Protecting horses from excessive music noise – a case study

Cornelius (Neil) Huybregts

Marshall Day Acoustics Pty Ltd, 6 Gipps Street, Collingwood VIC 3066, Australia
nhuybregts@marshallday.com

ABSTRACT

When Flemington Racecourse, the site of Australia's most famous horse race – the Melbourne Cup – became the proposed venue for Australia's largest touring music festival – the Big Day Out – there was concern expressed by the owners of the thoroughbred race horses stabled at the racecourse that the horses may react badly to the potentially excessive music noise, and Marshall Day Acoustics was commissioned to assess the likely impact on the horses.

The constraints of consulting allowed only a brief review of current knowledge regarding the effect of noise on horses, which provided useful background information, but, predictably, little guidance on criteria. Nevertheless, a recommendation was made that, if possible, noise levels not exceed 65dBA LAeq.

The noise exposure (LAeq,15 minutes) of horses during major race events was measured at 58-62 dBA in the stables (rising to 66-68 dBA during helicopter fly-overs), and 65-70 dBA in the stalls. The Clerk of the Course's horse was exposed to 76 dBA LAeq,6h at Randwick Racecourse during the New Easter Carnival and 85 dBA LAeq,6h at Flemington during the Melbourne Cup, although this second figure is difficult to reconcile with the measured noise levels at the various locations.

During the Big Day Out, the noise exposure (LAeq,15 minutes) of horses in the stables was measured at 54-70 dBA. The horses generally showed little response to the music noise except when the noise was associated with visible stimuli, or when the noise was of an alarming character such as short bursts of high-pitched singing.

INTRODUCTION

Flemington Racecourse, in Melbourne, Australia, is a major horse racing venue. It is best known as the venue for the Melbourne Cup, a race for which a public holiday is declared in Melbourne and which is famously known to 'stop the nation'. Because of its large size (1.3 square kilometres) and its relative isolation from noise-sensitive land uses, the racecourse is also sometimes used as a venue for outdoor concerts.

The Big Day Out is a one-day touring music festival held annually in various cities in Australia and New Zealand. The 2008 Big Day Out event for Melbourne was held at Flemington Racecourse, and featured 72 bands playing at 8 stages, including 2 main stages adjacent to each other, with the major acts alternating between the two stages. The main stages were the loudest, and were located approximately 200m from the horse stables, facing away from the stables. The main stages were approximately 300m from the nearest residence.

When it was proposed to hold the Big Day Out at Flemington Racecourse, the owners of the thoroughbred race horses stabled at Flemington expressed some concern that the music noise levels in the stables would be excessive and that the horses may react badly.

Marshall Day Acoustics (MDA) was commissioned by the Victoria Racing Club, the trustees of Flemington Racecourse, to review current knowledge regarding the effect of noise on horses, to measure the noise exposure of horses during a race event, to

provide an opinion on the likely effect of the noise on the horses, and to measure music noise levels in the stables during the 2008 Big Day Out.

This paper describes the investigations and findings of the study undertaken by MDA, but also looks at some of the difficulties encountered when the results of a somewhat obscure field of study are to be applied to the management of noise impacts on animals.

CURRENT KNOWLEDGE

The budget for this project allowed only 8 hours for a review of current knowledge concerning the effects of noise on horses. The actual time spent was 12 hours.

Understandably, the review was broad-brush, consisting of:

- A search of the MDA library (including ICBEN and other conference proceedings)
- Posting of queries on the MDA discussion forum (which brought out some previous MDA projects where effects of noise on animals was considered, and which led to discussions with the flora and fauna experts involved in those previous studies)
- Google searches, including Google Scholar
- Discussions with horse handlers and the equine veterinarians at the racecourses
- Correspondence with Professor Rickye Heffner from the University of Toledo (Ohio, USA) Department of Psychology.

