Year End Descriptive Epidemiology Report: Bovine TB Epidemic in the England Edge Area

Delivery Area: Northern Cheshire (part county)

Year-end report for 2017

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1. Executive Summary

a. The Edge Area was established in 2013 and was later incorporated into the Government’s strategy to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038. It has a relatively low but recently rising incidence of infected herds. This annual report describes the bovine tuberculosis (bTB) epidemic in Cheshire, one of five counties straddling the Edge and High Risk Area (HRA) between 2013 and 2017, and fully included in the Edge Area from 1st January, 2018. The Cheshire Edge Area in 2017 includes the northern three quarters of the county whilst the southern quarter comprises 62 parishes in the HRA.

b. Cattle industry. A predominantly dairy county but with some beef fattener and suckler herds of varying sizes, calf rearers, smallholders and pet cattle.

c. Level of bovine TB. The incidence of TB in the Cheshire Edge Area has increased from 10% in 2016 to 13% in 2017.

d. New breakdowns of bovine TB. The number of breakdowns in 2017 has increased by 36, from 116 in 2016 to 152 in 2017. This represents an increase of 31%.

e. Disclosing tests. Over 75% of new breakdowns in 2017 were detected at routine six monthly whole herd testing (WHT). There was no history of Officially Bovine Tuberculosis Free Status Withdrawn (OTFW) in the previous three years in 83% of herds with a TB incident disclosed during 2017. In addition, 61% of these breakdowns in previously unconfirmed herds were OTFW. These figures are of concern as they illustrate the level of confirmed TB in herds which have no recent history of previous confirmed infection. This suggests that the disease is continuing to spread within the cattle population.

f. Risk pathways for bovine TB infection. Wildlife (badgers) was considered to be the most likely source of infection in 77% of OTFW breakdowns occurring in 2017, while only 10% were concluded to be infected by purchased cattle.

g. Impact of bovine TB. There were 830 cattle removed as reactors to the tuberculin skin test. A further 764 cattle were removed after testing positive to the interferon gamma blood test.

h. Clusters: A number of clusters of TB infection have been identified in 2017, the most significant of these being in the parish of Mobberley which borders the Low Risk Area (LRA) to the north.

i. Cases in other species. There were two bacteriologically confirmed cases of *M. bovis* infection in non-bovine species, both in domestic pet cats from non-farming households.

j. Changes in the epidemic. Of all counties in the Edge Area, Cheshire continued to sustain the largest number of herd breakdowns and one of the highest herd incidences in 2017. There has been a 31% increase in the number of TB breakdowns in 2017 compared to 2016, with a more extensive geographical distribution of cases than previously.

k. Risks to the LRA and from the HRA. The risk to the LRA is considerable: TB is established in the north east corner of Cheshire and there is a corridor to the east of Manchester in the western Pennines where there is a significant cattle density and badger population providing a route for the disease to continue its northward spread. The risk from the HRA is relatively unchanged as TB appears to already be well established across a large part of Cheshire, but there is a cluster in the Wales Intermediate TB Area North near Wrexham which is being carefully monitored.

l. Forward look. Despite increased cattle controls, ongoing six-monthly surveillance for TB in cattle herds and good compliance from the farming community, TB continues to spread across the county. If the epidemic continues to progress on its current trajectory there is no prospect of achieving OTF status by 2025. Reducing the crude herd incidence to <2% by 2019 is unachievable.
2. **Introduction**

A key action in the implementation of the Government’s objective to achieve OTF status for England by 2038 was to recognise the different levels of TB in different parts of the country and vary the approach to control accordingly. To this end, three management regions or zones have been established. This report describes the epidemiology of bTB in the section of Cheshire which formed part of the Edge Area until the end of 2017 (see Appendix 1). This area has a relatively low but recently rising incidence of infected herds and control efforts are seeking to slow down and reverse geographic spread, and reduce the incidence rate, with the aim of obtaining OTF status for this area as soon as possible.

3. **Cattle industry in the Edge Area of Cheshire**

Cheshire is still predominantly a dairy county with 70% of herds in this classification (see Appendix 2). The county also has numerous beef enterprises – suckler herds, calf rearers and fattening units as well as some smallholders. Many dairy herds breed their own replacement cows, but some are partly or entirely “flying” herds, where replacement cows or heifers are purchased from other farms.

Although there are still many smaller traditional family farms in the county, there is a gradual trend for dairy herds to increase in size: there are 100 herds in Cheshire keeping more than 500 cattle and a large proportion of these are dairy units, some with over 1000 milking cows. There are a number of dairy farms which do not graze animals i.e. keep either their cows or their whole herd housed all year round. Cows on these farms may be “zero grazed” for some of the year, where fresh grass is cut daily and fed to the cattle indoors, or they may be fed a grass silage based diet all year round. Breakdowns have been seen on a number of farms which have adopted this management strategy. At the other end of the spectrum there are also many herds on the “New Zealand” style grazing system keeping cattle outdoors for as much of the year as possible, using small paddocks to keep grazing tight, and maximise yields from the grassland.

