

Acoustic Consultancy Report

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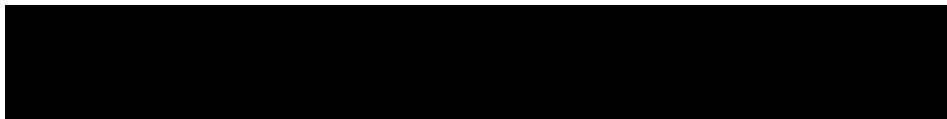
Background Noise Survey

Report Prepared For

Paragon Llp
Arun Retail
30 January 2014

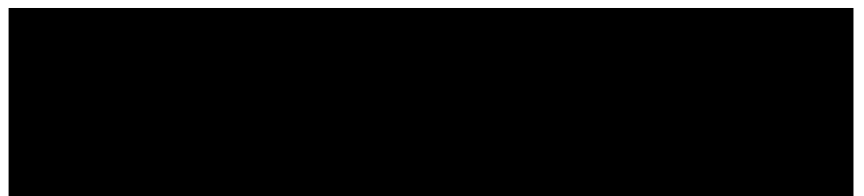
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i) Executive Summary

Refurbishment is proposed for two buildings (units D1 and D2) at Arun Retail Park, in Bognor Regis.

LCP has been commissioned by Paragon LLP to carry out a background noise survey and to use the obtained data to set design criteria.

The design criterion is as follows:

Day: 39 dB $L_{Aeq,T}$ at 6m, Riverside Holiday Park;

Evening: 35 dB $L_{Aeq,T}$ at 6m, Riverside Holiday Park;

Night: 35 dB $L_{Aeq,T}$ at 6m, Riverside Holiday Park.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	30/01/2014	Initial Issue	RM	MB

Evaluation of Design Criteria

Residential Design Criterion

004142:1007

BS4142:1997 states that the 'likelihood of complaints' are to be assessed by subtracting the measured background noise level from the calculated rating level. The following table demonstrates the resultant assessments based upon the calculated rating level.

Table 2: BS4142 assessment based upon rating level

Difference between background noise and rating levels	Assessment
+ 10 dB	Complaints are likely
+ 5 dB	Marginal significance
- 10 dB	Complaints are unlikely

In acoustic terms, a calculated rating level 10 dB below the measured background noise level means that the measured background noise level is not increased.

An explanation of the effects of changes in the difference between the rating level and the background noise level can be found in the glossary in Appendix D. The corresponding subjective change in loudness is described.

A 5 dB correction shall be applied in the case of intermittent or tonal plant noise emissions.

BS4142:1997 also states that background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low. Therefore a rating level of 35 dB is recommended. This will also ensure compliance with BS 8233 and World Health Organisation Guidelines.

World Health Organisation Night Noise Guidelines for Europe (2009)

The WHO's document 'Night Noise Guidelines for Europe (NNG) states the following:

“...it is recommended that the population should not be exposed to night noise levels greater than 40 dB of $L_{\text{night, outside}}$ during the part of the night when most people are in bed.”

It then goes on to say:

“An interim target (IT) of 55 dB $L_{night, outside}$ is recommended in the situations where the achievement of NNG is not feasible in the short run for various reasons.”

As the above guideline values consider the combined level of noise external to a façade (i.e. vehicular traffic, air traffic, building services noise etc), it is recommended that a criterion of 10 dB below these given levels is applied, depending on the particulars of the site in question.

World Health Organisation (WHO) Guidelines for Community Noise (1989)

The WHO's 'Guidelines for Community Noise' gives the following relevant noise criteria:

Table 3: Guideline values for community noise, from Guidelines for Community Noise (WHO, 1999)

Specific Environment	L _{Aeq, T} dB	Time Base (hours)	L _{Amax, fast} dB
Outdoor living area (serious annoyance, daytime and evening)	55	16	-
Outdoor living area (moderate annoyance, daytime and evening)	50	16	-
Dwelling, indoors	35	16	-
Inside bedrooms	30	8	45
Outside bedrooms	45	8	60
Outdoors in parkland and conservation areas*	-	-	-

* Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low

3.1.4 BS8233:1999

The criteria offered in BS8233 for residential buildings are largely based on the recommendations made in the Guidelines for Community Noise. BS8233 gives internal criteria for bedrooms and living rooms for both 'reasonable' and 'good' resting/sleeping conditions.

