SHARPS REDMORE

ACOUSTIC CONSULTANTS

Report

Land at Plover Road, Minster, Isle of Sheppey

Noise assessment of a proposed mixed used residential and retail development

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1.0 Introduction

1.1 Sharps Redmore (SR) was instructed by Dalemarch (Sheppey) Ltd and Asda Stores Ltd to undertake an environmental noise assessment of a proposed residential and Asda development at Plover Road, Minster. The proposal includes an outline planning application for approximately 100 dwellings and a detailed planning application for an Asda store with four satellite retail units, with associated car parking and a service yard. A site location plan is attached as Appendix A

1.2 The site is currently a green field site bordered by Parish Road to the north and the properties off Plover Road to the south. The proposal is for the Asda store and four retail units to be located towards the southern end of site adjacent to Plover Road and accessed off Yarrow Drive. The closest existing properties to the proposed retail uses will be those in Yarrow Drive and Mimosa Avenue (off Plover Road).

1.3 This assessment is based on the following BDB Design architects drawings:

- Proposed site plan drawing 2279-101G;
- Proposed Asda elevations drawing 2279-104G;
- Proposed Asda elevations drawing 2279-105F;
- Proposed retail units pland and elevations drawing 2279-106C;
- Proposed street elevations drawing 2279-107D;
- Proposed residential layout drawing 2279-108.

1.4 The objective of the assessment is to determine how noise that may be generated as a result of the proposal would affect residential amenity of both existing and future residences.

1.5 Section 2 of this report contains a discussion of the available methods of assessment and assessment criteria.

1.6 Section 3 of this report presents details of the environmental noise survey undertaken at the site.

1.7 An assessment of the proposed residential element of the development is presented in Section 4. The different components of Asda/retail unit operational noise are considered in sections 5 to 8; the assessment conclusions are contained in section 9.

1.8 A guide to the acoustic terminology used in this report is shown in Appendix F.

2.0 Assessment methodology and criteria

2.1 The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 123 of the NPPF states the following:

Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts[27] 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 business wanting to develop in continuance of their business should not have unreasonable restrictions put on them because changes in nearby land uses since they were established;[28] and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

2.2 It can be seen that the NPPF reinforces the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, 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."

[27] See Explanatory note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).

[28] Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.

2.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

2.4 It is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

i) The effect may be determined by reference to guideline noise values. British Standard (BS) 8233:2014 and World Health Organisation (WHO) "*Guidelines for Community Noise"* contain such guidelines.

ii) Alternatively, the impact may be determined by considering the change in noise level that would result from the proposal, in an appropriate noise index for the characteristic of the noise in question. There are various criteria linking change in noise level to effect. This is the method that is suited to, for example, the assessment of noise from road traffic because it is capable of displaying impact to all properties adjacent to a road link irrespective of their distance from the road.

iii) Another method is to compare the resultant sound level against the background sound level (L_{A90}) of the area. This is the method employed by BS 4142:2014 to determine the significance of sound impact from sources of industrial and/or commercial nature. The sources that the new standard is intended to assess are sound from industrial and manufacturing processes, sound from fixed plant installations, sound from loading and unloading of goods at industrial and/or commercial premises and the sound from mobile plant and vehicles, such as forklift, train or ship movements.

Guideline noise values

2.5 There are a number of guidance documents that contain recommended guideline noise values. These are discussed below.

2.6 British Standard 8233:2014 is principally intended to assist in the design of new dwellings; however, the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.

2.7 The WHO guideline values are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological or physiological effect.

2.8 The World Health Organisation/BS 8233 guideline noise values are summarised in the following table:

TABLE 1: WHO/BS 8233 guideline noise values

Document	Level	Guidance
World Health Organisation "Community Noise 2000"	L_{AeqT} = 55 dB	Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	L_{AeqT} = 50 dB	Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	L_{AeqT} = 35 dB	Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	L_{AeqT} = 30 dB	Sleep disturbance, night-time (indoors)
	L_{AMAX} = 60 dB	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
	L_{AMAX} = 45 dB	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)
BS 8233:2014 "Sound Insulation and noise reduction for buildings"	L_{AeqT} = 55 dB	Upper limit for external steady noise. (gardens and patios).
	L_{AeqT} = 50 dB	Desirable limit for external steady noise. (gardens and patios).
	$L_{Aeq\ 16\ hours}$ = 35 dB	Resting, living room day. (Internal – steady noise)
	$L_{Aeq\ 16\ hours}$ = 40 dB	Dining, dining room day. (Internal – steady noise)
	$L_{Aeq\ 16\ hour}$ = 35 dB	Sleeping, bedroom day (Internal – steady noise)
	$L_{Aeq\ 8\ hours}$ = 30 dB	Sleeping, bedroom night (Internal – steady noise)

2.9 For L_{AeqT} criteria the time base (T) given in the documents is 16 hours for daytime limits and 8 hours for night time limits. When assessing impact, this has the tendency to smooth out the hourly variations in noise level. As such, our calculations are carried out to a 1 hour time base, which is a more stringent assessment than is given in the guidance documents.

Changes in noise level

2.10 Changes in noise levels of less than 3 dBA are not perceptible under normal conditions and changes of 10 dBA are equivalent to a doubling of loudness. This guidance has been accepted by inspectors, at inquiry, to encompass changes in noise levels in the index L_{AeqT}.

2.11 The following table shows the response to changes in noise (known as a semantic scale):

TABLE 2: Change in noise level

Change in noise level L_{AeqT} dB	Response	Impact
<3	Imperceptible	None
3 – 5	Perceptible	Slight/moderate
6 – 10	Up to a doubling	Moderate/significant
11 – 15	More than a doubling	Substantial
>15	-	Severe

Assessment using BS 4142:2014

2.12 As outlined, this British Standard enables the significance of sound impact to be determined in relation to industrial and commercial sources. The significance of sound impact is to be determined according to the following summary process:

i) Determine the background sound levels, in terms of the index L_{A90}, at the receptor locations of interest.

ii) Determine the specific sound level of the source being assessed, in terms of its L_{AeqT} level (T = 1 hour for day or 15 minutes for night), at the receptor location of interest.

iii) Apply a rating level acoustic feature correction if the source sound has tonal, impulsive, intermittent, or other characteristics which attract attention.

iv) Compare the rating sound level with the background sound level; the greater the difference between the two, the higher the likelihood of adverse impact.

v) A difference (rating – background) of around +10 dB is an indication of significant adverse impact, depending on the context; a difference of +5 dB is an indication of an adverse impact, depending on the context. 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 upon context.

vi) The general intent of the planning system is to ensure that a development does not result in "significant adverse impacts on health and quality of life." BS 4142:2014 considers that the threshold of significant adverse impact is "a difference around +10 dB or more … depending upon the context". However the NPPF and NPPG state that where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement *"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur"*.

2.13 BS 4142:2014 is a radical departure from the assessment methodology of the former 1997 Edition. There are a number of key changes to BS 4142:2014 that are worthy of consideration in the 'context' of this noise assessment; these are:

- Sound and noise;
- Title/Scope;
- Context;
- Acoustic feature corrections;
- Uncertainty.

Sound and noise

2.14 Throughout the 2014 version of BS 4142 great care is taken to use the word 'sound' as opposed to 'noise'. The foreword to the new version explains that "*response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood. This edition of the standard recognizes the importance of the context in which a sound occurs. Great care has, therefore, been taken in the use of the words "sound" and "noise". Sound can be measured by a sound level meter or other measuring system. Noise is related to a human response and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive*.

Title/Scope

2.15 The 2014 edition of BS 4142 is entitled *"Methods for rating and assessing industrial and commercial sound"*; this is different to the former 1997 version of BS 4142 which was entitled *"Method for Rating industrial noise affecting mixed residential and industrial areas"*.

