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Proposed Residential Care Home

Land to the north of Fairfield Road, Boorley Green, Botley, Hampshire So32 2BX

Noise Impact Assessment

For:
ADG Architects

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1 Introduction

1.1 Overview

Environmental Noise Solutions Limited (ENS) has been commissioned by ADG Architects to carry out a noise impact assessment for a proposed new build residential care home on land to the north of Fairfield Road, Boorley Green, Botley, Hampshire, SO32 2BX (hereafter referred to as ‘the site’).

The objectives of the noise impact assessment were to:

- Determine external noise levels at the site
- Assess the potential impact of the external noise climate on the proposed residential development with reference to relevant guidelines
- Provide recommendations for a scheme of sound attenuation works, as necessary, to protect future occupants of the proposed residential development from a loss of amenity due to noise

This report details the methodology and results of the assessment and provides recommendations for the building envelope (fenestration and ventilation). It has been prepared to accompany a planning application to be submitted to Eastleigh Borough Council.

The report has been prepared for ADG Architects for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties referring to the report should consult ADG Architects and ENS as to the extent to which the findings may be appropriate for their use.

A glossary of acoustic terms used in the main body of the text is contained in Appendix 1.

1.2 Site Description and Development Proposals

The site is located to the north of Fairfield Road and to the west of Winchester Road on the northern side of Boorley Green as shown (highlighted in red) in Figure 1.1.

Figure 1.1: Location of Proposed Development



The site is bound by:

- Winchester Road to the east and Fairfield Road to the south
- Residential estates (currently under construction) to the south and west
- Open fields and (dairy) farmland to the north.

The ambient noise climate at the site is dominated by road traffic noise on Winchester Road and roundabout with a lesser contribution expected from vehicles accessing the residential estate along Fairfield Avenue. Daytime construction noise was present during the survey as works are ongoing although did not impact the evening and night-time measurement periods. No significant noise was noted from any other local source.

Development proposals are for a care home development comprising up to 70 no. beds.

The closest noise sensitive receptors (NSRs) to the site are considered to be:

- Existing residential dwellings to the north and east on Winchester Road (NSR1)
- New residential dwellings to the south and west (NSR2)

2 Policy Context and Assessment Guidance

2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)¹ was updated in 2023 and sets out the Government's planning policies for England and how these are expected to be applied.

Where issues of noise impact are concerned the NPPF provides brief guidance in paragraph 174 where it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of.....noise pollution'.

Paragraph 185 advises that:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should.....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'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NPSE) which reinforces and supplements the NPPF.

2.2 Noise Policy Statement for England

The Noise Policy Statement for England² (NPSE) sets out the long-term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by the following aims:

- Avoid significant adverse impacts on health and quality of life
- Mitigate and minimise adverse impacts on health and quality of life
- Where possible, contribute to the improvement of health and quality of life

The NPSE describes the following levels at which noise impacts may be identified:

- 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

According to the explanatory notes in the statement, where a noise level falls between the lowest observable adverse effect level (LOAEL) and a level which represents a significant observable adverse effect level (SOAEL):

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

1 National Planning Policy Framework. Ministry of Housing, Communities and Local Government (2023)

2 Government Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. March 2010.

2.3 Planning Practice Guidance on Noise

Planning Practice Guidance³ (PPG) is an online resource which provides additional guidance and elaboration on the NPPF. It advises that the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur
- Whether or not an adverse effect is occurring or likely to occur
- Whether or not a good standard of amenity can be achieved

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

‘...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation’.

The PPG also provides general advice on the typical options available for mitigating noise, suggesting that Local Plans may include noise standards applicable to proposed developments within the Local Authority’s administrative boundary, although it states that:

‘Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed’.

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation. The following guidance documents provide some meaningful context.

2.4 ProPG Planning and Noise: New Residential Development

ProPG Planning and Noise: New Residential Development (ProPG)⁴ was published in 2017 by the Association of Noise Consultants, Institute of Acoustics and the Chartered Institute of Environmental Health.

Stage 2: Element 2 of ProPG sets indoor ambient noise levels for residential dwellings based on the guidance contained in British Standard 8233:2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’⁵ (BS 8233), see Table 2.1.

