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ACOUSTIC CONSULTANTS

Acoustic Assessment conducted at the land off Beechdale Close, Moston, Manchester.

architectural

environmental

occupational

industrial

noise control at source

project management

planning

legal services

expert witness

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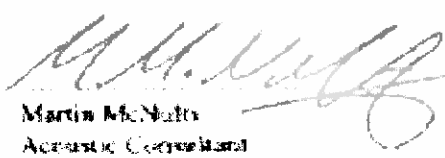
1.0 SUMMARY

At the request of Jones Homes, an acoustic assessment has been conducted at the proposed residential development in the area of land off Beechdale Close, Moston, Manchester.

In accordance with Planning Policy Guidance 24 (PPG24) continuous measurements have been made over what are considered to be the noisiest periods of the day. The purpose of this being to quantify the level of incident noise on the development and also to determine the nature of it as some concerns over the nearby rail line have been raised. It has been found that the development is subject to Noise Exposure Category (NEC) 'B' during daytime periods and NEC 'B' during the night. Noise factors affecting the area consisted of a variety of noise sources including distant road traffic, pedestrian noise and passing aircraft. With respect to noise from rail activity, it has been found that whilst predominantly used for passenger/commuter purposes, freight trains were heard on one occasion. Naturally, upon occurring, the passing of both types of train presented a peak in the ambient noise climate.

As a result, 'break-in' internal noise levels have been calculated within the development, using average noise levels from those measured. It has been shown that throughout the development, the 'reasonable' resting and sleeping criteria as stated in BS 8233 'Sound insulation and noise reduction for buildings – Code of practice' can be achieved provided that the guidance on glazing and ventilation within this report is adhered to.



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2.0 BRIEF FOR CONSULTANCY

PDA Ltd. was engaged to undertake the following:

a) We will travel to the site in Moston and undertake a short term ambient noise survey in the vicinity of the proposed development in accordance with PPG24. The survey will be undertaken between during 0600 – 1000 and 2300 – 0100 hours The measurements will include the overall dB(A) levels and octave bands in terms of the L_{eq}, L_{max}, L_{10} and L_{90} parameters.

b) Once obtained the ambient noise data will be collated and used to assess the sound insulation of the proposed building envelope, with reference to meeting all requirements of the local authority. Where the comparison proves to be unfavourable, we will specify all additional sound insulation measures such that the design target is met.

c) The results from parts (a) and (b) will be presented in a full and detailed report in a format that is suitable for submission to the local authority.

3.0 SURVEY DETAILS

3.1 Site Description.

The development is positioned in a predominately residential area in Moston, Manchester and is situated in an area of land that lies between the ends of Beechdale Close and Dresden Street.

Locally, the development is in close proximity to a rail line which, at the time, was observed to be fully operational. Nearby roads include the A62 (Oldham Road) and the A663 (Broadway) which serve the immediate area and a degree of distant noise was observed to originate from them.

3.2 Survey Times and Personnel

The survey was completed during two visits to site encapsulating what are considered to be the noisiest periods of a typical day. The first visit was during the hours 0600 – 1000 on Monday 31st March 2008. The second was completed during the hours 2300-0100 during the night/early morning of 31st March/1st April. All measurements were made and attended by Mr Joe Grimes of PDA Ltd.

It should be noted that measurements from the surveys have been grouped into "day" and "night" categories in accordance with the following times

Daytime:	Between 0700 and 2300 hours
Night-time	Between 2300 and 0700 hours

Consequently, the first hour of measurements made during the first visit on the morning of 31st March will be classed as a period of the night in terms of the PPG24 assessment.

3.3 Weather

Visit 1: 0600 – 1000 Hours, Monday 31st March
Road and surface conditions were dry during this visit. Recorded temperatures during were in the region of 8°C, cloud cover was approximately 10%. Wind speed was an average of 0-0.5m/s.

Visit 2: 2300 – 0100 Hours, Monday 31st March and Tuesday 1st April
Road and surface conditions were mainly dry during this visit. Initially, prevailing wind conditions were poor at times with strong gusts forcing the abandonment of early measurements at the first position. Relocation of the meter resulted in measured wind speeds being reduced to an acceptable level, approximately 2m/s.

Recorded temperatures during were in the region of 7°C, cloud cover was approximately 100%.

3.4 Equipment

The survey was conducted using a CEL Instruments 593 sound level meter, full details of the equipment can be found at the rear of this document.