2.16 The scope to the 1997 edition limited the standard to the rating of noise from factories, or industrial premises, or fixed installations, or sources of an industrial nature in commercial premises to determine the likelihood of complaint. The scope of BS 4142:2014 has been broadened to provide a method for rating and assessing sound of an industrial and or commercial nature. The scope now specifically includes sound from industrial and manufacturing processes, sound from fixed plant, sound from loading and unloading of goods at industrial and commercial sites and mobile plant forming an intrinsic part of the overall sound from a premises or process.

2.17 Sharps Redmore has contended over the past 20 years that the assessment of delivery activity and other non-industrial type noise sources should not be carried out using the BS 4142 assessment methodology. There were both strong textual and technical reasons for maintaining this position.

2.18 The textual reason was in the title of BS 4142; the 1997 version was titled *"Method for rating industrial noise affecting mixed residential and industrial areas."* I do not believe that noise from a retail delivery event is industrial in nature, nor can a retail store be classed as an industrial noise source. BS 4142: 1997 is explicitly clear in that BS4142: 1997 should be used for assessing industrial noise. The scope to BS4142:1997 limits the application of the assessment method to "*noise levels from factories, or industrial premises, or fixed installations, or sources of an industrial nature in commercial premises*". Whilst it was reasonable to consider fixed plant equipment associated with a retail development as "*sources of an industrial nature in commercial premises";* the same could not be said in relation to delivery event noise.

2.19 The technical reasons were that BS 4142: 1997 is intended as a guide to assessing steady or pseudo-steady noise, such as that from machinery (originally intended to be for factory installations). Upon review of the first edition of BS 4142, published in 1967, it is quite evident that it was intended to assess the likelihood of complaints from fixed plant machinery and factories. This was still borne out in the 1997 version of the document with all four examples presented in Annex A relating to noise from factory installations.

2.20 Perhaps the most important aspect in considering the applicability of BS 4142 to the assessment of loading and unloading (delivery activity) noise was the fact that the 1997 (and earlier editions) were not based on any substantive research on human response to industrial noise sources. The Foreword to the 1997 version states *"the user is reminded that this standard is not based on substantive research but rather on accumulated experience"*.

2.21 During the formal consultation process of the draft version of BS 4142:2014 it was identified that the basis for the proposed draft BS 4142 was also "accumulated experience" rather than research into human response to different types of noise source. The main concern with this is whilst weight can be given to almost 50 years accumulated experience in relation to the assessment of industrial type noise sources using BS 4142 (with the first version being issued in 1967), the same cannot be said when the scope of the Standard is extended to specifically include loading and unloading activity at industrial/commercial premises. In the foreword to BS 4142:2014 it explains that some aspects of the standard are based on research undertaken since the publication of the previous version. Further 'NOTE 3' to section 11 in BS 4142:2014 states "*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.*

2.22 However, upon closer inspection of the Bibliography to the document, there appears to be no specific research undertaken with regard to noise from unloading or loading activities at commercial premises (for example, deliveries to a retail store or similar, which are likely to be fairly common applications of BS 4142:2014). Any broadly relevant examples are made in the context of existing industrial premises; this is a key point in relation to 'context', upon which we comment next.

Context

2.23 BS 4142:2014 introduces the concept of '*context*' to the process of identifying noise impact. Section 11 of BS 4142:2014 explains "*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* (my emphasis). A*n 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"* (my emphasis).

2.24 There are many *context* points to consider when undertaking an assessment of sound impact including:

- The absolute level of sound;
- The character and level of the specific sound in the context of the existing noise climate; for example is the sound to occur in a location already characterised by similar activities as those proposed?
- The sensitivity of the receptors;
- The time and duration that the specific sound is to occur;

- The conclusions of assessments undertaken using alternative assessment methods, for example WHO guidelines noise values or change in noise level;

- The ability to mitigate the specific sound through various methods, for example by screening, the selection of quiet plant equipment, the use of attenuators and louvres, through the imposition of noise management plans and good practice, façade design and layout/orientation;

- The form and scale of a development. For example, does the proposed development involve a new industrial or commercial premises being built or is the proposal the installation of new plant or an extension to an existing premises?

2.25 It is therefore entirely possible that whilst the numerical outcome of a BS 4142 assessment is indicative of adverse or significant adverse impact, when the proposal is considered in *context* the significance of the impact is reduced to an acceptable level.

Acoustic feature corrections

2.26 The revised BS 4142:2014 offers an overhaul to the way in which previous editions of the Standard applied a rating penalty for acoustic character. Until the release of the 2014 version, the BS 4142 assessment methodology allowed for the addition of a single 5 dB rating level correction to the specific sound for acoustic features such as tonality, impulsiveness or if the noise was irregular enough to attract attention.

2.27 BS 4142:2014 extensively changes the way in which a rating level correction is to be applied. The new Standard allows up to 6 dB to be added to the specific sound level for tonality, with a rating correction of up to 9 dB to be added depending on the degree of impulsivity; both of these rating level corrections can be added together in linear fashion if required. Where the source is neither tonal nor impulsive but that a feature characteristic is present that makes the sound source readily distinctive a correction of 3 dB can be added. Finally a correction of 3 dB can be applied for intermittency.

2.28 Hence under the methodology of BS4142:2014 noise sources that would formerly have only been corrected by up to 5 dB (using BS 4142:1997), may now be corrected by up to 18 dB which could significantly influence the outcome of the assessment. It is for reasons such as this that the *context* of an assessment is extremely important.

Uncertainty

2.29 The assessment methodology now includes for the issue of uncertainty to be taken into consideration. The Standard explains how to reduce the element of uncertainty through good practice. The new examples in Annex A of the Standard show how uncertainty is to be included in the calculation, however the examples are unclear on how one defines a numerical value to place on uncertainty.

3.0 Noise survey details

3.1 A noise survey was undertaken between Wednesday 3rd September and Thursday 4th September 2014 at a single measurement representative of the noise climate at the closest properties in Mimosa Avenue to the south/east of the proposed Asda store. The measurement location was also representative of the closest proposed residential dwellings to the proposed Asda store (and existing main noise source Plover Road. The measurement location is indicated at Appendix A.

3.2 Noise measurements were taken using a Norsonic 140 sound level meter fitted with environmental microphone kit. The sound level meter was calibrated at the start and end of the measurements and no variation in levels noted.

3.3 Weather conditions during the survey were dry, partly cloudy (20% cover) and warm (20°C) with light and variable winds.

3.4 Noise measurements were made every 5 minutes during the survey. The sound level meter microphone was located in free field conditions at a height of approximately 2 metres above local ground level.

3.5 The purpose of the noise survey was to establish the typical minimum daytime and night time background and ambient noise levels, primarily for use in establishing fixed plant noise level limits in accordance with the guidance in BS 4142:1997, and also what design implications the existing noise climate would have for the proposed residential development.

