

Western Cape Contingency Plan

African horse sickness

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Disease Summary

African horse sickness (AHS) is a peracute, acute, subacute or mild infectious but noncontagious disease of equids caused by an orbivirus, of which there are nine serotypes, all transmitted by *Culicoides* midges. The disease is manifested by pyrexia, inappetence and the clinical signs and lesions compatible with impaired respiratory and circulatory functions that are characterized by oedema of subcutaneous and intermuscular tissues and of the lungs, transudation into the body cavities, and haemorrhages, particularly of the serosal surfaces.

The mortality rate in horses, the most susceptible species, may be as high as 95% while donkeys and mules are considerably less susceptible and generally develop milder disease. The disease occurs regularly in most countries in sub-Saharan Africa. (Coetzer & Guthrie, 2004). There is strong evidence that AHS is not endemic in the greater part of South Africa, with the exception of the north-eastern Lowveld of Mpumalanga Province where zebra in the Kruger National Park acts as reservoirs for the disease. Each year the disease first appears in the north-eastern Lowveld, occasionally during December but usually in January, and then spreads southwards. The extent of the southerly spread is influenced by the time of the year in which the disease first makes its appearance and by the extent of favourable climatic conditions for the breeding of *Culicoides* midges (Coetzer & Guthrie, 2004).

Legislative mandate

Summary of most relevant sections of the animal diseases act, no 35 of 1984 and its regulations with regards to control measures for AHS

Section 9 enables the authorities to implement various control measures for controlled animal diseases.

Regulation **20(1)(a)** deals with movement restrictions regarding controlled animal diseases and stipulates that nobody may move or remove a controlled animal to or from an area specified in Annexure 2, or move a controlled animal across or from land in a controlled area except if a permit has been issued by the responsible state vet and in accordance with the conditions specified on the permit.

Regulation **20(1)(c)** further stipulates that the responsible person (manager/owner) may not allow any person to move an animal to or from his land before he has determined if a permit has been issued for the movement.

Regulation 20B: This regulation deals with the keeping of equines and zebras in the AHS controlled area and **20B(2)** stipulates that no equines or zebras may be vaccinated in the AHS free and surveillance zones for AHS without the written permission of the director.

Section 11 places certain duties on owners of animals and managers of land with regard to animal diseases. Amongst other things they have a duty to take all reasonable steps to prevent the spreading of any animal disease.

Regulation 11 deals with the application of the controlled veterinary acts by the responsible person. These are the control measures specified in Table 2 of the Regulations.

Regulation 1: Responsible person (def) : manager or owner of land or owner of animals

Regulation 12 stipulates that a responsible person has to report the incidence or suspected incidence of any controlled animal disease to the state vet or responsible technical officer. Furthermore, he must also bring this to the attention of all his neighbours and any prospective buyers or people who have bought animals from him in the past 30 days.

Regulation 13 places a duty on the responsible person (owner) to isolate contact or infected animals (as determined in Table 2) and such animals shall stay in isolation until the isolation (quarantine) has been revoked by the state vet.

Section 16 gives the director (and any person authorized by the director for this function, which include State Veterinarians and Animal Health Technicians) the power to enter and inspect any land and conveyance in the RSA at any time and without prior notice to the owner. This has to be for any power and function in terms of the Act. It further stipulates that the director may take any assistance, tools, etc. with him necessary for this purpose.

Section 24(2) determines that any person who is required under this Act to have a permit, authority or other document, must produce that document immediately when requested to do so by any authorized person.

Section 27 places a limitation on the liability of any person who performs his duties under this Act, if done in good faith. [if you are therefore implementing the provisions of the Act you will not be personally liable for any potential damage that someone suffers (unless you act maliciously)]

Section 32 sets out the offences that can be committed in terms of the Act. It is worthwhile remembering that when dealing with people who refuse to co-operate, Section **32(1)(c)** makes it an offence to obstruct or hinder and officer or authorized person to perform his duties and functions in terms of this Act.

Table 2: of the Regulations - Control measures relating to controlled animal diseases

Animal disease	Nature, causal organism and symptoms	Susceptible animals	Controlled veterinary act to be performed in respect of-		
			Susceptible animals	Contact animals	Infected animals
African Horse sickness	Viral disease transmitted by biting insects and characterised by high fever, respiratory distress, subcutaneous oedema and acute death	Equines and Zebra	<ol style="list-style-type: none"> All equines in the Republic except equines in the African Horse sickness free zone and the African Horse sickness surveillance zone as described in Table 1, shall between the ages of 6 and 12 months, then between the ages of 12 and 18 months and then again once every year thereafter be immunized with an effective remedy by the responsible person; Provided that the director in a particular case may determine that such immunization must be carried out by an officer or veterinarian. Equines in the African Horse sickness free zone and surveillance zone as described in Table 1 shall only be immunized with the written permission of the director. 	<ol style="list-style-type: none"> Contact animals in a controlled area shall be isolated and immunised as determined by the director. Contact animals outside the controlled area shall not be moved into a controlled area without the permission of the director. 	<ol style="list-style-type: none"> Infected animals in a controlled area shall be isolated for the period determined by the director. Infected animals outside the controlled area shall not be moved into a controlled area.
[‘African Horse sickness’ inserted by GN R254 of 6 February 1997 and amended by GN R885 of 21 September 2001 and by GN R558 of 22 May 2009.]					

Epidemiological Considerations

Virus stability

Optimal pH for survival of the virus is 7.0–8.5.

Environmental stability and resistant to detergents

Virus is very stable outside the host. It is not destroyed by putrefaction and may retain infectivity in putrid blood for more than 2 years. Acid disinfectants are most suitable for decontamination. The virus is not however transmitted in contact fashion except perhaps to dogs and surface decontamination is not a concern in outbreaks of the disease.

