SHARPS REDMORE

ACOUSTIC CONSULTANTS • Established 1990

Report

Dol-Y-Dintir, New Mill Road, Cardigan

Noise assessment of proposed residential development

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Appendices

1.0 Introduction

1.1 Sharps Redmore (SR) have been instructed by Wales & West Housing Association to carry out a noise assessment for a proposed residential development at land to the north and west of New Mill Road, Cardigan, as indicated at Figure 1 below.

FIGURE 1: Site location plan

1.2 The site is bordered to the south and east by New Mill Road, with the main A487 beyond to the south. To the west are existing residential properties in Heol-Y-Wern, and the northern boundary is formed by a large detached dwelling. It is anticipated that the main noise source impacting the site will be from vehicles using the A487.

1.3 The purpose of this report is therefore to assess the impact of road traffic noise on the proposed residential development. The report is structured as follows:

- Section 2 - A discussion of the available methods of assessment and assessment criteria.
- Section 3 - Details of the environmental noise survey;
- Section 4 - Initial noise assessment
- Section 4 - Noise Assessment including SoundPLAN acoustic models.
- Section 5 - Summary and conclusions

2.0 Assessment methodology and criteria

2.1 National planning policy in Wales is contained within Planning Policy Wales (PPW), Edition 12, dated February 2024.

2.2 Section 6.7.14 of the document provides advice on air quality and soundscape and states the following.

"Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission".

2.3 It is recommended in the PPW that development should be based on good design principles and best practice in terms of acoustic design. Footnote 163 to the guidance refers to the guidance produced by the Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CHIEH), and Professional Practice Guidance (ProPG) on Planning and Residential Development. This is discussed in detail below.

Design Guidance

BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings

2.4 General guidance on noise for planning applications is contained in Technical Advice Note (TAN 11), "Noise", issued in October 1997. Annex B paragraph B17 of TAN 11 explains that general guidance on acceptable noise levels within buildings can be found in BS 8233:1987 (now superseded by BS 8233:2014). For the purposes of this assessment we have used BS 8233:2014 for guidance as appropriate. BS 8233:2014 recommends the following internal noise standards:

TABLE 1: Guideline noise values

BS 8233:2014 Table 4 – Indoor ambient noise levels for dwellings			
Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.5 The previous version (1999) of BS 8233 contained two guidelines for internal criteria; good and reasonable. The difference between the good and reasonable criteria was 5 dB. Whilst the 5 dB relaxation in noise criteria is not specifically referred to in the table above, Note 7 advises that "*where development is considered necessary or despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

2.6 There is no longer a L_{AMAX} standard for bedrooms in BS 8233. However, footnote 4 to Table 4 states that *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values".* In this case, it is proposed that the previous BS8233 internal

standard (also referenced in World Health Organisation Guidelines for Community Noise) is applied. This is 45 dB L_{AMAX}, inside bedrooms.

2.7 For outdoor areas (e.g. balconies/gardens), BS 8233:2014 recommends that *"it is desirable that the external noise level does not exceed 50 dB L_{AeqT}, with an upper guideline value of 55 dB L_{AeqT}"* However, the document recognises that that these guideline values are not achievable in all circumstances and in higher noise areas, a compromise might be warranted. In such circumstances, development should be designed to achieve the lowest practicable levels in these external amenity spaces.

ProPG: Planning and Noise – New Residential Development

2.8 The ProPG professional practice guidance on planning and noise has been jointly produced by the Chartered Institute of Environmental Health (CIEH), Institute of Acoustic (IOA) and Association of Noise Consultants (ANC).

2.9 Whilst the scope of ProPG does not cover Wales the two stage approach of initial site risk assessment and then assessment based on the general hierarchy of control measures, as shown below, is a useful approach in the assessment of noise (and, as mentioned above, is referenced within the PPW at Footnote 163).

Hierarchy of control measures

- Maximise the spatial separation of noise source(s) and receptor(s);
- Using existing topography and existing structures to screen the proposed development site from significant sources of noise;
- Incorporating noise barriers as part of the scheme to screen the proposed site from significant sources of noise;
- Using the layout of the scheme to reduce noise propagation across the site;
- Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms;
- Using the building envelope to mitigate noise to acceptable levels.

Institute of Acoustics – Acoustics Ventilation and Overheating (AVO) Residential Design Guidance (January 2020).

2.10 This guidance provides advice on the noise and overheating and considers the interdependence between acoustics, ventilation and over-heating design. The guide is based on the noise criteria found in BS8233:2014. Usefully the AVO guide provides noise limits based on external noise levels and a suggested action in the design process in relation to over-heating. It is therefore directly applicable in this case.

