

# Foot and Mouth Disease: Vhembe District End of Outbreak

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21 May 2019

## FINAL REPORT

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**agriculture,  
forestry & fisheries**

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Department:  
Agriculture, Forestry and Fisheries  
**REPUBLIC OF SOUTH AFRICA**

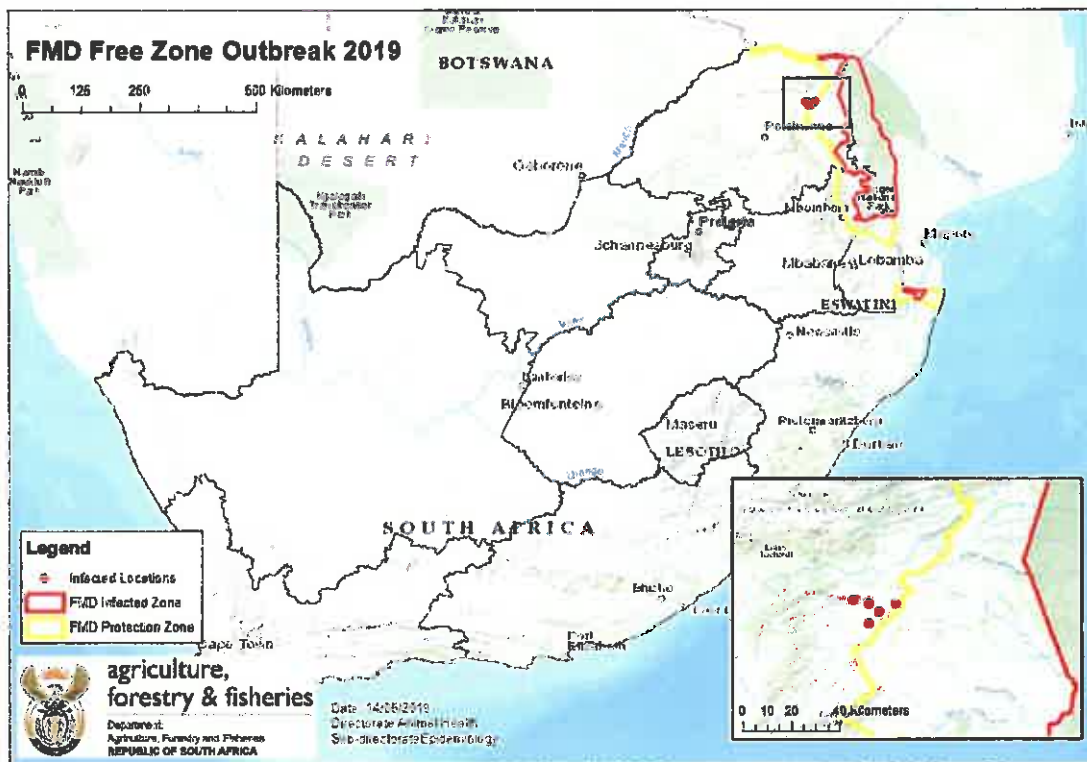
Report compiled by:  
Directorate: Animal Health

# 1. Introduction and summary

South Africa had an outbreak of Foot and Mouth Disease (FMD) and lost the OIE recognised FMD free zone without vaccination status on 7 January 2019. The disease, in the free zone, was first noticed on 2 January 2019 and confirmed on 7 January 2019 by the OIE FMD reference laboratory. The last positive location was reported to the OIE on 4 February 2019.

The Department of Agriculture, Forestry and Fisheries is confident that the clinical end point of the outbreak was reached on 31 January 2019 and the final report on this event was submitted to the OIE on 7 May 2019.

As a result of the confidence that the FMD outbreak was successfully contained, South Africa applied to the OIE for recognition of an FMD containment zone. The remainder of South Africa's free zone without vaccination has not been compromised by this outbreak. The international recognition of a containment zone will re-affirm the official recognition of the free zone status of the rest of the country.



Map 1: Location of the FMD outbreak in the FMD free zone of South Africa

## 2. Outbreaks reported in the FMD free zone

The outbreak occurred in the Vhembe district of Limpopo Province in the high surveillance area of the FMD Free Zone, immediately adjacent to the protection zone. A total of 5 clinically positive locations were identified. The affected animals are cattle kept in rural villages with communal diptanks and grazing. The 5 locations are all in close proximity.

