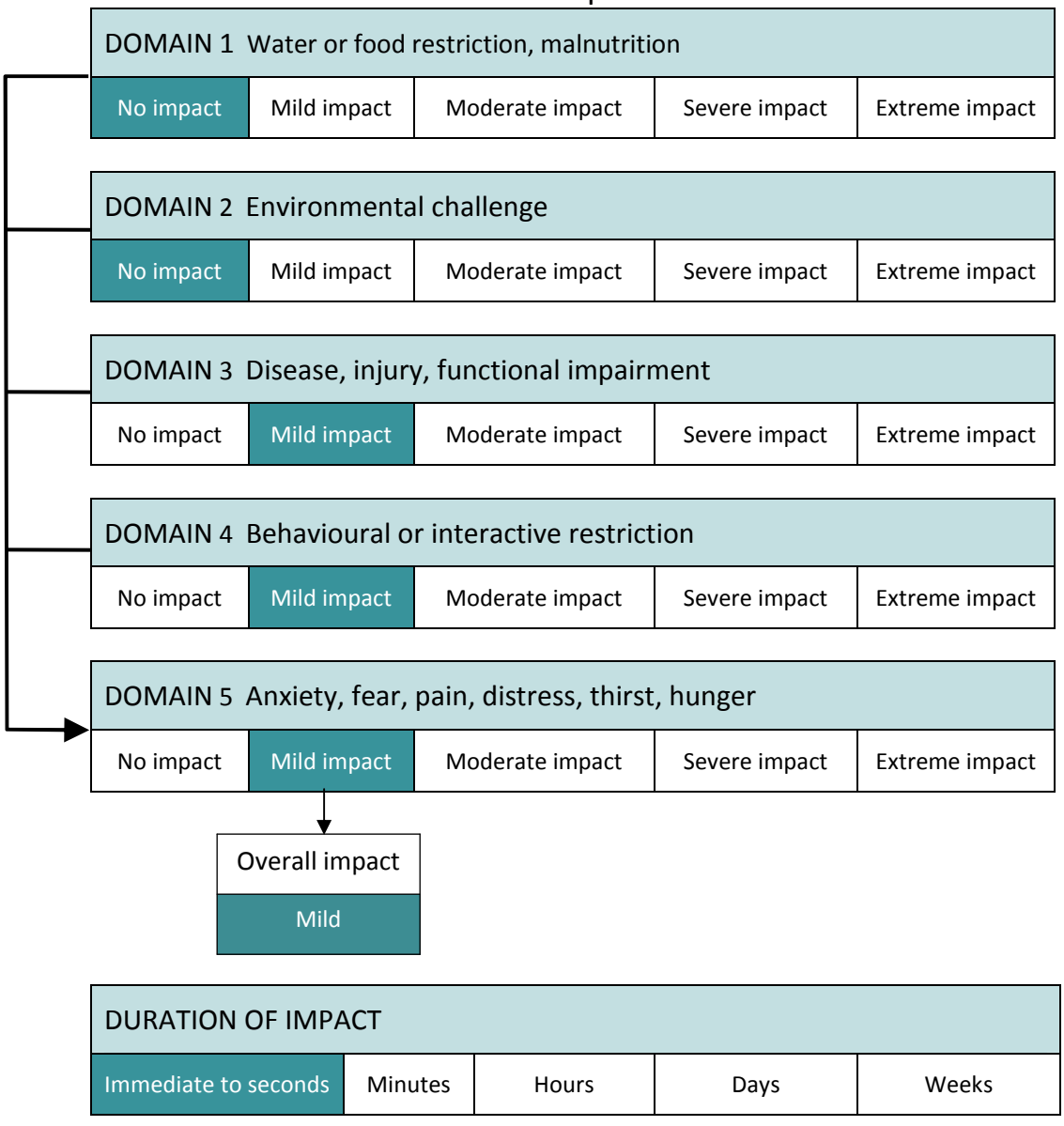
Control method: Ground shooting of feral pigs

