Martec Environmental Consultants Ltd.
Waterbrow Wood, Gressingham, LANCASTER LA2 8LX
Tel: 01524 222000
Email: info@martecenviro.co.uk
Website: www.martecenviro.co.uk

NOISE ASSESSMENT

27-29 Trenchard Dr
Wythenshawe
Manchester M22 5LZ

Client: Mr Kanwarpreet Singh

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Site Visit by: N/A
Site Visit: N/A
Prepared by: M A Kenyon MSc BSc MIOA



Checked by: D A B Kenyon BSc CIEH MIOA



Staffordshire / Cheshire Office:
2, Betley Hall Gardens, Betley, Crewe CW39BB

Ormskirk Office:
131 New Court Way, Ormskirk, Lancs L39 2YT

Loughborough Office:
8 Bayliss Close, Quorn
Loughborough LE12 8PF

ANC ACOUSTICS & NOISE CONSULTANTS

CONTENTS

1.0 INTRODUCTION 3

2.0 PROJECT BACKGROUND..... 3

3.0 NOISE CRITERIA 4

4.0 AIRCRAFT NOISE LEVELS 12

5.0 PREDICTED INTERNAL LEVELS 15

7.0 CONCLUSIONS 21

APPENDIX 1..... 23

APPENDIX 2..... 24

APPENDIX 3..... 25

1.0 INTRODUCTION

Messrs Howard & Seddon, on behalf of Mr Kanwarpreet Singh, instructed Martec Environmental Consultants Ltd. to undertake a noise assessment at a development site located at 27-29 Trenchard Dr, Wythenshawe, Manchester M22 5LZ.

This report considers measurements taken on this site, the requirements of current government guidance and makes recommendations for noise mitigation as necessary. Acoustic terminology is explained at Appendix 1; consultants' qualifications at Appendix 2; References at Appendix 3, a site plan at Appendix 4 and email correspondence with the local authority appears at Appendix 5.

2.0 PROJECT BACKGROUND

The proposals are described in greater detail elsewhere, but in brief Nos 27 & 29 Trenchard Drive would be refurbished and a new 'block' of 3 houses built immediately adjacent to the existing properties.

The main noise source affecting the site is aircraft approaching and departing from Manchester Airport.

The noise levels used in this report are derived from two sources:

1. Daytime and Nighttime noise contour data published by Manchester Airport.
2. A report by REC Ltd "Noise Impact Assessment – Trenchard Drive Manchester" – REC Ref. 90600r0, which was prepared in connection with residential development for a site on the opposite side of Trenchard Drive. It was used in a recent application [MCC Ref. CDN/19/0294] and is hence in the public domain.

3.0 NOISE CRITERIA

3.1 ProPG: Planning & Noise

This document was jointly issued in June 2017 by the professional bodies of both environmental health officers [CIEH] and noise consultants [IoA & ANC]. It draws together the recommendations on assessing the noise impact on new residential developments from various documents including NPPF, NPSE and PPG-Noise, BS8233 and WHO.

The first step in the process is to assess the noise risk of the site, based on indicative measured/predicted noise levels for both Day [dB LAeq,16hr] and Night [dB LAeq,8hr] as shown in Table 1.