The CEL 593 sound level meter is a precision grade 1 (as per BS EN 60651: 1994 and IEC 651) computing sound level meter capable of operating as an integrating sound level meter complying with BS EN 60204: 1994 (IEC 804). The meter was set to measure both linear and 'A' weighted sound pressure levels linear and the time weighting was set to fast response. The microphone was of the 'free field' type. The meter was field calibrated before, after and during the survey as required, during which time no significant calibration drift was observed.

Measurements were made at least 3.5 metres from any potentially reflecting surfaces and a microphone windshield was used throughout the survey.

3.5 Measurement Positions

A measurement position at the foot of Beechdale Close was chosen in order to assess ambient noise levels and the ingress of rail generated noise at a location simulating that of the proposed development facades.

During visit 1, the microphone of the sound level meter was attached to an extension cable such that it could be raised over the lightweight wooden hoarding at the foot of the road, thus measuring unshielded noise from the rail line.

On visit 2 however, the wind conditions were too strong at times for successful measurements to be completed at height. Consequently, the meter was removed from the extension unit and housed on the standard tripod. The repositioning of the meter was not seen to produce a significant variation of measured maximum noise levels generated by passing trains.

For the purposes of the PPG 24 assessment, the measurement locations are detailed in Figure 1 at the end of this report.

4.0 PPG 24 ASSESSMENT

4.1 Assessment Criteria

Planning Policy Guidance Note 24 (PPG24): - Planning and Noise, determines whether noise should be a major factor when granting planning permission for development of residential homes.

The method used to assess whether noise dominates a development site is through the use of Noise Exposure Categories (NEC's).

There are four NEC's that the site could fall into; all of these are shown in the table below.

NEC	Description of NEC Level
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.

Table 1: Definition of NEC categories

The NEC level is selected by it's noise level and source category, as shown in the table below.

	Noise Exposure Category			
Noise Source	A	B	C	D
Road traffic:				
0700-2300	<55	55-63	63-72	>72
2300-0700	<45	45-57	57-66	>66
Rail traffic:				
0700-2300	<55	55-66	66-74	>74
2300-0700	<45	45-59	59-66	>66
Air traffic:				
0700-2300	<57	57-66	66-72	>72
2300-0700	<48	48-57	57-66	>66
Mixed sources:				
0700-2300	<55	55-63	63-72	>72
2300-0700	<45	45-57	57-66	>66

Table 2: Definition of NEC categories

Furthermore, when individual night-time noise events regularly exceed 82dB (A) $L_{s,\,max,}$ the site should be classified as NEC level C.

4.2 Subjective Results

Visit 1: 0600 to 1000 hours
During the entirety of this measurement period, noise from road users in the local area, presumably those on the nearby A62 and A663, were found to be the greatest contributors in terms of ambient noise around the development.

Regular aircraft over-flights, occasional vehicles on Beechdale Close, occasional siren noise and pedestrians talking were additional contributory noise sources noted throughout this period.

With regards to rail noise, trains were observed to regularly pass the measurement position, creating a noticeable increase in the noise climate for a short duration.

Visit 2: 2300 to 0100 hours
Subjectively, noise levels during this time were observed to be quiet. Noise from local road users was still audible however, it was to a significantly lesser degree in comparison to daytime periods.

As prevailing wind speeds were noticeably higher during this visit, the rustling of leaves presented an additional noise source during this visit.

Trains were noted to pass on various occasions.

4.3 Measured Results

Full details of the measured results can be seen in the table included at the end of this report.

4.4 Noise Exposure Categories

The measurement position at the end of Beechdale Close (Position 1) is representative of the noise levels incident on the facades facing the rail line and represents a worst case noise level for the whole facade.

The noise exposure categories for the six plots are detailed in the table below.

Measurement Period	**Average Calculated Noise Level dB L_{Aeq}**	**Noise Exposure Category**
Daytime: 0700 - 2300 hours	61	B
Night-Time: 2300 – 0700 hours	56	B

Table 3: Average noise levels – Position 1

As can be seen from the table above this area of the site falls into the NEC category B during the day and NEC category B during the night-time assessment.

For sites falling into NEC B, the advice given in PPG 24 is as follows;

'Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.'

During the night-time measurements, maximum noise levels measured did not regularly exceed of 82dB (A) $L_{s, max.}$

4.5 Discussion

As stated in the above section, areas within the proposed development fall into NEC B.

It is PDA's experience that developments falling into these categories are suitable for residential development provided that adequate acoustic attenuation is provided to habitable areas. Considering the acoustic weak points of the system, typically the glazing and the ventilation, an increased performance specification in these areas will ensure that internal noise levels as stated in BS 8233 - 'Sound Insulation and Noise Reduction for Buildings – Code of Practice' can be realistically achieved.

