



ACOUSTIC CONSULTANTS LTD

Proposed Food Store
Lidl, Hayling Island

Noise Impact Assessment

Reference: 6586/PP/pw
March 2017



Proposed Food Store
Lidl, Hayling Island

Noise Impact Assessment

Client:

Lidl UK
Southampton Property Office
Foxes Park
Brownhill way
Nursling
Southampton
SO16 OYP

Noise and Acoustic Consultant:

Acoustic Consultants Limited
Raleigh House
Wellsway
Keynsham
Bristol
BS31 1HS

Prepared by:

P. Prayoonsakul MEng. AMIOA

Checked by:

Blake Lucas BEng. (Hons), MIOA

Issue Number:

1st Issue
Revision A

Date:

16 February 2017
1st March 2017



Table of Contents

1.	Introduction	4
2.	The Site and Proposals	5
3.	Planning and Noise	6
4.	Assessment Methodology	10
5.	Baseline Noise Assessments	15
6.	Plant Noise Assessment	20
7.	Delivery Noise Assessment	27
8.	Limitations	38
9.	Summary & Conclusions	39



1. Introduction

Lidl appointed Acoustic Consultants Limited to undertake a noise impact assessment for the proposed Lidl food store development on land adjacent Manor Road, Hayling Island in support of a planning application.

This report provides a noise impact assessment in accordance with "British Standard 4142:2014" and the "IEMA Guidelines for Noise Impact Assessments" of plant and deliveries associated with the Lidl food store on the nearby sensitive receivers.

The author of this report is an Associate Member of the Institute of Acoustics (AMIOA) with a recognised acoustic qualification and two years' experience. The report has been checked and approved by a full Member of the institute of Acoustics with 9 years' experience within the field.

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.



2. The Site and Proposals

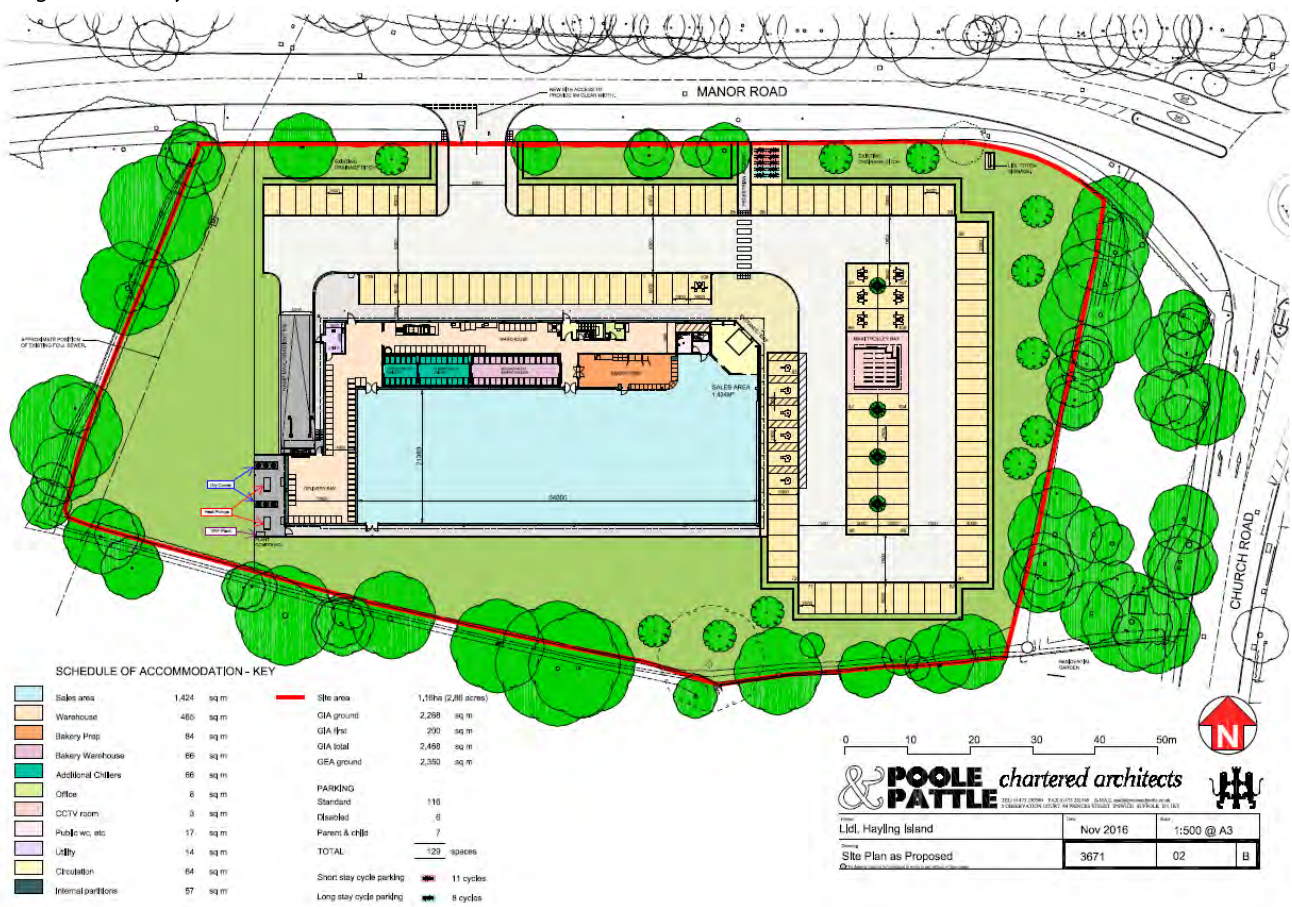
The proposal is for a Lidl Food Store located on empty land off Manor Road next to the roundabout between Manor Road, Church Road and Havant Road. The site is within a residential area. To the west is empty land, to the north is Manor Road (A3023) and to the southeast is residential houses.

The plant associated with the Lidl Food Store will be located within the plant compound at ground level next to the delivery bay which is located to the west of the site. The plant will operate 24 hours a day according to demand. It is proposed to have deliveries 24 hours.

The most sensitive receivers to plant noise from the store are the residential properties off Manor Road (R2) to the northwest of the plant location. All other residential dwellings are at a further distance away from the plant or shielded by the store.

The figure below shows the proposed site layout.

Figure 1: Site Layout





3. Planning and Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and replaces Planning Policy Guidance Document 24. This is a significantly shortened document. Section 11 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 109 states:

"109. 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."*

Paragraph 123 states:

"123. 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 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."*

The document does not prescribe any assessment methodology or criteria to assess the adverse affect of noise.



3.2. Noise Policy Statement for England

The NPPF refers to the Noise Policy Statement for England (NPSE). This was published in March 2010 by DEFRA and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. It applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

The NPSE introduces the concept of “Significant Adverse” and “Adverse” impacts of noise. These are applied as follows:

NOEL – No Observed Effect Level

This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

LOAEL – Lowest Observed Adverse Effect Level

This is the level of noise exposure above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level of noise exposure above which significant adverse effects on health and quality of life occur.

The NPSE does not provide any assessment criteria for the noted effect levels.