These very large herds present their own challenges to TB management as they generally operate over multiple premises which may not be covered by a single County Parish Holding (CPH) number. There are also still many smaller and medium sized dairy farms following a more traditional management system utilising pasture grazing in the summer and feeding conserved forage in winter. Each of the system types differ in their risk factors for TB infection with the more intensive units vulnerable to contamination of stored feedstuffs by wildlife and the increased potential for horizontal spread of cattle infection in housed animals in close proximity. The grazing herds are more likely to encounter infection from pasture contamination. As shown in Figure 1, there are 572 herds of 50 cattle or fewer: these represent hobby farmers as well as small scale beef or calf rearing units and pedigree herds.
Figure 1: Proportion and number of holdings according to herd size in the Cheshire Edge Area in 2017
(n= 1418, data in Appendix 2)

There is now only one livestock market operational in Cheshire, located at Beeston Castle Auction near Tarporley. The number of weekly market days at this site has increased to four following the closure of the market site at Chelford and the amalgamation of the two businesses. Cattle of all types (including those from TB restricted holdings) are sold. Many farmers in Cheshire also use markets in neighbouring HRA counties including Market Drayton and Shrewsbury (Shropshire), and Leek (Staffordshire). Leek in particular tends to sell cattle from a very high risk part of the country and is a popular source of purchased dairy cattle, which has potential implications for spreading TB further into the Edge Area via cattle movements. Although all cattle from the HRA are required to be pre-movement tested (PRMT) before sale, the test cannot possibly detect all infected animals, allowing some to be moved with the risk of spreading infection into their new herd.

There were 20 Approved Finishing Units (AFUs), five Pre-movement Testing Exempt Finishing Units (EFUs) and 17 TB Isolation Units (TBIUs) active in the Cheshire Edge Area in 2017. The AFUs and TBIUs are all non-grazing units and should present little risk of spread of infection as long as the biosecurity conditions are adhered to by the operators. AFUs and TBIUs provide an essential outlet for bTB infected herds subject to cattle movement restrictions. The sale of cattle to these units enables the restricted farm to avoid overstocking and its associated welfare issues when cattle cannot be sold on the open market.

There are no areas of common grazing for cattle in Cheshire.

Overview of the TB epidemic in the Edge Area of Cheshire

a. History of TB in the Edge Area of Cheshire

As shown in Figure 2, prior to 2009 the number of TB cases in Cheshire was low. Between 2009 and 2010 there was an almost two fold increase in the number of breakdowns in Cheshire and this appeared to stabilise until 2012 to 2014 when there was a large increase of almost 60% during this period. Prior to 2013, routine TB surveillance testing in many of the Cheshire parishes was carried out at two, three or...
four year intervals. In January 2013, the Edge Area was established and annual whole herd testing commenced for all cattle herds which resulted in an overall increase in TB testing with some exemptions.

There has been a 31% increase in the number of TB breakdowns in 2017 compared to 2016, from 116 to 152 breakdowns, despite there being an overall decrease in the number of cattle herds in the county (47 fewer herds than in 2016). This is a disappointing development from the plateau of 2015/6 – the previous increase from 2013 to 2014 could be accounted for by the initiation of the Edge Area strategy and increased testing frequency disclosing more cases, but there is no such explanation for the recent significant increase.

The current evidence points strongly towards infection ‘creep’ within the large badger population in Cheshire, as evidenced by the comparative maps in Figure 11 showing spread of new breakdowns in a northern and easterly direction from 2016. This spread cannot be explained by cattle movements and additionally only seven breakdowns were conclusively linked to bought-in infection, with a further three highly likely to have been due to bought-in infection. A further 19 breakdowns were possibly caused by movement of cattle with undetected infection but infection via wildlife contact was an equally likely possibility.

![Figure 2: Annual number of new TB breakdowns in the Cheshire Edge Area, 2006-2017](image)

The pattern of seasonality of new breakdowns has continued to diminish with the continuation of six monthly herd testing in the Cheshire Edge (Figure 3). There is still a slight seasonal effect with fewer breakdowns disclosed in May, June, August and December but the remainder of the year is fairly consistent. This is probably partly explained by farmers preferring to complete their herd tests before Spring turnout if their testing window permits this. There is also a natural break in TB testing due to the Bank Holidays over the Christmas and New Year period which may account for the dip in detection in December. The greatest number of breakdowns occur in October and November which, as in previous years, suggests detection of infection acquired during the grazing period.
b. Geographical distribution of bovine TB cases (new and ongoing) in the Edge Area of Cheshire

The map in Figure 4 shows that the greatest concentration of breakdowns is in the south and east, as in previous recent years. However, for 2017 it is immediately noticeable that there are more breakdowns further to the north and west of the county than previously in 2016. In the south Cheshire Edge Area there are a number of very large dairy farms, created when farms have taken on the land of other previous standalone cattle holdings. As shown by comparing the cattle holding density map with the inset animal density map in Figure 4, there are fewer registered cattle holdings in this area but the population of cattle is dense, with a single holding possibly accommodating more than 1000 animals and total herd sizes sometimes exceeding 3000 head of cattle.
Figure 4: Geographical distribution of all new TB breakdowns (OTFS and OTFW) in 2017 and any pre-2017 OTFW TB breakdowns still ongoing at the end of the report period overlaid on a cattle holding density map, with a cattle density map for the area inset (NB only breakdowns which occurred within the Edge Area outlined in red shown)
The following maps in Figure 5, derived from APHA’s Spatially Interactive Disease Atlas (SPIDA), illustrate the stark deterioration of the TB epidemic in Cheshire in the last eight years:

![Figure 5: Distribution and density of TB breakdowns in 2009 and 2017](image)

The number of cases has increased dramatically over this period from 39 cases in 2009 (some of which are in the area later classed as HRA) to 152 in 2017 which is almost quadruple the number of cases.