3 Planning Practice Guidance on Noise: <http://planningguidance.planningportal.gov.uk/blog/guidance/noise/>

4 ‘ProPG Planning and Noise: New Residential Development (ProPG)’, 2017. Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH)

5 British Standards Institution (2014). *British Standard 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings*.

Table 2.1: Indoor Ambient Noise Levels in Dwellings

Activity	Location	Good Indoor Ambient Noise Levels	
Resting	Living Room	35 dB L_{Aeq} (0700-2300)	-
Dining	Dining Room/Area	40 dB L_{Aeq} (0700-2300)	-
Sleeping (daytime resting)	Bedroom	35 dB L_{Aeq} (0700-2300)	30 dB L_{Aeq} (2300-0700) 45 dB L_{AFMax} (2300-0700)

Note 4 to the above table states:

‘A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In 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.’

Note 5 to the above table states:

‘Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7’.

This is consistent with the guidance contained within the PPG, which states that:

‘... consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations’.

Note 7 to the above table states:

‘Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.’

On the basis of the above, the following criteria (with windows closed and an alternative means of ventilation provided) are considered appropriate for the proposed residential development and considered to represent good resting and sleeping conditions:

- ≤ 35 dB L_{Aeq} (0700-2300) during the daytime
- ≤ 30 dB L_{Aeq} (2300-0700) and 45 dB L_{AFMax} not regularly exceeded during the night-time

2.5 BS 4142:2014+A1-2019

British Standard BS 4142:2014+A1-2019 'Methods for Rating and Assessing Industrial and Commercial Sound' (BS 4142) describes methods for determining, at the outside of a building, noise levels from factories or industrial premises and a method for assessing whether the noise is likely to give rise to adverse impacts, and states:

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. Typically, the greater this difference, the greater the magnitude of the impact. For example:

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

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

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 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

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the absolute level of sound.

The rating level is described as the specific sound level (the equivalent continuous A-weighted sound pressure level at the assessment position (NSR) produced by the specific sound source over the given reference time interval) plus any adjustment for the characteristic features of the sound. The character correction relates to whether and to what degree the specific sound is assessed to have an element of tonality, impulsivity and/or characteristics that are readily distinctive against the residual acoustic environment.

The background noise level is the A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 percent of a given time interval, T, measured using time weighting 'F' and quoted to the nearest whole number of decibels.

The reference time interval of the specific sound is 1 hour during the day and 15 minutes at night.

3 Noise Survey

3.1 Overview

In order to determine the level of external noise affecting the proposed development and its surrounding environs, noise monitoring was carried out on Thursday 23rd through to Friday 24th November 2023 and on Monday 11th December 2023.

For the purpose of the assessment, the following noise monitoring positions were adopted (shown in Appendix 2):

- MP1 was located at the north-eastern corner of the site, at 5 metres from Winchester Road
- MP2 was located at the south-eastern corner of the site, at 5 metres from the roundabout
- MP3 was located at the southern site boundary
- MP4 was located at the western site boundary

Noise measurements were undertaken in free field conditions at 4 metres above ground level using a Bruel & Kjaer 2250 Type 1 integrating sound level meter. The meter was connected to a windshield covered microphone positioned at the locations detailed above.

The measurement system calibration was verified immediately before and after the survey period using a Bruel & Kjaer Type 4231 calibrator. No drift in calibration levels greater than 0.5 dB was noted.

Measurements consisted of A-weighted broadband parameters including L_{Aeq} , L_{A10} , L_{A90} , and L_{AFmax} together with linear octave band data.

Monitoring was conducted during dry periods with wind speeds < 5 m/s. Weather conditions were therefore considered appropriate for noise monitoring.

3.2 Summary

Table 3.1 presents a summary of the noise data for each measurement session, at each measurement position, rounded to the nearest decibel.