Assumptions:

- Best practice is followed in accordance with the standard operating procedure PIG003.
- The shooter is competent and will make accurate decisions about whether the shot can be successfully placed.
- Head shots are the preferred point of aim.
- Shooting is conducted in daylight hours.
- Assumes any piglets are dealt with according to the SOP, however this is unlikely to always be feasible. The effect on dependent young is not taken into consideration with this assessment only the impact on the target animal.
- Note that recreational hunting of pigs with dogs is not an effective or humane method of managing feral pig populations. However, trained dogs are sometimes used to detect or flush out pigs prior to shooting. It is unacceptable to set a dog onto a feral pig with the intention of bringing it down, holding or attacking it.

PART A: assessment of overall welfare impact



SCORE FOR PART A:	**2**

Summary of evidence:

Domain 1	No impact in this domain.
Domain 2	No impact in this domain.
Domain 3	There is a higher potential for injury compared with ground shooting of other species such as than horses since the skill level of shooters will be more variable. If dogs are allowed to 'hold' pigs the risk of injury would be higher.
Domain 4	The SOP requires killing of piglets, but in many situations this is unlikely to be feasible. Also, the SOP says to avoid shooting at times when sows have recently farrowed but this too can be difficult. If dogs are used to flush out and 'bail-up' pigs (without being allowed to physically contact or 'hold' the pigs as specified in the SOP) this would increase to moderate impact. If dogs are allowed to hold pigs this would increase even further.
Domain 5	There will be some impact in this domain due to pigs being frightened by the noise of the gunshot and also if other pigs in a group start to run after the first shot has been fired. Although adult boars are often solitary, adult sows typically live in groups[1]. Therefore if some animals in a group are not killed, the impact on the remaining animals in unknown but we assumed that removal of individuals in a group could potentially cause distress. If dogs are used to flush out and 'bail-up' pigs (without being allowed to physically contact or 'hold' the pigs as specified in the SOP) this would increase to moderate impact.

PART B: assessment of mode of death – head shot

Time to insensibility (minus any lag time)				
Very rapid	Minutes	Hours	Days	Weeks
Level of suffering (after application of the method that causes death but before insensibility)				
No suffering	Mild suffering	Moderate suffering	Severe suffering	Extreme suffering

PART B: assessment of mode of death – chest shot

Time to insensibility (minus any lag time)				
Very rapid	**Minutes**	Hours	Days	Weeks
Level of suffering (after application of the method that causes death but before insensibility)				
No suffering	Mild suffering	**Moderate suffering**	Severe suffering	Extreme suffering

SCORE FOR PART B:	**Head shot - A** **Chest shot - D**
Summary of evidence:	
Duration –	With head shots, a properly placed shot will result in immediate insensibility[2, 3, 4]. With chest shots, time to insensibility can range from seconds to a few minutes. The time to loss of consciousness and the time to death will depend on which tissues are damaged and, in particular, on the rate of blood loss and hence the rate of induction of cerebral hypoxaemia[5]. Loss of consciousness and death is likely to be quick when animals have been shot in the heart. 'Hydrostatic shock' (see below) may also contribute to rapid incapacitation and potentially rapid loss of consciousness with shots to the chest; however this effect seems to be variable and doesn't occur in all instances. Death from a chest shot could take longer with ground shooting compared with aerial shooting as there is limited opportunity for a rapid second shot.
Suffering –	When animals are rendered insensible immediately with a well-placed head shot that causes adequate destruction of brain tissue there should be no suffering[2]. Animals that are chest shot and still conscious are likely to have a short period of suffering, though the extent of suffering will vary depending on which tissues are damaged and the rate of blood loss. During haemorrhage there is likely to be tachypnoea and hyperventilation, which, when severe, would indicate that there is a sense of breathlessness before the loss of consciousness[5]. Severe haemorrhage in humans is also associated with anxiety and confusion[6]. If chest shot animals are rendered insensible by the mechanism of 'hydrostatic shock' and they do not regain consciousness prior to death they are unlikely to suffer.

