

QUEEN'S DRIVE, EXMOUTH, DEVON

Badger Bait Marking Study

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for

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1.0 INTRODUCTION

1.1 Commissioning Brief

Julian Brown Consultancy Ltd (a specialist badger consultancy) have been contracted by East Devon District Council to carry out a badger *Meles meles* bait marking study to establish the status of a badger sett (Sett A on Figure 1) that would be impacted by a proposed mixed-use development (predominantly providing leisure and recreational facilities) on land at Queen's Drive, Exmouth, Devon (hereafter referred to as the 'site'). The centre of the site is located at OS grid reference SY004802.

1.2 Site Location and Description

The site (outlined in red on Figure 1) is located at the southern edge of Exmouth, on the edge of the Exe Estuary. The majority of the site comprises amenity grassland with scattered trees and hedgerows, along with a significant area of hardstanding. The area is currently used as a tourist attraction and has a Pitch and Putt course, boating lake, miniature railway, adventure playground and trampolines. Buildings scattered throughout the site consist of kiosks, an amusement arcade, a soft play area for children ('Jungle Fun') and sheds. The site covers an area of approximately 3.6ha.

The habitats surrounding the site are semi-urban. A sports pitch and residential area abut the northern site boundary, with a cricket ground (Exmouth Cricket Club) to the east and beach and seafront to the south-west of the site.

1.3 Development Proposal

Outline planning permission has been approved (granted by East Devon District Council on 10 December 2013) for a proposal to re-develop the existing leisure facilities at Queen's Drive to provide a new recreation and leisure zone on Exmouth's seafront. The development would include:

- indoor play and recreation area;
- a water sports hub;
- retail;

- public open space;
- a hotel or holiday accommodation;
- cafes and restaurants;
- car parking for 200+ spaces; and
- realignment of the existing road away from the seafront to improve access to the beach and the overall attractiveness of the area.

1.4 Details of Previous Badger Surveys

An Extended Phase 1 Habitat Survey was undertaken by Tamar Consulting in May 2012 (Tamar Consulting, 2012). This survey recorded no evidence of badger activity.

A survey of badger activity at Queen's Drive was undertaken by Dr Julian Brown MCIEEM¹ in June 2015 (Julian Brown Consultancy, 2015). This survey identified two badger setts within the site. These comprised a possible small main sett (Sett A on Figure 1) and nearby possible annexe sett (refer to Appendix 1 for a description of the different sett types). An extended badger survey, also carried out in June 2015 by Dr Julian Brown MCIEEM, identified a main sett (Sett C) and an artificial sett (Sett D)



1.5 Purpose of this Report

This report presents the findings of a badger bait marking study on land at Queen's Drive, Exmouth, Devon (refer to Appendix 2 for the specifics of bait marking investigations). The study was undertaken by Dr Julian Brown MCIEEM during April and May 2016 (see Appendix 3 for experience and qualifications of the surveyor).

The objectives of the bait marking study were to establish the following:

- the current status of Sett A (a possible main sett), situated within the site;
- ensure that if an artificial sett is required, the new sett would be constructed within the correct badger territory; and
- inform the badger mitigation strategy.

¹ Full member of the Chartered Institute of Ecology and Environmental Management

2.0 BADGER ECOLOGY AND LEGISLATIVE BACKGROUND

2.1 Badger Ecology

Badgers in Britain usually live in groups of 3-10 individuals (Neal & Cheeseman, 1996), occupying a territory that is jointly defended against neighbouring badgers (Kruuk, 1978). Other badgers are more or less excluded from this land, which will encompass sufficient foraging areas to support the group throughout the year. Badger social groups are formed by individuals remaining within their natal group (Kruuk & Parish, 1982; Cheeseman *et al.*, 1987), with badger group size being determined by the amount of food available within the territory, while territory size is determined by the distribution of food patches (Kruuk & Parish, 1982).

Badgers defecate in pits termed dung pits and aggregations of these pits are called latrines. Other sources of badger scent such as urine and secretions from the anal, subcaudal and interdigital glands may also be deposited at latrines. Latrines are found throughout the social group territory, but in rural areas are concentrated on its periphery (Kruuk, 1978). These boundary latrines may be used by more than one social group and provide the opportunity for information exchange between neighbours. In urban areas latrines are generally concentrated around setts (Cresswell & Harris, 1988). Badgers tend routinely to use a network of well-worn paths to access different parts of their territory. The territory may include a number of setts of different sizes and functions (see Appendix 1).

