



ACOUSTIC CONSULTANTS LTD
noise and acoustic specialists since 1987

Noise & Acoustic Report

Lidl Store
Purbrook Way, Havant

Reference: 8470/BL



Client:		Acoustic Consultant:
		 ACOUSTIC CONSULTANTS LTD <i>noise and acoustic specialists since 1987</i>

Document Control

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1 st Issue	--	03/09/20	Blake Lucas	Daniel Oldaker
RevA	Updated with BREEAM	05/10/20	Blake Lucas	Daniel Oldaker
RevB	Updated site plan	23/10/20	Blake Lucas	Daniel Oldaker
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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.

The report limits itself to addressing solely on the external noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. 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.



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1. Introduction

Lidl appointed Acoustic Consultants Limited to undertake an environmental noise assessment for the proposed Lidl food store to be located at a vacant plot of land located off Purbrook Way, Havant.

This report provides a noise assessment of activities associated with the food store, specifically plant and delivery noise, on the nearby sensitive receivers around the site.

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) and British Standard 4142:2014+A1:2019 (BS4142).

The report has also been updated to address the requirements of BREEAM Hea 05 and Pol 05.

The author of this report is a Member of the Institute of Acoustics (MIOA) and has over 13 years' experience in the field of noise, and is considered suitably qualified to undertake this noise impact assessment. The author also meets the BREEAM definition of a suitably qualified acoustic consultant.

2. The Site & Development

The site is a vacant plot of land located off of Purbrook Way, Havant. The site is to the west of the existing B&Q.

Lidl propose to construct a food store on the site with its main noise generating areas (plant/deliveries) on the northern boundary.

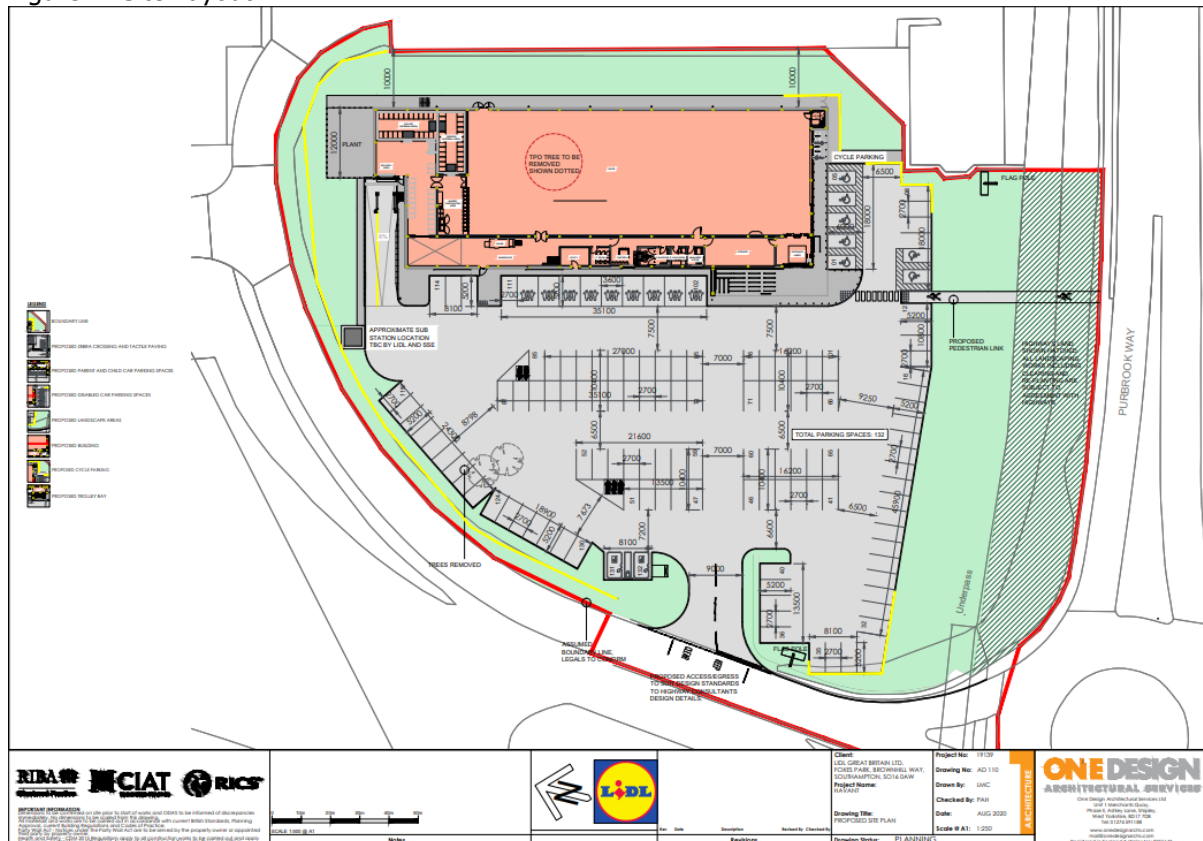
The site lies within a commercial areas. Asda and an Industrial estate to the south, the A3(M) to the west, and the most sensitive dwellings to site noise will be those 450m to the north off of Covert Grove (indicated with a red google pin below).