Given that the proposed development is to be situated in an area mainly comprising of residential buildings, it is felt that the development will be suitable for residential purposes provided that suitable acoustic provisions are made.

5.0 CALCULATION OF INTERNAL NOISE LEVELS

The following section of the report considers the proposed envelope design development and calculates resultant internal noise levels within the habitable spaces inside the apartments.

5.1 Standards

British Standard 8233 'Sound insulation and noise reduction for buildings – Code of practice' provides the following values for reasonable resting conditions in indoor spaces:

Criterion	Typical Situation	Design Target in dB $L_{Aeq,T}$
Reasonable resting conditions (Daytime)	Living Rooms	40
Reasonable sleeping conditions (Night-time)	Bedrooms	35

Table 5: BS8233 Design Criteria

Further to this for a reasonable level standard in bedrooms at night, individual noise events should not normally exceed 45 dB $L_{(F)max}$ although it should be borne in mind that this is a particularly stringent criterion and that urban areas regularly see an exceedance of this noise level.

5.2 Internal Noise Level Calculation

The sound insulation provided by the building envelope is a combination of the sound reduction indices of the individual façade elements and the area of the façade they cover. The result is a composite sound insulation value for the whole façade.

Room volumes and surface areas have been provided by Jones Homes and consist of proposed plans and elevations in the form of architect's drawings.

The following external wall construction has been assumed.

External Walls

102mm Red Facing Brickwork
100mm cavity filled with glasswool insulation
100mm solid block, 1050 kg/m3
1 layer of 12.5mm plasterboard on adhesive dabs.

Ventilation

As each of the developments have fallen into NEC B it follows that it will be insufficient to provide ventilation via open windows alone. The ventilation required is in the form of background ventilation for general living conditions.

A suitable system to provide background and rapid ventilation would involve continuous mechanical extract ventilation. This method would involve extract fans within the wet areas and acoustically treated inlets within habitable rooms. This method can be used in combination with any suitable trickle ventilator or airbrick. In addition a boost control would be fitted to the extract system to provide the rapid ventilation requirements.

A suitable system to provide sufficient ventilation would involve the installation of window trickle vents. In our calculations we have considered the Greenwood AAB-4000 as a suitable vent. It should be noted that other products will also be suitable for this development however, the product must satisfy the following minimum values for octave-band $D_{ne,w}$ performance as shown in the table below.

Octave Band Frequency (Hz)	**32**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
$D_{ne,w}$ (dB)	28*	30*	32	41	49	52	53	53*	53*

*Estimated values

Table 6: Octave Band $D_{ne,w}$ Performance Values

5.3 Calculations

Internal noise levels have been calculated throughout the proposed development. During the assessment the following assumptions have been made.

A) Average measured noise level in terms of dB L_{Aeq} during the day and night used in assessments.

B) Wall construction and all room dimensions taken from Jones Homes plans and section constructions drawings.

C) Reverberation time in habitable rooms has been assumed at 0.5 seconds.

D) The roof will be mainly shielded from view from nearby noise sources due to the rail line lying in a cutting. Consequently, it is unlikely to be a prominent path for the ingress of break in noise. Furthermore, the construction specification is to a more than adequate level to provide a

sound reduction suitable for the expected internal noise levels required. As such, the roof area has not been considered in our calculations.

5.4 Results

The following tables detail the results of the calculations.

Room	Glazing Specification	Calculated Internal Noise Level with Trickle Vents dB(A)
Living Room	4/12/4	35*
Bedroom 1	4/12/4	31*
Bedroom 2	4/12/4	35*

*Assuming ventilation specification as detailed in Section 5.2

Table 7: Internal Noise Levels, Living Rooms and Bedrooms

5.5 Discussion

With regard to daytime internal noise levels, it can be seen from the above tables that the Living Room areas meet the 'reasonable' resting criterion as detailed in BS 8233 on the proviso that the correct glazing specification is used in accordance with an appropriate ventilation system.

With regard to night-time internal noise levels, it can be seen that all of the bedroom types will meet the 'reasonable' sleeping criteria as detailed in BS 8233, provided a suitable glazing specification is used.

Notes on Glazing Installation

It is noted that all sound insulation values quoted in the tables above must be achieved by the **overall combination of frame and glazing**, and not just by the glazing alone. PDA Ltd would be happy to look over manufacturers tender submissions for glazing systems to assess suitability.