The findings were similarly broad brush, consisting mostly of a discussion of issues such as chronic versus acute exposure, energy conservation in wild animals, and habituation. There was some information gathered that turned out to be of practical benefit, or at least relevant to the manner in which the noise exposure of the horses was ultimately managed, namely:

- That horses may be startled by noise is common knowledge. One of the basic guides to horse care and management published by the Equine Centre in Werribee, Victoria, entitled *Horse Health Care – Management: Safety around Horses*, states that when approaching a horse, “you should be aware that horses are most easily scared by sudden movements or loud noises, particularly outside of the animal's field of binocular vision. Quick movements or loud noises in these areas will trigger fear reactions such as spinning or bolting…”
- Discussions with flora and fauna experts have indicated that many animals are more likely to be concerned (ie, interrupt feeding or resting activity) about noise that is associated with visual stimuli.
- It appears that noise can be more unsettling when associated with unfamiliar situations. One comment from Rickye Heffner was that “horses (and other species) can be disturbed by anything new in their environment – after all, if things are going well and there is a change, that could signal a change for the worse; change is usually a bad thing until proven otherwise.”
- The United States National Park Service's *2004 Sheep Report* provides a comprehensive review of the likely effects of aircraft fly-over noise on animals, with particular emphasis on wildlife. The report differentiates between chronic exposure, for which the major concerns are related to the animals’ energy conservation, and acute exposure, such as startle and panic behavior. The report states

that "acute responses… occur in most wildlife species evaluated at noise levels greater than 95 dBA."

- One other factor to consider is habituation. If the noise is familiar and not associated with danger, the animals' response will become moderated. This is most evident in the (often ineffectual) use of scare guns to remove pest species such as cockatoos from crops or seagulls from airports.
- A review of research into the relative hearing ability of a wide variety of animals (in *Comparative Psychology: A Handbook* by Greenberg and Haraway) found that the hearing threshold of horses was 5-15 dB higher than humans – that is, horses are somewhat deaf compared to us.
- Discussions with the handlers at Randwick Racecourse in Sydney and Flemington and the equine veterinarian at Flemington indicated a widely-held opinion that thoroughbred horses are likely to be sensitive to noise but without any indication of how much noise would be acceptable. However, most felt that loud bangs, such as that associated with fireworks, would not be acceptable.
- The connection between temperament and noise-sensitivity has been studied in cattle, with one study showing that cattle that were more flighty (faster gait, jerky movements, more vigilant) were more noise-sensitive.

These findings provided useful background information, but were of limited value in setting criteria for the exposure of horses to music noise. As with other reviews of the effects of noise on fauna undertaken by MDA, the information was lacking one or more of the aspects of the problem we were facing: the noise exposure was not quantified (eg, "high levels" or "loud bangs") or was of the wrong type (eg, aircraft noise rather than music noise); the species was wrong (eg, orange-bellied parrots); or the information was not particularly well-supported, amounting to little more than expert speculation in some cases.

NOISE EXPOSURE AT RACE EVENTS

Overview

During race events, the horses are kept in stables until it is close to the time for the horse to race. The horses are then led to the stalls, where they are saddled up. A few minutes before the race, the horses are led to the pre-mounting yard to be lightly exercised, then to the mounting yard, and then onto the race track.

Noise levels were measured using several noise indices, including L_{Amax}, L_{Aeq}, L_{Amin} and various L_{An}. Results were reported almost exclusively in L_{Aeq}. Although the results of the review of current knowledge indicated that startling noises may be of most concern – indicating that L_{Amax}, or at least some form of L_{max} – would be appropriate, it was considered that L_{Amax} would be 'poorly behaved' – that is, it would not always be clear during any particular sample period whether there were repeated noisy events or just one or two noisy events. The L_{Aeq}, on the other hand, would show some increase in level if there were repeated events and would give an indication of noise dose. Also, it was considered that reporting of the results would be more easily understood if only one noise metric was used.

New Easter Carnival – Randwick Racecourse

The first set of noise measurements during a race event was conducted during the 2006 Easter Carnival at Randwick Racecourse in Sydney on 15 April 2006. Noise

levels were not measured in the stables, but there were noise monitors at several fixed locations about the venue, noise dosimeters attached to two of the Clerk of Course horses and on the consultant undertaking the measurements, and spot measurements at various locations during the event. Post-event analysis showed that the most useful information was obtained by the noise monitor in the stalls and the dosimeter attached to Yotis, one of the Clerk of Course horses.

Figure 1 shows the measured noise levels in the stalls. Noise levels ($L_{Aeq,15\ minutes}$) were in the range 64-70 dBA.

