

Sound Advice

Our Ref: Avalon Barrow Brook

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Noise and Vibration Consultancy
Surveys and Training

11, Wellington Street, Lytham
Lancashire. FY8 5BL

Tel/Fax: 01253 796267 (24hrs)

John Houldsworth BSc MIOA

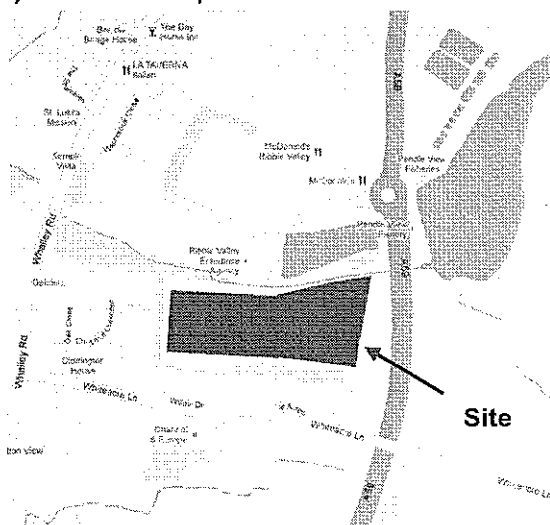
Email: johnhouldsworth@btconnect.com

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Introduction.

There is a proposed development of land at Barrow Brook Business Village, Clitheroe to provide multiple dwellings of various types (Ref: Avalon Town Planning Drawing No: Hine/01 Drg.01p1 Dated 11/11). The development site is located south of the Business Village access road on land to the north of existing houses on Willow Drive and The Acres off Whiteacre Lane (see inset map). The A59 Skipton Road is adjacent to the east of the site.

It is normal in the determination of Planning Permission that an assessment of the traffic and other noise that may be affecting the site be carried out in order to assess the suitability of the development. Therefore, the Ribble Valley Local Authority Planning officers have advised that they require a traffic noise assessment in accordance with Planning Policy Guidance note PPG24.



Details of the exact protocol for this survey are explained in the Assessment Method section on Page 2 of this report.

The period chosen for the tests was the daytime of Wednesday 11th January 2012. The weather was cool and overcast but dry and with very little wind. The roads remained dry for all the measurement periods.

Assessment Method

1. The requirement of the Ribble Valley Planning Department is to see a representative noise assessment in accordance with Planning Policy Guideline PPG24. Ideally, PPG24 requires noise measurements to be taken over the periods 07:00 to 23:00 for daytime and 23:00 to 07:00 for night. The overall figures for the LAeq are to be provided. These figures are then compared with a set of Noise Exposure Categories (NECs), which are based on World Health Organisation guidance, to determine any planning conditions.
2. It is likely that daytime noise affecting the quiet relaxation of any future residents in gardens or in rooms facing the A59 would be the most significant problem since the busy traffic periods on the road do not extend from much before 07:00 in the early morning and certainly not at night. There is still a possibility of night traffic noise affecting bedrooms but this should be dealt with by the measures needed for the higher daytime noise levels and an assessment of LAFmax values.
3. In some situations, the night-time average traffic figures are less than the daytime figures and this can permit a lower specification for windows of bedrooms. However, there is no difference in the maximum level of a passing vehicle whatever the time of day. The general background noise from other sources will be less at night and early morning but this is numerically of little consequence in the overall average when there are repetitive higher maximum levels. Therefore, it is considered prudent to use the window specification calculated for daytime figures for the bedrooms.
4. It has been found by experiment that a good PPG24 value can be obtained by an alternative method of daytime averaging. (Ref: Department of Transport - Welsh Office: Estimating Road Traffic Noise). The method involves measuring the LAF10 of the traffic noise between 10am and 5pm in three separate 1-hour periods. From this an estimate is made of both the 18-hour LAF10 and then the 16-hour LAeq.

