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Acoustic Report.

Noise impact assessment for proposed industrial units at
Goodlass Road, Speke.

Date of Survey: 22nd February 2011

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Environmental Noise Assessment to BS4142:1997 and BREEAM Pol-8

Site: Proposed Industrial Units
Goodlass Road
Speke
LIverpool

Client: Speke Business Park Ltd

Date of Survey: 22nd February 2011

Acoustic Consultant: *Iain Critchley MIOA MInstSCE for Peninsular Acoustics*

1. Introduction.

This report was commissioned by Speke Business Park Ltd, to determine the likely noise impact from the proposed development of new industrial units at Goodlass Road, Speke, on neighbouring noise sensitive property.

This assessment will be based upon the proposed industrial units, referred to as Units A, B, C and D. The layout of these units in relation to the existing office building is shown in the scale site plan of Annex A.

2. Site Description.

The proposed development site lies at the western end of Goodlass in an existing industrial estate. The site is bordered on its southern boundary by railway lines which carry inter-city passenger trains, local trains and freight trains. The Speke Junction sidings are a stopping point for freight trains and there were several stationary trains present during the survey period.

To the west of the site is the premises of Eleco Timber Frame, while to the east of the site is a four-storey office block, part of a new business park development.

At the time of writing this report, the intended use of the industrial units is not known so this report will set noise limits for the building and any associated external plant and equipment.

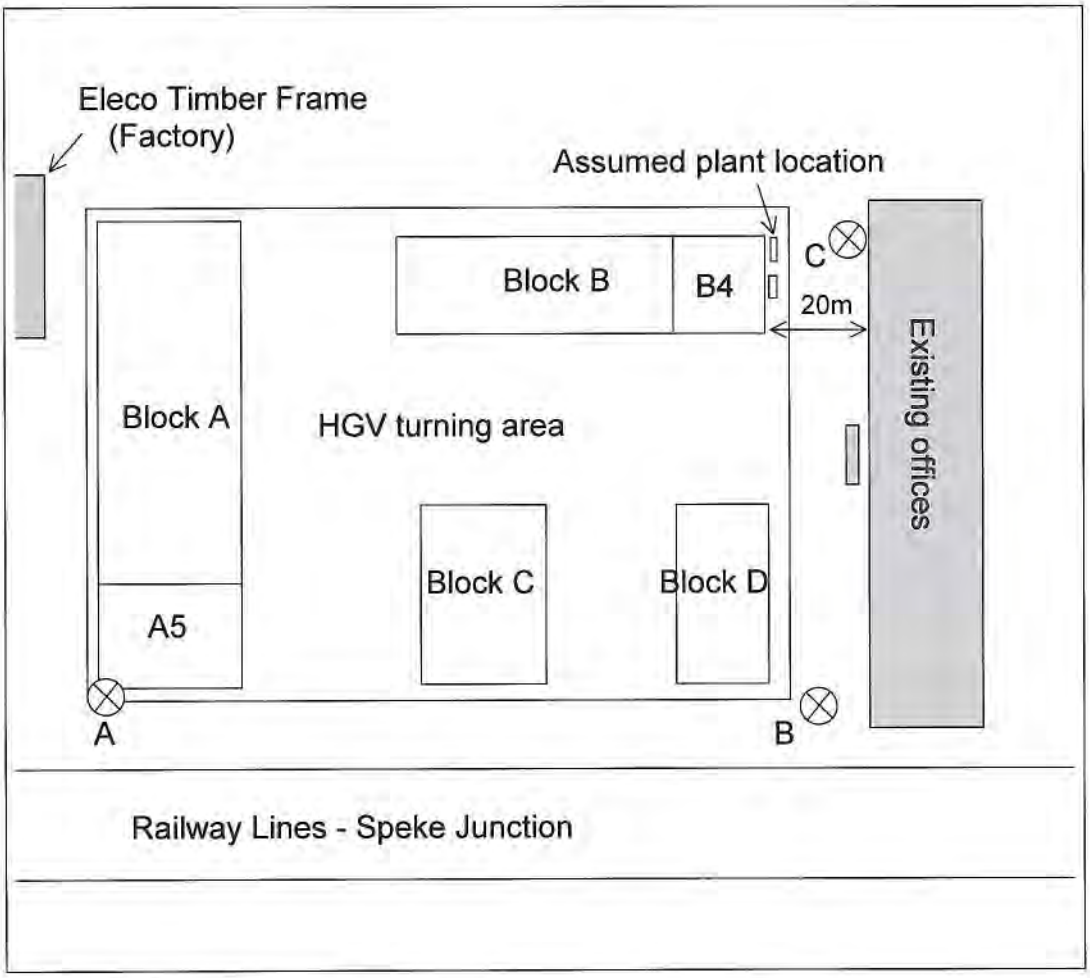
It will be assumed that the associated plant and equipment could be operational for 24 hours per day.

