BEFORE THE HEARING PANEL

IN THE MATTER OF	The Resource Management Act 1991 ("the Act")
and	
IN THE MATTER OF	an Application by Weston Lea Limited for land use and subdivision consents for the development of approximately 105 hectares of land at 337 – 461 Peacockes Road, Hamilton.
AND	
IN THE MATTER OF	a submission on this application by the Director-General of Conservation.

STATEMENT OF EVIDENCE IN CHIEF OF MOIRA ANNE PRYDE FOR THE DIRECTOR-GENERAL OF CONSERVATION

23 April 2019

Department of Conservation

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Submission Number: 59

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1. INTRODUCTION

1.1 My full name is Moira Anne Pryde

1.2 I am a Technical Advisor in the Ecosystems and Species Unit with the Department of Conservation (DOC).

1.3 I hold a Post-Graduate Diploma in Wildlife Management in Ecology from Otago University, Dunedin (2001) and a Resource Studies degree from Lincoln University, Christchurch (1996).

QUALIFICATIONS AND EXPERIENCE

1.4 I was employed by DOC between 1997-2004 to undertake various birds and bats survival studies in the Eglinton Valley, Twizel, Haast, Grand Canyon, Hanging Rock in South Canterbury. I obtained a permanent position with DOC in 2005 as a wildlife researcher. My work has involved active research and management of threatened species as well as an advisory role where I comment as a bat expert on DOC permissions and Resource Management Act matters as well as give advice to DOC operations staff on monitoring bats and birds.

1.5 I have 19 years' experience working with bats in New Zealand. I have worked on various significance assessments and consents including the proposed monorail in Fiordland and Kaimai Wind farm application. My role with DOC is wide ranging but has largely focused on forest birds and bats and the impacts predators have on these fauna as well as on developing conservation recommendations to reverse population declines. An example is in the Eglinton Valley where we have been monitoring kaka, robins, bats and morepork.

1.6 I belong to the Natural Heritage Group for Bats that advise on bat research in New Zealand.

1.7 As mentioned in 1.5, the main project that I have worked on since 1999 is in the Eglinton Valley. The Eglinton Valley is a long-term study site in southern Fiordland that has been running since 1993. Various management methods have been applied involving predator control by trapping, bait stations and aerial 1080 operations. Outcome

monitoring looks at endemic species abundance and survival. I analyze long-tailed bat data for this project to identify survival and population changes. I was also involved in the Canterbury (Hanging Rock) and Waikato (Grand Canyon) projects where we compared bat survival with the Eglinton data.

1.8 I run the National Database for the distribution of bats and have my own research project on bats in Kahurangi National Park in North-west Nelson.

1.9 I have published peer reviewed scientific papers on bats, management reports and best practice documents on the management of bats in New Zealand.

1.10 I am familiar with the proposed Amberfield site and inspected the area on 14 December 2018.

CODE OF CONDUCT

1.10 While this is not an Environment Court hearing, I have read the Environment Court Code of Conduct for Expert witnesses and I agree to comply with it. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

1.11 I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed. I have specified where my opinion is based on limited or partial information and identified any assumptions, I have made in forming my opinions.

2. SUMMARY OF EVIDENCE

2.1 The long-tailed bat is classed as Nationally Critical, which is the highest threat category for New Zealand species.

2.2 Long tailed bats are Absolutely Protected Wildlife under the Wildlife Act 1953.

2.3 The presence of long-tailed bats in the Amberfield area triggers significance criteria for representativeness, rarity and distinctiveness

as identified in the Waikato Regional Policy Statement (WRPS), Waikato District Plan and the Hamilton District Plan.

2.4 The long-tailed bat population in Hamilton is distinctive and nationally important due to its high threat status and the rarity of bats in urban landscapes in New Zealand.

2.5 Hamilton bats are mainly found in the southern part of Hamilton, which is where the Amberfield subdivision is proposed.

2.6 Roost sites, foraging habitats and commuting flyways have been identified within the proposed Amberfield subdivision.

