

VISTRY GROUP PLC

PROPOSED RESIDENTIAL DEVELOPMENT:
LAND EAST OF TYE LANE, WALBERTON

NOISE ASSESSMENT

REPORT REF: 183246-01A

PROJECT NO: 183246

SEPTEMBER 2020

**PROPOSED RESIDENTIAL DEVELOPMENT:
LAND EAST OF TYE LANE, WALBERTON**

NOISE ASSESSMENT

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**REPORT REFERENCE 183246-01A
PROJECT NO. 183246
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DOCUMENT CONTROL SHEET

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT	ADS	MND	KM	12.08.20
-	2 nd Draft	MNR	MNR	KM	26/08/20
-	Final	MNR	MNR	SJB	27/08/20
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D I S T R I B U T I O N

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1.0 INTRODUCTION

- 1.1 Ardent Consulting Engineers (ACE) has been appointed by Vistry Group PLC to provide acoustic advice to support a planning application of the proposed residential development at Land East of Tye Lane, Walberton, submitted to Arun District Council (ADC).

Site Location

- 1.2 The site is circa 10.5ha and is located to the north of Walberton town centre, positioned to the west of Yapton Lane and to the east of Tye Lane. Walberton & Binsted C of E Primary School is located immediately to the south and to the north is Hilton Avisford Park hotel and golf course. Further away to the north is the A27, which runs in an approximate east to west direction.
- 1.3 The site is centred approximately at Ordnance Survey grid co-ordinates 497323E, 106231N comprising mainly of greenfield. The site location is shown on **Figure 1.1** below.



Figure 1.1: Site Location Plan

Planning Background

- 1.4 A Reserved Matters (RM) application (reference: WA/95/18/RES) was approved on the 16th April 2019 and detailed the appearance, landscaping, layout and scale for 175 new dwellings.
- 1.5 The planning application is for a revision to part of the permitted and partially implemented development at Tye Lane, Walberton. The description of development is as follows:

Full Planning Application to revise the approved and partly implemented permission (WA/95/18/RES and WA/44/17/OUT) at land at Tye Lane, Walberton to provide for 30 additional dwellings including 9 affordable units with associated landscaping, road layout, access and parking.

- 1.6 The proposal seeks to provide 30 new dwellings on the approved development site (WA/95/18/RES and WA/44/17/OUT) which was granted consent for a total of 175 dwellings. A total of 81 residential units were to be situated within the area proposed to be revised by this current planning application. The proposal will therefore provide a total of 111 dwellings incorporating 9 affordable units (an uplift of 30 dwellings from the approved 81 dwellings). Across the wider site this will deliver 205 new dwellings in total.
- 1.7 This report seeks to demonstrate that the uplift in dwellings is acceptable in noise terms.

Development Proposals

- 1.8 A full description of the proposed redevelopment of the site is contained in the supporting documents accompanying the planning application.

- 1.9 The proposal seeks to provide 30 new dwellings on the approved development site (WA/95/18/RES and WA/44/17/OUT) which was granted consent for a total of 175 dwellings. A total of 81 residential units were to be situated within the area proposed to be revised by this current planning application. The proposal will therefore provide a total of 111 dwellings incorporating 9 affordable units (an uplift of 30 dwellings from the approved 81 dwellings). Across the wider site this will deliver 205 new dwellings in total.
- 1.10 For full development proposals refer to ECE Architecture drawing number 6913 PL_LOC_1, which accompanies this application.

2.0 RELEVANT POLICY AND GUIDANCE

- 2.1 The purpose of the assessment is to test the development proposals against the planning conditions however this section is included to provide context to the discussions.

National Planning Policy Framework (NPPF) – February 2019

- 2.2 Under the NPPF: *paragraph 180 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 tranquil areas 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)

- 2.3 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. “

2.4 The NPSE has three aims as follows:

The first aim of the Noise Policy Statement for England

“Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development.”

The second aim of the Noise Policy Statement for England

“Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL.