There have been a number of cluster breakdowns in Cheshire in 2017. One, in Mobberley, is of particular concern due to its bordering the LRA in the north of the county and is discussed in detail in Section 6.

Other clusters have been noted at Wincle in eastern Cheshire, where there are three immediate neighbouring cattle herds which have all had breakdowns in 2017 (two of which were OTFW). In the neighbouring parish of Bosley, there have been four breakdowns. There have also been breakdowns in the other adjacent parishes of Sutton and Wildboarclough. This cluster has possibly been ongoing since 2016, when an explosive breakdown was disclosed in a heifer rearer herd in Wildboarclough which had sourced calves from three farms in the Wincle area, two of which have since had breakdowns. An epidemiological link through cattle movements was never proven. All *M. bovis* isolates from this cluster are genotype 25:a. There is significant badger activity in the area as well as wild deer: a wildlife source of infection is considered most likely. Farmers have reported that installation of deer fencing in Macclesfield Forest has increased the density of the wild deer population using the farmland but no data is available to report whether there is TB infection in this deer population.

Another cluster at Ridley, in the centre of the county, saw TB infection disclosed in five farms in a small area in the space of a few months in the latter part of 2017, with all isolates of *M. bovis* being genotype 25:a. A dairy herd had been moved into this area from Staffordshire (HRA) in 2015, where the herd had had a history of repeated OTFW breakdowns with genotype 25:a. Reactors were disclosed at the first new herd check test (CT NH1) in September 2016. The second short interval test (SIT) disclosed 36 reactors. However, it is unlikely that this introduced herd is responsible for the cluster, as there had already been TB breakdowns in the area before, and it is a very short timescale for a newly introduced herd to have infected the wildlife and for the wildlife to have disseminated the infection to other herds locally within the space of 18 months.

Another area of interest is Minshull Vernon, north of Nantwich, where there have been three breakdowns with genotype 17:a in close proximity.

Genotype 25:a remains the predominant type of *M. bovis* implicated in Cheshire breakdowns. As shown in Figure 6, the defined homerange of this genotype has retracted somewhat between 2015 and 2017. This has not been reflected in a decrease in the number of breakdowns attributed to this type. Three-quarters of breakdowns in 2017 with an available genotype (n=91) in 2017 were 25:a. In addition, breakdowns with genotype 25:a are being identified progressively further west, well outside the calculated homerange.
It is of concern that an area of the LRA in South Manchester is considered to be within the homerange of 25:a, as shown in Figure 6. Although this is a partially urban area with a lower cattle density than Cheshire, it is the urban fringe with cattle resident in this area. This represents a risk of TB incursion into the LRA.

Figure 6: Maps illustrating the apparent retraction in homerange for genotype 25:a between 2015 and 2017

Genotype 17:a is a less common genotype in Cheshire, accounting for 19% of cases with an available genotype. As shown in Figure 7, there is an apparent contraction of the homerange, but again this is inconsistent with the findings on the ground: twenty-one parishes had at least one breakdown attributed to genotype 17:a in 2017, compared with nine parishes in 2015.

Figure 7: Maps illustrating the apparent retraction in homerange for genotype 17:a between 2015 and 2017

This apparent contraction in the homeranges can probably be explained by the definition of a homerange: a 5km square is considered as part of the homerange if there have been three separate breakdowns of that genotype, on at least two holdings, within a five year window. This may therefore be influenced by fluctuations in the incidence of TB in an area depending when breakdowns are disclosed relative to the defined calculation period.
Other genotypes have been identified sporadically including 25:l (which is considered to be a local mutation of 25:a), 17:c and 9:c. The infection pathways have not been conclusively linked to bought-in cattle in any of these breakdowns.

Of the 100 OTFW incidents in the Cheshire Edge in 2017, 77 were attributed to wildlife infection, 10 to purchased animals introducing disease and 13 were undetermined. This bolsters concerns highlighted in previous years that TB is becoming endemic in the badger population in the county.

Genotyping has become of somewhat limited value in helping to determine the source of infection in this county. In many cases genotypes 17:a and 25:a are both known to infect the badger population in Cheshire but also many source farms of purchased cattle are within the homerange of one or both of these genotypes.

There have been two confirmed cases of M. bovis infection in domestic pet cats in 2017, with a third suspect cat later confirmed as M. microti. These are described in more detail in Section 5 below.

The endemicity map for England in Figure 8 below illustrates that the TB ‘disease front’ is well established and has reached approximately halfway across the county. It has reached the border with the LRA in Greater Manchester.

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**Figure 8:** TB ‘disease front’ as generated by the APHA algorithm showing the density of TB test reactor cattle and slaughterhouse cases in 2017
As shown in Figure 9, the number of Officially Tuberculosis Free Status Suspended (OTFS) cases has climbed steadily from 2015 to 2017. The number of OTFW cases decreased slightly from 73 cases in 2015 to 67 in 2016, but then increased significantly to 100 cases in 2017.

Figure 9: Number of suspected (OTFS) and confirmed (OTFW) cases of TB in the Cheshire Edge, 2015 – 2017

4. Descriptive epidemiology of bovine TB in in the Edge Area of Cheshire

a. Level of bovine TB

The incidence of TB in the Cheshire Edge in 2017 was 13.6%, an increase from 10% in 2016. In 2017, although beef herds represent only 24% of the cattle population in Cheshire, they accounted for almost 34% of the breakdowns, as shown in Figure 10.