2.3 Sensitive Receptors

The nearest residential property is 0.6 km distance from the site (on Barford Road) and there is no other noise sensitive property in the area so the only premises likely to be affected by the proposed development is the adjacent office block. The nearest part of the proposed development to the existing office block is Unit B4 (300 m^2), which is approximately 20 metres from the office block.

The railway is a significant source of noise so this assessment will also consider the impact of railway noise on Unit A5 of the proposed development, as an example.

Figure 1 - site plan showing noise monitoring points A and B (not to scale)



3. Survey Methodology and Results.

This study was in two parts; a) to establish typical weekday ambient and background noise levels on the site and b) to estimate noise levels from the proposed development due to fixed plant and equipment and due to vehicle movements associated with the development.

The survey method is broadly in accordance with British Standard BS4142:1997 *'Method for Rating industrial noise affecting mixed residential and industrial areas'.*

However, as there is no residential property to consider, the assessment method is not strictly applicable, so some aspects of BS4142 i.e. comparison with underlying background noise LA90, will not be included.

3.1 Establishing ambient and background noise levels.

Two sound level meters were used for this survey to log noise for a four hour period from 2.00 p.m. until 6.00 p.m. on the 22nd February 2011.

Noise logging equipment for the investigation comprised a Norsonic 140 sound level meter (Ser. No.1402728) and a Norsonic 118 sound level meter (Ser. No. 31512), which were calibrated on site before and after each sequence of measurements.

Monitoring positions were at a notional height of 1.5 metres above ground, relative to the ground level of the affected properties, in accordance with the measurement Standards.

For all locations, the sound level meter was preset to record the parameters of LAeq, LAf,max and LA90, in 5 minute periods. Weather conditions were dry and mild throughout the survey period with a daytime air temperature of 8^0 Celsius. Wind speeds were less than 2 m/sec from the south-east.

3.2 Results of ambient and background noise survey.

Daytime and night time 'average' noise levels were obtained by taking the energy average of the LAeq (ambient) noise measurements at each location, and the 10th percentile of the LA90 (background) noise measurements at each location.

A further 5 minute 'spot' measurement was recorded at location C (see sketch plan - Figure 1) which indicated that the ambient noise here (due to trains) is about 9 dBA less than at Location B, while the background noise is about the same.

The results of the noise survey are presented in Table 1.

Table 1 - Daytime 'average' noise levels at each location.

Receptor Locations		**LAeq**	**LA90**
A	Unit A5	60.8 dBA	47.8 dBA
B	Block D and existing office block	61.4 dBA	47.1 dBA
C	Block B and existing office block	52 dBA*	47 dBA*

* not directly measured but estimated based upon spot readings.

3.3 Establishing noise emitted from the proposed development.

Noise breakout from within Unit B4.

There are no details of the future occupants of Unit, or the type of activity likely to take place within the unit. For the purpose of this assessment it will therefore be assumed that internal noise levels could be as high as 85 dBA.

Noise breakout from the building can then be estimated according to the estimated sound reduction of the building, the internal noise level, the surface area of the 'visible' portion of the building from each receptor, and the propagation distances.

To simplify the calculations, it will be assumed that 50% of the surface area of the building is the effective radiating area. That is approximately 300 m^2.

Noise transfer from inside to outside can be calculated using the following formula:

$L_{ext} - L_{int} - R_w + 10\log S - 20\log R - 14$

where Lint is the internal noise level, S is the effective radiating area and R is the source to receiver distance.

The estimates the noise at the office block, due to noise breakout from within Unit B4 (worst case), to be 35 dBA.

Fixed plant and equipment.

To have zero impact on the existing office block, noise from fixed plant should not exceed 52 dBA at the facade of the offices. If external plant is located on the east elevation of Unit B4 (worst case) then the noise limit specification for such plant will be 78 dBA @ 1 metre, or an equivalent sound power level (Lw) of 86 dBA.

Any plant which is likely to exceed these limits should be located within the unit, in a sound insulated enclosure, or sited further from the office block.

Vehicle Movements.

There is no available estimate of the number of vehicle movements likely to be associated with the proposed development, nor the type of vehicles which will be used for delivery and collection.

However, the following information is provided as a source of reference.

Delivery vehicles typically range from small 'Transit Combi' type diesel vans which have a relatively benign noise profile compared to heavier commercial vehicles, to articulated lorries.

