ARDENT
CONSULTING ENGINEERS

COUNTRYSIDE PARTNERSHIPS

LAND AT BROOK FARM, DAWS HEATH

NOISE ASSESSMENT

REPORT REF.
W461-02

June 2022

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Contents

Appendices

Figures

Tables

Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT	CM	LD	WIP DRAFT ONLY	23/05/22
-	DRAFT	CM	LD	DRAFT	31/05/22
-	FINAL	CM	CM	LD	01/06/22

Distribution

1. INTRODUCTION

1.1. Ardent Consulting Engineers have been instructed by Countryside Partnerships to undertake a Noise Assessment for a residential development. The site is at Brook Farm, Daws Heath.

Site Location

1.2. The site is located in a predominantly residential area. To the west of the site is the Daws Heath Road, to the north is Bramble Road. The surrounding area and approximate site boundary (in red) are shown in Figure 1-1.

Figure 1-1: Site Boundary and Surrounding Area (Google Earth 2022)

Site Proposals

1.3. Proposals for the development are for 173 dwellings, associated parking and landscaping. An extract of the proposals for the site are shown in Figure 1-2:

Figure 1-2: Site Proposals - Extract

2. LOCAL AUTHORITY LIAISON

2.1. Contact[1] has been made with the acoustic consultant working on behalf of Castle Point Borough Council. The following was agreed in relation to the assessment criteria and methodology:

- Assessment of the suitability for the site would be conducted in accordance with BS8233 and ProPG from a noise perspective;
- The assessment would consider the impact of noise from road traffic from the development at operational stage;
- The measurement positions and dates of the noise survey have all been agreed as acceptable.

2.2. A summary of relevant guidance and policy is shown in Appendix E.

[1] Email contact on 01/04/22, 10/04/22 and 13/04/22

3. ENVIRONMENTAL NOISE LEVELS

3.1. Environmental noise surveys were undertaken at the site between 3rd and 5th March 2022, the measurement positions are shown in Figure 3-1.

3.2. Measurement positions were selected in order to obtain representative baseline noise levels at locations representative of the proposed façade of the development due to the main observed sources at the site.

Figure 3-1: Measurement Positions

3.3. A description of the measurements positions is as follows:

- **Long Term Measurement Position 1 (LT1)** - The microphone was mounted at a height of 1.2m above local ground level in free field conditions and had an unobscured path to Daws Heath Road.

- **Long Term Measurement Position 2 (LT2)** - The microphone was mounted approximately 1.2m above local ground level in free field conditions.
- **Long Term Measurement Position 3 (LT3)** - The microphone was mounted approximately 2.5m above local ground level in free field conditions.

3.4. The equipment used for the survey was as follows:

- Svantek Svan 971 Sound Level Meter (serial number: 34787)
- Svantek Svan 977 Sound Level Meter (serial number: 34133)
- Svantek Svan 977 Sound Level Meter (serial number: 45351)
- Rion NC74 Calibrator (serial number: 34172694)

3.5. All equipment used has been professionally calibrated. Field calibration of the sound level meter (and complete measurement signal chain) was undertaken before and after measurement to ensure no drift of the calibration signal. Calibration certificates are available upon request.

3.6. With the exception of 18:00 to 19:00, 4th May when rain and strong winds were observed, weather conditions were suitable for the duration of the surveys with a light breeze and no rain. The period of adverse weather has been excluded from assessment.

3.7. Elevated noise levels occurred between approximately 04:30 and 05:30 during the survey at every monitoring position and on every day. Analysis of the data indicates that this is very likely due to dawn chorus, these periods have been excluded from further assessment. Spurious events were noted at measurement position LT2 which have been excluded from assessment.

3.8. A summary of the measurements taken at the site are summarised in Table 3-1. Time histories of measured noise levels are shown in Appendix A, which indicate periods excluded from assessment.

Monitoring Position	Ambient Sound Level, dB $L_{Aeq, T}$ Range (Average)		Night-time dB L_{AFmax} Range (Representative)
	Daytime	Night-time	
LT1	37-65 **(52)**	25-61 **(47)**	35-85 **(68)**
LT2	29-60 **(48)**	26-62 **(44)**	35-96 **(65)**
LT3	31-64 **(49)**	26-58 **(43)**	36-81 **(62)**

Table 3-1: Summary of Measured Noise Levels

3.9. The representative L_{Amax} level is the value which has been exceeded fewer than 10 times in the 8-hour night-time period, i.e. one which can be considered to be 'not normally exceeded' as per the World Health Organisation (WHO) guidelines.

3.10. Representative octave band levels are provided in Table 3-2, these are used in glazing calculations to ensure a robust assessment of internal noise levels.

		Octave Band Centre Frequency, dB							
		63	125	250	500	1k	2k	4k	8k
LT1	$L_{Aeq,T}$ (day)	58	50	45	44	45	45	45	44
	$L_{Aeq,T}$ (night)	50	43	39	39	38	38	41	41
	$L_{Amax,T}$ (night)	65	58	51	56	58	61	64	60
LT2	$L_{Aeq,T}$ (day)	52	48	44	41	38	40	43	40
	$L_{Aeq,T}$ (night)	49	45	41	39	37	36	37	36
	$L_{Amax,T}$ (night)	59	60	55	48	47	60	60	51
LT3	$L_{Aeq,T}$ (day)	55	50	46	43	42	42	41	38
	$L_{Aeq,T}$ (night)	48	43	39	38	38	32	36	32
	$L_{Amax,T}$ (night)	57	55	52	51	52	57	55	55

Table 3-2: Octave Band Data for Noise Monitoring Locations

3.11. Based on the noise survey results, the site would be considered low risk when compared with Figure 1 of ProPG Guidance. This would not prohibit the development as good acoustic design processes can be followed to reduce sound levels to as low as practical across the site.

4. DEMOLITION AND CONSTRUCTION NOISE

4.1. Given the proximity of proposed construction to neighbouring noise sensitive properties such as residential areas, it is possible that site clearance, preparation and construction noise may impact nearby receptors.

4.2. A detailed construction programme; specific plant data and operations are not available at this stage of the project. Therefore, it is not possible to undertake a detailed assessment of likely impact at this time. Reasonable construction noise limits can be derived using the Example Method 1 (the ABC Method) of BS 5228, within section E.3.2. Table E.1 from the standard is reproduced below in Table 4-1:

Table E.1 Example threshold of significant effect at dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23.00–07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

[A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

[B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

[C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

[D] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

Table 4-1: Table E.1 – BS5228 Part 1

4.3. Measurements taken in the area indicate that the ambient level is within Category A of Table E.1. Therefore, the following ambient noise levels set out in Table 4-2 resulting from construction activities will be deemed to have a significant effect.

Time Period	Noise Levels Likely to have a significant effect dB L_{Aeq}
Monday to Friday (07:00 – 19:00) & Saturday (07:00 – 13:00)	>65

Table 4-2: Ambient Noise Levels as a Result of Construction Activities at Which a Significant Effect is Likely

Best Practice Recommendations

4.4. During construction, the contractor will employ best practicable means to control noise from construction operations. It is expected that the development will be subject to a Construction and Environmental Management Plan which will be secured by condition, and which will contain appropriate measures to protect residential amenity during the construction process.

4.5. Temporary screening in the form of solid timber hoarding can be used where operations are adjacent to sensitive receptors. Consideration will be given to neighbouring residential properties when locating the temporary site compounds and material stockpiles.