In rural areas of Britain, earthworms (*Lumbricus terrestris*) have been identified as the single most important component of the badgers' diet (Bradbury, 1974; Kruuk & Parish, 1982; Hofer, 1986; Shepherdson *et al.*, 1990). Earthworms are largely obtained from grassland areas, particularly areas of short turf (Kruuk *et al.*, 1979) and to a lesser extent from deciduous woodland (Hofer, 1988). Suburban badgers are less dependent on earthworms with a significant proportion of their diet being anthropogenic in nature (e.g. food specifically put out for nocturnal mammals by local residents; food put out for wild birds and household pets; and gleanings from dustbins and compost heaps) (Harris, 1984). This human-derived food is largely obtained from residential gardens, which is the preferred foraging habitat for suburban badgers (Cresswell & Harris, 1988; Davison *et al.*, 2009).

2.2 Badgers and the Law

Badgers were initially partially protected by inclusion on Schedule 6 of the Wildlife and Countryside Act 1981. This protection has subsequently been strengthened by the Protection of Badgers Act 1992. The purpose of the Protection of Badgers Act 1992 is to protect badgers from incidental effects of lawful activities and deliberate attempts to inflict injury or kill badgers. Under the Act it is illegal to:

- wilfully kill, injure, take, possess or cruelly ill-treat a badger or attempt to do so;
- interfere with a badger sett by damaging or destroying it;
- obstruct access to, or any entrance of, a badger sett; and
- disturb a badger when it is occupying a sett.

A badger sett is defined as 'any structure or place which displays signs indicating current use by a badger'. This can include culverts, pipes and holes under sheds, piles of boulders, old mines and quarries etc. Natural England have not set a time period for current use as the rate of decay of badger signs around a sett varies depending on soil type, topography, etc. Natural England recommends that in addition to currently occupied setts, plans also consider the effect of development on seasonally-used setts as these may be in use by badgers when development starts (Natural England, 2007).

2.3 Badgers and Development and Licence Requirements

2.3.1 Badger Disturbance

Under the Protection of Badgers Act 1992, any activity causing disturbance of badgers when they are occupying a sett is an offence unless it is undertaken in accordance with the terms of a disturbance licence from Natural England. As the Act does not highlight what constitutes disturbance, English Nature (the predecessor of Natural England) provided advice on the types of development activities, and their proximity to setts, that would warrant a badger disturbance licence (English Nature, 1995, 2002). English Nature (1995) state "Up to 30 metres from any sett entrance is considered by English Nature to be a reasonable distance for work to be considered as licensable. Badgers are likely to show observable changes in their behaviour when some types of work are carried out within this distance". English Nature's disturbance licensing guidelines can be summarised as follows:

- all work within 10m of the nearest sett entrance should be licensed;
- between 10 and 20m use of machinery is licensable, but hand digging is not unless tunnels are accidentally breached;
- between 20 and 30m only the largest machinery requires a licence; and
- over 30m the use of explosives and pile-driving may need to be licensed.

Natural England's interim badger licensing guidelines (Natural England, 2007) do not refer to disturbance zones around setts for different types of development activities. This is largely due to uncertainty over what activities will disturb badgers and a lack of clarity over the legal interpretation of the word 'disturbance'. The 2007 guidelines recommend the following in relation to badger disturbance:

- badger tunnels can extend to 20m from the entrance holes and are located between 0.2 and several metres deep (depending on soil and topography), therefore excavation work and heavy machinery should be kept well away from where it could result in damage to the sett or disturbance to any badger occupying the sett; and
- disturbances, such as loud noise or vibrations, that might agitate badgers occupying a sett should be avoided or limited to areas well away from the sett.