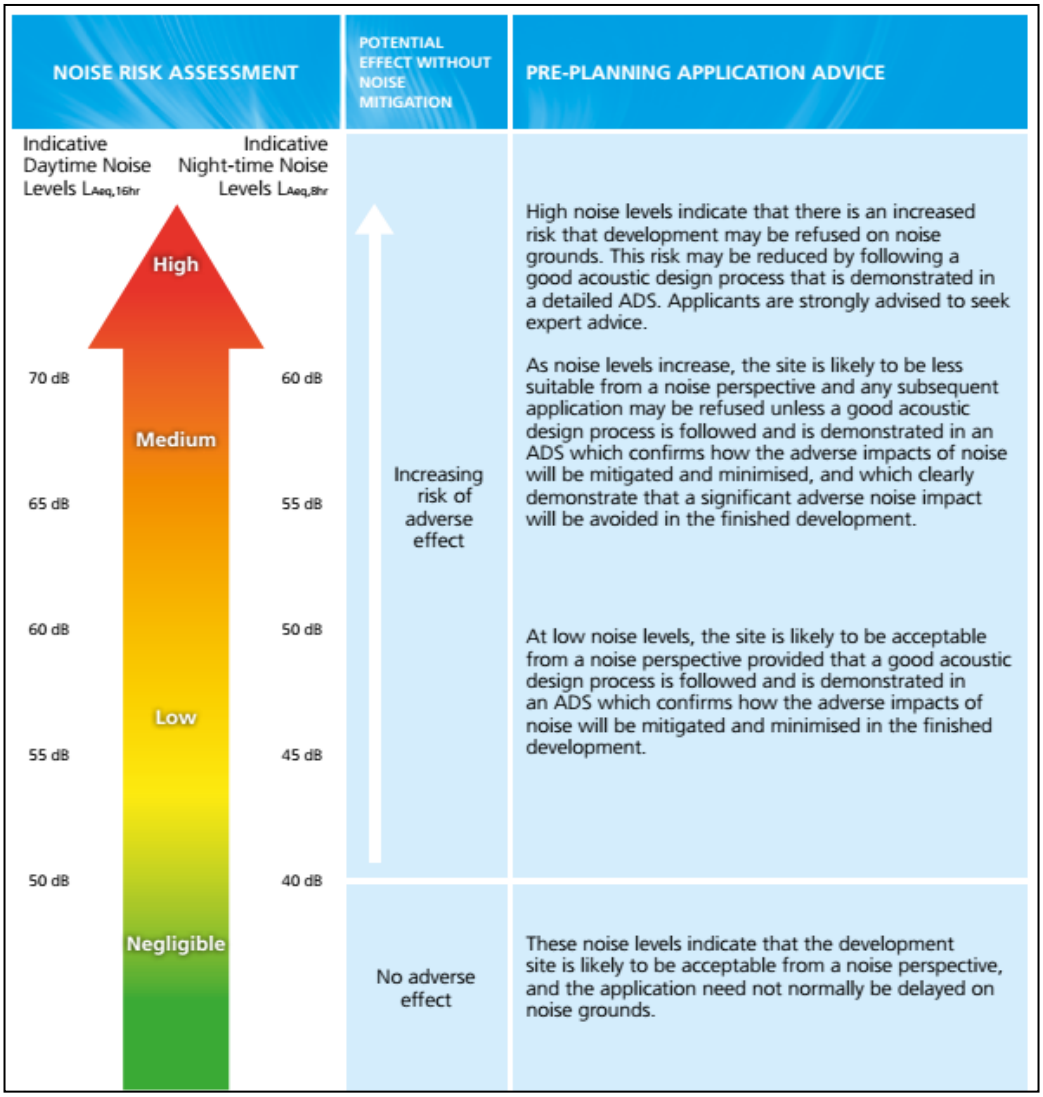

Table 1: ProPG - Noise Risk in terms of Day [LAeq,16hr] & Night [LAeq,8hr] Levels

The figures in Table 1 are free-field noise levels and include all forms of transportation noise as well as industrial/commercial noise provided that it is not dominant.

A footnote to the table in the ProPG states that a site cannot fall into the "Negligible" category, where noise has no adverse effect, if there are 10 nighttime events that exceed 60 dB LAmax,F.

The risk category and size of the scheme effectively control the extent of the noise assessment and of the Acoustic Design Statement [ADS].

3.1.1 Internal Noise Levels

The ProPG's target noise levels are broadly as set out in BS8233:2014 [see below] with additional guidance on nighttime noise events based on World Health Organisation advice.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 LAeq,16hr	--
Dining	Dining Room/Area	40 LAeq,16hr	--
Sleeping (daytime resting)	Bedroom	35 LAeq,16hr	30 LAeq,8hr 45 LAmax,F [1]

Table 2: ProPG - Target Internal Noise Levels

[1] Added from WHO and applies to 10th highest nighttime event.