4.6. Stationary equipment and plant such as generators will be placed as far as practicable from noise sensitive properties, and preferably in areas benefiting from existing or purpose-built attenuation such as bunding or behind non-sensitive buildings.

4.7. Delivery of materials and removal of waste from the site will be planned to minimise disturbance to neighbouring properties. Idling of plant, machinery and delivery vehicles should be prohibited when not in use.

4.8. If required noise levels can be monitored regularly in accordance with BS 5228 to ensure the above set limits are not exceeded. In addition to the above all other guidance within BS 5228–1 will be followed at all times.

5. ROAD TRAFFIC NOISE

5.1. Traffic flow volumes provided by Iceni have been used to calculate the change in noise levels arising due to road traffic when the site is occupied.

5.2. Traffic flows are presented in Appendix C, the data is presented as daytime (07:00 – 23:00) and night time (23:00 – 07:00) traffic flows. It is understood from information provided by Iceni that the development traffic will occur only during the daytime.

5.3. This section considers traffic noise impact of the operational stage of the site against the future baseline.

5.4. Tables 5-1 show the traffic flows and predicted changes in noise levels for the change in traffic flow due to operational traffic when compared to the future baseline for the daytime. Calculations are presented in Appendix D.

Road	Future Baseline	Future Baseline + Operational Traffic	Change in Noise Level, dB
Daws Heath Road	41,217	45,302	0.4

Table 5-1: Change in Noise Levels Due to Operational Traffic Compared to Future Baseline - Daytime

5.5. The change in noise levels is negligible when compared to Table 3.54b of DMRB, LA 111.

6. GLAZING AND VENTILATION

6.1. The aim of this section is to identify glazing and ventilation capable of achieving the internal guidance sound levels.

6.2. Calculations have been conducted based on the measured noise levels, where necessary noise levels are corrected for distance and screening effects. The calculations are presented in Appendix A.

6.3. The glazing and ventilation specifications shown in this section will be provided as standard for all dwellings at the site.

External Building Fabric - Non-Glazed Elements

6.4. It is assumed that the non-glazed external building fabric elements comprise masonry cavity walls or equivalent acoustic performance. This would typically provide a sound reduction performance of at least the figures shown in Table 6-1 when tested in accordance with BS EN ISO 10140-2:2010 (figures derived from: Representative Values of Airborne SRI for Some Common Structures: Appendix B of Flakt Woods 'Guide to Noise Control').

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Masonry Cavity Wall	34	43	55	66	77	85

Table 6-1: Non-glazed Elements Sound Reduction Performance

External Building Fabric - Glazing

6.5. Table 6-2 sets out the required glazing performance, these specifications take into account the glass, frame, seals and associated fittings.

Room Type	Sound Reduction Index, dB R_w	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
All rooms	**29**	21	17	25	35	37	31

Table 6-2: Required Minimum Sound Reduction Performance for Glazing

External Building Fabric - Ventilation

6.6. Table 6-3 sets out the required ventilation performance.

Room Type	Element Normalised level difference, dB D_{new}	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
All rooms	**32**	36	36	35	33	29	31

Table 6-3: Required Minimum Sound Reduction Performance for Ventilation

6.7. All major building elements should be tested in accordance with BS EN ISO 10140-2:2010. Sole glass performance data would not necessarily demonstrate compliance with this specification.

6.8. It should be noted that there may be additional considerations for glazing requirements such as overheating, security, thermal performance, and air quality. Alternative glazing could be used assuming the minimum acoustic performance is met.

6.9. Windows and trickle vents with the above minimum performance will be installed across the whole site. On a small number of facades windows will need to be closed to achieve the internal noise levels according to the guidance (but the owners would still have the option to open windows according to their preference). This affects 9 out of 173 or 5% of properties only and for the vast majority of dwellings open window ventilation will be suitable.

6.10. Figure 6-1 indicates where closed windows will be required at the site:

Figure 6-1: Closed Windows and Alternative Ventilation

6.11. Utilising closed, but not sealed, windows, and alternative ventilation for these dwellings means that residents have the choice to close windows whilst still having the provision of suitable background ventilation.

6.12. No additional measures are required to control noise at these dwellings.

7. DISCUSSION

Overheating

7.1. Noise levels place dwellings in close proximity to Daws Heath Road in the low risk category during the day and night. All other dwellings on site are in the negligible risk category during the day and low risk category during the night according to Acoustics Ventilation and Overheating (AVO) guidance.

External Amenity Areas

7.2. Gardens are proposed across the site as well as a play area, as shown in Figure 7-1:

Figure 7-1: Amenity Areas

7.3. Based on the results of the noise survey, external sound levels at amenity areas across the site will meet the guidance criteria of BS8233.

8. CONCLUSIONS

8.1. A noise survey has been undertaken at the site, the measured noise levels have been used to calculate and assess suitable glazing and ventilation specifications, demonstrating the guidance values of the standards can be met.

8.2. The site is considered low risk when compared with Figure 1 of ProPG Guidance. This would not prohibit the development as recommendations to reduce internal sound levels in habitable rooms have been provided and external sound levels are suitable for amenity areas across the site.

8.3. Closed, but not sealed, windows and alternative ventilation, provided by trickle ventilation, are recommended for dwellings affected by road traffic noise to provide suitable internal amenity during normal conditions.

8.4. Where dwellings are sufficiently set back from and/or screened from these roads, open windows will be suitable. The number of affected dwellings is minimal when compared to the total number of proposed dwellings at the site and the excess above the guidance criteria when windows are open is marginal.

8.5. The provision of closed windows, but not sealed, and alternative ventilation for these dwellings means that residents have the choice to close windows whilst still having the provision of suitable background ventilation. This situation is not unusual and is widely applied across other similar schemes in the area.

8.6. The glazing and ventilation specifications which are being provided for the entire site will be suitable where closed windows are required and therefore no additional measures are required to control noise at these dwellings.

8.7. The risk of noise impact under overheating conditions within properties has been considered in accordance with AVO Guidance. Noise levels place dwellings in close proximity to Daws Heath Road in the low risk category during the day and night. All other dwellings on site are in the negligible risk category during the day and low risk category during the night.

8.8. External sound levels at external amenity areas across the site will meet the guideline values set out in the standards.

