Legal & General Affordable Homes

Hart Road, Thundersley

248 Hart Road, Thundersley, Benfleet, Essex

Noise Assessment Report

REPORT REF.
2200170-01

February 2022

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Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Draft	JG	LD	DRAFT	09/02/22
-	Final	JG	JG	LD	10/02/22

Distribution

1. Introduction

1.1. Ardent Consulting Engineers were instructed by Legal and General Affordance Homes (LGAH) to undertake a Noise Assessment to support the residential development at Hart Road, Thundersley (hereafter referred to as the site).

1.2. This report addresses the comments raised by the Environmental Health Department at Castle Point Borough Council in relation to planning application reference 21/1137/FUL.

Site Location

1.3. The site is located in a predominantly residential area in Thundersley, Benfleet, Essex. The site is bound to the west by Cedar Hall School, to the north by residential properties on Hart Road, to the east by residential properties on Greenleas and open green space, and to the south by open green space.

1.4. The surrounding area and approximate location are shown in Figure 1, while the site's red-line boundary is shown in Figure 2.

Figure 1 Aerial photograph of development site

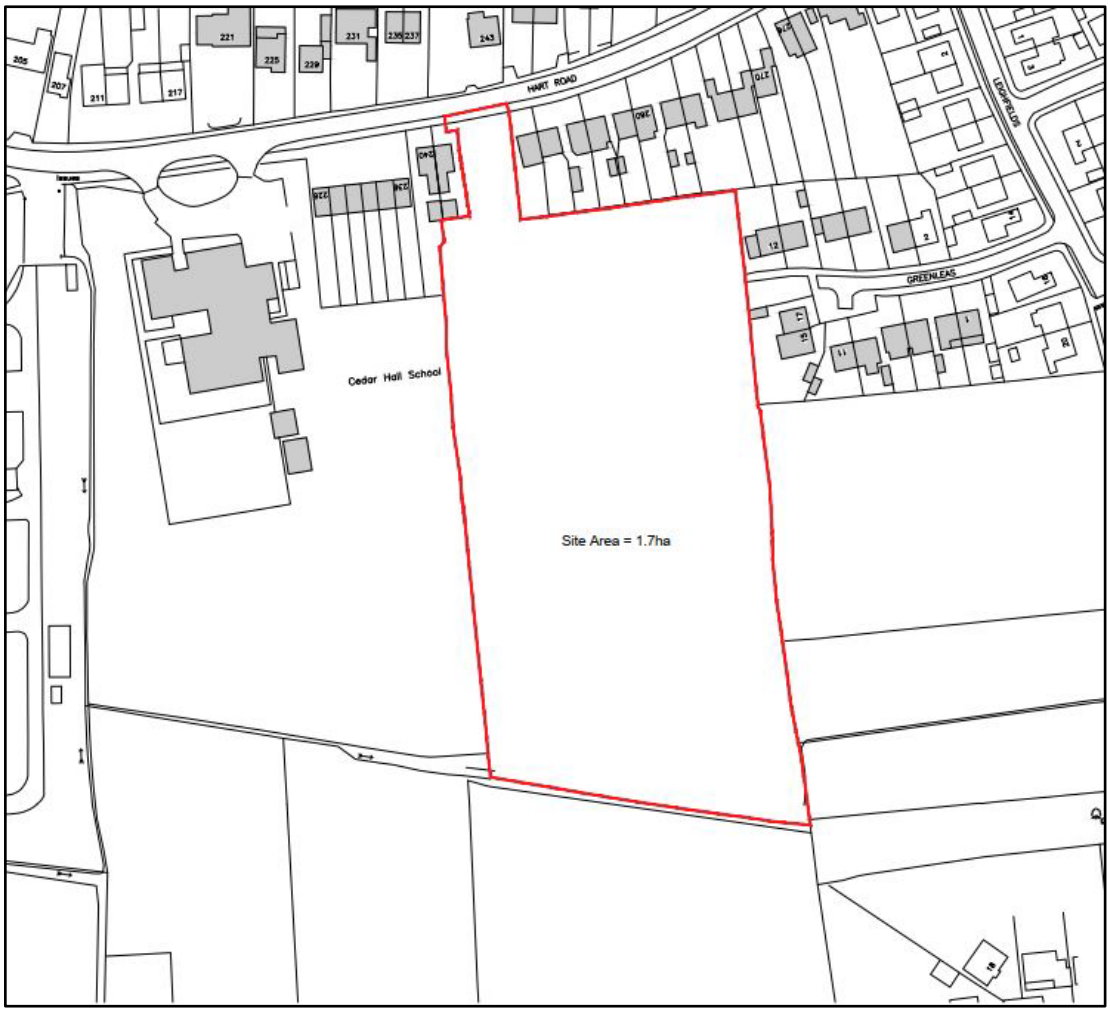


Figure 2 Planning boundary of the development site

Site Proposals

1.5. The proposal is for the erection of 46 dwellings with open space, play space, landscaping, access and associated infrastructure at land off Hart Road, Thundersley, Benfleet.

1.6. The proposed site layout of the completed development is shown in Figure 3.

Figure 3 Proposed site layout

2. Relevant Policy and Guidance

Liaison with Local Authority

2.1. Ardent have received commentary from the Environmental Health department at CPBC regarding application ref: 21/1137/FUL, dated on the Planning Portal at 23rd December 2021. The comments received are duplicated here:

"The application site is located to the south of Hart Road. Residential properties, Hart Road and small woodland blocks form the northern and eastern boundaries of the proposed site. Cedar Hall School is to the west with agricultural fields to the south.

The main source of noise on the application site would emanate from Hart Road via vehicular movement. However, the site is somewhat set back from the carriageway, behind an existing line of dwellings on the south site of Hart Road. Noise pollution is therefore considered to be fairly minimal.

The west boundary is adjacent to Cedar Hall School, which aside from peak drop off/pick up times, and at break times has been assumed that it would not be deemed to produce an extensive amount of noise but has not been assessed.

The east and south boundaries are predominantly bounded by open fields and landscape features such as trees and hedges and therefore is reasonable that it would not be deemed to provide noise disturbance.