Glazing frame systems must be fully sealed with any small gaps (<10mm nominal) around the perimeter to be stuffed with dense mineral wool to full frame depth and sealed both sides with acoustic non-setting mastic, with additional weathering protection to be applied additionally externally to this. No gaps should be left unsealed, and in no instance should lightweight foams be used as a sealant behind weathering protection.

6.0 CONCLUSION

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Figure 1

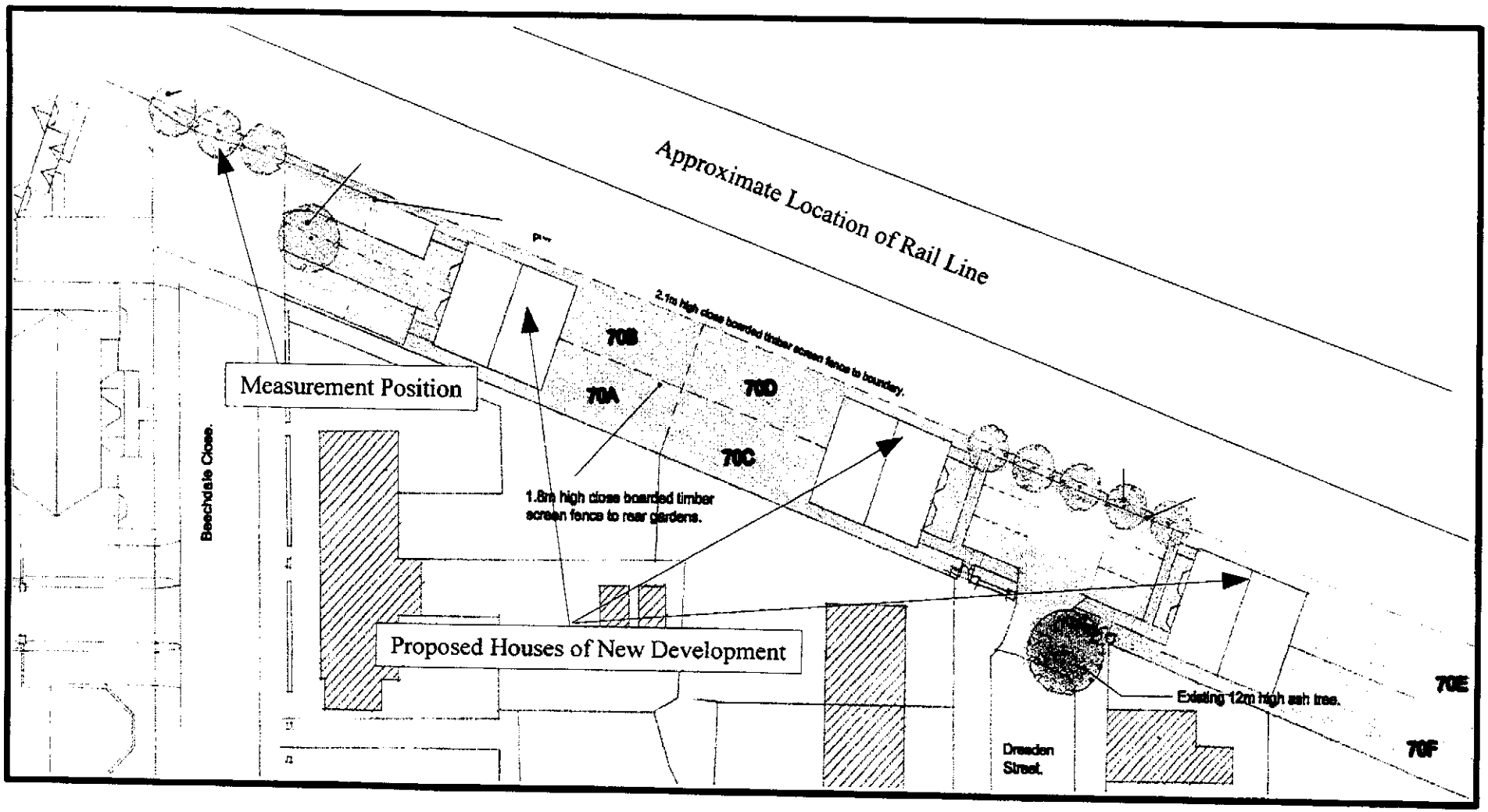

Figure 1: Location Map.

Appendix 1: Definition of Acoustic Terms

Definition of Acoustic Terms (Environmental)

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB L_{Aeq}. Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB L_{An}. It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) L_{max}, dB L_{Amax}, etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.