Incubation period

Usually 5–7 days, but it may be as short as two days and is rarely longer than ten days (Coetzer & Guthrie, 2004). Incubation periods up to 21 days have been recorded.

Infectious period

Control and outbreak cessation procedures are generally determined by the OIE infectious period of 40 days.

Transmission

Transmitted between susceptible animals by biting midges (*Culicoides*). Dogs can become infected by eating infected fresh uncooked horse meat. There is no aerosol spread of AHS. There may be windborne spread of infected vectors.

Wildlife equidae (e.g. zebras) and donkeys

Can become infected but do not usually show clinical signs. The importance of these hosts is primarily in their ability to act as reservoir hosts when their numbers and herd structures are large enough, as in the Kruger National Park. Within an outbreak in the AHS controlled area their importance should be considered as there is evidence that their infectious period is longer than that of horses (generally 4–8 days and <21 days) with Zebras showing low grade viraemia for up to 40 days (Erasmus et al 1978, Barnard et al 1994) and donkeys of at least 17 days (Fassi-Fihri et al 1998, Hamblin et al 1998).

Arthropod vectors

Biting midges of the genus *Culicoides* are recognised as the most important vectors. Historically in the AHS controlled zone the vector associated with outbreaks has been *C. imicola*. Experimentally three species of mosquitoes, the brown dog tick (*Rhipicephalus sanguineus*) and the camel tick has transmitted the virus.

Zoonosis

Humans are not affected.

Clinical Signs

“Dunkop” or pulmonary form This form occurs most commonly when AHSV infects fully susceptible horses, notably foals that have lost their passively acquired immunity. It is also the usual form in dogs. Following the incubation period, a fever may be the only sign for a day or two, with the rectal temperatures reaching 41° C or higher. The characteristic clinical signs are severe dyspnoea, paroxysms of coughing and, in some, discharge of large quantities of frothy serofibrinous fluid from the nostrils (which only appears after death in most cases). The onset of dyspnoea is generally very sudden and death often occurs within a few hours. The prognosis for horses suffering from the “dunkop” form is extremely grave; less than 5% recover (Coetzer & Guthrie, 2004).

“Dikkop” or Cardiac Form Subcutaneous oedematous swelling chiefly of the head and neck and particularly the supraorbital fossae characterize this form of AHS. The febrile reaction reaches its maximum at a later stage in the course of the disease than in the “dunkop” form. Some animals may repeatedly lie down or are restless when standing, and frequently paw the ground with their front feet as a result of severe colic. The mortality rate of this form of the disease is about 50% (Coetzer & Guthrie, 2004).

The Mixed Form Although this is the most common form of AHS it is very rarely diagnosed as such clinically; one of the other preceding forms predominates and this is reflected in the diagnosis. It is only during necropsy when lesions of both the pulmonary and cardiac forms are observed that the diagnosis is made. The clinical signs may include either respiratory distress followed by oedematous swellings or, initially “dikkop” signs before suddenly developing respiratory distress. The mortality rate of this form is approximately 70% (Coetzer & Guthrie, 2004).

Horsesickness Fever This is the mildest form and is frequently overlooked in natural outbreaks. The febrile reaction lasts one to six days followed by a drop in temperature to normal and recovery. The conjunctivae may be slightly congested, the pulse rate may be increased, and a certain degree of anorexia and depression may be present. This form of the disease is usually observed in donkeys and zebra or in immune horses infected with a heterologous serotype of AHS virus (Coetzer & Guthrie, 2004).

Gross Lesions

The lesions observed at necropsy examination depend largely on the clinical form of disease manifested by the animal before death. In the pulmonary form the most characteristic changes are oedema of the lungs and hydrothorax. The mediastinum, and often the loose connective tissue around major blood vessels in the thorax, oesophagus, trachea and thymus, may also be oedematous. The trachea and bronchi usually contain large amounts of froth and serofibrinous fluid which may be gelatinous. Hydropericardium is rare in this form of the disease. Epi- and endocardial haemorrhages of varying size (particularly severe in the left ventricle), sometimes accompanied by slight oedema of the fat in the coronary grooves and of the atrioventricular valves, may be evident. All the lymph nodes are slightly to moderately enlarged, but the bronchial and mediastinal nodes are most severely swollen and oedematous (Coetzer & Guthrie, 2004). In the cardiac form the most characteristic change is the presence of distinctly yellowish gelatinous oedema of the subcutaneous and intermuscular connective tissues of the head and neck. In severe cases this extends to the back, shoulders and chest. The lungs are usually normal or slightly congested, and only occasionally slightly oedematous. The thoracic cavity seldom contains an excess of fluid (Coetzer & Guthrie, 2004). In the mixed form the lesions are made up of a mixture of both the forms described above.

Diagnosis

Please refer to Appendix 1 in this chapter for a schematic of the Root Cause Investigation to confirm AHS cases in the AHS controlled zone

Preliminary diagnosis

During the early febrile phase of AHS, a field diagnosis may be virtually impossible. However, a presumptive diagnosis should be possible once the characteristic clinical signs have developed and, more particularly, at necropsy.

Laboratory diagnosis

Confirmation of a presumptive diagnosis is based on virus isolation and identification as well as RNA detection through PCR testing. There are also type specific PCR tests available for typing of the infection.

Horses that survive infection develop specific antibodies within 10-14 days after infection that reach a peak about 10 days later. It is always advisable to use paired (acute and convalescent phase) serum samples for serological confirmation.