Figure 1: Measured noise levels in the stalls

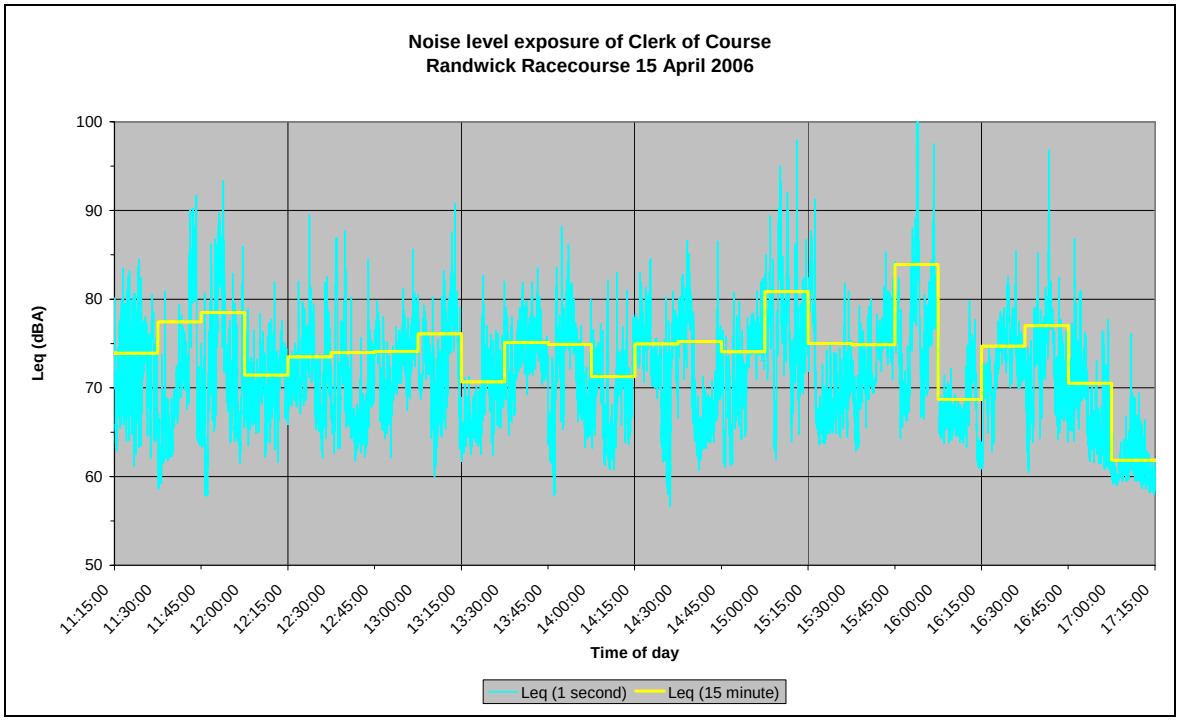

Figure 2: Noise exposure of Yotis, a Clerk of the Course horse

Figure 2 shows the noise exposure of Yotis, the Clerk of Course's horse, moving between stalls, the pre-mounting yard, the mounting yard and the race track for the whole event. Noise levels ($L_{Aeq,15\ minutes}$) were in the range 69-84 dBA. The $L_{Aeq,6h}$ noise level for the whole of the measurement period was 76 dBA.

Melbourne Cup Carnival – Flemington Racecourse

Noise measurements at Flemington during the 2007 Melbourne Cup Carnival consisted of:

- Noise monitors situated near stables and on the roof of the stalls. These were in place during 3-12 November inclusive, taking in all of Derby Day, Melbourne Cup Day, Oaks Day and Stakes Day, as well as several non-race days
- A noise dosimeter attached to Subzero, the Clerk of the Course's horse, on Melbourne Cup Day
- Spot measurements at various locations on Melbourne Cup Day.

Figure 3 shows the measured noise levels at various locations on Melbourne Cup Day. Note that the race at 15:00 is the Melbourne Cup. This is the race that 'stops the nation'.

