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**CLAY TARGET SHOOTING
NOISE MEASUREMENT REPORT**

Warton Clay Shoot

Crag Foot, Warton, Carnforth LA5 9SA

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1.0 INTRODUCTION

Lancaster City Council instructed Martec Environmental Consultants to carry out controlled trials of clay target shooting noise at a shooting ground, located at Crag Foot, Warton, Carnforth LA5 9SA. The purpose of the exercise was to identify of the loudest stand(s), as experienced at a nearby property [Green Acres] such that noise control measures can be directed so as to reduce shooting noise levels at this property.

Acoustic Terminology is explained in Appendix 1 and the author's qualifications and experience are set out at Appendix 2. An Aerial Photograph of the area showing the shooting ground and the measurement location appears as Figure 1 to this report.

The tests were conducted with the kind cooperation of the operators of the shoot, Wrights Leisure Ltd, and the residents of Green Acres, Rudolph & Shirley Quagliana.

2.0 DESCRIPTION OF THE AREA & SHOOTING

A large-scale plan of the ground showing the firing locations and directions had been requested; unfortunately this was not available at the time of the site visit; consequently an inspection of the ground was conducted, the results of the inspection of the ground are shown in Figure 1, Appendix 4. The stand locations [positions from which shots are fired at clays] and firing directions were as advised by the

operators.

The measurement location was located some 311m away to the south-west of the nearest stand [No.3].

It is understood that there are 9 stands of which 5 are chosen on any one shooting day; it is understood that Stand 2 is no longer used. In addition, there is a flush/compact sporting layout which comprises five adjacent stands under a single roof. This layout also has lighting and can therefore be used after dark.

Stand	Easting	Northing	Left Shot	Right Shot
Flush/Compact	348324	473491	120	250
1a	348326	473541	55	155
1b	As above but 12m northeast			
2	348327	473444	300	320
3	348347	473429	100	180
4	348413	473467	60	80
5	348418	473523	85	105
6	348403	473550	340	15
7	348431	473529	355	40
8	348457	473495	90	140
9	348513	473568	70	135
10	348489	473602	280	335

Table 1: Shooting Stands [Arc of fire in deg.N]

3.0 NOISE ASSESSMENT METHODOLOGY

The Chartered Institute of Environmental Health has published "*Clay Target Shooting - Guidance on the Control of Noise - January 2003*"; this document relies on research undertaken by the Building Research Establishment. The BRE research report has not been published, but Martec has received a copy and some details are in the public domain. The main findings of the research were:

- a. With the possible exception of high background noise levels, which the researchers wished to investigate further, the level of background noise, or the excess of the shooting noise over the background, was not found to be an important factor.
- b. The research did not find that Sunday shooting was generally more disturbing than shooting on other days of the week.
- c. The research did not find that the frequency (oftenness) of shooting or the rates of fire were important in deciding the degree of disturbance.
- d. Measurements were made when there was a positive wind vector [following wind] and using the logarithmic average of the 25 loudest shots in a 30 minute period. This is known as the Shooting Noise Level [SNL]. Arithmetically averaging a number of SNLs from different shooting days produces a Mean Shooting Noise Level [MSNL]

- e. The research considered that widespread annoyance is unlikely below a Mean Shooting Noise Level around 55 dB(A, but likely above around a Mean Shooting Noise Level of 65 dB(A).

Martec has many queries relating to the above that, despite enquiry, have not been answered, and therefore cannot determine whether we agree with the above conclusions; however, this is the only research on clay target shooting noise disturbance in the UK.

It should also be noted that the SNL is dependent on the number of shots fired in any given period, i.e. the more shots fired, the higher the average of the loudest 25 shots will be; when firing rates are low, the SNL will approximate to the average of shots of the loudest stand(s); however, as the rate of fire increases, the more the SNL will tend towards the loudest shots from the loudest stand(s).