It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

The third aim of the Noise Policy Statement for England

“Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”

- 2.5 The explanatory note to the NPSE introduces three concepts relating to the adverse impacts of noise. The following three statements have been reproduced from the explanatory note:

*“**NOEL** – No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.”*

*“**LOAEL** – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected”*

*“**SOAEL** – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.”*

- 2.6 The NPSE acknowledges that the values for NOEL, LOAEL and SOAEL are likely to vary depending on the noise source and environment and at present, there are no defined numerical values to allow flexibility within the policy until further evidence and guidance is presented. For the purpose of this assessment, we seek to mitigate against and minimise noise levels as far practicable, thus minimising the adverse effects.

World Health Organisation

- 2.7 The WHO document ‘*Guidance on Community Noise 1999*’ 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 and states 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 LAeq 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 LAeq."

- 2.8 WHO 'Guidelines for Community Noise (1999)' also states the following paragraph with regard to the effects of L_{Amax} 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)."

- 2.9 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.
- 2.10 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.
- 2.11 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.”

- 2.12 External (free-field) recommendations included in the Environmental Noise Guidelines for the European Region are presented in **Table 2.1** 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 2.1: Extract from Environmental Noise Guidelines for the European Region

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

- 2.13 The 2014 revision of BS8233 is 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. The levels shown in Table 4 of BS8233:2014 are based on the current guidelines provided by WHO for residential development and is reproduced in **Table 2.2**.

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

Table 2.2: Extract from Table 4– Indoor ambient noise levels in dwellings

2.14 The latest revision of the document does not include a recommended maximum internal noise level. However, NOTE 4 of section 7.7.2 *Internal ambient noise level for dwellings* does advise guideline values may be set in terms of SEL or LA_{fmax} depending on the character and number of events per night.

2.15 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 LAeq,T, with an upper guideline value of 55 dB LAeq,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, but should not be prohibited.”

- 2.16 This guidance is clear that there is some flexibility in the level of external noise that is acceptable and this is dependent on a range of factors. Whilst the planning permission makes reference to a threshold noise level of 55dBL_{Aeq,16h} this requirement should be considered in the context of this advice.

ProPG: Planning and Noise - May 2017

- 2.17 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. 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.
- 2.18 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 2.1** 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.

2.19 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.”