Table 3.1: Summary of Noise Measurement Data

Position	Date	Time	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{A90} (dB)	L_{A10} (dB)	Comment
MP1	11/12/2023	1311–1411	62	76	54	66	Road traffic on Winchester Road dominant
		1411–1511	63	77	55	67	
		1511–1611	63	75	55	66	
		1611–1625	62	76	53	66	
MP2	11/12/2023	1245–1300	60	76	53	63	Road traffic on Winchester Road dominant
		1636–1651	61	74	51	64	
MP3	23/11/2023	1122–1222	59	71	56	61	Noise levels controlled by local road traffic noise and occasional construction activity
		1336–1436	59	70	55	62	
	24/11/2023	1152–1207	58	70	55	60	
MP4	23/11/2023	1630–2300	48	66	44	50	Noise levels controlled by local and distant road traffic noise
	23-24/11/2023	2300–0700	42	55	34	45	

The noise environment at the site was generally controlled by road traffic on Winchester Road.

For the prediction of daytime road traffic noise, the Department of Transport's Memorandum on the Calculation of Road Traffic Noise (CRTN) explains that the following shortened measurement procedure may be used. Measurements of L_{A10} are made over any three consecutive hours between 10:00 and 17:00 hours. Using $L_{A10 (3 \text{ hour})}$ as the arithmetic mean of the three consecutive values of hourly L_{A10} , the $L_{A10 (18 \text{ hour})}$ can be calculated from the equation:

$$L_{A10 (18 \text{ hour})} = L_{A10 (3 \text{ hour})} - 1 \text{ dB}$$

A study prepared by TRL Limited on behalf of the Department for Environment, Food and Rural Affairs (DEFRA) entitled 'Converting the UK Traffic Noise Index $L_{A10 (18 \text{ hour})}$ to EU Noise Indices for Noise Mapping' presents a methodology for calculating daytime $L_{Aeq (0700-2300)}$ and night-time $L_{Aeq (2300-0700)}$ ambient noise levels based on the $L_{A10 (18 \text{ hour})}$ noise levels, as follows:

$$L_{Aeq (0700-2300)} = \frac{10 * \log ([10^{((0.95 * L_{A10 (18 \text{ hour})} + 1.44)/10)*12}] + [10^{((0.97 * L_{A10 (18 \text{ hour})} - 2.87)/10)*4}])}{16}$$

$$L_{Aeq (2300-0700)} = 0.90 * L_{A10, 18 \text{ hour}} - 3.77$$

Based on the above formulae, the daytime and night-time ambient noise levels at MP1 are measured / calculated at **63 dB $L_{Aeq (0700-2300)}$** and **55 dB $L_{Aeq (2300-0700)}$** respectively. Maximum noise levels were up to **77 dB L_{AFMax}** at MP1.

Measurements at MP1 were undertaken at 5 metres from the nearside kerb of Winchester Road, whereas the latest site layout plans indicate that the residential development footprint is set back at least 15 metres from the road.

Correcting for distance, robustly assuming line-source propagation for ambient noise levels and point-source propagation for maximum noise levels, the worst-case design noise levels at the proposed care home façade are therefore taken as:

- **58 dB $L_{Aeq (0700-2300)}$**
- **50 dB $L_{Aeq (2300-0700)}$**
- **67 dB L_{AFMax}**

Long-term measurements were conducted at the rear of the site (MP3) in order to determine background noise levels in the area. Measurements were undertaken between 1630 and 0700 hours in order to avoid ongoing construction noise in the vicinity.

Typical (most commonly occurring) background noise levels measured to the rear of the site were circa **44 dB $L_{A90 (15 \text{ min})}$** in the daytime period and **35 dB $L_{A90 (15 \text{ min})}$** in the night-time period. These levels are considered representative of background noise levels at the nearest NSRs.

Daytime and night-time ambient noise levels to the rear of the site were measured at **≤ 48 dB $L_{Aeq (0700-2300)}$** , and **≤ 42 dB $L_{Aeq (2300-0700)}$** .

4 Noise Assessment

4.1 Sound Attenuation Scheme Proposals

Noise levels throughout the site have been measured/calculated at:

- $\leq 58 \text{ dB } L_{Aeq} (0700-2300)$ during the daytime
- $\leq 50 \text{ dB } L_{Aeq} (2300-0700)$ and $\leq 67 \text{ dB } L_{AFMax}$ during the night-time

In order to calculate the sound insulation requirements of the building envelope for habitable rooms throughout the development, the Building Research Establishment (BRE) building envelope insulation calculation spreadsheet was used. This spreadsheet is based on the calculation methodology advocated in BS 8233. The spreadsheet allows input of external noise levels, typical room dimensions and reverberation time together with parameters for the various elements of the building envelope and calculates the internal noise level in terms of the external noise level metric (L_{Aeq} and L_{AFMax} in this case).