The CIEH document states that *"At shooting noise levels below the mid 50's dB(A) there is little evidence of significant levels of annoyance at any site, whereas for levels in the mid to high 60's, significant annoyance is engendered in a majority of sites. For levels in between however, the extent of the annoyance varies considerably from site to site. Thus a level of, say, 60 dB(A) may be deemed acceptable at one site, but not at another."*

When granting planing permission, many local authorities seek to achieve an MSNL (mean shooting noise level) of between 55 and 65 dB for normal/club shooting depending on the circumstances. A higher

MSNL for weekday small scale shooting such as one-to-one tuition may be acceptable. It should be noted that the MSNL level is heavily dependent on the loudest shots from the loudest stand at any given location.

Given the above, a successful noise control strategy should identify and address the loudest shots affecting any given location; unless and until the noise of the loudest shots are reduced, the overall SNL/MSNL will not alter and, according to the assessment methodology, the noise impact will not change.

4.0 NOISE MEASUREMENTS

The sound level meter was a SVAN type 957, mounted on a tripod at a height of 1.2-1.4m, and fitted with a standard windmuff at the location shown in Figure 1, Appendix 4 [Green Acres]. The meter calibrated correctly before and after the measurements using a RION calibrator and had been laboratory calibrated within the preceding two years. A Davis Instruments hand held anemometer (s/n 06951892) was used to ensure that wind speeds at the microphone were less than 5 m/s, as required.

Model	Instrument	Serial No.	Lab Cal Certificate	Date of Due Calibration
E Svan 957	Sound Level Meter	23202	23202/69865	08/03/2019
Svan SV12L	Preamp	24264	23202/69865	08/03/2019
PCB 377B02	Microphone	LW135130	23202/69865	08/03/2019
RION NC74	Calibrator	34262041	34262041/69865	08/03/2019

Table 2: Instrumentation Used on Site

As instructed by the operators:

1. Standard cartridges were used for the tests – Cheddite Universal Trap 28gm 7.5 12 bore cartridges.
2. The shots were all fired from an RA Sport EOS 12 bore shotgun with 30 inch barrels.
3. The shooting was not observed directly by the author and the results rely upon the shooters having fired in the stated direction from the stated location using the stated cartridges.

The weather conditions were 50% high cloud cover, a temperature around 15 to 20 degrees Centigrade, and a wind of around Beaufort Strength 0 to 1 with the direction difficult to discern. These conditions are likely to have resulted in lower than average noise levels at the measurement location [Green Acres].

From the detailed measurements results contained in Appendix 3, the following table can be derived:

Stand	Log Ave
Flush RHMB	52.9
Flush LHMB	46.0
Stand 1A	42.6
Stand 2 LHMB {Discont.}	50.6
Stand 2 RHMB [Discont.]	48.3
Stand 10 LHMB	38.7
Stand 3 RHMB	47.7
Flush RHMB	53.3
Old Stand 2 RHMB [Discont.]	47.8
Combined Flush RHMB	53.0

Table 3: Summary of Results at Green Acres [dBAF]

Notes: LHMB – left hand most shot [RHMB – right hand most]

5.0 DISCUSSION AND CONCLUSIONS

From Table 3, it can be seen that on the day of the measurements the Flush Stands, also used for Compact Sporting, were the source of the loudest shots.

The flush/compact layout fires broadly south, which during daylight hours causes difficulties with shooters losing sight of the clays in the sun, i.e. the orientation is not optimal; consequently, the operators were considering altering the layout to move flush/compact so as to

fire north, and hence away from Green Acres. In addition, the re-orientated flush/compact layout would also have to move further away from Green Acres so as not to overshoot the clubhouse and car park; consequently, noise levels from the loudest layout, and the one that operates after dark, should fall significantly.

Given the relatively low shooting noise levels on the day of the tests, it is likely that quieter stands such No.1 and No.10 were affected by background noise, i.e. the “real” shooting levels from these stands were in fact lower than the recorded values.

In order to reduce noise levels experienced at Green Acres, it is recommended that the alteration to Flush/Sporting take place as soon as possible. It is also recommended that Stand 2 should continue not be used, and that as much as possible shooting should be re-orientated so as to fire north.

