Sandyhurst, Welwyn

Site Suitability and Noise Impact Assessment

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17033 Sandyhurst Welwyn

Client: Jarvis Homes

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Contents

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Introduction

This report summarises the noise survey and subsequent acoustic assessment carried out for the site at Sandyhurst, Welwyn.

The site is currently occupied by a single residential dwelling, but outline plans are under consideration for further development of housing on the site.

The site is bounded by the A1(M) to the East, Nodeway Gardens (four storey apartments and townhouses) to the North, and the B197 Welwyn By-Pass Road to the West. To the South is an area of meadow and woodland, between the B197 and the A1(M).

The intention of this report is to report upon the prevailing noise climate affecting the site, and consider the potential development of residential properties on the site utilising noise attenuation measures to reduce the noise impact within residences to acceptable levels.

Standards and Guidance

The following standards and guidance are referred to in this report.

Welwyn Hatfield District Plan – Supplementary Design Guidance (February 2005)

Policy R19 *Noise and Vibration* requires noise to be considered against the requirements of PPG 24 *Planning and Noise*. Following the introduction of the NPPF (see below), PPG 24 has been withdrawn. We have consulted with Mr Roger Evans, Environmental Health Officer at Welwyn Borough Council, who has confirmed that the Council would consider any proposed new housing against BS 8233 *Sound Insulation and Noise Reduction for Buildings* as detailed below.

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

BS 8233 gives guidance for noise levels within residential properties. It discusses appropriate criteria for reasonable rest and sleep conditions and provides noise levels which are considered to provide appropriate conditions in accordance with WHO guidelines. The guidance on limits from the Standard is reproduced below:

Table 1 – Internal Ambient Level Limits set by BS8233:2014

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

It should be noted that these levels represent the average noise level over the 16-hour day or 8-hour night period. This potentially means that higher noise levels may be experienced internally over a shorter period of time (e.g. Individual passing trains). These equivalent noise levels over a period of time are the best representation of the average noise level and are generally the main focus when it comes to evaluating noise exposure.

To assess the maximum instantaneous noise levels. WHO Guidelines for Community Noise: 1999 recommend a L_{Amax} of 45dB with an open window within bedrooms.

Under the updates to BS 8233 in 2014, for both day and night time cases, a relaxation of up to 5 dB is considered to provide "reasonable internal conditions" where development is considered necessary or desirable. This relaxation has not been assumed within our assessment.

There are no formal external amenity areas associated with this proposal.

National Planning Policy Framework (NPPF)

The NPPF provides a set of overarching aims broadly reflecting those already covered in the Noise Policy Statement for England (NPSE) described below. They are directed towards the avoidance of significant adverse impacts and reduction of other adverse impacts on health and quality of life, set within the context of the Government's policy on sustainable development.

With regard to sustainable development, the NPPF requires that "*Where the development plan is absent, silent or relevant policies are out-of-date, permission should be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this framework taken as a whole".*

Noise Policy Statement for England (NPSE)

NPPF affirms that National Policy Statements form part of the overall framework of national planning policy, and should be a material consideration in decisions on planning applications. The Noise Policy Statement for England came into force in 2010 and states:

This Noise Policy Statement for England (NPSE) should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise. The NPSE does not apply to noise in the workplace (occupational noise).

Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

The NPPF noise aims widely reflect those in NPSE. The NPSE does however include some context within the explanatory note to assessing noise impact and uses established concepts from toxicology currently being applied to noise impacts, these include:

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.

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

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

However, it is clear that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.

The table on the following page is extracted from the Government's Planning Practice Guidance on noise. It summarises the noise exposure hierarchy, based on the likely average response.

