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PJD/PPN/C/1234.01

26th July 2016

4 Paul St
Liverpool
L3

Environmental Planning Noise Assessment

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1.0 SUMMARY

It is proposed to construct a residential development at 4 Paul Street, Liverpool L3. ADC Acoustics was asked to carry out an independent planning assessment of the level of background noise present at the proposed development site.

We are not aware of any other criteria associated with this project. BS8233 is intended primarily for traffic noise, but it was originally based on WHO criteria for general community noise and is thought to be the most suitable standard to apply to this assessment since industrial noise is not the most dominant form of background noise.

The survey was carried out by Mark Pickering of ADC Acoustics.

The most dominant source of background noise on the site was from seagulls and road traffic.

Some industrial noise was audible but at a lower level.

Calculations have been performed using a standard glazing arrangement such as 4mm glass 20mm air gap and 4mm glass and have shown that the predicted internal noise levels will be within the requirements of BS8233.

A R Raymond

P J Durell

2.0 INTRODUCTION

It is proposed to construct a residential development at 4 Paul Street, Liverpool L3. ADC Acoustics was asked to carry out an independent planning assessment of the level of background noise present at the proposed development site.

This report begins by discussing the various assessment criteria applicable to this situation. We follow by describing in simple terms our basic approach to assessment and modelling. After a short description of survey details, we discuss our results and present our conclusions and recommendations.

3.0 ASSESSMENT STANDARDS

3.1 NPPF

The National Planning Policy Framework provides nothing in the way of quantitative criteria. The main statement on noise is to be found in paragraph 123:-

123. Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

The NPPF refers to the Noise Policy Statement for England (NPSE) which sets out the following aims:-

1. avoid significant adverse impacts on health and quality of life;
2. mitigate and minimise adverse impacts on health and quality of life; and
3. where possible, contribute to the improvement of health and quality of life.

It also introduces the concepts of:

- NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

3.2 BS8233

BS8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations.

Table 4 of BS8233 gives the desirable criteria for indoor ambient noise levels for dwellings as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,16hour}$

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,16hour}$	45 dB $L_{Aeq,16hour}$

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions. Note that the new version does not explicitly state criteria for bedroom noise in terms of dB L_{Amax}.

Garden area criteria are unchanged with 50 dB L_{Aeq} and 55 dB L_{Aeq} being considered desirable and reasonable respectively.

Note that the new version of BS8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

3.3 BS4142

BS 4142 was updated in November 2014. The standard is very complicated but, basically, it describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

a) sound from industrial and manufacturing processes

b) sound from fixed installations which comprise mechanical and electrical plant and equipment

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises

d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

   The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Characteristics and Context

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, we need to add a character correction to the specific sound level to obtain the rating level.

These features can include tonality, impulsivity and intermittency with corrections typically ranging potentially from 0dB to 9 dB. Corrections at the higher end would represent characteristics which are highly perceptible in the context of the ambient noise as a whole. Corrections at the lower end would represent characteristics which are just perceptible in the presence of the ambient noise as a whole,

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Overall Suggested Criterion

We are not aware of any other criteria associated with this project. BS8233 is intended primarily for traffic noise, but it was originally based on WHO criteria for general community noise and is thought to be the most suitable standard to apply to this assessment since industrial noise is not the most dominant form of background noise.

4.0 SURVEY DETAILS

5.1 Site Times and Personnel

The survey was carried out by Mark Pickering of ADC Acoustics.

Site Notes:

Night-time Background survey.

Carried out on the 18th July 2016
Description of area.
Student accommodation at the bottom off Paul street & industrial units further on ,
Main source of noise is seagulls.

Weather conditions
Temperature 27 degrees
Wind direction south east
Pressure 1013 mb
Cloudy skies
Wind speed 1.0m/s

Rush Hour Carried out

on 20th July 2016

Main Source of Noise, is coming form from the industrial units adj to position 1
Seagulls making noise,

Weather Conditions

Temperature 26 degrees
Wind direction north west
Wind Speed 0.3m/s

5.2 Instrumentation

Instrumentation used was a Rion NA 28 . This is a precision grade sound level meter which holds a current calibration certificate and which was field- calibrated as required.

5.3 Measurement Positions

Main assessment positions were as shown on the following sketch. In all cases, measurements were about 1.5 m above the ground but well away from other reflecting surfaces, see below:

6.0 RESULTS AND CONCLUSION

Please see appendices for measurement data and calculations.

The most dominant source of background noise on the site was from seagulls and road traffic.

Some industrial noise was audible but at a lower level.