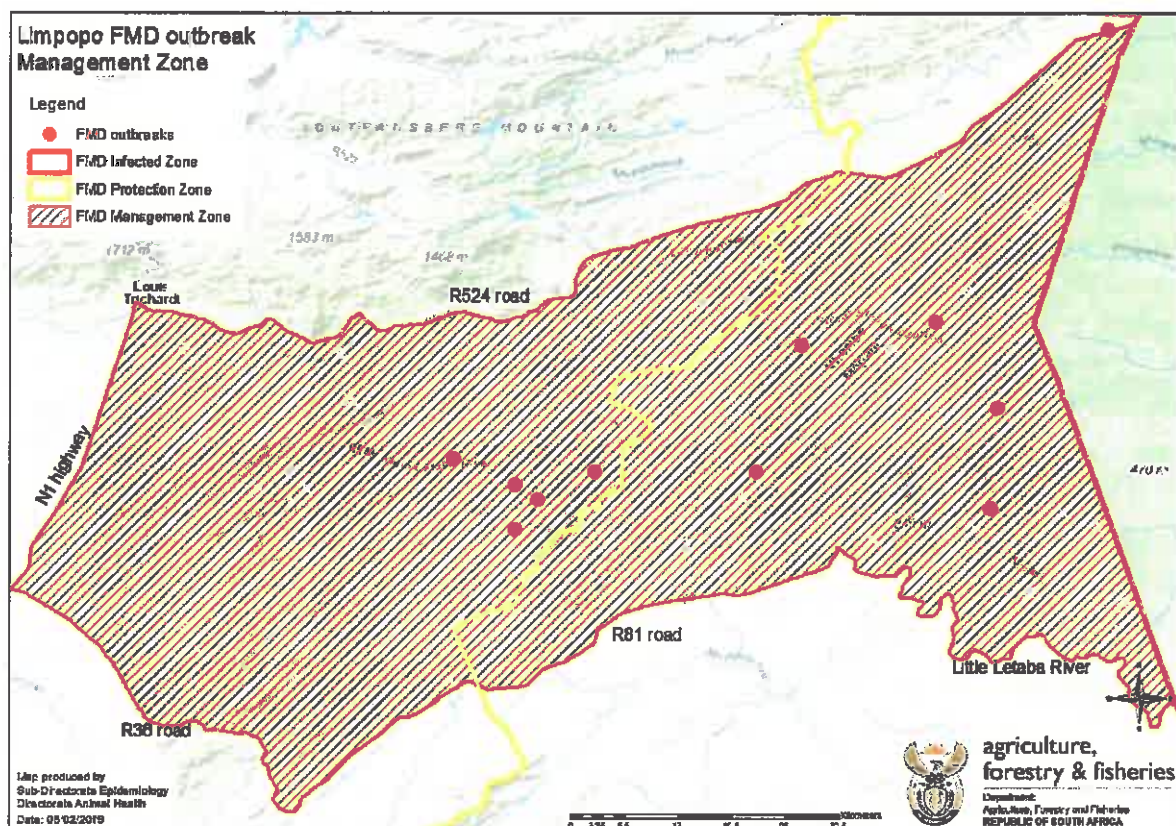
### 3. Control measures implemented

#### 3.1 Establishment of a Disease Management Area:

Immediate control measures were instituted upon suspicion of the disease. A Disease Management Area was declared shortly after confirmation of FMD and disease control measures were applied within this area. Disease control measures implemented in the Disease Management Area include movement control, clinical inspections, emergency vaccination and serological surveillance.

The details of the Disease Management Area were published in the Government gazette. Joint Operations Committee (JOC) and Veterinary Operations Committee (VOC) met on a daily basis to ensure that all the measures that had been put in place inside this area were maintained.

The Disease Management Area included a part of the (suspended) Free Zone as well as a part of the Protection zone. Main roads were selected as boundaries, since these were deemed to be the most suitable physical boundaries upon which successful implementation of disease control measures could be based. The following map (Map 2) indicates the boundaries of the Disease Management Area.



Map 2: The Disease Management Area that was legally declared to aid in disease control

### **3.2 Movement control in the Disease Management Area**

Movement restrictions were instituted on the 2<sup>nd</sup> of January in the affected village, while awaiting the laboratory results. A quarantine notice was served physically as well as verbally on the owners of the affected cattle, at a meeting that included the head lady (Chief) of the community and the head of the local Livestock Committee.

A Joint Operations Committee (JOC) was established on the 10<sup>th</sup> of January, as soon as the confirmatory laboratory results were received, consisting of Traffic, Departmental and District Disaster Management bodies, Police, Industry (the National Animal Health Forum and Feedlot Association) and Provincial and DAFF veterinary officials. The JOC facilitated the placement of 15 road blocks at strategic points, which enabled the implementation of movement control out of the area. These roadblocks also greatly enhanced awareness of the FMD situation and associated control measures within the local communities.

After confirmation of the outbreak, a complete standstill of cloven-hoofed animals was instituted in the Disease Management Area. Movement permits, which had been issued prior to the occurrence of the outbreak, were withdrawn. Products from cloven-hoofed animals were allowed to move within the Disease Management Area, but movements out of the area were considered on merit and only allowed with permits issued by the local State Veterinarian and in compliance with the conditions of such permits. Only products processed by methods validated to inactivate FMD virus were permitted to be moved out of the area.