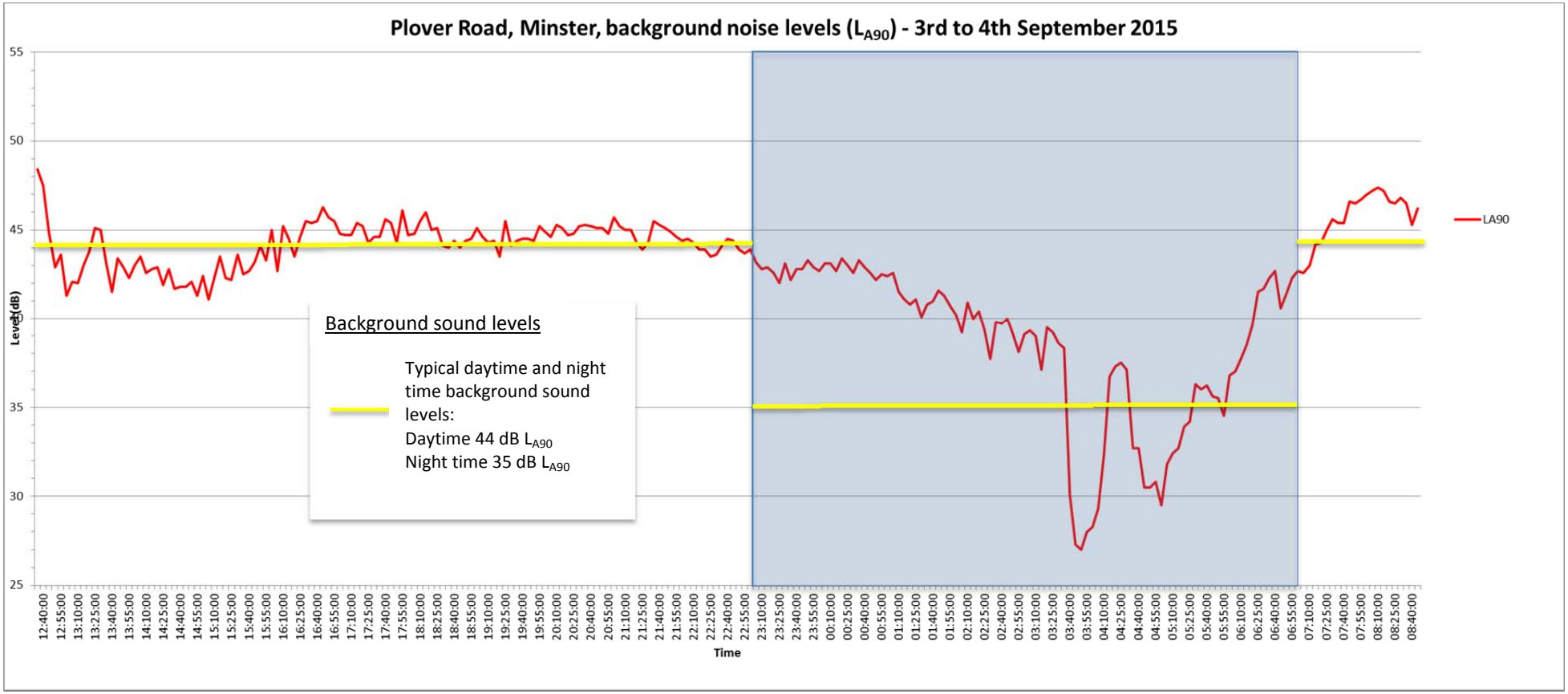
3.6 The noise levels measured during the survey were dominated by local road traffic sources; some construction noise was audible from the residential building works to the north east.

3.7 The results of the noise survey are summarised below and presented in full in Appendix B.

TABLE 3: Summary of measured noise levels

Measured noise levels dB				
Daytime (0700 – 2300)		Night time (2300 – 0700)		
L_{A90}	L_{AeqT}	L_{A90}	L_{AeqT}	L_{Amax}
41.1-48.4	43.9-58.3	27.0-43.9	30.3-55.0	41.8-77.6

FIGURE 1: Identification of 'typical' background noise levels (dB L_{A90}) Wednesday 3rd and Thursday 4th September 2014



4.0 Proposed residential development

4.1 The proposed residential development comprises approximately one hundred dwellings.

4.2 It is proposed that the building envelope and glazing should be specified such that the internal noise levels within the new residential units meet the criteria presented in BS 8233:2014.

TABLE 4: BS 8233 internal noise levels

Room/conditions	Noise level dB
Resting, living room day. (Internal – steady noise)	$L_{Aeq\ 16\ hours}$ = 35 dB
Dining, dining room day. (Internal – steady noise)	$L_{Aeq\ 16\ hours}$ = 40 dB
Sleeping, bedroom day (Internal – steady noise)	$L_{Aeq\ 16\ hour}$ = 35 dB
Sleeping, bedroom night (Internal – steady noise)	$L_{Aeq\ 8\ hours}$ = 30 dB

4.3 The residential planning application is made in outline; the layout is subject to change therefore detailed calculations to establish specific sound insulation for individual properties cannot be undertaken.

4.4 The general calculations presented below are based on the reasonable assumption that the external wall construction provides a sound reduction index at least 10 dB higher than the most onerous glazing performance.

4.5 The noise survey results can be used to assess the noise climate that would affect the proposed residential development. From the measured noise levels the daytime ambient noise level is 51 dB $L_{Aeq\ 16\ hours}$ and the night time level is 45 dB $L_{Aeq\ 8\ hours}$.

4.6 Comparison with the criteria outlined in Table 4 above suggests that in order to reduce internal noise levels to 35 dB during the daytime (living rooms and bedroom), this would require an inside to outside overall reduction of 16 dB. For night time, in order to achieve a level of 30 dB inside bedrooms a reduction of 15 dB would be required, based on the measured night time ambient level of 45 dB $L_{Aeq\ 8\ hours}$.

4.7 Glazing is often specified using an RW value which would typically be around 6 dB [1] higher than the noise level reductions quoted. The glazing requirements will be in the region of R_W=22 dB for daytime and R_W= 21 dB for night-time.

4.8 These glazing requirements may be achieved using a standard double glazed unit. In order to achieve the reductions stated windows will need to be closed and therefore an alternative means of background ventilation will be necessary to satisfy the requirements of Building Regulations. The means of providing alternative background ventilation shall be selected so not to degrade compliance with the internal noise limits in Table 4 when considered in combination with the overall façade.

4.9 Noise from Asda/retail unit operations should be mitigated to the new residential apartments through appropriate screening and façade (glazing) design as required.

4.10 It is recommended that detailed sound insulation calculations are undertaken at the appropriate time (once internal layouts are determined) to ensure internal noise levels comply with the internal noise levels contained in BS 8233:2014. This work can be secured by imposition of suitably worded planning condition.

[1] This is a typical value; detailed calculations will take into account room and glazed area dimensions. This report must not be used for detailed design or procurement purposes.

5.0 Noise from mechanical services plant

5.1 The precise details of the mechanical services and refrigeration equipment (type and noise signature) are not known at this stage; however the proposed site plan drawing indicates that the plant is to be located at ground level on the north side of the Asda store building.

5.2 The closest existing residential properties to the proposed Asda plant area are approximately 40 metres away at Mimosa Avenue to the south. Asda mechanical services plant noise to existing and proposed dwellings will be controlled through a combination of mitigation measures including screening and the selection of intrinsically quiet plant together with the layout, orientation and glazing design of the proposed dwellings.

5.3 The objective assessment of plant sound sources in commercial premises should be undertaken in accordance with British Standard 4142:2014. This Standard enables the resultant sound levels from new plant equipment to be compared against the existing background sound level (L_{A90}) of an area to assess the impact.

5.4 In determining suitable plant sound criteria SR have considered measured background sound levels taken during the noise survey. The graph at Figure 1 indicates that the typical daytime background noise level is 44 dB $L_{A90\ 16\ hours}$ daytime and 35 dB $L_{A90\ 8\ hours}$ at night.

5.5 To ensure that the amenity of local residents would not be affected, it is proposed that the rating level should not exceed the typical measured background sound level. The advice in BS 4142:2014 is that *"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 of having a low impact, depending on the context*" (clause 11, note 'd').

5.6 It is proposed to adopt the following plant noise criteria at the nearest existing residences at Mimosa Avenue (and those at Yarrow Place):

TABLE 5: Proposed plant rating noise limits

Time period	Proposed rating noise level
Daytime	44 dB
Night time	35 dB

5.7 The following planning condition is recommended to secure the above criteria:

"*No fixed plant and/or machinery shall come into operation until details of the fixed plant and machinery serving the development hereby permitted, and any mitigation measures to achieve this condition, are submitted to and approved in writing by the local planning authority. The rating level of the sound emitted from the site shall not exceed 44 dBA between 0700 and 2300 hours and 35 dBA at all other times. The sound levels shall be determined by measurement or calculation at the nearest noise sensitive premises. The measurements and assessment shall be made according to BS 4142:2014.*"

5.8 The suggested plant noise limits in Table 5 should also apply to all plant associated with the proposed four separate retail units.