A google image of the approx. site location and surrounding area is provided in Figure 1 below, the site layout is also provided in Figure 2 below.

Figure 1: Site Location



Figure 2: Site Layout





3. Planning and Noise

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012 and revised in February 2019. Section 15 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning. Paragraph 170 states:

"170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;"*

Paragraph 180 states:

"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation. "*

The document does not prescribe any assessment methodology or criteria to assess the adverse effect 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 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 and applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.



The NPSE sets out the long-term vision of Government noise policy. This long-term vision is supported by three noise policy aims which are as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of 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."*

The NPSE introduces the concept of "Significant adverse" and "Adverse" impacts of noise which relate to the noise policy aims. These are applied as follows:

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.

SOAEL – Significant Observed Adverse Effect Level - This is the level above which significant adverse effects on health and quality of life occur. With regard to where there is potential for noise impact it states the following in relation to the second noise policy aim:

"The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur."

The NPSE does not provide any assessment criteria for the noted effect levels and each case must be considered on its own merits. The NPSE does, however, emphasise that in dealing with noise, Local Planning Authorities are required to take a balanced approach in considering the benefits of development against any adverse effects which arise. Paragraph 2.18 of the NPSE is particularly relevant in this respect and states:

"There is a need to integrate consideration of the economic and social benefits of the activity or policy under examination with proper consideration of the adverse environmental effects, including the impact of noise on health and quality of life. This should avoid noise being treated in isolation in any particular situation, i.e. not focusing solely on the noise impact without taking into account other related factors."



3.3. National Planning Practice Guidance, Noise (NPPG)

The National Planning Practice Guidance (NPPG) on noise, referred to here, is based on the current version (July 2019) 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."*

The document provides generic guidance on how to determine the impact of noise 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 on the following page.

Table 1: NPPG Noise – Perception of Effect Levels

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required
Present 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			
Present 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			
Present 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
Present 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.

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.

The Noise Policy Statement for England (NPSE) states that noise levels above the Lowest Observed Adverse Effect Level are acceptable in planning where reduced to a minimum when taken into account against all other planning considerations.

Section 4 of this report identifies guidance which is considered to provide noise criteria equivalent to effect levels below the Lowest Observed Adverse Effect Level. This is where the perception of noise is “not noticeable” or “noticeable but not intrusive” as indicated in Table 1 above.

3.4. 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. *"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."*

For industrial and commercial noise the most relevant guidance is provided within British Standard 4142:2014+A1:2019. 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 initial estimate 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). Clause 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 Clause 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.

Table 2: BS4142 Difference in Relation to Effect Levels

BS4142 Assessment Difference	Corresponding Effect Level*	Action*
≤-10 dB	No Observed Effect	No specific measures required
-9.9 dB to 0 dB	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level	
0.1 dB to 5 dB	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level	
5.1 dB to 10 dB	Significant Observed Adverse Effect	Avoid
≥10.1 dB	Unacceptable Adverse Effect	Prevent

* BS4142 states that "where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration". Therefore the assessment levels and effect levels above are not definitive and can be modified due to context.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is. BS4142 states:

"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level 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."

The second part of Clause 11 sets out three contextual matters that should be taken into account once the initial numerical estimate has been determined. It is important to note that the three listed is not exhaustive and all pertinent factors should be considered.

4. BREEAM 2018

The relevant design criteria are set out in BREEAM 2018. The noise and acoustic requirements of BREEAM 2018 are the credits within Hea 05 and Pol 05. The credits are outlined below.

4.1. Hea 05

There are three credits within Hea 05. BREEAM 2018 states that:

The following is required to demonstrate compliance:

▼ Up to three credits - Acoustic performance

For all building types, except Residential institutions (short term and long term stay), which have four credits available below.

1 The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:

- 1 a: Sound insulation
- 1 b: Indoor ambient noise level
- 1 c: Room acoustics.

OR

2 A suitably qualified acoustician (SQA) is appointed to define a bespoke set of performance requirements for all function areas in the building. The bespoke performance requirements use the three acoustic principles defined in criterion [Hea 05 Acoustic performance: Criterion 1](#), setting out the performance requirements for each and the testing regime required.

The criteria for a “retail” building are provided in Table 5.18 of Hea 05.