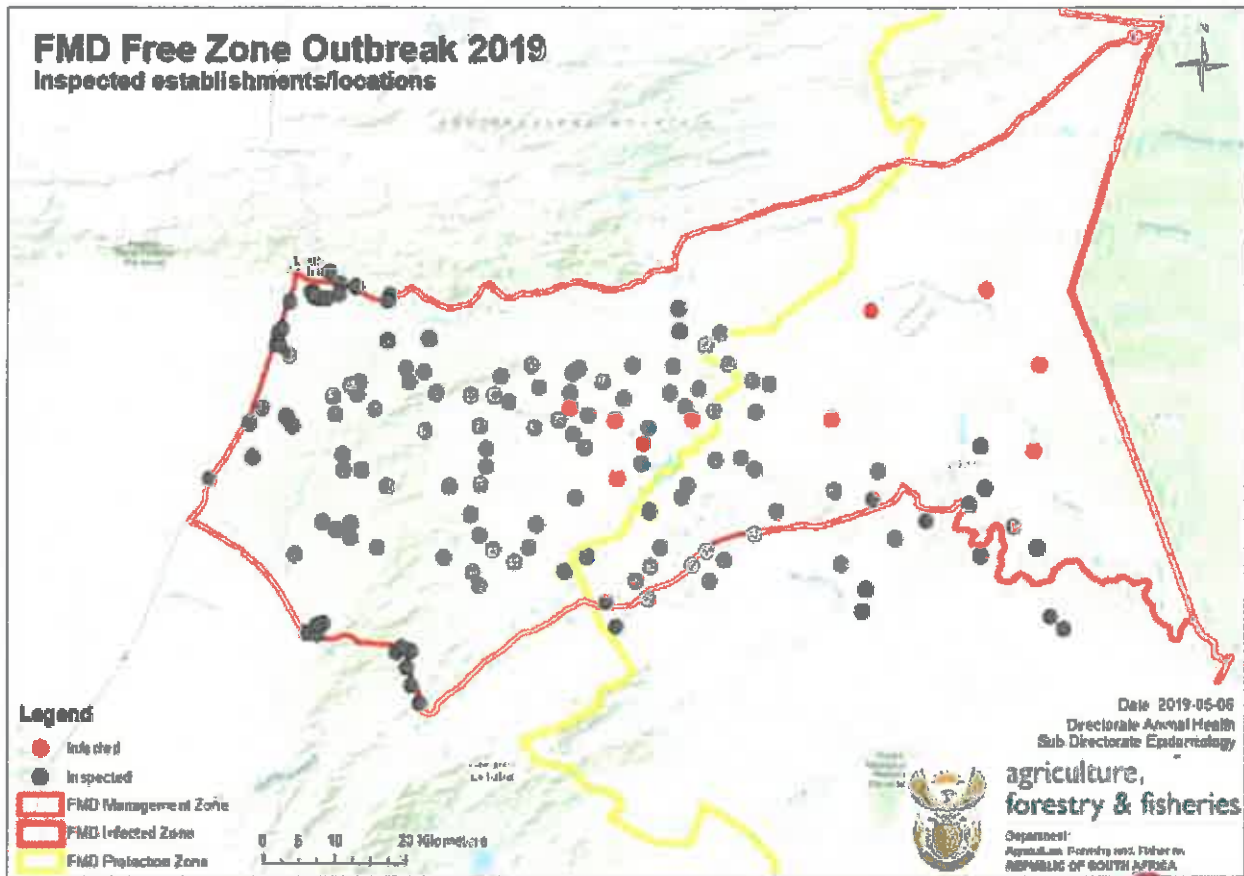
Initially, movement of cloven-hoofed animals (including wildlife) and unprocessed products out of adjacent districts and municipalities was discouraged. However, by 8 February 2019, since there was no sign that the disease had spread beyond the declared Disease Management Area, the caution regarding movement of cloven-hoofed animals (including wildlife) and unprocessed products out of adjacent districts and municipalities was discontinued.

The roadblocks were discontinued at the end of April. However, the restriction on movements out of the area will remain in place and the roadblocks will be replaced by more intensified roaming patrols. The above control measures continue to be applied, with particular emphasis on preventing live cloven-hoofed animals and their unprocessed products from moving out of the Disease Management Area.

### **3.3 Clinical Inspections in Disease Management Area:**

Clinical inspections were conducted on a weekly or two-weekly basis at establishments/locations in the Disease Management Area. All suspicious cases were eliminated by either the lesions being inconsistent with FMD, or by negative tests for FMD. No clinical evidence was found that the outbreak spread beyond the 5 infected establishments/locations, which all fall well within the Disease Management Area and the proposed containment zone.

The following map (Map 3) indicates the 152 establishments/locations that have been repeatedly inspected in the Disease Management Area.



Map 3: Clinically inspected establishments/locations in the Disease Management Area

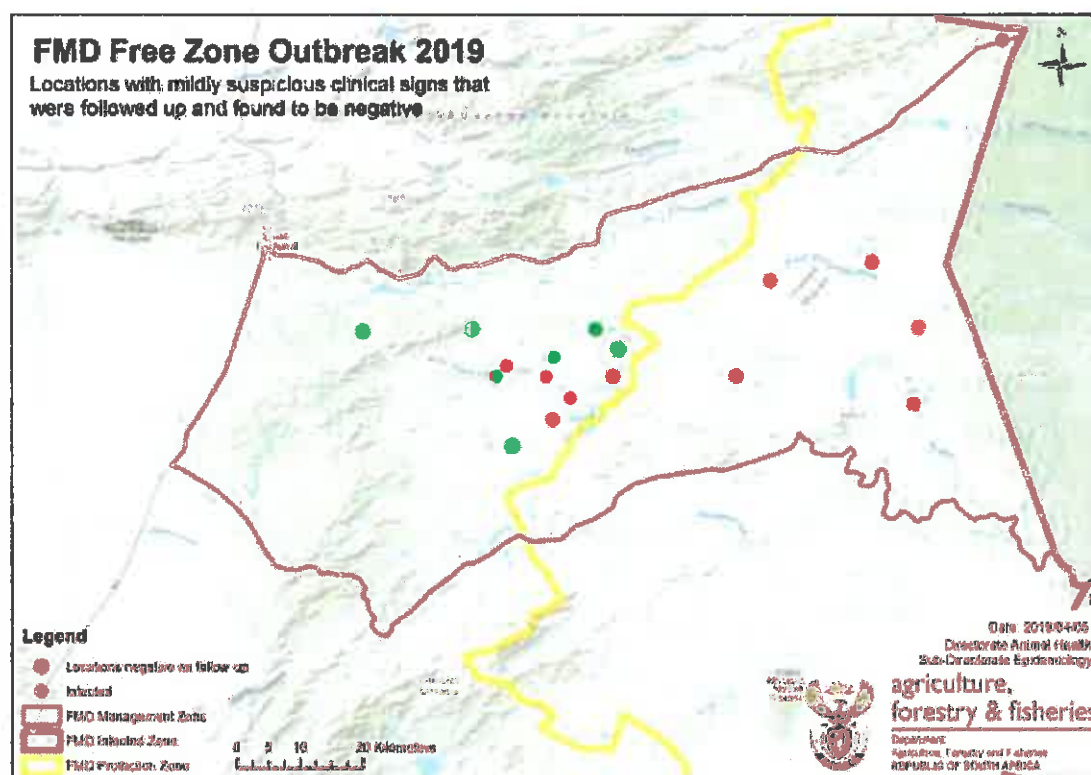
The following table (Table 1) indicates the number of establishments/locations and number of animals that were inspected during each week:

Table 1: Number of establishments/locations and animals inspected in the Disease Management Area per week

Week	Number of establishment s/locations inspected	Number of cattle inspected	Number of small stock inspected	Number of pigs inspected
14 -18 January 2019	7	3318		
21 – 25 January 2019	114	38 864	1 255	116
28 Jan – 1 Feb 2019	115	40 092	1 024	
4 – 8 February 2019	88	27 974	941	
11 – 15 February 2019	77	24 988	767	
18 – 22 February 2019	126	43 436	1 107	1
25 Feb – 1 Mar 2019	116	38 913	408	
4 – 8 March 2019	124	44 264	717	66

11 – 15 March 2019	117	44 116	664	
18 – 22 March 2019	93	35 732	806	111
25 – 29 March 2019	78	32 436	282	
1 – 5 April 2019	62	24 309	154	4
8 – 12 April 2019	75	26 398	518	33
15 – 19 April 2019	72	27 973	128	4
<b>Total</b>	<b>1 295</b>	<b>463 749</b>	<b>8 771</b>	<b>335</b>

Ongoing clinical surveillance periodically identified suspect FMD signs, which were all found to be negative on further investigation. The map below indicate the establishments/locations at which suspicious clinical signs were identified during inspection, but at which follow-up testing failed to reveal evidence of infection.

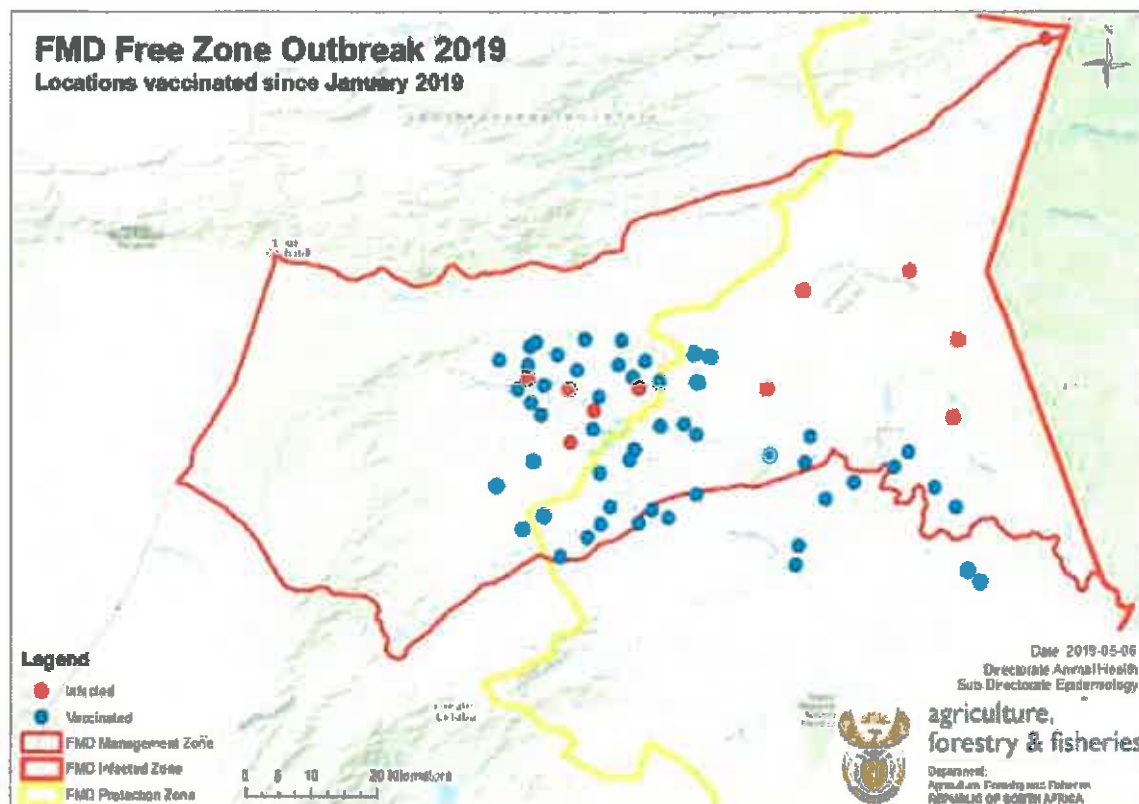


Map 4: Establishments/locations at which suspect clinical signs were detected, but found to be negative on follow-up testing

### 3.4 Emergency vaccination in the Disease Management Area:

Emergency vaccination was applied in the Disease Management Area, at establishments/locations immediately surrounding the affected dip tanks. A trivalent vaccine (SAT 1, SAT 2 and SAT 3) was used. The first round of vaccination started on the 14<sup>th</sup> of January and the second round started on the 25<sup>th</sup> of February and was completed on 5 April 2019. All vaccinated cattle were branded with an “FC” mark on the right side of their necks, to identify them as vaccinated.

A number of establishments/locations outside of the Disease Management Area (but within the protection zone) were also vaccinated in order to prevent spread of the infection within the protection zone. A total of 29 establishments/locations in the proposed containment zone (previously free zone) were vaccinated, as well as 33 establishments/locations in the protection zone (refer to Map 4).



