VRA 1A - What are the risks of causing a new outbreak of foot and mouth disease (FMD) by walking susceptible livestock from one part of a premises to another part of the same premises across a public road for welfare reasons, such as for milking, emergency veterinary treatment or to give birth, in the Temporary Control Zone, Surveillance Zone and/or Protection Zone?

1. SUMMARY OF OVERALL RISK & RECOMMENDED ACTION

This risk assessment was based on EPIC's veterinary risk assessment (VRA)1, which considered the risks of walking susceptible livestock from one part of a premises to another part of the same premises across a public road in the Restricted Zone. VRA1 was compiled according to terms of reference provided by the Scottish Government regarding time of delivery, title of VRAs and level of detail required. EPIC scientists created a generic framework suitable for the VRAs; collated and updated existing information on risks; filled gaps in the documents (including references where appropriate); and drafted new VRAs where necessary. EPIC point out that these documents may require updating as new information becomes available or legislation develops, or if more in-depth assessment is necessary.

The purpose of this document is to qualitatively assess the risk of the specified activity in the face of an FMD outbreak in the UK. The assessment includes proposed actions to mitigate the risks associated with the specified activity, and which could form the basis of licence conditions, should the activity be permitted. The summary of overall risk below assumes that the risk mitigation measures in Section 8 are implemented.

DEFINITIONS OF RISK LEVEL (OIE 2004, DEFRA 2011):

***Negligible** So rare that it does not merit consideration*
***Very low** Very rare but cannot be excluded*
***Low** Rare but could occur*
***Medium** Occurs regularly*
***High** Occurs very often*
***Very High**: Events occur almost certainly*

Overall risk: The risk of allowing the activity described is **LOW** in the Temporary Control Zone/ Protection Zone. This assessment is the combined risk offered by the potential risk pathways, detailed in section 5 below.

POTENTIAL OPTIONS FOR MITIGATING RISK (SEE POINT 8).

2. LEGISLATION, DEFINITIONS & ASSUMPTIONS

Statutory disease control requirements are applicable to livestock premises on suspicion and confirmation of FMD. When suspicion of disease cannot be ruled out, and diagnostic samples are taken, a Temporary Control Zone will be put in place (TCZ) surrounding the suspect premises. On confirmation of disease, a national movement ban (NMB) will be enforced by introducing a national Restricted Zone (RZ). A 3 km Protection Zone (PZ) and 10km Surveillance Zone (SZ) will be implemented which place restrictions on movements and activities around infected premises to prevent spread of disease. Later in the outbreak, restrictions may be relaxed either through reducing the size of the RZ or through allowing some resumption of normal activities under licence within the RZ, SZ or PZ. In this VRA, RZ is used to refer to areas which are within the RZ, but do not also fall within the PZ or SZ

General prohibitions on animal movements do not apply to movements from one part of premises to another part of the same premises using a public highway, if authorised by a licence granted by a veterinary inspector or an inspector at the direction of a veterinary inspector (FMD (Scotland) Order 2006 Schedule 2, paragraph 4; Schedule 4, paragraphs 10, 26).

Disinfectants used must be approved for use by the Diseases of Animals (Approved Disinfectants) (Scotland) Order 2008.

3. HAZARD IDENTIFICATION

(a) **Hazard**: FMD virus (FMDV)

(b) **Specific risk**: Moving FMD-infected livestock (incubating, undetected or unreported) over a public road increases the risk of contaminating the road, and of spreading infection to previously uninfected parts of premises (via the animals themselves), and to new premises (via fomite spread). Moving uninfected livestock over public roads contaminated with FMDV could infect those livestock with FMD.

Movement restrictions cause particular difficulties for premises that are situated either side of a public road and need to walk livestock across the road for welfare reasons - including for milking, emergency veterinary treatment, or to give birth. In these cases, a no-movement policy cannot be enforced without seriously compromising animal welfare.

4. POTENTIAL RISK PATHWAYS

Infection Sources:

A1 Animals to be moved are infected and excreting FMDV.
A2 Road or environment is contaminated with FMDV.
A3 Livestock keeper and/or equipment is/are contaminated with FMDV

Risks of transmission:

B1 Virus passing to uninfected livestock from the road.
B2 Virus passing to uninfected premises from infected livestock crossing roads, via fomites/vehicles.