3.3. National Planning Practice Guidance, Noise

The National Planning Practice Guidance (NPPG) on noise referred to here is based on the current version (January 2015) as provided on the Planning Guidance Website. It states that:

“Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment.”



It provides generic guidance on how to determine the noise impact and what factors could be a concern. It includes the option types to mitigate any adverse effects of noise stating that there are four broad types of mitigation.

These are engineering, layout, using planning conditions or obligations and noise insulation. Paragraph 5 of the NPPG provides a table identifying the effect level and examples of effect relating to the impact effect levels provided in the NPSE. The table is duplicated below:

Table 1: NPPG Noise – Perception of Effect Levels

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 behaviour 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



The table does not provide any objective assessment which equates to the noted effect levels however the NPPG identifies that where noise is audible it is not necessarily intrusive. The effect and impact on people is based primarily on the level of noise.



4. Assessment Methodology

The following section identifies guidance which is considered to provide noise criteria equivalent to or below the LOAEL described in NPPG and NPSE, i.e. where *“Noise can be heard, but does not cause any change in behaviour 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.”*

4.1. Plant Noise – British Standard 4142:2014

For plant noise the most relevant guidance is provided within British Standard 4142:2014. The British Standard 4142:2014 entitled ‘Method for rating and assessing industrial and commercial sound’ was published on the 31st October 2014.

The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premises used for residential purposes. The principle is that of establishing the ‘difference’ between the ‘rating level’ and the ‘background sound level’.

The ‘rating level’ is the ‘specific sound level’ of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Section 9 entitled ‘Rating Level’ states:

“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. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.”

An acoustic character correction should be added to the ‘specific sound level’ if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location.



In Section 11 of the Standard, entitled 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

Based on the initial assessment outcomes of British Standard 4142, and depending on context, it is our opinion that the NOEL, LOAEL and SOAEL levels stated in the Noise Policy Statement for England would generally fall within the following categories when considered in conjunction with the effect levels of the NPPG Noise.

- NOEL (No Observed Effect Level) – The No Observed Effect Level is considered to apply where the rating level does not exceed the background sound level (less than or equal to 0dB) would fall within the No Effect level or No Observed Adverse Effect level of the NPPG Noise.
- LOAEL (Lowest Observed Adverse Effect Level) – The Lowest Observed Adverse Effect Level is considered to fall between a difference of 0dB (where according to British Standard 4142:2014 the impact is low) and 5dB (where according to British Standard 4142:2014 there is a likely indication of adverse impact).
- SOAEL– The Significant Observed Adverse Effect Level is considered to fall between a difference of 5dB (where according to British Standard 4142:2014 there is a likely indication of adverse impact) and 10dB (where according to British Standard 4142:2014 there is a likely indication of significant adverse impact). A difference in excess of 10dB is expected to result in an unacceptable adverse effect and therefore exceeds the significant observed adverse effect level.



In all instances the context needs to be considered when determine the overall impact and Observed Effect Level. In terms of context British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*
- 2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*

NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

- 3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
 - i) façade insulation treatment;*
 - ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
 - iii) acoustic screening."*



4.2. Delivery Noise

At a Lidl food store there are only one or two deliveries a day. The arrival and departure of the vehicle is similar to road noise and short-term in nature. The unloading is considered to be of an industrial and commercial nature.

Unloading

We consider British Standard 4142:2014 the most appropriate assessment methodology for determining the impact of the unloading and loading of a delivery vehicle.

The assessment method is as stated above and we would consider delivery noise acceptable where the noise impact is low, i.e. an assessment difference of 0 dB.

However, context needs to be considered including the absolute levels and residual noise climate.

Arrival/Departure of Vehicles

There is no specific planning guidance in relation to the arrival and departure of the site vehicles. We would consider the arrival and departure of site vehicles to be outside the scope of British Standard 4142:2014. As such we have followed a common-sense approach and assessed the impact in accordance with the Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment.

Following this guidance we consider it appropriate to determine the impact on the noise-sensitive receivers around the site by comparing existing equivalent noise levels (Daytime $L_{Aeq}(1 \text{ hour})$, Night-time $L_{Aeq}(15 \text{ minutes})$) to the predicted equivalent noise levels of the vehicles arriving/departing ($L_{Aeq}(1 \text{ hour})$ or $L_{Aeq}(15 \text{ minutes})$). The overall impact is then determined by the change in noise levels as a result of the movement of these vehicles.

The IEMA Guidelines for Environmental Noise Impact Assessment, Version 1.2 published in November 2014 categorises the significance of a change in noise level; this is summarised as follows and taken from Table 7-14 of the guidance:



Table 2: IEMA Impact from the Change in Sound Levels (Table 7-14)

Long-term impact classification	Short-term impact classification	Sound Level Change L_{pAeqT} positive or negative) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB
Major		≥ 10 dB

As a delivery is short-term in nature we would consider a more appropriate assessment period would be 1 hour during the day and 15 minutes at night.



5. Baseline Noise Measurements

An assessment to British Standard 4142 requires that the "Background Sound Level", typical for the area, be established. Two noise surveys were undertaken during the daytime and night-time period's representative of the noise sensitive receivers around the site.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a Class 1 Sound Level Meter with a half-inch condenser microphone using the "fast" setting. The equipment is checked annually using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2005 and in accordance with British Standard EN 10012:2003 and traceable to the National Standards. This equipment was checked and calibrated as noted below and the certificates are available for inspection.

Table 3: Monitoring Equipment

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
Sound Level Meter, Cirrus Research, CR:171C	G071684	13/09/2016	241340
Calibrator, Cirrus Research, CR:515	73217	13/09/2016	107762
Microphone, Cirrus Research, MK224	606369B	13/09/2016	107763
NTI XL2 Sound Level Meter	A2A-09705-E0	30/08/2016	15060
NTI MA220 Pre-Amp	5332	30/08/2016	15060
NTI Microphone Capsule	8433	30/08/2016	15060
Calibrator, CEL, Type 284/2	3/02716829	30/08/2016	15059

The meters were checked for calibration before and after the tests which gave a drift of -0.1 dB. However this drift is not significant enough to affect any of the results.



5.2. Meteorological Conditions

During the long term monitoring, conditions were dry, with wind speed of 3-4 metres per second. The air temperature was between 2 to 5 degrees centigrade. These conditions are not expected to have any adverse effect on the measured levels.

During the short-term monitoring, conditions were dry, with wind speed of 0-1 metres per second. The air temperature was 2 degrees centigrade. These conditions are not expected to have any adverse effect on the measured levels.

5.3. Monitoring Procedure

A long term noise monitoring exercise was carried out from the 13th – 15th December 2016 to determine the baseline noise conditions around the site at Location A. The microphone cable to the meter was damaged at around 21.00 hours on the 13th December 2016 by rodents and all data after this time was considered adversely affected and have been discounted from the assessment.

As such a short term attended survey was undertaken at Location B between 22:00 hours on the 7th February 2017 and 00:30 hours on the 8th February 2017.

Both noise monitoring surveys were undertaken in accordance with British Standard 4142:2014. The monitoring locations are as shown on Figure 2 below.



Figure 2: Monitoring Locations



At all locations the microphone was on a tripod approximately 1.5 metres above ground level.