Table 2 - Noise Exposure Hierarchy

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 (LOAEL)	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude. E.g. turning up the volume of the television; speaking more loudly; where there is no alternative ventilation, having to close windows are some of the time because of the noise. Potential for some reportedly 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 (SOAEL)	
Noticeable and disruptive	The noise causes material change in behaviour and/or attitude e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep the windows closed most of the time because of the noise. Potential for sleep disturbance result in difficulty in getting to sleep. Premature awakening and difficulty 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 the effect of noise leading to psychological stress or psychological effects e.g. regular sleep deprivation/awakening; loss of appetite; significant, medically definable harm e.g. auditoria and non-auditory	Unacceptable adverse effect	Prevent

Noise Survey

To assess the noise environment at the site, a noise survey was undertaken between the afternoons of Thursday 25th July and Tuesday 30th July 2013. Due to heavy rain on Tuesday 23rd, an additional visit to site was made on Thursday 1st August in order to carry out supplemental measurements at locations across the site.

The survey comprised one primary measurement position which is referenced in Figure 1, approximately 25m from the carriageway edge. Measurements were continuous at this location throughout the survey period, and were of 15 minutes duration. Noise levels were logged every minute in order to allow a full assessment of the prevailing noise climate affecting the development.

Manual measurements were also made across the site on Thursday 1st August. Measurements were made in the primary location as well as at other points around the site as shown in Figure 1. The measurements made on this day accorded well with those made during the long-term survey.

The measurement locations are described as follows:

- Continuous monitoring location M: free field measurement within wooded area to the north of the site, approximately 25m from the road edge. Line of sight to traffic movements on the A1(M). Dominated by traffic noise.
- Location 1: free field spot measurement on north western boundary. Dominated by traffic noise from the A1(M) as well as regular traffic on the Welwyn By-Pass Road. Visually screened from this road by undergrowth.
- Location 2: free field spot measurement on the south-western boundary of the site within an existing gateway. Line of sight to Welwyn By-Pass Road.
- Location 3: free field spot measurement within land to the south east of the site, approximately 30m from the A1(M). Line of sight to motorway traffic.
- Location 4: free field in the middle of the lawn at Sandyhurst. Dominated by traffic noise.
- Location 5: Free field at Nodeway Gardens overlooking A1(M).

Figure 1: Site Plan Showing Measurement Locations

Road traffic noise was the dominant noise source at all locations. Measurements at Location 2 were affected by works at houses on the other side of the B197 and as such some readings have been discarded. Measurements made by the long-term monitor during periods of heavy rain (and subsequent periods when there was standing water on the roads) have also been disregarded for the purposes of this assessment.

In all cases the microphone was located approximately 1.5m above ground level and 3.5m away from any other reflective surface, i.e. in free field conditions.

The weather during the survey was changeable, with periods of thunderstorms which have been disregarded in this analysis. There was a mean temperature of 22°C during the day and a typical night time temperature of 13°C. The wind speed varied between 0 and 6 m/s (occasional gusts during storm periods). Measurements on Thursday 1st August were made in temperatures of 30°C with no wind.

The noise monitoring equipment used during the survey for the continuous measurement was a Norsonic 140 Type 1 sound level meter, serial number 1403345. Spot measurements were undertaken with this meter and also with a CEL-63X Type 1 sound level meter, serial number 153298. On site calibration checks were performed on the meter before and after the measurements and were found to be within the permitted tolerance of BS EN 61672-1:2003. All equipment had a valid calibration certificate at the time of the survey.

The continuous measurement was set to record 15 minute periods, with levels logged every minute. The meter was also equipped with audio recording, allowing noise sources to be identified throughout the measurement period.

Data Used for Assessment

A significant amount of noise data was gathered over the 100+ hours of the noise survey; this is not presented in full in this report, but is available upon request.

As noted above, some periods during the long-term measurements were affected by heavy rain (wet roads) and storm conditions. This data has been excluded from the assessment.

Measurement Results

The measurement results from the continuous noise monitor are summarised in Table 3 below.