In June 2009, Natural England published further guidance on badger disturbance licensing following a legal review (Natural England, 2009). This guidance suggests that badgers are relatively tolerant of moderate levels of noise and activity around their setts (e.g. badgers will create setts under roads and railways and within urban gardens that are well-used by children and pets) and that low or moderate levels of apparent disturbance at or near to badger setts would not necessarily disturb badgers and would therefore not require a licence under the Act. Examples of activities at or near badger setts that Natural England do not consider likely to cause disturbance to badgers, and therefore would not normally be expected to require a disturbance licence, include the following:

- development, or other activities occurring close to badger setts (use of hand tools and/or machinery), where there is no reason to believe that the 'disturbance' will be greater than that which badgers commonly tolerate, and therefore any badger(s) occupying the sett are unlikely to be disturbed;

- vegetation removal (including felling small trees or shrubs) over or adjacent to setts (using hand tools and/or machinery); and
- clearing out of ditches/watercourses using machinery and/or hand tools where badger setts are present.

Notwithstanding the above, the persons involved with activities near badger setts will need to exercise judgement as to whether their action may or may not cause disturbance to badgers. Where badger disturbance is unavoidable, works would need to be carried out under a Natural England badger disturbance licence. It is important to note that these licences are only issued by Natural England between July and November inclusive (see below).

2.3.2 Sett Interference

If necessary, it is possible to move badgers from a sett, but the difficulty/success of such actions depends upon the importance of the sett to that group of badgers and whether a suitable alternative sett exists within their territory. For setts in 'current use' by badgers, a licence must be issued (by Natural England) before the badgers can be moved and/or the sett destroyed. In general, the smaller the sett, the less important it is likely to be to the continued survival of a group of badgers, and the more successfully the badgers can be excluded from it. For example, the closure of a small number of outlying setts within a territory, which mainly function as nocturnal refuges when badgers are disturbed (Butler & Roper, 1994) and as temporary resting sites for badgers during the night (Brown, 1993), would be expected to have little or no impact on the badger group involved.

Any attempt to move badgers by direct means (using exclusion fencing, for example) must be done responsibly, and with suitable expertise. The licensing procedure should ensure that the implications of such an action have been fully investigated, any mitigating measures have been undertaken, and that a person with suitable expertise carries out the operation.

Badger development licences are generally only issued at sites with full planning permission (to avoid any possible conflict with the planning process) and are not generally issued during the period 1 December to 30 June inclusive (the badger 'breeding season') and therefore development works need to be carefully timed to avoid the 'close season' on licence applications. The 'close season' on licensing is due to the following:

- badgers are markedly less active during the winter months and actions such as exclusion are unlikely to be effective; and
- pregnant and lactating females, and dependant cubs, are likely to be found underground between mid January and the end of June.

For badger setts that require closure due to development, Natural England are only able to issue a sett interference licence to enable badgers to be relocated to another sett(s) within that group's territory. There is no provision under the Protection of Badgers Act 1992 to kill badgers for development of land and it is also not permitted to 'take' them for this purpose, thereby ruling out translocation as an option.

3.0 METHODOLOGY

3.1 Survey Area

The survey concentrated on the site and the cricket ground and The Maer (a County Wildlife Site and Local Nature Reserve) to the east, but also included areas of open space (where access was possible) up to 900m from the site.

3.2 Bait Marking Study

The principle behind the bait marking technique is that if Sett A is situated within the territory of a social group of badgers inhabiting the main sett [REDACTED] (Sett C), then marked bait (bait containing indigestible non-toxic plastic markers) placed at Sett A would result in marked badger dung at latrines (see Section 2.1) on and adjacent to Sett C (and vice-versa for a different colour of bait fed to Sett C).

3.2.1 Administering the Bait

The bait marking was undertaken using the method recommended by Delahay *et al.* (2000). Marked bait was fed for 14 days² to Setts A and C (red pellets fed to Sett A and yellow pellets to Sett C) between 18 April and 7 May 2016 inclusive. The bait comprised peanuts, crushed oats and coloured plastic pellets held together by golden syrup. The ratio of these ingredients by volume was 4 peanuts : 1 oats : 0.5 pellets : 0.8 syrup.

At each feeding visit, approximately 2.5 litres of bait was fed to each of the above setts. To maximise the number of badgers finding and eating the bait, bait was distributed around each sett at up to eight bait points (shallow pits in the ground created up to a distance of 20m from the outer sett entrances), that were each covered with a large stone to protect the bait from the rain and to reduce the amount of bait consumed by non-target species. For the first few days of feeding, bait was also dropped down the active sett entrances to encourage interest in the bait. Bait that had been taken and old uneaten bait was replaced at each visit. At each visit a note was made of the number of bait points that had been taken to ensure sufficient bait uptake by badgers.