At monitoring location A, the microphone was placed within the paddock and in a free-field position.

At monitoring location B the microphone was placed on the footpath of Church Road. The measurement position B was at 1 metre from the boundary fence and in a façade level.

The main noise source affecting monitoring locations are road traffic from the surrounding highway network. The measured levels are considered representative of the baseline noise level at the dwellings around the site.

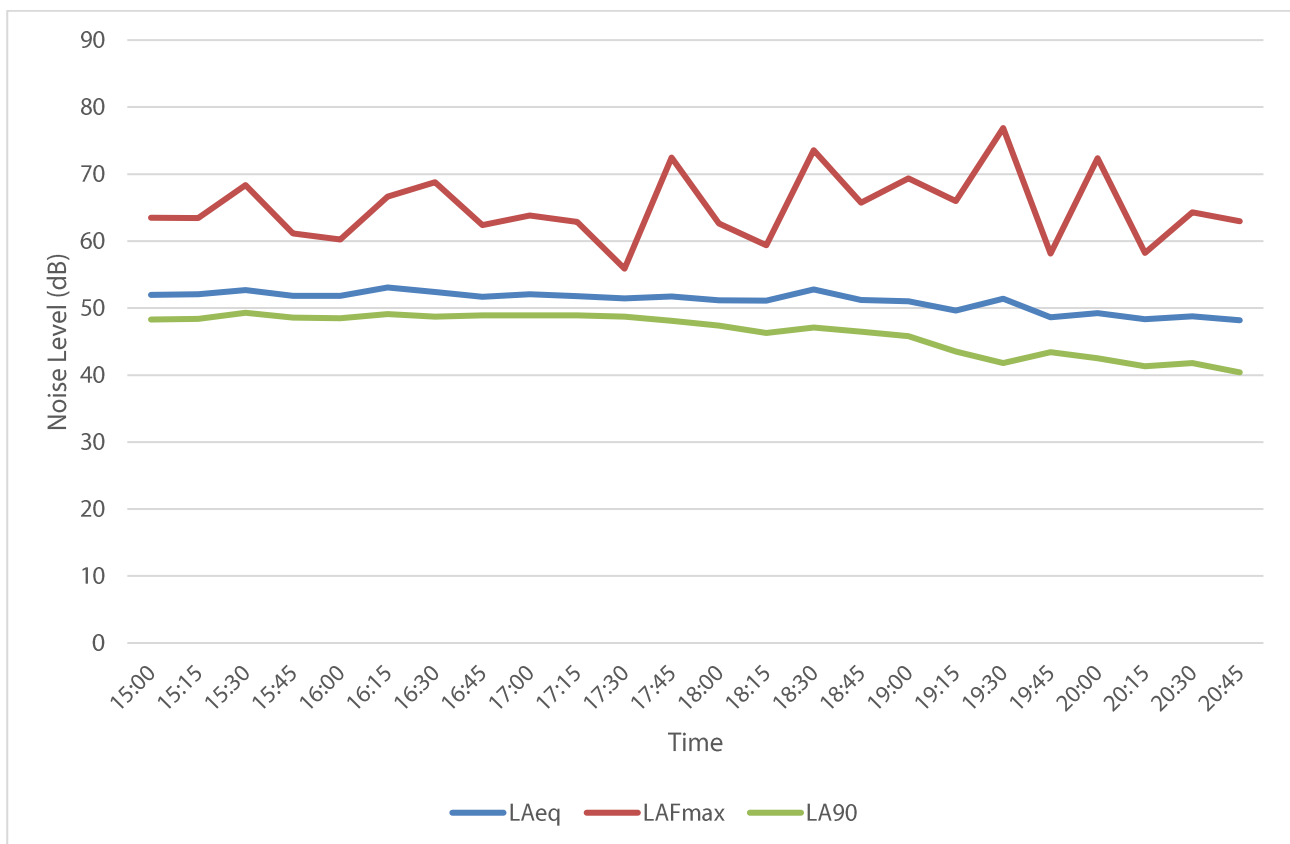


5.4. Measured Data

Monitoring Location A

The following chart provides the results of the unattended A weighted noise levels at Location A. The measured data consists of Equivalent Noise Level ($L_{Aeq,15min}$), and Background Sound Level ($L_{A90,15min}$) in dB (A). The graphical results of the monitored period (15:00 – 21:00 hours on the 13th December 2016) at monitoring location A are provided below.

Chart 1: Measured Noise Levels at Location A





Location B

The following table provides the short term night-time noise levels at Location B. the measured levels are façade levels.

Table 4: Short Term Attended Noise Monitoring at Location B (Façade Level)

Start Date and Time	LAeq	L 90.0 %
07/02/2017 22:00	67	44
07/02/2017 22:15	66	40
07/02/2017 22:30	64	38
07/02/2017 22:45	67	39
07/02/2017 23:00	67	39
07/02/2017 23:15	65	37
07/02/2017 23:30	63	34
07/02/2017 23:45	62	35
08/02/2017 00:00	59	32
08/02/2017 00:15	57	31

Therefore we have determined a design background sound level is 31 dB $L_{A90(15 \text{ mins})}$ (façade level) which following the methodology of British Standard 4142:2014 equates to 28 dB $L_{A90(15 \text{ mins})}$ for free field level during the worst case time (night-time).

During the daytime we have determined a typical design background sound level of 49 dB $L_{A90(1 \text{ hour})}$ (free-field level).

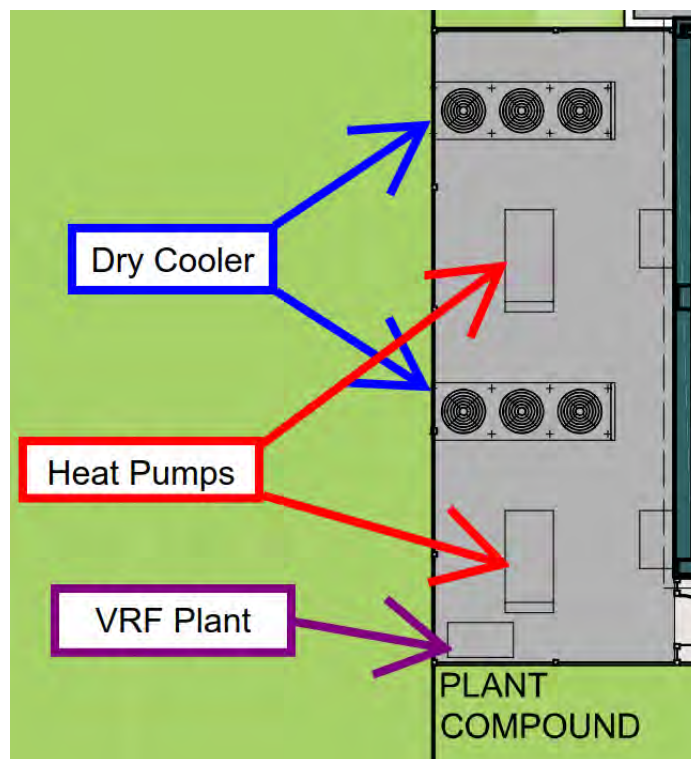


6. Plant Noise Assessment

6.1. Proposed Plant

We have been advised that the proposed plant is as follows. It should be noted that any changes to the following schedule, or changes to the location or layout of the plant units will affect the predicted levels at the receiver points around the site and as such will need reassessing. The plant will be located to the west of the store at ground level within a plant compound adjacent to the delivery bay.