The proposal is for up to 46no. residential dwellings, split between two- and three-bedroom houses, with associated car parking, private gardens and open green space.

Appropriate noise guidelines have been followed within the report such as Noise Policy Statement for England, National Planning Policy Framework (NPPF).

Units 30 to 44 are at the boundary of Cedar Hall School, and it is essential that appropriate façade design is employed to protect future occupants from noise from the school.

No information has been provided assessing the potential noise impact from the school and road traffic.

I therefore recommend that in order for this section to make an informed comment the applicant should be requested to provide further information assessing the noise impact of the external noise sources on the proposed residential accommodation.

The report should include, if appropriate, measures to be taken to mitigate excess noise impact.

The report should be prepared by a person with appropriate acoustic qualifications and should be with full regard to all relevant guidance including BS 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings and BS 4142:2014 Methods for rating and assessing industrial and commercial sound."

2.2. Contact[1] was made with Castle Point Borough Council (CPBC) requesting to discuss the application and the methodology of the noise assessment with the relevant department. At the time of writing no response has been received.

2.3. It is noted that BS4142 is not strictly relevant to the assessment of noise from the school and is not intended to be used to assess recreational activities or noise from people, i.e. noise from children playing. The BS 4142 assessment however has been included in this report subsequent to the comments received from Environmental Health and to provide context to the overall assessment of noise levels from Cedar Hall School.

2.4. The assessment addresses the points raised by CPBC as duplicated in Paragraph 2.1.

BS4142:2014 Methods for rating industrial and commercial sound

2.5. BS4142:2014 uses a comparison between the rating and background sound levels to establish an initial estimate of the likely significance of impact. The standard notes:

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

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

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

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact

[1] Email contact on 31st January 2022 to info@castlepoint.gov.uk

or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.6. The context of the assessment must then be considered, which can significantly alter the outcome of the assessment. Factors that might alter the outcome of the assessment include the absolute level of sound compared to the residual sound level, the character of the sound compared to the residual, the sensitivity of the receptor etc.

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

2.7. 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.