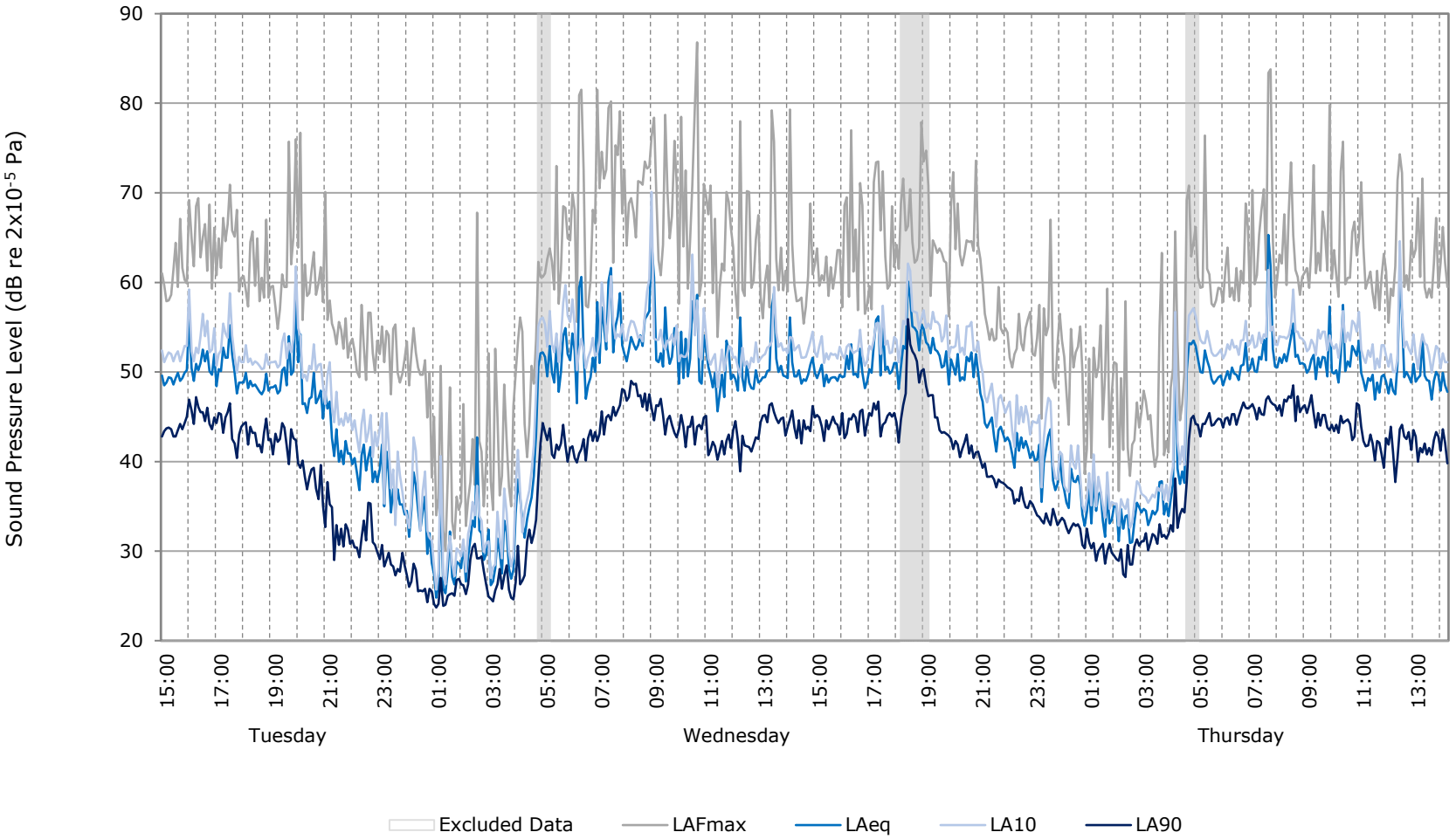
8.9. The change in noise levels due to operational traffic at the site when compared to the future baseline is negligible.

8.10. This assessment demonstrates that the site is suitable for residential development subject to the recommendations included in this report.

