PROOF OF EVIDENCE OF
PROFESSOR JOHN ALTRINGHAM

ON BEHALF OF

GWENT WILDLIFE TRUST

In the matter of:

Public Local Inquiry into the M4 relief road around Newport: The effects of the proposed M4 extension across the Gwent Levels

February 2017

1. Biography

1.1 I am John Altringham. I hold a BSc in Biology (University of York) and a PhD in Zoology (St. Andrews University). I am Emeritus Professor of Animal Ecology and Conservation at the University of Leeds (Professor 1999-2016). I have conducted and published zoological and ecological research for 38 years and have written over 150 scientific papers and reports on a broad range of zoological topics. I was awarded the Scientific Medal of the Zoological Society of London in 1994 “for distinguished work in zoology”.

1.2 I have been actively involved in bat research and conservation for over 30 years. I am author of three major books on bat biology and conservation: Bats: Biology and Behaviour (1996), British Bats (2003) and Bats: from Evolution to Conservation (2011). I am senior author of a review book, Bat Conservation: Global evidence for the effects of interventions (Synopses of Conservation Evidence Series 2013). I have extensive field experience with wild bats in the UK and abroad, applying a wide range of techniques to their study. My research has been funded by government and by national and international conservation charities. I regularly advise Natural England, Natural Resources Wales, Scottish Natural Heritage, the Bat Conservation Trust and Wildlife Trusts on bat ecology and conservation issues. I am author of a number of guidance notes for Natural England and others related to best practice conservation. I run and contribute to training courses in bat conservation, survey and research and I am a past member of CIEEM. I am a member of a number of advisory groups, including the Natural Environment Group of the National Trust, an independent advisory body of expert volunteers, and the Yorkshire Dales Biodiversity Forum, a volunteer body that advises and assists the national park authority in formulating and delivering its conservation objectives. I am a regular advisor and contributor to BBC Natural History Unit programmes on bats and other topics.

1.3 Of particular relevance to this case is my interest in the effects of transport infrastructure on bats (and other animals). Our published research has demonstrated that operational major roads reduce bat activity and species diversity over more than 1 km either side of the road (Berthinussen & Altringham 2012a) and that current mitigation practice is largely ineffective (Berthinussen & Altringham 2012b). We have recently published a major DEFRA-commissioned and funded report (Berthinussen & Altringham 2015a). This summarises current knowledge in the field of road ecology related to bats, details our extensive further research that supports earlier conclusions, and provides detailed best practice guidance on survey, monitoring and mitigation for

bats on transport infrastructure. This report was produced with the aid of a steering group whose members included representatives from the statutory nature conservation organisations of the UK and Highways England. I have also published recent review works on bats and roads and evidence-based conservation in general (e.g. Abbott et al. 2015, Berthinussen et al. 2013, Berthinussen & Altringham 2015b, Altringham & Kerth 2015) and been an invited speaker at conferences and workshops in the UK, Australia and Denmark, on the subject.

2. Introduction

2.1 My evidence will consider the likely effects on bats of the proposed M4 extension across the Gwent levels, through an assessment of the Environmental Statement ("ES"), the mitigation/compensation proposals within it and my own research experience. It will also include a brief discussion of well documented, long-term impacts of roads on wildlife that are not acknowledged by the ES. I have included some detailed commentary on key points raised in Chapter 10 of the ES. For the avoidance of doubt, the absence of a detailed critique of other parts of this document, or other documents, does not imply agreement with the contents of those documents. In particular, the ES is repetitive and many issues are raised two or three times. Where I have referred to an issue in relation to one section of the ES, I do not repeat that criticism where the same criticism may be relevant to a later paragraph.

3. Methodology

3.1 The bat surveys along the proposed route described in the ES use appropriate methods and are reasonable in scope. There are some gaps, such as those highlighted by Natural Resources Wales (4 May 2016) and the Bat Conservation Trust, but the data are sufficient to show that the footprint of the motorway falls on important bat habitat along most of its route and the road has the potential to do considerable damage to bat populations.

4. Landscape-Scale Impact

4.1 The ES concerns itself almost entirely with the impact of the proposed M4 extension during construction and makes little reference to the long-term, landscape-scale impact of the operational phase of the road. This is despite the fact that Berthinussen & Altringham (2012a, 2015a) are cited and extensively quoted, and this issue is a major

part of our report. That report makes clear that major roads, whether under construction or long-established, are associated with lower bat activity and species diversity for at least 1-1.6 km either side of the road. The causes are multiple (habitat loss, degradation and fragmentation) and not all are well understood. The effect, however, is clear and widespread. The 'missing' bats have died or been displaced – and displacement probably also leads to population decline, since displaced bats would be in competition for resources with other bats. Again, the authors of the ES appear not to understand this basic ecological principle and assumes (without any evidential basis for doing so) that there is lots of empty habitat waiting for these displaced bats to move into. There is not, it is already occupied.