Table 5.18 BREEAM acoustic criteria for Industrial, Retail, Prisons and Other building types

Industrial, Retail, Prisons and Other building types (three credits)	
First credit-Sound insulation	
All room functions	
Criteria	The sound insulation between rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014. Alternatively, propose performance standard based on demonstrably best practice.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology section of this BREEAM issue.
Rooms with specific functions	Educational space (teaching and lecture spaces) refer to Table 5.14 Medical treatment rooms refer to Table 5.15
Second credit – Internal indoor ambient noise levels	
Criteria	Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology section of this BREEAM Issue.
Rooms with specific functions	Education space (teaching and learning spaces) refer to Table 5.14 Medical treatment rooms refer to Table 5.15
Third credit - Room acoustics	
Criteria	Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Section 7 of BS 8233:2014
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology section of this BREEAM issue. For spaces where the acoustic environment is controlled through the use of defined amounts of sound absorption, installation of a specification compliant with the BS 8233:2014 criteria demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.
Rooms with specific functions	Educational space (teaching and learning spaces) refer to Table 5.14 Medical treatment rooms refer to Table 5.15



The following sections outline the minimum performance requirements throughout the Lidl store.

4.1.1.1. Credit 1 – Sound Insulation

The most relevant guidance for the sound insulation between spaces within a food store is provided in British Standard 8233:2014 entitled "Guidance on Sound Insulation and Noise Reduction for Buildings". Section 7.5 entitled "Internal Sound Insulation" states:

"In addition to controlling exterior noise and internal services noise, sound from adjacent spaces can affect the intended use, depending on the noise activity, noise sensitivity and privacy requirement. A matrix may be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space are established (see 7.2). An example matrix, which can be adapted according to the specific building use, is given in Table 3. Each room may be both a source and a receiving room. Where adjacent rooms have different uses, the worst case sound insulation should be specified."

Table 3 Example on-site sound insulation matrix (dB $D_{nT,w}$)

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 ^{A)}
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 ^{A)}
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 ^{A)}
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

NOTE Background noise can also influence privacy. See also 7.7.6.3.

^{A)} $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

The full criteria is provided below:

Solid Walls

Based on the British Standard 8233 matrix above we would advise that the following on-site sound insulation requirements are met between all of the following spaces of the development where there are no doors, vision panels or openings within the partition.



Table 3: Airborne Sound Insulation Criteria

Source Room	Receive Room	Minimum Airborne Sound Insulation, D_{nTw} dB
Canteen	IT room	37
Cash room	WC	
Cloakroom	Cash room	
Managers office	Cash Room	
Managers office	Store	

4.1.2. Corridor Walls

We would recommend that the walls with doors in them such as the Managers Office/Cash Office, Cloakroom and Staff Room should achieve a minimum sound reduction index ' R_w ' rating of 40 dB.

4.1.3. Doors

We would recommend that the doors leading from the acoustically sensitive spaces such as the Managers Office/Cash Office, Cloakroom and Staff Room should achieve a minimum sound reduction index ' R_w ' rating of 30 dB.

The door sets should be selected with verifying test data conforming to British Standard EN ISO 140-3:1995 and British Standard EN ISO 717-1:1997 or any future equivalent versions of these standards.

The doors between the warehouses, sales and warehouse and changing rooms/toilets and corridors have no acoustic requirement.

4.2. Credit 2 – Indoor Ambient Noise Levels

The most relevant guidance for Internal Ambient Noise Levels within the spaces of a food store is provided in British Standard 8233:2014 entitled "Guidance on Sound Insulation and Noise Reduction for Buildings". Section 7.7.4 entitled "Spaces in non-domestic buildings when they are unoccupied" provides design criteria for unoccupied rooms within Table 6.

The most applicable criteria derived from British Standard 8233:2014 is provided below. The criteria below provide the cumulative level of both external sources outside (such as road traffic) and building services. The $L_{Aeq,1hr}$ is the relevant criterion derived from BS8233:2014 and the NR level is to be used for guidance only.



Table 4: Maximum Indoor Ambient Noise Levels

Type of Room	Criteria	
	L _{Aeq,1hr}	NR Level
Cash Room	≤40 dB	≈NR35
IT Room		
Canteen		
Manager's Office		
WC	≤55 dB	≈NR50
Cloakroom		
Warehouse		
Bakery Prep		
Sales Area		

4.3. Credit 3 – Reverberation Time

British Standard 8233:2014 does not provide any performance criteria in terms of reverberation time control within a food store. As such, we have used our experience for other similar sites to set the reverberation time limits.

The limits considered relevant to the Lidl stores are described below. The Reverberation Time (T_{mf}) criteria is the arithmetic average of the mid frequency bands (500 Hz, 1KHz, and 2 KHz).

Table 5: Maximum Reverberation Time

Type of Room	Reverberation Time Criteria T_{mf} (seconds)
Managers Office	≤1.0
Cash Office	
IT Room	
Toilet	≤1.5
Staff Room	
Cloakroom	
Warehouse/Bakery Prep	≤2.0
Sales Area	



4.4. **Pol 05**

As follows is the relevant passage of the Pol 05 credit requirements for this development in BREEAM 2018.

Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014¹ is commissioned. Noise levels must be measured or determined for:

2.a: Existing background noise levels:

2.a.i at the nearest or most exposed noise-sensitive development to the proposed assessed site

2.a.ii including existing plant on a building, where the assessed development is an extension to the building

2.b: Noise rating level from the assessed building.