Table 3 - Summary of day and night time measured noise levels at north east of site

Date	Period	L_{Aeq}	L_{A90}	L_{Amax}
Thursday 25th July	Night time (23:00-07:00)	62	49	75
Friday 26th July	Daytime (07:00-23:00)	67	63	83
	Night time (23:00-07:00)	59	49	79
Saturday 27th July	Daytime (07:00-23:00)	66	62	81
	Night time (23:00-07:00)	60	47	73
Sunday 28th July	Daytime (07:00-23:00)	67	63	85
	Night time (23:00-07:00)	62	49	73
Monday 29th July	Daytime (07:00-23:00)	68	64	87
	Night time (23:00-07:00)	62	47	83

Figure 2 below shows the variation in noise levels across the long-term measurement period.

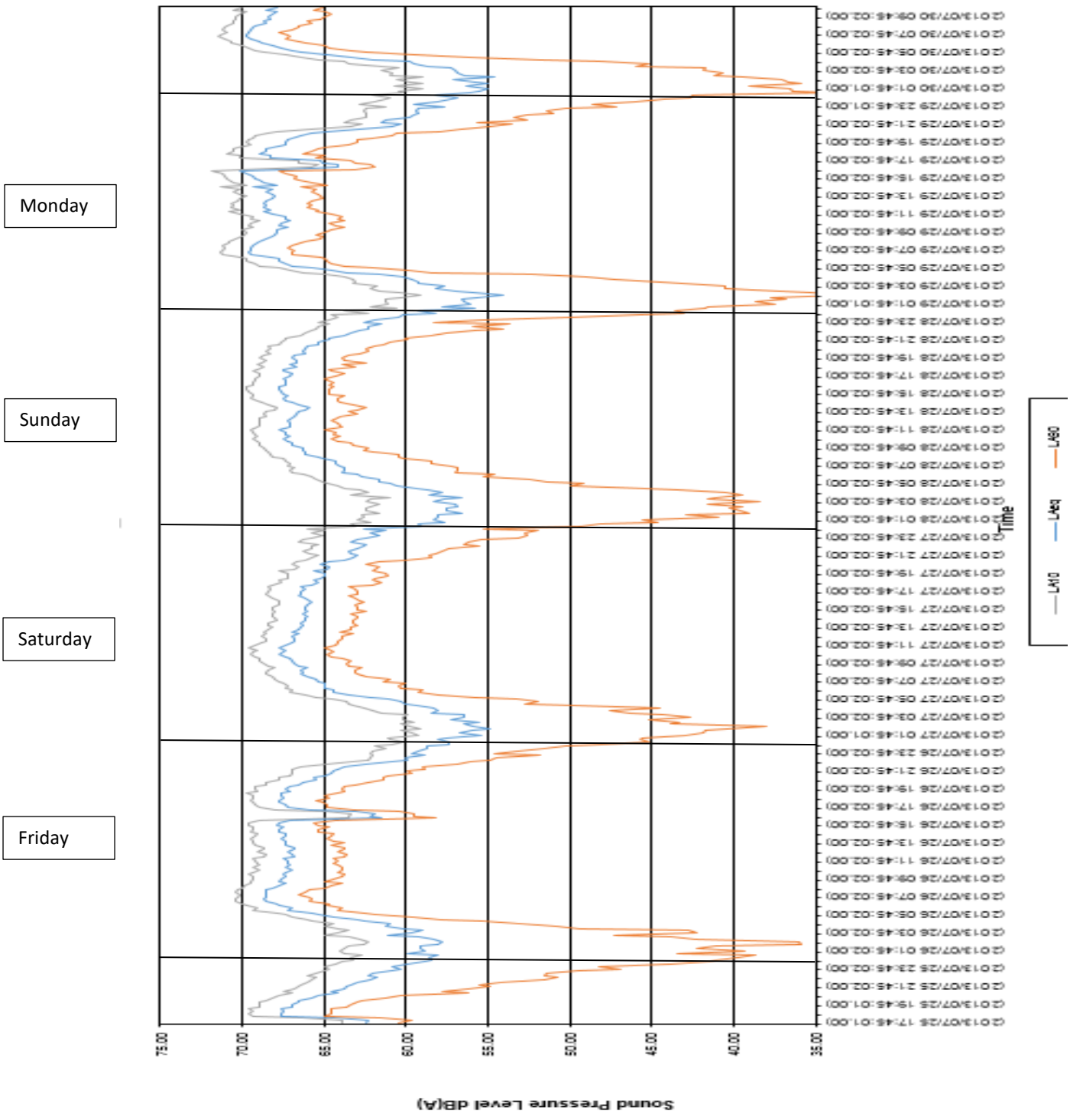

Figure 2: Measured Noise Data, Long Term Survey

The spot measurements made on Thursday August 1st are presented in the table below:

Table 4 - Comparison of spot measurements (traffic noise only) with simultaneous measurement at monitoring position.

Location	Time	L_{Aeq}	L_{A90}
M	11.21	67	64
	12.21	67	64
	13.23	66	63
1	11.23	62	59
	12.24	63	60
	13.21	64	60
2	11.42	67	63
	13.39	66	63
3	11.38	64	62
	12.39	65	62
	13.39	65	63
4	12.00	65	63
	12.40	65	63
	13.23	65	63
5	12.04	67	64
	13.02	67	64

