
ARR/PPN/C/2001.02

17th November 2013

Oakwell Community Assets

Assessment of noise at the
land to the NW of Oakwell Stadium
for proposed residential development

Prepared for :-

Planning and Law
The Old Office
Grange Farm
Grange Road
Singleton
Lancashire
FY6 8LP

Prepared by :-

Andrew Raymond

CONTENTS

1.0 SUMMARY

2.0 INTRODUCTION

3.0 ASSESSMENT STANDARDS

3.1 NPPF

3.2 BS8233

3.3 Planning Conditions

4.0 SURVEY DETAILS

4.1 Site Times and Personnel

4.2 Instrumentation

4.3 Measurement Positions

4.4 Survey Conditions

5.0 RESULTS AND DISCUSSIONS

5.1 Basic Results

5.2 Assessment

5.3 Mitigation

6.0 CONCLUSIONS/RECOMMENDATIONS

Appendix 1: Definition of Acoustic Terms

Appendix 2: Measurement Details

1.0 **SUMMARY**

Nearly all the time, noise was dominated by the A628 to the South and the A61 to the west. During the match, there were swells in the noise from the stadium and activity in the car park, but general traffic was still dominant most of the time. The crowds were well controlled and arrived and dispersed well.

Noise levels are within BS8233 criteria with partly open windows assumed or with basic garden fencing.



A R Raymond



P J Durell

2.0 **INTRODUCTION**

ADC was asked to carry out an independent assessment of the above site with regards to its suitability for residential development from a noise perspective.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

After a brief statement of survey details we discuss basic results and the resulting assessment, along with any mitigation which might be implied. We sum-up and conclude at the end, along with brief 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 impacts²⁷ on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts²⁷ 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;²⁸ 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.

3.2 **BS8233**

BS8233 is a wide-ranging document which covers many aspects of noise in buildings but includes recommended “Reasonable” and “Good” noise climates in its Table 5. Of most significance to environmental noise assessments are the levels given for living rooms and bedrooms.

The significant aspects are summarised below:

Environment Experiencing the Noise	Criterion	Noise Levels		
		L _{Aeq} (0700-2300)	L _{Aeq} (2300-0700)	L _{Amax} (2300-0700)
Living Rooms	Good Conditions	30 dB	n/a	n/a
	Reasonable Conditions	40 dB	n/a	n/a
Bedrooms	Good Conditions	n/a	30 dB	45 dB
	Reasonable Conditions	n/a	35 dB	45 dB
Gardens and Balconies	Desirable	50 dB	n/a	n/a
	Upper Limit	55 dB	n/a	n/a

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:-

Environment Experiencing the Noise	Criterion	Noise Levels		
		L _{Aeq} (0700-2300)	L _{Aeq} (2300-0700)	L _{Amax} (2300-0700)
Living Rooms	Good Conditions	45 dB	n/a	n/a
	Reasonable Conditions	55 dB	n/a	n/a
Bedrooms	Good Conditions	n/a	45 dB	60 dB
	Reasonable Conditions	n/a	50 dB	60 dB
Gardens and Balconies	Desirable	50 dB	n/a	n/a
	Upper Limit	55 dB	n/a	n/a

Note also that the standard is aimed at general anonymous noise and not necessarily specific and identifiable sources. In a rural situation this might be distant traffic interspersed with infrequent local traffic. In a suburban situation this might be local and middle distance traffic. In a city centre, this might be crowds of people and busy traffic, and perhaps some faint music.

Most acoustics professionals have some difficulties with BS8233. Firstly, it is design guidance. It is not a set of rigid criteria, below which a development “passes” and above which a development “fails”. For instance, with windows open, there can be very few developments outside the quietest of areas where the internal levels do not exceed at least some of the various “good” criteria. Also, there is the issue that the L_{Amax} criteria for night time are the same for “good” and “reasonable” conditions. It is not clear why this is so, and many argue that it has no relevance in many areas, especially a city centre and that an internal level of 50 dB L_{Amax} would be more than reasonable and the draft revision of BS8233 allows for levels up to 55 dB L_{Amax}.

3.3 Planning Conditions

As far as we are aware no noise related planning conditions have been suggested.

4.0 SURVEY DETAILS

4.1 Site Times and Personnel

The measurements were carried out by Andrew Raymond of ADC Acoustics.

Non match day assessments were carried out on 22nd November 2011 between about 16:00 hours and 18:00 hours to represent rush hour, and between about 23:00 and 01:00 the following night, representing what is likely to be the noisier end of the night. A match was also assessed between about 18:00 and 22:30 on 6th December 2011.

4.2 Instrumentation

Instrumentation used was a Larson Davis 824. This is a precision grade sound level meter which holds a current calibration certificate and which was field-calibrated as necessary. The meter was set up to measure 10 to 20 minute samples in terms of dB L_{eq} , dB L_{Amax} and dB L_{A90} in overall A-weighted terms, and in octave bands across the frequency range. See Definition of Acoustic Terms in Appendix 1.

4.3 Measurement Positions

The measurement position was as shown on the following plan.



The microphone was 1.5 m above ground and well away from other reflecting surfaces.

4.4 Survey Conditions

We have no reason to believe that the conditions we found on the surveys were anything other than representative of normal conditions.

The match was on a chilly but pleasant evening, with an average attendance for the season and a 2:1 home win. More details statistics are shown in Appendix 2.

Weather conditions had negligible impact on the measurements. Details are as follows :-

Rain	:	none, dry roads
Cloud	:	0 to 100% high
Temperature	:	5 to 10 Celsius
Wind	:	less than 5m/s from an indeterminable direction

5.0 RESULTS AND DISCUSSIONS

Nearly all the time, noise was dominated by the A628 to the South and the A61 to the west. During the match, there were swells in the noise

from the stadium and activity in the car park, but general traffic was still dominant most of the time. The crowds were well controlled and arrived and dispersed well.