FIGURE 2: Summary of AVO guidance

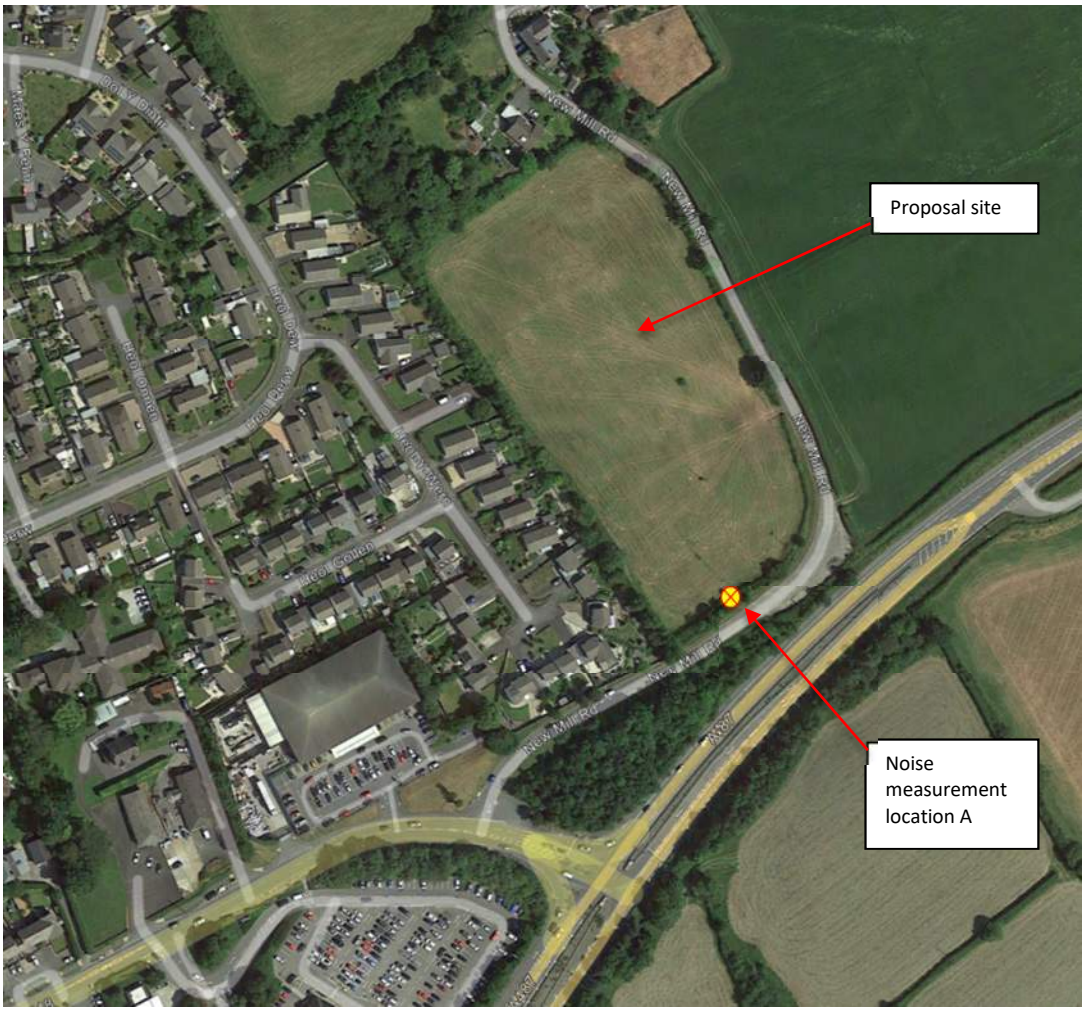
External free-field ambient noise level at façade location[2]			Example Level 1 noise & overheating risk assessment outcome	Suggested action in the design process
Daytime $L_{Aeq,\ 16\ hr}$	Night-time $L_{Aeq,\ 8\ hr}$	Night-time L_{AFmax}[3]		
> 63 dB	> 55 dB	Normally exceeds 78 dB L_{AFmax}	High	Indicates that opening windows are likely to be unsuitable to mitigate overheating for any duration. Carry out a Level 2 assessment.
> 53 dB and ≤ 63 dB	> 48 dB and ≤ 55 dB	-	Medium	If opening windows are proposed to control overheating, carry out a Level 2 assessment and use AVO Diagram to assess risk of adverse noise effects.
> 48 dB and ≤ 53 dB	> 43 dB and ≤ 48 dB	-	Low	Mitigate and minimise noise impact where possible, although open windows are likely to enable reasonable conditions.
≤ 48 dB	≤ 43 dB	Do not normally exceed L_{AFmax} 58 dB more than 10 times a night	Negligible	Nothing – open windows are likely to be suitable.

The guidance introduces a risk based assessment, including an initial assessment based on external noise levels.

3.0 Noise survey details

3.1 A baseline noise survey was undertaken between Tuesday 15th and Wednesday 16th August 2023. Noise measurements were taken at a single location representative of the noise climate at the southern site boundary, closest to the main noise source affecting the site, the A487.

FIGURE 3: Noise measurement location



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

3.3 The sound level meter microphone was mounted on a tripod, positioned approximately 1.5 metres above the ground in free field conditions.

3.4 Weather conditions during the survey were dry and partly cloudy with temperatures between 11-20°C; winds were light (<5m/s) and variable. Weather conditions are not considered to have materially affected the measured noise levels.

3.5 The results of the noise survey are summarised in Table 2 and Figure 4 below, and in full at Appendix A.

3.6 Table 2 below summaries the period noise levels during the survey.

TABLE 2: Summary of hourly noise levels at measurement location A

Date	Time	Noise level dB		
		$L_{A90\ 1\ hour}$	$L_{A90\ 15\ mins}$ *	$L_{Aeq\ 1\ hour}$
15.8.23	09:00:00	39.9		49.2
	10:00:00	40.5		49.9
	11:00:00	41.2		50.0
	12:00:00	40.7		49.9
	13:00:00	40.8		49.5
	14:00:00	42.0		56.2
	15:00:00	41.3		49.7
	16:00:00	41.0		48.8
	17:00:00	40.7		50.8
	18:00:00	39.0		48.2
	19:00:00	36.6		47.3
	20:00:00	39.0		47.5
	21:00:00	38.4		45.9
	22:00:00	36.2		44.9
	23:00:00		29.4	40.7
16.8.23	00:00:00		27.0	37.9
	01:00:00		26.1	36.8
	02:00:00		21.1	32.5
	03:00:00		21.7	39.6
	04:00:00		24.2	40.6
	05:00:00		24.0	42.2
	06:00:00		26.0	46.8
	07:00:00	43.0		52.9
	08:00:00	48.0		54.9
	09:00:00	46.7		53.6

NOTE: * lowest background noise level in 15 minute sample

3.7 Analysis of the noise survey data indicates the following measured daytime and night time ambient noise levels at measurement location A.