Figure 10: Percentage of breakdowns by breed purpose in the Cheshire Edge
As seen in previous years the greatest density of breakdowns occurs in the south and east of the county. However when comparing the 2016 and 2017 maps at Figure 11, it is immediately apparent that there have been more cases to the north and west of Cheshire in 2017 than in previous years as well as the overall density of breakdowns being greater. This suggests that infection is slowly creeping into this previously less affected part of the county.

![Figure 11: Distribution of new breakdowns in the Cheshire Edge in 2016 and 2017](image)

The mean number of months spent under restrictions (for breakdowns which had concluded by the end of the reporting period) was nine. There were 21 breakdowns still open at the end of the reporting period (31st December, 2017). At the beginning of the report period there were 23 breakdowns still open from 2016.

Herd type does not appear to have an influence on the length of time spent under restrictions (TB2): mean TB2 length was 6.72 months for dairy herds and 6.36 months for beef herds.

OTFW herds generally spend longer under restrictions than those which are OTFS. For OTFS breakdowns the mean length of time spent under restrictions was slightly shorter at 5.23 months whereas for OTFW herds it was an average of 7.47 months. For OTFS beef and dairy herds the mean breakdown lengths were 5.27 and 5.13 months respectively. For OTFW beef herds the mean time under restrictions was 7.45 months and for OTFW dairy herds it was 7.5 months, again showing that herd type does not seem to have much influence on breakdown duration. Breakdown duration can also be artificially lengthened by factors such as delays in reactor removal, farmer non-compliance, or administrative errors resulting in delayed testing or lifting of restrictions.
Figure 12: Breakdown duration by herd type (concluded breakdowns in 2017)

There were five persistently infected herds (i.e. those with TB breakdowns lasting more than 18 months) in Cheshire during 2017. Many of these breakdowns are difficult to manage as there is suspected constant reinfection from the local wildlife. One persistent case is an extremely longstanding breakdown which has been ongoing since 2002. This breakdown is subject to a number of enhanced management protocols including in-house skin testing by APHA.
b. Risk pathways for TB infection

The infection source of the majority (n=77) of OTFW breakdowns in Cheshire in 2017 was strongly attributed to direct or indirect contact with local wildlife. A further thirteen cases had an undetermined infection source, but for most of these contact with wildlife was cited as a possible source. However there were other factors such as purchased cattle or residual infection which could also have been the source, but with insufficient evidence available to draw a firm conclusion to the definitive cause. Only ten breakdowns could be clearly linked to the purchase of animals with undisclosed infection. It was also considered that the source for a number of breakdowns could have been residual infection in the herd following a previous breakdown. However, once TB becomes established in the local wildlife it becomes very difficult to determine whether a herd is re-infected by contact with local wildlife or whether it is recrudescence from undetected infection from a previous breakdown.

![Risk pathways for OTFW breakdowns in Cheshire Edge in 2017 (n=100)](image)

Figure 13: Risk pathways for OTFW breakdowns in the Cheshire Edge in 2017 (n=100)

There is much anecdotal evidence to suggest that TB is well established in the badger population in Cheshire. This should be confirmed by the Defra-funded badger survey conducted by the University of Nottingham in 2016-2017, the results of which are awaited. There have been a number of breakdowns in longstanding closed herds with very little potential for contact with neighbouring cattle. One OTFS herd has been closed for female replacements for 34 years and only buys the occasional bull every 5-7 years, and has no close neighbouring cattle. Infection from a cattle source is considered highly unlikely in this instance.

c. Role of other species

a. Badgers and other wildlife

Cheshire has a high density badger population evidenced by the number of carcases visible at the roadsides and also from talking to farmers on Disease Report Form (DRF) visits: the vast majority of farmers report high levels of badger activity on and around their farmland and many report having seen badgers around their farm buildings and are aware of multiple setts on or near their land. Of the 100 OTFW breakdowns in 2017, the infection source of 77% were strongly attributed to wildlife contact.

Some areas have carried out BCG vaccination of badgers privately in the past, but this has ceased in recent years due to unavailability of vaccine.
b. Other domestic species:

There were two cases of confirmed *M. bovis* infection in domestic pet cats in the Cheshire Edge in 2017. Both were genotype 25:a. A third feline suspect case was confirmed as *M. microti*, a species of TB associated with small mammals such as mice and voles.

Case one was on the rural borders of the town of Macclesfield and was diagnosed in March 2017 in a pet cat from a non-farming household. The nearest cattle breakdown in 2017 was around 3.5km away, but there had been two breakdowns around 1km away during 2016.

Case two was in another domestic pet cat living on a rural non-farming property south of Congleton. The neighbouring farm had a TB breakdown in late 2016 and there were also two other breakdowns within 2km.

Epidemiological investigations into these cases are ongoing.

d. Detection of cases

Routine surveillance testing comprises six monthly whole herd testing (WHT) for all farms in the Cheshire Edge Area. Routine six monthly testing of all cattle herds (except TB units) has replaced contiguous testing in the county. Radial testing is not carried out except where breakdown farms are close to the LRA. Non-routine testing includes test types such as post-breakdown testing (6M) tests, tracing tests (TR), pre-movement tests (PRMT) and check tests (CT). Passive surveillance at abattoirs is carried out by the Food Standards Agency (FSA) by *post mortem* examination of all cattle slaughtered for human consumption. Slaughterhouse cases (SLH) are animals in which lesions suspicious of TB have been disclosed at the abattoir.