The footnotes to this table make it clear that the guidance is based on the current WHO recommendations and that the above internal levels can be relaxed by 5dB to achieve "reasonable" internal conditions. The footnotes also make it clear that planning consent can be granted when external levels exceed the WHO guidance targets provided that appropriate internal noise levels are achieved.

The ProPG makes it clear that, where possible, the target internal noise levels in Table 2, should be achieved with windows open.

Following on from the above, the question then arises as to what attenuation should be assumed for an open window. Section 2.33 of the ProPG states

"It should be noted that the acoustic performance of the building envelope will be reduced in the event windows are opened for ventilation or cooling purposes, typically reducing the insulation to no more than 10 to 15 dB(A)."

In addition, it will be recalled that the ProPG states that if nighttime **external** noise events are 60 LAmax,F or less, then there is negligible risk of noise and no adverse **effect**; given that the corresponding **internal** target noise level is 45 LAmax,F, it can be seen that the ProPG is assuming

that the difference between external and internal levels, i.e. the attenuation of a façade with an open window, is 15 dBA [60-45=15].

In addition to the above, the Defra research report NANR116 tested a variety of open windows and concluded that the difference between external and internal road traffic noise levels, ranged from 12 dBA [wide open outward opening side-hung casement] to 18 dBA [top hung opening light of single casement window]. The distribution of performance from NANR116 is as shown in Figure 1.

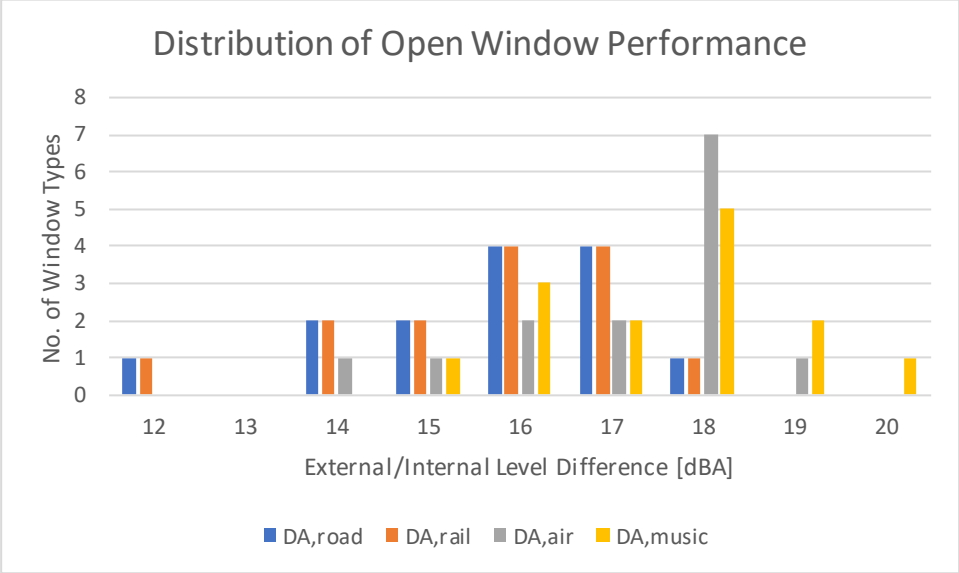

Figure 1: NANR116 test data

Given the above, for road traffic noise it is considered reasonable to assume a "global" figure of 15 dBA as the difference between external and internal levels for a façade with an open window.

NANR116 also reports details of research carried out by Ford and Kerry who found that secondary glazing with staggered openings permits through "fresh air" ventilation and "*It was concluded that, in general, open double windows are about 10 dBA better than open single windows."* The ProPG refers to this window type as "plenum" windows. Therefore, it is considered reasonable to assume a "global" figure of 25 dBA as the difference between external and road traffic noise internal levels for a façade with an open "plenum" window.