6.0 Noise from delivery events

6.1 The closest existing residential properties to the service yard would be those to the south in Mimosa Avenue. 10 Mimosa Avenue would be approximately 23 metres from a delivery vehicle manoeuvring upon arrival and departure within the service yard and approximately 37 metres from unloading activity. Asda expect there typically to be two deliveries per day to the foodstore; one at the start and end of the day.

6.2 The noise levels of the different components of delivery event activity have been measured at a large number of retail food stores, and the following maximum noise levels and typical event durations have been used extensively in the planning and design of similar stores:

TABLE 6: Delivery activity - baseline source noise levels (free field)

Event Noise Level (at 10 metres)					
Arrival		Unloading		Departure	
Duration (mins)	$L_{Aeq\,T}$ (dB)	Duration (mins)	$L_{Aeq\,T}$ (dB)	Duration (mins)	$L_{Aeq\,T}$ (dB)
2	69	30	66	0.5	67

6.3 All these sound levels are representative at 10 metres and are measured with the microphone in free field, away from any reflecting surfaces. The levels stated are realistic worst case noise levels from a large collection of sample measurements and include all service yard activity noise including refrigeration units, cage movements, vehicle manoeuvres and reversing alarms.

6.4 Delivery activity noise at 10 Mimosa Avenue is predicted to be 43 dB $L_{Aeq\ 1\ hour}$ (see calculation at Appendix C1); this is based on the attenuation provided by an assumed 3 metre high solid service yard boundary fence or similar (as indicated at Appendix E).

6.5 An assessment of delivery activity noise levels using the methodology in BS 4142:2014 are presented in Appendix C2. The predicted daytime rating sound level is 5 dB above the typical daytime background noise level. The guidance in BS 4142:2014, Section 11, states:

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

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

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not

exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context".

6.6 As explained in paragraph 2.23, Section 11 of BS 4142:2014 explains "*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* (my emphasis). *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"* (my emphasis).

6.7 The BS 4142 assessment at Appendix C2 summarises the key contextual considerations in this instance. The first is how the predicted delivery activity noise levels compare to the WHO guideline noise values; the table below shows this comparison.

TABLE 7: Comparison of predicted delivery event noise levels with the WHO guideline noise values

Time period	Predicted delivery activity noise level (dB $L_{Aeq\ 1\ hour}$)	WHO daytime guideline value (dB $L_{Aeq\ 16\ hours}$)*
Daytime	43	50

* WHO Moderate annoyance criterion

6.8 In the context of the WHO guideline noise values the significance of the impact would be low.

6.9 The second key contextual consideration is how the predicted delivery activity noise levels compare to the existing ambient noise climate and what the resultant change in ambient noise level would be. Since deliveries are sought between 0700 and 2300 hours, it is appropriate to consider predicted delivery noise levels in the context of the existing ambient noise climate between these times. The Table below shows this comparison during the hours that deliveries are proposed to occur.

TABLE 8: Comparison of predicted delivery event noise levels with the existing ambient noise climate and overall change in noise level

Date	Time period	Existing ambient noise level $L_{Aeq\ 1\ hour}$	Predicted delivery activity noise levels dB $L_{Aeq\ 1\ hr}$	Combined noise level	Overall change in noise level
Wednesday 3rd September	13:00:00	47.2	43	48.6	1.4
	14:00:00	47.1	43	48.5	1.4
	15:00:00	47.5	43	48.8	1.3
	16:00:00	47.7	43	49.0	1.3
	17:00:00	47.4	43	48.7	1.3
	18:00:00	47.5	43	48.8	1.3
	19:00:00	47.5	43	48.8	1.3
	20:00:00	47.2	43	48.6	1.4
	21:00:00	46.5	43	48.1	1.6
	22:00:00	45.7	43	47.6	1.9
Thursday 4th September	07:00:00	51.9	43	52.4	0.5
	08:00:00	52.6	43	53.1	0.5

6.10 The predicted delivery activity noise levels in Table 8 are below the existing ambient noise climate at all times. The resultant change in noise levels would be imperceptible, in accordance with the guidance in Table 2. The impact classification in the context of change in noise level for deliveries occurring at any time is therefore considered to be low.

6.11 This assessment has focused on noise from deliveries to the main Asda service yard. Deliveries to the other retail units would take place from within the proposed car park. This delivery location would be screened by the units themselves to the properties in Yarrow Road, and by increased distance attenuation when comparing the distance between the proposed Asda service yard and the properties in Mimosa Avenue. Deliveries to retail units 1 to 4 should be undertaken within the same time period as for the Asda deliveries.

6.12 All three methods of noise assessment outlined in paragraph 2.4 (guideline values, BS 4142:2014 and change in noise level) demonstrate that significant adverse impact from delivery noise is avoided for proposed deliveries occurring between 0700 and 2300 hours. Hence the proposal to receive deliveries between 0700 and 2300 hours complies with the requirements of paragraph 123 of the NPPF.

7.0 Noise from car parking activity

7.1 The closest residential properties to the main Asda car park in Mimosa Avenue to the south, and Yarrow Drive to the northwest. The closest parking spaces are approximately 10 metres from Mimosa Avenue and 34 metres from 9 Yarrow Drive.

7.2 SR has previously undertaken extensive noise monitoring of retail store car parks; at 10 metres from the boundary of a busy car park measured noise levels are 48 dB $L_{Aeq,1hr}$ (free field) have been found.

7.3 Resultant predicted car parking activity noise levels will therefore be 38 dB $L_{Aeq,1hr}$ at 10 Mimosa Avenue (48 - 20*log (10/10) - 10 dB [screening (2m fence); Appendix D3]); and 37 dB $L_{Aeq,1hr}$ at 9 Yarrow Drive (48-20*log[10/37]). Both of these noise levels comply with the WHO daytime guideline noise value; this demonstrates that trading could occur between 0700 and 2300 hours without associated noise giving rise to significant adverse impact.

7.4 Observations of retail car park activity indicate that customers have a strong preference to park as close as possible to the store entrance. During off peak periods when the availability of spaces is greatest, this would have the effect of significantly increasing the distance separation between the properties in Mimosa Avenue and areas of car parking activity as customers are likely to park as close as possible to the store entrance. Therefore the predicted car parking activity noise level presented in paragraphs 7.3 can be considered worst case.

8.0 Noise from road traffic

8.1 The increase in road traffic noise as a result of the development can be determined by comparing the baseline traffic flows, with the baseline plus retail development flows, provided to SR by PBA, by means of the formula found in "Calculation of Road Traffic Noise":

Increase in noise level = 10 $\log_{10}$ (future total traffic flow ÷ existing traffic flow) dB

8.2 To increase the noise level by 3 dBA, the minimum perceptible, the future traffic flow would need to be at least twice the existing traffic flow.

8.3 This assessment of road traffic noise has been undertaken for two way AM and PM peak hour flows with and without the retail development for the following road segments:

- Segment 1: Plover Road, north of retail site entrance
- Segment 2: Plover Road, south of retail site entrance

TABLE 9: Changes in road traffic noise – AM peak hour flows

Road segment	background flow	with Asda development flow	Change in noise level (dB)	Impact
1	442	493	+0.5	Negligible
2	437	457	+0.2	Negligible

TABLE 10: Changes in road traffic noise – PM peak hour flows

Road segment	background flow	with Asda development flow	Change in noise level (dB)	Impact
1	447	584	+1.2	Negligible
2	438	491	+0.5	Negligible

8.4 In relation to the closest noise sensitive receptors to the site the changes in road traffic, as a result of the proposal would result in a negligible noise impact.

9.0 Assessment conclusions

9.1 Having undertaken this assessment against objective criteria, it is concluded that the Asda and retail development can proceed without the likelihood of subsequent operations harming the amenity of local residents, on the basis of the following operating hours:

Store trading:	0700 to 2300 hours;
Store servicing:	0700 to 2300 hours.

9.2 Mechanical services and refrigeration plant can be designed such that the suggested criteria, daytime 44 dBA and night time 35 dBA are achieved at the nearest existing noise sensitive properties; these noise limits could be secured by the following planning condition.