The majority of new breakdowns in 2017 (almost 76%) were identified at the routine WHT, as shown in Figure 14. As the Cheshire Edge is subject to six monthly herd surveillance testing with generally good compliance from farmers (there are few longstanding overdue tests), detection of new infection is rapid.

![Figure 14: Breakdowns by disclosing test type (n=152)](image)

A further 10% of breakdowns were disclosed at the 6M test following resolution of a breakdown and can probably be considered to be residual infection from the previous incident. Only 2.6% of breakdowns were
detected by PRMT. However, due to frequent routine testing many cattle in Cheshire will be moved or sold using a clear statutory herd surveillance test as their PRMT. Therefore this will not be recorded as a standalone PRMT.

Ten breakdowns (two OTFW) were detected by re-testing of inconclusive reactors, eight of which originated from routine herd tests, one from a PRMT and one from a 6M post-breakdown test.

Passive surveillance in the slaughterhouse detected 6.5% of breakdowns. Of these, 50% had further reactors identified at subsequent skin testing which proves the value of passive surveillance: these additional infected cattle would otherwise have remained on farm for a number of months until the next scheduled skin test. Passive surveillance is also a useful tool for detecting anergic animals – a number of slaughterhouse cases were detected in animals that had a previous history of being an inconclusive reactor or came from herds that had recently concluded a breakdown.

The graph at Figure 15 illustrates that the majority of breakdowns had no history of OTFW in the last three years, and can therefore be considered to be truly new cases rather than a recurrence of previous infection. A total of 116 breakdowns (76%) had no history of OTFW in the last three years and of these 63% were OTFW in 2017.

![Figure 15: Number of breakdowns in 2017 which had an OTFW breakdown in the previous three years](image)

e. Burden of bovine TB

TB infection in cattle represents a considerable and increasing burden in Cheshire, both to the farmer and to the taxpayer. The burden to the farming community is not solely a financial one as TB breakdowns can cause a great deal of emotional stress, for example due to the loss of outwardly healthy livestock, pedigree animals and cows which are heavily in-calf.

Many of the larger dairy farms in the county encompass several geographically discrete sites within the enterprise, and TB breakdowns can make management of their cattle herd very complex. Many dairy farms send their heifer calves for rearing away from the main site. This second holding is not necessarily covered by the parent CPH, a temporary CPH (tCPH) or a Temporary Land Association (TLA) link. Further complications can occur when the heifer rearing premises is not equipped to deal with calving and milking cows. This situation can be very difficult to deal with when a TB breakdown arises on one or more of the associated premises. The inability to move stock off a farm for a period of time can have a significant impact on welfare through overstocking, especially as there is no income from the stock which cannot be sold. Dairy farms in particular also suffer when they have large numbers of reactors, as the loss of milk yield is instant and cannot be planned for: most dairy contracts will have a penalty clause for not meeting forecasted milk yields and this can be particularly punitive for those who have large numbers of reactors at
their disclosing test and cannot replace the cows for at least two months i.e. until the first short interval test has been completed. Infection with TB also can have an overall negative impact on the welfare of cattle: when farms have reduced cow numbers due to removal of TB reactors it means that there can be a tendency to retain animals which should have been removed as cull cows. This can result in increased problems such as lameness.

For beef herds which rely on selling animals as stores rather than straight to slaughter, a TB breakdown can result in considerable cash flow problems as well as resulting in overstocking as animals intended for sale need to be retained until restrictions are lifted. The AFUs and TBIUs go some way to relieving this pressure but there is insufficient capacity to cope with the numbers of TB restricted cattle. Additionally, in many cases, farmers are reluctant to sell their cattle to AFUs either privately or via a Dedicated Sale for TB Restricted Cattle ('orange market') due to the depression in their value.

TB is most certainly not a disease restricted to large commercial cattle herds and there have been numerous breakdowns in small pedigree herds, smallholders and even in cattle kept as pets.

f. Key drivers of the bovine TB epidemic

The current key driver of the bovine TB epidemic in the Cheshire Edge is considered to be contact with infected wildlife. A wildlife infection source was attributed to 77 of the 100 OTFW cases disclosed in 2017, and only ten cases were considered to have been caused by the purchase of infected stock. A further 13 cases were undetermined: these are generally herds which have evidence of both potential bought in infection and strong suspicion of wildlife involvement; often there is not enough information available to draw a firm conclusion either way.

The Cheshire situation is complicated by there being large numbers of multi-premises dairy herds: this has been brought about by economic pressures in the industry driving increasing herd size. These multi-site herds are likely to become bigger and more numerous in the future and rely on cattle movements between their premises in order to be able to function.

g. County description

The Cheshire Edge Area is extremely unlikely to achieve OTF status by 2025, despite the extra cattle controls, given its increasing incidence of disease largely driven by wildlife infection. Licensed badger culling only began in one area of Cheshire in 2017 and its expected beneficial effect on TB incidence in cattle will take years to materialise. The key challenge is reducing indirect contact between cattle and badger excreta: whilst farms can often make changes to significantly reduce badger access to stored feed and cattle housing it is difficult to restrict badger access to pasture land.
5. Summary of risks to the Low Risk Area (LRA) and any mitigating factors

There is a high risk of TB making incursions into the LRA, particularly from the northeastern part of Cheshire. Although the cattle density in the LRA of South Lancashire and Greater Manchester is lower than in Cheshire because of the urban areas of Liverpool and Manchester, there is still a cattle population here which could become infected, and a number of wildlife corridors (such as the land either side of the M6 motorway) which could provide a route for TB to spread north. The map in Figure 16 illustrates cattle density overlaid with the TB risk areas and breakdowns in 2017. It illustrates the potential corridor to the east of Greater Manchester where TB could potentially spread northwards. The green circle highlights the area of greatest concern, and the 2016 privately-funded Stockport badger survey identified genotype 25:a positive badgers within this highlighted area.