Map 5: Vaccinated establishments/locations

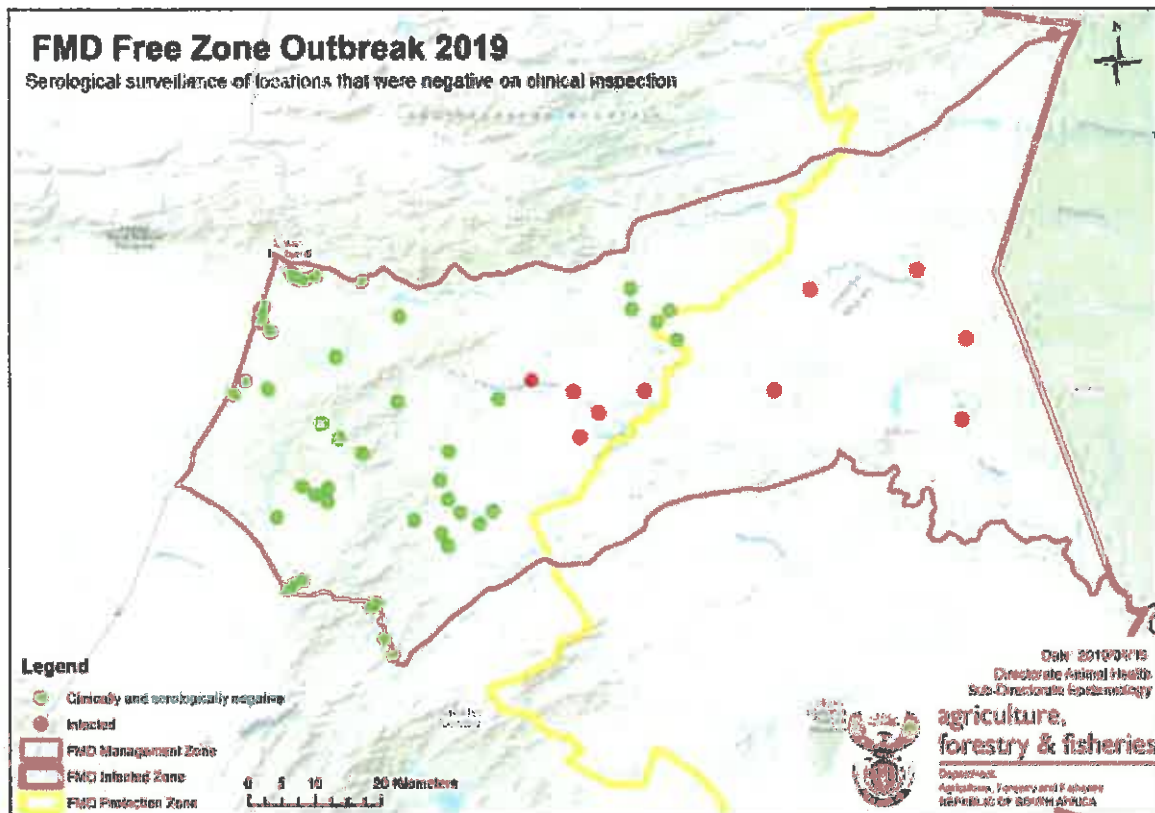
### 3.5 Serological surveillance in the Disease Management Area

In addition to the clinical inspections that were carried out, serological surveillance was also conducted within the Disease Management Area, of both the vaccinated and unvaccinated establishments/locations. Preliminary serological results indicate that the infection percentage was very low, and there is good evidence that infection never spread outside of the vaccinated locations. Clinically and serologically the infection has therefore come to an end.

#### 3.5.1 Serosurveillance at unvaccinated diptanks:

Unvaccinated establishments/locations that were negative on clinical inspection were serologically sampled (and tested by Solid Phase Competition ELISA) after the clinical endpoint, to ensure that there was no unidentified spread of the infection. The required sample size was calculated using EpiTools epidemiological calculators (Ausvet Pty Ltd.) to substantiate freedom, with the following parameters: Population size 1000; Test sensitivity 95%; Test specificity 100%; Design prevalence 12%; Type I error 0.05; Type II error 0.05. The required sample size for establishments/locations that were negative on clinical inspection was therefore 25.

In total, 48 establishments/locations that were negative on clinical surveillance were serologically tested. Solid Phase Competition ELISA testing was done since the locations were not vaccinated. Results indicate that all non-vaccinated establishments/locations remained serologically negative, i.e. indicating that the infection did not spread out of the vaccinated area. The map below indicates the establishments/locations that were negative on clinical inspection, at which serological samples were collected.



Map 6: Establishments/locations that were negative on clinical inspection, that were serologically surveyed for evidence of sub-clinical infection and confirmed negative

### 3.5.2 Serosurveillance at vaccinated diptanks:

A survey was designed to determine whether there was any spread of the virus in the vaccinated establishments/locations, to determine whether there was any active circulation of virus in the area, and to estimate the proportion of serologically positive animals to guide further control actions.

The 5 establishments/locations that were clinically infected (and vaccinated) were included in the survey, so it could be reasonably expected that some exposed animals would be identified. The survey could therefore not be designed as a freedom survey, so a prevalence survey was designed. Since cattle from adjacent villages/diptanks mix on a daily basis (during grazing and at water sources), the whole area is regarded as a single epidemiological unit.

