

Anglo American Drayton South Proposal: Expert Report

October, 13th 2015

Report prepared for Coolmore Stud
3367, Golden Highway
Jerrys Plains
NSW 2330

Andrew McLean, PhD

Director, Equitation Science International
Honorary Associate, University of Sydney
Honorary Fellow, International Society for Equitation Science (ISES)
730 Clonbinane Rd, Clonbinane, Victoria, Australia, 3658
t: +61 (0)3 57871374
f: +61 (0)3 57871220
www.esi-education.com
www.equitationscience.com

Index

Executive Summary	3
A. Introduction.....	5
1. Scope	5
2. Purpose of this evaluation	5
3. Background	5
4. Preamble.....	6
B. Analysis of the Hansen Bailey report compiled for Anglo American.....	9
Relating to Section 5. Horse Stud Submissions.....	9
Relating to Section 4. Mine Creep and Buffer	10
Relating to Section 5.2.4 Noise and Blasting, Anglo.....	11
Relating to Section 5.2.5 Equine Health.....	11
Relating to: Conditioning and Fear (Habituation).....	13
Relating to: Hearing of Horses	14
Relating to: Horse Stud Viability	14
Relating to Appendix G Response to submissions	14
C. Conclusion	21
D. References.....	23
E. Curriculum vitae - Dr Andrew McLean	24

Executive Summary

In my opinion there are a number of major flaws with the EIS.

Firstly *there is no scientific literature* on the effects of open cut mine explosions on horse behaviour, let alone on thoroughbred horses. This is likely due to the fact that it is *unthinkable* that *any* would-be-stud-developer would choose to locate adjacent to a coalmine.

It is significant that there is no information on the precise details of the regular explosions to be perceived at Coolmore from the proposed Drayton South Coal Mine Project. In addition, the *timing* of the explosions has not been revealed by Anglo except to say that they will occur on average 5 times per week. This could mean a few explosions on one day and none the next. The *uncertainty* of this can add to both human and equine stress and can make the management of horses, and daily event planning very difficult. Therefore increasing the distance of the mine by a few hundred metres is likely to have a negligible effect regarding the equine behavioural impact on surrounding horse studs.

The EIS fails to address in any expert manner the possible behavioural reactions of horses at Coolmore Stud (and Darley) to the daily explosive events (except Sundays) that are proposed for the Drayton South Coal Mine. These behavioural responses may range from flight responses manifesting as bolting (galloping off out of control), shying (sudden swerving) or leaping out of control of rider or handler thus endangering the both horses and humans.

Sudden fear responses to unpredictable stimuli can also have deleterious effects on animals resulting in chronic stress. The effects of stress include the deterioration of *learning* abilities and the tendency not to trial new learned responses. These effects can make the training of young horses difficult, for example in yearling preparation, and therefore render them dangerous to themselves and their handlers. Stress also is known to affect the horse's *gut*, potentially resulting in colic and not uncommonly, death from colic. Also, there are powerful effects of stress on the *immune* system, which can render animals more susceptible to disease. Finally, stress can have strong effects on an animal's *reproductive biology*, where stallions may become less fertile or lowered in libido, and reproductive disorders and miscarriages may occur in mares. Published research shows that some species such as elk and caribou, similar in flight response to thoroughbred horses show panic, running and miscarriages when exposed to sonic booms in Alaska from USA air force planes.

Contrary to allegations that horses would eventually habituate, it is doubtful that all horses would habituate to (i.e. become used to) random explosions especially since the precise size of the charges to be used have not been disclosed. At any rate, habituation capabilities in animals are not uniform or universal – some individuals will habituate better than others and some will not habituate and therefore be exposed to danger.

Therefore it is of the utmost importance that the precautionary principle is applied here. Coolmore and Darley Studs, the breeding ground of the cream of Australian racing, should not become an experiment on the effects of coal mine explosions on thoroughbred racehorses.

Dated this 13th day of October, 2015



Andrew McLean, PhD

Director, Equitation Science International

A. Introduction

1. Scope

This report deals with the potential effects of the Drayton South Coal Mine on the behavioural aspects of the horse's health and the questions that arise in determining these effects.

2. Purpose of this evaluation

This evaluation has been undertaken upon request by Coolmore Stud to respond to the application by Anglo American (hereafter referred to as Anglo) for the Drayton South Coal Project mining operation. As a behavioural expert, my remit pertains to the effects that this project will have on the health and more specifically on the mental health of thoroughbred racehorses at Coolmore stud. There are highly significant omissions and shortcomings of the PAC report which concluded that the mining can now go ahead following certain ameliorations to the original project proposal. These omissions and shortcomings form the substance of my evaluation.

3. Background

The initial application by Drayton South Mine was rejected, and the appeals process required an Equine Health Impact Assessment Report (EHIA). The NSW Planning Assessment Commission (PAC) concluded that the mine 'should not proceed at the planned scale in this location', owing to the potential impacts on the nearby thoroughbred horse studs (Coolmore and Woodlands). On 17 October 2014, PAC refused the project. The Commission's grounds for refusal included:

- the project did not provide a sufficient buffer to protect Coolmore and Woodlands horse studs as recommended in the Commission review;
- the project has not demonstrated that it would not adversely impact equine health and the operations of the studs;
- the approach of monitoring the response of thoroughbreds to mining operations to address uncertainty is not acceptable;
- the project's economic benefits do not outweigh the risk of losing Coolmore and Woodlands studs, and potential impacts on the thoroughbred and viticulture industry; and
- the project is not in the public interest.

Anglo has revaluated the project, and now believes that it can develop the Drayton South area in an economically viable manner that complies with the Commission's recommended setback.

Anglo has also argued that it has incorporated a range of mitigation measures into the design of the project to minimise its impacts people, surrounding land uses – such as the Coolmore and Woodlands horse studs – and the environment.

The Department's detailed assessment has found that the project would be able to comply with the relevant air, noise and blasting criteria at the Coolmore and Woodlands studs:

- noise levels would remain well below the intrusive and amenity criteria in the *NSW Industrial Noise Policy*;
- blasting impacts could be controlled to ensure compliance with the relevant overburden pressure and ground vibration criteria in the relevant ANZEC guidelines;
- air quality levels would remain well below the relevant cumulative annual average ambient quality criteria in the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW*; and
- while the modelling indicates there could be up to 5 additional days in a year where the short term PM10 criteria may be exceeded when mining is closest to the studs, Anglo is likely to be able to avoid such exceedances occurring by implementing best practice dust control on site, and curtailing its operations during adverse weather conditions.

The Department now considers that the project would not result in adverse impacts on the health of horses residing either permanently or temporarily at the studs. Consequently, the Department has concluded that the project is unlikely to have any significant physical impacts on the studs, and would certainly not affect the physical capability or suitability of the site to be used for horse breeding.