APPENDIX A

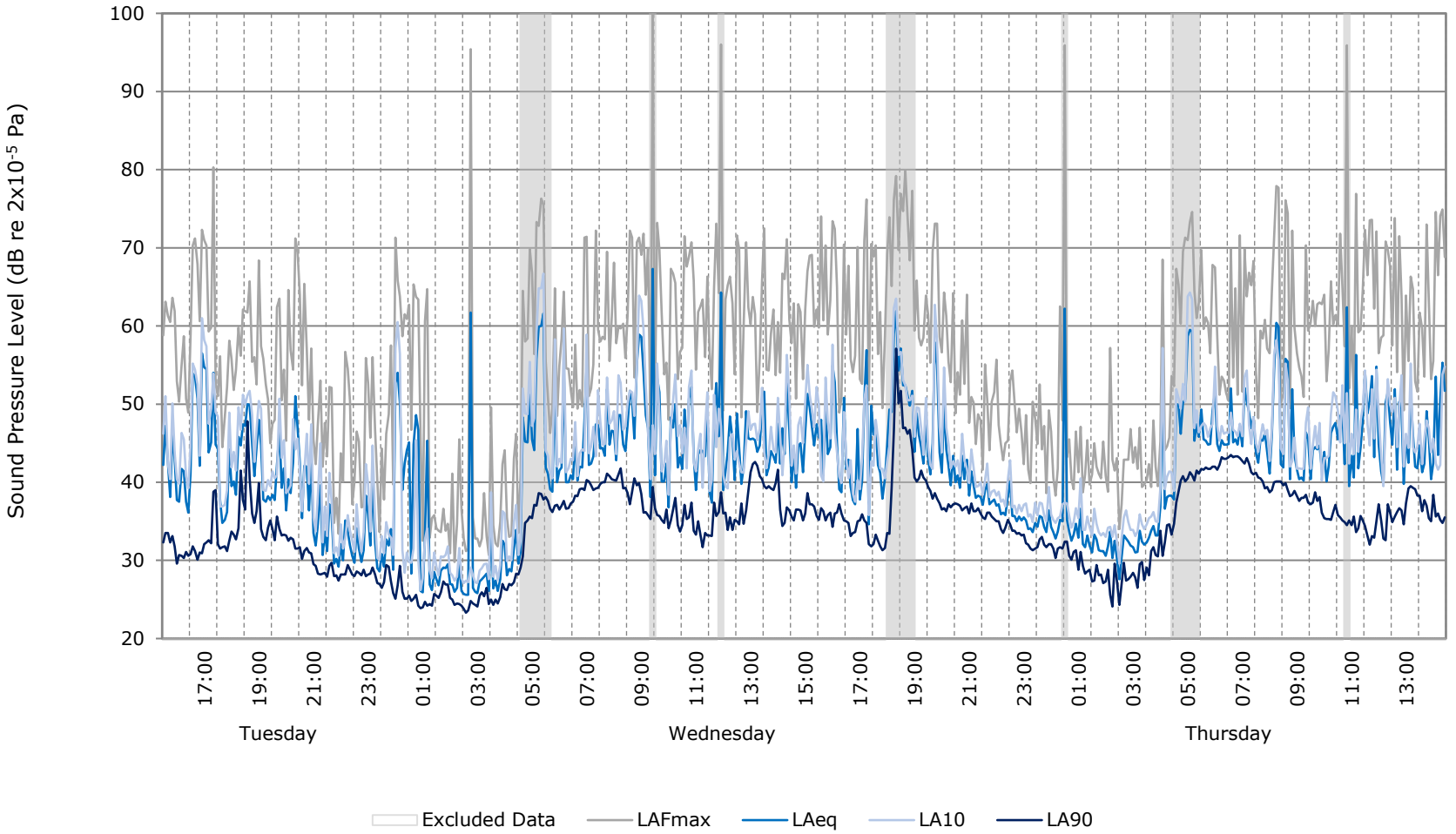
Land at Brook Farm - Position LT1

Environmental Noise Time History
03 May 2022 to 05 May 2022



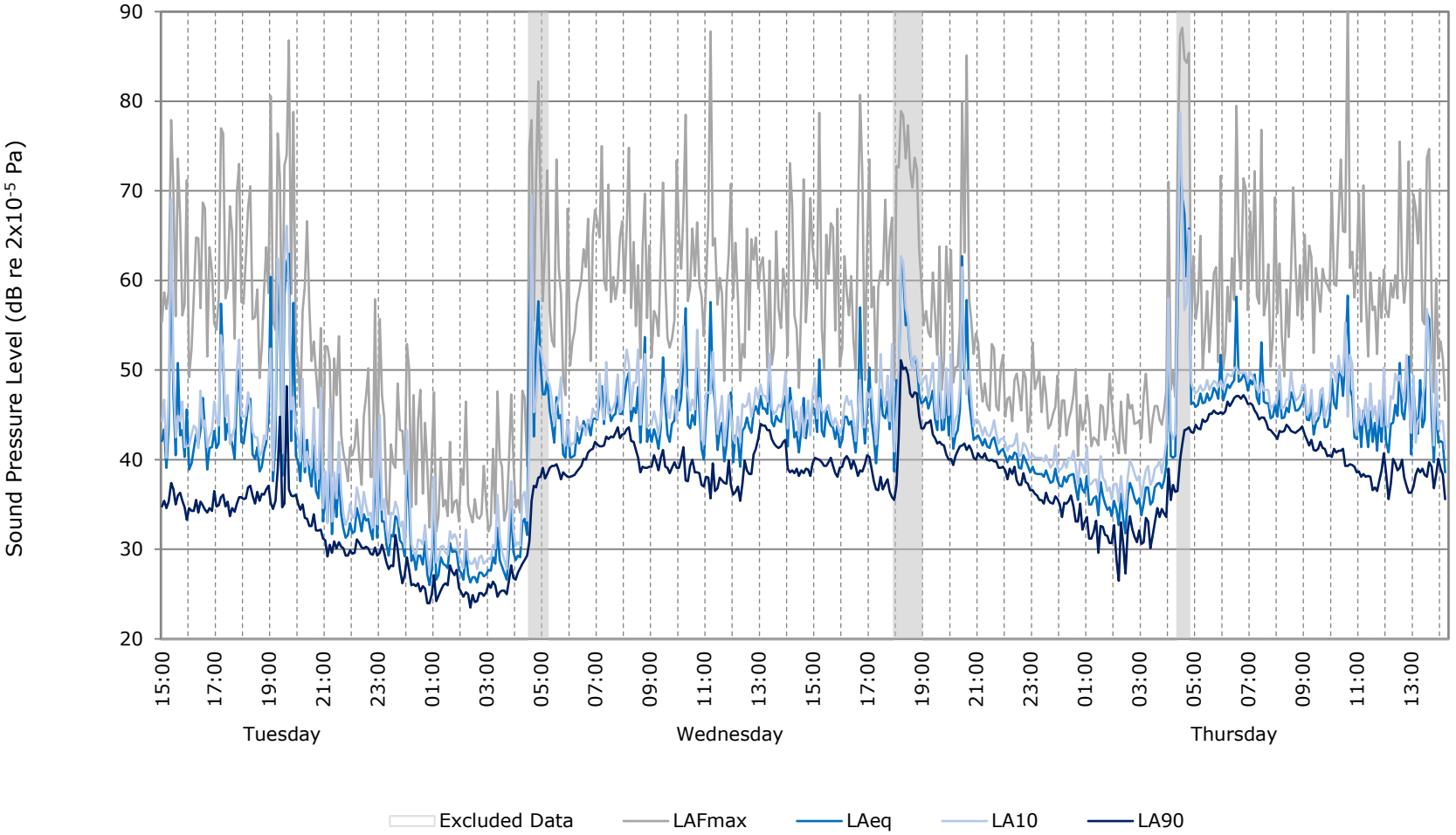
Land at Brook Farm - Position LT2

Environmental Noise Time History
03 May 2022 - 05 May 2022



Land at Brook Farm - Position LT3

Environmental Noise Time History
03 May 2022 - 05 May 2022



APPENDIX B

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

- Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	58	50	45	44	45	45	45	44	52
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	58	50	45	44	45	45	45	44	52

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	37.7	25.9	24.2	16.1	13.3	16.3	15.6	7.2	23	
Lp (Direct)	35.9	24.1	22.4	14.2	11.5	14.5	13.8	5.4	21	**Criteria**
Lp (Rev & Direct)	40	28	26	18	16	19	18	9	25	**≤ 35**
BS8233	40	28	26	18	15	18	18	9	25	**≤ 35**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

- Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	50	43	39	39	38	38	41	41	47
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	50	43	39	39	38	38	41	41	47

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	29.7	18.9	18.2	11.1	6.3	9.3	11.6	4.2	17	
Lp (Direct)	27.9	17.1	16.4	9.2	4.5	7.5	9.8	2.4	16	**Criteria**
Lp (Rev & Direct)	32	21	20	13	9	12	14	6	20	**≤ 30**
BS8233	32	21	20	13	8	11	14	6	19	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	35.00	**- Based on typical size**
Total Surface area	65.50	
Wall façade area	10.00	
Roof façade area	0.00	
Glazing area	3.60	
Dne Ref Area, A0	10.00	

Total façade area	13.60

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000		
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		**- Typical Bedroom RT**
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17		
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27		
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82		

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	65	58	51	56	58	61	64	60	68
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Lmax)	65	58	51	56	58	61	64	60	68

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	44.7	33.9	30.2	28.1	26.3	32.3	34.6	23.2	39	
Lp (Direct)	42.9	32.1	28.4	26.2	24.5	30.5	32.8	21.4	37	**Criteria**
Lp (Rev & Direct)	47	36	32	30	29	35	37	25	41	**≤ 45**
BS8233	47	36	32	30	28	34	37	25	41	**≤ 45**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

- Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	52	48	44	41	38	40	43	40	48
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	52	48	44	41	38	40	43	40	48

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	31.7	23.9	23.2	13.1	6.3	11.3	13.6	3.2	20	
Lp (Direct)	29.9	22.1	21.4	11.2	4.5	9.5	11.8	1.4	18	**Criteria**
Lp (Rev & Direct)	34	26	25	15	9	14	16	5	22	**≤ 35**
BS8233	34	26	25	15	8	13	16	5	22	**≤ 35**

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Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

- Based on typical size

Total façade area	13.60

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	49	45	41	39	37	36	37	36	44
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	49	45	41	39	37	36	37	36	44

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	28.7	20.9	20.2	11.1	5.3	7.3	7.6	-0.8	16	
Lp (Direct)	26.9	19.1	18.4	9.2	3.5	5.5	5.8	-2.6	15	**Criteria**
Lp (Rev & Direct)	31	23	22	13	8	10	10	1	19	**≤ 30**
BS8233	31	23	22	13	7	9	10	1	18	**≤ 30**

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Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

- Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	59	60	55	48	47	60	60	51	65
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Lmax)	59	60	55	48	47	60	60	51	65

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	38.7	35.9	34.2	20.1	15.3	31.3	30.6	14.2	36	
Lp (Direct)	36.9	34.1	32.4	18.2	13.5	29.5	28.8	12.4	34	**Criteria**
Lp (Rev & Direct)	41	38	36	22	18	34	33	16	38	**≤ 45**
BS8233	41	38	36	22	17	33	33	16	38	**≤ 45**

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Noise Break-in Calculation - Position 3

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

- Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	55	50	46	43	42	42	41	38	49
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	55	50	46	43	42	42	41	38	49

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	34.7	25.9	25.2	15.1	10.3	13.3	11.6	1.2	21	
Lp (Direct)	32.9	24.1	23.4	13.2	8.5	11.5	9.8	-0.6	20	**Criteria**
Lp (Rev & Direct)	37	28	27	17	13	16	14	3	24	**≤ 35**
BS8233	37	28	27	17	12	15	14	3	23	**≤ 35**

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Noise Break-in Calculation - Position 3