4.2 Persistent, landscape scale effects of operational roads are not unique to bats. There is a considerable body of evidence to show that many animal species are subject to similar effects, often of greater magnitude. The evidence can be concisely summarised through a recently published paper (Torres et al. 2016). Based on an analysis of 232 species of bird and mammal, average bird species abundance is reduced by 50% within 200 m of major roads and average mammal species abundance is halved within 1 km. These are permanent effects of operational roads, not simply short-term disruptions due to construction. The causes of these dramatic effects are summarised in Fig. 1. No thought is given in the ES as to how these might be mitigated against, for bats or any other mammal or bird.

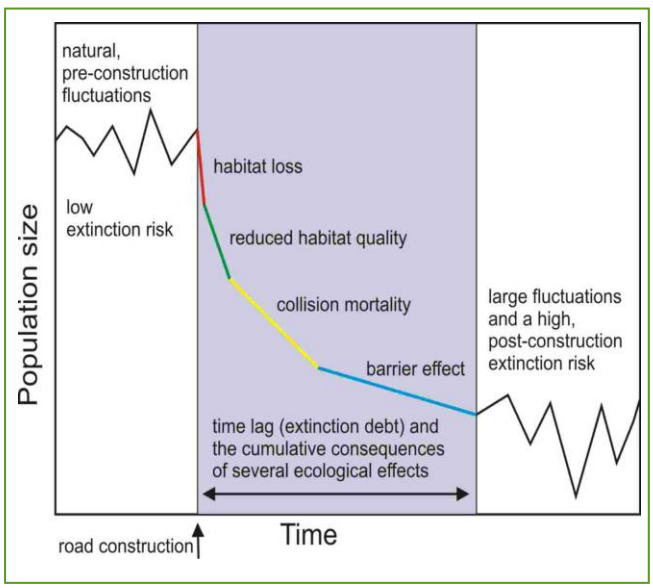

Fig. 1. The cumulative effects of roads on animal populations. Habitat loss is due to the footprint of the road and ancillary structures. Reduced habitat quality is due to noise, light and chemical pollution. Collision mortality is direct roadkill. The barrier effect is caused by the reluctance or

inability of animals to cross open spaces and/or being turned back by traffic, light and noise. A full discussion can be found in Altringham & Kerth (2015).

5. Mitigation in Principle

5.1 The ES (Chapter 10) assesses the likely impact of the construction of the road on bats as moderate adverse without effective mitigation. It is claimed that the package of mitigation measures proposed would reduce the impact to slight adverse.

5.2 However, European Union law takes a precautionary approach to environmental harm. The Court of Justice of the European Union ("CJEU") made clear in Case C-127/02 *Waddenzee v Staatsscretaris van Lanbouw* [2005] All ER (EC) 353 that (absent imperative reasons of overriding public interest) a competent authority can only grant consent for a project if it is "*convinced"* that the project would not adversely affect the integrity of the protected site concerned. In order to be satisfied of this the competent authority must be satisfied that "no reasonable scientific doubt remains as to the absence of such effects."

5.3 The evidence provided in the ES does not meet this standard. Despite citing a DEFRA report (Berthinussen & Altringham 2015a), of which I was one of the authors, and quoting extensively from the best practice recommendations within it, the ES ignores the evidence in that report that shows the mitigation measures proposed in the present case would be at best high-risk and largely ineffective and at worst completely ineffective.

5.4 Table 10.18 of the ES presents the evidence its authors have collated side by side with details of the proposed mitigation. The table shows that most species would not benefit from the mitigation, and acknowledges the lack of evidence for its effectiveness for others. If the ES had included evidence from our paper and DEFRA report, its authors would have been bound to conclude that the situation is significantly worse than that drawn from the flawed evidence they cite.

5.5 In addition to passing over much important evidence, the ES fails to draw the critical distinction between the ***use*** of a structure by individual bats and its ***effectiveness*** at protecting bat populations. This distinction has been the subject of published scientific discussion for some time (e.g. Altringham 2008. Berthinussen & Altringham 2012b).