4. Preamble

In Anglo's *Response to Submissions* prepared by Hansen and Bailey, the report reveals a large number of inadequacies of information that would be necessary to give a clear go-ahead for a coal mining operation. It is significantly problematic that there is no limitation on the charge size only vibration limit. Nor have they provided any indication as to the timings of the daily explosions except that they will occur on average 5 times per week. This could mean a few explosions on one day and none the next. The *uncertainty* of this randomness can add to both human and equine stress and can make the management of horses, and daily event planning

very difficult. The randomness of explosive events would inhibit habituation (a learning process that means becoming accustomed to a stimulus) for horses.

In their defence of this project, Anglo have necessarily had to account for not only potential pathological health issues faced by horses at Coolmore and Darley, studs, but also behavioural aspects of the horse's health and more precisely, potential behavioural outcomes of the proposed mining activities and the likelihood of the horses habituating to these stimuli. While Anglo attest that they have assembled a vast array of expert witnesses with collectively over "500 years" of experience, it is a major weakness that they have not employed any expert testimony in behavioural science.

Anglo have also questioned my expertise in this area pointing out that I am not a veterinary scientist. With respect, I point to my qualifications in behavioural science and my many scientific publications in respected journals such as *The Veterinary Journal* (My CV is attached as an addendum).

As I will reference later in this report, there are documented effects of various levels of noise on animals ranging from deleterious health issues to behaviour dysfunctions to breeding disorders.

In addition, low frequency sound waves *are not absorbed by environmental features* to the extent that higher frequencies are. It is important to note that research into low frequency noises (such as those that form part of the noise profile of explosions), can have deleterious physiological effects well beyond perceptive abilities of animals. The World Health Organization recognises low frequency noise as an environmental problem. Its publication on Community Noise (Berglund et al., 2000) makes a number of references on the effects of low frequency noise:

- " It should be noted that low frequency noise can disturb rest and sleep even at low sound levels"
- "It should be noted that a large proportion of low frequency components in a noise may increase considerably the adverse effects on health"
- "The evidence on low frequency noise is sufficiently strong to warrant immediate concern"

It is incongruent that the EIS report concluded that while there is some uncertainty as to the mining operation's effect on nearby horses, it nonetheless proposes to allow it to go ahead. This decision seems extraordinary in the light of the 'precautionary principle' which should be held in even higher priority considering that the horses involved in this issue represent the cream of Australian racing.

The pertinent effects on horses, especially breeding horses should be known with a high degree of certainty before any extension of the Drayton South mine goes ahead and to avoid a catastrophe of international significance. There are too many unanswered questions. Therefore, Coolmore Stud and their clients continue to hold grave concerns for the safety of their staff and horses.

B. Analysis of the Hansen Bailey report compiled for Anglo American Coal Project entitled: Response to Submissions (July, 2015).

Relating to Section 5. Horse Stud Submissions

At the outset, it is of significance to note that the PAC refused the previous project application as modified in the 'Retracted Mine Plan' (PAC Determination Report; October 2014) based on the view that *'it has not been conclusively demonstrated that mining in close proximity (500m) to the studs would not negatively impact on equine health or the operations of ...Coolmore and Darley'*.

Crucial to this evaluation is the contention that regardless of the current modifications to the proposal by Anglo, *it (still) has not been conclusively demonstrated* that mining in close proximity to the studs would not negatively impact on equine health or the operations of Coolmore and Darley.

This report provides my response to issues pertinent to the EIS report findings, in chronological order of appearance in that document.

5.1 Overview

In this preliminary section, Anglo note Coolmore and Darley's purported 'us' and 'them' attitude in the media.

Dr Andrew McLean's (hereafter AM's) Response: This is hardly surprising given the next statement in their report where they state that they have continually consulted with the Horse Studs and "considered their concerns (regardless of whether such concerns could be substantiated through facts or evidence)". This is an unfortunate statement given the fact that Anglo have not sought expert opinion on horse behaviour including learned behaviour but instead have sought opinion from a veterinary surgeon with no formal training in behavioural science (as outlined in the Preamble of this report).

Under the section entitled 1. *Third Application For The Same Project* (p 85), Anglo report that in this latest plan (Second Application (current)) that they have proposed to:

- "Doubles the buffer distance to protect the Horse Studs from the impacts of mining as recommended in the PAC Review Report and Gateway Panel Report;
- Demonstrates that it will have no adverse impact on equine health (confirmed by the equine health assessment and two independent experts peer reviews);

- Will have no impact on the viability of operations at Coolmore or Woodlands Horse Studs and presents no tangible justification for either Horse Stud to consider leaving the Hunter Valley region;
- Will have no impact on the viability of the thoroughbred, viticulture or tourism industries, whilst continuing to deliver significant economic benefits to the local region and NSW; and
- Delivers a project that is in the public interest.”

AM's Response: There are several issues here. Firstly doubling the buffer distance (by a few hundred metres to less than 1km) from the stud's operations is of little value considering that the actual effects on horses and staff in studs nearby are not known in their entirety. For example, as stated in the Preamble, the precise blast characteristics potentially experienced at the Coolmore site are not clearly described or evaluated by the report of Bridges Acoustics. Moreover the range of blast frequencies (Hertz) are not described at this site yet there are known deleterious sonic effects on ungulate mammals ranging from panic to miscarriage (Huybreghts, 2008; Calef, 1974; Bond *et al.*, 1974; Espmark *et al.*, 1974). Research on noise impacts on horses shows that reactions were the strongest when the noise was of an alarming character e.g. a short burst such as an explosion. Importantly, the funnel shape of horse's ears provides an acoustic pressure gain of 10 to 20dB (Fletcher, 1985). At the very least, the *precautionary principle* should prevail when it is considered that the horses are amongst the most valuable in Australasia.

Therefore each of the proposals outlined in the 5 bullet points above are not met to any degree of satisfaction.

Relating to Section 4. Mine Creep and Buffer

Anglo outline the minimal constraints for the mine to go ahead:

*Anglo: a) Open cut mining must be setback behind the natural ridgelines;
b) Considerable buffering to shield the studs from the mine is necessary and, having regard to the topography of the area, open cut mining must not be allowed to extend through the second ridge to the north of the Golden Highway. (p 91)*

AM's Response: Data on the blast noise characteristics are not supplied in Anglo's report and without this valuable information, the efficacy of a buffer cannot be determined. It is well known in science that low frequency sound waves travel further than high frequency waves and are less subject to the effects of environmental buffering. Thus the mitigating effect of the range of frequencies emitted by variable mine blasts cannot be determined.

The daily visual and odour effects of the gas plume that results from blasting has not been demonstrably mitigated by the new proposal which only places the mine a few hundred metres further back than originally planned. As stated earlier, there are no adequate details of the characteristics of the blast and overpressure that are implicit characteristics of explosions. This would vary according to the mass of the explosive and these data are also absent from the report. To describe the daily explosions as *“the sensation will be limited to a period of less than 10 seconds and is akin to hearing a distant rumble of thunder”* is inadequate (p 97).