The noise impact assessment must be carried out by a suitably qualified acoustic consultant.

The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.

If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion.

5. Noise Monitoring

A noise monitoring exercise was undertaken during the worst case time (night-time period) on the 10th August 2020 to determine the baseline noise climate at a location representative of the noise sensitive dwellings.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a sound level analyser with half-inch condenser microphone, using the 'fast' setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2017 entitled "General requirements for the competence of testing and calibration laboratories"; in accordance with British Standard EN 10012:2003 "Measurement management systems. Requirements for measurement processes and measuring equipment"; and traceable to the National Standards. This equipment was checked and calibrated as noted below.

Table 6: Monitoring Equipment

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-11053-E0	22/04/2020	34610
Pre-Amp, NTI, MA220	5871	22/04/2020	34610
Microphone, NTI, MC230A	9276	22/04/2020	34609
Calibrator, Nor-1251	35227	27/08/2019	32692

The measuring systems were checked for calibration before and after the tests. No drift was detected.

5.2. Weather Conditions

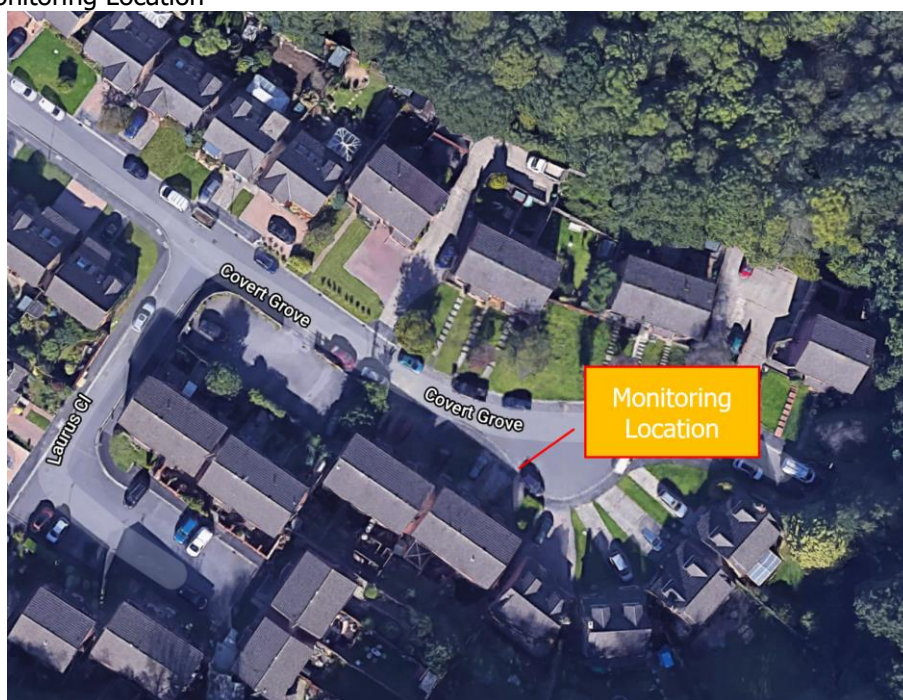
During the monitoring, conditions were dry and calm. Wind speeds were low and did not exceed 5 m/s. The average air temperature during the survey was 20 degrees centigrade.

5.3. Monitoring Procedure

The monitoring location was located on Covert Grove. The microphone was situated on a tripod at a height of 1.5 metres above ground in a free-field position. The monitoring position is considered representative of the sensitive receivers in the area. The baseline noise levels affecting the noise sensitive receivers in the area were determined primarily by road traffic along the surrounding roads and distant traffic from the A3(M).



Figure 3: Monitoring Location



5.4. Measured Baseline Noise Levels

The full 15-minute A-weighted baseline background sound levels and equivalent noise levels are provided in the table below:

Table 7: Variation in Noise Levels (free-field levels)

Date	Time	L _A F _{max} dB	L _A eq dB	L _A F ₉₀ dB
10/08/2020	21:45:00	69.5	47.9	43.8
10/08/2020	22:00:00	77.7	49.7	42.6
10/08/2020	22:15:00	56.4	44.3	41.3
10/08/2020	22:30:00	51.8	43.5	40.6
10/08/2020	22:45:00	47.2	42.4	39.4
10/08/2020	23:00:00	57.1	42.2	37.7
10/08/2020	23:15:00	53.8	42.4	37.4
10/08/2020	23:30:00	45.4	39.8	35.5
10/08/2020	23:45:00	58.8	41.8	35.0

We have determined a daytime background noise level of 41 dB L_{A90(1hr)} and night-time of 35 dB L_{A90(15min)}.