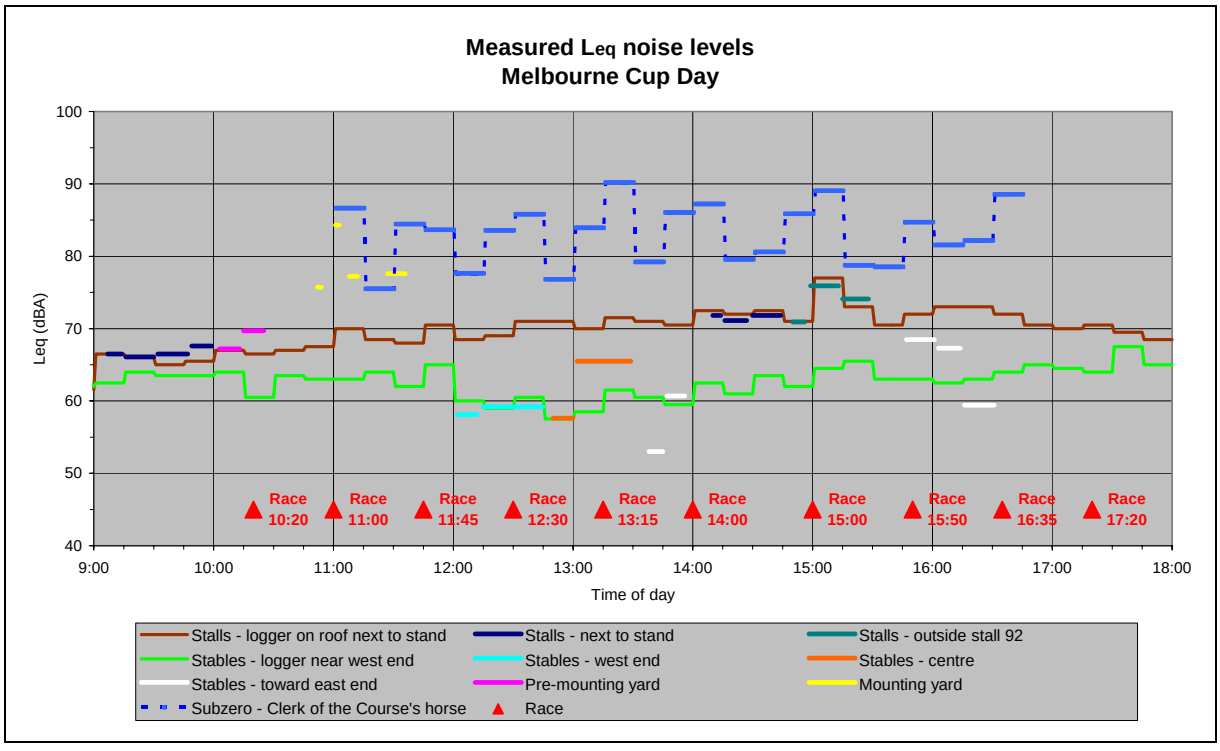

Figure 3: Measured noise levels – Melbourne Cup Day

Stables

Results of the noise monitoring near the stables showed that on non-race days, the $L_{Aeq,15\ minutes}$ noise levels were in the range 50-65 dBA during the day. On race days, noise levels were about 51-68 dBA.

The handheld measurements on Melbourne Cup Day showed similar noise levels to those at the monitoring position, except during helicopter arrivals and departures. Noise from helicopter arrivals and departures were measured at:

- 66 dBA at the centre of the stables, about 8-14 dBA higher than at the monitoring position (which was at the west end of the stables, closer to the grandstand but further from the helipad) at the same time
- 67-68 dBA at the east end of the stables, about 10 dBA higher than at the monitoring location at the same time.

Table 1 provides a summary of the measured L_{Aeq} noise levels near the stables.

Table 1: Summary of measured noise levels – stables

	L_{Aeq} noise levels, dBA
Noise monitoring position	
Non-race days	50-65
Race days	51-68
Centre and east end	
During helicopter movements (Melbourne Cup Day)	66-68

Horses participating in races

Results of the noise monitoring at the stalls showed that L_{Aeq} noise levels during the day were generally in the range 55-70 dBA on non-race days. On race days the noise levels were about 9 dBA higher than non-race days.

Melbourne Cup Day

Handheld measurements were undertaken at several locations around the stalls. Noise levels were similar to those at the noise monitor.

In the mounting yard, L_{Aeq} noise levels were 76-78 dBA while there were horses in the yard. During Race 2, when there were no horses in the yard, the L_{Aeq} noise level was 84 dBA. The mounting yard is located in front of the grandstand and is exposed to high levels of noise from the crowd and the public address system.