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	35.00
Total Surface area	65.50
Wall façade area	10.00
Roof façade area	0.00
Glazing area	3.60
Dne Ref Area, A0	10.00

Total façade area	13.60

- Based on typical size

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

- Typical Bedroom RT

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	48	43	39	38	38	32	36	32	43
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	48	43	39	38	38	32	36	32	43

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	27.7	18.9	18.2	10.1	6.3	3.3	6.6	-4.8	15	
Lp (Direct)	25.9	17.1	16.4	8.2	4.5	1.5	4.8	-6.6	13	**Criteria**
Lp (Rev & Direct)	30	21	20	12	9	6	9	-3	17	**≤ 30**
BS8233	30	21	20	12	8	5	9	-3	17	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 3

Description	
Ardent CE Project No.	**W461**
Property Address	**Land at Brook Farm, Hadleigh**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	35.00	**- Based on typical size**
Total Surface area	65.50	
Wall façade area	10.00	
Roof façade area	0.00	
Glazing area	3.60	
Dne Ref Area, A0	10.00	

Total façade area	13.60

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	
Total Absorption	11.27	11.27	11.27	11.27	11.27	11.27	11.27	11.27	
10Log S/A	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	57	55	52	51	52	57	55	55	62
Façade to free field	0	0	0	0	0	0	0	0	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Lmax)	57	55	52	51	52	57	55	55	62

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	21	17	25	35	37	31	40	29	**Pilkington 4/16/4**
Transmission Coefficient	0.015849	0.007943	0.019953	0.003162	0.000316	0.000200	0.000794	0.000100		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.006096	0.002584	0.005512	0.001056	0.000444	0.000897	0.000755	0.000138		
Average SRI	22	26	23	30	34	30	31	39	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	36.7	30.9	31.2	23.1	20.3	28.3	25.6	18.2	33	
Lp (Direct)	34.9	29.1	29.4	21.2	18.5	26.5	23.8	16.4	31	**Criteria**
Lp (Rev & Direct)	39	33	33	25	23	31	28	20	35	**≤ 45**
BS8233	39	33	33	25	22	30	28	20	35	**≤ 45**

APPENDIX C

16-T022 Daws Heath Road AAWT Data for Noise Assessment

	2022 Base	2027 Base	2027 Base + development
AAWT (07:00-22:59)	39,908	41,217	45,302
HDV % (07:00-22:59)	798	824	824
AAWT (23:00-06:59)	1,697	1,753	1,753
HDV % (23:00-06:59)	34	35	35
85th percentile Speed	28.03		
Mean Speed	32.62		
HDV %	2%		

NOTES:

1. There are no committed development flows on Daws Heath Road, therefore the '+Committed Development' scenario is not shown
2. Proposed development trips are assumed to be daytime trips

APPENDIX D

DMRB Calculations - Daytime, Operational

Source	Traffic Flow		Change in Noise Level, dB	DMRB Magnitude of Noise Impact
	Future Baseline	Future Baseline + Operational Traffic		
Daws Heath Road	41217	45302	0.4	Negligible

APPENDIX E

RELEVANT POLICY & GUIDANCE

National Planning Policy Framework (NPPF) – July 2021

Under the NPPF: paragraph 185 of Section 15, with regard to environmental noise; Planning policies and decisions should aim to: -

- mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- 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.

Noise Policy Statement for England (NPSE)

To avoid and mitigate adverse noise effects on health arising from and impacting on new development, the NPPF makes reference to NPSE. The NPSE was published in March 2010 and covers all forms of noise, other than occupational noise. For the purposes of this report, "Neighbourhood Noise" is most relevant as NPSE defined at paragraph 2.5:

"*neighbourhood noise which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.* "

NPSE introduces three concepts to the assessment of noise in the UK:

- NOEL – No Observed Effect Level – This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observable Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

NPSE does not numerically define levels for the NOEL, LOAEL or SOAEL rather it makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc.

National Planning Practice Guidance (2014)

The purpose of the guidance is to complement the NPPF and provide advice on how to deliver its policies.

The purpose of the guidance is to complement the NPPF and provide advice on how to deliver its policies.

The guidance includes a table (as shown in Table 1) that summarises "the noise exposure hierarchy, based on the likely average response" and which offers "examples of outcomes" relevant to the NOEL, LOAEL and SOAEL effect levels described in the NPSE.

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

Table 1: Noise Exposure Hierarchy, Based on the Likely Average Response.

Calculation of Road Traffic Noise – 1988

For new developments, road traffic noise levels should be predicted in accordance with CRTN. This prediction method uses the traffic flow, vehicle speed, and percentage of heavy-duty vehicles (HDVs, over 3.5 tonnes), road gradient and other factors to calculate noise levels at receptor points.

Design Manual for Road and Bridges, Volume 11 (LA111 – Noise and Vibration

Changes in noise level as a result of additional vehicles on the public highway can be assessed using methodologies presented in Design Manual for Road and Bridges (DMRB LA111),

This guidance document sets out the requirements for noise and vibration assessments from road projects. The construction, operation and maintenance of highway projects can lead to changes in noise and vibration levels in the surrounding environment.

The magnitude of change (in sound level) is defined in Table 3.54a of the guidance for short term and Table 3.54b for long term, as presented in Table 2:

Short term magnitude	**Short term noise change (dB $L_{A10,18hr}$ or L_{night})**
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	less than 1.0

Long term magnitude	**Long term noise change (dB $L_{A10,18hr}$ or L_{night})**
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3.0 to 4.9
Negligible	less than 3.0

Table 2 (Table 3.54a and b DMRB, LA 111 - Magnitude of Change)

Control of Pollution Act 1974

The local authority has powers under the Control of Pollution Act 1974 to control noise from construction sites. Section 60 of the Act allows a local authority to serve a notice of its requirements for the control of site noise. This notice may include specification of plant that is or is not to be used, hours during which the construction works can be carried out and levels of noise emission. Section 61 of the Act allows a contractor or developer to take the initiative and agree with the local authority the methods of construction, steps to minimise noise and hours of work.

The Environmental Protection Act 1990

Local authorities have a duty to deal with statutory nuisances under the Environmental Protection Act 1990. For noise to amount to a statutory nuisance, it must be "prejudicial to health or a nuisance" as outlined in Section 79 of the Act. Any proposed development should not result in a statutory nuisance being declared.

Should the Local Authority declare a development to cause a statutory nuisance, an abatement notice can be served to the developer who has up to 21 days to appeal to Magistrates' Court, as detailed in Section 80 of the Act.

The Building Regulations 2010

Building Regulations approvals are required for most new buildings and for most types of works on existing buildings. Part 10 of The Building Regulations 2010 contains provisions, including power for local authorities to test building work, take samples, and provision to ensure compliance. Part E of the Regulation 'Resistance to the passage of sound' is expanded in Approved Document E, which provides robust details to control and mitigate noise within buildings. This Document is separated over four parts which include:

- E1: Protection against sound from other parts of the building and adjoining buildings;
- E2: Protection against sound within dwelling-house etc.;
- E3: Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes;
- E4: Acoustic conditions in schools.

World Health Organisation

The WHO document Guidance on Community Noise specifies additional information for noise affecting noise sensitive receptors and forms the basis of many noise limitations and design ranges for internal and external ambient noise levels. It defines noise as 'a class of sounds that are considered unwanted' (by the listener), 'that adversely affects, or may affect the physiological and psychological wellbeing of people.' Much of the research around this study is based on transportation noise.

