SKIMMINGDISH LANE, BICESTER
ACOUSTIC STATEMENT

1.0 INTRODUCTION

There is no requirement to provide an acoustic report to accompany this proposal. However this statement has been prepared to acknowledge and address potential noise sources in the future which may impact upon the development once built, and to describe mitigation measures incorporated into the design of the building.

2.0 BACKGROUND

Currently the site is wholly undeveloped, including all the land that lies around. However the Bicester Masterplan produced by White young Green indicates potential new employment land to the north of the site (see Design and Access Statement). It is envisaged that this development will take the form of office pavilions rather than manufacturing, offering high quality design in the Conservation Area of RAF Bicester.

The design development of the care home described in the D & A explains how the plan form has evolved to accommodate as yet unknown proposals in principle. The building creates its own sheltered and dedicated communal garden by its shape.

Some account of traffic noise also needs to be taken into the design of the fenestration.

3.0 DESIGN CONSIDERATIONS AND SOLUTIONS

Also gives acceptable indoor ambient levels, consistent with the World Health Organisation at 30dB inside bedrooms at night and 35dB during the day in the rest of the home.

It is not possible to measure noise that does yet exist, so the design follows earlier experiences, in which the worst case of ambient night time noise level of 43dB and 50dB daytime were measured.

Calculation of the performance of the glazing when open.

Consider first the sound levels in the dwelling with the windows open.

A partially open window provides a noise reduction from outside to inside of 10-15dB R_w (BS 8233 : 1999 Table 10). The sound level at ground level outside the proposed dwelling at night is 44 dB $L_{Aeq\ (8\ hours)}$. The sound level at ground level outside the proposed dwelling during the day is 50 dB $L_{Aeq\ (16\ hours)}$.

The target sound levels inside the ground floor living rooms will be 35 dB $L_{Aeq\ (16\ hours)}$ during the day and inside the bedrooms 30 dB $L_{Aeq\ (8\ hours)}$ at night.

To reduce the noise exposure inside the proposed care home, attention should be given to the sound insulation of both the roof and façade. A traditional pitched roof with concrete tiles and a 9mm plasterboard ceiling, covered in mineral fibre thermal insulating material, will have an insulation of about 43 dB R_w (see Table 11 of BS 8233). The windows, and any trickle ventilators, will normally be the weakest part of a brick and block façade. Insulating double glazed sealed glass units with sound insulating trickle ventilators comprising:

4mm glass
12mm cavity
4mm glass

Will have an insulation of about 33 dB R_w, However, if the windows are intended to be opened to provide rapid ventilation and summer cooling, the insulation will reduce to about 10-15 dB R_w.

The sound level within the dwelling with an open window is the external sound level minus the sound reduction index of an open window.

External noise level during the day at ground level L_{AeqT}	= ……	50	dB
Deduct the sound reduction index of an open window R_w	= ……	-10	dB
Noise level inside ground floor rooms during the day L_{AeqT}	= ……	40	dB

As the noise level inside the ground floor living rooms exceeds the target noise level of 35 dB $L_{Aeq\ (16\ hours)}$, mechanical ventilation should be considered.

The sound level within the dwelling with an open window is the external sound level minus the sound reduction index of an open window.

External noise level during the day at ground level L_{AeqT} = …… 44 dB
Deduct the sound reduction index of an open window R_w = …… -10 dB
Noise level inside ground floor rooms during the day L_{AeqT} = …… 34 dB

As the noise level inside the ground floor living rooms exceeds the target noise level of 30 dB $L_{Aeq\ (8hours)}$, mechanical ventilation should be considered.

Strictly, the insulation here relates to a pink noise spectrum, and actual values achieved will be lower for traffic noise. Furthermore, the method does not take account of the absorption (e.g. furnishings) in the room. However, the R_w values will suffice for a rough calculation, although it is likely to underestimate the level in the room by up to 5 dB.

Calculation of the performance of the glazing when closed.

Different types of glazing will control noise to differing amounts and will vary according to the type of noise that should be reduced. The performance of glazing is established by measurement in the laboratory.

Reference to Pilkington's literature "Pilkington Optiphon" CI/SfB (31) Ro8 (P2) dated October 2008:

Sound reduction Index

R_w is the weighted sound reduction, in decibels, which incorporates a correction for the ear's response.

C & C_{tr} are the spectrum adjustments, which ate the values added to R_w to take account of the characteristics of particular sound spectra.