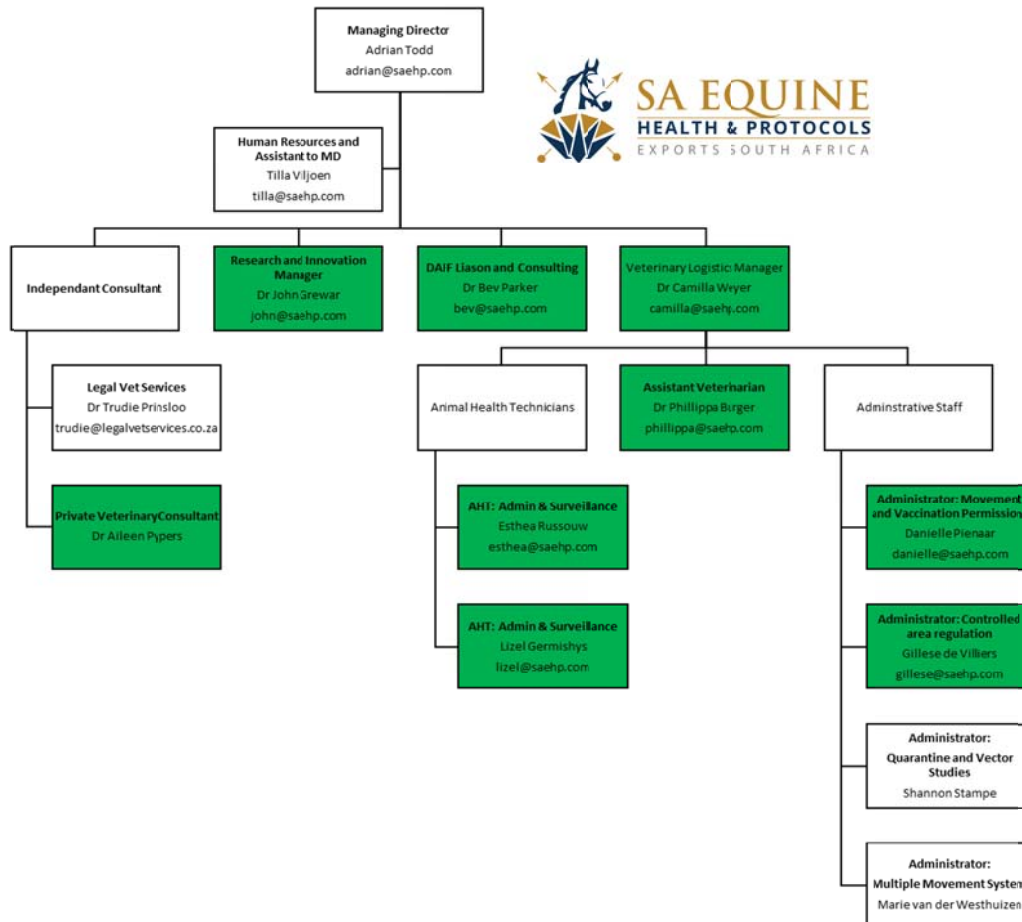
The PCR and serological tests currently in use do not have the ability to differentiate infected from vaccinated animals so establishing the recent vaccination history of a sampled horse is crucial. Serological tests can demonstrate AHS antibodies for 1 to 4 years after infection.

Differential diagnosis

The clinical signs of AHS, particularly when not fully developed, may be confused with other infections, notably equine encephalosis and equine viral arteritis (EVA). The former disease occurs under the same epizootiological conditions as AHS, and in South Africa the two diseases frequently occur simultaneously. Horses suffering from equine encephalosis usually do not have characteristic lung oedema or subcutaneous oedema, and the mortality rate is considerably lower than in AHS. Severe cases of EVA may readily be confused with AHS. The presence of ventral oedema (in EVA), particularly of the lower limbs, and the much lower mortality rate should allow differentiation. In countries where piroplasmiasis occurs, the early stage of this disease, before blood parasites can be demonstrated and anaemia develops, may be confused with AHS. The necropsy lesions of AHS can be confused with those found in cases of purpura hemorrhagica. In the latter condition, the haemorrhages and oedema seem to be more severe and widely distributed than in AHS and usually involve the limbs and lower abdomen. The highly sporadic occurrence of purpura also aids in differentiation. The early stages of biliary fever, when *Babesia* parasites may be difficult to demonstrate in blood smears, are occasionally confused with AHS. AHS may also be complicated by babesiosis, and in such cases ventral oedema may be severe (Coetzer & Guthrie, 2004)

Institutional Capacity

Notwithstanding the Provincial Veterinary Services who are primarily involved in any outbreak of AHS the equine industry has an Epidemiology Unit in the Western Cape to assist with outbreak response. The current capacity this contributes during outbreaks is reflected in the organisational chart below showing the structure of the industry body with their delegated officials (in green highlight).



Historically the industry has been intimately involved in assisting during control area outbreaks of AHS but this has mainly been in a supportive and logistical manner. Policy decisions, such as movement policies, control zone boundaries, official communication and sampling strategies are determined by veterinary services (Epidemiology Unit) with the industry Epidemiology unit providing consultation support where required. Sampling has primarily been performed by authorised industry veterinarians and technicians with the assistance by available WCDOA technicians. WCDOA technicians have primarily assisted with clinical surveillance and census collection. Vector surveillance has been predominantly performed by authorised industry veterinarians and technicians. Communications have been primarily performed by the WCDOA with the exception of specific queries by the public or private vets with regards to individual situations regarding movement control and sampling logistics. The centralised database for all permits, census and vaccination permissions would also be used in any outbreak with any movement permits issued in response to the outbreak being

captured and issued by authorised officials from this database. All results from the outbreak should also be captured in this database and any information for SRI's should be stored and retrieved from this same database. This allows for centralised data control throughout an outbreak.

It should be made clear in the initial Joint Operations Committee meetings which section/organisation is responsible for which control measure (both the policy and its implementation). Also take note of the **Collaboration with DAFF** section below the control section with regards to importance of this component of control.