Figure 3: Plant Compound and Proposed Plant locations





Dry Coolers

The dry coolers are the Guntner unit's model number "GFW 090.1/3-E(J)-F4/06/6P". The top of the unit will be approximately 2.0 metres above the ground. It is proposed to install two dry coolers which will operate 24 hours a day according to demand.

The following table provides the supplied octave band sound power level of the plant, the octave band noise data is 'A weighted' and taken directly from the manufacturer's noise data.

Table 5: Dry Cooler A-Weighted Sound Power Level

Frequency (Hz)	125	250	500	1k	2k	4k	8k
L _{WA} (dB)	48	55	59	59	58	50	43

Heat Pumps

The heat pumps are the Dimplex units. The top of the units will be approximately 2.3 metres above the ground. It is proposed to install two heat pump units which will only operate 24 hours a day according to demand.

The following table provides the supplied octave band sound power level of the plant, the octave band noise data is 'A weighted' and has been converted directly from the supplied manufacturers third octave noise data.

Table 6: Heat Pump A-Weighted Sound Power Level

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
L _{WA} (dB)	56	61	67	68	68	65	63	55



VRF plant

The VRF plant is a Mitsubishi unit. The top of the unit will be approximately 1.5 metres above the roof. It is proposed to install one VRF unit which will normally operate during store hours to cool the store, occasionally during the summer the VRF may operate during the night on hotter than average nights.

Table 7: VRF Plant Noise Level

Manufacturer	Model Number	Quantity	Individual Unit Sound Pressure Level $L_{Aeq(T)}$
Mitsubishi	FDC335KXRE6	1	62.5 dB at 1 metre

6.2. Predicted Specific Sound Level

The most sensitive receivers in the vicinity of the proposed plant will be that identified above, i.e. the dwellings to the northwest. Using the manufacturer's data, site layout and Google Earth images, predictions have been undertaken to the nearest dwelling following methodology of ISO 9613.

The plant noise emission has been modelled in the noise modelling software Cadna:A by DataKustik. The modelling software calculates sound levels based on the inputted sound emission values, source and receiver locations, and primarily distance, barrier and ground attenuation.

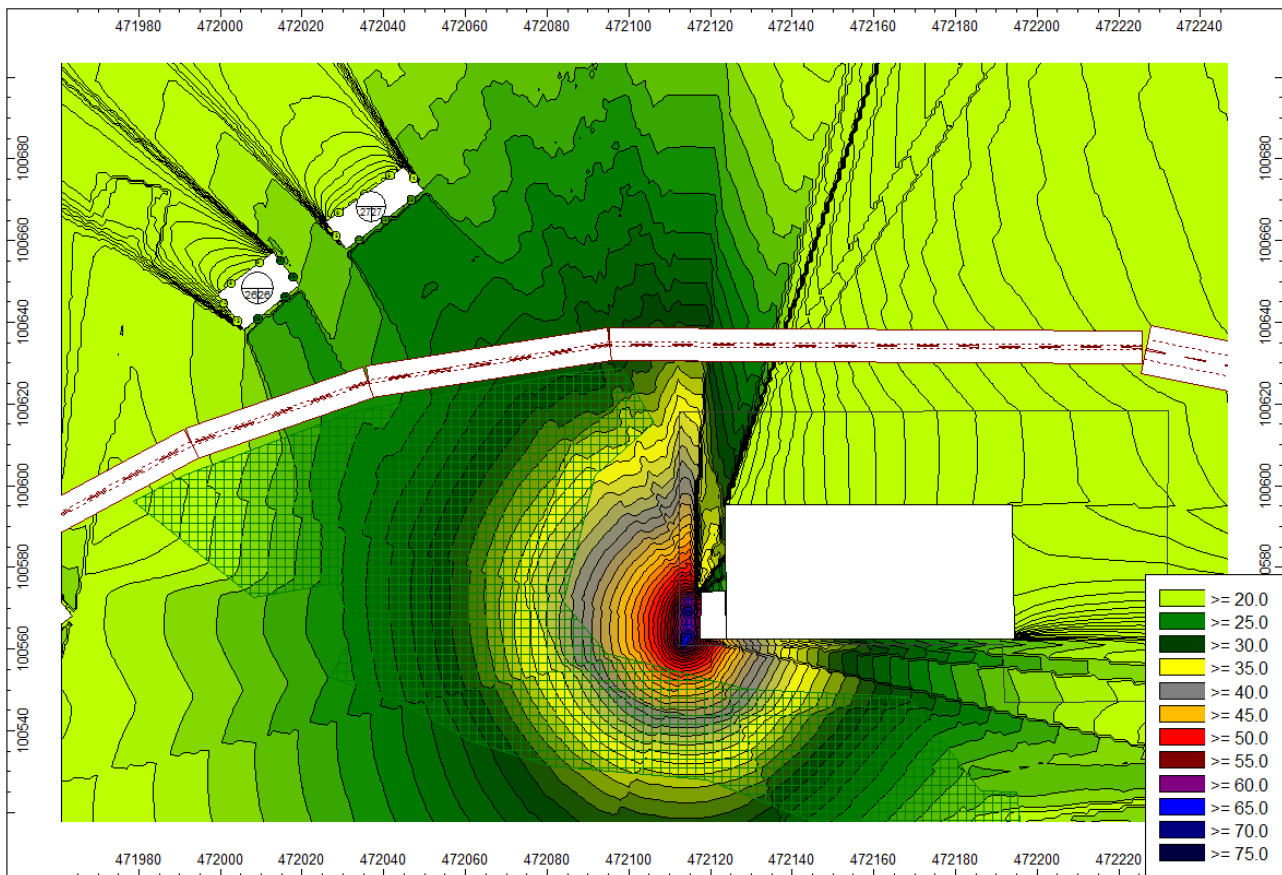
Calculations are undertaken using the General Method of Calculation from ISO 9613. The parameters within the Cadna:A model are as follows and are considered reasonable assumptions:

- The store height is based on similar Lidl LOF schemes i.e. the height of the proposed store are assumed to be 11 metres at the front of the store and 9 metres at the rear.
- The existing residential buildings have been assumed to be two storeys with a pitched roof (7 metres) except Receiver R2 where it is a single story house (5 metres).
- The plant is as noted above and located as per the supplied drawings.



- No barriers have been included around the plant or site.
- The order of Reflections is 3, and all buildings and barriers are reflective.
- 5 metres in height foliage has been included to the south and west of the site.
- The ground around the site (car park) is considered hard and reflective.
- The ground at surrounding area is considered as soft ground.
- The topography of the site is assumed to be flat.
- The predictions are based on the supplied plant noise levels noted above and all plant operating continuously.
- The predicted building noise map level at sensitive receiver R2 is at ground floor height, i.e., 1.5 metres above ground. At other residential building the predicted building noise map level is at first floor height, i.e., 4.5 metres above ground.
- Noise Grid map is calculated at 1.5 metres above ground.