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The unit of noise is the decibel (dB). The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated dB(A).

These dB(A) values may be measured with sound measuring system set to one of several time weightings; 'Peak', 'Impulse', 'Fast', and 'Slow'. Broadly speaking 'Peak' produces the highest readings of gunfire then 'Impulse', 'Fast' and 'Slow'. The human ear cannot respond as quickly as a meter set to 'Peak' or 'Impulse' and it has been found that 'Fast' best represents the human ear's response to gunfire noise.

The Shooting Noise Level [SNL] is the logarithmic average of the 25 loudest shots in a 30 minute period using L_{AFmax} .

The following table gives an approximate indication of the comparative loudness of various noises expressed in terms of the A weighted scale:

Source of noise	dB(A)	Nature of Noise
Inside Quiet bedroom at night	25-30	Very Quiet
Quiet office	40-45	
Rural background noise	35-45	
Normal conversational level	55-65	
Busy restaurant	65-75	
Inside suburban electric train	70-80	
Hand clap @ 1m	75-85	
HGV accelerating @ 5m away	85-90	Very Loud

APPENDIX 2

QUALIFICATIONS AND EXPERIENCE

My full name is Melville Alexander Kenyon. I am the principal of the firm of Martec Environmental Consultants Ltd, a consultancy company that specialises in environmental noise assessment and control. I graduated in 1982 with a Bachelor's degree in Engineering and subsequently a Master's degree in Environmental Acoustics. I have been a corporate member of the professional body for noise and vibration specialists, the Institute of Acoustics, since 1988, and have sat on the British Standards Committee dealing with noise in buildings [BS.8233:1999].

I have lectured at Liverpool John Moores University on the Diploma of Acoustics course and at Manchester Metropolitan University on their Environmental Health degree course.

The firm of Martec Environmental Engineering was formed in the 1970's and joined The Association of Noise Consultants in 1996. It is now known as Martec Environmental Consultants Ltd.

A speciality of the firm is our experience in measuring and calculating the impact of gunfire noise. We provide impartial advice to both opposing groups. I have made noise measurements at some 100 such facilities, often returning to a site to assess the impact of noise control measures. I was a member of the Working Group advising the Chartered Institute of Environmental Health on clay target shooting noise.

APPENDIX 3

DETAILED NOISE MEASUREMENTS

Stand	Log Ave																																					
Flush RHMB	52.9	53.0	51.1	53.3	52.7	57.4	52.5	49.5	49.7	50.4	52.6	51.8	53.0	51.6	53.0	54.3																						
Flush LHMB	46.0	46.6	46.0	46.1	44.5	46.3	45.3	46.9	46.4	46.4	44.8																											
Stand 1A	42.6	44.0	42.0	44.0	37.4	43.0																																
Stand 2 LHMB [Discont.]	50.6	49.4	50.9	51.0	49.5	51.7	51.8	52.0	50.9	50.0	49.9	50.0	49.3	50.7	49.4																							
Stand 2 RHMB [Discont.]	48.3	49.8	50.4	46.4	46.9	48.5	48.3	46.1																														
Stand 10 LHMB	38.7	44.9	37.5	36.6	35.5	36.0	38.7	37.4	34.9	34.1	37.9																											
Stand 3 RHMB	47.7	46.2	44.2	47.0	46.2	51.6	47.2	48.6	46.3																													
Flush RHMB	53.3	54.9	52.0	55.0	54.7	51.1	54.1	51.5	53.4	50.5																												
Old Stand 2 RHMB [Discont.]	47.8	48.2	46.7	47.8	48.0	47.3	46.5	47.2	48.6	48.5	48.3																											
Combined Flush RHMB	53.0	54.9	52.0	55.0	54.7	51.1	54.1	51.5	53.4	50.5	53.0	51.1	53.3	52.7	57.4	52.5	49.5	49.7	50.4	52.6	51.8	53.0	51.6	53.0	54.3													