Further guidance on the recommended levels is given in the World Health Organisation (WHO) Guidelines for Community Noise. In this document it is stated that:

"*To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}."*

WHO also states the following paragraph with regard to the effects of LAmax events in a night-time period:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)."

WHO guidance 'Night Noise Guidelines for Europe' is concerned with the longer-term average noise levels that are covered by the EU Directive on Environmental Noise, although this does appear to suggest external maximum noise levels of around 57dBA outside bedrooms during the night to achieve internal maximum levels of 42dBA.

The World Health Organisation has recently published Environmental Noise Guidelines – for the European Region (2018) to provide recommendations for protecting human health from exposure to noise sources such as transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise.

The guidance document defines the 'strength' of recommendation (for protecting against noise exposure) as either 'strong' or conditional', outlined below.

Strength of Recommendation

*"A **strong** recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about values, preference*

and resources – inform this recommendation, which should be implemented in most circumstances."

*"A **conditional** recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply."*

External (free-field) recommendations included in the Environmental Noise Guidelines for the European Region are presented in Table 3 for specific noise sources.

Noise Source	dB L_{den}	dB L_{night}	dB $L_{Aeq,\ 24hr}$ (yearly average)	Recommendation
Road Traffic	53	45	-	Strong
Railway	54	44	-	Strong
Aircraft	45	40	-	Strong
Wind Turbine	45	-	-	Conditional
Entertainment	-	-	70	Strong/Conditional

Table 3: Extract from Environmental Noise Guidelines for the European Region

BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

Formerly a Code of Practice, the 2014 revision of BS8233 is now presented and intended as a guidance document. The standard is mainly concerned with building design from an acoustic standpoint. It does however, contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings.

Table 2 of BS8233:2014 provides suitable internal levels for spaces such as open-plan offices and restaurants and notes that an upper and lower noise levels should be considered, as presented in Table 4.

Objective	Typical Situation	Design range dB LAeq,T
Typical noise levels for acoustic privacy in shared spaces	Restaurant	40 - 55
	Open plan office	45 - 50
	Night club, public house	40 - 45
	Ballroom, banqueting hall	35 - 40

Table 4: Extract from Table 2 – Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important

An extract of Table 4 of the document relevant for residential development is reproduced in Table 5.

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

Table 5: Extract from Table 4 – Indoor ambient noise levels in dwellings

Whilst the above criteria is for dwellings, BS8233 states that these recommendations are similar for hotel guestrooms and therefore these have been adopted as the criteria for assessment.

The guidance of BS8233:2014 with regards to external amenity spaces is as follows:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport*

network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

ProPG: Planning and Noise - May 2017

Guidance in ProPG Planning and Noise provides an approach which aims to inform developers, practitioners and local authorities on how potential residential sites should be assessed. ProPG states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.

The guidance also builds upon government planning policy that noise should not be treated in isolation and there should be a holistic approach to good acoustic design.

ProPG sets out a 2-stage approach; the first of which is a risk assessment to identify the likelihood of significant adverse impact, then depending on the outcome of this risk assessment the extent of the acoustic design statement required. The graphic in Figure 1 is an extract from ProPG and indicates the level of risk associated with ranges of sound levels and provides some guidance on the likely extent of work associated with progressing a development exposed to these sound levels.

In relation to maximum noise levels, ProPG states that:

"In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."

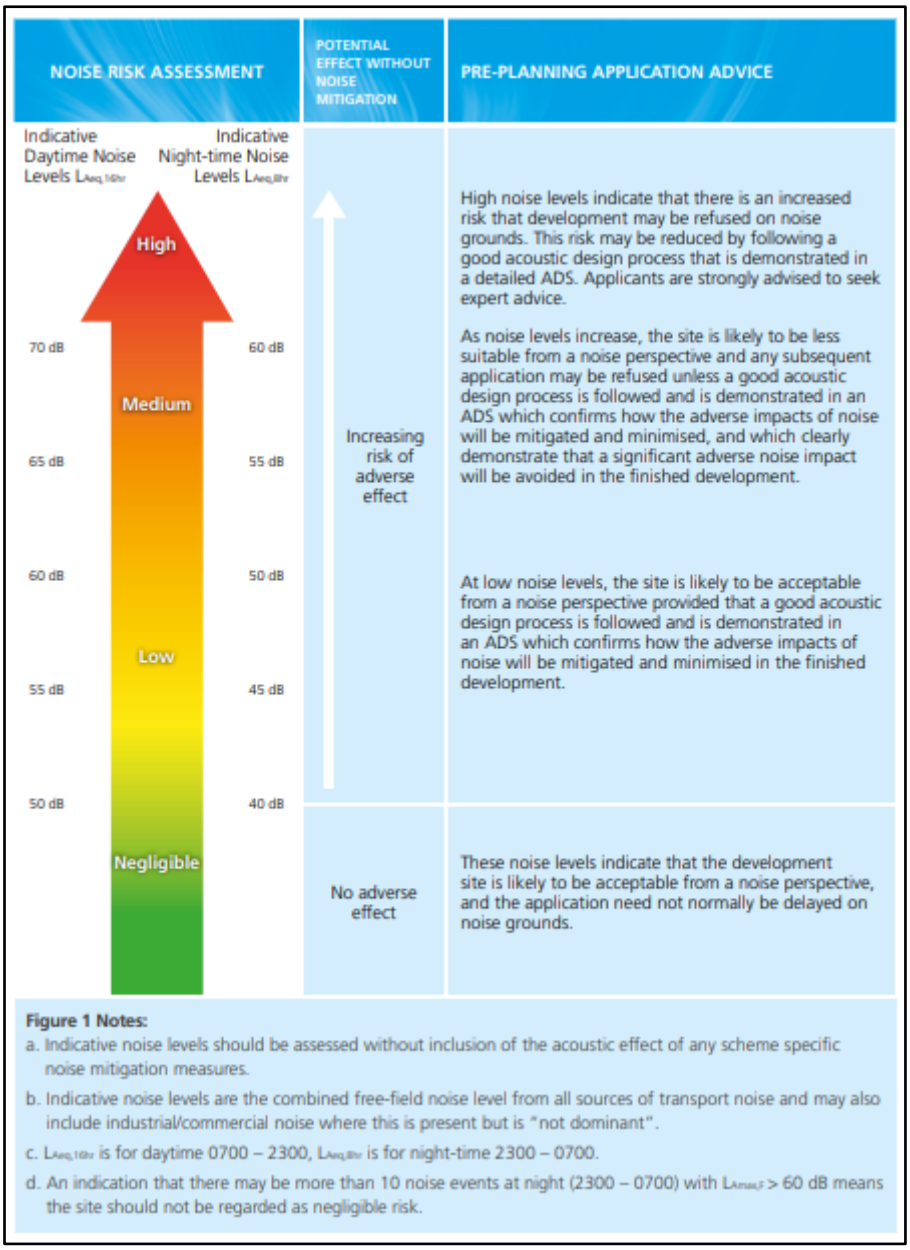

Figure 1: Extract from Figure 1 in ProPG – Initial Site Noise Risk Assessment

The second stage involves four key elements where discussion is expanded on:

- Element 1 – Good Acoustic Design Process
- Element 2 – Internal Noise Level Guidance
- Element 3 – External Amenity Area Noise Assessment
- Element 4 – Assessment of Other Relevant Issues

Having worked through the approach practitioners can present a recommendation to the decision maker.