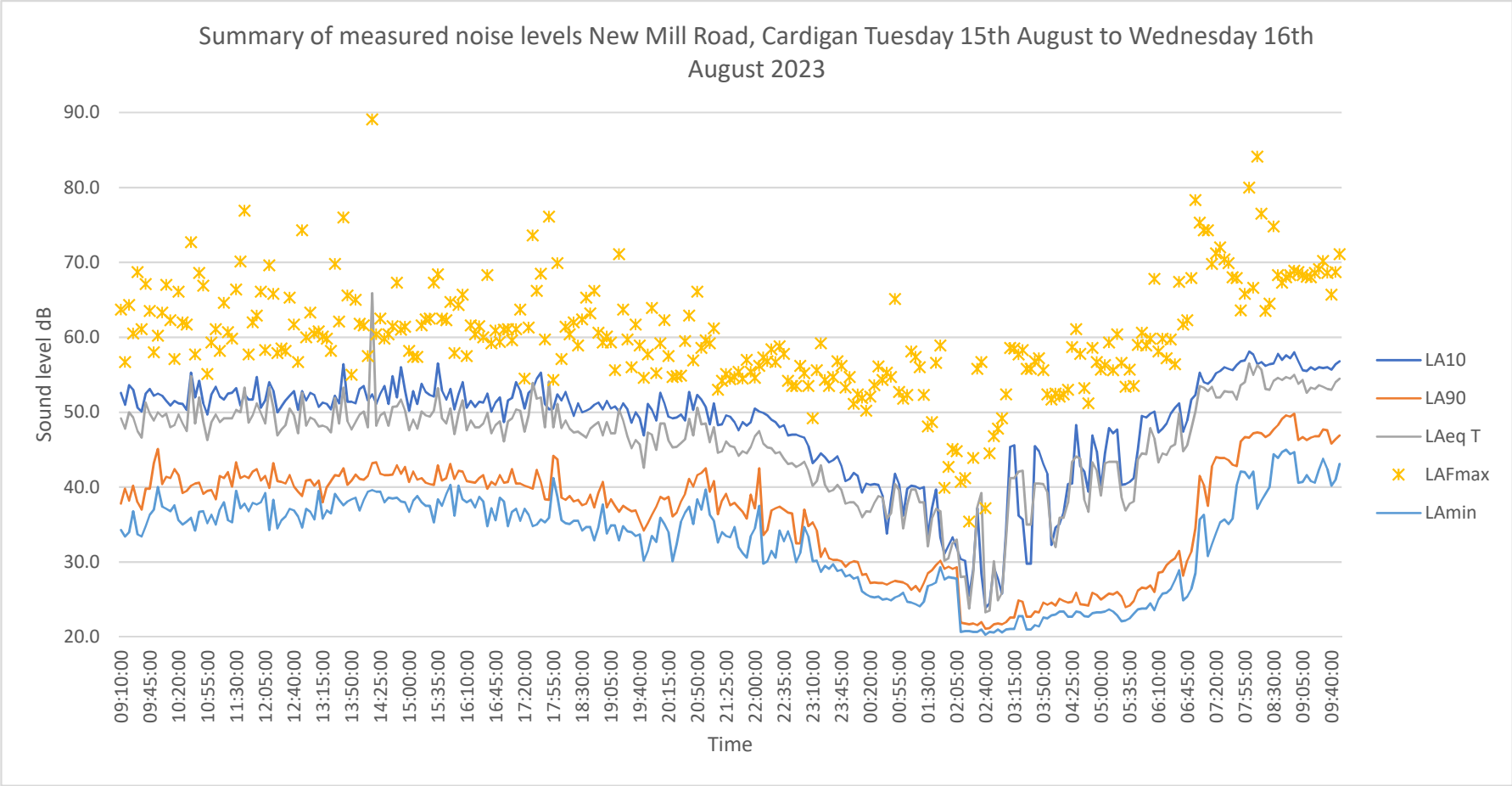
TABLE 3: Measured period ambient noise levels for day and night

Period	Noise levels dB
Day	51 dB $L_{Aeq\ 16\ hours}$
Night	41 dB $L_{Aeq\ 8\ hours}$

3.8 In terms of soundscape the noise climate at the site is dominated by road traffic using the A487 to the south. It can be seen from Figure 4 that once road traffic volumes reduce after 2200 hours, and particularly in the early hours of the morning, that noise levels fall quite

noticeably compared to the daytime period. Road traffic using the A487 does not start to increase measured noise levels until just before the end of the night time period (around 0645 hours). Subjectively it was noted that noise levels on the morning of Wednesday 16th August were higher than during the same period on the previous day. Whilst wind speeds during the noise survey were very low at all time, it is noted that the predominant wind direction on the Tuesday was from the west, whilst on the morning of Wednesday the wind had changed direction to be more from a southerly direction. This may have had the affect of increasing noise from the A487 to the south, albeit the A487 is in fairly close proximity to the site.

FIGURE 4: Summary of measured noise levels at location A



4.0 Initial noise assessment

4.1 Using the period noise levels from Table 3 and using SoundPLAN noise modelling software package to predict the noise levels from road traffic (based on traffic flow data), SR has determined the noise levels across the proposal site. SoundPLAN calculates $L_{Aeq\,T}$ levels at defined receptors in accordance with the appropriate standards. The calculation is based on a number of input parameters including; source noise level data, barriers, receptor positions, topography and intervening ground conditions.

4.2 In accordance with the principles ProPG, and as shown in Figure 5 below, an initial noise assessment has been carried out. This assessment is based on an open site and does not include the effect of any mitigation measures.

FIGURE 5: ProPG Initial Noise Assessment

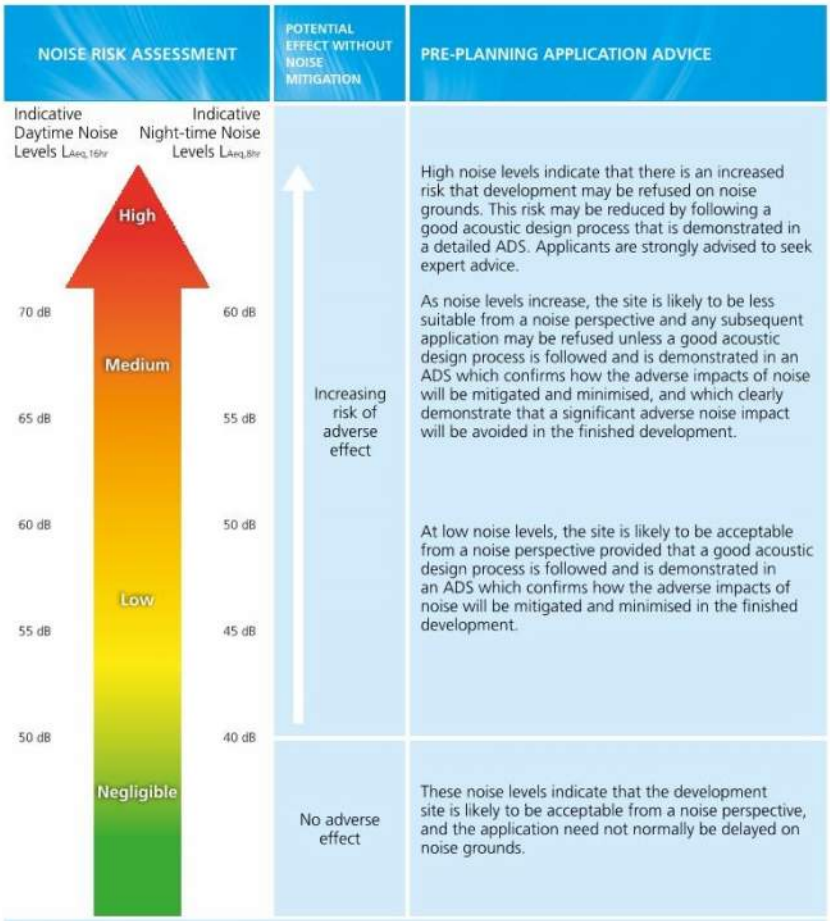


Figure 1 Notes:

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.

d. An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,f}$ > 60 dB means the site should not be regarded as negligible risk.