Summary

CONTROL METHOD:	**Ground shooting of feral pigs**
OVERALL HUMANENESS SCORE:	**Head shot – 2A** **Chest shot – 2D**

Comments

Wounding rates with ground shooting

When animals are shot at, some will be killed outright, others will be missed and some will be wounded but not killed. Of the ones that are wounded, some will be killed by subsequent shots but some will escape to either die later or recover. Therefore to determine welfare impact we are interested in the extent of injury or wounding associated with ground shooting and the likelihood of it happening. There do not appear to be any reported wounding rates from ground shooting of feral pigs but there have been a few studies in other species. For example:

Impala

A study of the night shooting of wild impala found that 93% of animals were killed instantaneously by the first shot[7]. The point of aim was the head. Of the 6.3% of animals that were wounded and timing of shots was recorded (n=31), the mean time between wounding and death was 30 seconds (maximum time 1 min 57s; minimum time 4.8s). Of a total of 990 shots fired, 74 (7.5%) missed animals completely and 57 (5.8%) resulted in animals being wounded (3 animals were wounded

before dispatch). No animals escaped after wounding.

Deer

Estimates of wounding rates by deer stalkers have shown that 2% of deer escape wounded, 11% of deer required two or more shots to kill and 7% took 2-15 minutes to die.[8]

In a study to examine the effects of wound site and blood collection method on biochemical measures obtained from red deer, 84% of 69 deer were killed with a single shot and no deer escaped wounded[9]. Eleven of the deer were shot twice (and one deer was shot 3 times), the first shot usually being in the chest. Of the deer killed with one shot, 38% of stags and 80% of hinds were shot in the head or neck. When deer had been shot in the chest, they often ran a short distance. An estimate was made of the time between the first shot and the deer falling to the ground. The median time was 60 secs for the multiple shot animals and 0 secs for the single-shot.

What would be considered to be an acceptable wounding rate for ground shooting?

As a guide, for captive bolt stunning in abattoirs, the level of acceptability is that 95% of animals must be rendered insensible with one shot. An excellent score is 99%.[10]

It has been suggested that a review of deer culling by shooting is warranted when, in a cull of average size (between 80 and 120 deer), 14 to 16% of the carcasses contain more than one permanent wound tract (i.e. required more than one shot).[11]

For comparison with a method that is considered to be less humane than shooting – bow hunting of deer-between 12% and 48% of shot deer may escape whilst injured.[5]

Hydrostatic shock

With shooting, in addition to the damage caused by the penetrating projectile, there is scientific evidence that organs can also be damaged by the pressure wave that occurs when a projectile enters a viscous medium, a phenomenon known as 'hydrostatic shock'[12,] Experimental studies on pigs and dogs demonstrate that a significant ballistic pressure wave reaches the brain of animals shot in an extremity such as the thigh[13, 14, 15]. It is hypothesised that damage to the brain occurs when the pressure wave reaches the brain from the thoracic cavity via major blood vessels but could also occur via acceleration of the head or by passage of the wave via a cranial mechanism[16]. It is also thought that hydrostatic shock may produce incapacitation more quickly than blood loss effects, however not all bullet impacts will produce a pressure wave strong enough to cause this rapid incapacitation[17].

Anecdotal reports by hunters maintain that some species are more susceptible to this shock effect than others; however no studies were found that confirmed this. However there is some speculation that, if one of the mechanisms that contribute to the effect of hydrostatic shock and subsequent damage to the brain is caused by acceleration of the head, it is possible that some animals may be more resistant to the incapacitating effects of shooting. It is recognised that animals such as head-butting ruminants appear to be more resistant to concussion than humans and are thought to have a higher acceleration threshold which could make them more resistant to traumatic brain injury not only from externally imposed forces, accelerations and blunt force trauma but also from an internal ballistic pressure wave generated by a projectile[18, 19].

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