Condition 24

Acoustic Associates Sussex Ltd.

PPG24 Assessment of the Impact of Railway Noise

Site: 13-23 St. Dunstans Road, Worthing
Client: Chipping & Dawson Ltd.

Report by: Pradeep Mistry BSc(Hons) MSc AMIOA
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1.0 Introduction

The purpose of this assessment is to establish the Noise Exposure Categories (NEC) that the proposed development would fall into under the provisions of Planning Policy Guidance Note 24: Planning and Noise (PPG 24). External noise levels are assessed and mitigation measures have been specified.

As the proposed development is in close proximity to West Worthing railway station it will be necessary for railway noise to be measured and assessed.

Planning approval has been given for this development subject to planning conditions. One of the planning conditions relates to railway noise and vibration. A separate vibration assessment has also been completed by Acoustic Associates Sussex Ltd.

The rail noise survey has been carried out in accordance with Planning Policy Guidance Note 24: Planning and Noise (PPG 24) and the document: Calculation of Rail Noise (CRN).

The rail noise survey and assessment shows that the worst case facade will fall into Noise Exposure Category "B"

If the recommended mitigation measures detailed in section 7 are implemented it is considered that the planning condition detailed above will be satisfied.

2.0 Planning Policy & Noise Assessment Criteria

2.1 Planning Policy Guidance 24 (Planning and Noise)

Planning policy guidance notes set out the Government's policies on different aspects of planning. Local authorities must take their content into account in preparing their development plans. They may be material to decisions on individual planning applications and appeals.

PPG24 gives guidance to local authorities in England on the use of their planning powers to minimise the adverse impact of noise

It outlines the considerations to be taken into account in determining planning applications, introduces the concept of noise exposure categories for residential development and advises on the use of conditions to minimise the impact of noise.

2.2 PPG24 Noise Criteria

"When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four noise exposure categories (NEC) the proposed site falls, taking account of both day and night-time noise levels. Local planning authorities should then have regard to the advice in the appropriate NEC, as below:"

NEC	
A	***Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.***
B	***Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.***
C	***Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.***
D	***Planning permission should normally be refused.***

2.3 WHO Noise Criteria

The target internal levels are based on guidelines laid out by the World Health Organisation (WHO) and are as follows:

Room Type	Target Maximum Internal Level - Leq dB (A)
Living rooms	35 (Daytime only)
Bedrooms	30 (Night)

The target maximum internal noise level for a bedroom during the night time corresponds to the threshold of sleep disturbance. Internal noise levels exceeding 30dB (A) are likely to cause sleep disturbance.

The target internal noise level for bedrooms and living rooms during the day time for a reasonable standard is set to 35dB(A). When the internal noise levels exceed 35dB (A) speech intelligibility levels of the occupants will be reduced.

WHO also state that, within an outdoor amenity area, noise levels above 50dB(A) are likely to cause moderate annoyance. Levels above 55dB(A) are likely to cause serious annoyance.

3.0 Rail Noise Survey

Rail Noise levels were monitored at one location on the site (pre demolition of existing building).

3.1 Equipment used:

- NOR118 Class 1 $^1/_3$ Octave Integrating sound level meter
- Weatherproof microphone housing
- Castle Class 1 Acoustic Calibrator

3.2 Survey carried out by: Pradeep Mistry BSc(Hons) MSc AMIOA

3.3 Measurement Positions:

A microphone was positioned on a tripod approximately 1.5m on a first floor flat roof area. The Microphone was approximately 30m from the nearest rail and greater than 3.5m from any reflecting surface. The measurements were taken at this height in order to measure the worst case scenario noise levels.

3.4 Façade Free Field Correction

Taking in to account the microphone location it follows that all measurements at this location are free-field measurements and therefore require no correction.

3.5 Weather conditions: Dry with wind no greater than 5ms^{-2}

3.6 Measurement Duration

Measurements were carried out on the 6th April 2011.

3.7 Existing Site Layout

The noise survey was carried out on the proposed site as shown in figure 1. The existing buildings are to be demolished in order to build the proposed development (Noise model section shows location of proposed development). It is understood that the most exposed façade of the proposed development will be approximately 15m from West Worthing rail station platform.