Noise levels for a typical 2 minute cycle of drive in to access road, turn and reverse park to loading bay, can range from 47 dB@10 metres to 62 dBA@10 metres. These figures are based on actual site measurements, by the author, for another project.

Table 2 - Noise measurements of small diesel 'Combi' van at 10 metres.

Source	**Noise level dBA**
Tyre noise	51 dBA
Engine idling (noisiest aspect)	53 dBA
Revving 2000 rpm	57 dBA
Doors opening/closing	58 dBA (as LAf,max)
Complete sequence	47 dB LAeq(2 minutes)

Table 3 - Noise measurements of HGV tractor and trailer at 10 metres.

Source	**Noise level dBA**
Tyre noise	51 dBA
Engine idling (noisiest aspect)	59 dBA
Revving 2000 rpm	67 dBA
Cab doors opening/closing	60 dBA (as LAf,max)
Air brakes	83 dBA (as LAf,max)
Reverse alarm	75 dBA
Complete sequence	62 dB LAeq(2 minutes)

As an illustration, Table 4 shows the predicted noise level that would arise if there were 4 vehicle movements per hour. This assumes that all deliveries will take place between the hours of 8.00 a.m. and 6.00 p.m.

The HGV turning area, identified on the scale site plan of Annex A, is approximately 95 metres from the existing office block.

The BS4142 assessment of daytime noise is based upon a unit of time of 1 hour. For the purposes of this assessment it will therefore be assumed that there will be up to four HGV deliveries (or departures) in any hour.

Table 4 - equivalent hourly noise levels due to vehicle activity.

Noise Source	Source Noise level (2 minutes) at 10 m	Noise level (1 hour) 10 m	Noise level 1 hour at 95 m
4 x HGV's	68 dBA	53 dBA	34 dBA
Resulting noise level (1 hour equivalent)		53 dBA	34 dBA

4. Noise Impact Assessment.

Noise impact assessments are normally based upon British Standard BS4142:1997 *'Method for rating industrial noise affecting mixed residential and industrial areas'.*

However, as the identified receptor is the office block i.e. non residential, a simpler assessment will be made which only compares the ambient noise levels (as LAeq).

Table 5 - Noise impact assessment at Office Block.

Measurement	**Value**	**Comment**
a)Source Noise Level due to fixed plant	52 dBA	upper limit
b) source noise level due to noise breakout	35 dBA	Predicted
c) noise due to HGV movements	34 dBA	Predicted
Combined noise from all sources	52 dBA	log sum of a+b+c
Existing Daytime Ambient Noise	52 dB LAeq	Measured
Excess of noise level over background level	0 dB	
The resulting noise level is 0 dB above the present ambient noise level		

5. Train noise affecting proposed industrial units.

The daytime average noise level measured near proposed Unit A5, due to trains, is 62 dBA but this can be as high as 66 dBA in any 5-minute period.

The lowest indoor ambient noise requirement, under the BREEAM guides, is 40 dBA and this is for offices.

Therefore, the outside to inside sound insulation of the affected buildings, as a simple level difference, would need to be at least 26 dBA to insulate against the highest external noise level resulting from train movements.

This level of sound insulation is easiliy achievable by all modern lightweight factory building systems, which have a sound insulation rating of typically 35 dB Rw.

The required level of sound insulation is also easily achievable with any double-glazed windows, when closed.

It is therefore recommended that there should not be any openings on the railway elevations of Blocks A, C and D for occupied spaces which have an ambient noise requirement of 55 dBA or less. These include:

- Single occupancy offices
- Multi-occupancy offices
- Staffrooms, restrooms
- Seminar/lecture rooms
- Cafe/canteen areas.

Windows can be openable for rapid ventilation but should be fitted with acoustic trickle vents (rated at 39 dB Dne,w minimum when open) or an alternative means of ventilation provided.

6. Office Areas (BREEAM)

This assumes that there will be some office space within each of the proposed industrial units, although this isn't clear from the supplied drawings.

6.1 Sound insulation requirements between adjacent offices.

According to BREEAM Offices HEA-13, the sound insulation should be at least 35 dB (Dw) where the indoor ambient noise level from combined sources is 40 dBA. As Dw is dependent on the reverberation time in the room, this needs to be factored-in, although this isn't mentioned in the BREEAM document. With a Class A ceiling (most ceiling tiles are absorption Class A) and carpeted floor, the rev time in offices will be around 0.6 seconds, which gives an equivalent sound insulation requirement of about 37 dB (DnTw). This requires a separating wall specification of at least 44 dB (Rw), where Rw is approximately equal to DnTw + 7. However, indoor ambient noise levels in small offices are commonly 35 dBA or less (unoccupied) so it will be better to design to a slightly higher spec of 49/50 dB (Rw).