2.7 Effects of the proposed subdivision could include killing, injuring or disturbing bats through loss of roost trees, loss of feeding and breeding habitats and fragmentation or severing of commuting routes as well as disturbance caused by increased lighting and noise in the area.

2.8 In my opinion, based on the evidence I present, the adverse effects of the proposed Amberfield subdivision are likely to be significant, and to a large degree irreversible for the Hamilton long-tailed bat population, particularly if roost trees are felled.

2.9 In addition, the bats affected by the proposed Amberfield subdivision are the same bats as those using other parts of Hamilton City, so the effects are likely to be incremental and accumulative on top of the effects of other development projects that are occurring in the city (eg. roading, further subdivisions).

2.10 If bat roost trees are removed it will result in the loss of bat habitat and the proposed mitigation to replace feeding, foraging and roosting habitat is unlikely to provide viable habitat for >50 years.

2.11 Three roost trees have been identified on the site proposed for the subdivision, and it likely that there are more. Protection of current and future potential roosts is essential for this critically endangered population.

2.12 The mitigation measures proposed by the applicant lack detail and provide little evidence on the effectiveness. I therefore support

Mr Riddell's recommendation for a significant redesign of the proposal.

3. SCOPE OF EVIDENCE

3.1 My evidence will cover the following matters;

a) the conservation status of long-tailed bats and their specialist requirements

b) the significance of the area proposed to be affected by the Amberfield subdivision for long-tailed bats

c) the potential impacts of the proposed Amberfield subdivision on the long-tailed bat population

d) the adequacy of information provided in the Applicant's resource consent application and subsequent evidence to evaluate impacts of the proposed subdivision on long-tailed bats

e) the adequacy of proposed mitigation and conditions offered to address the potential effects of the proposed subdivision on long-tailed bats

f) my conclusions

MATERIALS CONSIDERED

3.2 In preparing my evidence I have reviewed the relevant documents provided

a) Section 42A Report

b) Assessment of Environmental Effects

c) Appendix G – Amberfield-Peacocke Structure Plan, 15 May 2018

d) S92 – Appendix B – Terrestrial Ecology (Boffa Miskell)

e) Additional Information – Appendix C – Ecological Assessment Addendum

f) Appendix E – Terrestrial Ecology Statement of evidence by Gerardus Kessels

g) Bat Ecology Statement of Evidence by Ms Georgia Cummings

h) Statement of evidence by Dr Stuart Parsons

i) Statement of evidence by Dr Kerry Borkin

j) Statement of evidence by Dr Laurence Barea

k) Statement of evidence from Andrew Riddell

JOINT WITNESS STATEMENT

3.3 I attended the expert joint caucusing and signed the Joint Witness Statement (JWS). The caucusing was held before the completion of the Hamilton radiotracking project, so no roosts had been found on Amberfield at that stage. It was discussed at caucusing that it was very important for this case to obtain the final report on this work. At this stage we have not received the final report, but it may be available before the hearing of the Director-General's Submission. I would like to be able to comment on this document at the hearing if it is available.

4. THE CONSERVATION STATUS OF LONG-TAILED BATS

4.1 DOC administers the Wildlife Act 1953 and long-tailed bats are Absolutely Protected Wildlife under this Act.

4.2 Bats were once common in New Zealand and were regularly seen by early settlers before the 1900's with descriptions of being seen in their "scores", "hundreds" and "thousands" (O'Donnell 2000a). The range and the numbers of bats have declined significantly since humans arrived, and in many areas continue to decline and are

threatened with extinction (O'Donnell et al. 2010, O'Donnell et al. 2018).

4.3 The long-tailed bat is now assigned to the category most at risk of extinction "Nationally Critical" (O'Donnell et al. 2018). This is assessed by a team who predicted a 70% decline over the next three generations of bats based on studies where the rate of decline was much greater in unmanaged populations (5-9% per annum; Pryde et al. 2005, 2006; O'Donnell et al. 2017).