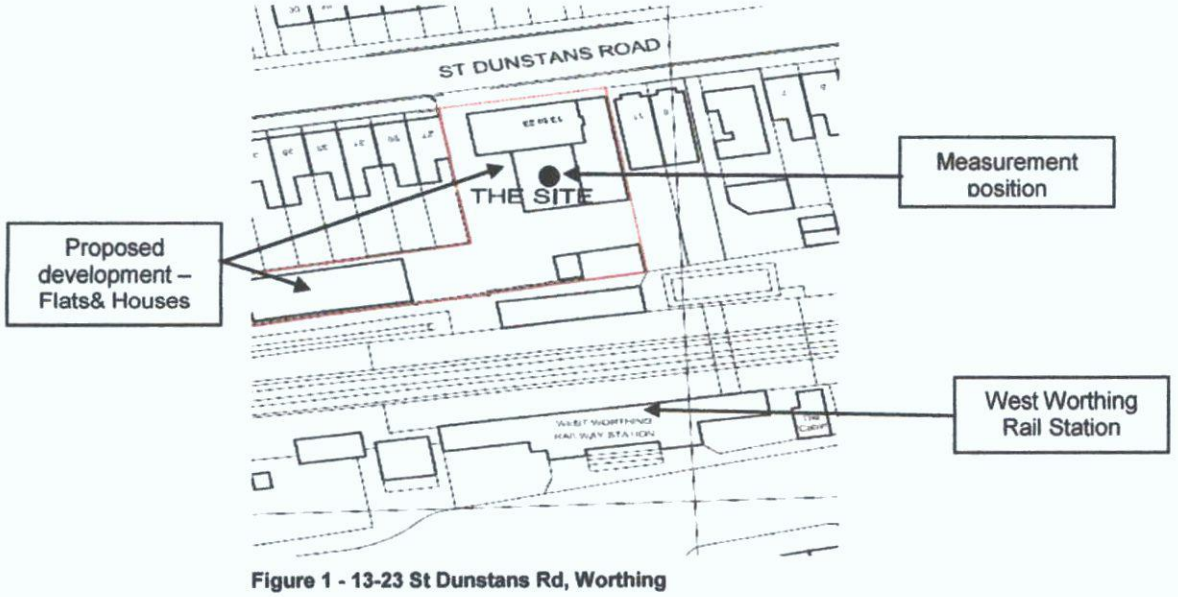

Figure 1 - 13-23 St Dunstans Rd, Worthing

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4.0 Rail Noise Assessment

This section gives details of the noise survey measurements and details of how the day and night time period noise levels have been predicted.

4.1 Noise Survey Results

During the survey 33 measurements were taken of the Sound Exposure Level (SEL) of the train pass-by events, as recommended by the *Calculation of Railway Noise* (CRN) document. Ambient noise measurements were also taken. As the majority of the train noise measurements were at least 10dB greater than the ambient noise level, no correction has been applied. The number of carriages and the direction of travel of each train pass-by were also noted.

Taking the (arithmetic) averages of the SEL values for each train type measured gave the following results:

4.1.1 Eastbound Trains

Quantity	Type	SEL (dB(A))
11	3 Carriage Train	72
6	4 Carriage Train	72

4.1.2 Westbound Trains

Quantity	Type	SEL (dB(A))
1	2 Carriage Train	75
9	3 Carriage Train	74
5	4 Carriage Train	72
1	8 Carriage Train	75

4.2 Train Timetable

Train timetable information for trains operating on the London to Southampton rail line was viewed online (Southern Trains). Below is a summary of the timetable information. During the rail survey, it was noted a diesel train (2 carriage train) from First Great Western also operates on this line. We checked the relevant timetables and noted not more than 4 diesel trains per day will pass through the station. The tables below show the number of trains, as derived from timetables, which pass by the proposed development

4.2.1 Eastbound Trains

Direction	Night-time Trains	Daytime Trains
Eastbound	10	75
Westbound	13	91

4.3 Converting Sound Exposure Levels (SEL) to L_{Aeq} Levels (measurement position)

To predict worst case scenario noise levels the higher average SEL values stated in 4.1.1 & 4.1.2 will be used.