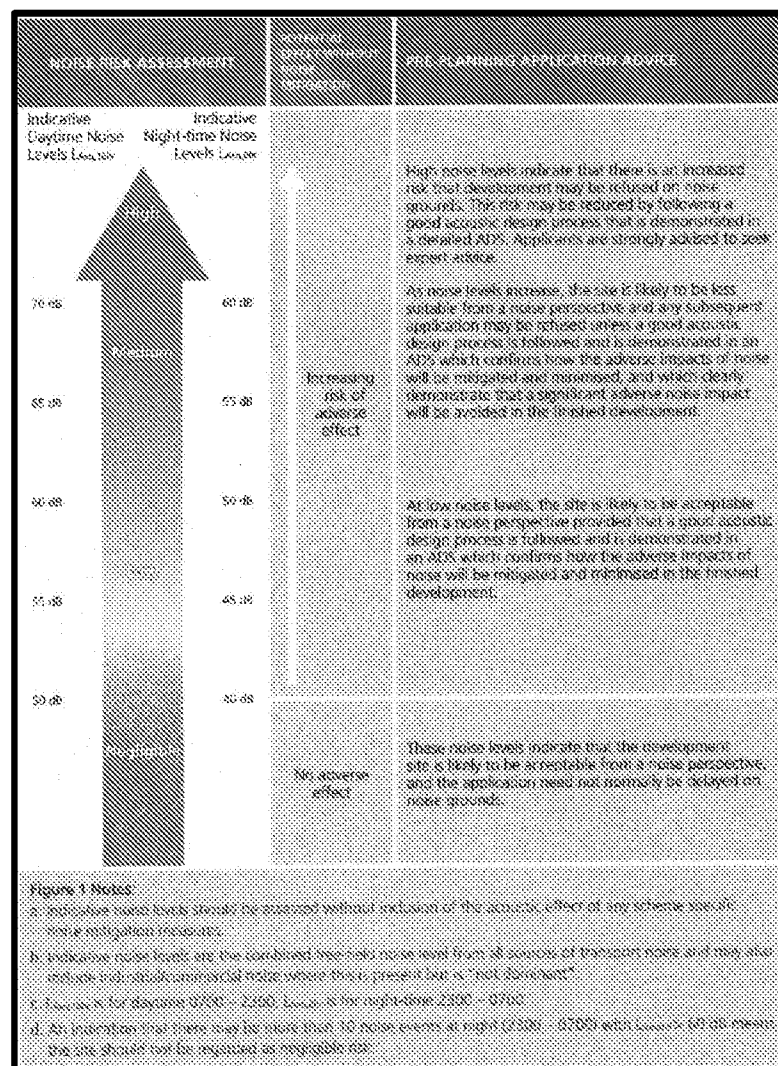


Figure 2.1: Extract from Figure 1 in ProPG – Initial Site Noise Risk Assessment

Local Authority Guidance

- 2.20 Discussions were where Held with Arun District Council's Environmental Health in preparation for undertaking the Noise Assessment 183240-04 in February 2019 to support the RM Application (WA/95/18/RES). These discussions were held with Mr Christopher Davies, Environmental Health Officer of Arun District Council to agree on a suitable noise assessment methodology for the proposed development. Ardent proposed an assessment in line with the above guidance mentioned in this section of the report, which was accepted by the Local Authority.
- 2.21 There have been no significant changes to policy that would affect the assessment of noise in relation to the re-planned and therefore it is considered that the methodologies agreed for the RM application remain suitable for the re-plan scheme.

3.0 ENVIRONMENTAL NOISE SURVEY

- 3.1 The environmental noise survey was undertaken between the 10th and 12th July 2018. Monitoring locations were chosen in order to obtain representative baseline levels due to the main observed noise sources within the vicinity of the development site.
- 3.2 Continuous automated monitoring was undertaken at 2 positions on site as shown in **Figure 3.1**. Position 1 is to the north of the school and position 2 is to the north east of the site, on the boundary near to the golf course. The locations were selected to represent exposed areas and in areas that equipment could be securely positioned.
- 3.3 Measurements were taken during school term-time to capture representative periods where noise levels may be elevated due to children are playing outdoors.



Figure 3.1: Monitoring Positions

- 3.4 Noise measurements presented as time histories can be found in **Appendix A** and are summarised in the following paragraphs.

Measurement Procedures

- 3.5 Staff involved with the measurements and observations are fully competent with regard to the requirements of environmental noise measurement. Measurement procedures used within this assessment conformed to relevant guidance within *BS 7445* and *CRTN* where appropriate.

Instrumentation

- 3.6 The equipment used was as follows:

- 2 x No Norsonic NOR140 Sound Level Meters
- B&K 4231 Class 1 Calibrator

- 3.7 All equipment used has been professionally calibrated. Field calibration of the sound level meters was undertaken before and after measurement to ensure no drifting of the calibration signal. Calibration certificates are available on request.

Observations

- 3.8 The main noise sources observed on site were distant and local road, rail traffic, children playing in the school playground during the day, bird song – particular dawn chorus, which was the cause of the elevated sound levels in the early morning, and foliage movement.
- 3.9 All measurements used within the calculations, mitigation recommendations and conclusions were taken during times of appropriate weather and representative traffic conditions.

Results

3.10 The L_{Aeq} , L_{Amax} , and L_{A90} acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as time histories in **Appendix A**.

3.11 **Table 3.1** provides a summary of the measured noise levels.

Monitoring location	Ambient Noise Level dB $L_{Aeq, T}$		Representative night-time L_{Amax} dB(A)
	Daytime [07:00 - 23:00]	Night-time [23:00 - 07:00]	
Position 1 (School)	50 - 59	43	54
Position 2 (Golf Course)	47 - 49	41	59

Table 3.1: Site average noise levels for daytime and night-time

3.12 The representative L_{Amax} level is the value which has been exceeded less 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 WHO guidelines.