Calculations have been performed using a standard glazing arrangement such as 4mm glass 20mm air gap and 4mm glass and have shown that the predicted internal noise levels will be within the requirements of BS8233.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20μPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20μPa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to give an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted levels are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

NR and NC Levels

NR curves and NC curves are a series of curves representing noise levels across the frequency range. A given noise climate has an NR level or NC level if it equals a point on the curve at any frequency. They are particularly, although by no means exclusively, used as a means of specifying noise limits in an indoor environment, for instance from mechanical services or traffic noise break-in from the outside. They are typically expressed as NR or NC followed by a number, e.g. NR40, NC55, etc.

Equivalent Continuous Sound Level, L_{eq}

This can be simplistically described as a way of expressing the average noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceed for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band from low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.

Sound Insulation

Sound insulation is best expressed across the frequency range in octave bands or third octave bands. Often, however, in known environments such as domestic sound insulation and speech privacy, it is simpler to express the sound insulation as a single figure. A higher value means better sound insulation.

The most common ways are dB D_{nTw}, dB R_w and $dB_{(mean\ 100\text{-}3150Hz)}$. The first two are ways of expressing average sound insulation, weighted to account for speech frequencies. The third is simply an un-weighted mean value.

The Building Regulations Approved Document E (ADE) routinely refer to D_{nTw} $+C_{Tr}$. The C_{Tr} term is a negative number which is used to modify the D_{nTw} value for the insulation properties at lower frequencies.

ADE also uses the L_{nTw} index for impact sound transmission. It is a measure of the level of noise in the room below a room in which a standard tapping machine is being used. It represents the impact sound transfer such as footfall noise, scraping chairs, washing machines, etc. A lower value means better insulation.

Reverberation Time

The most common measure of Reverberation Time is, effectively the time taken for sound from a steady source to decay by 60 dB after it has been abruptly cut off. In practice it is often difficult to measure a 60 dB decay and so decays of 30 dB, 20 dB, or even 10 dB are often used and adjusted pro rata, although the exact measure is not quite the same.

Reverberation Time is generally expressed as RT in seconds. We may, if we are being precise, add subscripts 60, 30, etc to show whether the basis of the measure is 60 dB decay, 30 dB decay, etc. E.g. the RT_{60} = 0.52s, the RT_{30} = 0.49s, etc.

RT can be expressed in octave bands or 1/3 octave bands across the frequency range, or at central frequencies such as 500 Hz or 1kHz.

Appendix 2

Measurements and Calculation Details

Daytime Measurements

Position	Time	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
1	16:00	Leq	**7**								
		Lmax	**7**								
		L90	**7**								
	16:30	Leq	**63**	68.7	58.3	60.1	57.5	59.9	53.7	49	38.8
		Lmax	**85**	88.4	82.8	85.2	79.2	80.5	78.5	75.8	69.3
		L90	**45**	52.2	44.8	44.3	41.1	42	36.1	30.6	20.2
	17:00	Leq	**64**	65.6	57.4	54	53.3	59.4	57.5	55.7	46
		Lmax	**89**	86.4	80.7	77.7	83.5	81.9	82.1	82.8	77.7
		L90	**45**	50.8	44.2	42.9	40.1	41.4	36.1	30.5	19
	17:30	Leq	**65**	65	59.5	59.5	58.8	61.3	56.5	56.1	47.8
		Lmax	**91**	89	86.9	83.6	83.8	83.6	82.8	85.9	80.8
		L90	**46**	50.3	45	43.3	41.8	42.6	36.5	29.3	16.2
2	16:07	Leq	**63**	65.3	59.2	59.7	57.9	61	55.3	46.7	38.4
		Lmax	**88**	84.4	79.5	84.9	83.1	85	80.3	71.4	64.8
		L90	**46**	52.3	46.5	44.5	42	43.1	37.1	29.7	17.1
	16:37	Leq	**62**	65.8	57.2	57.8	56.7	60	54	48	38.4
		Lmax	**88**	89.6	75.6	81.8	80.2	84.6	81.4	80.2	71.5
		L90	**47**	52.1	45.7	44.3	43	43.9	39	31.2	17.6
	17:07	Leq	**63**	69.3	58.4	60	58.1	61.2	52.9	46.6	37.7
		Lmax	**86**	92.9	83.2	86	81.4	83.2	74.5	71.9	61.2
		L90	**44**	53.7	45.9	42.3	39.3	40.7	35.4	27.9	16.2
	17:37	Leq	**59**	68.7	56.6	56.6	53.8	55.8	51.6	46.3	38.5
		Lmax	**83**	91.8	77.2	80.9	77.3	78.3	77.1	71.6	66.6
		L90	**43**	52.7	45.5	42.1	39.4	40.1	34.2	26.1	15.5