Risk Assessment

Sources of infection can be detected through a number of surveillance activities but the risk of introduction of AHSV into the AHS controlled zone is limited to:

- Movement of an infected equid into the controlled area from the infected area that either moves illegally or is not prevented through the movement control process
- Illegal vaccination of a horse in the Nov – May period that results in a re-assortment or reversion to virulence that is then transmitted by competent vectors

The dispersal of infected midges is theoretically a possibility but the prevailing winds, low prevalence of disease within a realistic radius around the controlled area and geographical boundaries (both mountains and large areas of desert or semi-desert) make this an unlikely. Climatic conditions also preclude the likelihood of overwintering or persistence of any prior outbreak or vaccination event during winter.

Risk Reduction

Risk reduction for AHS introductions are performed through the following processes

1. Movement control
 - a. Positive identification with use of approved passports
 - b. Permit system for movements from infected zone
 - c. Pre-movement health checks and vaccination details prior to movement by registered veterinarian
 - d. No vaccination against AHS within 40 days of movement with confirmed vaccination within past 2 years
 - e. Direct movement permitted only from AHS low risk areas as determined by State Vet of origin
2. Vaccination control
 - a. Protection zone AHS vaccinations compulsory but only permitted between 1 June and 31 October each season
 - b. Surveillance and Free zone vaccinations only permitted with permission from Provincial Veterinary Services and only between 1 June and 31 October each season if approved

Surveillance activities, both active and passive, within the AHS Surveillance zone assist in decreasing risk of dissemination if an outbreak does occur.

Response

Sampling

Blood specimens obtained at the peak of the fever should be preserved in EDTA (purple top) and transported at 4°C to the laboratory. Spleen, lung and lymph node samples collected from freshly dead animals should be unpreserved and transported on ice (not frozen) to the laboratory. Serum: preferably paired samples should be taken 21-days apart (red/ yellow-top serum tube).

Current laboratories available are included in Appendix 1. The Stellenbosch Provincial Veterinary Laboratory can assist in determination of which lab to submit samples to.

Control

General movement policies and application can be found at www.myhorse.org.za

Implementation of campaign

The following actions should be taken immediately:

1. All infected and suspect premises must be placed under quarantine – see Annex 5 below
 - 1.1 Ideally all properties within any declared controlled area should also be put under quarantine. During census and clinical surveillance by officials this can be instituted on at least every farm that is visited within the controlled area
 - 1.2 Properties should be classified as
 - 1.2.1 IP – Infected property – this implies that the property contains a infected animal based on the case definitipon
 - 1.2.2 CP – contact property
 - 1.2.3 SP – Suspect property
2. All movements to / from the infected premises during the last 8 weeks should be traced. Tracing can be done electronically as described in Appendix 2 below.
3. Officials should delineate an area of control, taking into consideration geographical borders such as mountains and rivers, as well as any transport or political boundaries such as magisterial districts or municipal boundaries. This will make it easier to communicate the area under control rather than by arbitrary lines. See Appendix 3 below for details on considerations to take when establishing a controlled area.
 - 3.1 The controlled area should be further sub-divided into a Restricted Area (RA) and a Controlled area based on the location of IP, CP's and SP's. Control, Surveillance and Census within the RA should be prioritised.
4. A movement embargo on all equids within, into, and out of the control zone should be implemented immediately and this restriction rigidly enforced. Movements can be considered but should occur under permit only. The use of vector protection (at origin or destination), health checks prior to movements and/or RNA based testing (PCR) can be incorporated into a movement policy.
5. The local SV must maintain daily contact with owners of horses on infected properties and request immediate notification from other equid owners in the area if any suspicion of infection is detected
6. An accurate census (see Appendix 4 below for the form), vaccination status and movement log (previous 2 months) should be compiled ASAP, for equids within the delineated controlled area
7. The deaths of all horses, inside and even outside the immediate delineated controlled area (standard practice in surveillance and free zones), must be reported and investigated to either make a diagnosis or confirm the cause of death. Post

mortems should be performed by a veterinarian and preferably by the Stellenbosch Provincial Laboratory pathology services.

8. This must be followed ASAP by an intense survey of equids resident within the delineated controlled area, beginning at IP and SP properties and radiating outwards through the RA into the rest of the CA. Outbreaks in recent times have shown the use of RNA detection surveillance using PCR on EDTA blood samples is very helpful and this should be strongly considered.
9. Furthermore, all horses should be stabled, at least from dusk to dawn, and sprayed with insect repellents to reduce the risk of insects feeding on the animals. If sufficient stabling facilities are not available, barns could be used. Even if not insect-proof, such housing will reduce the risk of infection (unless *C. bolitinos* is the main vector of the outbreak). Alternatively it is advisable to remove horses from low-lying moist areas or vleis and move them to drier camps or higher ground, particularly from 2 hours before dusk until 2 hours after dawn.
10. Once the diagnosis has been confirmed, vaccination of all susceptible animals with the relevant mono-/polyvalent AHS vaccine must be considered. This decision will be guided largely by the success of measures already taken. Note that since the confirmation of the influence of the Live Attenuated Vaccine on outbreaks and their origins in the controlled area (Weyer et.al 2015) the use of LAV to control an outbreak should be considered a last resort.

The OIE guidelines and documentation on AHS should be consulted at the start of outbreaks to ensure that case definitions used and control and surveillance plans are appropriate according to the OIE guidelines.

Surveillance

The goal of surveillance during and after an outbreak is to establish spread of infection, determine control areas and finally establish an outbreak end-point. In the post outbreak period surveillance is performed to confirm the end of outbreak decision.