4.3 The results of the initial assessment SoundPLAN noise modelling is shown in Appendix B to this report. The predicted daytime noise levels across the site are based on traffic flow information from the highway consultant Acstro Limited, whilst (due to the very low traffic

flows on the A487 at night) the night time noise contours are based directly on the measured night time noise levels.

4.4 Daytime noise levels contours are indicated to be between 50-55 dB $L_{Aeq\ 16\ hours}$ towards the front of the site, closest to the A487, with noise levels below 50 dB $L_{Aeq\ 16\ hours}$ across the majority of the site. This corresponds well with the measured noise levels from the survey at the southern boundary of the site of 51 dB $L_{Aeq\ 16\ hours}$. The night noise measured period noise level was 41 dB $L_{Aeq\ 8\ hours}$.

4.5 By reference to the guidance in the ProPG, Figure 5 above, the initial assessment risk will be low to negligible.

5.0 Detailed noise assessment

External noise levels

5.1 Appendices C1 and C2 show the SoundPLAN noise contour plans with resolution presented in 2 dB increments, and including the plot positions. The daytime noise contours indicate that noise levels across the site where plots and gardens would be located, would fall below the upper guideline value of 55 dB $L_{Aeq\ T}$, with the majority of the plots well below 50 dB $L_{Aeq\ T}$. The model has not included the mitigation effects from garden boundary treatment (fences), which would reduce all usable outdoor garden space noise levels to below 50 dB $L_{Aeq\ T}$. It is therefore not considered that external noise levels in gardens will cause significant adverse impact to future residents.

Internal noise levels

5.2 Predicted daytime noise contours have been based on road traffic data supplied by Acstro Limited. They have supplied a 2022 AADT traffic flow figure of 7947 over a 24 hour period. Day/night splits of road traffic flows are not available, albeit, our noise survey result indicate low traffic flows at night. Therefore, we have adopted a robust approach in assuming that all 7947 (over a 24 hour period) would occur during the 16 hour day.

5.3 The highest daytime noise levels occur at the 'front' three plots closet to the southern boundary of the site. Predicted noise levels at these plots would be 51-53 dB $L_{Aeq\ 16\ hour}$. The plots immediately behind the front three plots would be subject to noise levels in the 46 to 50 dB range, with the majority of the plots experiencing noise levels below 42 dB.

5,4 At all plots internal noise levels in accordance with the criteria in BS 8233:2014 would be achieved through the installation of standard thermal doubled glazed windows. Indeed, at the majority of plots internal noise levels in accordance with BS 8233:2014 would be achieved without the need for windows to be closed.

5.5 At the eight plots highlighted in Figure 6 below, it may be necessary to have windows closed and therefore an alternative means of ventilation would have to be provided (to meet the internal noise levels in BS 8233:2014). This can be achieved through the installation of acoustic through-frame vents.

FIGURE 6: Extent of plots requiring closed windows to meet BS 8233 internal noise levels

Over-heating

5.6 The Acoustics Ventilation and Overheating (AVO) Residential Design Guidance (January 2020) provides advice on noise and overheating and considers the interdependence between acoustics, ventilation and overheating design and provides a means of assessment to satisfy the issues of acoustics, ventilation and overheating at the planning stage.

5.7 The guide is based on the noise criteria found in BS8233:2014. Usefully the AVO guide provides noise limits based on external noise levels and a suggested action in the design process in relation to over-heating. It is therefore directly applicable in this case.

FIGURE 7: Summary of AVO guidance

External free-field ambient noise level at façade location[2]			Example Level 1 noise & overheating risk assessment outcome	Suggested action in the design process
Daytime $L_{Aeq,\ 16\ hr}$	Night-time $L_{Aeq,\ 8\ hr}$	Night-time L_{AFmax}[3]		
> 63 dB	> 55 dB	Normally exceeds 78 dB L_{AFmax}	High	Indicates that opening windows are likely to be unsuitable to mitigate overheating for any duration. Carry out a Level 2 assessment.
> 53 dB and < 63 dB	> 48 dB and < 55 dB	-	Medium	If opening windows are proposed to control overheating, carry out a Level 2 assessment and use AVO Diagram to assess risk of adverse noise effects.
> 48 dB and ≤ 53 dB	> 43 dB and ≤ 48 dB	-	Low	Mitigate and minimise noise impact where possible, although open windows are likely to enable reasonable conditions.
≤ 48 dB	≤ 43 dB	Do not normally exceed L_{AFmax} 58 dB more than 10 times a night	Negligible	Nothing – open windows are likely to be suitable.

5.8 By comparing the noise contours and predicted noise levels at each plot a level 1 risk assessment to identify the properties where further consideration of over-heating is required can be made. Predicted/measured noise levels at all plots would fall within the negligible to low risk category for both daytime and night time periods enabling internal noise levels to be met with windows open.

5.9 Lastly, although in most respects the guidance is now outdated, the noise contour plans of both predicted and measured noise levels indicate that the site would fall into Noise Exposure Category (NEC) A of the Technical Advice Note 11 (TAN11, 1997). The TAN explains that for sites which fall into NEC A "*Noise need not be considered as a determining factor in granting planning permission, although the noise at the high end of the category should not be regarded as desirable*".

6.0 Summary and conclusions

6.1 Sharps Redmore has undertaken an environmental noise assessment of a proposed residential development at Dol-Y-Dintir, New Mills Road, Cardigan. The purpose of the assessment is to consider the impact of existing noise climate, found to be dominated by road traffic sources, on the site to determine the suitability for residential use.