3.13 Average sound levels are around $47dB_{LAeq,16hour}$ to $59dB_{LAeq,16hour}$ during the day and $41dB_{LAeq,8hour}$ to $43dB_{LAeq,8hour}$ at night. This would be considered a 'low risk' development site for residential use when compared with Figure 1 included in Section 2 of ProPG, as shown in **Figure 2.1** of this report. A low risk site is summarised as:

“At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.”

3.14 Good acoustic design processes will be followed to reduce sound levels to as low as practical across the site.

3.15 Representative octave band levels are provided in **Table 3.2**. These are used in glazing calculations to ensure a robust calculation of internal noise levels.

		Octave band centre frequency dB							
		63	125	250	500	1k	2k	4k	8k
P1	L _{Aeq} :16hr (day)	53	54	47	49	52	50	43	37
	L _{Aeq} :8hr (night)	44	40	37	40	40	31	28	23
	L _{Amax} :T (night)	59	56	51	55	50	47	44	46
P2	L _{Aeq} :16hr (day)	54	51	55	41	40	35	33	34
	L _{Aeq} :8hr (night)	46	40	37	39	37	29	32	23
	L _{Amax} :T (night)	65	57	55	59	50	51	54	48

Table 3.2: Octave band data for noise monitoring locations

4.0 MITIGATION RECOMMENDATIONS

4.1 The measured results and indicative layout were used to undertake calculations, presented in **Appendix B**, for suitable façade treatments. Mitigation recommendations are outlined in the following paragraphs.

4.2 Careful design of internal layout can be beneficial to achieve suitable internal sound levels; for example, positioning non-sensitive rooms such as kitchens and bathrooms on the more exposed façades and sensitive rooms such as bedrooms and living areas on more the sheltered elevations, which have been considered in the design.

External Building Fabric - Non-Glazed Elements

4.3 It is assumed that the non-glazed external building fabric elements of the proposed development comprise masonry cavity walls. This would typically provide a sound reduction performance of at least the figures shown in **Table 4.1** 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 4.1: Non-glazed elements assumed sound reduction performance

4.4 This would contribute towards a significant reduction of ambient noise levels in combination with a good quality double-glazed window configuration, as shown in **Table 4.2**.

External Building Fabric - Specification of Glazed Units

- 4.5 Sound reduction performance calculations have been undertaken to specify the minimum performance required from glazed elements in order to achieve recommended internal noise levels shown in **Table 2.3** of **Chapter 2**.
- 4.6 Calculations have been based on habitable rooms with relatively higher ratios of glazing to masonry, in order to present a more onerous assessment. This specification therefore presents a robust assessment, for BS8233:2014 criteria for internal noise levels in all affected facades.
- 4.7 Glazing calculations have been performed using the L_{Aeq} and L_{Amax} values (as appropriate) as detailed in **Table 3.1**, together with the octave band levels as shown in **Table 3.2**.
- 4.8 The required glazing performance is shown in **Table 4.2**. The performance is specified for the whole window unit, including the frame.

Glazing Type reference, description and typical dimensions(mm)	Sound Reduction Index R_w	Octave band centre frequency (Hz) SRI (dB)					
		125	250	500	1k	2k	4k
Standard Thermal double (6/16/6mm)	32	20	21	30	35	32	37

Table 4.2: Minimum glazing specification

External Building Fabric - Specification of Vents

- 4.9 It should be noted that there may be additional considerations for glazing requirements such as security and thermal performance, therefore the above specified glazing is merely guidance for how the acoustic criteria can be achieved. Alternative glazing could be used in place of the above specified units, assuming the minimum acoustic performance is met.
- 4.10 In addition, where non-sensitive rooms and sensitive rooms form part of an open plan area, for example a dining and kitchen area, the glazing specification for the more sensitive room should be used across all windows in this area.
- 4.11 Properties fronting onto the school playground are subject to slightly higher sound levels during the day when the school is open. If windows are open during this period, this may result in levels that are above what is considered suitable in authoritative guidance. However, during the evenings when residents are most likely to be resting in their homes, suitable internal sound levels can be achieved with partially opened windows.