The measurements made at location M are comparable to those recorded during the long-term survey, indicating that the noise climate was consistent throughout the survey periods. There is little variation with noise levels across the site, with the key reason for variation being distance from the A1(M) which was the dominant noise source at all locations.

Noise Model

A noise model of the site has been created using Soundplan modelling software. This uses the methodology from *Calculation of Road Traffic Noise* (CRTN) (HMSO, 1998), and ISO 9613-2:1996 *Attenuation of Sound During Propagation Outdoors*, in order to predict noise transfer across the site.

Traffic flows for the A1(M) and Welwyn By Pass Road were input based upon data available from the Department for Transport (www.dft.gov.uk) and the model of the undeveloped site was calibrated against the noise survey results.

The screenshot below shows the initial acoustic model. The predicted results are within 3 dB of those measured on site during both day and night time periods, which is considered accurate.

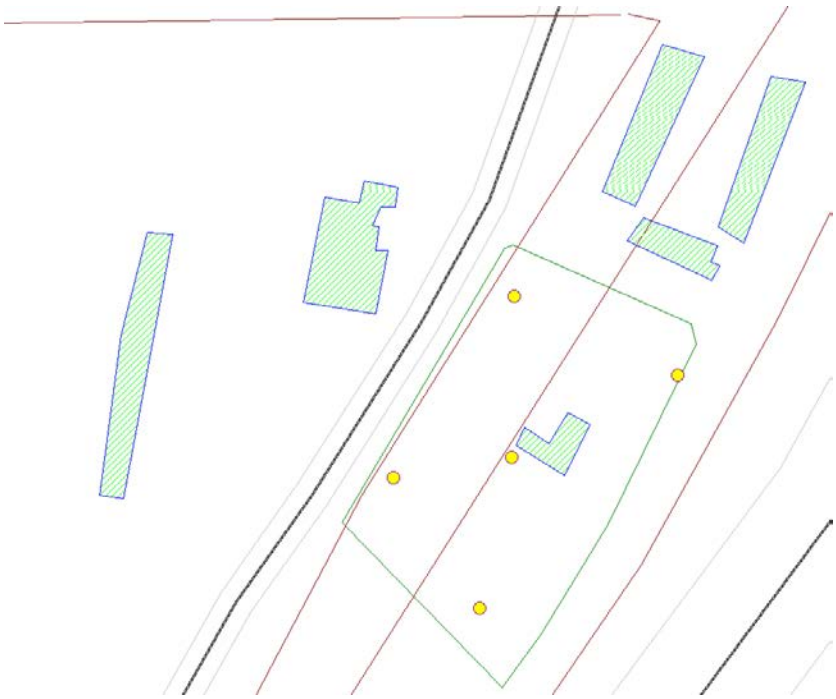

Figure 3: Calibration Noise Model

Further iterations of the model were then created including the proposed housing development, to examine potential noise mitigation measures; these are discussed in more detail in the following sections of the report.