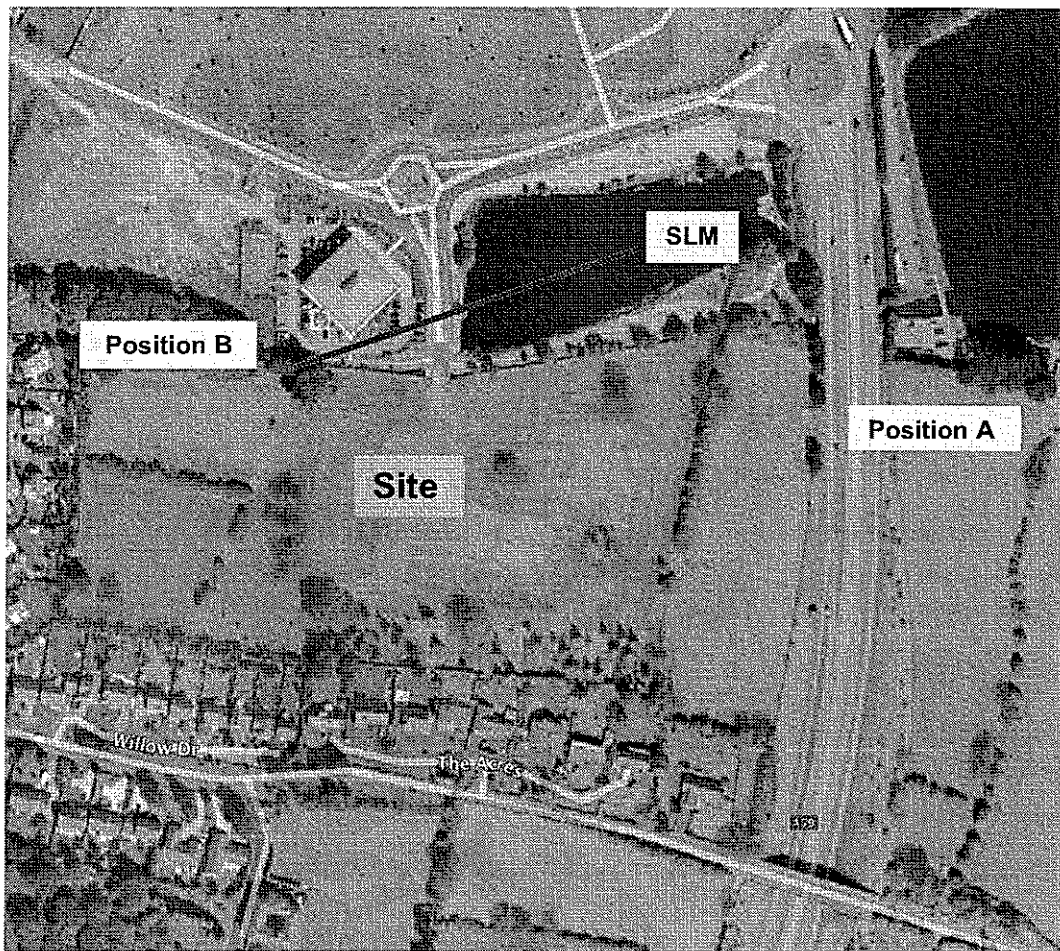
The formulae are:
$$LAF10_{(18hr)} = \Sigma 3 \times LAF10_{(1hr)} / 3 - 1dB.$$

$$PPG24 LAeq_{(16hr)} = LAF10_{(18hr)} - 2$$

This method has been shown to be accurate to within a dB or two and was used in this survey.

5. PPG 24 advises that noise measurements should be taken *"on an open site at the position of the proposed dwellings, well away from any existing buildings, and 1.2m to 1.5m above the ground"* (Annex 1, paragraph 8). Therefore, the sound level meter was set up to the east of the site on the open ground at about 65m from the A59 eastbound carriageway (see aerial photograph on Page 3 below). The noise was stored and was averaged using the Bruel & Kjaer Evaluator software to produce the PPG 24 figures.

Site Aerial Photograph and Site Considerations:



The sound level meter was positioned at Position A about 65m from the nearest carriageway for the PPG24 study.

The outdoor amenity areas planned for the houses are between the houses and the A59.