Surveillance takes the form of 3 major components

- Active surveillance
- Passive/Clinical surveillance
- Vector surveillance

Active surveillance

Equines on the infected, suspect and contact premises should be observed daily for clinical signs of disease. If deemed necessary by the PDVS blood can be taken at weekly intervals from a statistically valid sample of animals.

Sampling of as many equines as possible (including donkeys and zebra) within the Restricted area should be the goal of the initial and ongoing surveillance strategy. PCR testing for AHSV RNA allows for single samples to be evaluated without the need for paired samples as would be the case for serology

If resources and institutional support allow then a full round of sampling with negative results (see **case definition** section below) should be obtained from at least the infected and suspect properties prior to the outbreak being declared over. This is particularly important if the outbreak is not as clinically apparent as one would expect.

Passive/Clinical surveillance

Communication to the public and veterinarians in the outbreak controlled area should include the emphasis on the observation and reporting of any equid showing clinical signs that might be associated with AHS. Historically this clinical surveillance has been integral in establishing where outbreaks have spread to, and this form of surveillance should not be underestimated. Suspect properties should be followed up on and tested where relevant. Any equine mortality that occurs within the outbreak controlled area should be post-mortemed by a veterinarian with the Stellenbosch Provincial Veterinary Laboratory providing support in this regard.

Communication channels should include:

- Written, audible and visual news media through the Department of Agriculture's communication protocols
- For public information the use of social media on relevant stakeholder platforms, such as Facebook, should be considered
- Private veterinarians can be contacted and informed through both the SAEVA (South African Equine Veterinary Association) and the Western Cape Department of Agriculture's private vet emailing lists
- Provincial State Veterinary officials should be contacted through Departmental channels
- National Veterinary Services (DAFF) should be contacted through official channels through the Western Cape Department of Agriculture, Veterinary Services.

While officials are performing census they should be observing equines for clinical signs of disease and requesting any recent clinical events from managers of properties they visit.

Vector surveillance

In the event of an outbreak, surveillance for vectors should be done to record the current species demographic of the population of biting insects. Collections can be made by non-expert personnel after brief instruction. An adequate number of light traps should be available at short notice. Collections should be made over at most weekly intervals and midge identification can be performed at Onderstepoort Veterinary Research (OVR).

Case Definition

Selection of a case definition at the onset of the outbreak is crucial and should remain consistent throughout the outbreak. Always consider the current OIE Terrestrial Animal Code for any changes to the internationally accepted case definition for AHS infected animals. Based on previous outbreaks the case definition generally used is:

Overarching outcome	Specific codes	Details
Positive	P1	Clinical and/or post-mortem signs synonymous with AHS with a positive RT-qPCR and/or virus isolation result
	P2	Positive RT-qPCR and/or virus isolation result only (Subclinical cases)
	P3	Clinical and/or post-mortem signs synonymous with AHS with no AHS positive laboratory confirmation but with epidemiological links to a confirmed case
Negative	N1	Clinical and/or post-mortem signs synonymous with AHS with confirmation of another cause of disease AND with a negative RT-

		qPCR
	N2	Routine outbreak surveillance with negative RT-qPCR
	N3	Clinical surveillance with no reported and/or detected clinical signs synonymous with AHS
Suspect	S1	Clinical and/or post-mortem signs synonymous with AHS with no lab positive confirmation of any associated disease
	S2	NO clinical and/or post-mortem signs synonymous with AHS with AHS PCR result of CT value ≥ 36

Destruction, disposal and decontamination

Whilst destruction and decontamination is not applicable to AHS outbreaks it is important that officials make sure that carcasses of equids are disposed of appropriately and that the carcasses are not available to dogs. Disposal should be made at registered landfill sites or by incineration.

Vaccination

In the event of an outbreak the PDVS can make the decision to vaccinate all susceptible equines in the control area. The virus causing the outbreak should be typed, and the bottle of vaccine containing that specific strain should be administered first. Note that since the confirmation of the influence of the Live Attenuated Vaccine on outbreaks and their origins in the controlled area (Weyer et.al 2015) the use of LAV to control an outbreak should be considered a last resort.

Situation report and reporting

The responsible Official Veterinarian should compile a weekly situation report for the attention of the DD and PDVS for further distribution as deemed necessary. Consider preparing both a technical situation report for dissemination to private and State Veterinarians involved in the outbreak and the a public situation report with information pertinent to the public both within and without the outbreak controlled area.

Individual case SR1's (DAFF disease notification form) should be compiled by the Epidemiology Unit of the Provincial Veterinary Services and disseminated as per standard SR1 requirements from DAFF and the Provincial services. The information in the SR1 will be used by DAFF Animal Health to report to the OIE and trade partners.

The responsible Official Veterinarian in collaboration with the Epidemiology Unit should submit a final report after the campaign to the Provincial Director for submission to the National Director for further distribution.

Collaboration with DAFF

Close collaboration with the National Director Animal Health and the specifically the Epidemiology and Disease Control sections are crucial in any outbreak within the AHS controlled area. In particular components and decisions regarding the declaration of an outbreak, the determination of the type of and area for the control measures, the decision on whether to implement vaccination and the decision to terminate the outbreak should be jointly decide between the Provincial and DAFF authorities.

Recovery

Termination of the outbreak

The PDVS will decide when the risk for spread has reduced sufficiently for quarantine to be lifted and normal control measures to commence. This will be at least 40 days (one infectious period) after the last clinical case and taking into account weather conditions, occurrence of disease in other parts of the country and the presence of vectors. As discussed in the surveillance section active surveillance should assist and be part of this decision if possible.