5. EXPOSURE ASSESSMENT

Factors which are likely to affect this probability of exposure are:	***Comments and risk estimates if/where appropriate:***
***Infection source:* A1 Animals to be moved are infected and excreting FMDV**	
• Requires animals with undetected or incubating FMDV infection, or failure to report FMD	• Animals may incubate FMD for 2 to 14 days before the appearance of clinical signs (Sanson 1994), depending on initial dose, route of infection and virus strain. • Whilst transmission is most likely around the time of or shortly after the appearance of clinical signs (Charleston *et al.* 2011), infected livestock may excrete FMD virus for several days

	before the appearance of clinical signs, potentially leading to transmission or contamination prior to disease detection, particularly in cattle and pigs (Alexanderson *et al.* 2003, Orsel *et al.* 2009). • FMD in sheep can be difficult to detect clinically as not all animals show clinical signs, and clinical signs are usually mild and short lived (Hughes *et al.* 2002). There is therefore a higher risk of sheep spreading infection. • Inspecting livestock before any movement will reduce the risk of undetected infection.
Risk that the premises is infected depends on: • Proximity to an infected premises	• Where the TCZ is utilised, it is declared immediately after identification of an IP, i.e. at the early stages of disease investigation. As the investigation progresses and the facts are established, the TCZ will be converted to a PZ +/- SZ. There is an inevitable level of uncertainty connected with the TCZ because the full extent of local disease may not yet be known. • Risk of a premises being infected is highest if it is adjacent or close to infected premises. Once a NMB is in place, most transmission occurs by local spread (<3k from an infected premises) (Gibbens *et al.* 2001, Keeling *et al.* 2001, Haydon *et al.* 2003). • Risk of airborne transmission decreases rapidly with distance from the infected premises and is only likely to occur over significant distances if many infected animals (especially pigs) are present (Donaldson and Alexanderson 2001). • Infected premises may be already detected, or as yet undetected. • In a TCZ or PZ, there is at least one detected infected premises. There is a risk of as yet undetected infected premises. Overall, the risk of local transmission is medium. • The premises within the SZ are at lower risk than those in the PZ, since they are at least 3 km from known infected premises. Given the risk of "local" spread of FMD (defined by Gibbens *et al* 2001 as within 3 km) SZ premises located at the PZ boundary are at slightly less risk than the outer PZ premises. The risk of local transmission for premises within the SZ is therefore low.
• Extent and timing of movements of susceptible animals from high risk areas	• Requires movements of infected animals before the NMB, or movements of animals with undisclosed infection by licence.

	• Likelihood of movements having taken place is influenced by type of premises, for example finishing units are likely to move animals in on a regular basis, whereas closed high-security units would represent the lowest risk. • In a TCZ. SZ or PZ transmission is most likely to result from direct or indirect contact with infected animals on IPs. Indirect contact may be via fomites or airborne spread. • Airborne spread of FMDV has been documented over tens of km but is more commonly responsible for local spread only (<3km) (Gibbens *et al* 2001), so is more likely to occur within the PZ than within the SZ. • Identifying the number and nature of livestock movements from high risk areas using livestock movement databases and tracings would allow better quantification of the risk. • Identifying all the IPs in the TCZ would also give greater certainty.
• Stage of outbreak	• Early in the outbreak there is increased risk of undetected infection and lack of information on movements.
• Likelihood of detection and transmission is influenced by FMD virus strain	• There are 7 serotypes of FMDV: O, A, C, SAT1, SAT2, SAT3 and Asia 1. The different serotypes (and different strains within each serotype) have different characteristics for example in terms of host species susceptibility, length of incubation period, ease of detecting clinical signs and likelihood of air borne transmission (Kitching and Hughes 2002, Gloster et al. 2008). Much UK research is based on the 2001 outbreak, which was caused by serotype O, strain PanAsia. However future outbreaks may involve other serotyopes/strains and therefore present different epidemiological situations. On confirmation of FMD, the serotype and strain would be identified by The Pirbright Institute. This information would help to inform estimates of risk.
Infection source: **A2 Roads or environment are contaminated with FMDV**	
• Proximity to infected premises	• Risk of infecting livestock is highest where a road is adjacent or close to infected premises. Once movement bans are in place, most transmission occurs by local spread as described above. It is difficult to quantify relative risks associated with different transmission routes within local spread but indirect transmission via fomites and contamination around infected premises are likely to play an important role.