The possibility of noise from fixed plant at nearby commercial premises was also considered at Position B.

Equipment:

All measurements were taken using a Bruel & Kjaer Type 2260 "Investigator" Precision Sound Level Analyser. The equipment was calibrated before and after the tests using a Bruel & Kjaer Type 4231 Class 1 Acoustic Calibrator with no deviation recorded. The equipment accuracy is traceable to UKAS. Type 4231 reference level 93.95dB calibrated to UKAS by Bruel & Kjaer (UK) Ltd. Cal Cert. C1106693. August 2011. The PPG24 values were calculated using the B&K 7820 Evaluator software.

Results:

Subjective assessment:

The noise affecting this site during the day was due entirely to the regular but not constant effect of vehicles passing on the A59. There is a mixture of types of traffic with a fair proportion of heavy vehicles. The road is dual carriageway and very open at this position. Vehicle passing speeds are quite high. There was no noticeable noise from fixed plant at the nearby commercial premises.

Measured results:

The graphs and tables below are copied from the B&K 7820 Evaluator software. **Graphs 1, 2 and 3** below show the logged the $LA_{eq(30sec)}$ and $LAF_{90(30sec)}$ from the daytime measurements from around 10:55am and into the mid afternoon. The graph traces show the variability expected from non-continuous traffic but also show the repeatable nature of the traffic. Hourly periods have been marked for use in the average calculations. The **Tables 1, 2 and 3** show the calculated parameters for the marked periods.

Graph 1

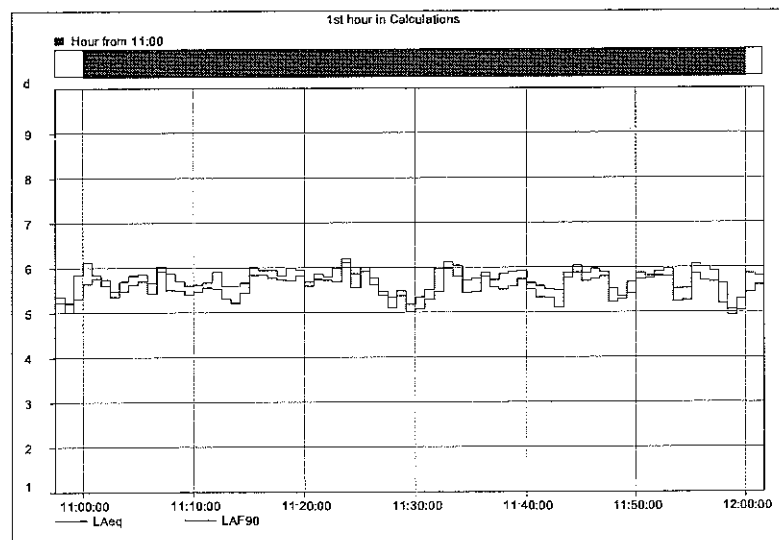


Table 1

1st hour in Calculations				
	Name	LAeq [dB]	LAF90 [dB]	LAF10 [dB]
1	Total	58.1	53.4	60.8
2	Unmarked	56.9	51.6	59.6
3				
4	(All) Hour from 11:00	58.1	53.6	60.7

Results: (continued)