Acoustics Ventilation and Overheating - Residential Design Guide, January 2020

Acoustics Ventilation and Overheating (AVO) recommends an approach to acoustic assessments for new residential development taking consideration for acoustics, ventilation, and overheating. AVO states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.

Section 3 involves a two-level risk assessment approach to estimate the potential impact on occupants in the case of overheating.

The Level 1 site risk assessment is based on external free-field noise levels and the assumed scenario where a partially open window is used to mitigate overheating (Table 3-2 of the guidance).

The sound level reduction from outside to inside for a partially open window is 13dB in this instance. A Level 1 site risk assessment is considered adequate if the site falls within the 'Negligible risk' category. A Level 2 assessment can optionally be undertaken to give more confidence in the case of Low or Medium risk sites, where appropriate. The Level 2 assessment is strongly recommended for 'High' risk sites.

The Level 2 assessment suggests that assessment of the adverse effect from noise exposure should include an estimate of how frequently and for what duration the overheating condition occurs (Table 3-3 of the guidance)

Figure 2 explains the two-level noise assessment procedure for overheating conditions.

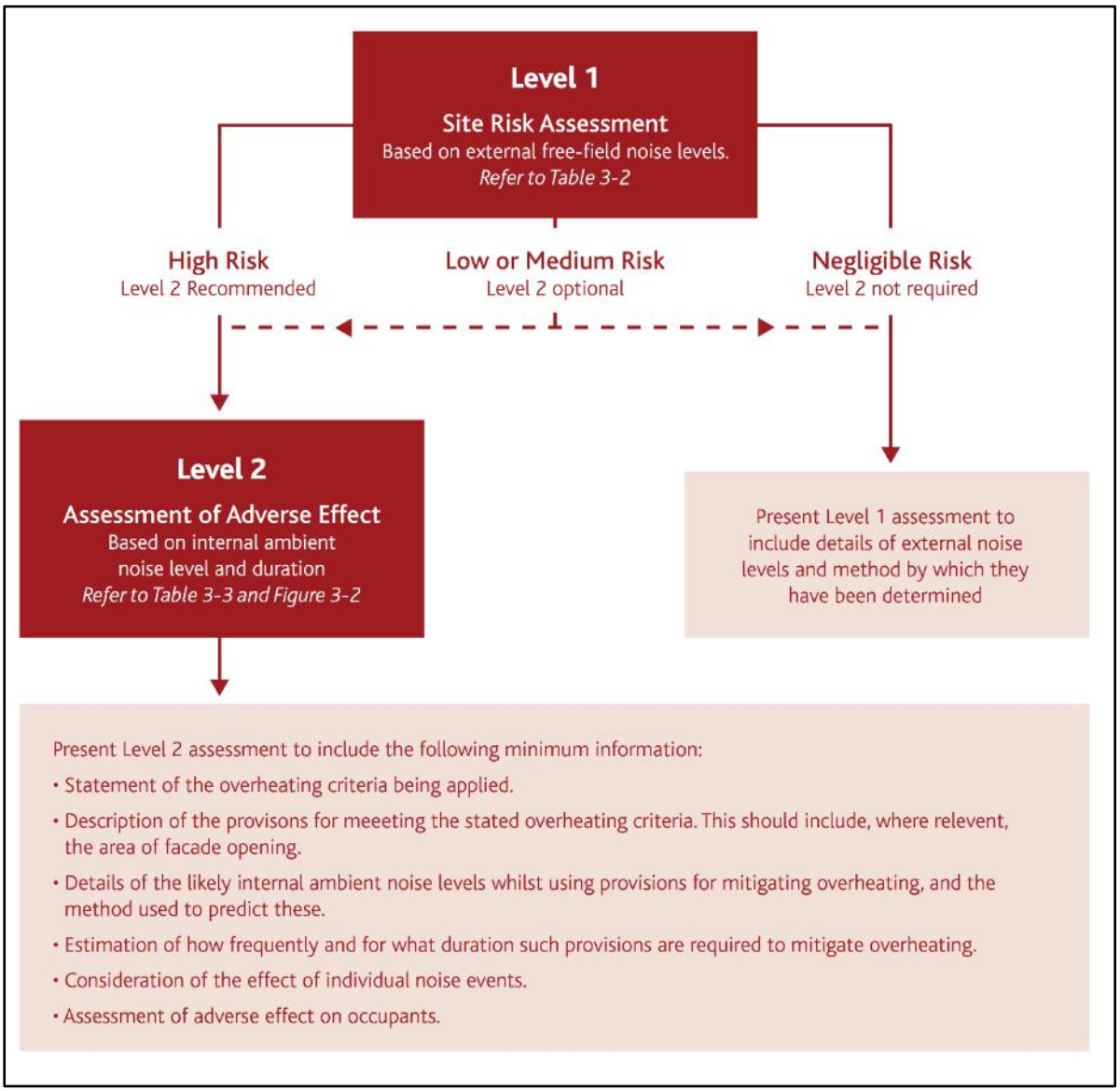

Figure 2: Two-level Assessment Procedure (Figure 3.1 of AVO Guidance)

Figure 3 shows the Level 1 site risk assessment of noise, relating to overheating conditions.