6. Plant Noise Assessment

6.1. Proposed Plant

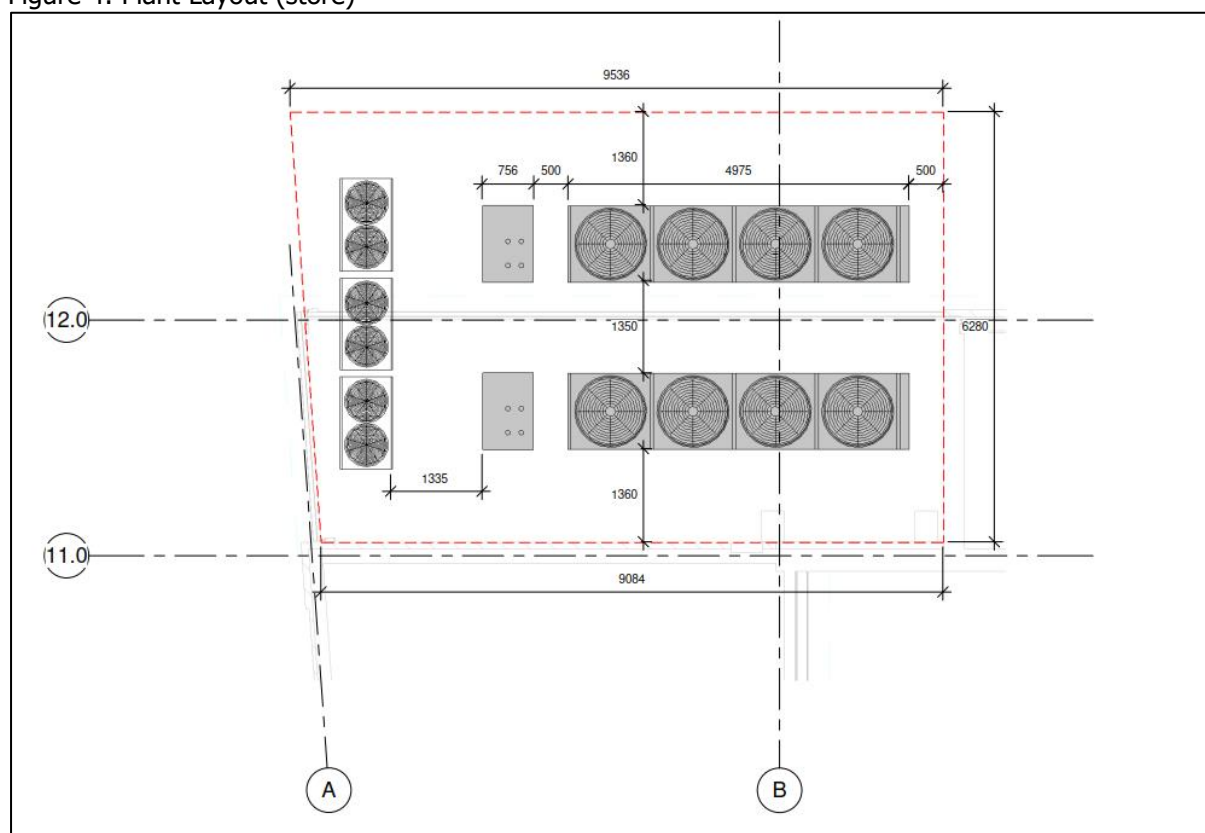
We have been advised that the proposed plant is as follows. It should also be noted that any changes to the schedule or the location or layout of the plant will affect the predicted levels at the receiver points around the site and, as such, will need reassessing.

Table 8: Plant Noise Data (serving store)

Plant	No.	Sound Pressure Level (dBA)	Sound Power (dBA)
VRF Heat Pump	3	61 @ 1m	72
Drycoolers	2	44 @ 5m	69
Pumping Station	2	43 @ 1m	54
Cumulative			78

We have been advised the plant serving the store will follow the layout below:

Figure 4: Plant Layout (store)



6.2. Predicted Specific Sound Level

The plant noise emission has been undertaken using the standard formulas for noise propagation to the dwellings 450m to the north.

6.2.1. Distance Attenuation

The nearest residential receiver is 450 metres away from the plant, so the attenuation of sound over distance needs to be calculated.

Outdoor noise propagation from a point source, with an allowance for one reflective planes, is calculated using the following formula:

$$L_p = L_w - 20 \log(R) - 8$$

Where 'L_w' and 'R' are respectively the known sound power level and the distance from the receiver; 'L_p' is the level at the noted distance.

This gives an attenuation due to distance and reflections of -61dB.

6.2.2. Barrier Attenuation

We have not included for any barrier attenuation.

6.2.3. Predicted Level at Receiver

Taking into account the above the predicted free-field level at the nearest dwelling is 17 dB L_{Aeq(T)}.

6.3. Plant Assessment

A British Standard 4142:2014+A1:2019 assessment has been undertaken at the sensitive receivers on the site.

6.3.1. Background Sound Level

We have determined a daytime background noise level of 41 dB L_{A90(1hr)} and night-time of 35 dB L_{A90(15min)}.