A noise map of the plant specific sound levels is provided below for the worse case time, i.e. night-time plant operation.

**Figure 4: Predicted Specific Sound Level of Plant L_{Aeq} (15 minutes)**

The most sensitive receivers to plant noise are the residential houses (Noise Sensitive Receiver R2) located off Manor Road. From noise mapping, the predicted free-field specific sound level of plant at the worse case noise sensitive receiver (Noise Sensitive Receiver R2) is 27 dB $L_{Aeq(T)}$.



6.3. Initial Estimate of Impact

A British Standard 4142:2014 initial estimate of the impact has been undertaken at the sensitive receivers around the site and is as follows:

Background Sound Level

From the measured data we have determined a typical worst case design background sound level to 28 dB $L_{A90(15\text{ min})}$ during the night at a location representative of the noise sensitive receivers.

Specific Sound Level

The cumulative specific sound level at the worst case receiver is 27 dB $L_{Aeq(15\text{ minutes})}$ (free-field level). This is the level determined at the noise sensitive receivers without any character corrections applied.

Character Corrections

Character corrections should be added to the “specific sound level” if the “specific sound level” exhibits any *tonality, impulsivity, other specific characteristics and/or intermittency* at the assessment location. Based on our site visit the character corrections to be applied are as follows:

Tonality– it is not possible to determine if the plant is tonal. The supplier should ensure this characteristic of the plant is not distinguishable at the noise-sensitive receivers in the area.

Impulsivity – Plant noise is not normally impulsive.

Intermittency – We do not expect that the intermittency of the plant will be distinguishable at the sensitive receiver over the residual noise climate and we have not applied correction for intermittency.

Other Sound Characteristics – We do not believe a character correction is necessary for other sound characteristics.

Therefore the British Standard 4142:2014 initial estimate at the most sensitive location is as follows:



Table 8: British Standard 4142:2014 Initial Estimate

Parameter	Worse Case Receiver
Background Level, $L_{A90}(T)$	28 dB
Specific Sound Level, $L_{Aeq}(T)$	27 dB
Acoustic Character Correction	+0 dB
Rating Level	27 dB
Excess of rating over background level	-1 dB

This means that the plant rating noise level will result in a British Standard 4142:2014 assessment 'difference' -1 dB at the nearest noise-sensitive receiver during the night-time. As such it is an indication that noise from the plant will be of a low impact on the noise-sensitive receivers in the area.

The difference between the rating level and the background sound level is -1 decibels at worst and as such the uncertainty in the measurements and assessment will not have a significant impact on the outcome of the assessment.

6.4. Context

British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration".

Following the "initial estimate" we consider that there is no significant alteration to the assessment due to the context implication and once all pertinent factors (i.e. context) are taken into account it is an indication that plant noise will be of a low impact when assessed to British Standard 4142:2014.

6.5. Observed Effect Level

We would consider the noise impact of the proposed plant to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPSE and NPPG and as such achieves the aims of National Planning Policy Framework (NPPF).



7. Delivery Noise Assessment

7.1. Summary of Delivery Operation

It is proposed to have deliveries 24 hours a day. The delivery bay will be located to the east of the store. The vehicle will access and exit the site via Manor Road. The unloading, arrival and departure of the delivery vehicle has the potential to affect the receivers to the Northwest of the site.

We understand that the deliveries are contained to an articulated vehicle which includes a refrigerated section with condensing unit. The vehicle arrives on site and reverses up to the enclosed loading bay dock. The engine is then turned off and the goods are moved internally from the trailer into the store. The goods are mostly on pallets and an electric pallet truck is used. The operation takes place internally and the vehicle departs after about one hour.

The most sensitive receivers to delivery noise are the residential houses (Noise Sensitive Receiver R2) located off Manor Road.

All other residential dwellings are either at a further distance away from the delivery activities or shielded from the noise by the store.

7.2. Delivery Noise Monitoring

Acoustic Consultants Limited have measured the delivery operation from Lidl food stores over a number of years at a number of different sites.

Our most recent noise survey was undertaken at the Lidl food store delivery operation at the existing Lidl Wonford store on the 18th September 2014. The noise monitoring location was set 50 metres back from the delivery activities and in line with the vehicle. The arrival and departure of the vehicle was measured at a distance of 10 metres from the HGV. The delivery yard was open at this store.

The measured noise levels are as follows; the measured levels are free-field levels and have been corrected to a distance of 10 metres where appropriate. The measured levels include reflections off the Lidl food store.



Table 9: Wonford Delivery Operation Noise Levels

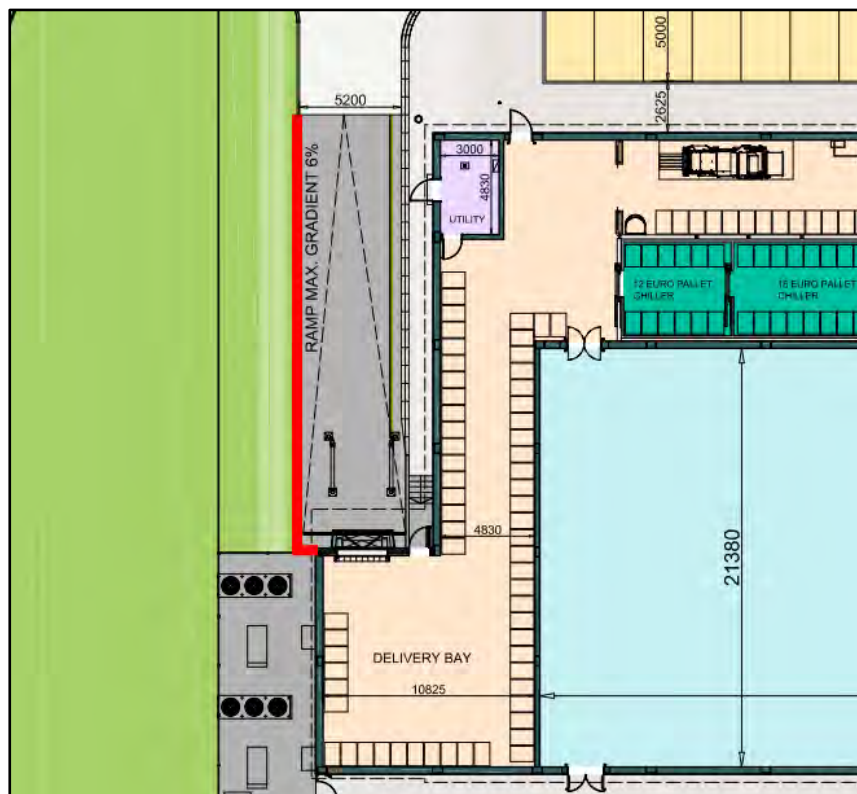
Start Time	Duration	L _{Aeq(T)} (dB)	Activity at 10 metres
23:23	347 seconds	61	HGV Arrive
23:30	57 minutes	57	HGV Unloading
00:30	120 seconds	63	HGV Depart

7.3. Delivery Noise Mitigation Measures

The following mitigation measures would be required to manage noise only for deliveries when background noise is at its lowest level (between 11pm and 7am) and have been included within Lidl's proposed design.