2.8. An extract of Table 4 of the document relevant for residential development is reproduced in Table 1.

Table 1 Extract of BS8233 Table 4 - Indoor ambient noise levels in dwellings

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

2.9. 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."

3. Environmental Noise Levels

3.1. Residual sound level measurements were taken over a 48-hour period during weekdays, to cover the acoustic environment during all times of the school day.

3.2. Measurements consisted of both unattended and targeted attended measurements. The targeted attended measurements were timed so as to coincide with the school's playtime and pick up/drop off period.

3.3. The survey was undertaken from 13:30 on Tuesday 1st February 2022 until 15:03 on Thursday 3rd February 2022.

3.4. Sound level measurements were taken at the southern and northern/western boundaries of the site. The survey locations capture noise levels at the boundaries with Cedar Hall School and residential properties on Hart Road.

3.5. Figure 4 shows the survey measurement locations.

Figure 4 Survey measurement locations

3.6. Time histories of the measurement data are presented in Appendix A.

3.7. The acoustic environment at MP1 is dominated by bird song and road traffic noise from vehicles passing on Hart Road. Distant road traffic from the north was audible. Children playing in the school fields to the west were audible during school playtime periods.

3.8. The acoustic environment at MP2 was dominated by road traffic noise on Hart Road, with children playing on nearby school fields audible during school playtime hours.

3.9. Attended measurements at the western boundary were undertaken at both MP2 and at a location to the south of MP2 on the western boundary of site, adjacent to the school fields. Children playing on the school fields was clearly audible at this location, although was not dominant over road traffic noise. Sports activity was regularly audible from the pitches to the southwest.

3.10. The time history graphs in Appendix A show that on Wednesday 2nd February and Thursday 3rd February, the measured noise levels at MP1 and MP2 remained relatively constant through the lunch playtime period at Cedar Hall School.

3.11. The survey was completed by an experienced and qualified Acoustic Consultant with extensive experience of surveys of this nature. All instrumentation holds valid calibration certificates, which are available on request and the calibration was checked before and after the survey.

Instrumentation

3.12. The following instrumentation was used for the survey:

- Rion NC-74 Calibrator (serial no. 34172694)
- Svantek 977 Sound Level Meter (serial no. 34133)
- Svantek 958 Sound Level Meter (serial no. 20804)

3.13. Weather conditions were noted during the survey. Upon installation of the equipment the temperature was 12°C, with reducing windspeeds of 5-6ms^{-1} and no cloud cover. Upon collection the temperature was 9°C, with windspeeds of <1ms^{-1} and 100% cloud coverage.

3.14. It is considered that local weather conditions at the time of the survey were within the limits set out in the guidance and were appropriate for the measurements to be taken.

3.15. A summary of the measurements taken during the weekend at nearby receptors is shown in Table 2.

Table 2 Summary of unattended sound level measurements

Location	Period	Ambient Sound Level dB $L_{Aeq, 15min}$	Background Sound Level dB $L_{A90, 15min}$	Representative max noise level dB $L_{Amax,T}$
MP1	Daytime	50	46	68
	Night-time	42	36	59
MP2	Daytime	52	47	69
	Night-time	45	34	61

3.16. A summary of the attended sound level measurements is shown in Table 3.

Table 3 Summary of attended sound level measurements

Location	Period	Ambient Sound Level dB $L_{Aeq, 15min}$	Background Sound Level dB $L_{A90, 15min}$	Representative max noise level dB $L_{Amax,T}$
Northwest of site / MP2	12:56 – 13:14 (School lunchtime/ playtime)	59	50	74
Western boundary of site	15:02 – 15:22 (School pickup/drop off)	51	47	66

3.17. Attended measurements at MP2 during school lunchtime periods are approximately 7dB above the measured daytime ambient noise level dB $L_{Aeq,}$ with the representative maximum noise level dB L_{Amax} approximately 5dB above the representative level for the whole daytime period.

3.18. The average A-weighted spectral noise levels from MP2 are shown in Table 4, and are considered to be a worst-case scenario for external noise levels at properties on the western boundary of the site.