In this section also, the Responses to Submissions report defends the calibre of the Anglo experts: Anglo: *“The sum total of the years of experience of the engineers and scientists that have contributed to the preparation of the EIS is in excess of 500 years. Many of these experts have provided evidence to court proceedings and all are willing to sign the Expert Witness Code of the Land and Environment Court of NSW.”*

To suggest that the EIS is ‘inaccurate’, ‘misleading’ or ‘invalid’ is insulting to each of the professionals involved and entirely unfounded” (p 99).

AM’s Response: Given the lack of behavioural science expertise and the absence of essential explosive blast data, as outlined in the Preamble to this report, it would suggest that the EIS is in fact inaccurate, misleading, questionable and invalid.

Relating to Section 5.2.4 Noise and Blasting, Anglo

“Coolmore, Darley and HTBA asserted in their submissions that the acoustic impact assessment as completed by Bridges Acoustic was inadequate and does not address the concerns raised previously by the horse studs with regard to potential impacts” (p 115).

AM’s Response: Despite the analysis that has been undertaken on this proposal to date, the fact remains that precise blasting data have not been provided in terms of the close proximity of the Horse Stud operations. These data should provide information as to the ranges of noise emanating from the daily explosions. Considering the established deleterious impact that these events can impose on animals, these data are essential.

Relating to Section 5.2.5 Equine Health Equine Behaviour

Anglo: *“Coolmore raise concern with regard to the way that equine behaviour has been assessed in the EHIA and note “this opinion is supported by Dr Andrew McLean”. (p 122) Anglo also comment that Dr McLean has “no veterinary training being a science graduate who has*

completed a PhD” and later they go on to say “the Coolmore submission claims that their horses have evolved a far greater flight response”. Anglo point out that although thoroughbreds have been selectively bred for speed for many years but that “this does not directly relate to flight response”. Also that “some of the fastest racehorses have the best temperaments and a very poor flight response”.

AM’s Response: As I have pointed out in the Preamble, for the purposes of this enquiry, health aspects that are related to behavioural science require the expertise of scientists qualified in behavioural science and welfare. In this regard I am well qualified. The title of my PhD was: “The mental processes of the horse and their consequences for training”.

Anglo have misunderstood Coolmore’s statements regarding flight response. Fundamentally the position is not that Coolmore horses have a greater flight response, but that thoroughbreds in general have a greater flight response than other non-racing breeds. Any breed selectively bred to race (such as quarter horses as Dr Kannegieter points out), have stronger hyperreactive tendencies (flight response) because it is known to make them run faster. Of course there are other factors, but in particular, sprint horses tend to be the most hyper reactive and this is well known in racing and three day eventing circles. It is widely known that the modern racehorse is derived from English farm horses crossed with 4 Arabian sires in the seventeenth and eighteenth centuries in order to win races. Furthermore it is common knowledge among horse people that thoroughbreds and Arabian horses are known as ‘hot blooded’, while ponies and draught breeds are known as ‘cold blooded’ and modern European riding horses are called ‘warmbloods’. Of course there is variation among breeds however these general characteristics remain true and this clearly exposes thoroughbreds to increased danger from their heightened flight response.

It is important to note that calmness and flight response are not mutually exclusive. Many racehorses are calm in temperament but still have a stronger flight response than other breeds. Thoroughbreds are predominantly flight animals and this is of great importance in assessing the likely effects of daily explosions nearby to horse studs.

Coolmore’s previous report: *“The horses resident at Coolmore are all thoroughbreds and particularly successful ones with a maximised flight response”*

Anglo: There is no scientific evidence to support this and in fact there is much that contradicts this statement. As Coolmore know, breeding fast horses is a complex issue and not just a matter of selecting those with the maximal flight response. Claiming such diminishes the expertise of top-level breeders, including Coolmore.

AM's Response: As I have mentioned earlier I agree that breeding racehorses is complex, but nonetheless the basic temperamental characteristic of the breed is that they have hyper-reactive tendencies. Any jockey or rider of thoroughbreds such as event riders will agree with this. As such, these animals need a more managed environment than other breeds.

Coolmore's previous report: "Horses do react to sudden and loud noises, and this is a risk to them and their handlers" (p 123)

Anglo: "It is agreed horses can react to sudden and loud noises which is a risk to them and their handlers. However, their exposure to such noises is far greater in their daily lives than those generated by the Project, which will be low intensity and not sudden. As confirmed by the Acoustic Assessment in the EIS all operational noise levels will be within the existing background levels. With regard to noise from blasting, this has been confirmed to be well below all guidelines and will at worst be perceived as a distant rumbling similar to distant thunder."

AM's Response: This is a contentious issue. Very few horses, I would contend, are exposed to stimuli in their daily lives comparable daily explosions of varying magnitudes. Given the paucity of data on the nature of the proposed explosions, Coolmore's concerns remain valid.

Relating to: Conditioning and Fear (Habituation)

Anglo: Coolmore have presented a case that horses could develop a permanent fear response to noise associated with mine blasting. (p 123)

AM's Response: Anglo is wrong to assume that any stimulus can be habituated to. The nature and characteristics of aversive stimuli, as mentioned in previous reports will determine this (Magnitude, erratic, advancing or novel) (McGreevy and McLean, 2010). It is basic psychology knowledge that the concept of escape learning means that escape from stimuli actually embeds the fearful stimulus as a "trigger" for flight. Contrary to allegations that horses would eventually habituate, it is unlikely that all horses would habituate to (i.e. become used to) random explosions especially since the precise size of the charges to be used have not been disclosed. Regardless, habituation capabilities in animals are not uniform or universal: some individuals will habituate better than others while some will not habituate at all and therefore be exposed to danger. You only have to go to the races or a horse show to see that many horses remain neophobic or further still may shy at frequently encountered stimuli. Testimony to this sensitive flight response of thoroughbreds was the unfortunate death of the racehorse *Araldo* after the 2014 Melbourne Cup when a member of the crowd waved a flag nearby as the horse returned to the mounting enclosure.

Relating to: Hearing of Horses

Anglo: *Coolmore have chosen to selectively misquote comments contained in the EHIA. They say “The statement that horses are somewhat deaf compared to humans made in the EHIA is incorrect” (p 125).*

AM’s Response: The references used by Anglo in their refutation of this statement are not current or scholarly. The range of equine hearing is in vicinity of 55Hz to 33.5 KHz whereas in humans it is accepted to be 20 Hz to 20 KHz. It is therefore untrue to say horses are somewhat deaf compared to humans as they hear at higher frequencies. Their range across the sound spectrum is simply different than that of humans. Because the magnitude of noise or even the timings of explosions are inadequately revealed by Anglo, it is indeterminate whether there is a likely effect on horses.

However it should be pointed out that the effects of sound on animals are not only related to hearing. Low frequency sounds have been studied extensively. It is known that low frequency sounds can have deleterious impacts on physiological processes and health.