Should it not be possible to meet the internal noise targets with openable windows, the ProPG sets out a variety of options that should be considered in an endeavour to avoid the need for windows to be closed, but if this is the only reasonable method by which the internal noise targets can be met, the ProPG requires that the approach should be justified and

"Where the local authority accepts that there is a justification that the internal target noise levels can only practically be achieved with windows closed, which may be the case in urban areas and at sites adjacent to

transportation noise sources, special care may be taken to design the accommodation…"

If closed glazing is required to achieve suitable internal noise targets, some local authorities require the glazing to be sealed; however, the ProPG explicitly states at Sn.2.22:

"*Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided;"*

Consequently, the ProPG confirms that windows should not be sealed.

3.1.2 External Noise Levels

Section 3(ii) of the ProPG states:

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$*."*

And at Section 2.49

"Developers are particularly encouraged to enter into pre-application discussions with the LPA where noise levels in proposed amenity spaces are likely to be above 55 dB $L_{Aeq,16hr}$

Therefore, noise levels up to 55 dB $L_{Aeq,16hr}$ in external amenity areas are within the "ideal" range. It is only when levels in these areas exceed 55 $L_{Aeq,16hr}$ that the ProPG recommends other methods to avoid significant adverse impact discussions with the LPA.

The wording of the ProPG [and BS8233] make it clear that the guideline noise levels for gardens, patios, larger balconies etc., are not overriding planning considerations in any event.

The wording of the ProPG [and BS8233] make it clear that the guideline noise levels for gardens, patios, larger balconies etc., are not overriding planning considerations in any event. It is also recognised that the 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 might be warranted. BS8233 goes on to say:

"In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

3.2 Summary

Given that

1. The 'new' external amenity spaces [gardens] for the development would be formed from the existing gardens, i.e. residents currently would experience the prevailing levels of aircraft noise AND
2. Manchester Airport forms part of the strategic transport network, AND
3. It is generally impracticable to reduce external levels from aircraft in flight,

It is considered that it would be unreasonable to apply the external noise criteria under these circumstances, and only the internal noise criteria will be considered in the remainder of the report. In addition it has been assumed that the refurbishment of the existing properties would be exempt from the requirement to meet the internal noise criteria.

4.0 AIRCRAFT NOISE LEVELS

4.1 Previous Measurements at Trenchard Drive

REC made measurements in two locations

1. NMP1 - to represent road traffic noise levels because parts of 'their' site are adjacent to Styal Road.
2. NMP2 – to determine aircraft noise levels across their site.

Figure 2 below is an amended version of a plan from the REC report:

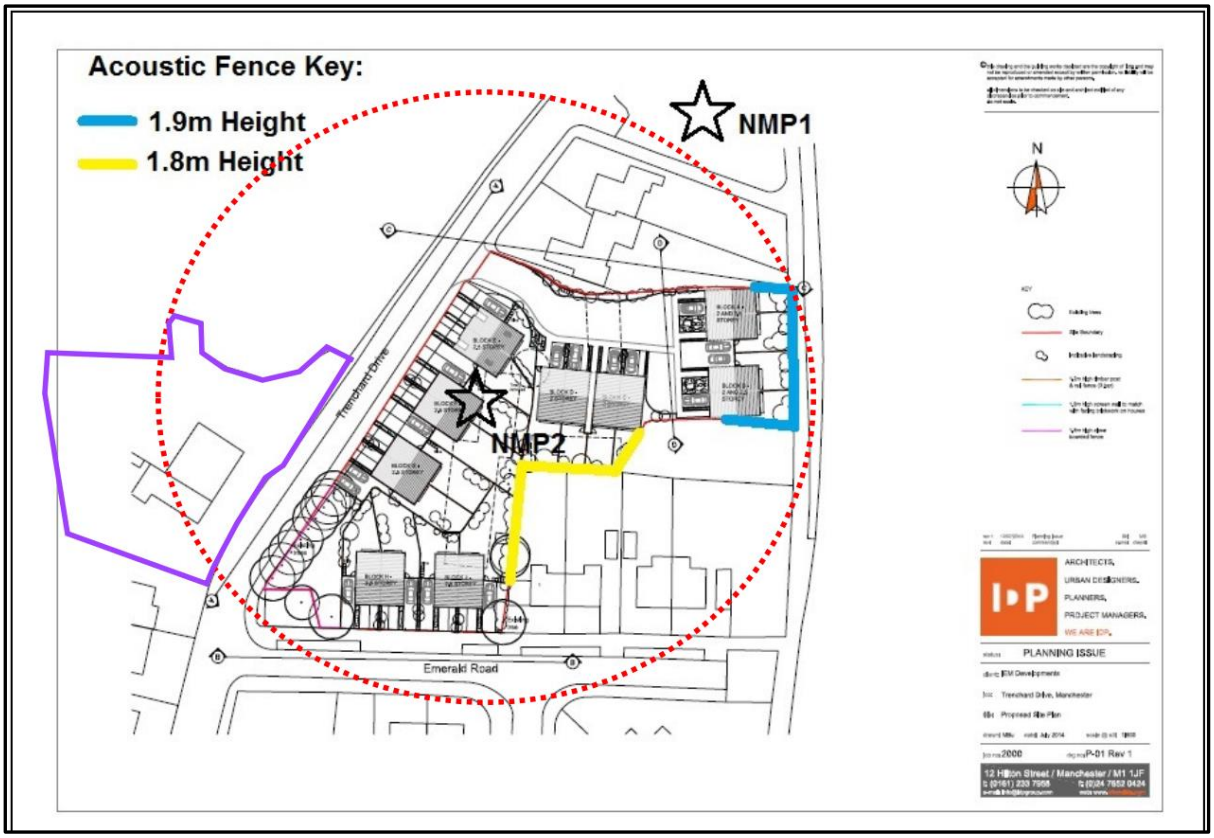

Figure 2: REC Location of Monitoring Positions

In Figure 2, the red dotted circle has been drawn centred on REC's NMP2 to enclose all of 'their' site. It can be seen that the circle also takes in most of the current site and buildings, which has been drawn in purple, particularly the part of the site where the new buildings would be located.

Consequently, it is considered that REC's measurements are applicable to the current site. REC's measurement results [converted to free-field levels] appear in Table 2 below:

Period	Measured Sound Pressure Level [free-field]	
	$L_{Aeq,T}$	$L_{Amax,F}$
Daytime [07-23:00]	58.4	--
Nighttime [23-07:00]	55.4	77.5

Table 3: REC's Measurement Results

4.2 Aircraft Noise Contours

For sites affected by aircraft noise it is common practice to use the published noise contours which take into account long term averages for flight patterns, i.e. period LAeq levels; no data is published for nighttime LAmax levels. From the latest contour plans [not reproduced here] the following noise levels can be derived specifically for the current site:

Period	Measured Sound Pressure Level [free-field]	
	LAeq,T	LAmax,F
Daytime [07-23:00]	**61 - 64**	**N/A**
Nighttime [23-07:00]	**58**	**N/A**

Table 4: Data Derived from Noise Contours

4.3 Aircraft Noise Spectrum

In order to undertake predictions as per Reference 6, it is necessary to use spectral data for aircraft noise; unfortunately neither Manchester Airport nor REC published such information; however, Ealing Council, (affected by noise from Heathrow), specifies a suitable spectrum shape to be used for sites affected by aircraft noise [Reference 7].

4.4 Summary of Information

If we take the highest levels from Tables 3 and 4 above, and the spectrum shape, the derived aircraft source levels are shown in Table 5 below

Period	Octave Band Centre Frequency [Hz]					dBA
	125	250	500	1k	2k	
Daytime LAeq,16hr	66.6	63.6	61.6	56.6	51.6	62.5
Nighttime LAeq,8hr	62.1	59.1	57.1	52.1	47.1	58.0
Nighttime LAFmax	81.6	78.6	76.6	71.6	66.6	77.5

Table 5: Aircraft Noise Levels [free-field]

5.0 PREDICTED INTERNAL LEVELS

Firstly, we need to consider whether the internal noise targets can be met with open standard glazing, which reduces external levels by 15 dBA [See Section 3 above]:

Condition	Metric	External Levels
External Levels Nearest Facade	Day LAeq,16hr	63
	Night LAeq,8hr	58
	Night 10th highest Lmax	78
Internal Levels with Open Standard Window Attenuation [-15dB]	Day LAeq,16hr	48
	Night LAeq,8hr	43
	Night 10th highest Lmax	63

Table 6: Indicative External [free-field] & Internal Levels [dBA]

From Table 6, the internal noise limits cannot be met with open standard glazing; therefore, it will be necessary to have closed windows and alternative ventilation.