Table 4 Ambient noise levels at MP2 during school playtime

Location	Octave Band Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Ambient Noise Level, dB $L_{Aeq,T}$	59	54	53	51	56	54	43	36
Representative Maximum Noise Level, dB $L_{Amax,T}$	81	71	61	60	72	70	60	52

3.19. The spectral levels in Table 4 will be utilised in the calculation of internal noise levels and required façade performance for properties located along the western boundary of the site, detailed later in this report (section 5). The calculations for properties towards the south/east of the site will utilise data measured at MP1.

4. Noise from Cedar Hall School

4.1. The proposed development is located immediately east of Cedar Hall School, which shares the western boundary of the development site. The location of the school in relation to the proposed development is shown in Figure 1 above.

4.2. According to the school's website, the school day begins at 09:00, with children arriving before 08:50. The school day finishes at 15:00. Whilst it is expected that the office hours are longer than these, it is also considered that the activities that are likely to be noise generating are those at times when children are present.

4.3. For the purposes of this assessment, the lunch playtime and morning and afternoon pick up / drop off periods were considered to be the most likely to generate elevated noise levels.

4.4. Noise from the school was audible on the development site during attended periods of the survey, although there are other noise sources in the area that are dominant; primarily road traffic noise and birdsong.

4.5. The proposed location of dwellings on site is shown above in Figure 3. The closest properties to the school fields will be those along the western boundary of the site. The attended measurements south of MP2 are considered to be representative of this location.

4.6. The daytime typical background sound level and residual sound level have been derived from the measurement data taken at position MP2. The typical background sound level is 47dB $L_{A90,T}$ and the residual sound is 52dB $L_{Aeq,T}$.

4.7. The specific sound level has been determined using the attended survey data at the site, using the average dB $L_{Aeq,1min}$ period during school playtime. It was noted that children playing on the school fields was the dominant noise source at this time, while other sources in the area remained audible.

4.8. It is understood that properties along the western boundary will benefit from a solid garden fence, and an allowance of 5dB has therefore been provided in the assessment for allow for partial acoustic screening. Table 5 below shows the BS4142 initial assessment.

Table 5 BS4142 Assessment of Noise from Cedar Hall School

Development Site	Daytime
Residual Sound level, dB $L_{Aeq,60min}$	52
Specific Sound Level, dB $L_{Aeq,60min}$	58
Acoustic Screening, dB	-5
Acoustic Feature Correction, dB	0
Rating Level, dB $L_{Ar,\ 60min}$	53
Background Sound level, dB $L_{A90,T}$	47
Excess over background, dB	+6
Assessment	Adverse Impact

4.9. The results of the initial assessment indicate that the impact of noise at Cedar Hall School will be 'adverse impact'. In terms of the context of the site, it is expected that noise from the school will be a prominent feature in the acoustic environment but will not be dominant.

4.10. It should also be noted that BS4142 is not intended to be used to assess noise from people or from recreational activities. The results of the BS4142 assessment are however of some use in understanding the relationship between noise from Cedar Hall School and the residual noise level without noise from the school.

4.11. Whilst BS4142 is designed to use external sound levels that might be present at a residential receptor and to assess the likely effects of sound on people who might be inside or outside a dwelling. BS4142 states the following regarding consideration of internal sound levels:

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

…3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) facade insulation treatment;

ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii) acoustic screening…"

4.12. The proposed glazing and ventilation strategy for the site which is outlined in Section 5 of this report will be sufficient to reduce noise levels from the school fields so that suitable internal amenity is achieved.

4.13. Furthermore, the proposed mitigation measures outlined in Section 5 are expected to be sufficient to reduce external noise levels in private gardens along the western boundary of the site so that suitable external amenity levels are achieved.

4.14. When the acoustic environment and proposed mitigation measures for the site are considered, it is expected that noise from Cedar Hall School will have a low impact on the new sensitive residential receptors.

5. Mitigation Recommendations

5.1. The measured results and currently available site layout have been used to undertake calculations, presented in Appendix B, for suitable façade treatments, outlined as follows.

5.2. To achieve suitable internal amenity sound levels during normal conditions, windows must remain closed, but not sealed, and an alternative means (e.g. trickle ventilation) of ventilation provided for dwellings at the western boundaries of the site. Residents will have the choice to open windows, e.g. for purge ventilation, whilst accepting elevated internal noise levels.