6.2 Noise levels from road traffic on the A487 which runs to the south of the site, have been determined by direct measurement (day and night) and by prediction (based on road traffic flows (daytime) using SoundPLAN acoustic modelling software.

6.3 The assessment has determined that the majority of plots at the development would comply with the requirements of BS 8233:2014, and the guidance contained in ProPG and Institute of Acoustics – Acoustics Ventilation and Overheating (AVO) Residential Design Guidance (January 2020) with windows open. A small number of plots Noise levels across the site are also compared to the Noise Exposure Categories in TAN 11, and found to be in NEC A, which states *Noise need not be considered as a determining factor in granting planning permission …"*

6.4 At a small number of plots it may be necessary to have windows closed and provide alternative means of ventilation.

6.5 This assessment objectively demonstrates that the above the site can be developed as proposed without noise causing significant adverse impact to future residents.

APPENDIX A

NOISE SURVEY RESULTS

Appendix A1	Title: Noise survey results

Southern site boundary with New Mill Road, Cardigan

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
15.8.23	09:10:00	52.6	37.8	49.2	63.7	34.3
	09:15:00	51.0	39.8	47.8	56.7	33.4
	09:20:00	53.6	38.2	50.0	64.3	34.0
	09:25:00	53.0	40.2	49.3	60.5	36.8
	09:30:00	50.6	38.0	47.5	68.7	33.7
	09:35:00	50.1	37.0	46.6	61.1	33.4
	09:40:00	52.5	39.8	51.3	67.1	34.8
	09:45:00	53.1	39.8	49.8	63.5	36.3
	09:50:00	52.2	43.2	48.9	58.0	37.0
	09:55:00	52.5	45.1	50.0	60.2	40.0
	10:00:00	52.2	40.4	49.4	63.3	37.4
	10:05:00	51.5	41.4	49.8	67.0	37.1
	10:10:00	50.9	41.2	48.0	62.3	36.8
	10:15:00	51.5	42.4	48.3	57.1	37.6
	10:20:00	51.2	41.6	49.7	66.1	35.6
	10:25:00	51.1	39.2	48.5	62.0	35.0
	10:30:00	50.3	39.5	47.5	61.7	35.4
	10:35:00	55.3	40.2	54.8	72.7	35.9
	10:40:00	52.0	40.5	48.5	57.7	34.2
	10:45:00	54.2	40.6	52.0	68.6	36.7
	10:50:00	51.2	39.1	48.8	66.9	36.8
	10:55:00	49.7	39.5	46.3	55.1	35.2
	11:00:00	52.4	39.6	48.7	59.3	36.3
	11:05:00	53.4	38.4	49.7	61.1	35.0
	11:10:00	52.1	41.5	48.7	58.2	37.0
	11:15:00	51.7	41.2	49.2	64.6	38.0
	11:20:00	52.5	42.0	49.2	60.7	35.6
	11:25:00	52.6	40.1	49.2	59.8	35.3
	11:30:00	53.2	43.3	50.3	66.4	39.5
	11:35:00	50.9	41.2	50.0	70.1	37.2
	11:40:00	52.4	41.5	53.3	76.9	37.8
	11:45:00	51.7	41.2	48.6	57.7	36.8
	11:50:00	51.7	42.1	49.6	62.0	37.9
	11:55:00	54.7	42.4	51.2	62.9	37.7
	12:00:00	50.6	40.9	49.9	66.1	38.0
	12:05:00	51.6	41.5	48.5	58.3	39.2
	12:10:00	54.0	39.9	53.3	69.6	34.3
	12:15:00	52.9	43.2	50.6	65.8	38.3
	12:20:00	50.0	40.8	46.9	57.9	34.5
	12:25:00	50.8	40.7	47.7	58.5	35.6
	12:30:00	51.6	40.5	48.3	58.2	36.1
	12:35:00	52.2	41.6	50.5	65.3	37.1
	12:40:00	52.8	40.1	49.6	61.7	36.9
	12:45:00	50.3	39.4	47.2	56.7	36.1
	12:50:00	52.8	38.8	52.6	74.3	34.6
	12:55:00	51.6	40.9	48.2	60.0	37.1
	13:00:00	52.6	41.0	49.3	63.3	36.7
	13:05:00	52.3	40.2	49.0	60.5	35.7
	13:10:00	50.7	40.9	48.1	60.8	39.5
	13:15:00	51.3	38.0	48.2	60.1	35.8
	13:20:00	51.1	40.0	48.0	59.8	36.9

Appendix A2	Title: Noise survey results

Southern site boundary with New Mill Road, Cardigan

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
15.8.23	13:25:00	50.4	40.8	47.3	58.2	36.5
	13:30:00	52.2	41.6	51.9	69.8	39.1
	13:35:00	51.2	41.5	48.5	62.1	38.3
	13:40:00	56.4	42.5	53.3	76.0	37.6
	13:45:00	51.4	40.3	48.8	65.6	38.1
	13:50:00	51.4	40.9	47.7	55.0	38.4
	13:55:00	51.2	41.7	48.7	65.0	38.6
	14:00:00	53.1	41.1	49.7	61.8	36.9
	14:05:00	53.5	41.0	50.1	61.6	38.3
	14:10:00	51.6	41.5	48.0	57.5	39.4
	14:15:00	52.4	43.2	65.9	89.1	39.6
	14:20:00	51.1	43.3	48.2	60.4	39.4
	14:25:00	52.5	41.8	49.6	62.5	39.4
	14:30:00	53.5	41.6	50.0	59.8	38.0
	14:35:00	51.1	41.6	48.2	60.4	38.6
	14:40:00	54.8	41.7	50.7	61.5	38.5
	14:45:00	52.0	42.9	50.8	67.3	38.6
	14:50:00	56.0	41.8	51.7	61.0	38.1
	14:55:00	52.9	42.7	50.2	61.4	38.0
	15:00:00	50.2	40.7	47.6	58.2	36.7
	15:05:00	52.8	42.1	49.0	57.4	38.2
	15:10:00	51.1	41.0	47.8	57.4	38.8
	15:15:00	53.8	41.2	50.1	61.6	38.0
	15:20:00	52.7	40.6	49.6	62.4	37.5
	15:25:00	52.3	40.4	49.4	62.5	37.5
	15:30:00	52.1	40.3	50.2	67.3	35.3
	15:35:00	56.5	42.9	53.2	68.4	38.4
	15:40:00	52.9	40.9	49.2	62.5	37.5
	15:45:00	51.7	41.2	48.5	62.3	39.1
	15:50:00	53.1	43.1	50.5	64.7	40.3
	15:55:00	50.4	41.1	47.1	57.9	36.2
	16:00:00	52.4	42.2	49.8	64.3	40.2
	16:05:00	54.0	42.1	51.6	65.7	38.4
	16:10:00	50.6	40.8	47.6	57.5	38.0
	16:15:00	51.5	40.7	48.9	61.6	38.3
	16:20:00	50.7	40.6	48.0	60.4	37.3
	16:25:00	51.4	41.2	48.0	61.5	38.7
	16:30:00	51.3	41.6	48.5	60.0	38.1
	16:35:00	52.5	39.8	49.9	68.3	34.8
	16:40:00	50.1	40.7	47.2	59.2	37.2
	16:45:00	51.3	40.3	48.3	60.9	35.6
	16:50:00	52.0	41.6	48.8	59.4	38.6
	16:55:00	48.7	40.6	46.1	61.0	38.1
	17:00:00	51.6	40.7	48.8	61.1	34.8
	17:05:00	51.9	42.4	49.2	59.6	36.7
	17:10:00	54.0	40.5	50.4	61.1	37.1
	17:15:00	52.9	40.5	50.2	63.7	35.5
	17:20:00	50.5	40.2	47.4	54.5	37.1
	17:25:00	52.6	40.0	49.6	61.3	36.3
	17:30:00	53.1	39.8	53.9	73.6	34.8
	17:35:00	54.5	42.3	51.8	66.2	35.0