This does not include for weakness due to doors and assumes that walls are built from floor to soffit. A typical door is only rated about 25 dB Rw, so if connecting doors are required between offices, they should be either double doors, or a heavy acoustic doorset.

6.2 Sound insulation for offices adjacent to noisy production areas.

The first requirement here is to achieve the required indoor ambient noise level of 40 to 50 dB. Assuming that the production area could be up to 85 dBA (any higher than this and it is probably in breach of the Noise at Work Regulations!), the minimum sound insulation required will be 35 to 45 dB (Dw). This will require a separating wall specification of at least 54 dB (Rw) as it good practice to design for the lower limit of the noise range.

This is not practically achievable with doors opening directly between the office and an adjacent production area so it is normal practice to have a buffer-zone, which is a corridor or lobby so that there are at least two standard doors between the office and the production area.

Free-standing offices within large production areas will need a substantial roof, which must also have a sound insulation specification of up to 54 dB (Rw).

6.3 Summary recommendations and suggested specifications.

1. Reverberation Time of 0.6 seconds or less – use Class A ceiling tiles for all suspended ceilings.

2. Between adjacent offices, use a separating wall spec of at least 50 dB Rw e.g Gypwall 'Classic' with2 layers of 12.5 mm wallboard either side of 70 mm 'C' studs, with 50 mm of mineral wool insulation in the cavity.

3. For offices next to production areas, use a separating wall spec of at least 54 dB (Rw) e.g. Gypwall 'Classic' with 2 layers of 15 mm 'Soundbloc' either side of 70 mm 'C' studs, with 50 mm of mineral wool insulation in the cavity.

4. For the roof over free-standing offices, you will need to use a heavier steel (or timber) joist section of at least 150 mm depth with 2 layers of 15 mm 'Soundbloc' either side of 70 mm 'C' studs, with 50 mm of mineral wool insulation in the cavity.

5. Ensure that mechanical services noise in offices does not exceed 35 dBA.

7. Summary and Conclusions.

1. The ambient noise on the site is 61 dBA averaged over the working day, due to train movements. This can be as high as 66 dBA in any 5 minute period. At the northern end of the existing office block, further from the railway lines, the average daytime ambient noise is about 52 dBA.

2. Occupied areas within the proposed industrial units e.g. office areas, canteen, staffroom etc, will require acoustic trickle vents to windows, or alternative means of ventilation, if they are located close to the railway.

3. There are no residential properties close to the development site. The nearest 'noise sensitive location' will therefore be assumed to be the existing office block.

4. Consideration has been made of noise from Unit B4 (worst case), taking account of noise breakout from within the building, fixed plant and equipment and general vehicle movements, but all based on assumptions about the likely usage.

5. The results of the noise impact assessment in respect of the existing office block, show that there will be no significant increase in ambient noise level at the facade of the existing offices, as a consequence of the proposed development, provided that no item of plant or equipment exceeds a sound power level (Lw) of 86 dBA, when located near Unit B4. The same condition will apply to any plant located on the east elevation of Block D.

This concludes the report.

Signature/name of consultant.....Date: 25/2/11

For and on behalf of:

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8. Definitions.

1. LAeq (t)

   This is a measure of the 'average' noise level, in decibels, which has occurred over a given time period (t) e.g. LAeq (8 hours). The 'eq' stands for equivalent level as its proper definition is *"the equivalent steady sound level containing the same energy as the fluctuating sound level over the same time period"*. The 'A' means that the quoted sound level is 'A' - weighted.

2. 'A' - weighting e.g. in dBA.

   The sound level has been measured with an instrument whose sensitivity has been 'tailored' to match the typical frequency response of the human ear. Nearly all environmental noise measurements are expressed in dBA.

3. LA90.

   This is the sound level, in decibels (dBA), which is exceeded for 90% of the measurement period. LA90 is used to determine the background noise level of an area.

4. LA10.

   This is the sound level which is exceeded for 10% of the measurement period and is a traditional unit for the measurement of road traffic noise.

5. LAf,max.

   This is the highest level or 'peak' level*, measured with 'fast' time weighting, which is reached by the fluctuating noise level over the stated time period, even if it is only reached for a fraction of a second. Used to describe the highest sound level of short duration individual events such as a vehicle pass-by, which might cause disturbance or wake someone from sleep. It is possible to have high values of LAf,max even where the 'average' noise level, the LAeq, is relatively low.

   * Technically, the term 'peak noise level' refers to a different parameter which is not measured as part of a normal noise survey. It is occasionally used in this report as a convenient shorthand for LAf,max as it is a concept which is more easily understood by people who do not have a knowledge of acoustics theory.

Annex A.

Plan of site.