Graph 2

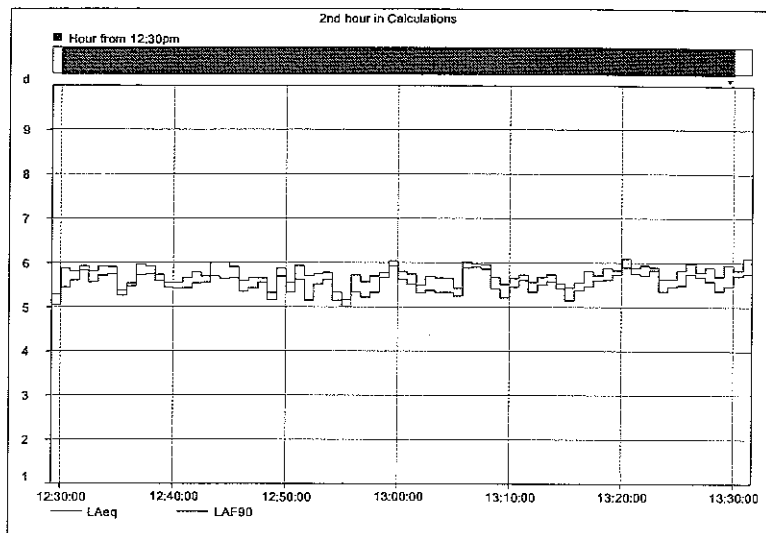


Table 2

2nd hour in Calculations				
	Name	LAeq [dB]	LAF90 [dB]	LAF10 [dB]
1	Total	57.7	53.6	60.2
2	Unmarked	58.5	50.9	62.1
3				
4	(All) Hour from 12:30pm	57.7	53.6	60.1

Graph 3

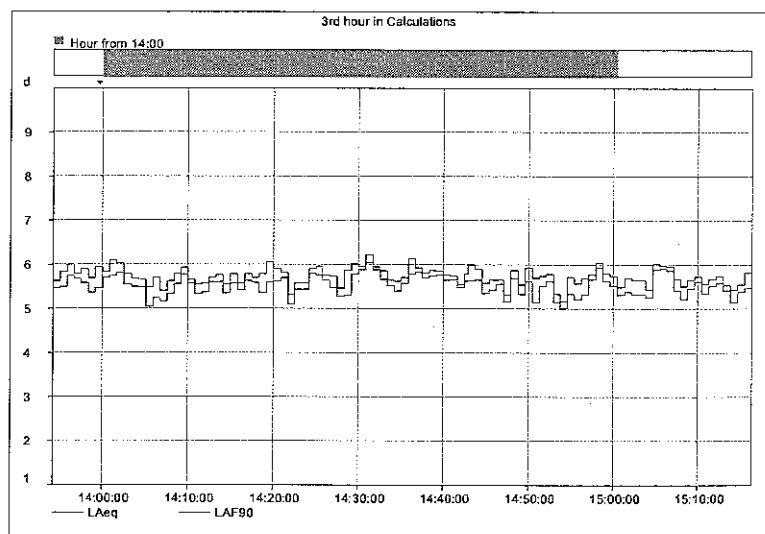


Table 3

3rd hour in Calculations				
	Name	LAeq [dB]	LAF90 [dB]	LAF10 [dB]
1	Total	57.8	53.6	60.1
2	Unmarked	57.4	53.6	60.0
3				
4	(All) Hour from 14:00	57.9	53.6	60.2

Calculations:

1. The Leq (16 hour) level for the whole daytime period can be calculated using the formula in the **Assessment Method** section above as 57.3dB(A) which is rounded in accordance with the standard to 57dB(A).
2. These results place the edge of the site at the lower end of PPG24 Daytime Noise Exposure Category (NEC) B, which has a daytime range of 55dB(A) to 63dB(A). The PPG24 document states that for this Category "*Noise should be taken into account and conditions should be imposed to ensure an adequate level of protection against noise.*"

However, Noise Exposure Category (NEC) A has an upper limit of 55dB(A). The PPG24 document states that for this Category "*Noise need not be considered as a determining factor in granting planning permission although the noise level at the high end should not be regarded as a desirable level.*"

3. Most of the dwellings on the site would be further away and would also be protected from traffic noise by other dwellings. Most dwellings would fall in the lower Noise Exposure Category A.

Conclusions and Recommendations:

1. The levels in PPG 24 were originally set with the intention of ensuring a level of 35dB(A) or less in a bedroom at night. This was based on World Health Organisation criteria, which suggested that this is the level required "to preserve the restorative process of sleep". The WHO recommendations have recently been updated to suggest a value of 35dB(A) in daytime living rooms for "acceptable" conditions and **30dB(A) in bedrooms**. UK Local Authorities have already generally adopted these values, in advance of an updated version of PPG24.
2. BS8233:1999 already goes further and suggests that a level of **30dB(A)** is also necessary in living rooms to provide "good" conditions. If this recommendation is taken as the best criterion, then the calculations for the required glazing must be equally applicable to the night-time WHO requirement of 30dB(A). Although night-time conditions are generally quieter the maximum levels do not change at all and this kind of noise is particularly intrusive at night. The use of the relevant glazing to meet daytime conditions is therefore very equally valid at night.