To claim that horses “are at far greater risk from noise generated on the stud” is unsubstantiated.

Relating to: Horse Stud Viability

Anglo: *“Coolmore, Darley and the HTBA have raised concerns over the potential impacts of the Project on the viability of the horse studs” (p 125).*

AM’s Response: It is an unknown and risky gamble for anyone to assume that there would be no publicly perceived risk for horses at Coolmore with daily explosions less than a kilometre away. Many mare owners would think twice before sending valuable mares to Coolmore and similarly owners of highly valuable stallions would think it a very unsuitable and dangerous environment to send their precious stallions.

Relating to Appendix G Response to submissions

Item raised: 2. Impact on equine Health

(a) LACK OF SCIENTIFIC EVIDENCE/ LACK OF CERTAINTY: Does not reliably demonstrate that there will be no adverse impact on equine health (HTBA Submission, page 1).

Anglo Response: The Technical studies in the EIS undertaken by pre-eminent experts conclude that there will be no adverse impacts to horse health at the studs as a result of the Project.

Three of Australia's most pre-eminent horse health experts support this conclusion in the EIS and have provided independent expert evidence, which they will verify as being true and not false and misleading under the Expert Witness Code. In light of the weight of evidence it cannot reasonably be argued that this fact has not been reliably demonstrated.

AM's Response: This statement is unfounded given the fact that the explosive data are not supplied by Anglo and the consequent mental health effects on horses are unknown. Furthermore, there remains the possibility of injury as result of flight response manifesting as bolting (galloping off out of control), shying (sudden swerving) or leaping out of control of rider or handler thus endangering the both horses and humans. There is no guarantee that explosive events at Drayton South will not precipitate flight response in horses nearby.

In addition, the accumulation of sudden fear responses arising from unpredictable noise stimuli can result in chronic stress. The effects of stress in animals are well documented and include:

- the deterioration of *learning* abilities and the tendency not to trial new learned responses. These effects can make the training of young horses difficult, for example in yearling preparation, and therefore render them dangerous to themselves and their handlers;
- Stress also is known to affect the horse's *alimentary canal*, potentially resulting in colic and not uncommonly, death from colic;
- There are also powerful effects of stress on the *immune* system, which can render animals more susceptible to disease;
- Finally, stress can have strong effects on an animal's *reproductive biology*, where stallions may become less fertile or lowered in libido, and reproductive disorders and miscarriages may occur in mares. Published research shows that some species such as elk and caribou, similar in flight response to thoroughbred horses show panic, running and miscarriages when exposed to sonic booms in Alaska from USA air force planes.

Item raised: 2. Impact on equine Health

(b) The assessment of impacts on thoroughbreds continues to be misleading and based on research that has little if any relevance to the breeding and rearing of horses on the Darley property and throughout the Hunter region (Darley Submission, page 13).

Anglo Response: As Above

AM's Response: As above

Item raised: 2. Impact on equine Health

(c) The EIS fails to provide evidence in support of the contention that there will be no impacts on equine health, the operations of the Coolmore and Darley studs or the adoption of the precautionary principle (Darley Submission, page 8).

Anglo Response: The first point is a matter for expert evidence, which Darley have not provided.

See 2(a) above.

AM's Response: We stand by this assertion. Given the unknown details of charge size or timing, the aforementioned spectre of flight response therefore cannot be ruled out. The precautionary principle is paramount here considering that these studs represent the elite of all breeding centres in Australia and as a breeding cluster, this region is known to be one of the top three thoroughbred breeding clusters in the world.

Item raised: 2. Impact on equine Health

(d) Precautionary principle should be applied and application refused (HTBA Submission, page 4).

Anglo Response: Section 7 (4) of Schedule 2 of the Environmental Planning and Assessment Regulation, 2000 states the principles of ecologically sustainable development. In this section the precautionary principle is discussed as follows:

(a) The precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and

(ii) An assessment of the risk-weighted consequences of various options.

There is scientific certainty over the impacts and outcome of the Project, if it is approved to proceed. Further, there are no serious or irreversible threats that have been identified to the horse studs nor the environment more generally as a consequence of the Project proceeding.

AM's Response: There is *no scientific certainty* surrounding the possible impacts of the Drayton South Coal Project given the fact that no reliable, informed scientific data have been produced by Anglo. *There is no scientific literature* on the effects of open cut mine explosions on horse behaviour, and therefore on thoroughbred horses. This is likely due to the fact that no prospective stud-developer would choose to locate adjacent to a coalmine. Anglo did not seek expert opinion from persons qualified in behavioural science. Nor have Anglo provided satisfactory data on the magnitude or timing of the proposed daily explosive events.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(a) REPUTATIONAL IMPACTS: Should the Drayton South open cut coal mine proposal be allowed to proceed, the visual, dust, noise, vibration, health, water, environmental and

reputational impacts this proposal will have on Darley's operations, and on the operations and reputation of other studs in the area and our entire industry, will be devastating (Darley Submission, page 2).

Anglo Response: This is based on perception and not on any real science or evidence. As concluded in the numerous Technical Studies completed by pre- eminent experts in the field, the Project will not adversely impact on equine health and the operations of Coolmore or Darley. Environmental impacts are predicted to be well within amenity criteria.

AM's Response: As stated earlier there is insufficient scientific data on either on the nature of the daily explosive events or on the mental health impacts on horses. The paucity of this information naturally will render Coolmore and Darley vulnerable to the natural outcome of negative public perception.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(b) This proposal represents a textbook case of an utterly incompatible land use (Darley Submission, page 2).

Ignores the incompatibility of thoroughbred breeding and mining which are competitive land uses (Darley Submission, page 9).

Anglo Response: There is no evidence to support the assertion that mining and the thoroughbred industry are incompatible land uses. This unsubstantiated statement contradicts the findings of the EIS completed for the project by pre-eminent experts, who when combined, have demonstrated experience exceeding 500 years. It also demonstrates no recognition of the significant buffer exclusion zone proposed by Anglo American to ensure no open cut mine would ever be extended or developed beyond that currently proposed.

The EIS concluded that this Project and the nearby horse industry can continue to co-exist, given there are no adverse environmental nor amenity impacts predicted.

This statement also appears to contradict the current situation with the nearby existing Bengalla Mine and Mt Arthur Mine operate nearby or adjacent to very successful operational horse studs.

AM's Response: The lack of appropriate expertise on the part of Anglo regarding behavioural science casts a cloud over the scientific reliability of their conclusions. The lack of adequate explosive data casts further doubt over the credibility of Anglo's assessment .

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(c) No reasonable person would choose to acquire, invest in, upgrade or operate a thoroughbred breeding business in such close proximity to a coal mine (Darley Submission, page 2).

Anglo Response: There is no evidence or information to support and/ or justify this

statement.

In fact to the contrary, both horse studs purchased in to the area with the full knowledge that the NSW Government had an approved EL over the area for years before Coolmore or Darley acquired their properties. When Darley acquired Woodlands in 2008 there was already a full feasibility study for a combined open cut and underground mine on the Drayton South site.