5.1.1 Bedroom Noise Levels

The derived external levels can be used to predict internal noise levels using the methodology described in BS EN 12354-3:2000 [Ref 6]. The following assumptions have been made for bedrooms (**Please inform Martec if any of the assumptions are incorrect**):

- External levels and spectrum as shown in Table 5
- Reverberation time for bedrooms is 0.3s
- Room Volumes and window areas taken from Howard & Seddon Drawing 13,673/06A
- Brick / block cavity construction
- All properties are provided with either Mechanical Extract

- Ventilation (MEV) or Passive Input Ventilation (PIV) system which extracts/supplies air from the habitable rooms, but which does not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to a quiet façade.

Bedroom 'in-roof'

BS EN 12354-Calcs	Use	Volume	Volume	112.9				
Version 4.3	length						Building Atten dBA (62.5 - 25.8)	37
© 2018 Martec Environmental Consultants Ltd	width		RT	0.3				
& Acute Acoustics Ltd	height		Octave Band Centre Frequency [Hz]					dBA
			125	250	500	1k	2k	
	External Spectrum Leq (Free Field & Lin)		66.6	63.6	61.6	56.6	51.6	62.5
	Adjustment to Given Level if required							
	External Spectrum Adjusted for Level		66.6	63.6	61.6	56.6	51.6	62.5
Wall		Area m2	Element Sound Reduction Index [SRI]					Contrib
None		0.0	0	0	0	0	0	0.0
Drs/Wndws								
6 (12)10		9.7	30	28	34	41	39	24.8
Roof Lights								
Velux GPU-60		1.4	27	26	35	38	37	17.7
Door								
None		0.0	0	0	0	0	0	0.0
Roof								
Roof tiles underdrawn with two layers of 12mmcement particle board		32.8	62	71	80	89	82	-9.4
Vent Dn,e		# Vents						
Greenwood MA3051 Acoustic Wall vent		2.0	47	46	49	56	66	11.4
								dBA
	Internal SPL/dBLin		33.0	31.6	23.4	11.9	8.5	26

Table 7: Daytime LAeq,16hr 2F Bedroom No.4

From Table 7 above it can be seen that the predicted internal daytime time noise level of **26.0dB LAeq,16hr,** using upgraded thermal glazing [10/12/6] for the main windows and doors and a Velux GPU-60 unit for the rooflight together with a Greenwood MA3051 wall vent [if required] would meet the target criteria of 35dB LAeq,16hr for daytime resting in

bedrooms. NB the roof specification has also been upgraded to *"Roof tiles underdrawn with two layers of 12mm cement particle board with a minimum density of 1300kg/m3. Bedroom ceiling of three layers of 15mm sound resistant plasterboard, Independent from the roof, Mineral wool Insulation within cavity."*

Given that nighttime levels are lower than daytime, it can be seen that the package of measures would also meet the target criteria of 30 LAeq,8hr for nighttime sleeping in bedrooms.

With the 10th highest LAmax level of say 78 dB [Table 5] and a "Building Attenuation" from Table 7 of 37 dBA, the target internal levels for LAmax of 45dB would also be met [78-37=41].