Since it fails to draw the crucial distinction between use and effectiveness, the ES is predicated upon a fundamentally flawed understanding of the scientific position.

5.6 I note that the ES cites reports that describe the use of overpasses and underpasses by small numbers of bats in support of their value as mitigation tools. There is no mention of the number of bats that no longer go near a site, or fail to cross the road, or those that cross the road at risk of being killed. The purpose of mitigation is to ensure that a very large majority of the bats present before construction continue to cross the road safely after construction. By these criteria, most mitigation is untested or failing (Berthinussen & Altringham 2012b). This important paper does not appear to have been cited anywhere in the ES (NB the online link to the references was broken), despite the fact that it is a widely publicised, freely available, open source paper.

6. The Proposed Mitigation Measures

6.1 Many of the mitigation measures proposed in the ES are insufficiently detailed to allow proper assessment. By way of example, the proposed noise plan (ES 10.8.412) and lighting plan (ES 10.8.405) should be significantly more detailed for it to be possible to assess their likely effectiveness. Moreover, there is little or no scientific evidence to support the effectiveness of a number of the specific mitigation measures proposed the details of which I consider below.

<u>Bat Boxes and Bat Barns</u>

6.2 Bat boxes are put forward as effective replacements to lost roosts. In fact, bat boxes and bat barns represent a high risk, poorly assessed mitigation/compensation 'solution' to lost roosts – there is no guarantee that they would work and a high probability that they would not. Stone et al. (2013), in an analysis of Natural England (English Nature) derogation licence returns, found that even when ***existing*** roosts in buildings were retained after development, bats did not return to 26% of the roosts and the number of bats using those roosts they did return to fell by more than 50%.

6.3 Against this background, ES paragraph 10.8.384 refers to "*the capture and translocation of any roosting bats to pre-installed bat roost boxes; and/or methods to encourage bats to leave the roosts prior to destruction e.g. use of deterrent lighting"*. However, there is no evidence provided to support the conclusion that the bat boxes would be suitable alternative roosts or that bats chased out of roosts would have

suitable alternative roosts. In my view this proposal is not effective mitigation. It is simply eviction.

6.4 Paragraph 10.8.385 suggests that "*all roosting bats would be captured and relocated to bat roost boxes suitable for the species of bat being displaced"*. Some species, such as horseshoe bats, do not use any of the commonly available roost boxes. Little is known about "suitability" when it comes to size, location, temperature and function (e.g. suitability as a nursery, mating site, etc.) for any species. Suitable here appears simply to be used to mean that a given species may have been seen to use a similar box somewhere, at some time, for some unknown purpose. Again, in my judgment, and on the basis of current scientific knowledge, there are very significant uncertainties and risks associated with this approach. It cannot properly be said to be effective mitigation. Furthermore, if the habitat around the roost has been degraded by construction, no roost may be suitable, since habitat is an important part of roost choice in bats.

6.5 Indeed at paragraph 10.8.386 the ES is forced to acknowledge the severe consequences of the use of these high-risk displacement methods. It states, "*Should displacement and relocation of bats result in the loss of, or reduced access to favourable foraging sites, alternative roosting sites and/or other bats in the area, the effect could be significant with regard to the long term viability of the population*."

6.6 The state of scientific knowledge is such that there is too little published information available on bat barns and similar structures to enable a satisfactory assessment of their effectiveness as a mitigation measure. Little if any weight can therefore be given to the proposal at ES 10.8.387 that "*in order to minimise the impact of displacement, a bat barn would be provided north of Magor*." For the reasons set out above this is a high risk strategy the effectiveness of which has not been tested. Anecdotal evidence suggests the odds are against the effective uptake of such structures and at best, reliance on bat barns as mitigation is a high risk strategy. Stone et al. (2013) reported that only 13% of bat boxes erected for mitigation were used and no assessment can be made of their value as effective replacement roosts. My own experience, working with the Forestry Commission for over 10 years on the monitoring of hundreds of boxes, is that a small proportion are used transiently by small numbers of bats: evidence of occupancy was found in <10% of boxes.

6.7 The proposals to mitigate the effect of the proposed M4 extension upon bats through the use of bat boxes/ barns (as proposed in the ES) therefore fails to provide

satisfactory scientific evidence to support the effectiveness of these structures. The authors of the ES simply do not appear to properly appreciate the high risk nature of the measures proposed.