Predicted Levels Post Development

A noise model of the site post development has been created to assess the acoustic requirements for the building facades and ventilation strategy.

Figure 4: Post Development Noise Model

Based on studies of the site carried out based on the initial noise survey, the site layout and building massing has evolved to provide the maximum feasible level of acoustic screening from road traffic noise. Units 20-37 are laid out internally such that all bedrooms and living rooms face the interior of the site and do not overlook the road.

The noise model has been used to predict the variation of noise levels across each façade containing living rooms and bedrooms, as well as to identify the noise levels at specific points (shown as red dots in the figure above). Predictions have been made for both day and night time. The figure below shows the variation of noise levels across the building facades during the daytime.

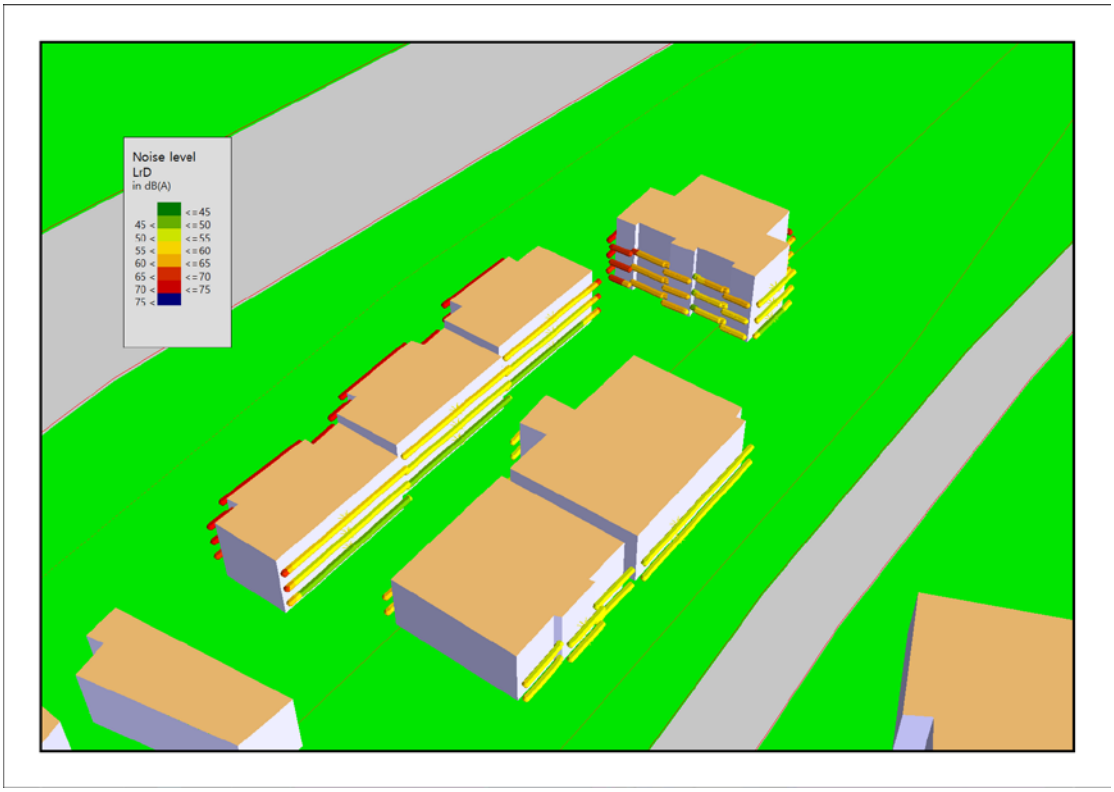

Figure 5: Facade Noise Map, Daytime

The table below summarises the predicted day and night-time noise level at each façade containing habitable rooms, as output from the modelling software.