First Floor Rear Bedroom

BS EN 12354-Calcs	Use	Volume	Volume	64.1				
Version 4.3	length						Building Atten dBA (62.5 - 24.7)	38
© 2018 Martec Environmental Consultants Ltd	width		RT	0.3				
& Acute Acoustics Ltd	height		Octave Band Centre Frequency [Hz]					dBA
			125	250	500	1k	2k	
	External Spectrum Leq (Free Field & Lin)		66.6	63.6	61.6	56.6	51.6	62.5
	Adjustment to Given Level if required							
	External Spectrum Adjusted for Level		66.6	63.6	61.6	56.6	51.6	62.5
Wall		Area m2	Element Sound Reduction Index [SRI]					Contrib
Brick/block/cavity		24.1	41	45	45	54	58	17.8
Drs/Wndws								
6 (12)10		4.0	30	28	34	41	39	23.5
Roof Lights								
None		0.0	0	0	0	0	0	0.0
Door								
None		0.0	0	0	0	0	0	0.0
Roof								
None		0.0	0	0	0	0	0	0.0
Vent Dn,e		# Vents						
Greenwood MA3051 Acoustic Wall vent		1.0	47	46	49	56	66	10.8
								dBA
	Internal SPL/dBLin		32.1	29.9	23.2	10.7	6.6	25

Table 8: Daytime LAeq,16hr FF Rear Bedroom No.3

From Table 8 above it can be seen that the predicted internal daytime time noise level of **25 dB LAeq,16hr,** using upgraded thermal glazing [10/12/6] for the main windows and doors, together with a Greenwood MA3051 wall vent [if required] would meet the target criteria of 35dB LAeq,16hr for daytime resting in bedrooms.

Given that nighttime levels are lower than daytime, it can be seen that the package of measures would also meet the target criteria of 30 LAeq,8hr for nighttime sleeping in bedrooms.

With the 10th highest LAmax level of say 78 dB [Table 5] and a "Building Attenuation" from Table 7 of 38 dBA, the target internal levels for LAmax of 45dB would also be met [78-38=40].

5.1.2 **Living Room Noise Levels**

The derived external levels can be used to predict internal noise levels using the methodology described in BS EN 12354-3:2000 [Ref 6]. The following assumptions have been made for bedrooms (**Please inform Martec if any of the assumptions are incorrect**):

- External levels and spectrum as shown in Table 5
- Reverberation time for bedrooms is 0.5s
- Room Volumes and window areas taken from Howard & Seddon Drawing 13,673/06A
- Brick / block cavity construction
- All properties are provided with either Mechanical Extract
- Ventilation (MEV) or Passive Input Ventilation (PIV) system which extracts/supplies air from the habitable rooms, but which does not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to a quiet façade.

BS EN 12354-Calcs		Use	Volume	Volume	64.1				
Version 4.3		length					Building Atten dBA (62.5 - 28.4)		34
© 2018 Martec Environmental Consultants Ltd		width		RT	0.5				
& Acute Acoustics Ltd		height		Octave Band Centre Frequency [Hz]					dBA
				125	250	500	1k	2k	
	External Spectrum Leq (Free Field & Lin)			66.6	63.6	61.6	56.6	51.6	62.5
	Adjustment to Given Level if required								
	External Spectrum Adjusted for Level			66.6	63.6	61.6	56.6	51.6	62.5
Wall			Area m2	Element Sound Reduction Index [SRI]					Contrib
Brick/block/cavity			22.0	41	45	45	54	58	19.6
Drs/Wndws									
6 (12)10			6.1	30	28	34	41	39	27.5
Roof Lights									
None			0.0	0	0	0	0	0	0.0
Door									
None			0.0	0	0	0	0	0	0.0
Roof									
None			0.0	0	0	0	0	0	0.0
Vent Dn,e			# Vents						
Greenwood MA3051 Acoustic Wall vent			2.0	47	46	49	56	66	16.0
									dBA
		Internal SPL/dBLin		35.7	33.8	26.8	14.5	10.5	28

Table 9: Daytime LAeq,16hr GF Rear Kit/Liv

From Table 9 above it can be seen that the predicted internal daytime time noise level of **28dB LAeq,16hr,** using upgraded thermal glazing [10/12/6] for the main windows and doors, together with a Greenwood MA3051 wall vent [if required] would meet the target criteria of 35dB LAeq,16hr for daytime resting in living rooms.