Compliance/ Monitoring

6.8 There is also a longstanding issue regarding compliance in this area. Stone et al. (2013) highlight poor levels of compliance: 67% of licencees failed to submit post-development reports and post-development monitoring was conducted at only 19% of sites. Our experience, discussed in many of our reports, is that non-compliance is still an issue and most of the reports that are submitted are not fit for purpose.

6.9 The approach to monitoring in the ES is flawed. A more detailed monitoring plan is required than that proposed in ES 10.8.413-417. The system is not, as it should be, built around quantitative targets for effectiveness at the population level and for the effectiveness of individual mitigation measures. No specifics are given regarding the metrics and threshold that would prompt action in the event of failure or what action would be taken in such an event. There does not appear to be a satisfactory contingency plan if the high risk mitigation measures proposed are unsuccessful.

6.10 It is true that ES 10.9.268 states that "*All replacement and new bat roosts required under the bat licence would be monitored by appropriately experienced ecologists during the construction period and for a an additional period after completion of the new motorway which would be defined in the European Protected Species licence. Monitoring of roosts would aim to determine use by bats and, where present, species and number of roosting bats present. Reporting of monitoring surveys is likely to be at least on an annual basis or as otherwise requested by NRW*." But this fails to take account of the strong possibility that bats simply do not use the roosts. This paragraph also displays the same over-reliance on the concept of use. Use alone is not enough to indicate effectiveness. If the bats have lost a nursery roost, it needs to be replaced by a nursery roost. The mere fact of monitoring species and numbers is insufficient satisfactorily to assess the success (or otherwise) of a given mitigation measure. Indeed, the ES does not make clear what the monitoring would achieve.

6.11 Failure to address how to remedy failures in the mitigation measures that are likely to emerge is visible from paragraph 10.9.269 of the ES. That paragraph states that the results of monitoring "*would inform the need for any further mitigation measures, such*

as a relocation of bat roost boxes in order to increase use or provision of additional roost boxes." This discloses a flawed approach. There is no reference to what information the monitoring measures would provide to guide any relocation. Moreover, if bats don't use the roosts provided, then providing more would be an entirely futile exercise.

Over and Under the Road Solutions

6.12 The ES acknowledges at 10.8.388 that "*major roads can present a barrier to the movement of some bat species. Berthinussen and Altringham (2012) recorded a significant reduction in bat activity up to 1.6 km from an 80 km section of the M6 in Cumbria, England. This reduction in activity was considered in part to be due to the barrier effect of major roads*." This is, however, an understatement. Major roads are a barrier to ***most*** bat species and the "significant reduction" was in fact a three-fold decrease in activity. Indeed, despite referring elsewhere to the 2015 DEFRA report which I co-authored, the ES does not cite the additional evidence contained in the report for this effect, through the study of seven more roads: motorways and A roads. This is a substantial omission.

6.13 At 10.9.271 the ES states that "*the retention of severed sections of habitat corridors (such as hedgerows), which are used by bats as commuting routes, too close to a new road may increase the risk of collision as bats may try to continue to use these commuting routes to cross the road (Highways Agency, 2011)."* On this basis the ES suggests that planting should be used to help guide bats towards alternative safe crossing points. The effectiveness of such a strategy is discussed below. However, the fact that habitat corridors cannot be retained demonstrates a significant problem with the proposed mitigation strategy. The whole point of mitigation is to make it possible for bats to continue to use existing flight lines by providing road crossing structures along them. To sever/remove these flight lines adds to the damage done by increasing the barrier effect the road would have and increasing fragmentation of bat populations and habitat.

6.14 Based on current evidence over the road structures (with the probable exception of wide green bridges) are not effective at helping bats cross safely (Abbott et al. 2015, Berthinussen & Altringham 2012b, 2015a). Under the road solutions (culverts and underpasses) have the potential to be effective if large enough, sited on pre-existing commuting routes and well connected to the landscape (Abbott et al. 2015,

Berthinussen & Altringham 2012b, 2015a). Unfortunately, most of those proposed in the ES would be too small, most would be placed well away from known commuting routes and many would probably be poorly connected to existing commuting routes. Of 21 under the road structures in Table 10.18, seven have a diameter of 900 or 1200 mm and nine are 1800 mm high. The minimum recommended height is 3 m (Abbott et al. 2015, Berthinussen & Altringham 2015a). Several of those larger than 1.8 m would carry roads (or the mainline railway) and their use by bats would be influenced by factors such as traffic volume and light. Only nine of the 21 structures would be on known bat flyways, the rest 50-300 m away. The Draft Bat Mitigation Strategy, Appendix SS10.5 (Crossing points, paragraphs D3.21 et seq.), suggests that it may be possible to increase the height of some of the smaller culverts, but in no case is it suggested that height can exceed 2 m. In combination, these factors are highly likely to make the mitigation ineffective.