The SEL data for each passenger train type can now be converted into L_{Aeq} data for both of the time periods using the following formula:

L_{Aeq} = SEL – 10Log T + 10Log N

N = no. of events in period T = no. of seconds in period

The formula was used to calculate the day and the night time values.

4.3.1 Train L_{Aeq} Data

Direction	07:00-23:00hrs	23:00-07:00hrs
	L(A)eq,16hr	L(A)eq,8hr
East	43 dB(A)	37 dB(A)
West	47 dB(A)	42 dB(A)

4.4 Predicted Noise Levels at measurement position.

The above values can be combined to give the total noise level for the day-time and night-time periods:

07:00-23:00hrs	23:00-07:00hrs
L(A)eq,16hr	L(A)eq,8hr
48 dB(A)	**43 dB(A)**

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5.0 IMMI Computer Modeling

The proposed development is to consist of a mixture of flats and housing. Plots 1-5 are to be flats while the remaining two plots are to be two bed houses. The two houses are approximately 15m to West Worthing rail station and are considered to be the worst case scenario.

We have produced a basic computer noise model using the computer package IMMI. We have used the measurement survey data and architect plans from Michael Cook Associates to produce the model.

The model displays the PPG24 Noise Exposure Categories over the area of the site for both day and night time periods.

The noise model was calibrated first completing a noise contour model detailing the empty site and the measurement position. A rail track has been added as the noise source. The noise source was adjusted until the reception point at the measurement position matched the measured noise levels detailed in the previous section.

The figure below shows the proposed site layout and reception points:

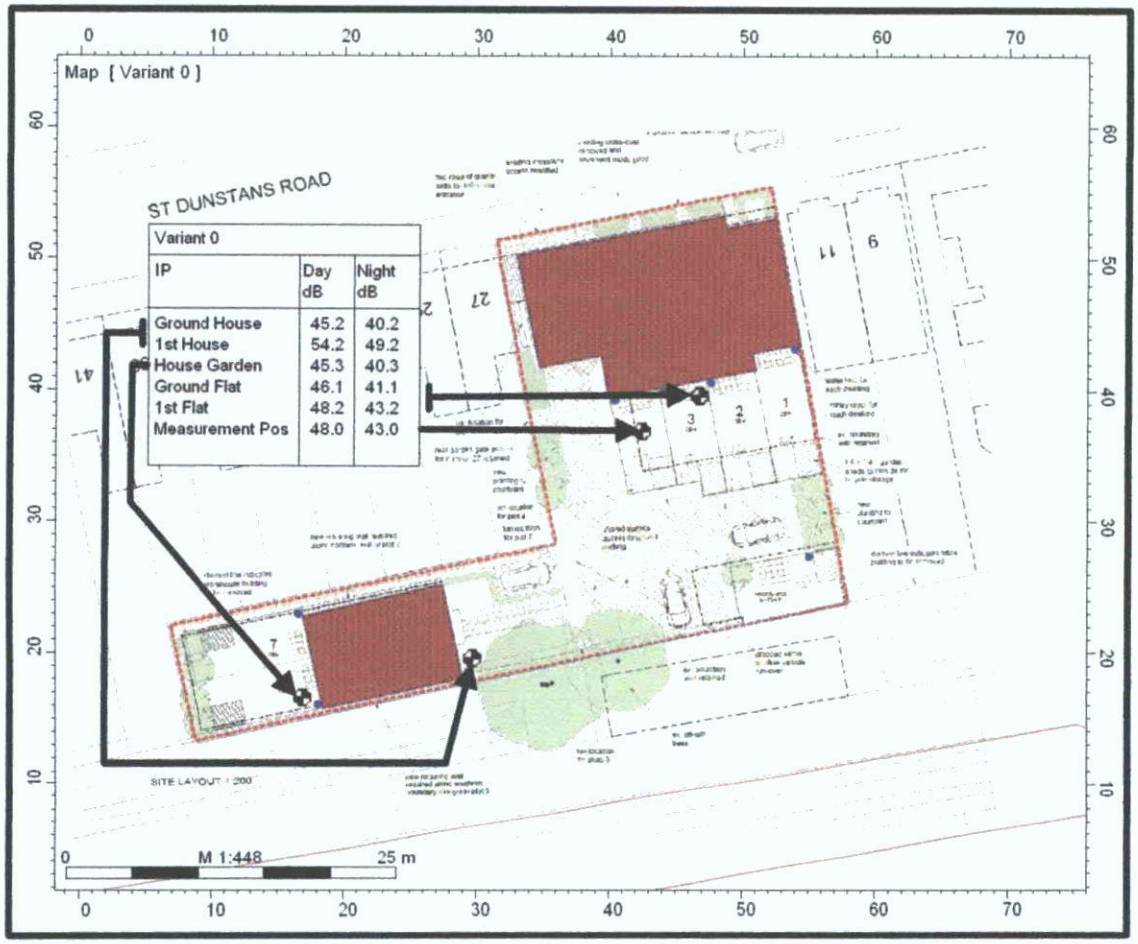

Figure 2 – Plan and Reception Points

The figures show the calculated results for first and ground floor levels.

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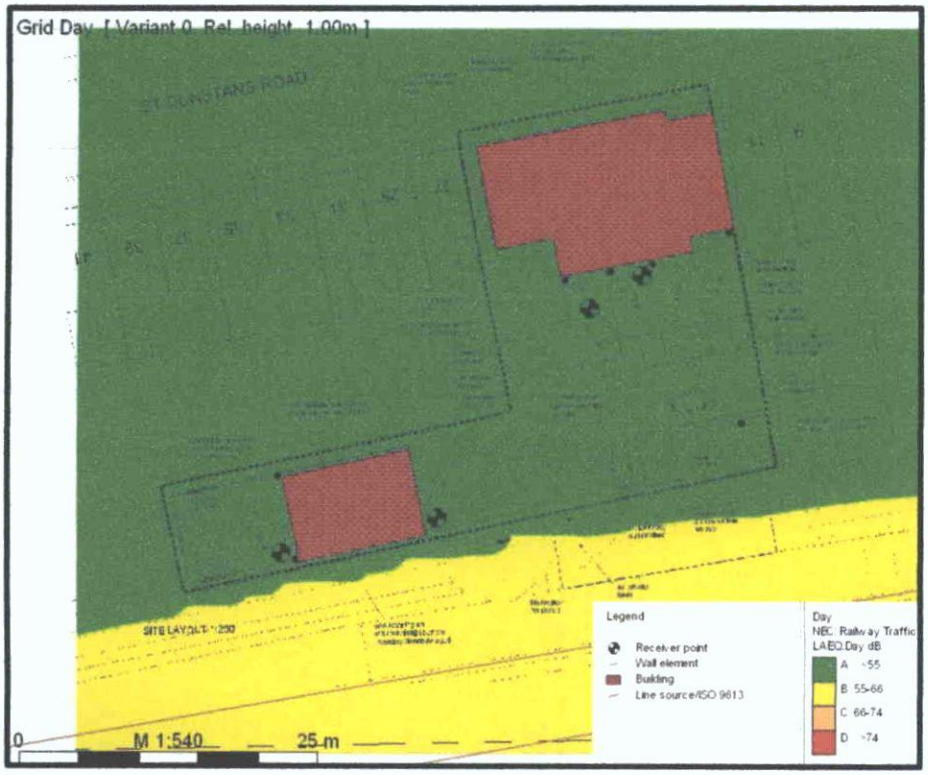