Appendix A3	Title: Noise survey results

Southern site boundary with New Mill Road, Cardigan

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
15.8.23	17:40:00	55.3	40.7	52.0	68.5	35.7
	17:45:00	51.1	38.4	48.0	59.7	35.3
	17:50:00	50.4	38.3	54.1	76.1	35.9
	17:55:00	50.5	44.2	48.0	54.3	41.2
	18:00:00	52.4	43.7	51.1	69.9	38.7
	18:05:00	51.6	38.6	47.9	57.1	35.6
	18:10:00	52.7	38.3	48.9	61.4	35.2
	18:15:00	51.1	38.8	47.8	60.4	35.1
	18:20:00	49.5	38.1	47.3	62.0	35.5
	18:25:00	51.2	38.3	47.4	58.9	35.5
	18:30:00	50.0	37.6	47.0	62.4	34.2
	18:35:00	50.2	37.8	46.6	65.3	34.7
	18:40:00	50.5	39.0	47.8	63.2	34.7
	18:45:00	51.0	37.3	48.3	66.2	32.9
	18:50:00	51.3	39.2	48.7	60.6	34.6
	18:55:00	50.4	40.7	46.9	59.3	37.7
	19:00:00	51.5	37.3	48.7	60.1	33.8
	19:05:00	50.5	38.4	47.2	59.3	34.9
	19:10:00	50.8	37.5	47.2	55.6	34.9
	19:15:00	50.1	36.7	50.4	71.1	32.9
	19:20:00	51.2	37.5	48.9	63.7	34.8
	19:25:00	50.4	37.1	46.8	59.7	34.1
	19:30:00	48.6	36.8	45.2	56.0	34.0
	19:35:00	50.0	36.9	46.3	61.7	33.5
	19:40:00	49.2	35.5	45.7	58.9	33.7
	19:45:00	46.9	34.2	42.6	54.6	30.2
	19:50:00	51.1	35.2	47.3	57.7	31.5
	19:55:00	50.3	36.3	47.0	63.9	33.5
	20:00:00	48.9	37.4	45.0	55.2	32.7
	20:05:00	52.6	38.7	48.5	59.2	35.9
	20:10:00	51.2	38.4	48.5	62.3	35.1
	20:15:00	49.4	38.7	46.2	57.5	34.0
	20:20:00	49.2	36.1	45.3	54.7	30.1
	20:25:00	49.3	36.6	45.4	54.8	32.4
	20:30:00	49.7	38.1	45.9	54.9	35.4
	20:35:00	48.9	39.1	46.4	59.5	36.6
	20:40:00	52.7	41.1	49.1	62.9	37.4
	20:45:00	50.3	40.1	46.9	56.9	35.1
	20:50:00	52.3	41.6	50.6	66.1	38.4
	20:55:00	51.7	41.9	48.4	58.6	37.0
	21:00:00	50.7	42.5	48.5	59.6	39.7
	21:05:00	48.4	39.4	46.0	59.2	36.3
	21:10:00	51.2	40.8	48.0	61.2	35.5
	21:15:00	48.3	36.4	44.6	53.0	32.6
	21:20:00	48.4	38.2	44.8	54.2	34.0
	21:25:00	49.6	39.1	46.1	55.1	33.5
	21:30:00	49.4	37.6	45.5	54.4	33.3
	21:35:00	48.7	37.9	45.3	54.7	34.7
	21:40:00	47.6	37.3	44.2	55.4	32.0
	21:45:00	48.7	36.7	44.8	54.5	31.2
	21:50:00	48.2	35.8	44.5	57.0	30.6