	• The risk of local transmission within a TCZ or PZ is medium, as above. Risk of transmission within SZ is low, as above.
• Extent and timing of movements from high risk areas	• Roads could be contaminated with FMDV if there have been movements of infected animals before the NMB, or movements of animals with undisclosed infection by licence.
• Biosecurity of local premises, cleansing and disinfection procedures in place	• FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer to roads via fomites such as personnel, vehicles and equipment.
• Presence of susceptible wildlife species	• All British deer species are susceptible to infection and can transmit virus to domestic livestock experimentally (Gibbs *et al.* 1975).Wild boar are also susceptible (Elbers *et al.* 2003, Hartley 2010) but the density of wild boar in UK is very low. In Western Europe post-outbreak serosurveys and diagnostic testing of animals with suspicious clinical signs have never revealed deer or wild boar carrying FMDV antibodies or FMDV (Elbers *et al.* 2003, Mouchantat *et al.* 2005) and there is no evidence to suggest that deer or boar have played a role in FMDV spread in UK. Other wildlife species can carry FMDV mechanically but this is very unlikely to be important except close to infected premises. Overall the risks of wildlife causing contamination of roads or the environment in the TCZ or PZ are very low.
• Survival of FMD virus on road	• FMD can survive on average for 2 to 3 months in bovine faeces at 4$_{o}$C. Survival duration increases with decreasing temperatures and presence of organic material and varies with virus strain (reviewed by Bartley *et al.* 2002).
Infection Source: **A3 Livestock keeper/equipment is/are contaminated with FMDV**	
• If there are infected but undetected animals on the premises, they will provide a source of FMDV and may contaminate the livestock keeper/farm staff/equipment.	• Personnel, equipment and vehicles can become contaminated with FMDV through direct/indirect contact with infected livestock. The FMDV can then be transmitted to livestock, either through direct contact or indirectly e.g. via contamination of roads, gates, field furniture. • FMDV is very sensitive to approved disinfectants and good biosecurity will reduce risk of virus transfer via fomites such as personnel, vehicles and equipment.
Risk of transmission: **B1 Infection passing to uninfected livestock from the public road**	

Comment [HC1]: Wildlife – considered not a risk in terms of perpetuating disease, but could spread disease by nose to nose contacts.

Comment [z2]: I think EPIC will provide a form of words acknowledging NEG's comments, which can also be inserted here. In addition, there would probably need to be a reference for spread by nose-to-nose contact with wildlife. JP

• Extent of contamination of public road	• The presence of material such as faeces on the road increases risk that FMD virus is present. In addition, viral material survives better when protected by organic matter such as faeces (Bartley *et al.* 2002).
• Distance travelled along public road	• Increasing distance travelled increases the risk that animals will be exposed to FMD virus.
• Animals straying	• Animals straying off the road are more likely to be exposed to FMDV left by infected livestock or contaminated people or equipment. Animals may be infected if they come into contact with infected livestock on nearby premises.
• Density of livestock on other premises and proximity to the road	• The location of livestock within premises is likely to vary seasonally. If animals are grazed or housed close to the road there is a higher risk of direct or indirect transmission.
• Frequency of movement	• More frequent movements, for example for twice daily milking, present a higher risk.
• Good hygiene, cleansing and disinfection of personnel and equipment	• Cleansing and disinfection of personnel and equipment before and after movement will reduce risk.
Risk of transmission: **B2 Infection passing to uninfected premises from infected livestock crossing roads, via fomites/vehicles**	
• Number and species of animals moved	• Larger groups increase the risk of transmission if infection is present. Species vary in their virus production – pigs are higher risk than dairy cattle, which are higher risk than sheep.
• Distance travelled along public road	• Increasing distance increases risk of contamination, and makes cleansing and disinfection increasingly difficult.
• Traffic volume, during and after movement	• Busy roads will increase the risk as it may be more difficult to control traffic during movement, and if virus is present it will be disseminated further.
• Animals straying	• Movement of animals off the road increases potential for contamination. Animals with undisclosed infection could come into contact with susceptible livestock in nearby premises.
• Density of livestock on other premises and proximity to the road	• The location of livestock within premises is likely to vary seasonally. If animals are grazed or housed close to the road there is a higher risk of direct or indirect transmission. Risk would be reduced if livestock were grazed/housed at a distance from the road, e.g. by using stand-off fencing or avoiding use of fields/housing neighbouring the road.
• Frequency of movement	• More frequent movements, for example for twice daily milking, present a higher risk.