As evidenced in the calculation sheet below, a typical standard double-glazed window (rated at least 29 dB R_w) with standard trickle vents (rated at least 32 dB $D_{n,e,w}$) will provide circa 26 dB(A) sound insulation from external to internal at the site.

Figure 4.1: Example BRE Calculation Spreadsheet

BRE Building Envelope Insulation

Switch to Reverberation Time Calculation

2) Select elements of facade structure, and enter corresponding internal surface area in m^2 OR enter number of vents.

1) Enter room dimensions or volume

Use dimensions

x m

y m

z m

Volume m^3

OR

Use volume m^3

3) Enter reverberation time of the room. 0.5 seconds

4) Select exterior sound level type

Option (A) ☒ User defined spectrum

58 dB L_{Aeq} (Day)

View/Edit Data

Option (B) ☐ Spectrum shape

Select spectrum shape and enter free field exterior sound level, L_{Aeq} (considering only the octave bands between 125Hz and 2kHz)

L_{Aeq} 58 dB

ISO 717 - 1 (C)

View Data

Internal sound level

L_{Aeq} 32.0 dB

The resultant internal noise levels are set out in the table below.

Table 4.1 – External Noise Levels and Resultant Internal Noise Levels

External Noise Level	Reduction	Resultant Internal Level	Comment
$\leq 58 \text{ dB } L_{Aeq} (0700-2300)$ $\leq 50 \text{ dB } L_{Aeq} (2300-0700)$ $\leq 67 \text{ dB } L_{AFMax}$	-26 dB	$\leq 32 \text{ dB } L_{Aeq} (0700-2300)$ $\leq 24 \text{ dB } L_{Aeq} (2300-0700)$ $\leq 41 \text{ dB } L_{AFMax}$	Good internal noise levels with closed windows

On the basis of the above, standard double glazing (i.e. 4 mm glass / 12 mm cavity / 4 mm glass) and standard trickle vents are considered appropriate throughout the development.

The following points should be noted:

- The glazing recommendations apply to the window within a sealed unit. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing.
- Internal noise levels due to mechanical ventilation plant should not exceed 26 dB(A) in bedrooms and 30 dB(A) in living rooms

4.2 Noise Associated with Fixed Installations

It is assumed that the development includes fixed service installations within the plant room indicated on the drawings, and assumed to be related to heating/ventilation. However, it is considered appropriate to specify suitable noise limits to which any externally mounted plant items should conform.

These limits should take account of the background noise level at the nearest noise sensitive receptor. For reference, typical day and night-time background levels at a location representative of the nearest residential neighbours to the development were **44 dB L_{A90} (15 min)** and **35 dB L_{Aeq} (15 min)** respectively.

It is considered that the operation of any fixed installations of mechanical and electrical plant items can be controlled by a suitably worded planning condition, which would typically be as follows:

The cumulative noise rating level associated with fixed installations of mechanical and electrical plant items should not exceed the appropriate background noise level at the nearest existing residential dwellings.

5 Summary and Conclusions

A noise impact assessment has been undertaken for the proposed new build residential care home on land to the north of Fairfield Road, Boorley Green, Botley, Hampshire, SO32 2BX.

The noise environment at the site is predominantly due to road traffic noise on Winchester Road.

Ambient noise levels throughout the site were found to not be of a significantly high level. As a consequence, standard double glazing and standard trickle vents are appropriate throughout the development.

Appendix 1 – Abbreviations and Definitions

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0)$$

Where L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μPa).

A-weighting

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T , has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T . $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T . L_{A90} is typically taken as representative of background noise.

$L_{AF \max}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Single Event Level / Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, regardless of the event duration. This allows for comparison between different noise events which occur over different lengths of time.

Weighted Sound Reduction Index (R_w)

Single number quantity which characterises the airborne sound insulation properties of a material or building element over a defined range of frequencies (R_w is used to characterise the insulation of a material or product that has been measured in a laboratory).

Appendix 2 – Noise Measurement Positions and NSRs / Site Layout