Figure 3 – Ground Floor Daytime

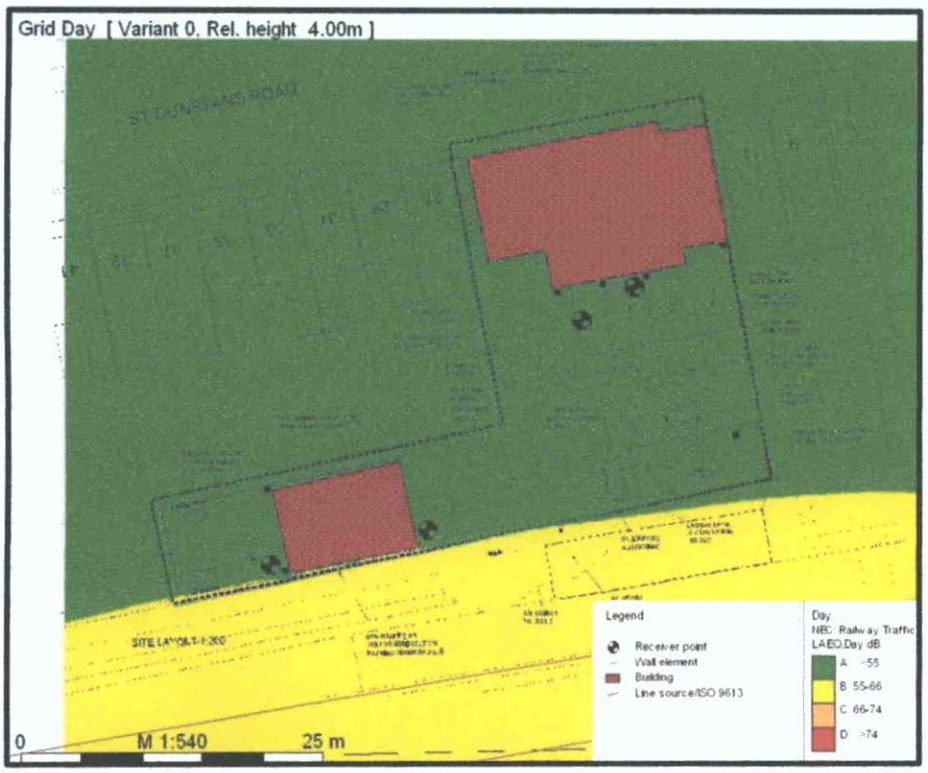

Figure 2 – 1st Floor Daytime

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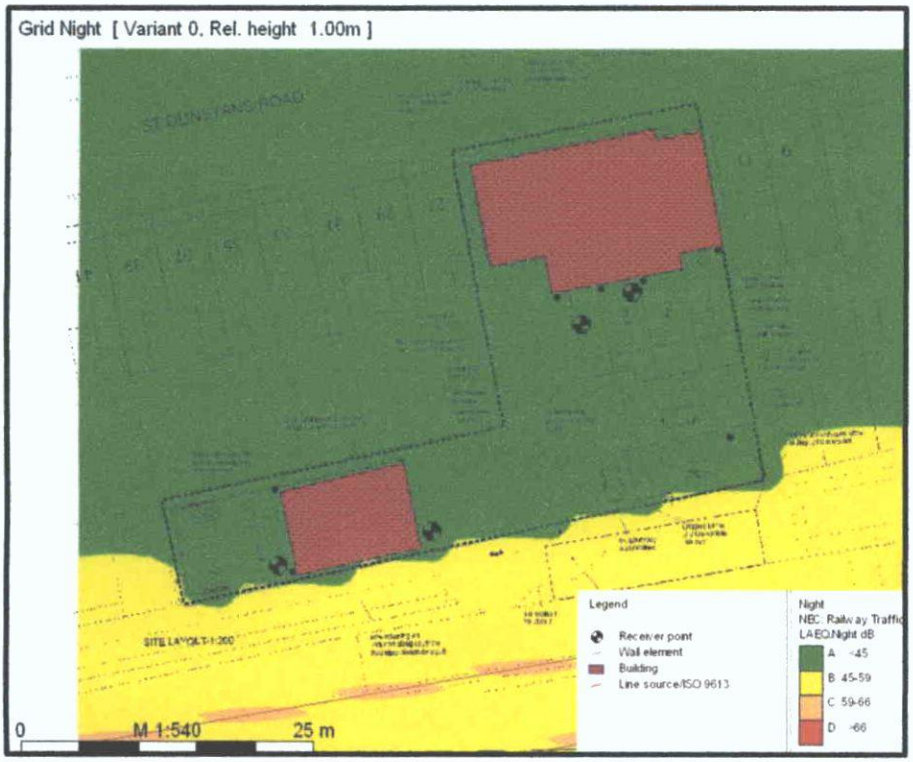