² Delahay *et al.* (2000) recommends a minimum of 10 days of feeding.

3.2.2 Latrine Survey

Following the completion of feeding, the survey area was systematically searched for badger latrines containing plastic pellets within badger faeces (survey undertaken on 9 and 13 May 2016). Latrine grid references were established using a hand-held GPS unit (Garmin eTrex 10).

Badgers that have consumed bait often pass dung containing substantial quantities of undigested peanuts and oats, which are a convenient food source for some rodents and birds. As a result, pellets may be scattered widely over a latrine and it can be difficult to estimate the number of marked droppings. Also, latrines are dynamic and may change appearance daily due to the burying and break-up of faeces by badgers digging. Consequently, rather than estimating numbers of marked badger droppings at each latrine, the number of dung pits containing coloured markers was recorded to provide an approximate indication of the size and level of use of latrines.

3.3 Sett Survey

The survey area was systematically searched for badger setts (also undertaken on 9 and 13 May 2016). Each sett identified was classified according to the criteria used in the National Badger Surveys (Cresswell *et al.*, 1990; Wilson *et al.*, 1997) (see **Appendix 1**). The current level of activity at each sett entrance hole was also classified as described in **Appendix 1**. Sett grid references were established using a hand-held GPS unit (Garmin eTrex 10).

3.4 Limitations

Access to residential gardens was not possible and therefore some badger signs may have gone unrecorded.

4.0 RESULTS

4.1 Bait Marking

Six latrines (Latrines 1-6) were located within the survey area, none of which contained marked badger dung. The location of Latrines 1-6 is shown on Figure 2 with details of the size and level of use of these latrines provided in Appendix 4.

4.2 Sett Status and Activity

Five badger setts were identified within the area surveyed. These included the four setts recorded in June 2015 (Setts A-D on Figures 1 and 2) and an outlying sett (Sett E on Figure 2) [REDACTED]

[REDACTED] Full details of the size and level of activity of the above setts are provided in Appendix 5.

4.3 Bait Uptake

The mean nightly bait consumption by badgers at Sett A was 56%, with 79% bait uptake at Sett C.

5.0 ASSESSMENT AND RECOMMENDATIONS

5.1 Assessment of Results

It is expected that a proportion of the latrines found to the east of the site represent territorial scent marking activity between the badger group inhabiting Main Sett C and a different group of badgers to the east of the survey area. The reason for the absence of marked badger dung is unclear.

The main finding of this study was the complete absence of territorial marking activity between Setts A and C (territorial scent marking would exist between Setts A and C if these setts were occupied by different badger groups). It is therefore expected that Setts A-E are used by the same social group of badgers. Based on the above, and the limited badger activity recorded at Sett A, this sett has been classified as a subsidiary sett. Sett B, which appears to be of fox origin, displayed no signs of current use by badgers and has been classified as an outlying sett.

Artificial Sett D was constructed in 2013 to accommodate badgers that were temporarily excluded from Main Sett C. The latter was required prior to the installation of a subterranean badger-proof barrier [REDACTED]

[REDACTED] This work was carried out under a sett interference licence from Natural England (Ref. WLM/2013/1915, issued on 16 September 2013). Given the absence of badger setts within the site in May 2012 (Tamar Consulting, 2012), it is possible that Setts A and B appeared as a result of the temporary closure of Sett C in 2013, further indicating a link between Setts A-C.

The development proposal would necessitate the permanent closure of Setts A and B. Badgers excluded from these setts would be able to relocate to Setts C-E and therefore the closure of these setts would have little or no impact on this badger group. No additional artificial sett is required to compensate for the above sett closures.

5.2 Recommendations

5.2.1 Sett Closures

The closure of Setts A and B would require a sett interference licence from Natural

England (see Section 2.3.2), issued for the purpose of development. As described above, badger development licences are generally only issued by Natural England between July and November inclusive (to avoid the badger 'breeding season') and at sites with full planning permission (to avoid any possible conflict with the planning process).