Conclusions and Recommendations (continued):

- Therefore, with an average hourly LAeq figure of 57dB(A), in order to meet the BS8233 daytime average noise criterion for "good" conditions (and hence also the WHO night criterion) the noise insulation performance requirement for the closest windows facing the A59 would be:

$$57 \text{ (source level)} - 30 \text{ (BS8233 criterion)} = \mathbf{27\text{dB (Insulation level)}}$$

- Published figures from Pilkington Glass suggest that this level of insulation can easily be achieved with a basic thermal double glazed unit of 4/12/4mm specification. The relevant table from the Pilkington Bulletin is shown below. These windows, when fitted in a solid surround will *theoretically* provide an insulation level of 31dB Rw, which apparently should reduce the average internal levels to 26dB(A). However, the noise is dominated by the low frequency content from the road traffic and it would be more correct to consider the Rtra parameter which reflects the resistance to traffic noise. This value is only 25dB for a 4/12/4mm unit. Therefore, the specification for the closest windows facing the A59 would be for a 6/12/6.4mm laminated thermal unit or better.

Extract from
Pilkington Technical
Bulletin – Glass and
Noise Control

Third-octave band Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)					
	4/12/4	6/12/6	6/12/6.4 rev	10/12/4	10/12/6	10/12/6.4 rev
100	25	27	29	23	25	27
125	24	26	28	22	24	26
160	23	25	27	21	23	25
200	22	24	26	20	22	24
250	21	23	25	19	21	23
315	20	22	24	18	20	22
400	19	21	23	17	19	21
500	18	20	22	16	18	20
630	17	19	21	15	17	19
800	16	18	20	14	16	18
1000	15	17	19	13	15	17
1250	14	16	18	12	14	16
1600	13	15	17	11	13	15
2000	12	14	16	10	12	14
2500	11	13	15	9	11	13
3150	10	12	14	8	10	12
4000	9	11	13	7	9	11
R _w (dB)	26	29	31	22	24	26
R _{tr} (dB)	21	24	26	16	18	20
R _{tr} (dB A)	15	18	20	10	12	14

- The window specification suggested above should apply to the windows of any room in the houses closest to the A59 that is used for normal domestic purposes and is directly facing the road. Toilets, bathrooms, kitchens (unless dining kitchens) would not normally require to be treated. The buildings themselves would significantly protect the windows to the front of the nearest houses. A noise reduction by the building of at least 10dB would be expected, probably much more. Therefore, these windows and all others on the site would only require a basic thermal unit specification of 4/12/4mm.

Conclusions and Recommendations: (continued)

6. Clearly, the internal noise requirements would not be met at any time in residential rooms if windows were left partially open for ventilation purposes. There is some disagreement about the effect of an open window, with WHO guidelines suggesting 15dB reduction whilst BS8233 suggests as low as 10dB. A compromise figure of 12dB is generally used. However, the argument is largely irrelevant since either method would still leave noise levels above the recommended values for internal noise.
7. Therefore, it will also be essential to incorporate an alternative ventilation system to all residential rooms. The simplest solution would be for a passive ventilation system such as a louvered ventilation duct fitted into the wall or "tricklevent". These systems generally provide as much attenuation as a closed window, particularly to lower frequencies (about 27dB is required), whilst allowing adequate ventilation. There are several proprietary systems for this purpose and specialist advice should be sought to provide a system that meets the structural and aesthetic requirements of the project. Ref: www.vents.co.uk, www.vent-axia.com, www.passivent.co.uk.
5. Maximum levels. An additional current WHO and BS8233 noise guidance criterion is that the Max level for events (LAFmax) should not regularly exceed 45dB INSIDE a dwelling at sleeping times. The external LAFmax levels recorded from passing traffic were around 65dB most of the time but can occasionally exceed 70dB. This would imply a need for a noise insulation level of more than 25dB. The glazing specifications suggested above for the continuous daily noise would be entirely appropriate with a significant safety margin.
6. The glazing suggestions above are the combinations used in the Pilkingtons Technical Bulletin. Other combinations from other manufacturers could well provide similar values. An 8/12/6mm system will probably perform as well as a 10/12/4 unit. The main factor in the noise insulation of thermal double-glazing units is the thickness of the glass. Units with dissimilar thickness panes also perform better than symmetrical units. The gap between the panes is of minor significance and is more relevant to heat loss.