4.4 Declines in bats in New Zealand result from a combination of threats including habitat loss through land clearance, predation and competition by introduced predators, habitat degradation, fragmentation and disturbance at roosts. Introduced predators including stoats, rats, cats and possums have all been implicated in the decline of bats (O'Donnell 2000a, 2000b, Pryde et al. 2005, O'Donnell et al. 2010, Scrimgeour et al. 2012). In the Eglinton Valley in Fiordland National Park, the population was declining at 5% per annum due to predators (Pryde et al. 2005) whereas in South Canterbury the population was declining by 9% per annum due to a combination of predators, habitat fragmentation and poor-quality roosts (Pryde et al. 2006).

4.5 DOC has led an active recovery programme for bats since 1995. The Recovery Plan, published in 1995 assessed the recovery potential of bat taxa, developed recovery objectives, identified priorities and produced a general guide to management actions for the next 10 years 1995-2005. The range of management tools includes

a) legal mechanisms for protection (National Parks)

b) general advocacy and education Eglinton Valley, Pelorus Bridge, Project Echo).

c) developing community-based conservation (Project Echo, Catlins)

d) control of exotic pests particularly introduced predators at key sites (Eglinton Valley, Pureora, Kahurangi National Park, Whirinaki)

e) active protection of roosts (South Canterbury)

f) protection and restoration of aquatic and terrestrial foraging habitats

4.6 There are also other organisations and individuals that are involved in bat conservation in New Zealand. In this case, the Hamilton City Council hosts Project Echo, which aims to gather information on long-tailed bat distribution throughout the city, identify bat roosting sites and raise awareness about the needs and threats of bats. Waikato Regional Council, Hamilton City Council and Riverlea Environment Society Inc. are the main project partners. In addition, Waikato Museum has run successful bat tours since 2010 raising community awareness and providing environmental education.

5. SPECIALIST REQUIREMENTS OF LONG-TAILED BATS

5.1 Long-tailed bats have specialist requirements in terms of their breeding sites, home range and foraging requirements, which makes them particularly vulnerable to human threats.

5.2 Long-tailed bats can be very long-lived (>20 years) therefore they can persist in the landscape for a long time.

5.3 Long-tailed bats breed once a year and generally only have one pup. An adult female can start breeding between the ages of 1 and 3 years. Adult females congregate together in maternity roosts between November and March. They generally move to a new roost each night carrying the young with them.

5.4 They shelter and breed in roost trees. The cavities they select are very specific and these can be quite rare in the landscape even in forest (e.g. only 1.3 % of cavities had optimum characteristics for breeding in the Eglinton Valley (Sedgeley & O'Donnell 1999a). They generally select older and larger trees for maternity roosts and relatively rarely roost under bark and in caves and buildings. In unmodified beech

forest they usually select trees which are >80 cm in diameter that tend to be 200 to >600 years old (Sedgeley & O'Donnell 1999b).

5.5 Roost cavities tend to be well insulated, which provide significant energy conservation benefits compared to other cavities (Sedgeley 2001). A typical preferred roost will increase in temperature slowly through the day reaching a peak at dusk when the lactating females leave the young alone whilst foraging. High temperatures are retained throughout the night until the mothers return.

5.6 Where long-tailed bats persist in modified landscape such as the outskirts of Hamilton and in South Canterbury they often still select the largest and oldest trees available, although these are frequently exotic trees. In South Canterbury from 1999-2018, 71% of roosts are in exotic trees, particularly willows but also oak, acacia, poplars, conifers and standing dead trees.

5.7 The trees in South Canterbury that bats were forced to use were suboptimal for breeding as they were poorly insulated, and survival of young was very low (only 24%) compared to Fiordland where virtually all young survive to fly (Sedgeley & O'Donnell 2004; O'Donnell & Sedgeley 2006).

5.8 There is a similar pattern of roost use in Hamilton. Of the 55 roosts found in the Hamilton City Council (HCC) project, 82% of the roosts are in exotic trees. Trees used varied from Tasmanian blackwood, black locust and macrocarpa to eucalyptus (Davidson-Watts Ecology 2018, HCC data). Three of the roost trees identified by the HCC project were located on the proposed Amberfield proposed subdivision (Figure 1). At least one of the roosts is planned for removal with the proposed Amberfield subdivision.