Figure 3 – Ground Floor Night-time

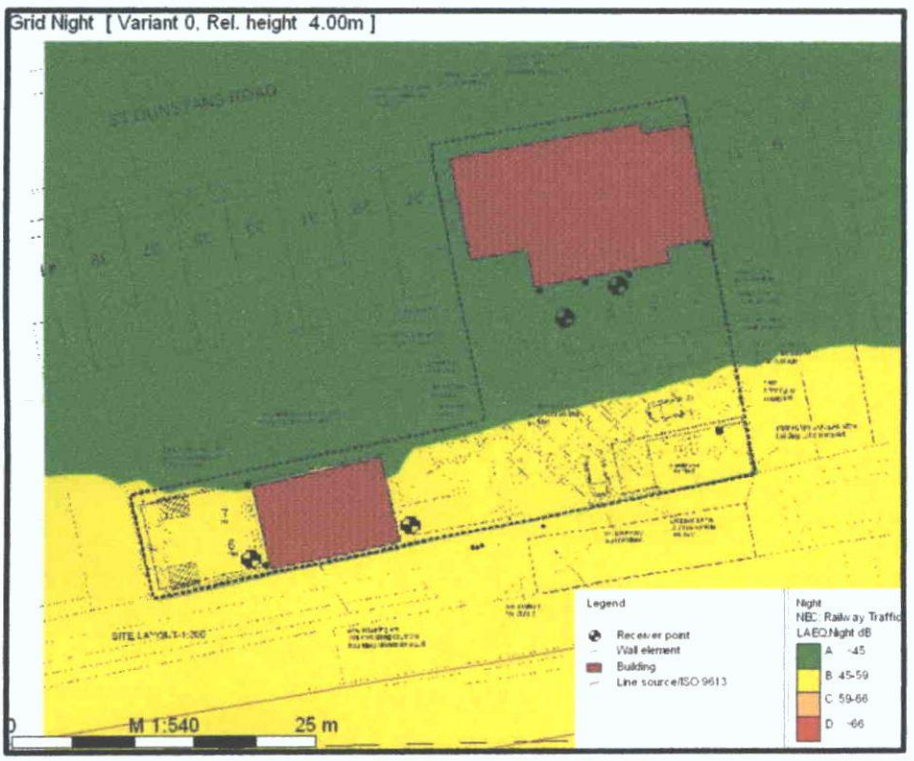

Figure 6 – 1st Floor Night-time

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6.0 Planning Policy Guidance 24 Assessment

PPG24 gives guidance to local authorities in England on the use of their planning powers to minimise the adverse impact of noise

It outlines the considerations to be taken into account in determining planning applications, introduces the concept of noise exposure categories for residential development and advises on the use of conditions to minimise the impact of noise.

6.1 PPG24 Noise Exposure Categories

PPG24 introduces the concept of noise exposure categories for a proposed development:

"When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four noise exposure categories (NEC) the proposed site falls, taking account of both day and night-time noise levels.

The table below is taken from PPG24 and shows the NEC noise level ranges for rail noise:

Noise Levels Corresponding To The Noise Exposure Categories For New Dwellings LAeq,T dB				
	Noise Exposure Category			
Rail Noise	**A**	**B**	**C**	**D**
07.00 - 23.00	<55	55 - 66	66 - 74	>74
23.00 - 07.00	<45	45 - 59	59 - 66	>66

6.2 Worst Case Noise Exposure Category

The predicted noise level at the nearest façade and the table above can be used to state the worst case NEC the development will fall into:

07:00-23:00hrs L(A)eq,16hr	NEC	23:00-07:00hrs L(A)eq,8hr	NEC
54	A	49	B

PPG 24 also states:

***"Night-time noise levels (23.00 - 07.00):** sites where individual noise events regularly exceed 82 dB LAmax (Slow time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8h (except where the LAeq,8h already puts the site in NEC D)."*

The results gathered on site did not exceed 82dB throughout the duration of the survey. The highest LAmax recorded was 72.6dB

7.0 Sound Insulation of Building Envelope and Internal Noise Levels

7.1 Required Noise Reduction of Façade/Window

The predicted external noise levels and the WHO target internal noise levels have been used to derive the required noise reduction of façade/window.