AM's Response: Given the doubt over the scientific veracity of the EIS report, significant doubt still hangs over this project and as such it is not inconceivable that the reputation of Coolmore and Darley would be seriously tarnished.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(d) Ignores the impacts on the Hunter Valley's wine and equine CICs (Darley Submission, page 7).

Anglo Response: The entire Mine Plan and Project has been designed to minimise impacts on nearby neighbours including the wine and equine operations.

AM's Response: As above

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(e) To say that any area of the stud farm is not part of their "primary operation" demonstrates a continued and complete lack of understanding of the business and therefore the impacts this mine will have on the operations and reputation (Darley Submission, page 13). Lack of understanding of the Darley business and the impacts the mine will have on their operations and reputation. (Darley Submission, pages 8 and 13).

Anglo Response: This is a complete turnaround from the advice given to Anglo American's experts at the numerous field visits to the horse studs where horse stud owners advised the location of their most sensitive viewing areas for the purposes of visual assessment.

To suggest now that some largely inaccessible and rarely inspected high points such as Trig Hill are primary operational areas is ludicrous.

It is also note that from Trig Hill numerous existing mines, power stations and the Coolmore quarry are clearly visible.

AM's Response: Because a stud farm implies not only breeding mares to stallions but also pregnancy and delivery, it is a consistent that the entirety of any stud farm would be vulnerable to the environmental events imposed by a nearby open cut coal mine.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(f) Anglo has regularly demonstrated that it is not willing or capable of acknowledging or understanding the sensitivity of the studs to this mine plan (HTBA Submission, page 4).

Fails to assess and entirely ignores the impact of the proposal on the studs (HTBA Submission, page 13).

Concern as to the credibility of the assertions and assurances made by Anglo regarding significant aspects of this project and the potential impact they may have on the viability of our business (Coolmore Submission, page 30).

Anglo Response: Anglo American has continued to consult with the horse studs over more than a decade, and has made numerous changes to mine plans and designs in an attempt to meet positions stated by the horse studs. This is despite environmental and technical assessments demonstrating that there will be no adverse impacts on the horse studs. The retractions in the current mine plan is a demonstration of Anglo American's commitment to addressing concerns raised by the horse studs

AM's Response: Coolmore's concerns over the strengths of the explosive devices, the noise level of the totality of these events and the impacts of daily explosions remain valid.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(g) Threatens the viability of the Coolmore and Darley studs and the Australian industry they underpin (HTBA Submission, page 1).

Impacts on decisions of broodmare owners as to whether to send their assets to board at Coolmore (Coolmore Submission, page 15).

The major clients and trainers in this industry have been clear and public in raising their concerns about the proposed project. This goes directly to threatening Coolmore's viability (Coolmore Submission, page 15 and Appendix D).

Anglo Response: Technical Studies completed by pre-eminent experts in the field, concluded that the Project will not adversely impact on equine health and the operations of Coolmore or Darley. Environmental impacts are predicted to be well within amenity criteria. There is no scientific evidence to suggest that the viability of the Coolmore or Darley studs will be threatened by this project.

AM's Response: As stated earlier, there are no supplied technical studies supplied by Anglo that avert concerns regarding the health of horses, staff and the viability of the horse studs.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(i) EIS GENERALLY: The EIS totally disregards the significant social, agricultural and economic impact the open cut coal mine will have on our thoroughbred breeding operations and our industry as a whole (Darley Submission, page 8).

Anglo Response: The EIS concluded there will be no adverse social, agricultural or economic

impact predicted on the nearby horse studs and the wider thoroughbred industry. There is no evidence provided with this submission to illustrate that the conclusions of the EIS are incorrect.

AM's Response: The information supplied by Anglo falls short of an objective and fair assessment of the problems that may be faced by Coolmore.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(j) The EIS makes inaccurate and misinformed judgments about the impact of the proposed open cut mine will have on our land and valuable livestock (Darley Submission, page 8).

Anglo Response: As above.

AM's Response: As I have stated earlier, the EIS represents a distorted view point and is inadequate and misinformed regarding many aspects that it has relied upon such as the potential effects on horse behaviour the lack of relevant acoustic data on explosive events.

Item raised: 4. Perceived Impact on Viability of CIC / Horse Studs

(k) The EIS represents a totally inadequate and dismissive response to Darley's concerns and future operations (Darley Submission, page 8)

Anglo Response: As discussed above. This is an unfounded comment. Anglo American has continued to consult with the horse studs since as early as 2005, and has made numerous changes to mine plan and designs in an attempt to appease the horse studs. This is despite environmental assessments demonstrating that there will be no adverse environmental impacts proposed on the horse studs. The retractions in the current Mine Plan are a demonstration of Anglo Americans commitment to addressing concerns raised by the horse studs and their future operations.

AM's Response: As stated above.

C. Conclusion

In my opinion there are a number of major flaws with the EIS.

Firstly *there is no scientific literature* on the effects of open cut mine explosions on horse behaviour, let alone on thoroughbred horses. This is likely due to the fact that it is *unthinkable* that *any* would-be-stud-developer would choose to locate adjacent to a coalmine.

It is significant that there is no information on the precise details of the regular explosions to be perceived at Coolmore from the proposed Drayton South Coal Mine Project. In addition, the *timing* of the explosions has not been revealed by Anglo except to say that they will occur on average 5 times per week. This could mean a few explosions on one day and none the next. The *uncertainty* of this can add to both human and equine stress and can make the management of horses, and daily event planning very difficult. Therefore increasing the distance of the mine by a few hundred metres is likely to have a negligible effect regarding the equine behavioural impact on surrounding horse studs.

The EIS fails to address in any expert manner the possible behavioural reactions of horses at Coolmore Stud (and Darley) to the daily explosive events (except Sundays) that are proposed for the Drayton South Coal Mine. These behavioural responses may range from flight responses manifesting as bolting (galloping off out of control), shying (sudden swerving) or leaping out of control of rider or handler thus endangering the both horses and humans.

Sudden fear responses to unpredictable stimuli can also have deleterious effects on animals resulting in chronic stress. The effects of stress include the deterioration of *learning* abilities and the tendency not to trial new learned responses. These effects can make the training of young horses difficult, for example in yearling preparation, and therefore render them dangerous to themselves and their handlers. Stress also is known to affect the horse's *gut*, potentially resulting in colic and not uncommonly, death from colic. Also, there are powerful effects of stress on the *immune* system, which can render animals more susceptible to disease. Finally, stress can have strong effects on an animal's *reproductive biology*, where stallions may become less fertile or lowered in libido, and reproductive disorders and miscarriages may occur in mares. Published research shows that some species such as elk and caribou, similar in flight response to thoroughbred horses show panic, running and miscarriages when exposed to sonic booms in Alaska from USA air force planes.