Culverts/ Underpasses

6.15 At 10.8.391 the ES states "*research commissioned by the Highways Agency (2011) confirmed that many bat species, in particular low-level gleaning species, will use underpasses*……." The document referred to does not include recent developments in the field and makes the error of supposing that use by an unknown proportion of bats equates to effective protection of populations. The Highways Agency's report was a review of the poor evidence available at the time. The state of scientific knowledge has now moved on and the out-dated approach relied upon in the ES is incorrect. It is followed by a detailed species by species description, but almost all of it is anecdotal, qualitative and again reliant on the wholly inadequate definition that use equates to effectiveness. In any event, the smallest underpass/culvert reported to be used by bats in the list was 1.2 m in diameter – significantly larger than the height proposed for many of the culverts along the M4 route (see previous paragraph).

6.16 Thus Table 10.18 (p10-270 et seq.) of the ES is a lengthy catalogue of mitigation measures that the table itself shows are very unlikely to work. The 900 mm diameter culverts are too small for most species to use at all, and probably for any to use effectively. Most of the remainder are lower than the recommended height of 3 m and some would carry roads. Many of the culverts are displaced considerable distances from the known commuting routes and where attempts to divert bats to new crossing points have been studied (Berthinussen & Altringham (2012b, 2015a) this has been unsuccessful.

Overbridges

6.17 At 10.8.393 the ES states that "*overbridges constructed as part of the Scheme would also provide potential crossing points for bats*." However, The ES itself presents evidence to suggest these would not be effective. Our published evidence adds weight to that conclusion.

Crossing Locations

6.18 At 10.8.395 the ES states that, "*The construction of these potential bat crossing points would be completed* ***as soon as practicable*** *during construction*". The use of the words "as soon as practicable", and similar phrases, are widespread in the ES and mean that there can be no guarantee that the works would be properly timed. Even if the proposed mitigation measures were likely to be successful their timing would be critical. Failure properly to time the works would aggravate the adverse effect of the proposed construction works upon the bat population.

6.19 Similarly ES 10.8.396 states that "*in order to improve the probability of bats finding and using crossing points (including culverts), in accordance with recommendations published by the Highways Agency (2011), crossing points would be constructed along, or* ***as close as practicable*** *to, sites where bat activity has been recorded to be high or very high*". The use of this wording again suggests that (even on the dubious assumption crossings points could provide satisfactory mitigation) there can be little certainty regarding whether or not crossings can and would actually be suitably located.

6.20 As regards the use of planting to guide bats towards alternative safe crossing points (such as box culverts and adjacent 900mm mammal crossings suggested in paragraph 10.9.272 of the ES), leaving aside the inadequacy of a 900mm crossing, this strategy is largely untested and, like almost all of the proposed mitigation measures, extremely high risk. Berthinussen & Altringham (2012b) did assess one such attempt. It was not successful.

6.21 The same problem applies to other measures referred to. In 'bat corridors' the ES states at 10.8.400 that "*bat corridors would be installed during night time hours between at least March and September inclusive (the main period of bat activity) and until landscape planting has become sufficiently developed to provide a permanent*

alternative." This suggests that the corridors would need to be constructed and dismantled every day. This increases the risk that ultimately the mitigation would not be provided which, in the context of reported failures even to implement one-off mitigation measures, is not encouraging. Even if the measure were effectively implemented there is no evidence that artificial 'bat corridors' (such as lines of hazel hurdle fencing) being retained in or connected to high and very high bat activity areas (ES 10.8.400) would encourage the use of new crossings in a way which effectively mitigates the harm from the proposed M4 extension. Similarly there is no evidence to suggest that the installation of mammal exclusion fencing would be able successfully "*to guide some species of foraging and commuting bats towards box culverts and mammal crossings, thereby encouraging their use"* (ES 10.8.403). Anecdotal observations suggest that even with low flying bats this strategy does not work.

7. Conclusion

7.1 In summary, in addition to there being no proper consideration of the long-term effects of the operational road on bats, there is considerable scientific uncertainty about the likely success of the short-term construction mitigation plan, and as such the plan does not meet the requirements of European law which demands that the success of the mitigation must be "beyond reasonable scientific doubt".

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