The exclusion of badgers from Setts A and B would be undertaken in accordance with any Natural England licence conditions. Exclusion typically involves installing a one-way badger gate within each sett entrance, plus badger-proof netting (e.g. 2.5mm gauge galvanised chain link netting) around the sides of the gates. Badgers would be excluded over a minimum period of 21 days (a Natural England licence condition), during which the sett exclusions would be examined at intervals of no more than three days (a licence condition) to ensure that the badger gates open and close freely and to ensure that badgers had not regained access to any of the setts. Following a period of 21 consecutive days of no badger activity, the setts would be destroyed using a mechanical digger, under the supervision of the licensee (again, a condition of any Natural England licence).

5.2.2 Protection of Setts During Construction

Should development commence prior to the closure of Setts A and B, it is recommended that temporary fencing (e.g. Heras fencing would be appropriate) is erected to create a 20m buffer zone around Setts A and B, thereby preventing any possible sett damage resulting from accidental encroachment by machinery.

5.2.3 Update Badger Survey

It is important to note that badgers are able to establish a new sett over the course of a few nights. It will therefore be necessary to carry out a pre-commencement badger survey, along with an update badger survey immediately prior to any licence application to Natural England (Natural England require survey data to have been collected within two months of the licence start date).

6.0 CONCLUSIONS

Land at Queen's Drive, Exmouth, is proposed for a new recreation and leisure zone on Exmouth's seafront (the site boundary is shown by the red line on Figure 1). A badger survey, undertaken by Julian Brown Consultancy in June 2015, identified two badger setts within the site, with these comprising a possible small main sett (Sett A) and a possible annexe sett (Sett B). A main sett (Sett C) and an artificial sett (Sett D) were recorded outside the site, [REDACTED]

A bait marking study was undertaken to establish the status of Sett A and thereby assess the impact of closing this sett on the resident badgers. The bait marking exercise was carried out by Julian Brown Consultancy during April and May 2016.

Six badger latrines were located within the survey area (see Figure 2), although none of these contained marked badger dung. Given that the level of bait uptake by badgers was satisfactory, the reason for the absence of marked latrines is unclear. It is expected that a proportion of the latrines found [REDACTED] represent territorial scent marking activity between the badger social group occupying Main Sett C and a different badger group [REDACTED]

The main finding of the bait marking study was the complete absence of territorial scent marking activity between Setts A and C. Territorial scent marking would exist between Setts A and C had these setts been inhabited by different badger groups. Given the limited badger activity recorded at Sett A, the absence of current signs of badger activity at Sett B and possible appearance of Setts A and B on site following the temporary closure of Main Sett C during 2013 (no badger setts were present on site in May 2012), this study concluded that Setts A-E are situated within the same badger group territory. Setts A and B were classified as a subsidiary and outlying sett respectively.

The development proposal would have a direct impact on Setts A and B and would necessitate their permanent closure. Badgers excluded from these setts would be able to relocate to Setts C-E and therefore these sett closures would have little or no impact on this social group of badgers. No additional artificial sett would be required to compensate for the above sett closures.

The closure of Setts A and B would require a sett interference licence from Natural England. Badger development licences are generally only issued by Natural England between July and November inclusive and at sites with full planning permission.

The exclusion of badgers from the above setts would be best achieved by installing a one-way badger gate within each active sett entrance, plus badger-proof netting around the sides of the gates. Badgers would be excluded over a minimum period of 21 days (a Natural England licence condition), during which the sett exclusions would be examined at intervals of no more than three days (a licence condition) to ensure that the badger gates open and close freely and that badgers had not regained access to any of the setts. Following a period of 21 consecutive days of no badger activity, the setts would be destroyed using a mechanical digger, under the supervision of the licensee.

Natural England require badger survey data to have been collected within two months of the licence start date. It will therefore be necessary to undertake an update badger survey to confirm the status of known setts and establish if badgers had created any new setts.

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Appendices

Appendix 1.

Types of Badger Setts and Levels of Use

The territory of a social group of badgers may include a number of setts of different sizes and functions:

Types of Setts

Main setts

These are in continuous use, they are large, well-established, often extensive and may have large spoil heaps outside the entrances. There are likely to be well-worn paths leading to the sett. It is where the cubs are most likely to be born. There is generally only one main sett per social group of badgers. Main setts are usually built in very specific positions, where there is the right combination of soil (to facilitate drainage and ease of digging), aspect, slope and cover. Since suitable sett sites are at a premium, main setts are usually long-established, and may have been in use for decades or even centuries. The average number of holes is 15.