Contrary to allegations that horses would eventually habituate, it is doubtful that all horses would habituate to (i.e. become used to) random explosions especially since the precise size of the charges to be used have not been disclosed. At any rate, habituation capabilities in animals are not uniform or universal – some individuals will habituate better than others and some will not habituate and therefore be exposed to danger.

Therefore it is of the utmost importance that the precautionary principle is applied here. Coolmore and Darley Studs, the breeding ground of the cream of Australian racing, should not become an experiment on the effects of coal mine explosions on thoroughbred racehorses.

D. References

Bond, J., Ruskey T.S., Menear, J.R., Colber, L.I., Kern, D., and Wienland, B.T. (1974). Effects of simulated sonic booms on eating patterns feed and behavioural activity of ponies and beef cattle. 170 – 175 Proc. Int. Livestock Environmental Symposium. Am Soc. Agric. Eng.

Berglund, B., Lindvall, T., Schwela, D., and Goh, K.-T. (2000): Guidelines for Community Noise. World Health Organisation.

Christensen, J. W., Keeling, L. J., Nielsen, B. L. (2005). Responses of horses to novel visual, olfactory and auditory stimuli. *Applied Animal Behaviour Science*, 93(1), 53-65.

Calef, G.W., (1974). The predicted effect of the Canadian Gas Pipeline Project on the Porcupine Caribou Herd. Vol 5. No IV Canadian environmental Protection board, Winnipeg, Manitoba.

Espmark, Y., Falt, L., and Falt B. (1974). Behavioural responses in cattle and sheep exposed to sonic booms and low altitude subsonic flight noise. *Vet, Rec*, 94 (6) 106-113

Fletcher, N. H. (1985). Sound production and hearing in diverse animals. *Acoustics Australia*, 13, 49-53.

Huybregts, J. (2008). Protecting horses from excessive music noise, a case study. 9th international congress on noise as a public health problem (ICBEN), Foxwoods, CT.

McGreevy, P. D. and McLean, A. N. (2010). *Equitation Science*. Wylie Blackwell.

E. CURRICULUM VITAE – DR ANDREW NEIL MCLEAN

PERSONAL

D.O.B: Camberwell, Melbourne, 10th December, 1954.

EDUCATION: Drouin State School (VIC); King Island District School (TAS); Launceston Matriculation College (TAS); University of Tasmania; University of Melbourne.

PROFESSION: Clinical ethologist/horse trainer/working elephant trainer.

ACADEMIC BACKGROUND

- Specialist academic areas are Animal Cognition (animal mental processes) and Equine learning/Training Psychology.
- PhD thesis (University of Melbourne) entitled “The Mental Processes of the Horse and their Consequences for Training” (PhD Scholarship 1994-1996).
- Bachelor of Science degree (double major in zoology).
- Diploma of Education, University of Tasmania.

ACADEMIC AWARDS AND POSITIONS

- Eureka Science Prize, 2011 (co-winner).
- John H Daniels Fellowship, 2014. National Sporting Library, Virginia, USA.
- Honorary Associate, Faculty of Veterinary Science, University of Sydney
- Sub Editor, Journal of Animal Welfare.

EQUESTRIAN SPORT ACHIEVEMENTS

- Represented Australia in eventing (Three Day Event) in 1989.
- Shortlisted for World championships, (3DE) 1990.
- State and National titles in both dressage and eventing.
- Represented Tasmania four times and Victoria twice in eventing.
- Represented Victoria in FEI dressage.
- Trained to Grand Prix level in dressage.
- Competed successfully in show jumping to Grand Prix level.
- Trained International Prix St George Derby winner, CDI, 2004.
- Trained Woodmount Magic, (first Australian-trained Eventing stallion sold to Europe), 1995.
- Raced in bareback races in Australia and New Zealand (1974 to 1981).

- Held a race trainer's licence from 1985 to 1991.
- Institute of Sport scholarship 1990, 1991.
- Olympic Academy delegate, 1991.

ACADEMIC JOURNAL PUBLICATIONS

1. Davies, M., Hawson, L., McLean, A., McGreevy, P. 2011. Methodology for the use of rein tensiometers in analyzing rein tension in the ridden horse (*Equus caballus*): a review. 7th International Equitation Science Conference, the Netherlands: Wageningen Academic Publishers.
2. DeAraugo, J., McLean, A., McLaren, S., Casper, G., McLean, M., McGreevy, P. 2014. Training methodologies differ with the attachment of humans to horses. *Journal of Veterinary Behavior*, 9 (5), 235-241.
3. Goodwin, D., McGreevy, P.D., Waran, N, McLean, A.N., 2009. How equitation science can elucidate and refine horsemanship techniques. *The Veterinary Journal* 181, 5–11.
4. Hawson, L., Koprinska, I., McLean, A., McGreevy, P. 2011. Deciphering the cues from riders' legs. 7th International Equitation Science Conference, the Netherlands: Wageningen Academic Publishers.
5. Hawson, L., McLean, A., McGreevy, P. 2013. A retrospective survey of riders' opinions of the use of saddle pads in horses. *Journal of Veterinary Behavior*, 8 (2), 74-81.
6. Hawson, L., Oddie, C., McLean, A., McGreevy, P. 2011. Is safety valued in the Australian pony market? *Journal of Veterinary Behavior*, 6(5), 254-260.
7. Hawson, L., Salvin, H., McLean, A., McGreevy, P. 2014. Riders' application of rein tension for walk-to-halt transitions on a model horse. *Journal of Veterinary Behavior*, 9 (4), 164-168.
8. Hawson, L.A., McLean, A.N., McGreevy, P.D., 2010. The roles of equine ethology and applied learning theory in horse-related human injuries. *Journal of Veterinary Behavior: Clinical Applications and Research*. 5, 324-338.
9. Hawson, L.A., McLean, A.N., McGreevy, P.D., 2010. Variability of scores in the 2008 Olympics dressage competition and implications for horse training and welfare. *Journal of Veterinary Behavior: Clinical Applications and Research*. 5, 170-176.
10. Hill, E., McGreevy, P.D., White, P., Caspar, G., McLean, A.N., 2015. The distribution of apparatus in popular equestrian disciplines. *Journal of Veterinary Behavior*, 10. 147-152.
11. McGreevy, P., Hawson, L., Salvin, H., McLean, A. 2013. A note on the force of whip impacts delivered by jockeys using forehand and backhand strikes. *Journal of Veterinary Behavior*, 8(5), 395-399.
12. McGreevy, P., Henshall, C., Starling, M., McLean, A., Boakes, R. 2014. The importance of safety signals in animal handling and training. *Journal of Veterinary Behavior*, 9 (6), 382-387.