Figure 1 : Roosts found by the Southern links radiotracking project 2018/19 within the vicinity of the Amberfield subdivision. (pink circles = roosts, green line = boundary of Amberfield, (HCC data, unpublished).

5.9 Long-tailed bats have large home ranges based on radiotracking studies. In the Eglinton Valley a colony of bats ranged over 117 km^2 (11700 ha) during the breeding season with individuals flying up to 19 km between roosting and foraging areas (O'Donnell 2001).

5.10 Across that home range, individual bats spread out across the landscape and use the habitat in clusters visiting specific foraging grounds night after night (averaging 300 - 2000 ha depending on age, sex and time of the breeding season). In addition, roost trees were concentrated in smaller area of forest (426-1391 ha) (O'Donnell 2000c).

5.11 While long-tailed bats in the Eglinton Valley have the largest home ranges known, ranges of bat colonies studied in fragmented habitats in the North and South Islands, including Hamilton, are still very large. Dr Borkin (paragraph 32) stated the home ranges of the individual studies done by Dekrout (2009) and Davidson-Watts Ecology 2018.

However, If the individual bat locations from the two studies in Hamilton are combined (data from the DOC database) the colony range is much larger – the width of the range is 9.5 km covering > 7000 ha (Figure 2) Similarly, large cumulated range widths have been calculated other bats living in fragmented landscapes. For the Grand Canyon bat population in the King Country the range width was 12 km (DOC, unpublished data) and 9 km in the fragmented landscapes of South Canterbury (O'Donnell 2000c, Sedgeley & O'Donnell 2004).

Figure 2 : Presence/absence and roost data that is held on the DOC database (white circles=presence, black small circles=absence, pink filled in circles=roosts). Data from Dekrout 2009, Davidson-Watts Ecology 2018, Hamilton City Council and DOC data. Green line is the proposed Amberfield subdivision area.

5.12 Bats require a large home range to find enough resources for roosting and foraging. They spread themselves around the landscape to reduce competition for resources (O'Donnell 2001, Dekrout 2009).

5.13 Research on long-tailed bats indicates that high quality breeding roosts are relatively rare in the landscape even in forests and once bats choose these roosts, they are relatively inflexible about moving to other roosts (Sedgeley & O'Donnell 1999a, 1999b, Sedgeley 2001,

O'Donnell & Sedgeley 2006). Hamilton bats may already be using suboptimal roosts and if roost trees are lost at a high rate then bats will be severely limited in where they can roost and breed.

5.14 Given that bats are critically endangered and are already facing many accumulative threats in Hamilton, the loss of more roosts in the landscape may ultimately lead to the extinction of the Hamilton bats.

6. SIGNIFICANCE OF THE AMBERFIELD AREA FOR LONG-TAILED BATS

6.1 Based on acoustic work that I have undertaken around the country, the Amberfield project area showed very high levels of bat activity in the northern parts of Amberfield and high activity in the southern part (Figure 3) Bats were recorded at 88% of the summer surveys and 100% of the autumn surveys (Boffa Miskell, 2018.

Figure 3: combined data from the summer and autumn surveys showing bat activity. Black dots=no activity and yellow circles = bat activity (size of activity related to number of bat passes). Data from Boffa Miskell.

6.2 The acoustic survey was adequate to show bat activity in the area but to determine the value of individual trees or clusters of trees for long-tailed bats there needs to be either more acoustic recorder surveys or further radiotracking work to show the importance of microhabitats as the survey did not focus on all the specific clusters of trees or single trees. In a survey done in Ruakura, in the north-east of Hamilton, all trees, including lone trees, had high levels of activity showing the importance of any trees in this landscape (Figure 4) (Data supplied by Boffa Miskell).

Figure 4 : Long tailed bat records from the Ruakura site in Hamilton East. Virtually every tree monitored detected bats (green circles = bats detected, black circle outline = survey done but no bats detected) Data from Boffa Miskell and DOC database.

6.3 The original AEE stated that "the relative levels of activity do not indicate that the bats are regularly roosting within the development footprint" (page 47 Section 5.7.2). However, the subsequent HCC radiotracking project found three bat roosts on the Amberfield site in

March 2019 (Figure 1). This shows the limitations of interpreting acoustic data and the importance of a radiotracking study.