5.3. Where possible screening should be provided from the surrounding road network and from Cedar Hall School to dwellings located away from the boundaries of the site by dwellings closer to the boundaries. Openable windows may be possible to achieve suitable internal amenity sound levels during normal conditions for dwellings located away from the site boundaries and/or sufficiently screened from the surrounding road network. This would need to be considered in more detail as the exact proposals for the site are established.

External Building Fabric - Non-Glazed Elements

5.4. It is assumed that the non-glazed external building fabric elements comprise masonry cavity walls. This would typically provide a sound reduction performance of at least the figures shown in Table 6 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').

Table 6 Non-glazed Elements Assumed Sound Reduction Performance

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

External Building Fabric - Glazing

5.5. Table 7 sets out the required glazing performance type. This specification takes into account the glass, frame, seals and associated fittings.

Table 7 Required Minimum Attenuation Values for Glazing

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

5.6. The minimum attenuation values in Table 7 are sufficient to ensure that internal noise levels are within the criteria of BS8233 for living rooms and bedrooms across the development.

External Building Fabric - Ventilation

5.7. Table 8 sets out the required ventilation performance:

Table 8 Required Minimum Attenuation Values for Ventilation

Ventilation Type	Element Normalised level difference, D_{new}	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
Standard Trickle Ventilation	35	36	34	31	34	38	38

5.8. Where non-sensitive rooms and sensitive rooms form part of an open plan area, for example a dining and kitchen area, the glazing and ventilation specification for the more sensitive room should be used across the combined area.

5.9. 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.

5.10. 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.

External Amenity Areas

5.14. The layout of dwellings and private amenity areas (gardens) at the site are shown in Figure 3 above. It can be seen that private amenity areas are provided to properties along the western boundary and will directly adjoin the boundary with the school fields.

5.15. Based on the attended measurements taken at the site, external sound levels in gardens in close proximity to and unscreened from the school would be expected exceed the upper guideline value of 55dB LAeq,16hour for external amenity areas, as defined in BS8233. All other gardens on site are expected to meet the guidance criteria of BS8233.

5.16. It should be noted that this exceedance is expected to be of short duration and limited to school playtimes and on occasions when there is intensive sports activity on the football fields. At all other times the external noise levels are expected to comply with the criteria of BS8233.

5.17. The provision of 2m high close boarded timber fences is recommended for gardens at the western boundary of the site. The proposed fences would reduce noise levels by a minimum of 5dB.

5.18. With the proposed fences, noise levels in gardens would be expected to fall below the guidance criteria of BS8233.

6. Conclusions

6.1. A noise survey has been undertaken over a 48-hour period during weekdays. Noise levels have been measured with and without activity at Cedar Hall School. The measured levels have been used to calculate and assess suitable glazing and ventilation specifications.

6.2. Whilst it is not strictly applicable to noise from Cedar Hall School, an assessment in accordance with BS4142 has been conducted for the school to the west of the site. The assessment demonstrates that noise from the school is expected to be a prominent feature in the acoustic environment at properties along the western boundary, but that elevated noise levels are relatively short duration and will otherwise not be dominant.

6.3. When the acoustic environment and proposed mitigation measures for the site are considered, it is expected that the school operations will have a low impact on the new sensitive residential receptors

6.4. Closed but not sealed windows will be provided to control internal amenity sound levels for west facing facades on dwellings at the western boundary of the site during school playtimes and an alternative means of ventilation such as trickle ventilation will be provided. Windows are not sealed shut and residents will have a choice to open windows for ventilation whilst accepting slightly higher internal sound levels.