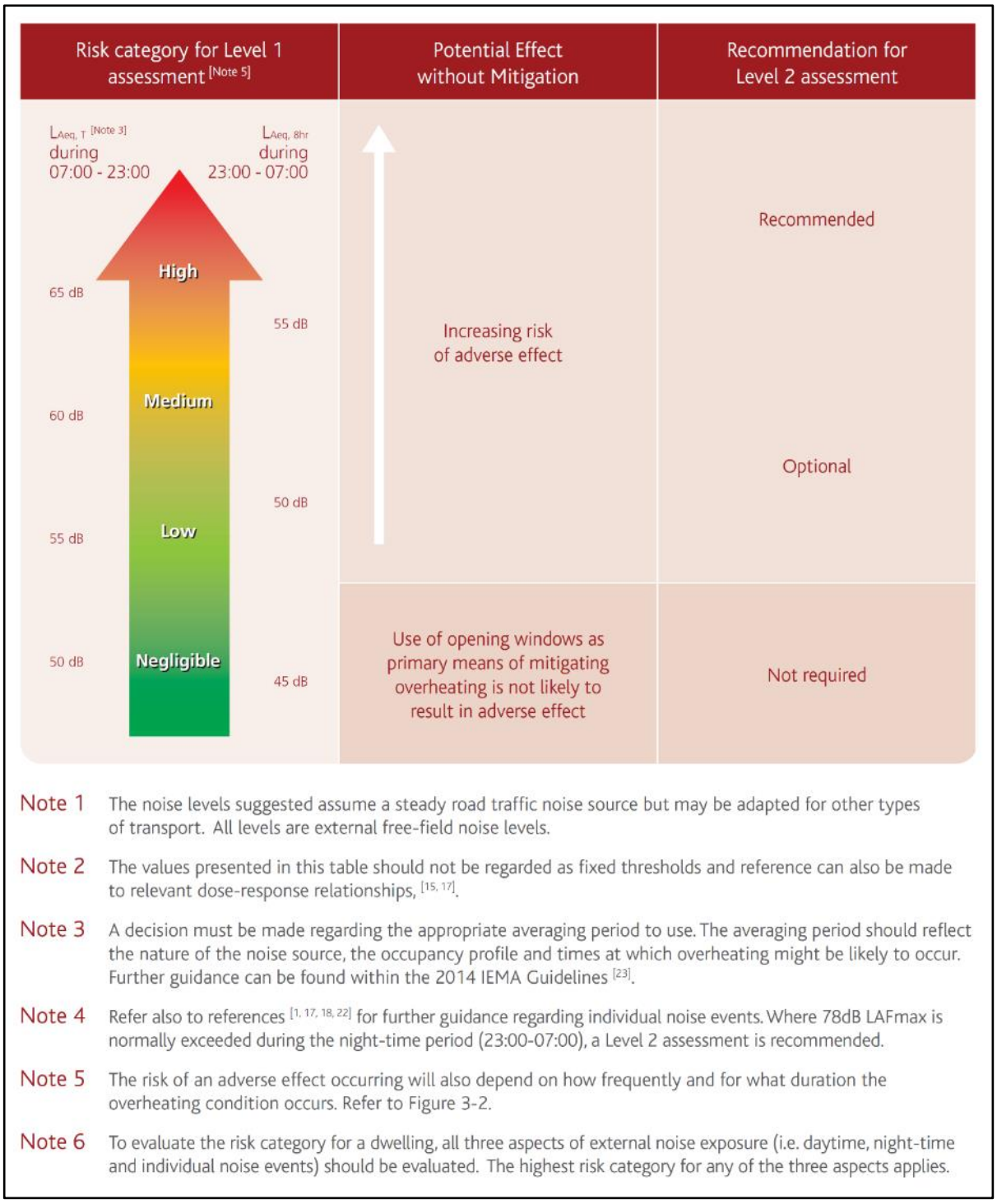

Figure 3: Level 1 Risk Assessment (Figure 3.2 of AVO guidance)

Figure 4 shows the Level 2 site risk assessment of noise, relating to overheating conditions.

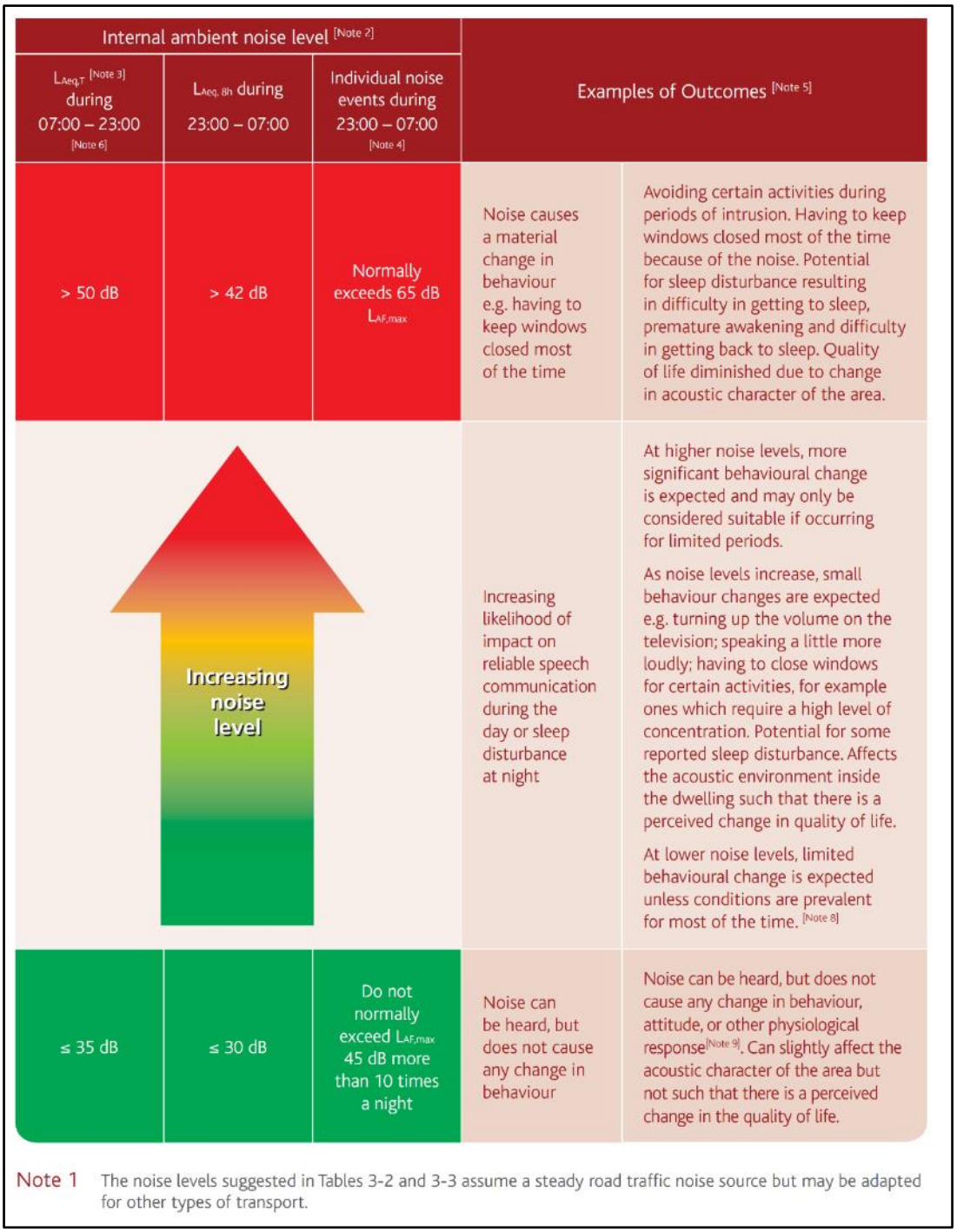

Figure 4: Level 2 Risk Assessment (Figure 3.3 of AVO guidance)

The noise levels suggested in Figure 3 and Figure 4 assume a steady road traffic noise source but may be adapted for other types of transport by taking account of the differing responses to different transport sources.

APPENDIX F

ACOUSTIC TERMINOLOGY

The effects of noise on human beings may be expressed in terms of physiological damage and annoyance. It is, however, only the annoyance impacts that need to be considered in detail when addressing environmental noise impacts. Annoyance also includes the immediate effects of activity interference, for example sleep disturbance and speech interference.

The practice has become to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear and it is useful to bear in mind that a noise level change of 3dB would be equivalent to doubling the energy level (for example doubling the volume of traffic) and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequency. The ear perceives high frequency sound of a given sound pressure level more loudly than a low frequency sound at the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It thus indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second, it is clearly impractical to specify the sound level continuously and thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

LAeq,T : the equivalent A-weighted continuous sound level.

This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hours for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic and industrial noise for planning purposes and in particular for PPG24.

LA10,T : the A-weighted level of sound exceeded for 10% of the time period T.

This unit is used for traffic noise measurement and is the preferred unit for prediction of traffic noise in the publication, 'Calculation of Road Traffic Noise'.

LA90,T : the A-weighted level of sound exceeded for 90% of the time period T.

This unit is commonly used to represent the background noise and is used in assessing the effects of industrial noise in UK.

LAmax : the maximum A-weighted level of sound over a period of measurement.

LAr,T : the rating level.

The specific Noise plus any adjustments for the characteristic features of the noise. Used for comparison between background levels with the noise source off.

SEL : the Sound Exposure Level.

Sound exposure level abbreviated as SEL and LAE, is the total noise energy produced from a single noise event condensed into a 1 second time period.

Rw : weighted sound reduction index.

A laboratory-measured value as defined in ISO717 Part 1.

DnTw :

The equivalent of Rw, but measured onsite as oppose to in a laboratory