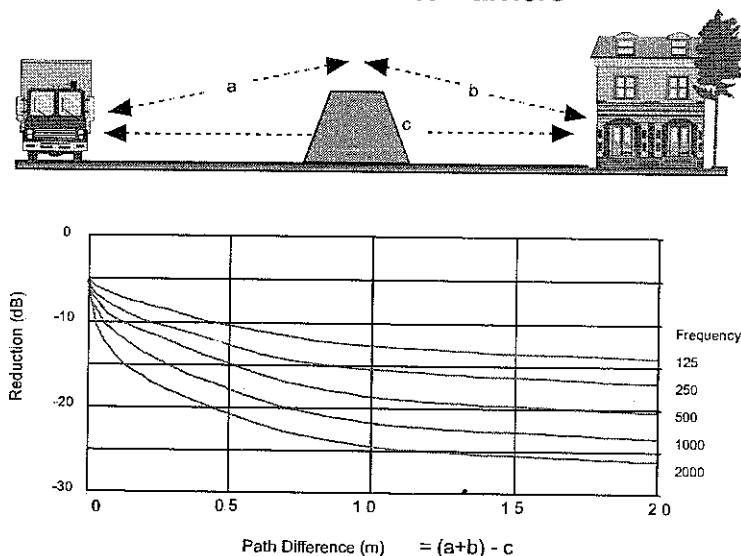
Conclusions and Recommendations (continued):

8. World Health Organisation Guidelines also suggest that daytime continuous noise levels in open amenity spaces (gardens/room balconies etc.) should not exceed an L_{eq} value of 55dB(A) in order to avoid "Serious Community Annoyance" or 50dB(A) to avoid "Moderate Community Annoyance".

The main gardens and amenity areas of the houses planned for the rear of the properties facing the A59 are likely to be subject to a noise level of around 57dB(A). This level would be marginally above the WHO criteria for Serious Community Annoyance.

9. The only practical solution to the noise issue in the gardens would be a barrier on the site perimeter. Even a solid fence of approximately only 1.8m height would be adequate to reduce the noise below the WHO 55dB(A) criterion although it would be more appropriate to improve the situation to below the 50dB(A) level.
10. The approximate amount of noise reduction due to a barrier can be calculated quite easily by applying Pythagoras' Theorem to a simple diagram of the relative positions of source, barrier and receiver to establish the path difference. The likely reduction can then be determined from standard curves that have been found by experiment and are used regularly by acoustic engineers. The curves are frequency dependent. This means that it is important to establish the frequency spectrum of the noise source. A barrier of a particular dimension that might be effective against the high frequency from steam leaks would be much less useful to deal with low frequency traffic noise. The theory of noise barriers is shown graphically in the diagrams below.

Attenuation due to Barriers



Conclusions and Recommendations: (continued)

11. Therefore, based on a distance of 65m from the gardens to the A59 road and a position about 4m from any perimeter barrier to the centre of the gardens, it can be calculated that a barrier of 1.8m height will provide about 0.33m path difference. This leads to a noise reduction of about 8dB at the low frequencies of traffic noise. A barrier of around 2.4m would improve the situation to a path difference of 0.54m and about 12dB reduction and well below the WHO guidelines for even Moderate Community Annoyance.
12. If the above matters are addressed then there should be no significant grounds for refusal of planning permission from a noise aspect.

John M Houldsworth. B.Sc. MIOA. *Sound Advice* 12th January 2012