"*No fixed plant and/or machinery shall come into operation until details of the fixed plant and machinery serving the development hereby permitted, and any mitigation measures to achieve this condition, are submitted to and approved in writing by the local planning authority. The rating level of the sound emitted from the site shall not exceed 44 dBA between 0700 and 2300 hours and 35 dBA at all other times. The sound levels shall be determined by measurement or calculation at the nearest noise sensitive premises. The measurements and assessment shall be made according to BS 4142:2014."*

9.3 Screening attenuation will be provided by a 3 metre high acoustic grade fence around the proposed Asda service yard (as indicated at Appendix E).

9.4 With regard to the residential dwellings proposed separately at Plover Road, it is recommended that detailed sound insulation calculations are undertaken once final scheme details are determined to ensure internal noise levels comply with the internal noise levels contained in BS 8233:2014. This work can be secured by imposition of suitably worded planning condition.

9.5 In summary, based on a thorough assessment against objective standards the proposed Asda and retail development would not give rise to significant adverse impact by reason of noise, and as such complies with the requirements of the NPPF.

APPENDIX A

SITE LOCATION PLAN

Appendix A: **Site location plan showing noise measurement location and receptors**

APPENDIX B

NOISE SURVEY RESULTS

Appendix B1	Title: Noise survey results

Measurement location A - Rear of 10 Mimosa Avenue

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
3.9.14	12:40:00	53.9	48.4	53.5	79.7	46.3
	12:45:00	52.6	47.5	50.4	59.8	45.1
	12:50:00	49.2	44.9	47.6	65.6	43.1
	12:55:00	47.6	42.9	46.4	69.8	41.2
	13:00:00	48.2	43.6	46.0	57.5	41.3
	13:05:00	45.4	41.3	43.9	64.5	39.6
	13:10:00	50.4	42.1	46.9	57.6	40.3
	13:15:00	49.6	42.0	46.4	57.5	40.9
	13:20:00	51.8	43.0	48.3	60.9	41.6
	13:25:00	47.0	43.8	45.8	60.2	42.0
	13:30:00	54.5	45.1	52.1	68.7	43.1
	13:35:00	48.1	45.0	47.0	62.1	42.8
	13:40:00	47.8	43.1	45.8	55.0	41.1
	13:45:00	48.2	41.5	45.5	54.8	39.3
	13:50:00	48.5	43.4	46.8	71.0	41.6
	13:55:00	46.2	42.9	44.9	58.5	40.1
	14:00:00	48.0	42.3	45.7	59.7	39.6
	14:05:00	47.5	43.0	45.5	56.0	41.0
	14:10:00	48.4	43.5	46.1	53.5	41.5
	14:15:00	46.3	42.6	45.2	55.7	41.2
	14:20:00	52.4	42.8	49.5	68.7	41.1
	14:25:00	47.8	42.9	45.9	58.4	41.1
	14:30:00	50.5	41.9	48.0	64.2	40.1
	14:35:00	52.0	42.8	49.4	67.8	41.2
	14:40:00	49.3	41.7	47.4	67.2	39.1
	14:45:00	47.5	41.8	45.3	56.3	40.1
	14:50:00	50.4	41.8	46.5	55.7	39.8
	14:55:00	51.2	42.1	47.4	60.6	39.8
	15:00:00	48.0	41.3	45.1	54.3	39.2
	15:05:00	54.5	42.4	51.8	66.2	40.4
	15:10:00	46.9	41.1	44.6	56.7	38.9
	15:15:00	47.9	42.3	45.6	66.2	39.9
	15:20:00	51.0	43.5	48.1	56.9	41.2
	15:25:00	52.4	42.3	50.5	67.6	39.0
	15:30:00	47.3	42.2	45.1	51.4	40.7
	15:35:00	49.8	43.6	47.4	57.2	41.4
	15:40:00	47.7	42.5	45.3	52.3	40.4
	15:45:00	48.1	42.7	45.8	56.4	40.5
	15:50:00	48.9	43.2	46.6	55.6	40.9
	15:55:00	48.6	44.1	47.0	61.8	42.1
	16:00:00	48.4	43.3	46.3	55.6	41.6
	16:05:00	51.8	45.0	49.0	57.4	43.3
	16:10:00	48.6	42.7	46.3	56.1	41.1
	16:15:00	49.8	45.2	48.0	57.5	43.1
	16:20:00	49.1	44.5	47.3	54.8	42.6
	16:25:00	48.6	43.5	46.6	57.1	42.0
	16:30:00	50.3	44.6	48.2	57.4	42.7
	16:35:00	49.1	45.5	47.5	55.8	43.8

Appendix B2	Title: Noise survey results

Measurement location A - Rear of 10 Mimosa Avenue

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
3.9.14	16:40:00	49.1	45.4	47.5	54.5	43.1
	16:45:00	49.7	45.5	47.7	56.3	43.4
	16:50:00	52.6	46.3	49.6	56.8	44.3
	16:55:00	49.5	45.7	47.6	58.8	43.6
	17:00:00	49.4	45.5	47.6	60.7	43.5
	17:05:00	48.6	44.8	46.9	54.6	41.6
	17:10:00	48.3	44.7	46.7	55.3	42.4
	17:15:00	49.8	44.7	47.3	56.0	42.6
	17:20:00	49.1	45.4	47.6	57.8	42.5
	17:25:00	51.3	45.2	48.2	55.8	42.5
	17:30:00	48.9	44.3	46.9	59.3	41.3
	17:35:00	48.3	44.6	46.6	53.5	41.9
	17:40:00	47.6	44.6	46.4	57.0	42.5
	17:45:00	50.7	45.6	48.3	57.5	42.4
	17:50:00	51.8	45.4	48.6	62.8	43.1
	17:55:00	48.8	44.3	46.9	57.1	41.9
	18:00:00	49.6	46.1	48.0	56.2	43.7
	18:05:00	50.2	44.7	48.5	61.2	42.5
	18:10:00	48.2	44.8	46.7	54.9	42.7
	18:15:00	48.5	45.5	47.0	52.8	43.7
	18:20:00	48.5	46.0	47.3	53.8	44.5
	18:25:00	48.2	45.0	46.9	53.3	43.2
	18:30:00	48.9	45.1	47.0	53.6	42.6
	18:35:00	47.6	44.1	46.9	63.8	42.2
	18:40:00	46.6	44.0	45.6	55.4	41.3
	18:45:00	51.6	44.4	48.9	59.9	42.0
	18:50:00	49.0	44.0	46.5	54.4	41.5
	18:55:00	51.3	44.4	49.2	61.4	42.5
	19:00:00	49.0	44.5	46.8	54.5	41.3
	19:05:00	49.7	45.1	47.8	60.1	43.5
	19:10:00	49.0	44.6	47.1	58.0	42.9
	19:15:00	50.1	44.3	47.2	54.2	42.5
	19:20:00	51.8	44.4	50.1	64.7	41.7
	19:25:00	46.7	43.5	45.4	51.4	41.1
	19:30:00	52.3	45.5	49.2	64.0	43.3
	19:35:00	51.7	44.1	48.4	60.3	41.6
	19:40:00	48.8	44.4	46.8	60.4	41.8
	19:45:00	49.2	44.5	46.9	56.1	42.4
	19:50:00	47.7	44.5	46.1	52.9	41.6
	19:55:00	46.9	44.4	45.7	51.5	41.1
	20:00:00	50.7	45.2	48.1	56.9	43.2
	20:05:00	48.3	44.9	47.0	56.9	42.6
	20:10:00	47.2	44.6	46.9	62.4	42.8
	20:15:00	49.7	45.3	47.7	56.6	43.4
	20:20:00	48.7	45.1	47.0	55.0	42.6
	20:25:00	47.8	44.7	47.5	64.3	42.5
	20:30:00	47.7	44.8	46.3	51.9	42.5
	20:35:00	48.2	45.2	46.7	52.4	43.1