Section 4.4 predicts that the worst case day and night time noise levels will be:

- Worst Case Day Time $L(A)_{eq,16hr.}$ = 54dB(A)
- Worst Case Night Time$L(A)_{eq,8hr.}$ = 49dB(A)

The target internal levels are based on guidelines laid out by the World Health Organisation (WHO) and are as follows:

Room Type	**Target Internal Level - Leq dB (A)**
Living rooms	35 (Daytime only)
Bedrooms	30 (Night)

Therefore the highest noise reduction that the façade/window will have to achieve will be:

- Day Time = 19dB(A)
- Night Time = 19dB(A)

7.2 Predictions for the Noise Reduction of Generic Façade/Window

With respect to outside-to-inside attenuation of various transportation noise sources PPG24 (Annex 6, Para. 4) states the following:

"Because the sound insulation of a window (and other components of the building envelope) varies with the frequency (or pitch) of the sound, the overall noise reduction provided by a window will depend, among other factors, on the spectrum of the external noise. Table 1 shows typical reductions in noise levels from common sources which would be expected from various types of window installations fitted in brick/block walls in a dwelling. The insulation provided by any type of window when partially open will be in the region of 10-15 dB (A)"

Table 1: Typical noise reduction of a dwelling facade with windows set In a brick/block wall:

Noise Source	Single Glazing	Thermal Double Glazing	Secondary Glazing
Road Traffic	28	33	34
Civil Aircraft	27	32	35
Military Aircraft	29	35	39
Diesel Train	28	32	35
Electric Train	30	36	41

7.3 Noise Reduction of Development's Façade/Window

Normal thermal glazing (4/12/4) will provide R_w31dB: source Pilkington Glass. It is recommended that if trickle vents are also required they should also have to achieve DnEw = 25dB.

Taking into account the information above the façade/window for the proposed development should be able to attenuate electric train noise by 36dB(A) and diesel train noise by 32dB(A).

Due to the low number of diesel trains travelling on this line it is assumed that the façade/window will attenuate rail noise by 35dB(A).

7.4 Open Windows

Section 5.2 states that the site falls into NEC "B". With respect to Noise Exposure Category "B" PPG24 states the following (Annex 2, Para 10):

"Because noise should be taken into account when determining planning applications in NEC B, it has been assumed that the minimum amelioration measure available to an occupant at night will be to close bedroom windows."

8.0 Conclusion

8.1 The rail noise survey and assessment shows that the nearest façade to the railway falls into Noise Exposure Category (NEC) "B".

8.2 Other areas of the development that are further away or shielded from the railway will fall into NEC "A"

8.3 For most affected facades World Health Organisation target internal noise levels will be achieved if windows are closed and normal double glazing is installed. For other facades it is likely that the target noise levels will not be exceeded if windows are left open. WHO state that an open window will attenuate external noise by approximately 15dB(A).

8.4 It is understood that there is little or no freight train activity on this railway line. There may well be an occasional leaf clearing or maintenance trains that operate during the day or night-time period. These trains will be seasonal and it is very unlikely that there would be one a week let alone more than one in any night time hour.

8.5 The World Health organisation also state target external noise levels for outdoor living areas. WHO state that the noise level in an outdoor living area should be below 55dB(A) in order to avoid Serious annoyance. The proposed houses have garden areas which are shielded, from the railway, by a boundary wall. Noise levels during the day time in this area will be less than 55dB(A).

8.6 If thermal double glazing which will achieve Rw = 31dB is installed into a brick clad timber frame façade or masonry facade and if trickle ventilators are fitted that achieve DnEw = 25dB it is considered that the planning condition relating to noise will be satisfied.

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