- 4.12 Acoustic trickle ventilation will be provided for the properties fronting onto the school grounds to offer a choice to ventilate properties during the daytime in lieu of partially open windows.

Element	Octave band centre frequency SRI, dB						Overall
	125	250	500	1k	2k	4k	Dn,e,w
Standard trickle ventilator	36	34	31	34	38	38	35

Table 4.3: Required minimum attenuation values for ventilation

- 4.13 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. No further mitigation measures would be required to achieve the recommended internal noise levels.

External amenity space

- 4.14 Gardens and external amenity spaces should aim to meet desirable ambient noise levels defined in WHO Guidelines and BS 8233. However, guidelines recognise that external levels of 55dBA is not always achievable and that a decision should be balanced against the other criteria for developing a site. In general, however, the lowest practicable levels should be achieved through good acoustic design.
- 4.15 External sound levels are generally suitable across the site and meet the criteria set out in the guidance. Gardens fronting onto the school playground will be subject to slightly higher sound levels during the day, however when the school is closed, suitable external levels can be achieved.
- 4.16 Careful orientation of gardens to the more sheltered side of dwellings or screening of gardens with close boarded fences or walls can reduce sound levels by around 5dBA to 10dBA.

- 4.17 Following these principles of good acoustic design, the vast majority of gardens areas can achieve suitable external sound levels as set out in the guidance.

