Proceedings of The Institute of Acoustics

PRACTICAL PROCEDURES FOR THE PREDICTION OF NOISE FROM CLAY PIGEON SHOOTING GROUNDS.

David Revill
Environmental Noise Studies Ltd.

1. INTRODUCTION

Clay pigeon shooting is a fast expanding sport which can now boast 150,000 regular participants. There is therefore considerable pressure for new shooting grounds as existing ones reach capacity. Unfortunately, it is an inherently noisy sport and the ideal sites are located in rural areas close to the major population centres. They are never far from residential properties.

The level of noise emitted by shooting grounds is dependent upon many variables, not least on the weather, and it is therefore impossible on the basis of a test shoot to obtain a reliable estimate of the level of disturbance likely from a shooting ground in future. This paper uses measurement data obtained at 9 shooting grounds over a period of 45 days to derive a prediction method for peak noise level on the 'worst days'.

2. BASE NOISE LEVEL

It is not difficult to identify the source of noise at a clay pigeon shoot, it is the guns, but deriving a base noise level for predictive purposes proves less easy. Despite the apparent uniformity of guns and cartridges, wide variations in the measured noise level and perceived loudness occur. Deviation from the mean of +/-10dBA are not uncommon, and even single guns firing cartridges from the same batch are likely to produce noticeably quieter or noisier shots now and again. However, given enough shots, the base level can be derived on a statistical basis. Figure 1 shows a culmulative distribution based on approximately 1000 shots at one shoot.

3. NUMBER OF GUNS.

A shoot may consist of only 6 guns firing at 25 clays in the course of a Sunday morning, or upwards of a hundred guns firing at 100 clays each over a weekend at an international event. Most commercial grounds have more than one layout in operation at one time, and as the number of layouts increase so does the probability of guns firing simultaneously. However, as few have more than 3 in use at any one time, the probability is still small and there is no correlation between peak noise level and number of layouts. There is of course an obvious relationship between Leq and number of shots fired in a given period of the form 10logN.

4. ORIENTATION OF THE GUNS.

Guns are not omnidirectional sources and hence their orientation with respect to the receiver makes a difference to the measured noise level. The estimate shown in Figure 2 was derived at a single shooting ground, and seems valid up to 500m. in the absence of reflecting surfaces.

5. ATTENUATION WITH DISTANCE.

The measurements indicate that 6dB/doubling predicts the attenuation with distance reasonably well, although conservatively. On Figure 3 are plotted the data points for 7 sites where measurements on more than 1 day were taken. The points refer to the worst day, with corrections for orientation where appropriate. Figure 3 indicates that it is as well to ignore ground and atmospheric attenuation. (See 7)

6. WIND AND WEATHER

Although the greatest single variable in the prediction of noise from a shooting ground is the weather, it is the most difficult to quantify. Variations between single days were in excess of 30dBA at some sites. As one might expect, the quietest were warm, still and sunny (normal temperature lapse), the noisiest, dull and overcast, or cold and clear. Measurements over 35 days shows there to be a skew distribution towards the quiet end, with a standard deviation of 7.5dBA. The predicted noise levels refer to 'worst days', i.e. mean +1 standard deviation.

7. BARRIERS.

Very few of the measurement sites had a direct line of site to the shooting ground, mainly due to the lie of the land. It was found that excess attenuations of the order of 5dBA could be expected as a minimum where the view of the shooting ground was obstructed by geographical features, and up to 20 could be allowed for such a substantial hill immediately between shooting ground and receiver. These allowances assume no ground attenuation is accounted for.

Purpose built acoustic barriers, straw bales, are the most common and suitable building material, can give attenuations of up to 8dBA in the absence of reflecting surfaces and depending on weather conditions.

8. CONCLUSIONS.

On the basis of the measurement data, an empiracle formula which predicts the average peak noise level from a shooting ground on the 'worst day', is tentatively suggested as follows;

Average peak Noise Level (dBA(fast)) = 124 - 20log r - X - S

where; r = distance to shooting layout (metres)

X = orientation correction (Figure 2)

s = barrier attenuation (Para. 7)

The equivalent slow response levels may be taken to be 5dBA lower. No data exists for the prediction of impulse or Leq levels.

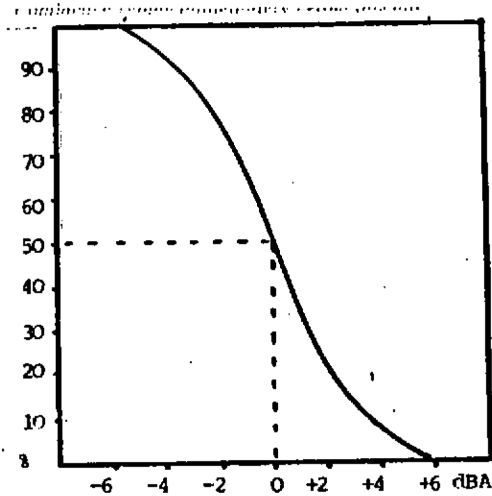

Figure 1.Culmulative Distribution of Firing Peak Noise Level(200m)

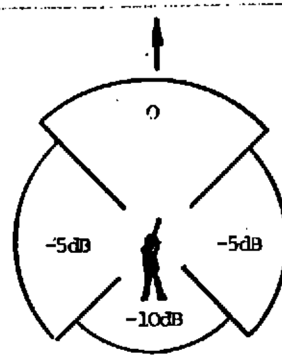

Figure 2.Correction for Orientation.

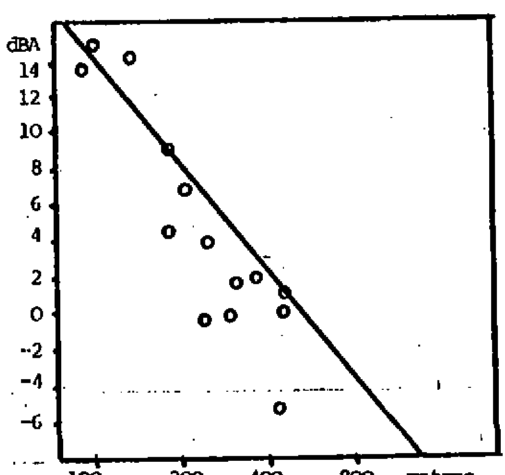

Figure 3. Attenuation with distance(6 dBA/doubling)