• Good hygiene, cleansing and disinfection of personnel and equipment	• Cleansing and disinfection before movement will reduce risk.
• Cleansing and disinfection of public road after movement	• Whilst this reduces risk, it is likely to become increasingly difficult with increasing journey distance.

6. CONSEQUENCE ASSESSMENT

Spread of disease to uninfected premises and/or uninfected parts of the same premises.

7. RISK MANAGEMENT OPTIONS/ADVICE

There are risks that allowing susceptible livestock to move between parts of the same premises by crossing a public road could allow further spread of FMD. These movements need to take place early in an outbreak, before complete epidemiological information is available, and before a full incubation period has passed, meaning that undisclosed infection may be present. The greatest risks are associated with animals with undetected infection contaminating long stretches of road, or where animals must pass close to susceptible livestock from adjacent premises.

Management options include:
(i) Not allowing the movements described to take place
(ii) Not allowing these movements to take place until a clear epidemiological picture is in place
(iii) Allowing essential movements to take place in the TCZ/PZ but with conditions in place to reduce risk, and limiting distance of movement to <100m
(iv) Allowing all movements from one part of a premises to another part of the same premises across a public road to take place without limiting distance.

These movements do represent a risk. However, some movements cannot be restricted without compromising animal welfare, so options (i) and (ii) are not realistic. Option (iv) represents the highest risk situation and is therefore not appropriate for the TCZ/PZ, where FMDV is likely to be present. It is suggested that option (iii) would be most appropriate for the early stages of the outbreak.

8. SPECIFIC RISK MITIGATION MEASURES

Walking of livestock across a public road for welfare reasons, including milking, emergency veterinary treatment or to give birth within a TCZ, PZ or SZ, presents a low risk provided that safeguards are in place. The following risk mitigation measures are suggested:

A. Before movement
i) Ensure all personnel are wearing clean, disinfected clothing and boots and any equipment is clean and disinfected before use.
ii) Thoroughly brush/scrape stretch of public road that livestock will be moving across to remove any solid debris, particularly any livestock excreta, after ensuring that it is safe to do so.
iii) Set up controls to manage traffic flow along the public road during movement.
iv) Inspect all livestock to ensure there are no clinical signs suggestive of FMD.

B. During movement
i) Ensure livestock movement is undertaken by the most direct route i.e. along shortest available stretch of public road and the distance does not exceed 100m.

ii) Ensure movement is undertaken as quickly as possible along the public road, with no animals being permitted to stray/escape or wander along any other stretch of the road
iii) Ensure appropriate management of traffic along the road whilst movement takes place, to avoid contamination of vehicle wheels.
iv) Efforts should be made to prevent any contact between the livestock, and any susceptible livestock in enclosures adjacent to the road.

C. After movement
i) After ensuring that it is safe to do so, thoroughly brush/scrape stretch of public road that livestock walked across, ensuring removal of any material (particularly faeces) that may contain FMDV and could be picked up by passing vehicles. This must be completed immediately after the move and before giving access to any traffic. Any waste cleaned off the road should be disposed of by the livestock owner in line with their appropriate normal disposal methods on the premises.
ii) Ensure that all personnel's clothing, boots and equipment undergo cleansing and disinfection before veterinary treatment, milking or other handling is undertaken.

Hygienic precautions
Farmers should be aware of the biosecurity of other local farmers. This includes ensuring all farm vehicles are appropriately cleansed and disinfected before being used on public roads. All staff and personnel should wear clothing and boots that have undergone cleansing and disinfection and wear different clothing and shoes whilst off the premises. All should be fully aware of all hygiene precautions that must be adhered to during an FMD outbreak.

It is assumed that relevant legislation applicable during "peacetime" is followed, for example regarding livestock identification and recording movements, births, deaths and medicines.

9. SOURCES OF EXPERT ADVICE

This VRA is substantially based on:
VRA1, which was compiled by Harriet Auty and Lisa Boden (EPIC CEADO) Date: 10/02/2012. VRA1 was based on:

- VRA 2009 #1 "*What is the risk of causing new outbreaks of FMD by walking susceptible livestock across a public road for milking?"*
- VRA 2009 #7 *"What is the risk of causing new outbreaks of FMD by walking susceptible livestock across a public road for Emergency Veterinary Treatment?"*

10. AUTHORS

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11. REFERENCES

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12. NOTES

None