6.3.2. Predicted Specific Sound Level

The cumulative specific sound level at the worst-case receiver is 17 dB L_{Aeq,15minute} (free-field level). This is the level determined at the noise sensitive receivers without any character corrections applied.

6.3.3. Character Corrections

Character corrections should be added to the 'specific sound level' if it exhibits any *tonality, impulsivity, other specific characteristics and/or intermittency* at the assessment location. Based on our site visit and knowledge of such heating units, corrections to be applied are as follows:

- *Tonality* – From our experience of other Lidl sites their plant is not usually tonal however the supplier and installer of the proposed plant should ensure any tonality is not distinguishable at the noise-sensitive receivers in the area.
- *Impulsivity* – Plant such as this 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. We have also assumed all plant is running continuously within our noise model.
- *Other Sound Characteristics* – We do not believe any correction is due to other characteristics.

6.3.4. Estimate of Impact

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

Table 9: British Standard 4142:2014 initial estimate for NSR

Parameter	Daytime	Night-time
Background Level, $L_{A90, (T)}$	41 dB	35 dB
Specific Sound Level, $L_{Aeq, (T)}$	17 dB	17 dB
Character Correction	+0 dB	+0 dB
Rating Level, $L_{Ar, 15min}$	17 dB	26 dB
Excess of rating over background level	-24 dB	-18 dB

This means that the plant rating noise level at the nearest noise sensitive receiver will result in a 'difference' of -24 dB during the day and -18 dB during the night time period at the nearest noise sensitive receivers.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is.

6.3.5. Context

With regard to context, BS4142 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.

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. We would advise the rating level is considered to allow for the character of the source.

The guideline states that noise levels should not exceed 35 dB $L_{Aeq(16hr)}$ within living rooms during the daytime, 55 dB $L_{Aeq(16hr)}$ in amenity spaces, and 30 dB $L_{Aeq(8hr)}$ within night-time rooms.

The internal level is approximately 15 dB quieter than the external free-field level (as stated by the BS8233:2014 and WHO 1999) 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 10: Comparison with British Standard 8233:2014 at Worst Case Receiver

Location	Predicted External Level $L_{Ar(T)}$ dB	Open Window Correction dB(A)	Predicted Internal Level $L_{Ar(T)}$ dB	Within Criteria
Daytime, façade	17	-15	2	YES
Night-time, façade	17	-15	2	YES

As can be seen from the table above, the internal rating sound level is comfortably below the British Standard 8233:2014 criteria.

6.4. Summary of Assessment

As can be seen above, once context is considered and the noise levels of plant and absolute levels are considered, then it is clear that plant noise will be acceptable and of a low impact during both day and night when assessed to British Standard 4142:2014+A1:2019.

On this basis, we would consider the noise impact of the proposed plant to fall in the Low Observed Adverse Effect Level (LOAEL) of the NPSE and NPPG and achieves the aims of National Planning Policy Framework (NPPF).

The plant assessment also achieves the requirements of BREEAM 2018 Pol 05 and therefore the credit can be awarded.

We consider that noise should not be considered a material constraint in determining the plant noise aspects of the planning application.



7. Delivery Noise Assessment

7.1. Summary of Delivery Operation

The vehicle will access the site from the south, along B&Q access route. All deliveries are to be via the delivery bay ramp to the northern part of the site. The arrival, unloading of goods and departure of the delivery vehicle also has the potential to affect the residential receivers around 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 loading area. 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 about one hour. In most stores there are 2-3 deliveries a day.

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. We have found that the noise level of a delivery operation does not vary significantly from site to site as the operation and site conditions are always the same. The measured noise levels of a typical Lidl delivery operation are as follows; these are free-field levels at a distance of 10 metres. The measured levels include reflections off the store building.

Table 11: Typical Delivery Operation Noise Emission

Duration, T (min)	L _{Aeq(T)} (dB)	Activity at 10m
5	61	HGV Arrive
60	58	HGV unloading
2	63	HGV Depart
Cumulative L _{Aeq(15min)} *	60	HGV Arrive + unloading

* Assumes arrival and unloading only at night.

7.3. Predicted Specific Sound Level

The delivery noise emission has been undertaken using the standard formulas for noise propagation to the dwellings 450m to the north.

7.3.1. Distance Attenuation

The nearest residential receiver is 450 metres away from the delivery area, so the attenuation of sound over distance needs to be calculated.

Outdoor noise propagation from a point source is as follows:

$$A_{div} = 20 \log(R1/R2)$$

This gives an attenuation due to distance of -33dB.

7.3.2. **Barrier and Reflections Attenuation**

We have not included for any barrier attenuation or reflections.

7.3.3. **Predicted Level at Receiver**

Taking into account the above the predicted free-field level at the nearest dwelling is 27 dB $L_{Aeq}(T)$.

7.4. **Delivery Assessment**

A British Standard 4142:2014+A1:2019 assessment has been undertaken at the sensitive receivers on the site.