13. McGreevy, P., McLean, A., Buckley, P., McConaghy, F., McLean, C. 2011. How riding may affect welfare: What the equine veterinarian needs to know. *Equine Veterinary Education*, 23(10), 531-539.
14. McGreevy, P., Oddie, C., Hawson, L., McLean, A., Evans, D. 2015. Do vendors value safety in Thoroughbred horses in the Australian recreational riding horse market? *Journal of Veterinary Behavior*, 10 (2), 153-157.
15. McGreevy, P., Sundin, M., Karlsteen, M., Berglin, L., Ternstrom, J., Hawson, L., Richardsson, H., McLean, A. 2014. Problems at the human- horse interface and prospects for smart textile solutions. *Journal of Veterinary Behavior*, 9 (1), 34-42.
16. McGreevy, P.D., Burton, F.L., McLean, A.N., 2009. The horse–human dyad: Can we align horse training and handling activities with the equid social ethogram? *The Veterinary Journal*. 181 (2009) 12–18.
17. McGreevy, P.D., Harman, A., McLean, A.N., Hawson, L.A. 2010. Over-flexing the horse's neck: a modern equestrian obsession? *Journal of Veterinary Behavior: Clinical Applications and Research*. 5, 180-186.
18. McGreevy, P.D., McLean, A.N., 2006. Ethological challenges for the working horse and the limitations of ethological solutions in training. 2nd International Equitation Science Symposium, Milan, Italy. Eds: M. Minero, E. Canali, A. Warren-Smith, A. McLean, D. Goodwin, Mari Zetterqvist, N. Waran, P. McGreevy.
19. McGreevy, P.D., McLean, A.N., 2007. The roles of learning theory and ethology in equitation. *Journal of Veterinary Behavior: Clinical Applications and Research*, 2, 108-118.
20. McGreevy, P.D., McLean, A.N., 2009. Punishment in horse-training and the concept of ethical equitation. *Journal of Veterinary Behavior*. 4, 193-197.
21. McGreevy, P.D., McLean, A.N., Thomson, P.C., 2009b. SMART: Sensitivity Models for Animals in Response to Training. *The Veterinary Journal*.
22. McGreevy, P.D., McLean, A.N., Warren-Smith, A.K., Waran, N., Goodwin D., 2005. Defining the terms and processes associated with equitation. Proceedings of the 1st International Equitation Science Symposium, Broadford, Victoria, pp.10-43. Eds: P. McGreevy, A. McLean, N. Waran, D. Goodwin, A. Warren-Smith. Post-Graduate Foundation in Veterinary Science, Sydney.
23. McLean, A., Henshall, C., Starling, M., McGreevy, P. 2013. Arousal, attachment and affective state. *Proceedings of the 9th International Equitation Science Conference*, Eds: C. Heleski and C Wickens, University of Delaware. 50.
24. McLean, A., McGreevy, P.D., 2006. Reducing wastage in the trained horse – principles that arise from learning theory. Proceedings of the 2nd ISES Symposium, Milan, Italy.
25. McLean, A., McGreevy, P.D., 2010. Ethical equitation. Ethical equitation: Capping the price horses pay for human glory. *Journal of Veterinary Behavior* 5, 203-209.
26. McLean, A., McGreevy, P.D., 2010. Horse-training techniques that may defy the principles of learning theory and compromise welfare. *Journal of Veterinary Behavior* (2010) 5, 187-195.

27. McLean, A.N., 2001. Cognitive abilities: The result of selective pressures on food acquisition? *Applied Animal Behaviour Science*, 71, (3) 241-258.
28. McLean, A.N., 2004. Short-term spatial memory in the domestic horse. *Applied Animal Behaviour Science*, 85, 93-105.
29. McLean, A.N., 2005. The positive aspects of correct negative reinforcement. *Anthrozoös*, 18 (3).
30. McLean, A.N., 2008. Overshadowing: A silver lining to a dark cloud in horse training? *Journal of Applied Animal Welfare Science*, 11, 3, 236-248.
31. McLean, A.N., 2012. Training the ridden animal: An ancient hall of mirrors. *The Veterinary Journal*. Personal view invitation, 2012.
32. Oddie, C., Hawson, L., McLean, A., McGreevy, P. 2014. Do vendors value safety in the Australian recreational (non-Thoroughbred) riding horse market? *Journal of Veterinary Behavior*, 9, 375-381.
33. Pierard, M., Hall, C., Kong von Borstel, C., Averis, A., Hawson, L., McLean, A., Nevison, C., Visser, K., McGreevy, P. 2015. Evolving protocols for research in equitation science. *Journal of Veterinary Behavior*, 10, 255-266.
34. Ternström, J., Hawson, L., Gunnarsson, E., Engvall, T., Karlsteen, M., Sundin, M., Berglin, L., McLean, A.N., McGreevy, P.D., 2013. Applications and use of smart textiles and technology in equine science. *Proceedings of the 9th International Equitation Science Conference*, Eds: C. Heleski and C Wickens. University of Delaware Press /Associated University Press. 41.
35. Warren-Smith, A.K., McLean, A.N., Nicol, H.I., McGreevy, P.D., 2005. Variations in the timing of reinforcement as a training technique for foals. *Anthrozoös*, 18 (3) 255-272.

BOOK PUBLICATIONS

1. McGreevy, P.D., McLean, A.N., 2010. *Equitation Science*. Published by Wiley-Blackwell, Chichester, UK.
2. McLean, A.N., McLean, M.M., 2008. *Academic Horse Training: Equitation Science in Practice*. Published by AEBC, Melbourne, Australia.
3. McGreevy, P.D., McLean, A.N., 2004. *Training*. In: *Equine Behaviour: A Guide for Veterinarians and Horse Professionals*. Published by W.B Saunders, London.
4. McGreevy, P.D., McLean, A.N., 2005. *Behavioural problems with the ridden horse*. In: *The Domestic Horse: The Evolution, Development and Management of its Behaviour*. Editors Professor Daniel Mills and Professor Sue McDonnell. Published by Cambridge Press, UK.
5. McLean, A.N., 2011. (Six contributions) *Habituation; Horse training; Whipping; Conflict Behaviour; Imprint Training; Imprinting*; In: *The Encyclopaedia of Applied Animal Behaviour and Welfare*. Editor-in-chief Professor Daniel Mills. Published by CAB International, Wallingford, UK.
6. McLean, A.N., 1978. *Cell biology and Genetics*. 1978. Published by, University of Tasmania Press.
7. McLean, A.N., 2007. *A Blueprint for Humane Elephant Training*. Published by Nepal WWF.

8. McLean, A.N., 2004. *The Truth About Horses*. Published by David and Charles (UK), Penguin (Aust) and Barron's (USA), (International Best-Seller).
9. McLean, A.N., McLean, M.M., 2002. *Horse Training The McLean Way: The Science Behind The Art*. 2002. Published by AEBC, Melbourne, Australia.
10. McLean, A.N., 2004. *Obedience Training For Racehorses*. Published by NMIT, Melbourne.
11. McLean, A.N., 2013. *Elephant-Friendly Training for Working Elephants*. Wildlife Trust of India publishers (also on Kindle via Amazon Books).
12. McLean, A (2014) *Hasthisiksha: A Manual On The Science Of Training Captive Elephants*. Menon, V; Ashraf, NVK; Bhardwaj, D (Eds.) Conservation. Reference Series 9. Wildlife Trust of India, New Delhi.