To mitigate delivery noise it is proposed to erect 3 metres barrier to the east of the delivery bay. The density of the barrier should be at least 10 kg/m². The construction could comprise of timber, blockwork or lightweight system such as composite panels. The materials should meet a minimum density of at least 10 kg/m². The figure below shows the barrier location (in Red).

Figure 5: Barrier location (in Red)





7.4. Delivery Operation Noise Predictions

Noise emission prediction calculations have been carried out for the potentially most sensitive locations to delivery noise (as stated above).

The delivery operation has also been modelled in the noise modelling software CadnaA by DataKustik. The parameters within the CadnaA model are as follows and are considered reasonable assumptions:

- The store height is based on similar Lidl LOF schemes i.e. the height of the proposed store are assumed to be 11 metres at the front of the store and 9 metres at the rear.
- The existing residential buildings have been assumed to be two storeys with a pitched roof (9 metres) except Receiver R2 where it is a single story house (6 metres).
- The order of reflections is 3, and all buildings and barriers are reflective.
- The predictions are based on the measured delivery noise emission levels noted above, the delivery times as detailed above, and the mitigation measures noted above.
- The delivery vehicle path has been based on reasonable assumptions.
- For the assessment we have predicted the equivalent noise levels over a 1-hour period to be representative of the daytime assessment period and 15 mins period for night-time assessment.
- 5 metres in height foliage has been included to the south and west of the site.
- The ground around the site (car park) is considered hard and reflective.
- The ground at surrounding area is considered as soft ground.
- The topography of the site is assumed to be flat.
- The predicted building noise map level at sensitive receiver R2 is at ground floor height, i.e., 1.5 metres above ground. At other residential building the predicted building noise map level is at first floor height, i.e., 4.5 metres above ground.