BS8233 also gives general guidance on the expected sound insulation performance of a given building façade, with details of how various elements can affect the overall performance. Concerning windows, it states that:

"...if windows are intended to be opened to provide rapid ventilation and summer cooling, the insulation will reduce to about 10 dB or 15 dB..."

This infers that should windows on a noise affected façade be openable, a sound insulation value of 10-15 dB should be applied to the whole façade to an internal room being assessed. On this basis, the criteria shown in the table below have been adapted from the criteria offered in table 5 of BS8233 in order to obtain acceptable external noise levels.

The noise levels shown should be treated as overall noise levels, i.e., the combination of all existing noise levels at the site, and noise levels from any proposed plant or activity.

Table 4: BS8233 criteria, dB re 2x10⁻⁵ Pa

External Facade	Design Range L _{Aeq, T}		L _{Amax} *
	Good	Reasonable	
Living Rooms	40	50	n/a
Bedrooms	40	45	55

* Fast time weighting

In addition to the above criteria, BS8233 goes on to say:

"In gardens and balconies etc it is desirable that the steady noise level does not exceed 50 $L_{Aeq, T}$ dB and 55 dB $L_{Aeq, T}$ dB should be regarded as the upper limit."

The above criteria are in line with the recommendations made in WHO's 'Guidelines for Community Noise'.

3.1.5 Local Authority Requirements

Graham Evans from Arun District Council stated that the Local Authority follows the guidance from BS4142.

3.1.6 Design Rating Level

On the basis of the above the design rating level shall therefore be:

Table 5: Design rating levels, dB re 2×10^{-5} Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq, 12 \text{ hr}}$	Design Level (Evening) $L_{Aeq, 4 \text{ hr}}$	Design Level (Night) $L_{Aeq, 8 \text{ hr}}$
Riverside holiday park	6	39	35	35

4 Conclusion

An environmental noise survey has been undertaken in order to establish the existing background noise levels local to the site generally in accordance with the method contained within BS4142: 1997.