Appendix A4	Title: Noise survey results

Southern site boundary with New Mill Road, Cardigan

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
15.8.23	21:55:00	48.7	39.0	45.4	55.4	33.5
	22:00:00	50.5	37.2	46.8	54.6	34.5
	22:05:00	50.1	42.5	47.5	56.2	37.5
	22:10:00	49.9	33.6	45.8	57.3	29.8
	22:15:00	49.6	34.3	45.3	56.8	30.1
	22:20:00	49.0	36.9	45.2	58.4	31.5
	22:25:00	48.7	37.2	44.5	56.7	30.6
	22:30:00	48.0	37.4	44.7	58.8	34.2
	22:35:00	48.3	37.0	43.8	57.8	32.8
	22:40:00	46.9	36.6	43.1	54.2	34.1
	22:45:00	47.0	36.5	43.2	53.5	32.5
	22:50:00	47.0	32.5	42.7	53.5	30.0
	22:55:00	46.8	32.5	43.0	56.2	31.2
	23:00:00	46.6	37.0	43.4	55.2	34.7
	23:05:00	45.5	34.8	42.2	53.5	33.4
	23:10:00	43.2	35.3	40.2	49.2	30.1
	23:15:00	43.8	34.2	40.8	55.6	30.2
	23:20:00	44.5	30.7	42.9	59.2	28.7
	23:25:00	44.0	31.8	40.3	54.3	29.5
	23:30:00	43.3	30.5	39.4	53.5	29.1
	23:35:00	43.6	30.3	39.6	54.7	29.7
	23:40:00	44.1	30.3	40.3	56.8	28.8
	23:45:00	42.8	30.1	39.6	56.2	29.0
	23:50:00	40.8	29.4	37.8	53.3	28.1
	23:55:00	41.1	29.9	38.0	54.7	28.3
16.8.23	00:00:00	41.9	30.1	38.0	51.1	27.8
	00:05:00	41.5	30.0	37.4	52.4	28.0
	00:10:00	39.3	28.3	36.0	51.9	26.1
	00:15:00	40.5	28.4	36.8	50.2	25.7
	00:20:00	40.3	27.2	36.7	52.1	25.4
	00:25:00	40.4	27.3	37.9	53.6	25.3
	00:30:00	40.3	27.2	38.8	56.1	25.4
	00:35:00	38.9	27.2	38.6	54.3	25.0
	00:40:00	33.8	27.0	35.8	55.3	25.1
	00:45:00	38.2	27.3	36.5	54.7	24.9
	00:50:00	41.8	27.5	40.4	65.1	25.3
	00:55:00	40.4	27.4	39.6	52.7	25.5
	01:00:00	36.2	27.3	34.5	51.8	25.9
	01:05:00	39.8	27.0	37.7	52.3	24.7
	01:10:00	40.2	26.3	39.7	58.1	24.6
	01:15:00	40.1	26.8	39.7	57.4	24.4
	01:20:00	39.8	26.1	38.0	56.0	24.1
	01:25:00	40.0	27.2	38.0	52.3	24.7
	01:30:00	33.4	28.5	32.1	48.1	26.8
	01:35:00	37.2	28.9	35.8	48.7	27.0
	01:40:00	39.7	29.6	37.1	56.6	27.3
	01:45:00	33.3	30.2	36.8	58.9	29.3
	01:50:00	31.1	29.1	30.2	39.9	27.7
	01:55:00	32.2	29.4	30.5	42.7	28.0
	02:00:00	33.3	29.1	32.5	45.1	27.9
	02:05:00	31.9	29.3	33.0	44.8	27.8

Appendix A5	Title: Noise survey results

Southern site boundary with New Mill Road, Cardigan

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
16.8.23	02:10:00	30.4	21.9	28.0	40.7	20.7
	02:15:00	30.2	21.8	28.1	41.2	20.8
	02:20:00	25.5	21.7	23.8	35.4	20.8
	02:25:00	29.0	21.8	28.6	43.9	20.7
	02:30:00	37.2	21.6	37.3	55.8	20.7
	02:35:00	28.5	22.0	39.2	56.7	21.0
	02:40:00	23.9	21.1	23.3	37.2	20.3
	02:45:00	24.5	21.2	23.5	44.5	20.7
	02:50:00	29.3	21.7	30.1	46.8	20.6
	02:55:00	27.8	21.8	24.9	47.8	21.0
	03:00:00	25.8	21.7	25.9	49.2	20.6
	03:05:00	34.3	22.0	33.3	52.4	21.0
	03:10:00	45.4	22.6	41.2	58.6	21.1
	03:15:00	45.6	22.6	41.2	58.5	21.1
	03:20:00	36.2	24.9	42.1	57.7	22.8
	03:25:00	35.7	24.7	42.2	58.3	22.8
	03:30:00	29.8	22.7	35.0	55.8	21.0
	03:35:00	29.8	22.7	35.0	55.8	21.0
	03:40:00	45.5	23.4	40.5	56.8	21.6
	03:45:00	44.8	23.3	40.5	57.2	21.4
	03:50:00	43.1	24.6	40.4	55.6	22.6
	03:55:00	41.8	24.3	39.3	52.4	22.5
	04:00:00	32.3	24.6	33.5	51.7	22.9
	04:05:00	34.6	24.2	32.0	52.5	23.0
	04:10:00	35.1	25.1	35.9	52.1	23.4
	04:15:00	36.7	24.8	35.9	52.4	23.4
	04:20:00	40.4	24.6	37.9	53.0	22.7
	04:25:00	40.5	24.7	43.4	58.7	22.7
	04:30:00	48.3	25.9	44.1	61.1	23.4
	04:35:00	42.8	24.4	43.8	57.8	23.3
	04:40:00	42.1	24.3	38.3	53.2	22.8
	04:45:00	39.4	24.2	36.7	51.2	22.7
	04:50:00	46.9	25.9	43.3	58.6	23.2
	04:55:00	44.8	25.6	42.2	56.7	23.3
	05:00:00	39.9	25.0	38.9	55.7	23.3
	05:05:00	44.5	25.4	43.2	56.3	23.4
	05:10:00	47.9	25.8	43.4	59.3	23.7
	05:15:00	47.2	25.7	43.4	55.6	23.4
	05:20:00	47.7	26.0	43.4	60.4	22.9
	05:25:00	40.3	25.4	38.7	56.6	22.1
	05:30:00	40.4	24.0	36.9	53.4	22.2
	05:35:00	40.7	24.2	37.8	55.7	22.5
	05:40:00	41.2	24.8	38.1	53.5	23.1
	05:45:00	45.0	26.2	43.7	59.0	23.7
	05:50:00	49.5	26.6	44.5	60.6	23.8
	05:55:00	49.3	26.5	44.4	58.9	23.8
	06:00:00	49.8	26.9	47.9	59.8	24.5
	06:05:00	50.1	26.0	46.5	67.8	23.6
	06:10:00	47.3	28.6	43.3	58.1	25.0
	06:15:00	47.8	28.7	44.5	59.8	25.8
	06:20:00	48.5	29.6	44.3	57.2	25.9

