/2017	02:30:00	0:15:00	44.1	53.5	42.1
29/07/2017	02:45:00	0:15:00	44.7	59.2	42.3
29/07/2017	03:00:00	0:15:00	43.9	54.4	41.4
29/07/2017	03:15:00	0:15:00	43.5	54.6	40.9
29/07/2017	03:30:00	0:15:00	41.9	50.2	39.7
29/07/2017	03:45:00	0:15:00	42.3	51.8	40.0
29/07/2017	04:00:00	0:15:00	43.6	51.7	41.4
29/07/2017	04:15:00	0:15:00	42.9	55.9	40.5
29/07/2017	04:30:00	0:15:00	43.2	52.7	41.3
29/07/2017	04:45:00	0:15:00	46.0	63.1	41.5
29/07/2017	05:00:00	0:15:00	47.0	64.8	41.6
29/07/2017	05:15:00	0:15:00	47.3	56.8	44.1
29/07/2017	05:30:00	0:15:00	47.9	59.7	45.5
29/07/2017	05:45:00	0:15:00	48.9	64.1	46.1
29/07/2017	06:00:00	0:15:00	48.5	57.4	45.8
29/07/2017	06:15:00	0:15:00	48.3	66.6	44.3
29/07/2017	06:30:00	0:15:00	47.7	56.7	44.4
29/07/2017	06:45:00	0:15:00	48.0	60.1	43.8
AVERAGE			46.1	-	42.9
HIGHEST			48.9	66.6	46.1
LOWEST			41.9	50.2	39.7
MODE			-	-	42.0

Table A2.6: Night time Noise Survey Data
Saturday 29 Jul 2017 to Sunday 30 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
29/07/2017	23:00:00	0:15:00	44.6	58.6	42.1
29/07/2017	23:15:00	0:15:00	43.5	54.6	41.2
29/07/2017	23:30:00	0:15:00	43.4	53.4	40.6
29/07/2017	23:45:00	0:15:00	43.6	52.4	40.8
30/07/2017	00:00:00	0:15:00	43.9	55.6	41.0
30/07/2017	00:15:00	0:15:00	46.6	52.6	43.6
30/07/2017	00:30:00	0:15:00	51.1	60.3	49.0
30/07/2017	00:45:00	0:15:00	52.6	57.4	50.8
30/07/2017	01:00:00	0:15:00	44.7	54.8	42.4
30/07/2017	01:15:00	0:15:00	42.2	64.8	38.3
30/07/2017	01:30:00	0:15:00	39.9	48.6	37.7
30/07/2017	01:45:00	0:15:00	39.2	53.0	36.1
30/07/2017	02:00:00	0:15:00	40.9	52.4	38.1
30/07/2017	02:15:00	0:15:00	45.4	51.1	41.3
30/07/2017	02:30:00	0:15:00	46.2	52.7	44.5
30/07/2017	02:45:00	0:15:00	47.5	52.2	45.8
30/07/2017	03:00:00	0:15:00	48.2	55.9	46.0
30/07/2017	03:15:00	0:15:00	45.3	56.8	42.9
30/07/2017	03:30:00	0:15:00	42.4	53.7	40.2
30/07/2017	03:45:00	0:15:00	42.0	54.4	39.6
30/07/2017	04:00:00	0:15:00	43.2	52.9	41.0
30/07/2017	04:15:00	0:15:00	44.3	56.6	42.6
30/07/2017	04:30:00	0:15:00	42.0	49.8	39.3
30/07/2017	04:45:00	0:15:00	41.3	55.5	38.9
30/07/2017	05:00:00	0:15:00	41.0	59.2	38.4
30/07/2017	05:15:00	0:15:00	43.3	59.6	40.3
30/07/2017	05:30:00	0:15:00	44.3	64.3	41.3
30/07/2017	05:45:00	0:15:00	47.7	70.6	41.4
30/07/2017	06:00:00	0:15:00	48.3	67.4	42.4
30/07/2017	06:15:00	0:15:00	51.8	75.2	42.7
30/07/2017	06:30:00	0:15:00	45.4	72.0	41.1
30/07/2017	06:45:00	0:15:00	54.3	84.9	42.4
AVERAGE			46.8	-	41.7
HIGHEST			54.3	84.9	50.8
LOWEST			39.2	48.6	36.1
MODE			-	-	41.0

Table A2.7: Night time Noise Survey Data
Sunday 30 Jul 2017 to Monday 31 Jul 2017

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
30/07/2017	23:00:00	0:15:00	44.4	58.0	41.9
30/07/2017	23:15:00	0:15:00	44.4	58.0	41.9
30/07/2017	23:30:00	0:15:00	44.3	56.5	41.2
30/07/2017	23:45:00	0:15:00	43.9	54.0	40.9
31/07/2017	00:00:00	0:15:00	43.7	55.0	40.9
31/07/2017	00:15:00	0:15:00	43.5	60.1	40.7
31/07/2017	00:30:00	0:15:00	42.3	51.9	39.7
31/07/2017	00:45:00	0:15:00	43.7	52.9	40.9
31/07/2017	01:00:00	0:15:00	43.7	52.0	40.8
31/07/2017	01:15:00	0:15:00	43.0	55.5	40.4
31/07/2017	01:30:00	0:15:00	42.9	51.9	40.6
31/07/2017	01:45:00	0:15:00	42.8	51.0	40.6
31/07/2017	02:00:00	0:15:00	42.8	54.6	40.0
31/07/2017	02:15:00	0:15:00	42.5	53.6	40.1
31/07/2017	02:30:00	0:15:00	42.8	52.6	40.3
31/07/2017	02:45:00	0:15:00	42.8	52.5	40.2
31/07/2017	03:00:00	0:15:00	42.3	52.6	40.0
31/07/2017	03:15:00	0:15:00	42.0	51.2	39.9
31/07/2017	03:30:00	0:15:00	42.8	52.1	40.8
31/07/2017	03:45:00	0:15:00	44.4	56.3	42.3
31/07/2017	04:00:00	0:15:00	44.8	57.9	42.0
31/07/2017	04:15:00	0:15:00	43.2	53.1	41.0
31/07/2017	04:30:00	0:15:00	44.3	52.1	41.9
31/07/2017	04:45:00	0:15:00	45.1	54.8	42.8
31/07/2017	05:00:00	0:15:00	47.8	68.1	44.2
31/07/2017	05:15:00	0:15:00	47.9	61.1	45.2
31/07/2017	05:30:00	0:15:00	49.3	62.9	46.4
31/07/2017	05:45:00	0:15:00	51.4	67.0	47.0
31/07/2017	06:00:00	0:15:00	59.7	88.8	46.8
31/07/2017	06:15:00	0:15:00	49.4	67.2	45.3
31/07/2017	06:30:00	0:15:00	48.3	58.4	45.8
31/07/2017	06:45:00	0:15:00	49.3	63.2	46.5
AVERAGE			48.1	-	42.2
HIGHEST			59.7	88.8	47.0
LOWEST			42.0	51.0	39.7
MODE			-	-	41.0