The required sample size was calculated using EpiTools epidemiological calculators (Ausvet Pty Ltd.) to determine seroprevalence, with the following parameters: Population size 21 500; Estimated true proportion 0.5; Desired precision 0.05; Confidence level 0.98. The required sample size for

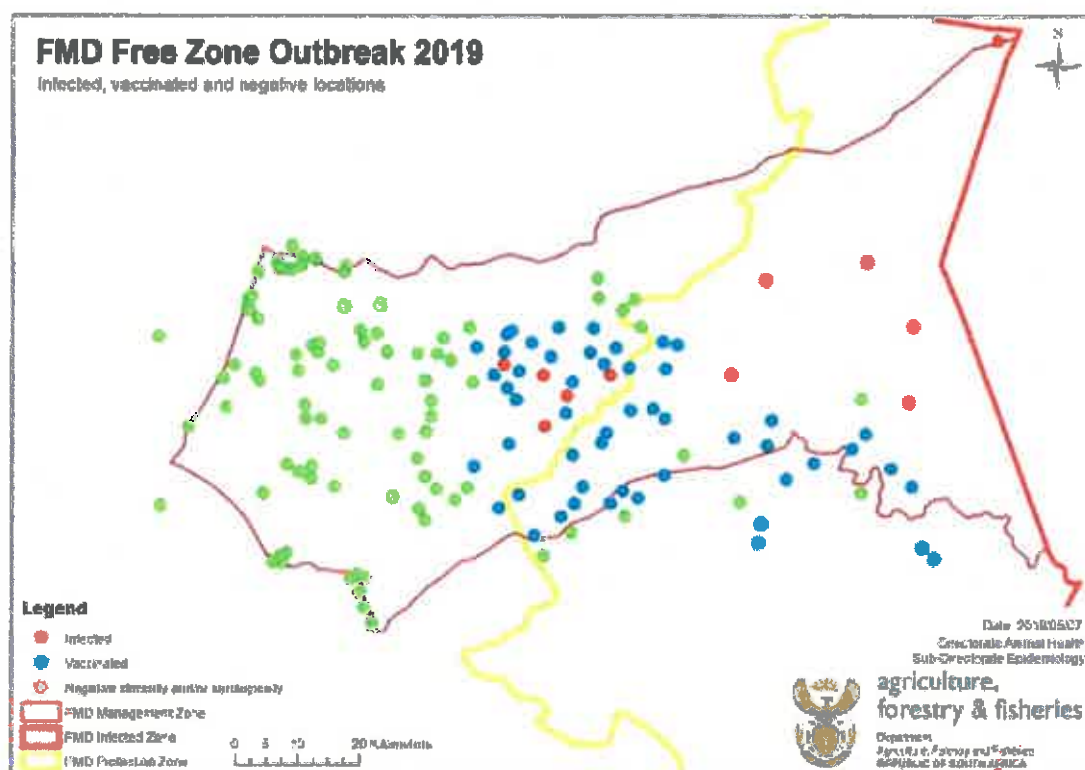


establishments/locations that were negative on clinical inspection was therefore 542. It was decided to sample all locations equally and the results may then be weighted according to the number of cattle per location. This resulted in approximately 18 samples per location. It was however decided to increase the number of samples per location to 25, to optimise the information obtained for the entire area as well as for individual establishments/locations.

The laboratory phase of the survey is still underway, but preliminary results of the vaccinated locations reveal a high percentage of SPCE positives, indicating good seroconversion following vaccination, and a low percentage of NSP positives.

### 3.6 Summary of control measures implemented

The disease control measures and surveillance implemented in the Disease Management Area resulted in the successful control of the FMD outbreak in the previously free zone. The five positive locations were geographically linked and the outbreak was limited to a small area adjacent to the protection zone. This was confirmed by repeated clinical investigations and confirmed by serological testing. All of the locations indicated in green in the map below were consistently negative on intensive clinical inspections, and the 48 of the 81 locations that were tested serologically also revealed that all samples were completely negative on Solid Phase Competition ELISA (SPCE). In addition, all the vaccinated locations (shown in blue in the map) were sampled, and the preliminary results reveal a high percentage of SPCE positives, indicating good seroconversion following vaccination, and a low percentage of NSP positives.



Map 9: Infected, vaccinated and negative locations

## **4. Epidemiological investigation**

Full epidemiological investigation revealed that the outbreak in the free zone was caused by illegal movement from an outbreak in the protection zone, which was in turn related to viruses previously isolated from African Buffalo in the Kruger National Park (infected zone). The outbreaks, as well as outbreaks in the FMD protection zone, have all been epidemiologically linked to FMD endemically infected buffalo populations in the Kruger National Park (infected zone), and have not been caused by incursion of foreign strains.

In May 2018, an FMD outbreak occurred in the Thulamela area in Limpopo Province within the protection zone. The outbreak was caused by a SAT 2 virus. The virus was found to be closely related to viruses previously isolated from buffalo in Kruger National Park. In August 2018, five further locations were identified as infected in the Giyani and Thulamela areas (Limpopo Province) of the protection zone. These SAT 2 viruses were found to be closely related to the viruses isolated in May 2018, so was considered as a continuation of that outbreak. This outbreak had not been closed prior to the occurrence of the outbreak in the free zone.

Two virus isolations from the outbreak in the free zone were found to be identical by phylogenetic analysis, to the viruses previously isolated from the same outbreak that was ongoing in the adjacent protection zone. Therefore the outbreak in the free zone was reported as a continuation of the outbreak in the protection zone.