Annexe setts

These occur in close association with the main sett (usually within 150m), and are linked to the main sett by clear well-used paths. Annexe setts consist of six holes on average, but they are not necessarily in use all the time, even if the main sett is very active. If a second litter of cubs are born, this may be where they are reared.

Subsidiary setts

These comprise five holes on average, but are not in continuous use and are usually some distance from the main sett (50m or more). There is no obvious path connecting them to the main sett and their 'ownership' can often only be determined by bait marking.

Outlying setts

These consist of only one or two holes. They can be found anywhere within the territory and usually have small spoil heaps, indicating that they are not very extensive underground. There are no obvious paths connecting them to other setts, they are only used sporadically and often used by foxes or rabbits when not occupied by badgers.

Sett Use and Levels of Activity

The size, status and level of activity of each sett can be assessed by counting the number of entrance holes. The degree of use of each entrance hole can be classified as follows:

Well-used holes

These are clear of any debris or vegetation, are obviously in regular use, and may or may not have been excavated recently.

Partially-used holes

These are not in regular use and have debris such as leaves and twigs in the entrance, or have moss and/or other plants growing in or around the entrance. They could be in regular use after a minimal amount of clearance.

Disused holes

These have not been in use for some time, are partially or completely blocked, and could not be used without a considerable amount of clearance. If the hole has been disused for some time, all that may be visible is a depression in the ground where the hole used to be, and the remains of the spoil heap, which may be covered in moss or plants.

In addition to their setts, badgers occasionally lie-up above ground in small depressions lined with dry grass and leaves, usually under a fallen log or dense patch of bramble. These are termed 'day nests', although it is uncommon for badgers to occupy them during the day; the animals more often use them as shelter for short periods during the night. These structures are not usually given the legal protection afforded to setts.

Appendix 2.

Bait Marking Methodology

Bait marking techniques rely upon the well-established phenomenon that badgers mark the boundaries of their territories with dung pits (or aggregations of these known as latrines). These are regularly maintained by a large proportion of the badger social group, although most of the marking activity is thought to be undertaken by adult males.

The principle of the technique is that indigestible markers are fed at the badgers' main sett will then be deposited in dung pits throughout their range, including other setts used by that group and at the territory boundaries. An accurate delineation of territory boundaries requires that the study be undertaken at the correct time of year (ideally during spring, but possibly during autumn, see below); that several adjacent groups are included; that baiting continue for an adequate period; that re-surveys are undertaken where necessary; and that the results are interpreted by a person with appropriate expertise (i.e. someone who already has expertise in the implementation and assessment of bait marking studies). Badger social organisation is not always straightforward (e.g. certain adult males have been recorded as using more than one otherwise separate social group) and this can confuse the bait marking results.

Badgers show considerable seasonal variation in their use of territorial dung pits. It is generally held that there is a peak in marking activity in the spring and a secondary peak in the autumn. The months in which dung pit use (in terms of number of faeces) reaches a maximum in each season are April and September. The secondary (autumn) peak in marking activity is relatively short-lived and bait marking must be undertaken between early September and mid October to take advantage of it. The timing of bait marking around the spring peak is a little less critical; any time from late February to late April should yield useful results. In general, spring bait marking studies generate the best results particularly if the aim is to delineate all territory boundaries accurately and wherever possible this work should be undertaken in the spring.

Bait marking investigations clearly rely on the repeated use of boundary latrines in order to delineate territory boundaries. Where territorial marking behaviour is less intense, the technique will generate less accurate results. In particular, badgers in some urban areas have been shown to be far less territorial. Dung pits in these situations tend to be clustered around setts rather than range boundaries, and range overlap is frequent and can be considerable, as can movements between groups. For these reasons bait marking investigations, which attempt to delineate territory boundaries, are often not appropriate in urban, suburban or urban fringe situations. In addition, it is often not possible to attempt to locate dung pits scattered through large numbers of private gardens. Badgers living at particularly low densities or populations that have been artificially reduced in size may also show variations in territorial behaviour and, once again, bait marking investigations may be inappropriate or may require extended baiting periods or repetitions.