Post outbreak determination of freedom

Post outbreak confirmation of freedom is an important component of any AHS outbreak in the controlled area of South Africa since it provides information to trade partners regarding the status of the zone. Surveillance activities within the controlled area provide a basis for declaration of freedom activities and these include ongoing passive surveillance as well as the sentinel surveillance program in the AHS Surveillance zone. Since 2014 outbreaks in the controlled area have included a stand-alone freedom of disease (FFD) survey in the late summer/early autumn following the outbreak. This is primarily a result of:

- most outbreaks occur just prior to winter, during which vaccination permissions (surveillance and free zone) are considered as well as compulsory vaccination (protection zone) for horses in the AHS controlled area – these can only occur between 1 June and 31 October each year.
- The lack of DIVA tests makes freedom of disease surveys and the use of any risk based surveillance strategy challenging
- Performing FFD's in the same season (although different year invariably) as when the prior outbreak took place allows for constancy in terms of environmental variables associated with the virus and vector – temperature, rainfall and wind being seasonally associated.

As with the sentinel surveillance program various surveillance parameters must be established, including:

1. **Case definition** to use in the surveillance – here typing and virus isolation and sequencing must be considered in the case definition to assist in determining whether any detected suspect/positive samples are associated with the prior outbreak
2. **Determine area of surveillance** – historically the outbreak control area has been the target of post outbreak surveillance. However, depending on the extent and location of the outbreak and the availability of sentinel surveillance in the area, consider expanding the FFD area of interest (i.e. if sentinels are sparse then there is a decreased confidence that this program would detect any cases in the immediate surrounds of an outbreak controlled area and an expanded FFD area should be considered).
3. **Single stage or two-stage strategy:** Since AHS is vector borne, clustering plays less of a role in the epidemiology of the disease; however historically some infected properties have been affected more than others. If a good population census is available then consider single stage random sampling; if clustering occurred in the outbreak prior or census data is poor then perform a 2-stage random selection – first random selection of holdings and then of horses per holding. The collection of AHS vaccination history should be mandatory during a FFD survey and considering the logistics of this a Single Stage pre-selected (randomly) sample list may be the most practical option for FFD – in that way much of the information required that is collected during the survey can be pre-obtained from farm managers.
4. **Make use of the prior outbreak information to decide on:**

- a. **Targeted minimum expected prevalence** If resources allow it is suggested to choose a conservative as possible MEP particularly given the level of vaccination coverage in the AHS controlled area. As a guideline 1% has been used for the 2016 FFD survey which resulted in a sample size of 271 horses (using the OIE Biological Standards Commission approved PCR test developed by the Equine Research Center)
 - b. **Population level sensitivity:** recommend at least a 95% probability level of detecting the infection should it exist
5. **Use of risk based surveillance:** If applicable and population information is available then the use of previously unvaccinated equids in the FFD survey can be considered. Historically however unvaccinated equines are highly clustered (breeding farms) and take this into consideration to establish whether the population sampled is representative of the underlying population at risk.

Base data that should be collected during FFD surveys are:

- Holding (including geographical location)
- Current census total on property (horses, donkeys, wild equids)
- Horse identification (sampled horse)
- Last AHS vaccination date for horse (both AHS bottle 1 and 2) – if applicable
- Sample date (all samples EDTA) and official who sampled horse