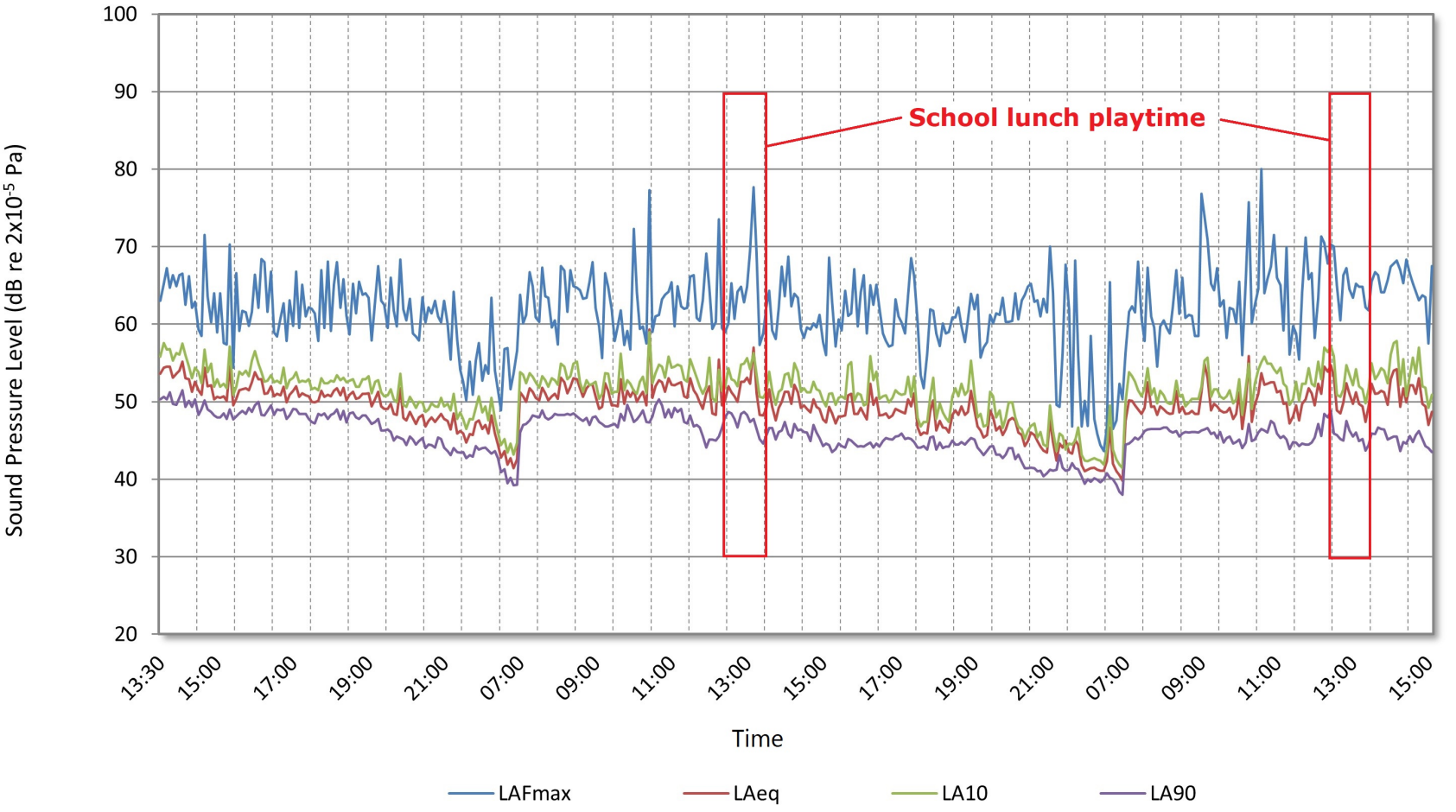
6.5. External sound levels in gardens directly overlooking Cedar Hall School are expected to marginally exceed the lower guidance criteria of BS8233, mitigation measures for these gardens have been recommended to reduce noise from the school fields to a level at is below the lower guidance criteria.