Appendix A: Site Plan

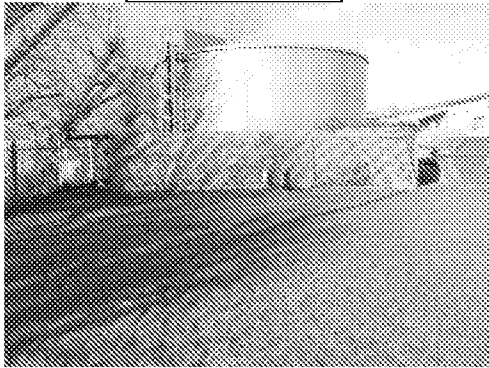


Google earth



Appendix B: Photographs

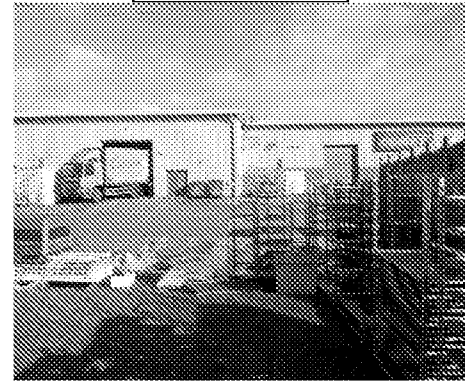
Looking North



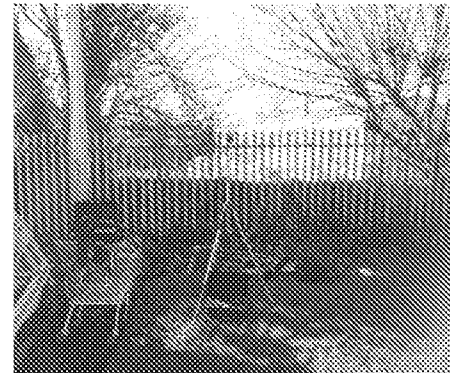
Looking South



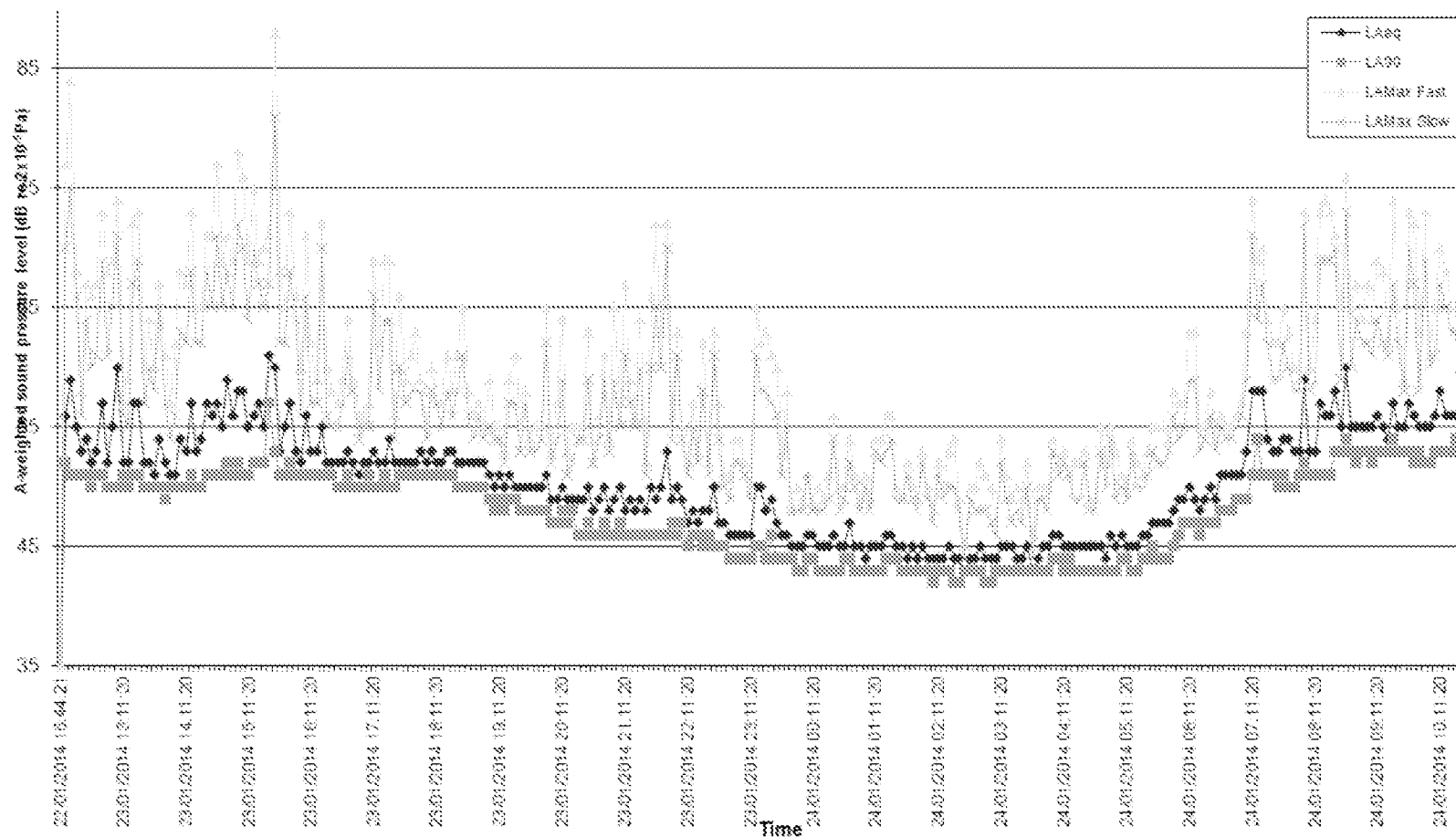
Looking East



Looking West



Appendix C: Measurement Data



Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11259
- Svantek pre-amplifier SV12L S/N: 11484 with GRAS microphone capsule 40AE S/N: 82239

Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10893 complying with Class 1 specification of BS EN 60942:2003, calibration level 94.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Appendix D: Glossary

The list below details the major acoustical terms and descriptors, with brief definitions:

'A' Weighting

Weighting applied to the level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The letter 'A' will follow a descriptor, indicating the value has been 'A' weighted. An 'A' weighted noise level may also be written as dB(A).