Appendix 1: Confirmation of Diagnosis

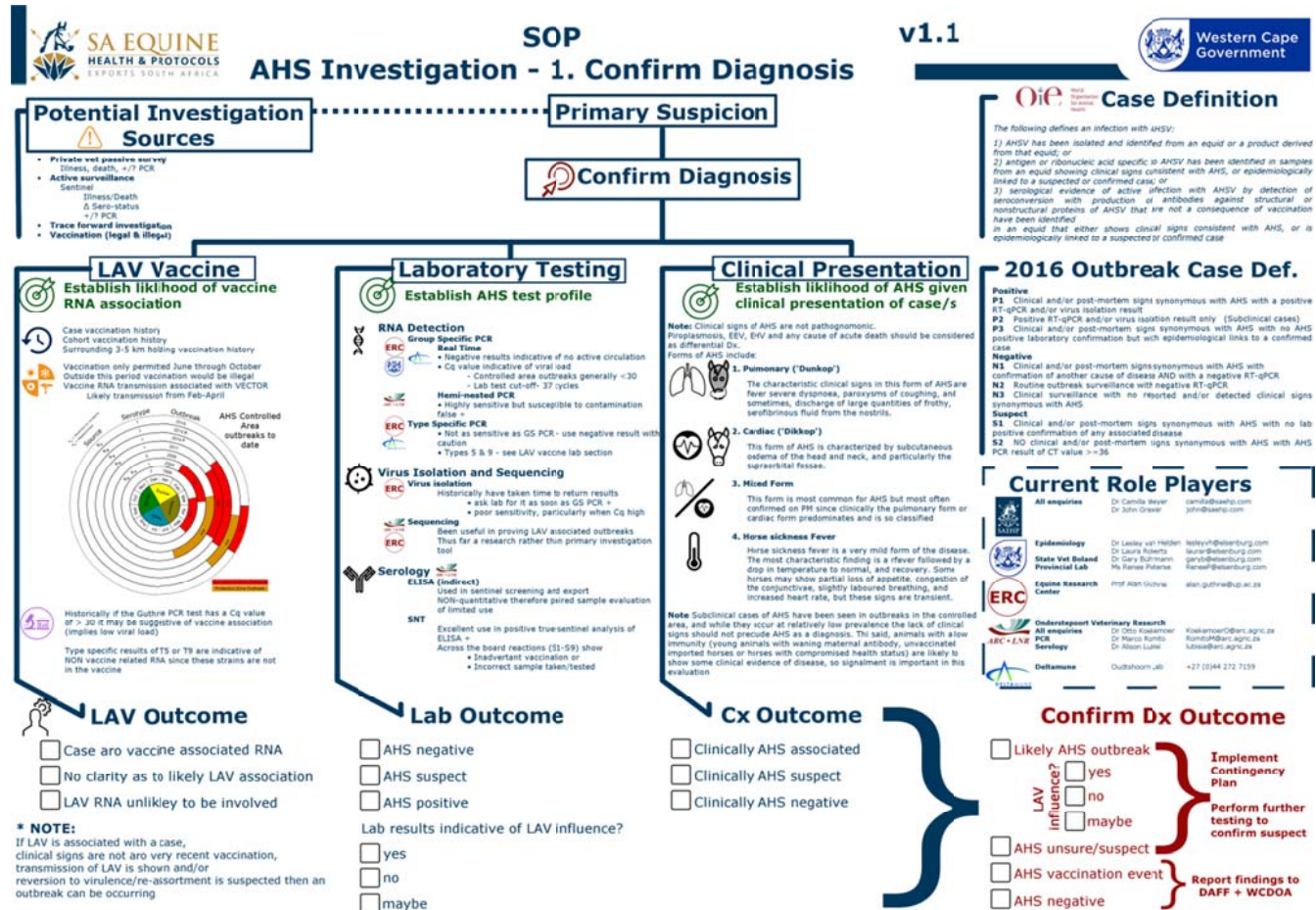


Figure 1: AHS investigation - Confirmation of Diagnosis - Full PDF available at [www.myhorse.org.za/infographics/AHS Investigation - 1. Confirm Diagnosis.pdf](http://www.myhorse.org.za/infographics/AHS%20Investigation%20-%201.%20Confirm%20Diagnosis.pdf)

Appendix 2: Tracing



SOP **v1.1**

AHS Contingency - Tracing



Goal is to perform a **trace back** for all horses moving from the AHS infected zone that might be a potential source of the outbreak under investigation. Secondly **trace forward** from restricted area holdings will assist in establishing potential spread of outbreak



www.shiny.myhorse.org.za

>> Outbreak investigations

>> Trace back - permits issued proximity query

1. Variable Input

Input Destination (trace back) or Origin (trace forward) space and time variable

Rule of thumb is use 2 months for investigation purposes

Find permits issued within Area - Click on map OR type in GPS address

Inputs

Latitude: -33.6 Longitude: 18.889

Search radius (km): 5

Date range of interest: 2018-03-01 to 2018-04-30

Either enter GPS coordinates or click on the Map to generate the buffer window



2. Spatial Visualisation

The buffer zone selected will show on the map and show all locations where permits were associated with.

If holdings are close to each other then the points will automatically cluster - zoom in or click on a cluster to get to the individual farm level

Green dots indicate where the location is a destination of a permit associated movement

Red dots indicate where the location is an origin of a permit associated movement



3. Identifying locations

Hovering over a point will give the holding ID's of the associated movement - in this example horses moved from 8106 TO 6470, and since the dot is green the location shown here represents holding 6470

Outputs - Permits issued

Download result set

Show: 25 entries

Permit ID	Origin	Destination	Total Horses	Movement Date	Point classification
4175	6505	8194	2	2018-03-18	to
4176	6505	8939	1	2018-03-18	to

4. List of permits

The list can be extensive - a table is shown of the basic details of all permit associated movements within the buffer - click on the DOWNLOAD RESULTS button to export that to a CSV file which can be used in further investigation

5. Identifying individual horses

Using the permit ID's either the actual permits can be obtained from State Vet Boland (the SAEHP current role players will assist given they issue the permits) or contact the myhorse database administrator to run a query extracting all horses moved from the permits downloaded in the CSV

Final Notes

Tracing investigations should follow up on any traced horse to establish recent clinical history, recent location history (particularly in the infected zone) and vaccination history.

The online system is limited to permit associated movements. Tracing interview questions should be included in primary investigations in the **Restricted Area**; this is particularly relevant for trace forward investigations since local movements won't be recorded if the movement is within or to a AHS zone of less control

AHS Contingency: Tracing - Current Role Players

SAEHP - South African Equine Health and Protocols

System input: Dr John Grewar (john@saehp.com)
Dr Camilla Weyer (camilla@saehp.com)
Dr Phillippa Burger (phillippa@saehp.com)

myHorse Database Dr John Grewar (john@saehp.com)

WCDOA - Western Cape Department of Agriculture

SV Epidemiology Dr Lesley Van Helden (lesleyvh@elsenburg.com)
Dr Laura Roberts (laurar@elsenburg.com)