Appendix B3	Title: Noise survey results

Measurement location A - Rear of 10 Mimosa Avenue

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
3.9.14	20:40:00	50.8	45.3	48.1	56.2	42.4
	20:45:00	48.2	45.2	46.9	55.1	43.1
	20:50:00	48.9	45.1	47.1	53.0	42.4
	20:55:00	48.3	45.1	46.9	52.0	42.5
	21:00:00	47.7	44.8	46.5	51.3	41.9
	21:05:00	48.9	45.7	47.4	54.1	43.4
	21:10:00	47.9	45.2	46.7	54.7	43.1
	21:15:00	47.7	45.0	46.7	56.2	42.2
	21:20:00	47.5	45.0	46.4	50.4	42.2
	21:25:00	48.6	44.3	46.7	54.5	41.1
	21:30:00	46.7	43.9	45.4	51.0	41.8
	21:35:00	46.7	44.3	45.7	53.2	40.8
	21:40:00	47.9	45.5	47.0	56.6	43.0
	21:45:00	47.6	45.3	46.7	53.9	41.9
	21:50:00	47.5	45.1	46.4	50.3	42.9
	21:55:00	47.1	44.9	46.1	49.0	41.8
	22:00:00	47.9	44.6	47.0	59.8	42.3
	22:05:00	46.8	44.4	45.7	51.0	40.9
	22:10:00	47.2	44.5	46.2	53.8	41.2
	22:15:00	46.8	44.3	45.8	50.1	41.0
	22:20:00	46.4	43.9	45.3	48.5	41.8
	22:25:00	47.1	43.9	45.8	55.5	40.5
	22:30:00	46.1	43.5	45.0	50.8	39.8
	22:35:00	46.1	43.6	45.0	50.0	40.7
	22:40:00	46.9	44.1	45.7	51.4	41.4
	22:45:00	47.1	44.5	45.9	49.7	42.3
	22:50:00	46.6	44.4	45.7	53.2	41.6
	22:55:00	46.4	43.9	45.2	49.6	41.4
	23:00:00	46.1	43.7	45.1	48.0	41.0
	23:05:00	46.4	43.9	45.5	53.3	41.1
	23:10:00	45.7	43.2	44.6	48.0	39.6
	23:15:00	45.0	42.8	44.0	48.9	40.4
	23:20:00	45.1	42.9	44.2	51.9	40.5
	23:25:00	44.8	42.6	43.8	47.4	40.1
	23:30:00	45.3	42.0	43.9	47.7	38.4
	23:35:00	46.4	43.1	44.9	50.4	39.8
	23:40:00	44.9	42.2	43.7	46.9	37.6
	23:45:00	45.2	42.8	44.1	47.1	40.0
	23:50:00	45.5	42.8	44.3	47.8	39.3
	23:55:00	46.1	43.3	44.9	47.9	39.2
4.9.14	00:00:00	45.4	42.9	44.3	47.9	39.9
	00:05:00	45.5	42.7	44.3	48.0	38.6
	00:10:00	45.7	43.1	44.6	48.2	40.7
	00:15:00	45.7	43.1	44.6	47.7	39.8
	00:20:00	45.4	42.7	44.3	47.4	39.7
	00:25:00	45.7	43.4	44.8	51.0	40.7
	00:30:00	45.9	43.0	44.7	48.1	39.1
	00:35:00	45.7	42.6	44.3	47.5	39.3

Appendix B4	Title: Noise survey results

Measurement location A - Rear of 10 Mimosa Avenue

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
4.9.14	00:40:00	46.1	43.3	44.9	47.8	39.9
	00:45:00	46.1	42.9	44.8	48.1	40.0
	00:50:00	46.0	42.6	44.6	47.9	39.6
	00:55:00	45.8	42.2	44.4	47.8	36.5
	01:00:00	45.4	42.5	44.1	48.5	37.8
	01:05:00	45.9	42.4	44.5	48.3	39.5
	01:10:00	45.9	42.6	44.6	47.6	37.0
	01:15:00	45.1	41.5	43.7	47.7	36.5
	01:20:00	44.0	41.1	42.7	46.1	37.7
	01:25:00	43.7	40.8	42.3	45.2	37.6
	01:30:00	43.7	41.1	42.6	46.6	37.7
	01:35:00	42.4	40.1	41.4	44.7	36.2
	01:40:00	44.9	40.8	43.1	47.1	37.5
	01:45:00	44.8	41.0	43.0	46.6	36.2
	01:50:00	44.3	41.6	43.0	46.1	37.2
	01:55:00	44.4	41.3	43.0	45.9	37.5
	02:00:00	43.5	40.7	42.2	48.2	35.5
	02:05:00	42.9	40.2	41.6	44.9	33.2
	02:10:00	42.6	39.2	40.8	45.1	33.4
	02:15:00	43.8	40.9	42.6	45.6	37.5
	02:20:00	43.3	40.0	41.9	45.2	36.2
	02:25:00	43.9	40.4	42.4	47.5	35.7
	02:30:00	42.4	39.3	40.9	45.2	34.2
	02:35:00	40.9	37.7	39.5	43.1	29.2
	02:40:00	41.9	39.8	40.9	43.9	34.4
	02:45:00	42.0	39.7	41.0	43.4	32.8
	02:50:00	42.0	40.0	41.1	45.2	36.1
	02:55:00	41.9	39.1	40.7	44.5	32.2
	03:00:00	41.5	38.1	40.0	44.8	30.5
	03:05:00	42.5	39.1	41.2	44.3	34.9
	03:10:00	41.7	39.3	40.6	44.1	34.1
	03:15:00	42.6	39.0	41.0	44.7	27.9
	03:20:00	42.1	37.1	40.5	44.5	30.1
	03:25:00	42.3	39.5	41.3	46.0	32.6
	03:30:00	42.4	39.2	41.2	44.3	30.1
	03:35:00	42.0	38.6	40.6	44.7	29.4
	03:40:00	41.9	38.3	40.4	45.2	27.8
	03:45:00	41.4	30.1	39.2	46.0	25.9
	03:50:00	36.2	27.3	32.5	44.5	24.6
	03:55:00	31.9	27.0	30.3	42.9	23.9
	04:00:00	33.3	28.0	31.4	46.8	25.5
	04:05:00	33.7	28.3	31.5	42.3	26.0
	04:10:00	39.6	29.3	37.0	43.3	26.1
	04:15:00	39.9	32.3	38.3	42.1	27.0
	04:20:00	39.8	36.7	38.6	41.8	27.4
	04:25:00	40.2	37.3	39.0	45.8	27.1
	04:30:00	40.7	37.5	39.4	46.8	28.6
	04:35:00	40.9	37.1	39.8	60.2	28.5