CONFERENCE AND CONGRESS PRESENTATIONS

1. Presented at the International Horse Symposium '*Conflict behaviour in the domestic horse*', University of Sydney, July 2001
2. Presented at RSPCA conference '*Conflict behaviour in the domestic horse and how to avoid it*', Canberra, February 2002.
3. Key speaker for satellite meeting at the International Society of Applied Ethology congress in Venice, Italy on the topic: '*Learning principles – the missing link in Equitation*', June 2003.
4. Presented at the International Society of Anthrozoology congress, Glasgow, October 2004 entitled: '*The positive aspects of correct negative reinforcement*'.
5. Presented at the First International Congress of Equine Ethology organized by the "Association des Vétérinaires Equins Français" in Nantes, France, entitled '*Behaviour problems in the domestic horse – associations with dysfunctions in negative reinforcement*' 2005
6. Presented at the First International Congress of Equine Ethology organized by the "Association des Vétérinaires Equins Français" in Nantes, France, entitled '*Development of behavioural problems: Applied Learning Theory*', 2005
7. Presented at The Ecole Nationale d'Equitation, Saumur, France '*Le Dressage efficace pour le bien-être optimal*' ('*Effective Horse training for optimal welfare*') 2005
8. FEI workshop on Röllkur: *Equitation and learning theory – positive and negative reinforcement*. Geneva, Switzerland January, 2006.
9. 2nd International Equitation Science Symposium, Milan, Italy: *Reducing wastage in the trained horse: training principles that arise from learning theory* September 2006
10. Global Dressage Forum, the Netherlands: *Learning theory: The New Frontier of Horse Training* October 2006
11. Global Dressage Forum, the Netherlands: *Training Principles and Learned Helplessness in horses*, October 2007.

12. 3rd International Equitation Science Symposium, Michigan, USA: *Overshadowing: A Silver Lining to a Dark Cloud in Horse Training* August 2007
13. Plenary Speaker at 6th ISES conference, Uppsala, Sweden August 2010: *Conflict Theory – The Missing Link in Equestrian Culture*.
14. Global Dressage Forum, the Netherlands: *Desensitisation Techniques in Sport Horses*. October, 2011.
15. Plenary Speaker, 8th ISES conference, Edinburgh, UK. *Distilling Equitation Science – Objectivity versus Subjectivity in Equine Behaviour Modification*, August, 2012.
16. Plenary Speaker, 9th ISES conference, Delaware, USA, *Can We Apply Attachment Theory to Horse/Human Interactions?* August, 2013.
17. Plenary Speaker, National Association of Equine Academics, Louisville, Kentucky. *Equitation Science – the last frontier in Equine Science*. June 26, 2014.
18. Plenary Speaker, Australian Equine Science symposium, Gold coast, Queensland, Australia. *Equitation Science – the last frontier in Equine Science*. July 20, 2014.
19. Plenary speaker, HETI (Horses in Equine Therapy International). Learning and cognition in horses. Tansui, Taiwan, June 21 -26.
20. Plenary speaker, 11th ISES conference, Vancouver, Canada. *Revisiting the 8 first Principles of Equitation Science*. August 5-7, 2015.

COACHING / EDUCATION

- Assisted Olympic Gold medallist Richard Davison (London, 2012) in dealing with behavioural problems.
- Coached Anky van Grunsven, 4 time Olympic Gold medal winner with behaviour problems at KWPN, Holland, 2007 and Imke Bartels 2 time Olympic Gold with young horses.
- Coached Jody Hartstone on Landioso, Donnerwind, and Whisper IV: New Zealand Grand Prix Dressage Champion, 2006, 2010 and Tri-Nations Cup winner 2007 (Johannesburg, South Africa) and highest placed NZ rider in 2008 Beijing Olympic qualifier.
- Coached the Indian Three Day Event team, Asia Pacific Games, 1995 (winning Bronze medal and India's first ever equestrian medal).
- Coached four State teams in the sport of Eventing at the National Junior Championships, South Australia.
- Lectured and demonstrated the psychology of training horses at EQUITANA 1999, 2001, 2003, 2005, 2008, 2010 and 2011.
- Demonstrated horse training at Roma Cavalli, Rome, June, 2012.
- Demonstrated horse training at British Horse Society, Kenilworth, Warwickshire, UK, 2010 and 2011.
- Lectured and demonstrated horse training at Haras de la Cense Expo, France, 2006.

- Instrumental in forming the International Society for Equitation Science, 2007, (Current Senior Vice President).
- Hosted the 1st International Equitation Science Symposium, 2005 at the AEBC.
- Designed and implemented the training protocol for the Belgian Federal Police, Mounted Section, 2011.
- Bi-annual and annual lectures, clinics, seminars and demonstrations at: 7 Universities and Colleges in the UK (Lincoln, Nottingham-Trent, Moulton, Warwickshire, Hartpury, Duchy, Rodbaston); Belgium (Verviers and Ypres); Denmark (Copenhagen Vet school, Seborgaard Heste Center and Blueberry Hill Show-jumping Stables); Sweden, (Uppsala Equestrian Centre, Kulla-vreta and Sparreholms Slott); Finland (Tamisaara-Ekenäs); France (ENE Saumur and Haras de la Cense, Rambouillet); USA (UCLA Davis, Missouri, Minnesota); Canada (Calgary, Fort Macleod, Vancouver, Kamloops and Cranbrook); Italy (Carabinieri headquarters, Rome); South Africa (Stellenbosch, Capetown and Johannesburg) and New Zealand (Auckland, Waikato, Wellington, Dunedin, Nelson and Christchurch) as well as all states of Australia.
- Established The HELP Foundation, (www.h-elp.org) and have trained young elephants to be ridden in Nepal and India since 2006. Lectured and demonstrated elephant training for government personnel in Nepal (Bardia and Chitwan) and on behalf of the Wildlife Trust of India (Kerala, Orang, Guwahati and Kaziranga). Current Senior Vice Chairman.

OTHER PROFESSIONAL ACTIVITIES

- Developed and currently Director of the Australian Equine Behaviour Centre.
- Television show, Pets Behaving Badly, 2000.
- Produced outline for the training manual for the Western Australia Mounted Police and the Federal Belgian Police.
- Developed methods of loading horses into race stalls used by the New York Racing Association (Saratoga, Belmont and Aqueduct racetracks).
- Commissioned by the WWF and WSPA to train elephants in Nepal, 2007. Implemented the 'positive learning method' for working elephants.
- Wrote systematic training manual for working elephants for the WWF, 2007.
- Designed and conducted subsequent research for state-of-the-art, horse-friendly starting gates for Steriline Pty Ltd, the world's leading manufacturer of race starting gates.