Table 5 - Post Development Results

Sandyhurst Welwyn
Assessed receiver levels
Post dev spots

2

Receiver	Fl	Dir	LrD dB(A)	LrN dB(A)	
1-3	GF	NE	51.5	46.8	
	F 1		54.2	49.5	
1-3	GF	SW	55.9	51.2	
	F 1		57.5	52.8	
4-7	GF	SW	57.2	52.5	
	F 1		58.6	53.9	
4-7	GF	SW	54.5	49.8	
	F 1		56.7	52.0	
4-7	GF	NE	51.8	47.1	
	F 1		54.4	49.7	
8-19	GF	NE	47.2	42.5	
	F 1		49.7	45.0	
	F 2		51.8	47.1	
8-19	GF	NE	47.9	43.2	
	F 1		50.3	45.6	
	F 2		52.3	47.6	
8-19	GF	SW	69.4	64.7	
	F 1		70.6	65.9	
	F 2		71.3	66.6	
8-19	GF	SW	68.4	63.7	
	F 1		69.7	65.0	
	F 2		70.4	65.7	
8-19	GF	NW	65.1	60.4	
	F 1		66.5	61.8	
	F 2		67.3	62.6	
20-25	GF	NE	48.2	43.5	
	F 1		51.2	46.5	
	F 2		56.2	51.5	
20-25	GF	NE	48.8	44.1	
	F 1		51.6	46.9	
	F 2		56.6	51.9	
32-37	GF	NE	48.2	43.5	
	F 1		51.1	46.4	
	F 2		56.1	51.4	

Façade Requirements

An external noise break-in assessment has been undertaken to provide an indicative assessment of the minimum sound insulation performance of the façades required to meet the internal noise criteria of BS 8233:2014. Due to the varying ambient noise levels predicted across the site, each relevant facade has been considered individually. For the sake of simplicity we have assumed that a single glazing configuration will be used per elevation and that the worst case incident noise level at each façade should be used.

It is assumed that the non-glazed elements of the building envelope will provide sufficient sound insulation against external noise sources. Therefore, as the glazing elements are likely to be the acoustic weak link of the external façade, it is appropriate to explore the level of protection afforded by the glazing.

Building 1-7 Facing By Pass

Table 6 – Table showing minimum glazing that will be required.

Parameter	Daytime (07:00 – 23:00 hrs)	Night time (23:00 – 07:00 hrs)
	$L_{Aeq,16h}$	$L_{Aeq,8h}$
Free-field External Level	54 dB	50 dB
Internal Ambient Noise Criteria	35 dB	30 dB
Minimum Required Sound Insulation Performance of Facade	19 dB $R_W + C_{tr}$	**20 dB $R_W + C_{tr}$**

Building 1-7 Facing Site Interior

Table 7 – Table showing minimum glazing that will be required.

Parameter	Daytime (07:00 – 23:00 hrs)	Night time (23:00 – 07:00 hrs)
	$L_{Aeq,16h}$	$L_{Aeq,8h}$
Free-field External Level	59 dB	54 dB
Internal Ambient Noise Criteria	35 dB	30 dB
Minimum Required Sound Insulation Performance of Facade	24 dB $R_W + C_{tr}$	**24 dB $R_W + C_{tr}$**

Building 8-19 South and West (facing site exterior)

Table 8 – Table showing minimum glazing that will be required.