Appendix B5	Title: Noise survey results

Measurement location A - Rear of 10 Mimosa Avenue

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
4.9.14	04:40:00	39.2	32.7	37.6	43.4	24.8
	04:45:00	39.7	32.7	38.1	48.0	27.1
	04:50:00	39.3	30.5	35.6	45.9	28.3
	04:55:00	39.5	30.5	35.9	43.8	27.7
	05:00:00	35.3	30.8	33.7	45.6	27.3
	05:05:00	39.1	29.5	35.7	47.3	26.8
	05:10:00	37.7	31.8	35.1	43.7	30.0
	05:15:00	38.4	32.4	36.0	48.0	28.0
	05:20:00	38.0	32.7	35.8	44.6	30.4
	05:25:00	39.7	33.9	37.3	47.2	32.0
	05:30:00	41.0	34.2	38.8	53.2	31.9
	05:35:00	45.8	36.3	46.8	65.7	34.0
	05:40:00	47.0	36.0	44.0	62.6	33.1
	05:45:00	49.5	36.2	44.8	59.0	34.0
	05:50:00	51.5	35.6	49.5	69.6	32.5
	05:55:00	43.6	35.5	40.5	51.4	31.4
	06:00:00	44.0	34.5	41.2	58.0	32.7
	06:05:00	45.1	36.8	42.6	59.6	34.8
	06:10:00	51.4	37.0	46.6	61.9	35.1
	06:15:00	43.5	37.7	44.7	61.8	34.8
	06:20:00	44.9	38.5	46.4	65.6	36.4
	06:25:00	56.5	39.6	54.4	71.3	37.8
	06:30:00	47.3	41.5	55.0	77.6	39.3
	06:35:00	47.9	41.7	51.2	75.3	38.8
	06:40:00	55.6	42.3	51.4	68.8	39.6
	06:45:00	57.4	42.7	51.7	69.9	39.9
	06:50:00	48.4	40.6	47.8	69.3	38.4
	06:55:00	47.7	41.4	50.5	74.4	39.8
	07:00:00	48.2	42.3	54.1	73.7	41.0
	07:05:00	63.2	42.7	58.3	72.1	40.3
	07:10:00	49.3	42.6	46.3	56.5	41.2
	07:15:00	51.0	43.0	48.8	66.9	41.3
	07:20:00	51.1	44.2	48.8	63.7	42.8
	07:25:00	49.3	44.3	49.0	64.8	42.9
	07:30:00	57.4	45.0	54.0	68.0	43.6
	07:35:00	51.6	45.6	48.6	58.1	44.3
	07:40:00	51.1	45.4	48.6	62.1	43.8
	07:45:00	49.1	45.4	47.4	57.1	43.6
	07:50:00	49.0	46.6	47.8	56.2	45.2
	07:55:00	54.5	46.5	51.8	66.8	45.5
	08:00:00	51.9	46.7	50.0	65.6	45.3
	08:05:00	55.4	47.0	52.1	67.0	45.7
	08:10:00	52.5	47.2	50.4	67.5	46.0
	08:15:00	60.7	47.4	55.8	70.2	45.9
	08:20:00	61.2	47.2	56.5	72.6	45.6
	08:25:00	50.3	46.6	48.4	57.5	45.0
	08:30:00	48.8	46.5	47.6	53.3	45.2
	08:35:00	50.9	46.8	48.9	58.9	45.6

Appendix B6	Title: Noise survey results

Measurement location A - Rear of 10 Mimosa Avenue

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
4.9.14	08:40:00	50.3	46.5	48.7	66.1	44.8
	08:45:00	61.8	45.3	56.2	69.3	43.9
	08:50:00	54.5	46.2	54.6	78.3	43.5

APPENDIX C

PREDICTED DELIVERY EVENT NOISE LEVELS

APPENDIX C1: Predicted delivery event noise at 10 Mimosa Avenue

Activity	Resultant noise level (dB)
Arrival	
Baseline level	$L_{Aeq,2\ mins}$ = 69
Distance attenuation to 23 metres = 20 log $^{10}/_{23}$ = -7	$L_{Aeq,2\ mins}$ = 62
Screening loss = -11 dB (see Appendix D1)	$L_{Aeq,2\ mins}$ = 51
Convert to 1 hour = 10 log $^{2}/_{60}$ = -15	**$L_{Aeq,1\ hour}$ = 36**
Unloading	
Baseline level	$L_{Aeq,30\ mins}$ = 66
Distance attenuation to 37 metres = -20 log $^{10}/_{37}$ = -11	$L_{Aeq,30\ mins}$ = 55
Screening loss = -10 dB (see Appendix D2)	$L_{Aeq,30\ mins}$ = 45
Convert to 1 hour = 10 log $^{30}/_{60}$ = -3	**$L_{Aeq,1\ hour}$ = 42**
Departure	
Baseline level	$L_{Aeq,0.5\ mins}$ = 67
Distance attenuation to 23 metres = 20 log $^{10}/_{23}$ = -7	$L_{Aeq,0.5\ mins}$ = 60
Screening loss = -11 dB (see Appendix D1)	$L_{Aeq,0.5\ mins}$ = 49
Convert to 1 hour = 10 log $^{0.5}/_{60}$ = -21	**$L_{Aeq,1\ hour}$ = 28**
Overall (36+42+28)	**$L_{Aeq,1\ hour}$ = 43**
WHO DAYTIME CRITERION ($L_{Aeq,16hr}$)	**55 dB**
WHO NIGHT TIME CRITERION ($L_{Aeq,8hr}$)	**45 dB**
Existing typical ambient daytime noise climate	**$L_{Aeq\ 1\ hour}$ = 47 dB**

APPENDIX C2: Assessment of delivery activity noise using BS 4142:2014: Daytime

Results	Receptor location 10 Mimosa Avenue	Relevant clause	Commentary
Background sound level: daytime	44 dB $L_{A90\,T}$	**8.1** **8.1.3**	The typical daytime sound level (0700 to 2000 hours) was derived from the graph of background sound levels in Figure 1 to the assessment.
Specific sound level	43 dB		Predicted levels from delivery sound source measurements taken over 20 years of assessing retail noise and its characteristics
Acoustic feature correction	+6 dB	**9.2**	Delivery activity noise is typically characterised by a series of short impulsive bangs, crashes and 'rattles' associated with the movement of produce roll cages. At this location the impulsivity associated with a delivery event is considered to be clearly perceptible in the context of the existing noise climate.
Rating level	49 dB	**9.2**	
Background level: daytime	44 dB	**8.1** **8.1.3**	
Excess of rating level over background level	49-44 = +5 dB	**11**	
Assessment indicative of significant adverse impact	**Relevant clause 11** The context is: 1. Predicted delivery event noise levels comply with the WHO daytime guideline value (50 dB $L_{Aeq\,16\,hours}$), hence against WHO guidelines there will be no significant adverse impact; 2. The predicted delivery activity sound levels are below the ambient noise climate at all times that deliveries are proposed (0700 to 2300 hours). The greatest change in noise level would be an increase of 1.9 dB between 2200 and 2300 hours; this increase would be imperceptible in the context of the guidance in Table 2.		
Uncertainty of the assessment	Relevant clause 10 The excess of the rating level over the background sound level is +5 dB, in this instance the uncertainty of the measurement might have some influence on the outcome of the assessment.		

APPENDIX D

SCREENING CALCULATIONS

APPENDIX D: Screening calculations

Appendix D1

BASIC BARRIER ATTENUATION

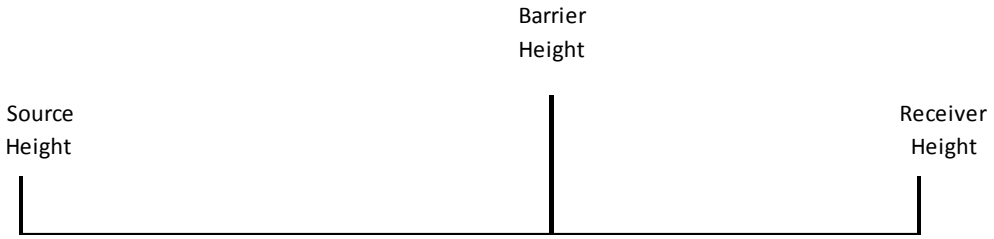
(based on Maekawa or CRTN)

Receptor: **10 Mimosa Avenue**

Project: **Plover Road, Minster**

Source: **Delivery activity: arrival and departure**

Receiver: **10 Mimosa Avenue**



Source-to-Barrier Distance

Receiver-to-Barrier Distance

Source-to-Barrier Distance	14.0 m
Receiver-to-Barrier Distance	9.0 m

Source Height	1.0 m
Receiver Height	1.8 m
Barrier Height	3.0 m

Path difference = 0.208 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	**6.6**	**7.8**	**9.6**	**11.8**	**14.4**	**17.1**	**20.0**	**22.9**	**10.9 dBA**