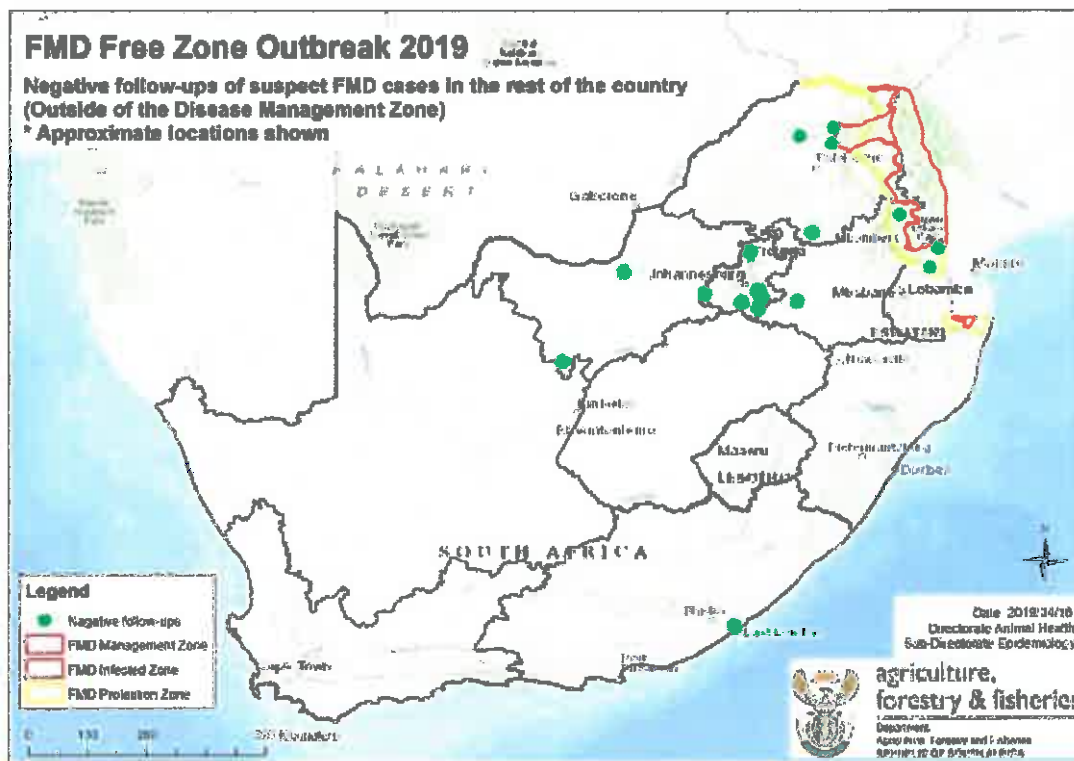
The source of the outbreak in the free zone was subsequently traced to a single cattle owner. The owner and his cattle originate from the free zone, but due to drought conditions he illegally moved his cattle to the area in the protection zone where there was an ongoing outbreak, since there was better grazing available in the protection zone at the time. After the seasonal rains started, he then moved his cattle back to his own village and communal grazing area in the then free zone. The cattle owner was aware of the dangers of FMD and that he had transgressed, so he reported his actions to the state veterinarian as soon as he saw that his cattle had developed clinical signs of FMD. That resulted in the outbreak being detected timeously. The source of the outbreak was reported to the OIE as spill-over before further investigations revealed the cause as illegal movement.

## 5. Surveillance in the FMD free zone

### 5.1 Passive surveillance in the FMD free zone:

FMD is a controlled disease according to South African legislation, and anyone who is aware of or suspects the occurrence of FMD, is required to report that suspicion to the local State Veterinarian. This occurs periodically and when it happens such reports are followed-up by clinical inspection and by testing as appropriate. This process has been strengthened during this FMD outbreak, as several requests were sent to the Veterinary Services of all of the Provinces, as well as to industry forums for private veterinarians and to the South African Veterinary Council for distribution, urging veterinarians and animal health technicians to report any suspicions that they followed up on.

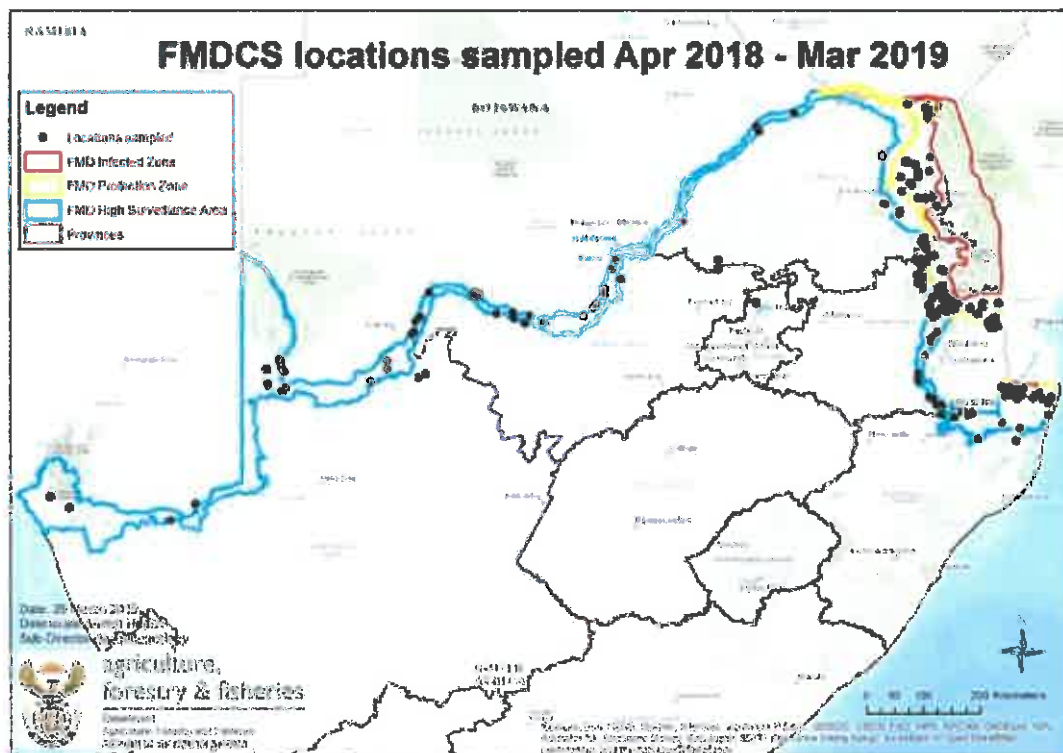
The following map indicates the approximate establishments/locations of suspicious outbreaks that have been followed up in the rest of the country since the beginning of the outbreak. All reports of FMD suspicions proved unfounded by follow-up actions performed.