Parameter	Daytime (07:00 – 23:00 hrs)	Night time (23:00 – 07:00 hrs)	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	L_{Amax}
Free-field External Level	70 dB	67 dB	72 dB
Internal Ambient Noise Criteria	35 dB	30 dB	45 dB
Minimum Required Sound Insulation Performance of Facade	35 dB $R_W + C_{tr}$	**37 dB $R_W + C_{tr}$**	27 dB $R_W + C_{tr}$

Building 8-19 North and East (facing site interior)

Table 9 – Table showing minimum glazing that will be required.

Parameter	Daytime (07:00 – 23:00 hrs)	Night time (23:00 – 07:00 hrs)
	$L_{Aeq,16h}$	$L_{Aeq,8h}$
Free-field External Level	52 dB	48 dB
Internal Ambient Noise Criteria	35 dB	30 dB
Minimum Required Sound Insulation Performance of Facade	18 dB $R_W + C_{tr}$	**18 dB $R_W + C_{tr}$**

Building 20-37 Facing Site Interior

Table 10 – Table showing minimum glazing that will be required.

Parameter	Daytime (07:00 – 23:00 hrs)	Night time (23:00 – 07:00 hrs)	
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	L_{Amax}
Free-field External Level	57 dB	52 dB	62 dB
Internal Ambient Noise Criteria	35 dB	30 dB	45 dB
Minimum Required Sound Insulation Performance of Facade	22 dB $R_W + C_{tr}$	**22 dB $R_W + C_{tr}$**	17 dB $R_W + C_{tr}$

Glazing Requirements Summary

In order to achieve the internal ambient noise limits required by BS 8233:2014, the following minimum glazing specifications are required to habitable rooms (living rooms, bedrooms and dining rooms).

Table 11 - Summary of Glazing Requirements

Building	Facade	Minimum required sound insulation performance of facade
1-7	Facing bypass	**20 dB $R_W + C_{tr}$**
	Facing site interior	**24 dB $R_W + C_{tr}$**
8-19	West and south (facing A1M)	**37 dB $R_W + C_{tr}$**
	North and east (facing bypass and site interior)	**18 dB $R_W + C_{tr}$**
20-37	All facades (habitable rooms are only facing site interior)	**22 dB $R_W + C_{tr}$**

With the exception of the west and south facades of Buildings 8-19, which are the most exposed to noise from the A1(M), these requirements should be readily met by standard thermally insulating double glazing.

To achieve 37 dB $R_W + C_{tr}$ for Building 8-19 will require a more specialised glazing construction, for example a 10/16/8.8 laminated construction (data from Pilkington Optiphon).

Ventilation Strategy

Open windows significantly reduce the sound insulation provided by the façade, to approximately 13 dB.

The required sound insulation for all facades of the development is significantly above 13 dB $R_W + C_{tr}$, indicating that open windows cannot be relied upon for background ventilation/cooling. Mechanical ventilation or suitably attenuated natural ventilation would therefore be the recommended method of background ventilation/cooling at all facades, with openable windows available for rapid cooling if necessary.

Conclusion

dBx Acoustics Ltd was commissioned by Jarvis Homes to carry out a noise assessment for the site at Sandyhurst, Welwyn.

The noise survey carried out at the site has been used to calibrate an acoustic model of the site, which has been populated with the proposed development. The development has been designed such that units 20-37 do not have habitable rooms facing the A1(M) and so that the building massing provides some screening of noise to the remainder of the site.

Based on the predicted noise levels incident upon each façade with habitable rooms, the minimum acoustic performance of glazing has been derived in order that the day- and night-time noise limits within the buildings as set within BS 8233:2014 are not exceeded. The assessment identifies that natural ventilation via open windows will not be appropriate for the habitable rooms within this development, and that attenuated or mechanical ventilation will be required.

Appendix A – Glossary of Acoustic Terminology

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is $2x10^{-5}$ N/m^2. The sound pressure level existing when microphone measured pressure is $2x10^{-5}$ N/m^2 is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during time, T.
$L_{Amax,T}$	The instantaneous maximum A weighted sound pressure level which occurred during time, T