7.4.1. **Background Sound Level**

We have determined a daytime background noise level of 41 dB $L_{A90}(1hr)$ and night-time of 35 dB $L_{A90}(15min)$.

7.4.2. **Predicted Specific Sound Level**

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

7.4.3. **Character Corrections**

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

- *Tonality* – From our experience of other Lidl sites the delivery noise will not be tonal at the dwellings.
- *Impulsivity* – From our experience of other Lidl sites the delivery noise will not be impulsive at the dwellings.
- *Intermittency* – We do not expect that the intermittency of the delivery 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 any correction is due to other characteristics.



7.4.4. Estimate of Impact

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

Table 12: British Standard 4142:2014 initial estimate for NSR

Parameter	Night-time
Background Level, $L_{A90, (T)}$	35 dB
Specific Sound Level, $L_{Aeq, (T)}$	27 dB
Character Correction	+0 dB
Rating Level, $L_{Ar, 15min}$	27 dB
Excess of rating over background level	-8 dB

This means that the delivery rating noise level at the nearest noise sensitive receiver will result in a 'difference' of -8 dB during the night time period at the nearest noise sensitive receivers.

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is.

7.4.5. Context

With regard to context, BS4142 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.

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. We would advise the rating level is considered to allow for the character of the source.

The guideline states that noise levels should not exceed 35 dB $L_{Aeq(16hr)}$ within living rooms during the daytime, 55 dB $L_{Aeq(16hr)}$ in amenity spaces, and 30 dB $L_{Aeq(8hr)}$ within night-time rooms.



The internal level is approximately 15 dB quieter than the external free-field level (as stated by the BS8233:2014 and WHO 1999) 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 Worst Case Receiver

Location	Predicted External Level $L_{Ar(T)}$ dB	Open Window Correction dB(A)	Predicted Internal Level $L_{Ar(T)}$ dB	Within Criteria
Night-time, façade	27	-15	22	YES

As can be seen from the table above, the internal rating sound level is comfortably below the British Standard 8233:2014 criteria.

7.5. Summary of Assessment

From the assessment it can be concluded that the deliveries would be considered acceptable 24 hours a day.

We would consider the noise impact of the proposed unloading and vehicle movements associated with deliveries to the Lidl food store to fall below the Low Observed Adverse Effect Level (LOAEL) of the NPPG and NPSE and deliveries at the site would be acceptable in terms of noise 24 hours a day.

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

It should be noted delivery noise is not a requirement of BREEAM Pol 05.



8. Hea 05 Assessment

8.1. Credit 1 – Sound Insulation

8.1.1. General Comments

All junctions will need to be carefully addressed to ensure there are no flanking weak points in the construction.

All walls should be full height from the floor to the underside of the roof. Detailing of the junctions between all walls and the underside of the roof will need to be addressed. The partition should have no gaps and sealed with a bead of dense non-setting mastic.

Any vision panels separating spaces should be carefully considered to ensure the internal sound insulation criterion is met.

A steel frame can transfer sound through the structure and adversely affect the performance of the sound insulating elements. It will be necessary to address this, including isolating the steel structure from the walls.

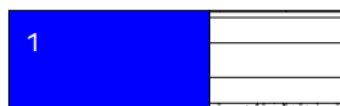
As follows are the typical Lidl wall constructions:

8.1.2. Partition to achieve 37 dB $D_{nT,w}$ and 40 dB R_w

To achieve a sound level difference ' $D_{nT,w}$ ' of at least 37 dB the standard Lidl separating is constructed as follows:



70mm metal stud - 15mm
Duraline each side.



Metal stud twin frame - 15mm
Duraline each side. (o/a width
varies subject to cavity) - see
setting out drawings for o/a widths

The proposed partitions should typically achieve the following minimum sound reduction indices:

Table 14: Typical Minimum Sound Reduction Indices of Internal Partitions

Partition Type	Frequency						R_w
	125	250	500	1k	2k	4k	
Type 1, R (dB)	19	31	44	52	47	45	42

Partitions should be selected with verifying test data conforming to British Standard EN ISO 140-3:1995 and British Standard EN ISO 717-1:1997 or any future equivalent versions of these standards.

8.1.3. **Doors**

Where the door opens into sensitive area there is a requirement for the door to provide a reasonable level of sound insulation. There are two options for satisfying this requirement.

Either

Select a door-set which is supplied with laboratory test data verifying a minimum performance of 30 dB R_w (when tested in accordance with ISO 140-3 1997 and rated in accordance with ISO 717-1:1997).

Or

Ensure the doors used have a minimum mass of 25 Kg/m² and are fitted with good perimeter seals (including the threshold where practical). The door seals should be acoustically rated to ≥ 30 dB R_w .

8.2. **Credit 2 – Indoor Ambient Noise Levels**

8.2.1. **Façade Noise Levels**

Typically, on a site exposed to facade noise levels of up to 65 dB $L_{Aeq,1hour}$ the Lidl developments can be fitted with the Lidl standard glazing and external façade construction.