A dosimeter was attached to the collar of Subzero, a Clerk of the Course horse, from 11:00am until 4:45pm. He was exposed to L_{Aeq} noise levels of 75-90 dBA. The $L_{Aeq,6h}$ noise level for the whole of the measurement period was 85 dBA.

Table 2 provides a summary of the measured noise levels.

Table 2: Summary of measured noise levels. Horses involved in race events – Melbourne Cup Day

Location	**L_{Aeq} noise levels, dBA**
Stalls	55-70
Mounting Yard	76-78
Clerk of the Course	75-90

Observations at the time of the measurements indicated that the noisiest area was the mounting yard, and that the major part of Subzero's noise dose would be accumulated there. However, the $L_{Aeq,15\ minutes}$ at Subzero's collar during Race 2 and during the noisy period prior to Race 3 was higher than the L_{Aeq} measured in the mounting yard. It appears that either Subzero was exposed to noise from other sources not apparent at the time, or that the dosimeter results are not reliable.

Comparison with Randwick Racecourse

Table 3 compares the measured noise levels at Randwick and at Flemington.

Table 3: Comparison of measured noise levels

Location	L_{Aeq} noise levels, dBA	
	Randwick	Flemington
Stalls	64-70	55-70
Clerk of the Course	69-84	75-90

This provides further evidence that the Clerk of the Course noise measurements at Flemington may be in error. However, the result is reported here as it may be accurate; there were no problems with instrument calibration and mounting of the microphone.

RECOMMENDATIONS

In our report to the client, it was recommended that the following matters be considered:

- That the circumstances of the exposure to concert noise would be somewhat unfamiliar
- That the people who worked with the horses felt that they were likely to be noise-sensitive, and that loud bangs should be avoided
- That the noise would not be associated with any danger and if there is any initial startle responses, habituation may occur quickly
- That the horses at the two race events investigated were exposed to "average" noise levels of 65-70 dBA in the stalls and 70-90 dBA when moving in and out of the stalls.

Clearly, definite recommendations regarding criteria for the exposure of thoroughbred horses could not be provided. However, it was felt that some kind of threshold level would be useful, prompting the following statement in our report to the Victoria Racing Club:

… it appears that use of Flemington Racecourse as a concert venue would be acceptable provided that the L_{Aeq} noise level in the stables did not exceed 65 dBA.

This was combined with recommendations that:

- Fireworks or other activities causing loud bangs should not be permitted
- Noise levels should be monitored in the stables to confirm that the L_{Aeq} noise levels do not generally exceed 65 dBA
- At least one horse expert should be present at the first concert to observe the horses' behavior for signs of stress.

NOISE EXPOSURE AT THE BIG DAY OUT

Noise levels

Noise levels at the stables were monitored and manually measured during the 2008 Big Day Out at Flemington Racecourse. Personnel undertaking the measurements were to contact the event's management to report any times when the noise threshold of 65 dBA was exceeded. Measured $L_{Aeq,15\ minutes}$ noise levels are shown in Figure 4. The measurement locations are shown in Figure 5.