Appendix 3.

Qualifications and Experience of Dr Julian Brown

Dr Julian Brown attained an Honours Bachelor of Science Degree in Zoology (1989) from the University of Bristol and a Doctor of Philosophy from the University of Bristol (1993) for his research on the transmission of bovine tuberculosis from badgers to cattle. This research developed a novel tracking technique which enabled the behaviour of badgers to be studied in more detail than has previously been possible and in particular provided detailed information on patterns of badger movement, foraging and scent marking behaviour.

Dr Brown has been a freelance badger consultant since 1996 and is largely contracted to undertake badger surveys for the planning, construction and development industries. This has included providing advice and recommendation on badger mitigation, bait marking studies to assess the proportion of territory to be lost to development, artificial sett construction, sett closures and attending public inquiries as an expert witness. In 1997, a high-profile contract from South Somerset District Council involved translocating (under a MAFF damage licence) a social group of badgers undermining residential gardens in St Andrew's Road, Yeovil, to a site on Exmoor.

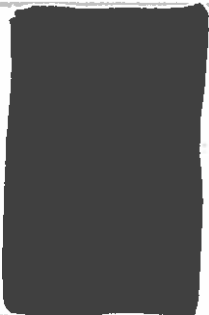
In 1994, Dr Brown was employed as a badger consultant with Bristol Ecological Consultants (BEC), where his main responsibilities were to conduct badger surveys in areas of potential development and to assess the impact of proposed developments on the long-term survival of local badger populations. While working with BEC, Dr Brown was involved with a badger radio-tracking study to assess the outcome of a badger relocation exercise.

In 1993, he was employed as a Scientific Officer to carry out an individual project to provide recommendations for the successful translocation of badgers. A social group of six badgers was monitored, following its translocation from an urban area of East Sussex to an artificial sett in a wooded location in Suffolk. Badgers were radio-tracked to determine their initial movements from the release site and their subsequent home ranges. Behavioural observations recorded information such as contact between individual badgers and use of feeding areas. Latrines were located and faeces removed for diet analysis and cage-trapping was used to monitor the condition of animals, including changes in weight and the breeding status of females.

Dr Brown is regularly invited to present papers and talks on badger ecology, which has included presentations at the Mammal Society Conference, National Federation of Badger Groups Annual Conference and the University of Oxford. He has published several scientific papers on different aspects of badger ecology, the latest of which uses the quantification of latrine use as a means of estimating badger social group size and population density (*Journal of Applied Ecology*, Vol. 38, pp 1114-1121). Dr Brown is a full member of the Chartered Institute of Ecology and Environmental Management.

Appendix 4.

Details of Latrines Recorded within the Survey Area

Latrine number	National grid reference	Number of dung pits with pellets
1		0/5 (latrine inactive)
2		0/2
3		0/3
4		0/7
5		0/3
6		0/5

Appendix 5.

Classification of Setts Recorded in May 2016

- Sett A Subsidiary sett that comprised at least 3 partially-used holes situated underneath a marquee housing a children's soft play area ('Jungle Fun') (OS grid reference SY 00449 80189). Although a torch-light search for sett entrances was undertaken, it was not possible to carry out an exhaustive search for entrances underneath the 'Jungle Fun' and therefore an additional entrance(s) may exist. The sett displayed only limited signs of badger activity.
- Sett B Outlying sett that comprised 4 partially-used holes situated adjacent to two sheds (OS grid reference SY 00461 80217). The sett displayed signs of use by fox, but no evidence of current use by badgers.
- Sett C Main sett that comprised 2 well-used holes, 8 partially-used holes and 1 disused hole situated [REDACTED]
[REDACTED] Bedding was recorded outside a well-used entrance. An inactive latrine (Latrine 1) was recorded within the sett area.
- Sett D Artificial sett that comprised 1 partially-used pipe entrance and 3 disused pipe entrances situated [REDACTED]
[REDACTED] The sett displayed no signs of current use by badgers.
- Sett E Outlying sett that comprised 1 partially-used hole situated [REDACTED]
[REDACTED] The sett displayed no signs of current use by badgers.

Figures