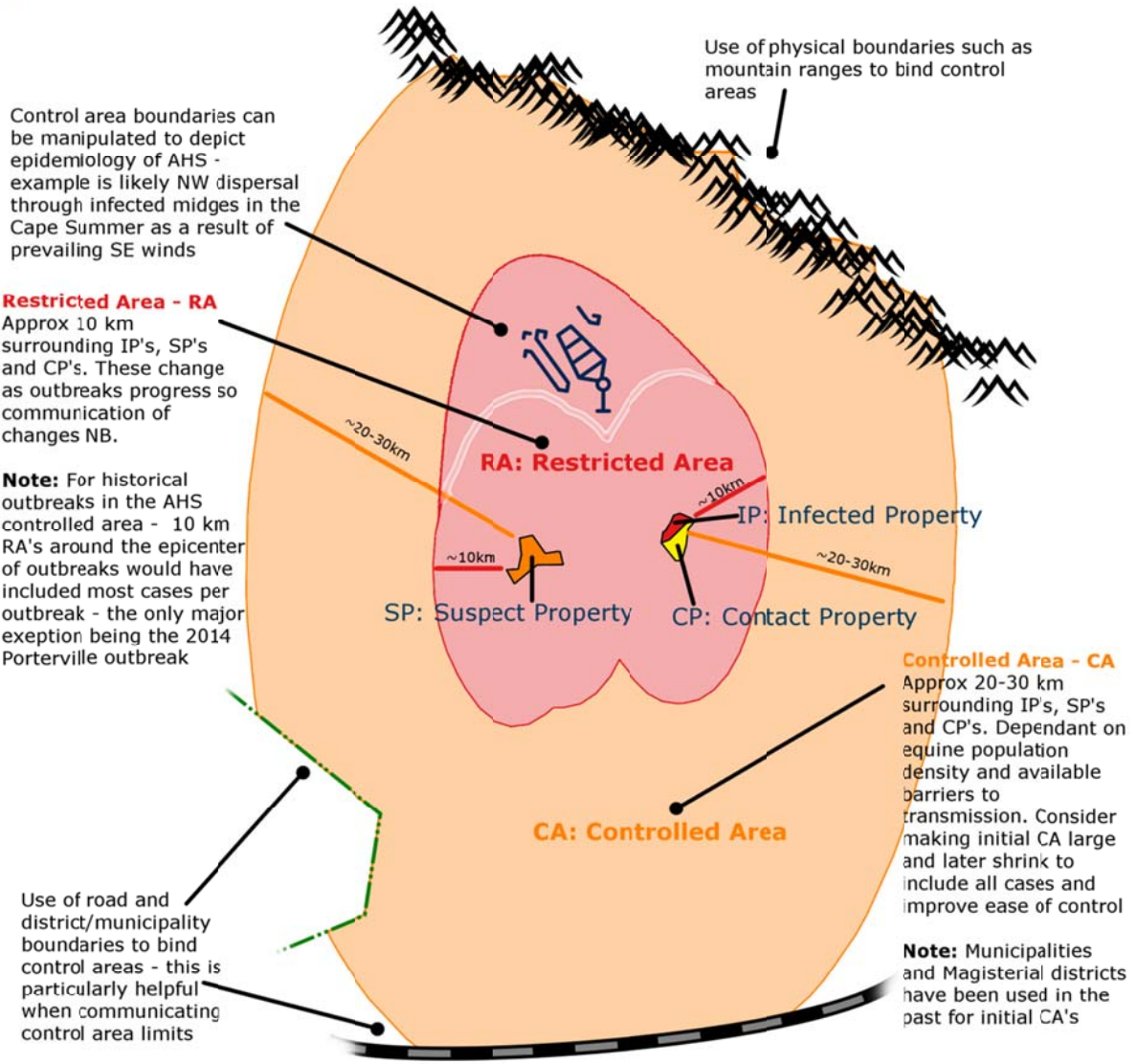
Appendix 3: Zoning Principles



SOP

v1.1

AHS Contingency - Zoning



AHS Contingency: Zoning - Current Role Players

SAEHP - South African Equine Health and Protocols
Epidemiology input: Dr John Grewar (john@saehp.com)
Dr Camilla Weyer (camilla@saehp.com)

WCDOA - Western Cape Department of Agriculture
SV Epidemiology Dr Lesley Van Helden (lesleyvh@elsenburg.com)
Dr Laura Roberts (laurar@elsenburg.com)

Appendix 4 – Equine census form

EQUINE CENSUS FORM

FARM INFORMATION										
FARM NAME								X		
SURNAME								Y		
NAME										
INITIALS				ADDRESS						
TELEPHONE										
EMAIL										
CELL										
PRIVATE VET										
DATE OF CENSUS	/ /									
HORSE INFORMATION										
Name/ID	Passport/Chip	Sex	DOB (if only year is known then choose 1 Aug of that year)	Colour	Breed	Species	Last AHS 1 Date + Batch (if only year is known then choose 1 Aug)	Last AHS 2 Date + Batch (if only year is known then choose 1 Aug)	Sample ID if applicable	
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
MOVEMENTS TO AND FROM THE PROPERTY (last 3 months) AND CLINICAL SIGNS COMMENTS										
FARMER/MANAGER					OFFICIALS NAME & SIGNATURE					
SIGNATURE					SIGNATURE					
As Farm Owner/Manager: I certify that the census figures above are accurate and I understand that these figures may be used for disease control purposes, planning and compensation										

Figure 2: Census form: available at www.myhorse.org.za/infographics/censusform.pdf

Annexure 5 – Default quarantine notice

Veterinary Quarantine Notice African horse sickness Control

To:
 Fax :
 Tel :
 e-mail:

You are hereby notified that **EQUIDS RESIDENT**

on the property(ties)

in the Magisterial district(s) of

are infected with or are suspected of being infected with or;
 are within an outbreak or suspected outbreak control area or;
 are in contact with one or more equids which is/are present on the property but has/have not fulfilled the movement requirements between African horse sickness control zones in the Republic of South Africa
(delete applicable)

No **EQUIDS (HORSES, DONKEY’S, MULES OR WILD EQUIDS SUCH AS ZEBRA)** may be moved, or caused or permitted to be moved to or through or from this property except upon the authority of and under the conditions of a permit issued by a State Veterinarian of the Western Cape Department of Agriculture.

The following animal disease control measures must be implemented: (amend as required)

Ensure that horses are stabled from 2 hours before sunset to 2 hours after sunrise. If this is not possible then use a registered insect repellent for horses during the above period – These measures are to prevent midges feeding on the horses on your property

This notice is issued in terms of the Animal Diseases Act, 1984 (Act 35 of 1984) as amended, and remains in force until repealed in writing by a State Veterinarian.

Date	State Veterinarian/ Authorised Official
.....

I the undersigned
 acknowledge receipt of this notice and declare that I have read and understand the contents thereof.

Date	Owner or authorised representative
.....

As witness