Map 7: Locations in the rest of the country (outside of the FMD Disease Management Area) where FMD suspicions have been followed-up

## 5.2 Active surveillance in the FMD free zone:

There is an ongoing serological survey in the FMD protection zone (without vaccination) and in the FMD High Surveillance Area. The continuous survey (with samples collected on a quarterly basis) has been in place for several years (expanded to include the High Surveillance Area in April 2018) and will continue. The map below indicates the establishments/locations that were sampled in the 2018/2019 cycle (April 2018 to March 2019). Serological reactors were followed up if they occurred, and no cases of infection were identified. The 2019/2020 cycle started on the 1<sup>st</sup> of April 2019 and will continue as normal.



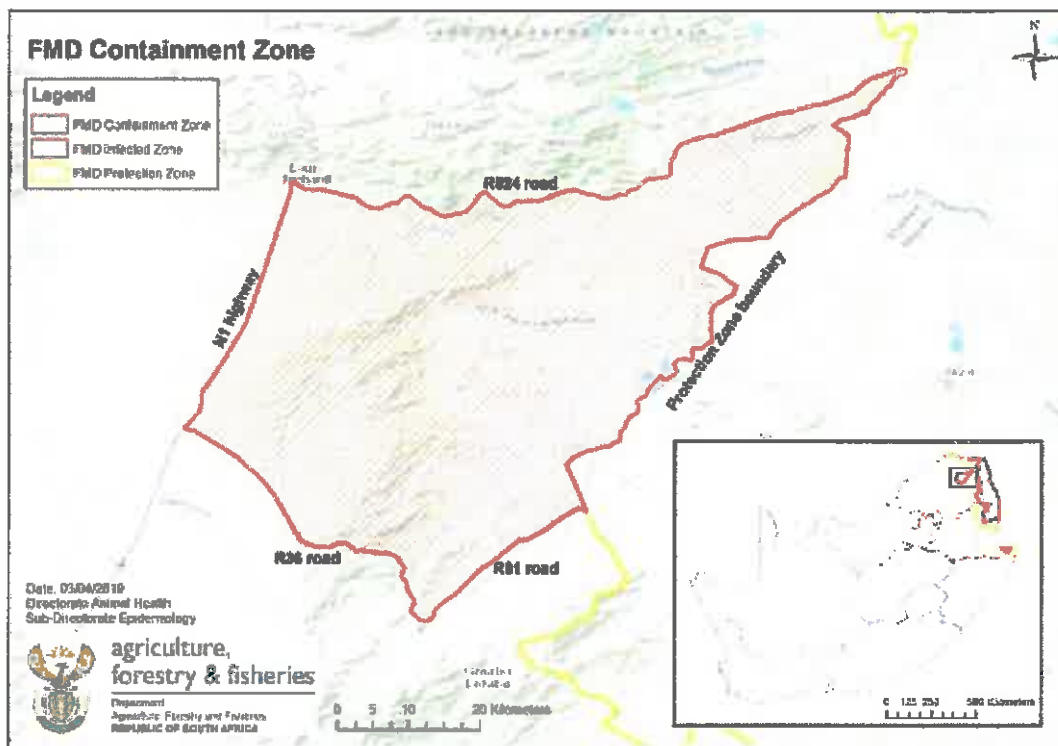
Map 8: Establishments/locations sampled as part of the FMD Continuous Survey for the 2018/2019 cycle (April 2018 to March 2019)

## 6. Declaration of end of outbreak

Based on inspections and surveillance done, the last clinical case was detected on the 31<sup>st</sup> of January 2019. A period of more than 3 months (seven (7) incubation periods) has therefore passed without any new cases being clinically identified. Based on this, the end of the outbreak was declared and the event was reported as closed with the OIE on 7 May 2019.

## 7. Containment Zone within Disease Management Area

The Disease Management Area was legally declared shortly after the outbreak was detected, to have a defined area within which to institute disease control measures. The Disease Management Area included a part of the previously Free Zone, as well as a part of the Protection zone. The part of the Disease Management Area that falls in the (suspended) free zone will now be regarded as the FMD containment zone. DAFF has submitted an application to the OIE for official recognition of the FMD containment zone. The map below indicates the boundaries of the containment zone.



Map 2: Map of the proposed Containment zone

## 8. Way forward

Within the containment zone, clinical inspections and serological surveillance will continue and vaccinated animals will remain identified to allow traceability. Movement restrictions will remain in place in the Containment zone (as well as the adjacent portion of the Protection zone which makes up the Disease Management Area, as was Gazetted), until the area is re-incorporated into the Free Zone. This process should be concluded within 12 months from declaration of the containment zone.

Outside of the containment zone, ongoing surveillance will continue to provide assurances of the status of the rest of the free zone. Serological surveillance will be conducted in the 20km area around the Containment zone. The continuous serological surveillance programme in the Protection zone without vaccination and the High Surveillance Area will continue. Passive surveillance and follow-up of any suspicions in the rest of the country will also continue.

DAFF has applied to the OIE for official recognition of the FMD containment zone. This application is for the OIE to favourably consider recognising the establishment of the containment zone in accordance with Article 8.8.6 of the OIE Terrestrial Animal Health Code. If approved by the OIE, South Africa's official OIE recognised FMD free zone status will be reinstated.

  
**DIRECTOR ANIMAL HEALTH**  
Date:

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