APPENDIX 4

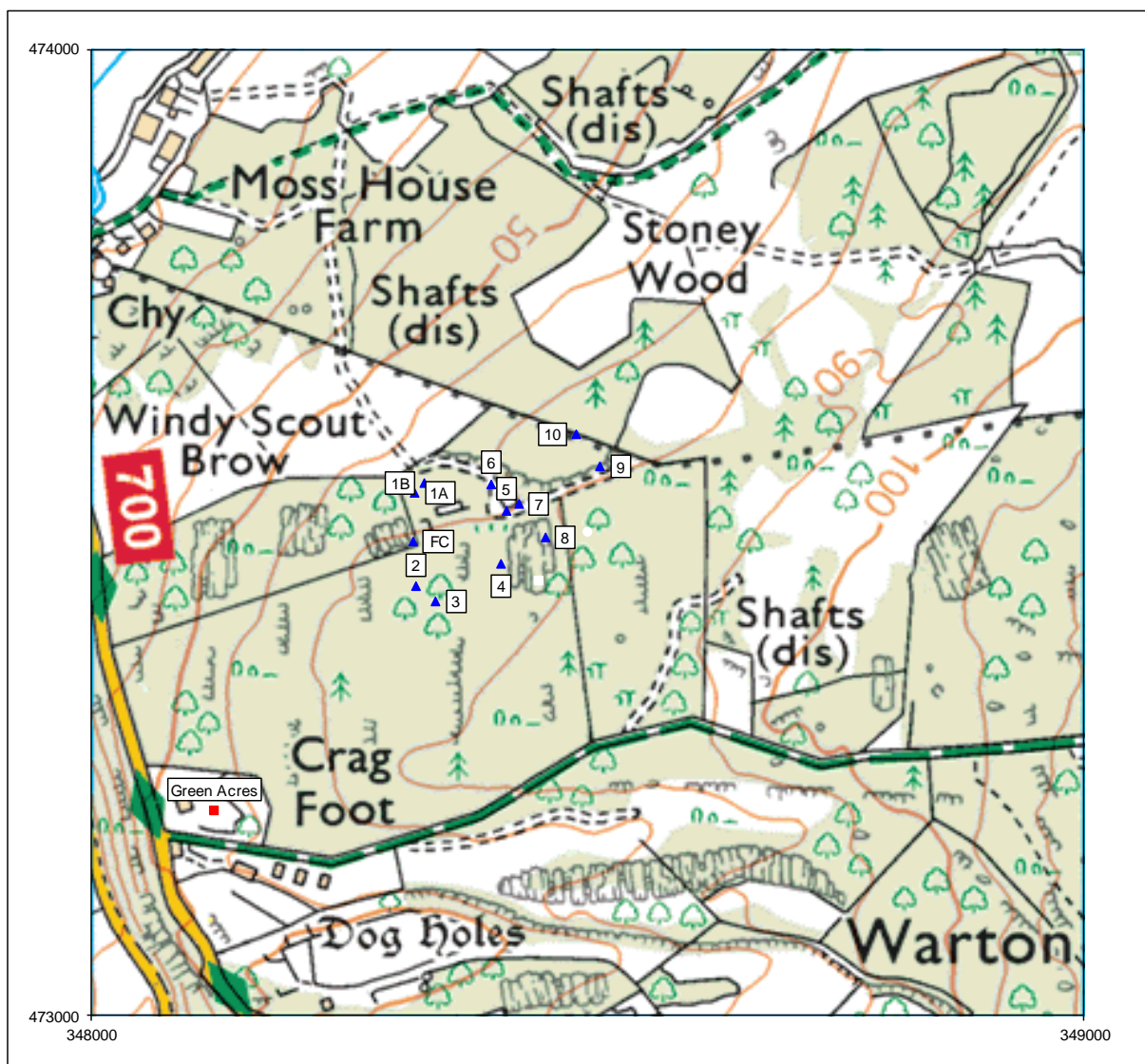


Figure 1 : Firing Locations and Measurement Position [Green Acres]