5.1 Basic Results

Full details are given in Appendix 2. A summary is as follows:-

<i>Measurement</i>	<i>Position</i>	<i>Index</i>	<i>dB(A)</i>
Rush Hour	Main	Leq	53
		Lmax	77
Night Time	Main	Leq	42
		Lmax	53
Match	Main	Leq	52
		Lmax	67

5.2 Assessments

The above results give the following assessments.

In terms of BS8233, we are mainly concerned with the dB(A) L_{eq} values, or the dB L_{Aeq} levels. See Definition of Acoustic terms in Appendix 1.

For night time, however, we are also concerned with the dB(A) L_{max} values, or the dB L_{Amax} levels.

The measured levels appear to suggest that sound insulation will need to be designed to reduce external noise by up to 13 dB for “Reasonable” daytime levels, and up to 8 dB for “Reasonable” night time levels. A reduction of up to 12 dB would be required for “Good” night time levels.

For outdoor living areas, there will be no reduction required to meet BS8233 “Upper Limit” criterion. Noise will need to be reduced by up to 3 dB to meet BS8233 “Desirable” criterion.

Note, of course, that these assertions are based upon the assumption that night-time noise levels are represented by measurements around midnight and that daytime noise levels are represented by measurements around afternoon at rush hour, and during evening matches (build-up, match, and die-down).

5.3 Mitigation

A partly open window can be expected to provide about 15 dB reduction. This is adequate for all conditions periods.

Basic garden fencing should also provide at least 5 dB reduction to gardens and ground floor rooms.

Of course, these assessments are very robust as they use what are likely to be the noisier times of day and night, assume all facades have

an unrestricted lines of site to the main sources and that the development itself will not provide any screening to its own properties.

6.0 CONCLUSIONS/RECOMMENDATIONS

Nearly all the time, noise was dominated by the A628 to the South and the A61 to the west. During the match, there were swells in the noise from the stadium and activity in the car park, but general traffic was still dominant most of the time. The crowds were well controlled and arrived and dispersed well.

Noise levels are within appropriate BS8233 criteria with partly open windows assumed or with basic garden fencing.

There is no reason at all why planning approval should be refused on the grounds of noise.

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 $20\mu\text{Pa}$ or a sound power of 1pW .

A sound pressure level or SPL should be expressed in dB(re. $20\mu\text{Pa}$). 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 given 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 level are discussed below.

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

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean 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} . The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

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 exceeded 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 exceeded 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.

Appendix 2

Measurement Details

Non Matchday - Rush Hour

Main Position	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
17:00	Leq	53	58	59	54	51	49	44	37	32
	Lmax	79	66	86	82	78	71	65	60	54
	L90	45	51	45	43	40	42	37	27	23
17:55	Leq	53	59	52	50	48	50	47	38	30
	Lmax	70	60	56	56	55	62	68	57	50
	L90	46	52	45	43	41	42	38	28	24

Non Matchday - Night Time

Position 2	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
23:35	Leq	42	48	41	40	37	38	34	24	17
	Lmax	55	64	51	50	50	53	46	37	28
	L90	36	42	35	34	31	32	28	17	13
00:30	Leq	42	50	43	42	39	38	34	26	22
	Lmax	47	54	47	47	43	41	37	38	31
	L90	36	42	36	35	31	32	27	17	14

Matchday - Build-Up, Match, Die Down, Match

Relevant Statistics (derived from www.barnsletfc.co.uk)

Statistics	Survey Night	Season Averages		
		2011/12	2012/13	2013 to date
Attendance	9,524	9,317	10,208	10,353
Goals For	2	0.7	0.6	0.7
Goals Against	1	0.8	0.7	1.6

Position 2	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
18:40 Music in stadium started at 18:35 Main road still audible	Leq	53	58	52	49	47	50	45	39	33
	Lmax	71	61	55	53	63	70	64	59	49
	L90	48	53	49	46	42	46	38	32	28
19:20 Crowd noise, music and main road	Leq	53	62	55	51	49	50	43	39	38
	Lmax	63	63	58	57	56	53	57	54	58
	L90	50	56	52	48	44	48	39	29	27
20:05	Leq	50	58	52	48	45	47	40	34	30
	Lmax	63	61	56	52	49	58	59	46	38
	L90	47	54	49	45	41	44	37	28	25
20:15 Away goal	Leq	54	59	52	48	49	51	45	34	29
	Lmax	62	61	51	47	53	61	54	41	27
	L90	49	54	48	44	44	47	40	28	24
20:55	Leq	51	57	51	49	48	47	42	38	35
	Lmax	66	60	56	68	64	62	55	48	40
	L90	45	52	46	43	42	42	35	29	25
21:05	Leq	49	59	50	46	47	46	39	32	27
	Lmax	55	65	56	54	54	52	44	35	28
	L90	45	53	46	42	43	41	34	26	24
21:45	Leq	50	56	49	46	47	46	42	40	38
	Lmax	62	60	53	53	51	55	56	56	54
	L90	44	52	45	42	41	41	32	24	23
21:55	Leq	50	56	51	47	48	46	41	39	37
	Lmax	63	62	53	53	57	56	57	57	56
	L90	46	51	47	44	44	43	36	27	24

Summary

Measurement	Position	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Rush Hour	Main	Leq	53	59	56	52	50	49	45	37	31
		Lmax	77	64	82	79	75	68	67	58	53
Night Time	Main	Leq	42	49	42	41	38	38	34	25	20
		Lmax	53	61	49	48	48	50	43	37	30
Match	Main	Leq	52	59	52	49	47	48	43	38	36
		Lmax	67	61	56	61	60	64	60	55	53