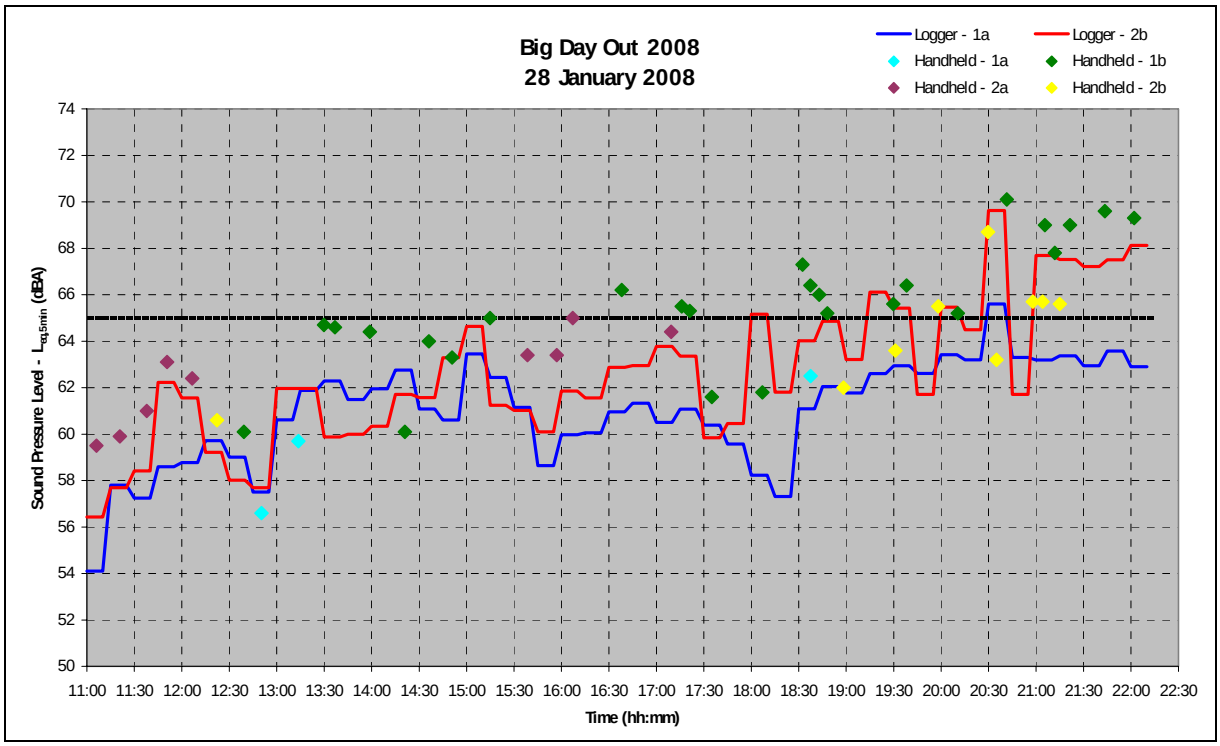

Figure 4: Noise levels in stables during the Big Day Out

Figure 5: Measurement locations

As shown in Figure 4, there were times when the 65 dBA threshold was exceeded. These exceedances were reported to management, who would then inquire as to the level of agitation being displayed by the horses. The horses' response is discussed below.

During the final hour or so, management were not able to respond to the reported exceedences, as they were having to deal with people climbing onto the roof of the bar – a temporary structure – located closest to the main stage, and evacuating the staff prior to the roof collapsing.

Horse behavior

Discussions with the equine veterinarian and MDA staff indicated that the horses were aware of the music noise, but generally showed only low levels of agitation. The exceptions were:

- Two horses were stabled where they could see two of the rides – a ferris wheel and a giant slingshot ride. These horses had elevated heart rates and were not eating. The horses became noticeably calmer and began to eat when shade-cloth was used to enclose the stables so that the visual stimulation was reduced. However, it was the vet's opinion that it was not just the visual stimulation that was the problem. The horses' state appeared to be due to a combination of the noise and the visual stimulation
- Some horses sometimes became noticeably agitated when the light-weight corrugated steel sheeting on the enclosure walls vibrated in response to excitation by low-frequency airborne noise
- During the second last act (approximately 20:00-21:45), several of the horses reacted to short bursts of high-pitched singing (squeals and screeches), even though these did not overly affect the $L_{Aeq,15\ minutes}$.

The equine veterinarian's overall opinion was that the impacts on the horses were acceptable, although there were concerns that the two horses that hardly ate may take a day or more to return to race-readiness. A recommendation has been made that, at next year's Big Day Out, horse managers be given the option of moving horses to stables at the rear of the stabling complex where there will be no visual stimulation associated with the music noise.

CONCLUSIONS

The findings of a brief literature review provided useful background, but little guidance on setting criteria. This is understandable given the likely significant effect of modifiers – such as visual stimulation – on the animals' response. The most useful recommendations arising out of the review of current knowledge – that startling noises and associated visual stimulation should be avoided – were consistent with the observed response of the horses to music noise during the Big Day Out. The equine veterinarian's recommendation to move horses to stables where there would be less visual stimulation appears to be worth implementing.

Although the recommended 65 dBA L_{Aeq} criterion was somewhat arbitrary, it appears to have had value as a threshold for initiating action. However, the most effective action taken – to erect the shade-cloth to reduce visual stimulation – was done more as a response to the animals' behavior than the measured noise level and would probably have been done even if the threshold was not available as a trigger for action.