Appendix A6	Title: Noise survey results

Southern site boundary with New Mill Road, Cardigan

Date	Sample start time	Noise Parameter - dB				
		L_{A10}	L_{A90}	L_{Aeq}	L_{AFmax}	L_{AFmin}
16.8.23	06:25:00	49.8	30.1	45.4	59.7	26.4
	06:30:00	50.6	30.5	45.7	56.4	27.6
	06:35:00	51.2	31.5	49.8	67.4	28.9
	06:40:00	47.4	28.2	44.8	61.7	24.9
	06:45:00	48.9	30.2	45.6	62.3	25.4
	06:50:00	51.7	31.4	47.8	67.9	26.4
	06:55:00	52.3	34.5	50.1	78.3	28.5
	07:00:00	55.3	41.5	53.5	75.3	35.7
	07:05:00	54.0	40.3	53.3	74.3	36.3
	07:10:00	53.8	37.5	52.8	74.3	30.8
	07:15:00	54.3	42.8	53.4	69.8	32.4
	07:20:00	55.2	44.0	52.0	71.2	33.9
	07:25:00	55.5	43.9	52.0	72.0	35.3
	07:30:00	56.0	43.9	52.8	70.4	35.7
	07:35:00	55.8	43.6	52.7	69.9	35.1
	07:40:00	55.6	43.0	52.7	68.0	35.8
	07:45:00	56.3	42.8	51.7	67.9	40.2
	07:50:00	56.8	46.1	53.6	63.6	42.1
	07:55:00	56.9	46.7	54.0	65.8	42.0
	08:00:00	58.1	46.6	56.5	80.0	41.2
	08:05:00	57.7	47.2	55.0	66.6	42.1
	08:10:00	56.4	47.3	56.3	84.1	37.1
	08:15:00	56.7	47.2	55.7	76.5	38.2
	08:20:00	56.2	46.7	53.1	63.5	39.1
	08:25:00	56.4	47.0	53.0	64.5	40.0
	08:30:00	56.5	47.7	54.2	74.8	44.4
	08:35:00	57.8	48.3	54.6	68.3	43.9
	08:40:00	57.0	49.1	54.3	67.3	44.7
	08:45:00	57.6	49.6	54.7	68.0	45.0
	08:50:00	57.2	49.4	54.5	68.3	44.4
	08:55:00	58.0	49.8	55.0	68.9	44.7
	09:00:00	56.8	46.3	53.8	68.7	40.6
	09:05:00	55.6	46.7	54.3	68.3	40.7
	09:10:00	55.5	46.3	52.6	68.1	41.6
	09:15:00	56.0	46.6	53.3	68.0	40.8
	09:20:00	55.7	46.8	53.1	68.6	40.6
	09:25:00	56.0	46.8	53.6	69.1	42.3
	09:30:00	55.9	47.7	53.4	70.2	43.8
	09:35:00	56.0	47.6	53.1	68.6	42.4
	09:40:00	55.7	45.8	53.0	65.7	40.2
	09:45:00	56.4	46.4	54.0	68.7	41.0
	09:50:00	56.8	46.9	54.5	71.1	43.1

APPENDIX B

SOUNDPLAN MODELS – OPEN SITE

dBA

	<= 50
50 <	<= 55
55 <	<= 60
60 <	<= 65
65 <	<= 70
70 <	

Open site

Daytime

(LAeq,16hour)

Contour Grid / Calculations at 1.5m height

(Noise contour plot provided for indicative purposes only)

Date: 22.08.2023

Project No: 2322043

Consultant: K. Metalfe

Scale 1:1250

0 5 10 20 30 40 m

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Noise Level Bands

	<= 40
40 <	<= 45
45 <	<= 50
50 <	<= 55
55 <	<= 60
60 <	

Open site

Night-time

(LAeq,8hour)

Contour Grid / Calculations at 4.5m height

(Noise contour plot provided for indicative purposes only)

Date: 22.08.2023

Project No: 2322043

Consultant: K. Metalfe

Scale 1:1250

0 5 10 20 30 40 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS

APPENDIX C

SOUNDPLAN MODELS – WITH DEVELOPMENT

With Development

Daytime

(LAeq,16hour)

Contour Grid / Calculations at 1.5m height

(Noise contour plot provided for indicative purposes only)

Date: 22.08.2023

Project No: 2322043

Consultant: K. Metcalfe

Scale 1:1250

0 5 10 20 30 40 m

SHARPS REDMORE
ACOUSTIC CONSULTANTS

With Development

Night-time Contours

(LAeq,8hour)

Contour Grid / Calculations
at 4.5m height

(Noise contour plot provided for indicative purposes only)

Date: 22.08.2023

Project No: 2322043

Consultant: K. Metcalfe

Scale 1:1250

0 5 10 20 30 40 m

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ACOUSTIC CONSULTANTS

APPENDIX D

ACOUSTIC TERMINOLOGY

Appendix D: Acoustic terminology

Ambient noise:

The totally encompassing sound in a given situation at a given time. Most often described in terms of the index L_{AeqT}.

Atmospheric absorption:

The excess acoustic attenuation, over and above that caused by distance attenuation, due to the interaction of an acoustic wave with air molecules.

A-weighting:

A frequency weighting which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Units may be denoted as dB(A) or as sound pressure levels L_{pA} in dB. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound.

Background noise:

See $L_{A90.}$

Correction (for characteristic features of noise source):

A 5 dB penalty applied to the specific noise level if the noise being assessed "contains a distinguishable, discrete continuous note", contains "distinct impulses", or is "irregular enough to attract attention" (ref BS 4142:1997).

Decibel (dB):

A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.

Façade noise level:

The noise level adjacent to the façade of a building, usually at a distance of 1 metre.

Free-field noise level:

The noise level away from the façade of a building or other structure.

Hertz (Hz):

Unit of frequency, equal to one cycle per second. Frequency is related to the pitch of a sound.

L_{A10T} : The A weighted level of noise exceeded for 10% of the specified measurement period, T. It gives an indication of the upper limit of fluctuating noise such as that from road traffic. $L_{A10,18hr}$ is the arithmetic average of the 18 hourly $L_{A10,1hr}$ values from 0600 hrs to 2400 hrs.

L_{A90T} : The A weighted noise level exceeded for 90% of the specified time period, T. In BS 4142:1997 it is used to define background noise level.

L_{AeqT} : The equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period, T. This period is taken to be 16 hours (0700 hrs to 2300 hrs) and 8 hours (2300 to 0700 hrs) to describe day and night, in PPG 24 L_{AeqT} is used to describe many types of noise and can be measured directly with an integrating sound level meter.

SEL or L_{AE}: The sound exposure level is the A-weighted sound energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparisons to be made between different noise events which occur for different lengths of time.