Appendix D2

BASIC BARRIER ATTENUATION

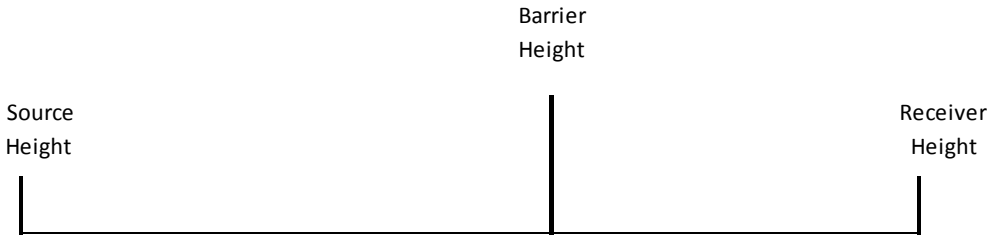
(based on Maekawa or CRTN)

Receptor: **10 Mimosa Avenue**

Project: **Plover Road, Minster**

Source: **Delivery activity: unloading**

Receiver: **10 Mimosa Avenue**



Source-to-Barrier Distance

Receiver-to-Barrier Distance

Source-to-Barrier Distance	29.0 m
Receiver-to-Barrier Distance	8.0 m

Source Height	1.5 m
Receiver Height	1.8 m
Barrier Height	3.0 m

Path difference = 0.127 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	**5.9**	**6.9**	**8.3**	**10.2**	**12.5**	**15.1**	**17.9**	**20.8**	**9.8 dBA**

APPENDIX D: Screening calculations

Appendix D3

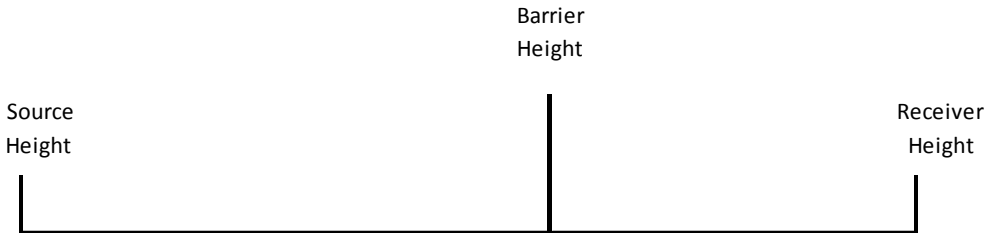
BASIC BARRIER ATTENUATION

(based on Maekawa or CRTN)

Receptor: **10 Mimosa Avenue**

Project: **Plover Road, Minster**

Source: **Car parking activity** **Receiver:** **10 Mimosa Avenue**



Source-to-Barrier Distance | Receiver-to-Barrier Distance

Source-to-Barrier Distance	5.0 m
Receiver-to-Barrier Distance	5.0 m

Source Height	0.5 m
Receiver Height	1.8 m
Barrier Height	2.0 m

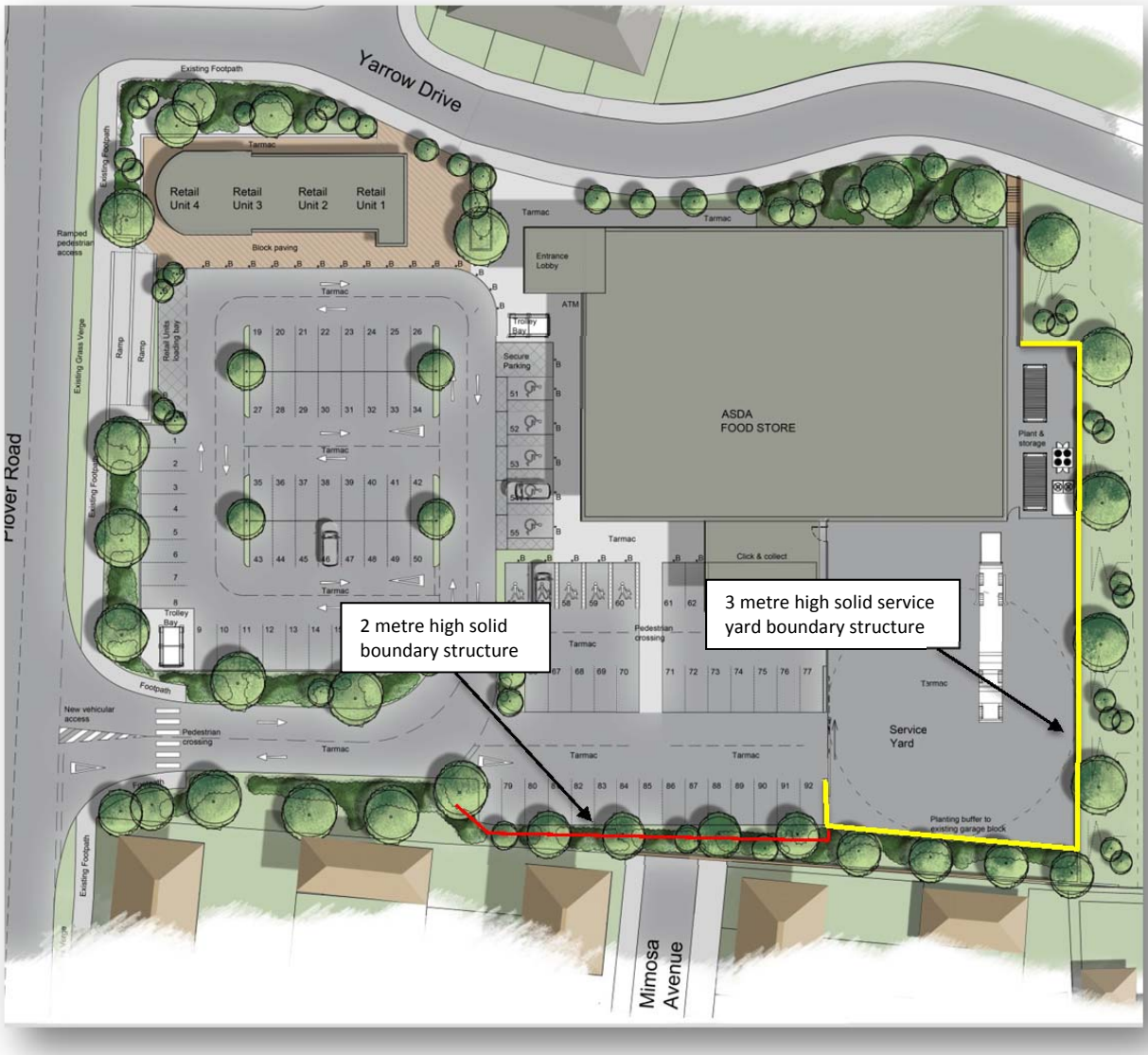
Path difference = 0.140 m

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	CRTN
Attenuation - dB	**6.1**	**7.0**	**8.5**	**10.5**	**12.9**	**15.5**	**18.3**	**21.3**	**10.0 dBA**

APPENDIX E

SCREENING REQUIREMENTS

APPENDIX D: Screening requirements



APPENDIX F

ACOUSTIC TERMINOLOGY

Acoustic Terminology

F1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. 50 dB + 50 dB = 53 dB. Increases in continuous sound are perceived in the following manner:

1 dB increase - barely perceptible.

3 dB increase - just noticeable.

10 dB increase - perceived as twice as loud.

F2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

F3 To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).

F4 The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p. Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p.

F5 External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

F6 The main noise indices in use in the UK are:

L_{A90}: The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.

L_{Aeq}: The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as aircraft and trains.

L_{A10}: The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

L_{AMAX}: The maximum level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

F7 The sound energy of a transient event may be described by a term SEL - Sound Exposure Level. This is the L_{Aeq} level normalised to one second. That is the constant level in dBA which lasting for one second has the same amount of acoustic energy as a given A weighted noise event lasting for a period of time. The use of this unit allows the prediction of the L_{Aeq} level over any period and for any number of events using the equation;

$$L_{AeqT} = SEL + 10 \log n - 10 \log T \text{ dB}.$$

Where

n = Number of events in time period T.

T = Total sample period in seconds.

F8 In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

$$60 - 20 \text{ Log } {}^{160}/_{10} = 60 - 24 = 36 \text{ dB}.$$