It has not been possible to complete the baseline noise survey at the development due to poor weather conditions since appointment. However based on Extrium Noise Mapping the noise levels at the façade will be close to this limit and it is expected the Lidl standard specification will be acceptable.

On this basis, Hea 05 Credit 02 can be achieved using the standard Lidl glazing and external façade constructions. However, noise ingress through the mechanical ventilation system should also be considered. This is addressed below.

8.2.2. **Ventilation**

All spaces of the development are to be ventilated mechanically. Noise ingress through the atmospheric terminals has the potential to influence the internal ambient noise climate within sensitive rooms across the scheme.



To control external noise, we would advise that the ventilation system achieves a sound level difference of at least 40 dB(A) between the atmosphere and internal spaces if ventilating fronting the road.

The ventilation and air conditioning system will also need to be designed to ensure building services noise does not impact on the overall noise levels within the spaces.

To ensure the BREEAM limits are not exceeded, we would advise that the noise from all building services plant should be at least 3 dB below the NR limits above in Section 4.2 within the sensitive spaces of the development.

The M&E installer/supplier should confirm that the above noise limits are achievable.

8.3. **Credit 3 – Reverberation Time Control**

The standard Reflected Ceiling Plan for Lidl stores defines ceiling type, i.e. lay in grid or plasterboard, however does not define Ceiling Class.

To achieve the BREEAM criteria within the staff room to achieve the above criteria, a **Class C** sound absorbent ceiling tile covering the full ceiling area should be used. The ceiling class should be determined when tested to British Standard EN ISO 11654:1997.

Within the shop floor above criteria has been shown to be achieved with a profile metal deck.

Within the offices the above criteria can be met with a plasterboard ceiling.

8.4. **Hea 05 Summary**

The advice demonstrates that with a suitably constructed building, the BREEAM Hea 05 credits can be met. Testing at completion is a requirement to achieve these credits. The construction should be undertaken carefully to ensure compliance.



9. Summary and Conclusions

Lidl appointed Acoustic Consultants Limited to undertake an environmental noise assessment for the proposed Lidl food store to be located at a vacant plot of land located off Purbrook Way, Havant.

This report provides a noise assessment of activities associated with the food store, specifically plant and delivery noise, on the nearby sensitive receivers around the site.

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) and British Standard 4142:2014+A1:2019 (BS4142).

The report has also been updated to address the requirements of BREEAM Hea 05 and Pol 05.

After assessing the proposed development we would consider the development noise to be acceptable in terms of environmental noise emission, to the sensitive receivers in the area and noise mitigation is not a requirement for the scheme to meet the requirements of planning or BREEAM Pol 05.

In terms of Hea 05 the assessment indicates that Hea 05 can be met with standard Lidl constructions. Testing at completion will be necessary to determine compliance.



10. Detailing, Workmanship & Verification

Noise control predictions have been based on the constructions as listed in this report with no allowance made for weak points. Small weaknesses in the fabric design and/or installation are likely to significantly reduce the predicted noise control performance. Predictions are based upon the best available information with regards to the performance of the building materials and systems.

It is therefore necessary to ensure that all detailing is carefully designed so that there are no weak points present. All brick and blockwork joints should be completely in-filled with mortar. It is also necessary to provide comprehensive site construction checks to ensure that the installation matches the design intent.

In general terms it should also be noted that there should be no gaps in the constructions and that all components should be carefully sealed airtight using suitable dense non-setting mastics (NOT FOAM) where appropriate. All walls, unless noted otherwise, should run the full height up to the slab soffit or underside of the roof. The details at these joins will require careful consideration.

All the elements should be constructed in accordance with the manufacturer's recommendations.

In terms of achieving the acoustic requirements of particular elements as noted in this report, the only contractual link is between the Contractor (the Builder) and Supplier. As such, it is very important that all purchase contracts include for the particular elements to comply with the acoustic requirements as noted in this report.

The verification should be in accordance with the appropriate British Standard or International Standards Organisation Standards. Weighted sound reduction indices (R_w) should be measured in accordance with British Standard EN ISO 140-3:1995 and rated in accordance with British Standard EN International Standards Organisation 717-1:1997. Sound absorption coefficients should be in accordance with International Standards Organisation 354 and rated in accordance with British Standard EN ISO 11654:1997.



11. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure p_A – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network

A-weighted sound pressure level, L_{pA} – quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$$L_{pA} = 10 \log_{10} (p_A/p_0)^2$$

where:

p_A is the A-weighted sound pressure in pascals (Pa);

p_0 is the reference sound pressure (20 μ Pa)

Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10 \log_{10} \left\{ (1/T) \int_{t_1}^{t_2} [p_A(t)^2/p_0^2] dt \right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 μ Pa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.



Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Specific sound level, $L_s = L_{Aeq,Tr}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

Rating level, $L_{Ar,Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.



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