6.4 I agree with Mr Kessels that there is insufficient evidence to understand how the site is being used in its entirety by long tailed bats (Paragraph 66). The acoustic survey done by Boffa Miskell was not adequate to answer questions like the importance of single or small clusters trees. Added to this three of the recorders failed in the Boffa Miskell summer survey and were not repeated – two of these sites were in areas of vegetation that is proposed for removal (Boffa Miskell, 2018: Appendix 13.3).

6.5 The presence of roosts of the critically endangered long-tailed bat and the bat habitat in the Amberfield area is significant in the context of section 6(c) of the RMA and Section 11 of the WRPS (see Mr Riddell's evidence paragraphs 61-64).

6.6 Habitats that support threatened species are significant by definition. Threatened species are in low numbers therefore small populations are significant to sustain current reduced populations and for the recovery of the species. The breeding potential of every individual is crucial to buffer against incremental loss and the threat of extinction. Bats around Hamilton are important because of their threat status within the Hamilton Ecological District and the rarity of bats persisting in the peri-urban environment nationally. The presence of bats in a city provides opportunities for public participation in their recovery (eg. Project Echo https://www.waikatoregion.govt.nz/environment/natural-resources/biodiversity/project-echo/).

6.7 Whilst acknowledging that this case refers only to Amberfield, there has to be some consideration of the wider landscape that the bats of Hamilton inhabit, the pressures on this landscape and the incremental effects on bats. Amberfield cannot be considered in isolation. The bats using the Amberfield site have been, are being and will be affected by the development projects within their colony home range. Already there has been loss of bat habitat in southern

Hamilton and now with the proposed Amberfield development, the future Peacocke subdivision and the Southern Links Roading project it is unknown whether the bat population will be able to withstand these pressures.

7. POTENTIAL IMPACTS OF AMBERFIELD ON LONG-TAILED BATS

7.1 Studies of bats in urban areas show that the habitat use of bats decreases in urban areas (Jung & Threlfall, 2016). This was shown in a Hamilton study where an increase in housing density showed a decrease in bat activity (Dekrout 2009; Dekrout et al. 2014). The habitat within the subdivision may therefore become unsuitable for bats due to a combination of housing density, roading density, artificial light and existing roost trees being lost and an increase in urban predators e.g. cats.

7.2 The potential adverse effects on bats will be

a) disturbance, direct deaths, injury, displacement through felling of roost trees during the construction of the proposed subdivision

b) loss and fragmentation of feeding habitat and shelter within the proposed sub-division

c) potential loss of critical present and future breeding roosts leading to significant adverse effects which may threaten the viability of the Hamilton population of bats.

d) increased noise and the introduction of permanent lighting in the sub-division impacting on the feeding, foraging, drinking and commuting of bats (Hale et al.2015, Russo et al. 2017).

e) impacts of construction (noise, lighting, vibration) on feeding.

f) impacts of increased traffic on bats including avoidance and possible deaths.

g) increase of urban predators e.g. cats

7.3 These adverse effects are acknowledged by the applicant in the AEE (Section 5.7.2) and verified by Boffa Miskell (2018). I agree with Dr Borkin in that, although there is no substantive evidence to date that noise affects long-tailed bats, a precautionary approach should be taken.

7.4 Even if bats are not killed directly during tree felling, the loss of even one or two maternity roosts could be potentially catastrophic for this population if they cannot find other sites. Bats may be forced to find suboptimal roosts which have been proven to reduce breeding success and survival (O'Donnell & Sedgeley 2006, Borkin et al. 2011).

7.5 Of the 55 roosting trees found in the Hamilton radiotracking project, only 10 trees were native (Kahikatea) and all the rest were introduced species including Tasmanian blackwood, pine, eucalyptus and black locust (Davidson-Watts Ecology 2018, HCC tracking data 2018/19 unpublished). Introduced trees generally have lower thermal benefits compared to native trees.

7.6 It is likely that due to the fragmented nature of the landscape and the lack of native and introduced trees, bats are already having to use sub-optimal roosts therefore the loss of any potential current and future roosts is likely to adversely affect this population further and may eventually lead to a non-viable population.