Figure 6: Unloading Specific Sound Level $L_{Aeq}(15 \text{ mins})$

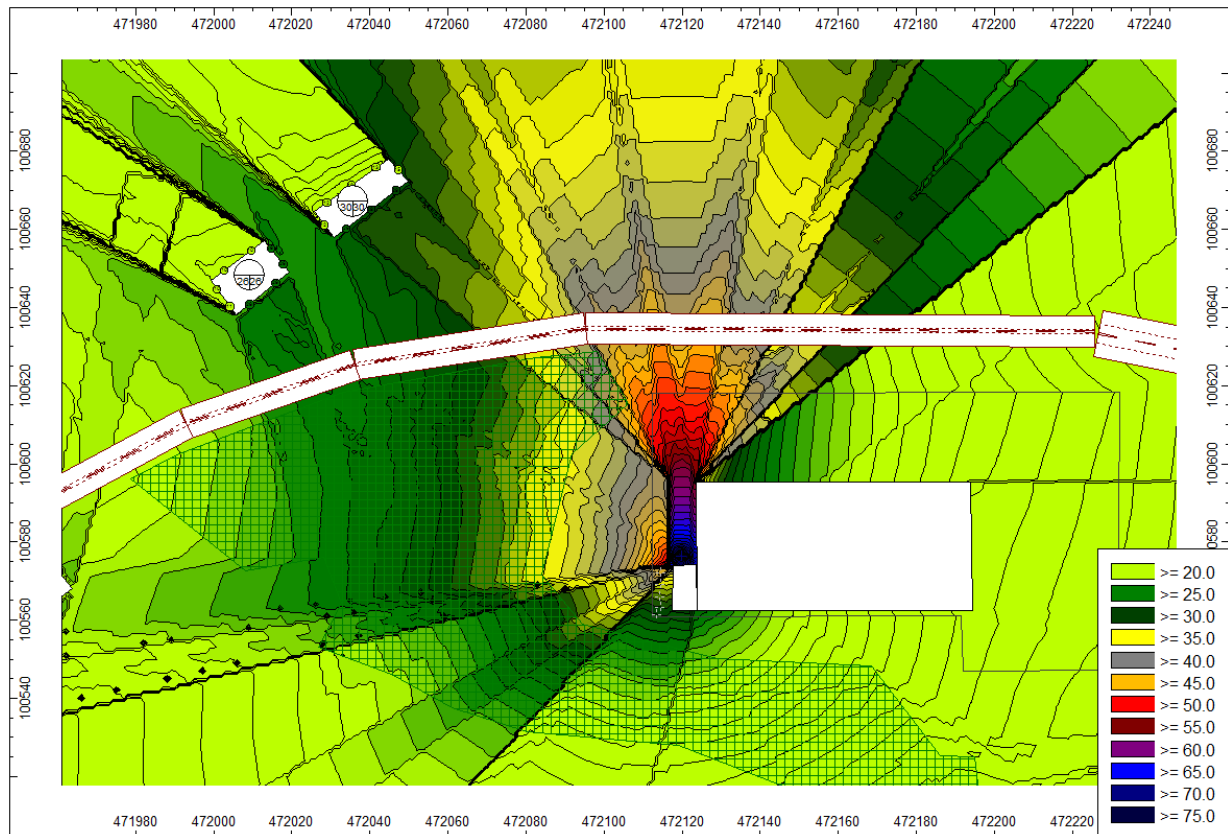


Figure 7: Vehicle Arrival Equivalent Sound Level $L_{Aeq}(15 \text{ minutes})$

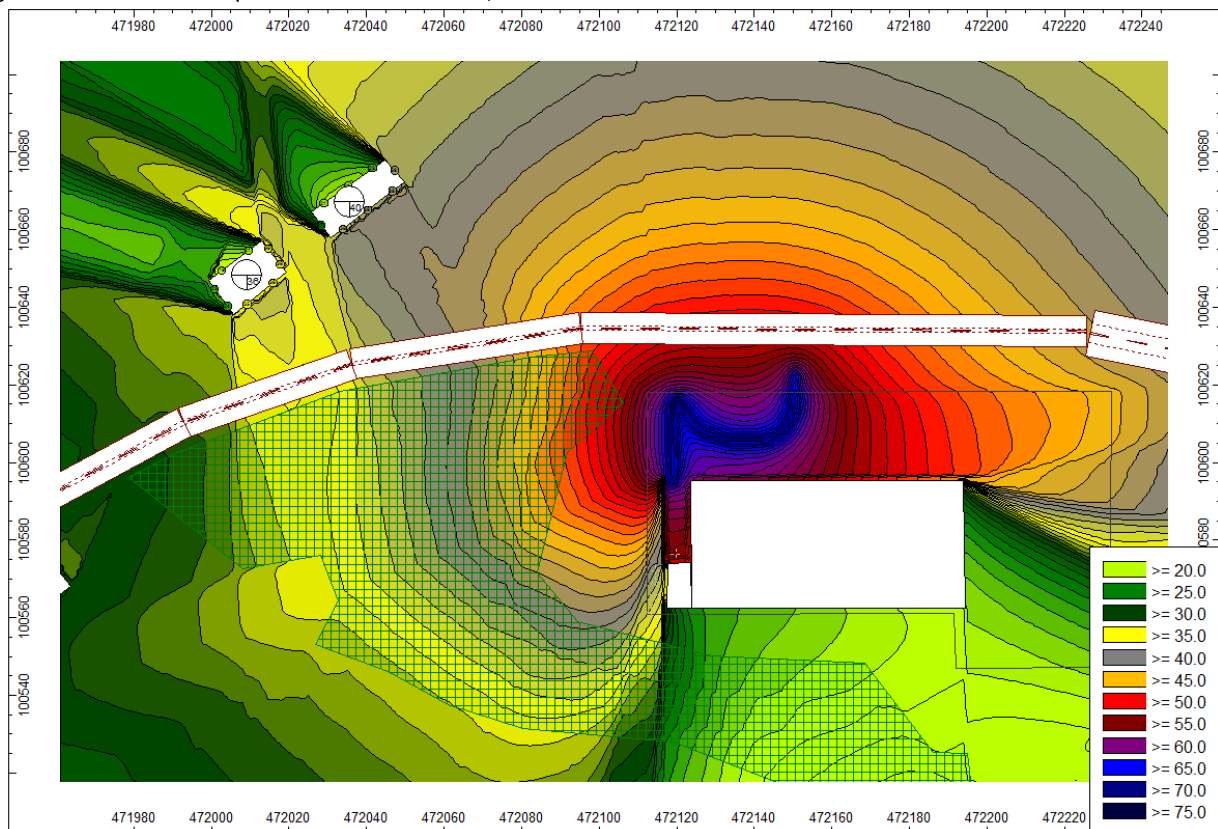
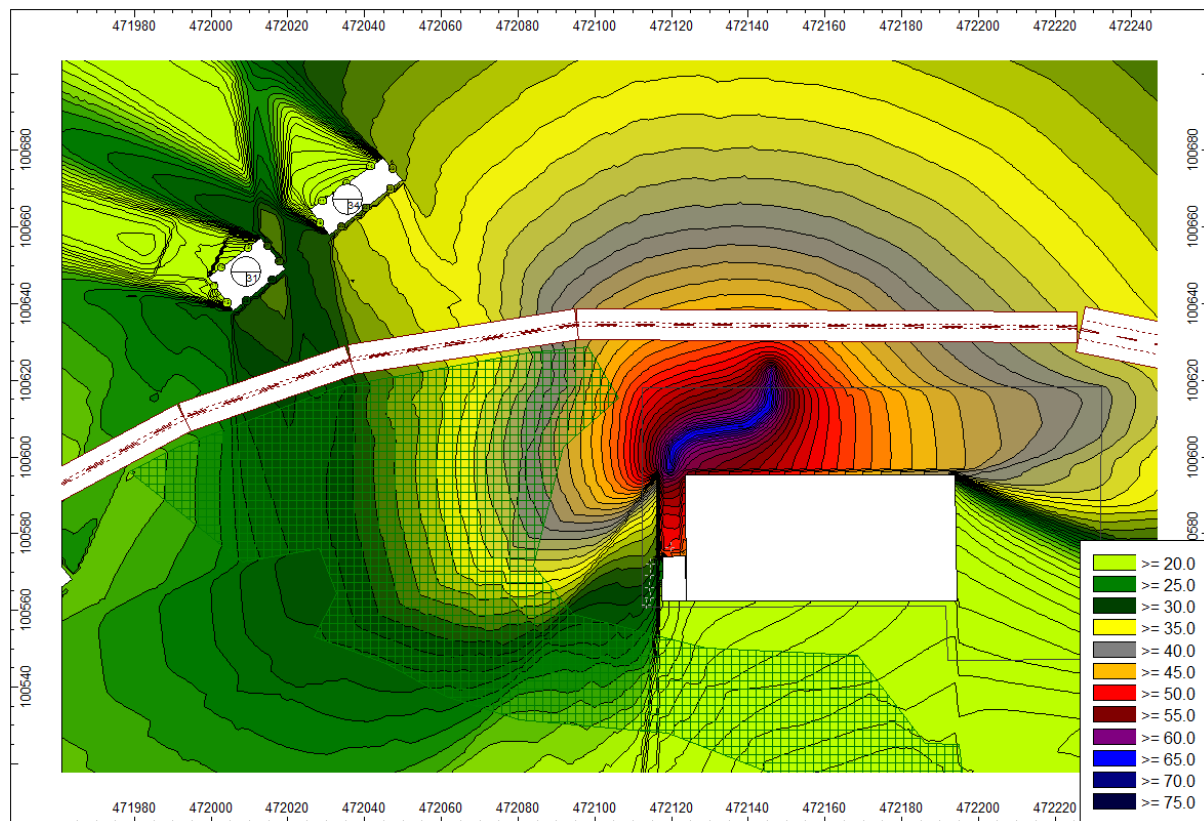


Figure 8: Vehicle Departure Equivalent Sound Level $L_{Aeq}(15 \text{ minutes})$ 

The results are summarised below.

Table 10: Predicted Free-field Level Delivery Specific Sound Levels $L_{Aeq}(15 \text{ minutes})$

Activity	Receiver R2
Unloading	30 dB
Arrival	40 dB
Departure	34 dB



7.5. Unloading Operation British Standard 4142:2014 Assessment

It is considered appropriate to assess the impact of loading/unloading of deliveries in accordance with the methodology of British Standard 4142:2014.

Initial Estimate of Impact

Background Sound Level

From the measured data we have determined a typical worst case design background sound level to 28 dB $L_{A90}(15 \text{ min})$ during the night at a location representative of the noise sensitive receivers.

Specific Sound Level

The cumulative specific sound level at the worst case receiver is 30 dB $L_{Aeq}(15 \text{ minutes})$ (free-field level). This is the level determined at the noise sensitive receivers without any character corrections applied.

Character Corrections

Character corrections should be added to the “specific sound level” if the “specific sound level” exhibits any *tonality, impulsivity, other specific characteristics and/or intermittency* at the assessment location. Based on our site visit the character corrections to be applied are as follows:

Tonality– it is not possible to determine if the plant is tonal. The supplier should ensure this characteristics of the plant is not distinguishable at the noise-sensitive receivers in the area.

Impulsivity –Delivery noise is normally impulsive. Impulsivity has been calculated based on our measurements of delivery noise on Lidl sites, the residual level at the noise-sensitive receiver and the methodology of Annex E of British Standard 4142:2014. Following this methodology the impulsivity correction at receiver R2 is +0 dB.

Intermittency – The delivery operation is intermittent however we do not consider the intermittency will be readily distinguishable against the residual noise climate and no correction is applied.



Other Sound Characteristics – We do not believe a character correction is necessary for other sound characteristics.

Therefore the British Standard 4142:2014 initial estimate at the worst-case time is as follows:

Table 11: British Standard 4142:2014 Initial Estimate

Parameter	Receiver R2
Background Sound Level, L_{A90} (15 minutes)	28 dB
Specific Sound Level, L_{Aeq} (1 hour)	30 dB
Character Correction	0 dB
Rating Sound Level L_{Ar} (1 hour)	30 dB
Difference between rating and background level	+2 dB

This means that the delivery rating noise level will result in a British Standard 4142:2014 assessment 'difference' of +2 dB at the most sensitive receivers and as such is estimated to be of a an adverse impact; however, the context of the site and the receivers needs to be taken into account.