Night Time Measurements

Position	Time	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
1	23:00	Leq	**53**	53.7	50	46.8	45.4	49.5	46	40.2	22.3
		Lmax	**74**	76.8	61.2	59.8	61.9	70.8	67.7	63	46.9
		L90	**43**	44.3	43.7	40.8	39.7	40.5	34.3	24.2	13.5
	23:30	Leq	**51**	58.1	54.8	48.7	45.7	48.7	40.9	34.2	21.7
		Lmax	**77**	85	88.7	78.6	72.3	67.1	60.1	62.9	59.4
		L90	**42**	48.2	45.2	40.7	38.7	39.4	32.2	22.2	13.5
	00:00	Leq	**49**	55.7	51.7	47.3	44.1	45.9	40.6	35.5	18.6
		Lmax	**68**	72.6	64.4	61.6	58.2	60.6	61.6	62.2	45.3
		L90	**42**	46.1	44.5	40.9	38.9	38.7	31.3	21.2	12.8
	00:30	Leq	**48**	53.3	50.1	46.3	44	44.8	38	29.1	18.5
		Lmax	**67**	70.5	63.6	61.9	60.4	59.9	63.1	57.2	49.1
		L90	**42**	43.9	43.2	40.2	38.8	39	31.9	21.2	12.8

Position 1 *Living Room*			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Width of Exposed Façade 1	2.70	m	**-**	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00	m	**-**	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00	m	**-**	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00	m	**-**	-	-	-	-	-	-	-	-
Total Exposed Façade Width	2.70	m	**-**	-	-	-	-	-	-	-	-
Element Height	2.50	m	**-**	-	-	-	-	-	-	-	-
Room Depth (re. Exposed façade 1)	3.00	m									
Element Area	6.75	m2	**-**	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	7.25	m2	**-**	-	-	-	-	-	-	-	-
Room Volume	20.25	m3	**-**	-	-	-	-	-	-	-	-
Assumed RT	0.50	s	**-**	-	-	-	-	-	-	-	-
Element Area Correction			**-**	9	9	9	9	9	9	9	9
Room Correction 10 x Log (RT/0.163/V)			**-**	-8	-8	-8	-8	-8	-8	-8	-8
Walls: Traditional Masonry	5.31	m2	**-**	23	32	41	47	49	53	58	55
Glazing: Basic thermal eg. 4+20+4	1.44	m2	**-**	15	24	20	25	35	38	35	32
Vents: Non-acoustic eg. Simon Airstrip 300	0.50	m2	**-**	23	28	26	26	40	38	32	36
Composite SRI	7.25	m2	**-**	20	29	27	31	41	43	40	38
Level Difference (Reverberant only)			**-**	-19	-28	-26	-30	-41	-43	-39	-38
Allowance for flanking/workmanship	7	dB	**-**	7	7	7	7	7	7	7	7
Predicted Internal Levels	Rush	Leq	**35**	53	36	38	32	25	19	21	13
	Night	Leq	**24**	43	31	28	21	14	6	4	-10
		Lmax	**50**	67	62	54	44	33	28	30	23

Position 1 *Bedroom*			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Width of Exposed Façade 1	2.70	m	**-**	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00	m	**-**	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00	m	**-**	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00	m	**-**	-	-	-	-	-	-	-	-
Total Exposed Façade Width	2.70	m	**-**	-	-	-	-	-	-	-	-
Element Height	2.50	m	**-**	-	-	-	-	-	-	-	-
Room Depth (re. Exposed façade 1)	3.00	m									
Element Area	6.75	m2	**-**	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	7.25	m2	**-**	-	-	-	-	-	-	-	-
Room Volume	20.25	m3	**-**	-	-	-	-	-	-	-	-
Assumed RT	0.50	s	**-**	-	-	-	-	-	-	-	-
Element Area Correction			**-**	9	9	9	9	9	9	9	9
Room Correction 10 x Log (RT/0.163/V)			**-**	-8	-8	-8	-8	-8	-8	-8	-8
Walls: Traditional Masonry	5.31	m2	**-**	23	32	41	47	49	53	58	55
Glazing: Basic thermal eg. 4+20+4	1.44	m2	**-**	15	24	20	25	35	38	35	32
Vents: Non-acoustic eg. Simon Airstrip 300	0.50	m2	**-**	23	28	26	26	29	29	29	36
Composite SRI	7.25	m2	**-**	20	29	27	31	38	39	38	38
Level Difference (Reverberant only)			**-**	-19	-28	-26	-30	-38	-39	-38	-38
Allowance for flanking/workmanship	7	dB	**-**	7	7	7	7	7	7	7	7
Predicted Internal Levels	Rush	Leq	**25**	43	31	28	21	17	11	6	-10
	Night	Leq	**25**	43	31	28	21	17	11	6	-10
		Lmax	**50**	67	62	54	44	36	32	31	23