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

Appendix A. Time Histories of Survey Measurement Data

Hart Road, Benfleet - MP1

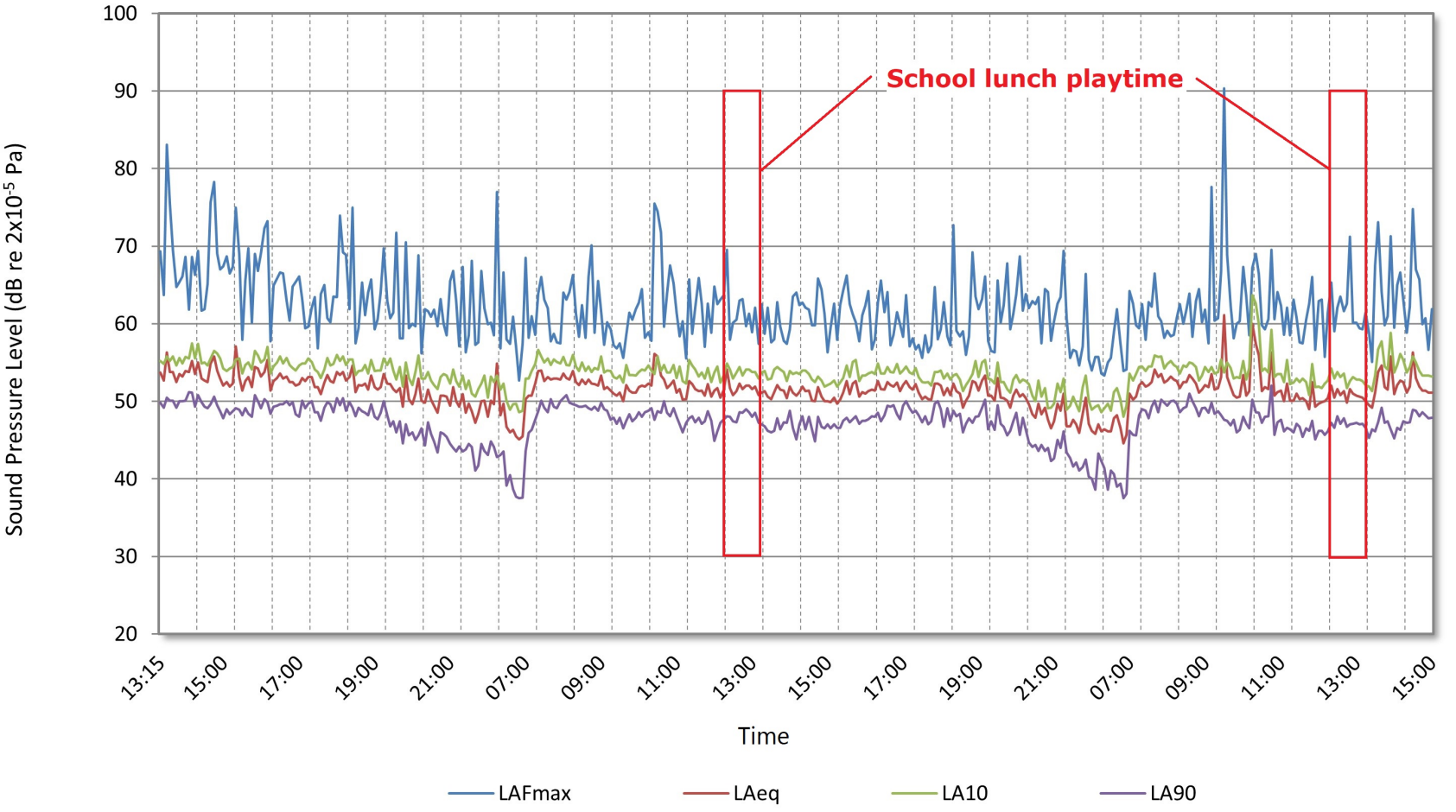
Environmental Noise Time History
01 February 2022 to 03 February 2022



Hart Road, Benfleet - MP2

Environmental Noise Time History

01 February 2022 - 03 February 2022



Appendix B. Façade Minimum Performance Calculations

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Noise Break-in Calculation - Western Boundary

Description	
Ardent CE Project No.	**2200170**
Property Address	**Hart Road Thundersley**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

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	59	54	53	51	56	54	43	36	59
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)	59	54	53	51	56	54	43	36	59

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	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent (35dB)**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143		
Average SRI	23	26	23	28	34	38	35	38	33	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	38.7	30.2	32.3	24.7	23.1	18.2	10.1	-0.4	29	
Lp (Direct)	36.9	28.4	30.5	22.9	21.3	16.4	8.3	-2.2	27	**Criteria**
Lp (Rev & Direct)	41	32	35	27	25	20	12	2	31	**≤ 35**
BS8233	41	32	34	27	25	20	12	2	31	**≤ 35**