![Map](image)

Figure 16: Map illustrating cattle density and 2017 breakdowns in the Edge and LRA showing the area of greatest risk of infection incursion into the LRA
The Cheshire Edge has 22 parishes which have a direct border with the LRA. It is notable that a number of cattle holdings in these border parishes have experienced a TB breakdown in 2017. There have been 15 breakdowns across eight of these border parishes, seven of which are in the South Manchester area as shown in Figure 17. Six of these seven parishes have had OTFW breakdowns in 2017.

![Figure 17: Map showing breakdowns in Cheshire parishes bordering the LRA in 2017](image)

Of greatest concern to the LRA is a cluster of breakdowns in Mobberley, a parish with a direct border to the LRA. In 2017 there were six breakdowns in this parish, five of which were OTFW. Three of the breakdown farms share a boundary with Manchester Airport land, which is said to have a large population of badgers. The breakdowns are in a variety of herds: dairy, beef, flying, closed, and heifer rearer. One breakdown farm is a truly closed herd which has not moved any animals on for 24 years. Two genotypes have been identified: 17:a and 25:a. The 17:a breakdown can be attributed to cattle movements but the 25:a breakdowns are more likely to have a wildlife source. One case was an explosive breakdown in a housed herd that used zero grazing. There were also breakdowns on six farms in the parish in 2016, one of which also had a repeat breakdown in 2017. A TB positive badger was found in the area in the 2014 survey and positive badgers have also been identified in the 2015/16 Stockport survey in the Low Risk Area (see the red circled area in Figure 18 below). Badgers from the Mobberley area have been sent for testing on the most recent survey but the results are not yet available.

The map in Figure 18 displays the location of TB positive badgers found within the LRA in 2014-16. This corresponds exactly with the high risk corridor illustrated in Figure 16.
There is also a risk to the LRA through movement of cattle from farms in the Edge. Many animals sold through Beeston market are bought by farmers in the South Lancashire area partly due to a lack of livestock markets more locally. Although animals being brought into the LRA from Cheshire must be post-movement tested 60-120 days after movement, most will be moving on to farms with grazing. This represents a risk of TB spreading into the local wildlife if any infected animals have been moved which pass both the pre and post movement tests. The following map at Figure 19 illustrates the location of livestock markets in north west England and demonstrates how many farmers in the LRA may be much closer to Beeston than markets further north and for that reason may prefer to source cattle from areas of higher TB risk further south.

Figure 18: Map illustrating locations of TB positive badgers close to and in the LRA 2014-16

Figure 19: Distribution of livestock markets in north west England
6. Summary of the risk to the Edge Area from the HRA

The border with the HRA of Staffordshire remains an ongoing risk of further infection spreading in to the Edge Area, although most border parishes and further into Cheshire have already had considerable problems with TB breakdowns for the past few years (see comparative map in Figure 5). The HRA portion of Cheshire also presents a similar situation at its border with the Edge Area.

Also important to consider is the border with the south east portion of Clwyd (Wrexham) which has seen a high number of breakdowns in 2017 as illustrated in the map at Figure 20 below. The green ring indicates the area of concern. This area has been classified as the Intermediate TB Risk Area of Wales, but there has been an increase in incidence in the Wrexham area recently, which is being closely monitored.

![Figure 20: Distribution of TB breakdowns in Clwyd](image)

7. Assessment of effectiveness of controls and forward look

If the course of the epidemic between 2016-17 continues it is likely that the situation will deteriorate further over the next two years. It is anticipated that TB will continue to spread north and westwards towards the Chester area, a part of the county that has previously been free from large numbers of breakdowns. TB will continue to be an increasing threat to the LRA particularly in the north-eastern corner of the county.

The six-monthly WHT regime and compulsory interferon-gamma testing of OTFW herds appears to be effective at identifying disease earlier in herds. However the enhanced cattle control measures in the Cheshire Edge Area do not seem to be preventing the northwards ‘creep’ of TB. This is evidenced by the fact that 76% of breakdowns in 2017 were in herds with no history of confirmed TB infection in the previous three years, and the fact that we are seeing more cases in areas of the county which have previously had a low incidence.

Anecdotally, awareness of cattle controls among farmers is improving: they are increasingly considering the risks of TB when purchasing cattle. Many of those seeking large numbers of replacement dairy cattle are choosing imported cattle from other European countries rather than British cattle, as it is difficult (through lack of availability) to source dairy cattle from the LRA. This brings its own challenges with the risk of introducing exotic diseases such as Bluetongue virus. The industry is also becoming more aware of making cattle feed stores less attractive or accessible to badgers but this still does not address the risk of badger contamination of the pasture environment.

From 1\(^{st}\) January 2018 the 62 parishes of the former Cheshire HRA-have been incorporated into the Edge Area, making Cheshire a fully Edge Area county.