Airborne Noise

Noise transmitted through air.

Ambient Noise

The total noise level including all 'normally experienced' noise sources.

dB or Decibel

Literally meaning 'a tenth of a bel', the bel being a unit devised by the Bell Laboratory and named after Alexander Graham Bell. A logarithmically based descriptor to compare a level to a reference level. Decibel arithmetic is not linear, due to the logarithmic base. For example:

$$30 \text{ dB} + 30 \text{ dB} \neq 60 \text{ dB}$$

$$30 \text{ dB} + 30 \text{ dB} = 33 \text{ dB}$$

$D_{nTw} + C_{tr}$

The weighted, normalised difference in airborne noise levels measured in a source room (L1) and a receive room (L2) due to a separating partition.

D	Is simply $L1 - L2$.
D_{nT}	Is the normalisation of the measured level difference to the expected (in comparison to the measured) reverberation time in the receiving room.
D_{nTw}	Is the weighted and normalised level difference. This value is the result of applying a known octave band weighting curve to the measured result.

C_{tr}

Is a correction factor applied to the D_{nTw} to account for the known effects of particular types of noise, such as loud stereo music or traffic noise.

Frequency (Hz)

Measured in Hertz (after Heinrich Hertz), and represents the number of cycles per second of a sound or tone.

Insertion Loss, dB

The amount of sound reduction offered by an attenuator or louvre once placed in the path of a noise level.

$L_{A90, T}$

The 'A' weighted noise level exceeded for 90% of the time period T, described or measured. The '90' can be substituted for any value between 1 and 99 to indicate the noise level exceeded for the corresponding percentage of time described or measured.

$L_{Aeq, T}$

The 'A' weighted 'equivalent' noise level, or the average noise level over the time period T, described or measured.

L_{Amax}

The 'A' weighted maximum measured noise level. Can be measured with a 'slow' (1 sec) or 'fast' (0.125 sec) time weighting.

L_{Amin}

The 'A' weighted minimum measured noise level.

NR

Noise Rating (NR) level. A frequency dependent system of noise level curves developed by the International Organisation for Standardisation (ISO). NR is used to categorise and determine the acceptable indoor environment in terms of hearing preservation, speech communication and annoyance in any given application as a single figure level. The US predominantly uses the Noise Criterion (NC) system.

Octave

The interval between a frequency in Hz (f) and either half or double that frequency (0.5f or 2f).

Pa

Pascals, the SI unit to describe pressure, after physicist Blaise Pascal.

Reverberation Time, T_{mf} , RT60, RT30 or RT20

The time taken in seconds for a sound to diminish within a room by 1,000 times its original level, corresponding to a drop in sound pressure of 60 dB. When taking field measurements and where background noise levels are high, the units RT20 or RT30 are used (measuring drops of 20 or 30 dB respectively). Sometimes given as a mid-frequency reverberation time, T_{mf} which is the average of reverberation time values at 500Hz, 1kHz and 2kHz.

R_w

The sound reduction value(s) of a constructional element such as a door, as measured in a laboratory, with a known octave band weighting curve applied to the result.

Sound Power Level

A noise level obtained by calculation from measurement data, given at the face of an item of plant or machinery. Referenced to 10^{-12} W or 1pW.

Sound Pressure Level

A noise level measured or given at a distance from a source or a number of sources. Referenced to 2×10^{-5} Pa.

Subjective Effect of Changes in Sound Pressure Level

The table below details the subjective effects of variations in sound pressures (adapted from Bies and Hansen).

Difference between background noise and rating levels	Increase in ambient noise level in 'real terms'	Change in apparent loudness
+ 10 dB	+ 10 dB	Twice as loud
+ 5 dB	+ 6 dB	Clearly noticeable
0 dB	+ 3 dB	Just perceptible
-10 dB	0 dB	No change

W

Watts, the SI unit to describe power, after engineer James Watt.