7.0 CONCLUSIONS

Given that the 'new' external amenity spaces are already domestic gardens, and given the wording of BS8233 and ProPG, it is not considered appropriate to apply external noise criteria to the amenity spaces in the

development.

Similarly, it is not considered appropriate to apply internal noise criteria to the refurbished parts of the development [the existing 27 & 29 Trenchard Drive]; consequently, the internal noise criteria have been taken to apply solely to the new-build sections of the development.

Noise data for the site has been obtained from the latest aircraft noise contours for Manchester Airport and from work carried out by others in relation to an adjacent site and forming part of a recent planning application.

Based on the above analysis, the predicted internal noise levels can meet the requirements of appropriate guidance and the noise impact should not bar the grant of planning consent for the development.

The performance of the various building elements should be as shown in Table 10 below [or similar and approved]:

Element	Unit	Octave Band Centre Frequency [Hz]				
		125	250	500	1k	2k
Windows	SRI	30	28	34	41	39
Rooflights	SRI	27	26	35	38	37
Roof	SRI	62	71	80	89	82
Vents	Dn,e	47	46	49	56	66

Table 10: Building Element Performance [dB]

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The dB or the decibel, is the unit of noise. The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated **dB(A)**.

A doubling of the sound is perceived, by most people, when the level has increased by 10 dB(A). The least discernible difference is 2 dB(A). Thus most people cannot distinguish between, say 30 and 31 dB(A).

The Background level of noise is most commonly represented by the level which is exceeded for 90% of the time i.e. the LA90.

If a noise varies over time then the **equivalent continuous level, or LAeq**, is the notional constant level of noise which would contain the same amount of acoustic energy as the time varying noise.

The following table gives an approximate indication of the comparative loudness of various noises expressed in terms of the A weighted scale:

Source of noise	dB(A)	Nature of Noise
Inside Quiet bedroom at night	25-30	Very Quiet
Quiet office	40-45	
Rural background noise	35-45	
Normal conversational level	55-65	
Busy restaurant	65-75	
Inside suburban electric train	70-80	
Hand clap @ 1m	75-85	
HGV accelerating @ 5m away	85-90	Very Loud

APPENDIX 2

QUALIFICATIONS AND EXPERIENCE OF M. A. KENYON

My full name is Melville Alexander Kenyon. I am the principal of the firm of Martec Environmental Consultants Ltd, a consultancy company that specialises in environmental noise assessment and control. I graduated in 1982 with a Bachelor's degree in Engineering and subsequently a Master's degree in Environmental Acoustics. I have been a corporate member of the professional body for noise and vibration specialists, the Institute of Acoustics, since 1988, and have sat on the British Standards Committee dealing with noise in buildings [BS.8233:1999].

I have lectured at Liverpool John Moores University on the Diploma of Acoustics course and at Manchester Metropolitan University on their Environmental Health degree course.

The firm of Martec Environmental Engineering was formed in the 1970's and joined The Association of Noise Consultants in 1996. It is now known as Martec Environmental Consultants Ltd.

Since its formation, Martec has advised many groups of both residents and developers about the problems of noise and vibration in the environment.

APPENDIX 3

REFERENCES

1 ProPG: Planning and Noise. – June 2017 – IoA, ANC & CIEH

2 BS.8233:1999 "Sound Insulation and noise reduction for buildings – Code of practice."

3 Calculation of Road Traffic Noise (CRTN) – Department of Transport and the Welsh Office, HMSO, 1988, ISBN 0-11-550847-3

4 Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping – TRL/Casella Stanger

www.defra.gov.uk/environment/quality/noise/research/crtn/documents/noise-crtn-update2006.pdf

5 Road Vehicles (Construction and Use) Regulations 1986(SI 1986/1078)

6 BS EN 12354-3:2000 *Building Acoustics-Estimation of Acoustic Performance in buildings from the performance of elements. Part 3 Airborne sound Insulation against outdoor sound.*

7 SPG 10 – Noise And Vibration – Ealing Council.