If the epidemic continues to progress on its current trajectory there is no prospect of achieving OTF status by 2025. Reducing the crude herd incidence to <2% by 2019 is unachievable.
APPENDICES

Appendix 1: Overview of risk and surveillance areas of England and Edge Area objectives and controls

Figure A1: Bovine TB risk and surveillance areas of England effective since January 2013, as set out in the Government’s Strategy for Achieving Officially Tuberculosis-Free Status for England.

1.1 Policy objectives for the Edge Area:
Short to medium term:
   a. slow down geographic spread
   b. maintain crude herd incidence of OTFW breakdowns <2% overall by 2019
   c. begin to reduce the incidence rate

Longer term:
   d. reduce geographic spread of bTB and push the Edge Area boundaries westward
   e. reduce OTFW herd incidence to <1% by 2025
   f. attain OTF status (incidence of indigenous OTFW herd breakdowns <0.1) for the lowest incidence counties in the Edge Area.

1.2 Key Control Measures
Surveillance
   a. enhanced herd test coverage (annual)
   b. extend targeted surveillance to 3km around new OTFW breakdowns in Cheshire and Derbyshire (radial testing), with six month follow-up
   c. possible RTA badger survey
Management of cases (‘breakdowns’)

a. increased sensitivity of breakdown herd testing:
   - OTFS breakdowns to pass two short interval tests at severe interpretation to regain OTF status
   - mandatory IFN-g parallel testing in OTFW

b. enhanced epidem. investigation and data analysis

c. information sharing - location of breakdown herds

Appendix 2: Cattle industry in the Edge Area of the region

Number of cattle premises by size band in the Edge Area of Cheshire in 2017

<table>
<thead>
<tr>
<th>Cattle per premises</th>
<th>1-50</th>
<th>51-100</th>
<th>101-200</th>
<th>201-350</th>
<th>351-500</th>
<th>501+</th>
<th>All</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of premises</td>
<td>572</td>
<td>205</td>
<td>223</td>
<td>208</td>
<td>103</td>
<td>100</td>
<td>1418</td>
<td>168</td>
<td>79</td>
</tr>
</tbody>
</table>

Cattle/herd purpose:

<table>
<thead>
<tr>
<th></th>
<th>Beef</th>
<th>Dairy</th>
<th>Dual purpose</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Cattle</td>
<td>59611</td>
<td>24.9</td>
<td>166719</td>
<td>69.8</td>
<td>12315</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>0.0</td>
<td></td>
<td></td>
<td>238677</td>
</tr>
</tbody>
</table>

Number of Approved Finishing Units (AFUs) registered in the region’s Edge Area = 20

Common land: no common land in Cheshire
## Appendix 3: Summary of the Edge Area regional headline cattle TB statistics

### Herd-level statistics

<table>
<thead>
<tr>
<th>Description</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Total number of cattle herds live on Sam at the end of the reporting period</td>
<td>1371</td>
<td>1303</td>
</tr>
<tr>
<td>b. Total number of herd tests carried out in the period</td>
<td>2669</td>
<td>2723</td>
</tr>
<tr>
<td>c. Total number of OTF cattle herds TB tested during the period for any reason</td>
<td>1155</td>
<td>1115</td>
</tr>
<tr>
<td>d. Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of TB02 restrictions)</td>
<td>1230</td>
<td>1150</td>
</tr>
<tr>
<td>e. Total number of cattle herds that were not under restrictions due to an ongoing TB breakdown at the end of the report period.</td>
<td>1297</td>
<td>1196</td>
</tr>
<tr>
<td>f. Total number of new TB breakdowns detected in cattle herds during the report period(^1)</td>
<td>116</td>
<td>152</td>
</tr>
<tr>
<td>- OTF status suspended (OTF-S)</td>
<td>49</td>
<td>52</td>
</tr>
<tr>
<td>- OTF status withdrawn (OTF-W)</td>
<td>67</td>
<td>100</td>
</tr>
<tr>
<td>g. Of the OTF-W herd breakdowns:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- How many can be considered the result of movement, purchase or contact from/with an existing breakdown based on current evidence?</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>- New OTF-W breakdowns triggered by skin test reactors or 2xIRs at routine herd tests</td>
<td>39</td>
<td>72</td>
</tr>
<tr>
<td>- New OTF-W breakdowns triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, etc.)</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>- New OTF-W breakdowns first detected through routine slaughterhouse TB surveillance</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>h. Number of new breakdowns revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds (may not be applicable to every county in the Edge Area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- OTF-S</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>- OTF-W</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>i. Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W breakdowns that began in a previous quarter)</td>
<td>74</td>
<td>18</td>
</tr>
<tr>
<td>j. New confirmed (positive <em>M. bovis</em> culture) incidents in non-bovine species detected during the report period (indicate host species involved)</td>
<td>2 cats</td>
<td>2 cats</td>
</tr>
</tbody>
</table>

### Animal-level statistics (cattle)

<table>
<thead>
<tr>
<th>Description</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Total number of cattle tested in the period (animal tests)</td>
<td>392802</td>
<td>403308</td>
</tr>
<tr>
<td>b. Reactors detected:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- tuberculin skin test</td>
<td>714</td>
<td>830</td>
</tr>
</tbody>
</table>

\(^1\) In some cases there is minor variation (under 4) between the total number of breakdowns reported in the Year End Descriptive Epidemiology Reports for individual counties and the report on Bovine tuberculosis in England in 2017. These are due to differences in the breakdown case definition, where incidents first detected in late 2016 are included as 2017 breakdowns in the individual county reports; and where incidents occur in epidemiologically linked premises.
- additional IFN-gamma blood test reactors (skin-test negative or IR animals) | 386 | 764

c. Reactors per breakdown | 9 | 10

d. Reactors per 1000 animal tests | 2.80 | 3.95

e. Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs) | 18 | N/K

f. SLH cases (tuberculous carcases) reported by FSA | 20 | 19

g. SLH cases confirmed by culture of *M. bovis* | 9 | 10 (1 in an AFU)

### Appendix 4: Suspected sources of *M. bovis* infection for all the new OTF-W breakdowns identified in the report period

The data for the distinction between provisional and final risk pathways was not available.