7.7 The Amberfield site has limited roosting trees for bats; the main sites include the river margins, the gully in the south, the east-west shelter belt in the north, the line of trees on the west boundary (running north-south) along with small clusters and isolated trees mainly north of the EW shelter belt (Figure 5).

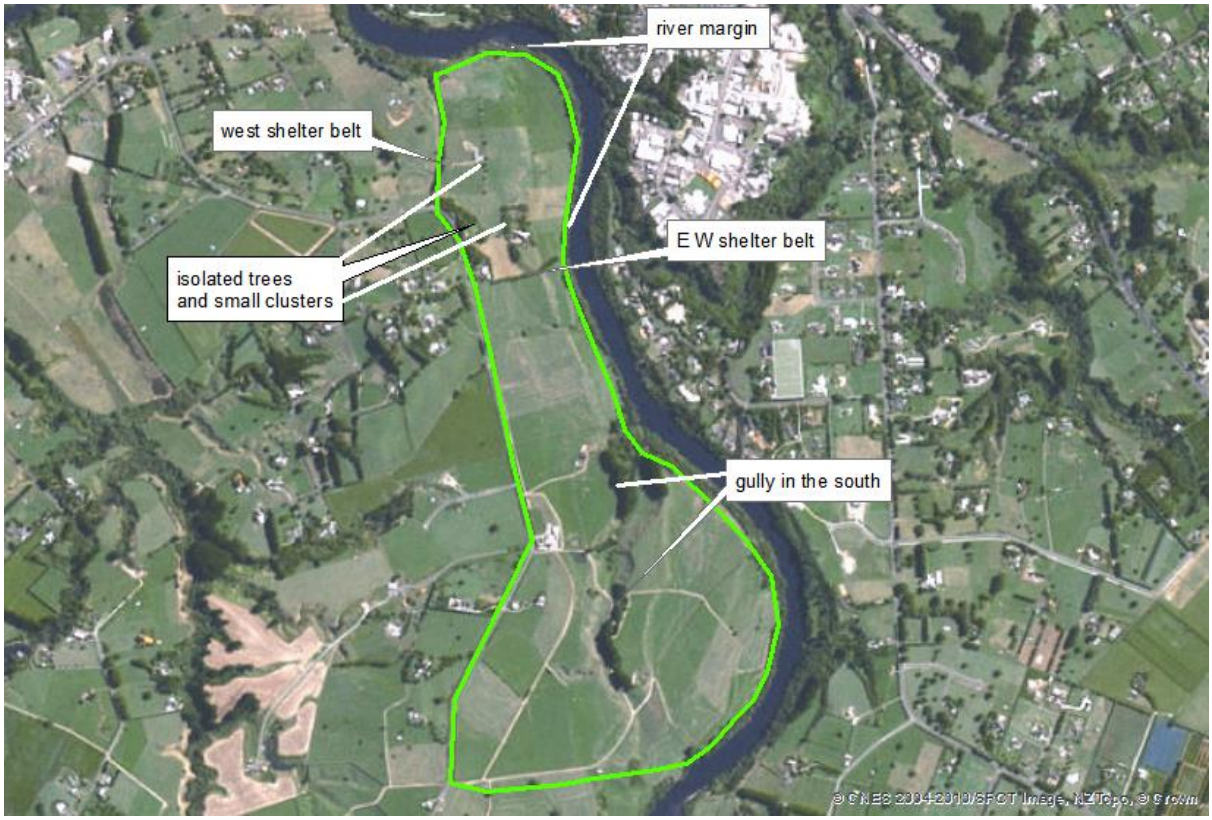

Figure 5: Current possible roosting sites for bats within Amberfield (green boundary).

This makes what is currently available very important. The three roosts located in the proposed subdivision are on the river margins and in a small group of trees around a property north of the shelter belt (Figure 5). Given the very short duration of the radiotracking study, which only provides a short snapshot of bat activity, it is highly likely that there are more roosts and hence my recommendation is to keep all current trees or do a long-term radiotracking study to identify all roosts.