Context of Site

British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

Absolute Levels

- 1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

With regard to 'absolute levels', the most relevant guidance is British Standard 8233:2014.



Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings from noise sources 'without a specific character' and are based on existing guidelines issued by the World Health Organisation in 1999.

The guideline states that noise levels should not exceed those as noted in Table 2 of the British Standard and these are summarised below.

Table 12: British Standard 8233:2014 Internal Ambient Noise Level Criteria

Activity	Location	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Resting	Living Room	35 dB $L_{Aeq,16\text{ hour}}$	-
Dining	Dining Room/area	40 dB $L_{Aeq,16\text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hour}}$	30 dB $L_{Aeq,8\text{ hour}}$

In addition we would also advise the maximum noise levels are considered. However, British Standard provides no definitive criteria for maximum noise levels from individual events ($L_{Amax,F}$).

Section 3.4 of the WHO Guidance (Guidelines for Community Noise) states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night"* (Vallet & Verbey 1991).

The internal level is approximately 15 dB quieter than the external free-field level (as stated by the WHO) allowing for the attenuation of a partially open window. Therefore based on the predicted rating levels noted above, the internal absolute levels are as follows.

Table 13: Comparison with British Standard 8233:2014 at NSR2

Parameter	Predicted External Level dB	Open Window Correction dB(A)	Predicted Internal Level dB(A)	Within Criteria
$L_{Aeq}(15\text{ minutes})$	30	-15	15	YES
L_{AFmax}	51	-15	36	YES

As can be seen from the table above the delivery rating sound level is at least 15 dB lower than the British Standard 8233:2014 criteria for night-time rooms and 9 dB lower of night-time maximum noise lower than the WHO 1999 guideline. Therefore we would consider delivery noise to be suitably controlled to the dwellings in the vicinity when absolute levels are considered.



Residual Noise Climate

British Standard 4142:2014 also states:

- 2.) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it."*

We have compared the residual noise climate, i.e. *the ambient sound at the assessment location when the specific sound source (deliveries) is suppressed to such a degree that it does not contribute to the ambient sound*, to the specific sound level (deliveries) and rating level (delivery noise level with character correction applied) over the worst-case time, the Sunday period.

This summarised below:

Residual Sound Level -	48 dB $L_{Aeq}(15 \text{ minutes})$
Specific Sound Level -	30 dB $L_{Aeq}(15 \text{ minutes})$ at R2
Rating Sound Level -	30 dB $L_{Aeq}(15 \text{ minutes})$ at R2

As can be seen the delivery noise level (with character) is 17 dB lower than the residual sound at R2. We would consider the noise source could not be heard in comparison to baseline residual climate.

Therefore we would consider unloading activities to be of a low impact at all noise-sensitive receivers when compared to the residual noise climate.

Summary of British Standard 4142:2014 Assessment

As can be seen above once context is considered and the noise impact of the delivery operation is compared to the existing noise climate, plus internal noise levels compared to the relevant adopted guidance, then it is clear that unloading activities associated with deliveries will be acceptable when assessed to British Standard 4142:2014.



Observed Effect Level

We would consider the noise impact of the proposed unloading activities associated with deliveries to the Lidl food store to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPPG and NPSE.

7.6. Arrival/Departure of HGV

Assessment Method

There is no specific planning guidance in relation to the arrival and departure of the site vehicles. We would consider the arrival and departure of site vehicles to be outside the scope of British Standard 4142:2014.

We therefore consider it appropriate to determine the impact on the noise-sensitive receivers around the site by comparing existing equivalent noise levels (Night-time $L_{Aeq(15 \text{ minutes})}$) to the predicted equivalent noise levels of the vehicles arriving and departing ($L_{Aeq(15 \text{ minutes})}$). The overall impact is then determined by the change in noise levels as a result of these vehicles.

The following table compares the predicted delivery equivalent noise level with the lowest baseline noise climate and determines the overall impact in accordance with the methodology of the Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment.

Table 14: Difference in Baseline $L_{Aeq(15 \text{ minutes})}$ and Predicted Delivery Vehicle Movements $L_{Aeq(15 \text{ minutes})}$

Vehicle Movement	Baseline $L_{Aeq(15 \text{ minutes})}$	Predicted Equivalent Noise Level $L_{Aeq(15 \text{ minutes})}$	Cumulative $L_{Aeq(15 \text{ minutes})}$ (Baseline + Delivery)	Change in Noise Level
Arrival	48 dB	40 dB	49 dB	+1 dB
Departure	48 dB	34 dB	48 dB	0 dB

As can be seen in the table above, the change between the cumulative equivalent noise levels (due to baseline conditions and vehicle movements) and the ambient baseline equivalent sound levels is no more than 1 dB at the noise-sensitive receivers.

Based on the general 'noise level change' scale of the IEMA guidelines this would equate to an imperceptible change in noise levels, with a negligible impact on Receiver R2



Therefore we would consider the arrival/departure of deliveries to be acceptable in terms of environmental noise emission to the sensitive receivers 24 hours a day.

Observed Effect Level

We would consider the noise impact of the proposed vehicle movements associated with deliveries to the Lidl food store to fall below the No Observed Adverse Effect Level (NOAEL) of the NPPG and NPSE.

We would consider that HGV noise should not be heard, and would not cause any change in behaviour or attitude; as such this achieves the aims of the National Planning Policy Framework (NPPF).



8. Limitations

The report limits itself to addressing solely on the noise control and acoustic aspects as included in this report. We provide advice only in relation to noise and acoustics.

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.



9. Summary & Conclusions

Lidl appointed Acoustic Consultants Limited to undertake a noise survey and an environmental noise assessment for the proposed Lidl Food Store development in support of a planning application.

This report provides noise predictions and a British Standard 4142:2014 noise assessment for the plant and deliveries associated with the Lidl food store on the nearby sensitive receivers around the store.

The noise impact assessment has been undertaken in accordance with the guidance in the National Planning Policy Framework (NPPF), Noise Policy Statement for England (NPSE), National Planning Practice Guidance (NPPG), British Standard 4142:2014 (BS4142) and the IEMA Guidelines for Environmental Noise Impact Assessment.

With the proposed plant and typical delivery operation (with mitigation) we would consider the noise impact of the plant and deliveries on the noise-sensitive receivers around the site to fall below the Lowest Observed Adverse Effect Level (LOAEL) of the NPSE and NPPG and as such achieves the aims of National Planning Policy Framework (NPPF).

Therefore we would consider the plant and delivery noise to be acceptable in terms of environmental noise emission to the sensitive receivers in the area.



ACOUSTIC CONSULTANTS LTD

Raleigh House, Wellsway, Keynsham, Bristol BS31 1HS

T: 0117 986 2956 E: mail@acoustic-ltd.co.uk www.acoustic-ltd.co.uk

Incorporated in the UK as Acoustic Consultants Limited. Registered Office: Raleigh House, Wellsway, Keynsham, Bristol BS31 1HS. Registered No: 8544901.