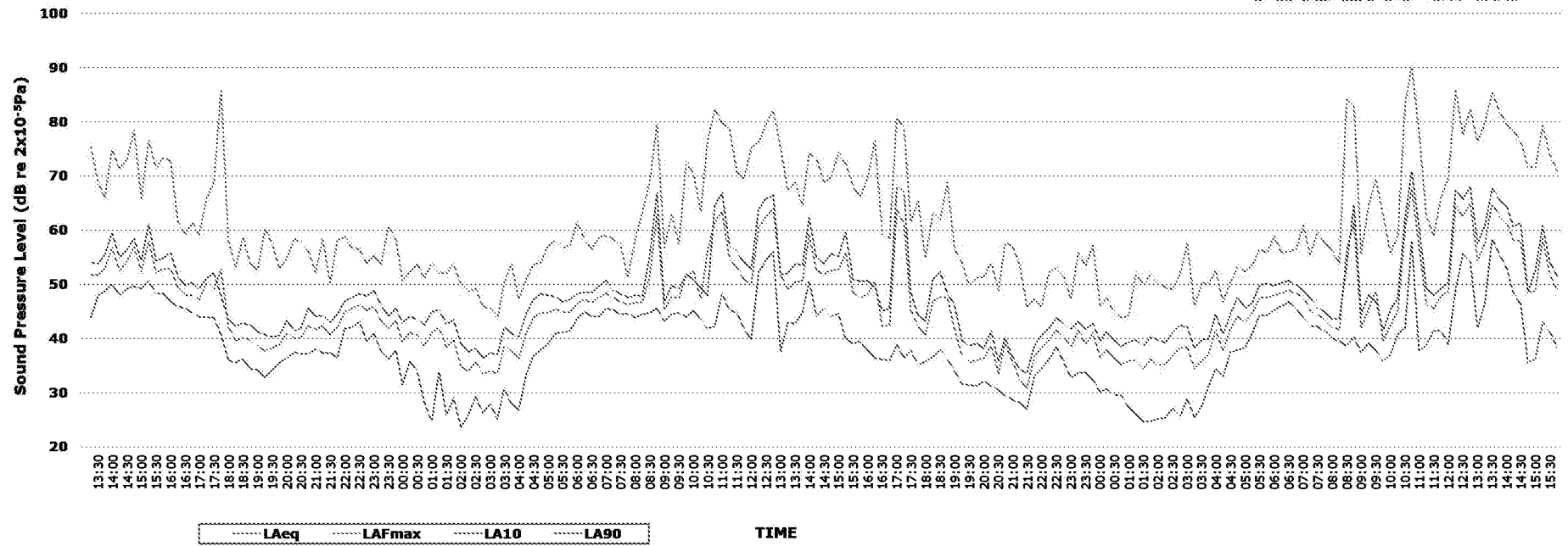
5.0 CONCLUSIONS

- 5.1 Noise levels have been measured at two locations across the site. Measured levels have been used to calculate and assess suitable glazing specification.
- 5.2 This is considered a 'low risk' site when considered in accordance with guidance in ProPG. Expert Acoustics advice has been sought and good acoustic design processes should be followed to reduce sound levels across the site.
- 5.3 External levels are suitable across the majority of the site. Properties near to the school playground may be subject to slightly higher sound levels during the day, sound levels will be reduced to as low a level as practicable in accordance with the principles of good acoustic design.
- 5.4 This assessment demonstrates that the site remains suitable for residential development and that the uplift in unit numbers is acceptable in noise terms, subject to the mitigation recommendations included in this report.

APPENDIX A

Walberton - Position 1 - School

ARDENT CONSULTING ENGINEERS



Walberton - Position 2 - Golf Club

ARDENT CONSULTING ENGINEERS



APPENDIX B

ARDENT CONSULTING ENGINEERS
Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	183240
Property Address	Walberton
Room Type	Bedroom
Parameter	LAeq, 16h

Room Dimensions and Areas	
Room volume	17.0m³
Total Surface area	55.9m²
Wall fa'ade area	10.00
Roof fa'ade area	17.0m²
Glazing area	1.0m²
Dne Ref Area, A0	0.17m²
Total fa'ade area	27.17m²

Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Fa'ade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	53.4	54.0	47.4	49.1	52.4	49.8	43.3	37.1	55.9
Fa'ade to free field	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Noise level at fa'ade (Leq)	53	54	47	49	52	50	43	37	56

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	20	21	30	35	32	37	44	32
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040	
Wall SRI	34	41	45	48	56	65	69	72	54
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	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
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127	
Average SRI	23	25	26	31	34	35	38	39	34

Thermal 6/16/6

Typical masonry cavity wall (300mm - 380kg/m2)

Standard Trickle Vent

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	31.0	29.4	22.1	19.3	19.0	15.2	6.5	-1.0	23.4
Lp (Direct)	30.1	28.6	21.2	18.4	18.2	14.3	5.6	-1.8	22.5
Lp (Rev & Direct)	34	32	25	22	22	18	9	2	26
BS 8233	33	31	24	21	21	17	8	1	25

Criteria

#35

#35

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	183240
Property Address	Walberton
Room Type	Bedroom
Parameter	LAeq, 8h

Room Dimensions and Areas	
Room volume	16.1m³
Total Surface area	56.0m²
Wall fa'ade area	10.00
Roof fa'ade area	16.1m²
Glazing area	1.0m²
Dne Ref Area, A0	3.0m²
Total fa'ade area	35.0m²

Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Fa'ade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	43.7	39.6	36.7	40.2	40.3	30.8	27.8	23.1	42.8
Fa'ade to free field	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Noise level at fa'ade (Leq)	44	40	37	40	40	31	28	23	43

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	20	21	30	35	32	37	44	32
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040	
Wall SRI	34	41	45	48	56	65	69	72	54
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	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
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127	
Average SRI	23	25	26	31	34	35	38	39	34

Thermal 6/16/6

Typical masonry cavity wall (300mm - 380kg/m2)

Standard Trickle Vent

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	21.2	15.0	11.4	10.3	7.0	-3.8	-9.1	-15.0	11.4
Lp (Direct)	20.3	14.2	10.5	9.5	6.1	-4.7	-9.9	-15.8	10.6
Lp (Rev & Direct)	24	18	14	13	10	-1	-6	-12	14
BS8233	23	17	13	12	9	-2	-7	-13	13