As the weighted sound reduction plus spectrum adaptation term $R_w + C_{tr}$ is used for urban road traffic, jet aircraft, long distance away, disco music or factories emitting mainly low & medium frequency noise, R_w & C_{tr} will be used as the measure of control by the glazing of this: urban traffic noise.

The following equation will be used to identify the minimum sound reduction index required of the glazing.

$SRI = L_2 – L_1$ dB

Where

SRI is the sound reduction index of the façade which is $R_w + C_{tr}$.

R_w is the weighted sound reduction, in decibels, which incorporates a correction for the ear's response.

C_{tr} takes into account the particular characteristics of the spectrum of the dominant noise outside the building which in this case is of urban road traffic.

L_1 is the design reverberant noise level in the building (L_{AeqT})

L_2 is the noise level immediately outside (1.0m) (L_{AeqT})

L_1 is the design reverberant noise level in the building (Bedrooms) $L_{Aeq\ (8\ hours)}$	=	30	dB
L_1 is the design reverberant noise level in the building (Living areas) $L_{Aeq\ (16\ hours)}$	=	35	dB
L_2 is the noise level immediately outside (Bedrooms) $L_{Aeq\ (8\ hours)}$	=	44	dB
L_2 is the noise level immediately outside (Living areas) $L_{Aeq\ (16\ hours)}$	=	50	dB

Bedrooms

L_1 is the design reverberant noise level in the building $L_{Aeq\ (8\ hours)}$	=	30	dB
L_2 is the noise level immediately outside (1.0m) $L_{Aeq\ (8\ hours)}$	=	44	dB
$R_w + C_{tr}$ for traffic noise reduction		14	dB

Living areas

L_1 is the design reverberant noise level in the building $L_{Aeq\ (16\ hours)}$	=	35	dB
L_2 is the noise level immediately outside (1.0m) $L_{Aeq\ (16\ hours)}$	=	50	dB
$R_w + C_{tr}$ for traffic noise reduction		15	dB

Summary

Glazing to bedrooms $R_w + C_{tr}$	=	14	dB
Glazing to living rooms $R_w + C_{tr}$	=	14	dB

L_1 is the design maximum noise level in the building (Bedrooms) L_{AmaxF}	=	45	dB
L_2 is the measured noise level immediately outside (Bedrooms) L_{AmaxF}	=	61	dB
$R_w + C_{tr}$ for traffic noise reduction		16	dB

Summary

Glazing to bedrooms $R_w + C_{tr}$	=	16	dB

Minimum sound reduction indices for the windows:

	Continuous traffic noise	Maximum traffic noise
Bedrooms	14 dB $R_w + C_{tr}$	16 dB R_{w_C}tr
Lounges	15 dB $R_w + C_{tr}$	

Of course, these are the minimum sound reduction indices and, for practical reasons, higher specifications could be used; particularly if it is intended that the rooms be tested after completion to check that the target noise levels have been achieved.

Sound Reduction Indices of Glazing

Although the laminated pane of glass (including a PVB (polyvinyl butyral) interlayer) is normally used as the inside pane for safety reasons the sound reduction is the same no matter which are the inner or outer panes. The following is a summary of the sound reduction index of Pilkington's glazing:

This data is from BS EN 12354-3: 2000. Building Acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound.

Both panes are conventional float glass.

Outer pane of float glass	Cavity	Inner pane of float glass	Weighted sound reduction plus spectrum adaptation term $R_w + C_{tr}$
4mm	6-20mm	4mm	25 dB

Choice of Glazing

After inspection of the above table, the following glazing exceeds the minimum sound insulation performance required:

4mm outer pane of float glass
6-20 mm cavity
4mm inner pane of float glass

The sound reduction index of this construction is:

25 dB $R_w + C_{tr}$

So even this simple standard of glazing exceeds the minimum sound reduction index required which has been calculated as:

$$13 \text{ dB } R_w + C_{tr}$$

Of course, if for whatever reason, heavier glazing is preferred, this would also be suitable.

4.0 CONCLUSION

It is demonstrated that double glazing is sufficiently effective in a standard format. However to give some design flexibility a 20mm cavity will be adopted to give optimum performance.

Certain elements will be glazed in 6mm glass for safety reasons further enhancing the performance. Finally, tree screening will aid separation as part of the landscaping scheme.