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Noise Break-in Calculation - Western Boundary

Description	
Ardent CE Project No.	**2200170**
Property Address	**Hart Road Thundersley**
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	54	53	53	51	47	45	41	35	53
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)	54	53	53	51	47	45	41	35	53

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	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent (35dB)**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143		
Average SRI	23	26	23	28	34	38	35	38	33	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	33.6	29.2	32.1	24.4	14.2	9.3	7.8	-1.5	26	
Lp (Direct)	31.8	27.4	30.3	22.6	12.3	7.4	6.0	-3.3	25	**Criteria**
Lp (Rev & Direct)	36	31	34	27	16	12	10	1	29	**≤ 30**
BS8233	36	31	34	26	16	11	10	1	28	**≤ 30**

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Noise Break-in Calculation - Western Boundary

Description	
Ardent CE Project No.	**2200170**
Property Address	**Hart Road Thundersley**
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

- 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	
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	81	71	61	60	72	70	60	52	75
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)	81.4	70.8	61.3	59.6	71.5	70.4	59.6	52	75

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	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent (35dB)**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143		
Average SRI	23	26	23	28	34	38	35	38	33	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	60.7	46.7	40.6	32.9	39.1	34.5	26.6	15.4	43	
Lp (Direct)	58.8	44.9	38.8	31.1	37.3	32.7	24.7	13.6	41	**Criteria**
Lp (Rev & Direct)	63	49	43	35	41	37	29	18	45	**≤ 45**
BS8233	63	49	43	35	41	37	29	17	45	**≤ 45**

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Noise Break-in Calculation - North/East/Centre/South of Site

Description	
Ardent CE Project No.	**2200170**
Property Address	**Hart Road Thundersley**
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	**- 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	58	52	46	45	46	41	42	39	50
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	52	46	45	46	41	42	39	50

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	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent (35dB)**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143		
Average SRI	23	26	23	28	34	38	35	38	33	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	36.9	27.8	25.3	18.5	13.6	5.2	9.2	2.3	22	
Lp (Direct)	35.0	26.0	23.5	16.7	11.8	3.4	7.4	0.5	20	**Criteria**
Lp (Rev & Direct)	39	30	28	21	16	7	11	5	24	**≤ 35**
BS8233	39	30	27	20	16	7	11	4	24	**≤ 35**

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Noise Break-in Calculation - North/East/Centre/South of Site

Description	
Ardent CE Project No.	**2200170**
Property Address	**Hart Road Thundersley**
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	49	43	38	38	38	32	33	28	42
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	43	38	38	38	32	33	28	42

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	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent (35dB)**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143		
Average SRI	23	26	23	28	34	38	35	38	33	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	28.0	19.1	17.3	11.0	5.4	-3.5	0.0	-8.7	14	
Lp (Direct)	26.2	17.3	15.5	9.2	3.6	-5.3	-1.8	-10.5	12	**Criteria**
Lp (Rev & Direct)	30	21	20	13	8	-1	2	-7	16	**≤ 30**
BS8233	30	21	19	13	7	-2	2	-7	16	**≤ 30**

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Noise Break-in Calculation - North/East/Centre/South of Site

Description	
Ardent CE Project No.	**2200170**
Property Address	**Hart Road Thundersley**
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	65	60	55	53	52	52	56	51	61
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)	65	60	55	53	52	52	56	51	61

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	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent (35dB)**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.005545	0.002580	0.005611	0.001423	0.000377	0.000169	0.000327	0.000143		
Average SRI	23	26	23	28	34	38	35	38	33	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	44.0	35.9	34.1	26.1	20.0	16.3	23.0	14.0	31	
Lp (Direct)	42.2	34.1	32.3	24.2	18.2	14.5	21.2	12.2	29	**Criteria**
Lp (Rev & Direct)	46	38	36	28	22	19	25	16	33	**≤ 45**
BS8233	46	38	36	28	22	18	25	16	33	**≤ 45**

Appendix C. Glossary of Acoustic Terminology

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