Criteria

H30

H30

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	183240
Property Address	Walberton
Room Type	Bedroom
Parameter	Lamax

Room Dimensions and Areas	
Room volume	16.1
Total Surface area	56.1
Wall fa'ade area	10.00
Roof fa'ade area	16.1
Glazing area	16.1
Dne Ref Area, A0	16.1
Total fa'ade area	
	32.1

Based on typical size

Room Absorption Calculation		63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar		0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption		14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A		-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Fa'ade level		63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level		59.0	55.8	51.3	55.1	50.1	47.4	44.4	45.9	54.3
Fa'ade to free field		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Angle of view		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Screening (Maekewa)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Distance correction		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Noise level at fa'ade (Leq)		59	56	51	55	50	47	44	46	56.3

Composite SRI		63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI		18	20	21	30	35	32	37	44	32
Transmission Coefficient		0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040	
Wall SRI		34	41	45	48	56	65	69	72	54
Transmission Coefficient		0.000398	0.000079	0.000032	0.000016	0.000003	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
Transmission Coefficient		0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff		0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127	
Average SRI		23.3	25.4	26.2	30.7	34.2	35.5	37.7	39.0	34

Thermal 6/16/6
Typical masonry cavity wall (300mm - 380kg/m2)
Standard Trickle Vent

Calculated Internal Noise Level, dB		63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source		36.5	31.2	26.0	25.3	16.7	12.8	7.6	7.8	25.3
Lp (Direct)		35.7	30.4	25.1	24.4	15.9	11.9	6.7	7.0	24.5
Lp (Rev & Direct)		39	34	29	28	19	15	10	10	28
BS8233		39	33	28	27	19	15	10	10	27

Criteria
H45
H45

ARDENT CONSULTING ENGINEERS
Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	183240
Property Address	Walberton
Room Type	Bedroom
Parameter	LAeq, 16h

Room Dimensions and Areas	
Room volume	15.1m ³
Total Surface area	55.0m ²
Wall fa'ade area	10.00
Roof fa'ade area	11.11
Glazing area	1.22
Dne Ref Area, A0	3.11
Total fa'ade area	30.33

Based on typical size

Room Absorption Calculation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Alpha bar	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	
Total Absorption	14.09	14.09	14.09	14.09	14.09	14.09	14.09	14.09	
10Log S/A	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	

Comment:
Typical Bedroom RT

Fa'ade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	54.2	50.6	44.2	41.1	40.1	35.4	33.1	34.2	47.7
Fa'ade to free field	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Angle of view	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Screening (Maekewa)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Distance correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Noise level at fa'ade (Leq)	54	51	44	41	40	35	33	34	45

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw
Glazing SRI	18	20	21	30	35	32	37	44	32
Transmission Coefficient	0.015849	0.010000	0.007943	0.001000	0.000316	0.000631	0.000200	0.000040	
Wall SRI	34	41	45	48	56	65	69	72	54
Transmission Coefficient	0.000398	0.000079	0.000032	0.000016	0.000003	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
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158	
Average Transmission Coeff	0.004673	0.002890	0.002419	0.000860	0.000378	0.000284	0.000169	0.000127	
Average SRI	23	25	26	31	34	35	38	39	34

Thermal 6/16/6

Typical masonry cavity wall (300mm - 380kg/m2)

Standard Trickle Vent

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A
Lp (Reverberant), line source	31.7	26.1	18.9	11.3	6.7	0.8	-3.7	-3.9	15.8
Lp (Direct)	30.9	25.2	18.0	10.4	5.9	-0.1	-4.6	-4.8	14.9
Lp (Rev & Direct)	34	29	22	14	9	3	-1	-1	18
BS8233	34	28	21	13	9	3	-2	-2	18

Criteria

H35

H35

APPENDIX C

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:

$L_{Aeq,T}$ 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.

$L_{A10,T}$: 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',

$L_{A90,T}$: 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.

L_{Amax} : the maximum A-weighted level of sound over a period of measurement.

$L_{Ar,T}$ 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.

S_{EL} 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