The undetermined/obscure category includes all cases where there were multiple risk pathways cited with no weighting as to which was the most likely. Almost all of these cited wildlife as a possible source.

<table>
<thead>
<tr>
<th>Most likely origin</th>
<th>Cheshire Edge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prov.</td>
</tr>
<tr>
<td>Introduction (e.g. purchase) of infected animal(s)</td>
<td>8</td>
</tr>
<tr>
<td>Local - lateral spread from neighbouring holdings</td>
<td>0</td>
</tr>
<tr>
<td>exposure to infected wildlife</td>
<td>53</td>
</tr>
<tr>
<td>other farmed species</td>
<td>0</td>
</tr>
<tr>
<td>recrudescence of residual infection from a previous TB breakdown</td>
<td>0</td>
</tr>
<tr>
<td>infected human source</td>
<td>0</td>
</tr>
<tr>
<td>Undetermined/obscure</td>
<td>39</td>
</tr>
<tr>
<td>Other (explain)</td>
<td>0</td>
</tr>
</tbody>
</table>

All new OTFW TB breakdowns identified in your region were categorised using the following risk matrix, according to (a) the probability of them being the result of introduced infection (inward cattle movements) and (b) the strength of evidence that we are dealing with an isolated incident without further propagation from the index farm to neighbouring herds (or vice versa). The corresponding numbers of breakdowns were entered in the relevant boxes.

<table>
<thead>
<tr>
<th>Probability of isolated, sporadic ('one-off') breakdown, without secondary cattle to cattle spread</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Likely</strong> (no secondary breakdowns detected)</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td><strong>Definite</strong></td>
</tr>
<tr>
<td><strong>Likely</strong></td>
</tr>
<tr>
<td><strong>Possible</strong></td>
</tr>
<tr>
<td><strong>Not likely</strong> (indigenous infection in the locality)</td>
</tr>
</tbody>
</table>
Appendix 5: Overview of the TB Control Programme in the Cheshire Edge Area

5.1 Edge Testing Policy
- All breakdowns in Cheshire require two short interval tests with negative results before OTF status is restored
- Mandatory interferon-gamma testing appears to be effective at decreasing the duration of breakdowns on individual farms but appears to be having little impact on the spread of disease across the county.
- Slaughter of IRs disclosed within breakdowns is encouraged along with removal of direct contacts (DCs) where appropriate.
- Exemptions to the interferon-gamma test are occasionally applied where there is clear epidemiological separation of certain groups within the herd e.g. heifers reared on a separate premises and reactors only found in adult milking cows.
- Radial testing was abolished in Cheshire in 2015 in favour of all herds undergoing six-monthly surveillance testing so that only herds bordering the LRA trigger radial testing.
- One herd is subject to enhanced management for a very long standing persistent breakdown including skin testing being done in-house by APHA.

5.2 Unusual TB breakdowns
- There were five breakdowns with large numbers of reactors. One was at a 6M post-breakdown test and another was linked to cattle bought in from Gloucestershire.
- No known cases of human zoonotic infection.
- One case where suspected manufacture of skin test reactors was investigated but not conclusively proven.
- One breakdown involving a producer-retailer but all milk sold is pasteurised.

5.3 Other Testing Measures
- Any fattening herds exempted from routine surveillance testing must meet a strict set of criteria:
  - All animals sold direct to slaughter or via a slaughter gathering.
  - No animals to be resident on the holding for more than 12 months.
  - No births in the unit.
  - No breeding activity in the unit.
  - All cattle must be permanently housed.
- No designated 'hotspots' in Cheshire.
- No contiguous testing in Cheshire as all farms are on routine six monthly tests.
- Compliance with TB testing in Cheshire is generally very good and there are few truly persistently overdue tests.

5.4 Other Control Measures
- Farmers have been encouraged to take advantage of the free TB Advisory Service visits.
- Auditing of Official Veterinarian (OV) delivery of skin testing has been active with corrective actions being taken as necessary. Cheshire OVs are fully on board with the seriousness of the situation.
- The Cheshire TB Eradication Group (TBEG) is active with input from farmers, the NFU, APHA and local OVs as well as wildlife groups. Anecdotally, farmers are increasingly choosing to source replacement dairy cattle from continental Europe rather than from within the UK in order to avoid the risk of bringing in TB infection.
- There is a close relationship with local Trading Standards officers regarding any compliance and cattle identity issues.
- Licensed badger culling commenced in the east of the county in Autumn 2017.

APHA is an Executive Agency of the Department for Environment, Food and Rural Affairs and also works on behalf of the Scottish Government, Welsh Government and Food Standards Agency to safeguard animal and plant health for the benefit of people, the environment and the economy.