7.8 Currently it is proposed that the line of trees in the west (running north-south), the clusters of trees and the single trees will all be removed (Figure 5). The Southern Links Roading project to the west of Amberfield has been required to do a radiotracking project to determine the location of the roosting areas. This information is important for the Amberfield site and has only just been released. The latest data on this project found one roost in the ornamental gardens in an area that was categorized as “low” ecological value (Boffa

Miskell 2018) and two on the river margins of Amberfield. It is highly likely that there are other roosts on the Amberfield site.

7.9 Single trees and small shelter belts can be incredibly important in a fragmented landscape. For example, in a study I was involved with in South Canterbury there were bats found regularly roosting and breeding in single isolated roost trees (Sedgeley & O'Donnell 2004).

7.10 I agree with Dr Borkin that the roosts found on the Amberfield site may be communal or solitary as only one roost was monitored for one night and therefore disagree with Georgia Cummings evidence where she states in paragraph 63 that all the roosts are solitary.

7.11 Artificial lighting is known to affect the commuting behaviour, foraging patterns and reproductive cycles of bats (Longcore & Rich 2004, Stone et al. 2009, Stone et al. 2015). Lighting is thought to increase the chance of predation (Speakman et al. 1991, Jones et al. 1994) and delay emergence from roosts meaning that bats miss out on the peak of dusk insect activity (Boldogh et al. 2007). If lighting is used along river corridors this may alter commuting patterns and potentially cutting off bats from their foraging grounds (Hale et al. 2015).

7.12 The Hamilton bat studies, highlighted a negative relationship between increasing artificial light intensity, roading and housing density and long-tailed bat activity (Dekrout et al 2014, Le Roux & Waas 2012a, Le Roux & Le Roux 2012b). This was supported by modelling that showed the probability of bat presence was inversely related to the distance to residential areas and street lighting (Crewther & Parsons 2017).

7.13 The first part of the recent radiotracking survey done by HCC found that generally bats are using the southern parts of Hamilton and this is associated with a lower density of housing and artificial lighting (Davidson-Watts Ecology 2018).

7.14 This radiotracking study also demonstrated the fact that bats disperse across open agricultural land (Davidson-Watts Ecology 2018). Ms Cummings stated that open pasture is of low value to bats (paragraph

37) and Dr Parsons also states that open pasture is not significant (paragraph 89). I believe that the acoustic recorder work done was not adequate to support these statements, and the limited radio tracking contradicts the assertions of Dr Parsons and Ms Cummings.

8. AN ASSESSMENT OF THE ADEQUACY OF THE PROPOSED MITIGATION AND CONDITIONS OFFERED FOR LONG-TAILED BATS

8.1 Overall, I think there has not been enough consideration to avoidance of the removal of bat habitat. The conditions offered in attachment 4 of the Section 42A focus on remediation and mitigation using methods that are mainly experimental.

8.2 I agree with Condition 83 to enhance the riparian vegetation along the Waikato River and the creation of a vegetative buffer to provide habitat in Condition 84, but the buffer shown on Boffa Miskell revision H is less than 100 m wide in many places. Kessels (2019) recommends a 100 m buffer and this is supported by the modelling done by Crewther and Parsons (2017). I agree that a 100 m buffer should be used as a minimum width while acknowledging that this is experimental.

8.3 I agree with the concept of a Bat Habitat Reserve proposed in Condition 85, but this is a very small reserve in the context of a species that can have a colony home range of >11,000 ha (O'Donnell 2001). Accumulating the presence/absence and roost data from the two main studies in Hamilton, the cumulative range width is 8.5 km with bat activity over at least 7000 ha (Dekrout 2009, Davidson-Watts Ecology 2018, unpublished data from Hamilton City Council and DOC) (Figure 2).

8.4 Habitat for bats need to be connected and considered at a landscape scale rather than one small reserve. I do, however, acknowledge that this reserve will connect with the east – west shelter belt and there is a plan that this corridor could be extended over to the

Mangakotutuku Gully, but there is no certainty that this will happen (Boffa Miskell 2019: Figure 1).

8.4 I agree with Condition 86 that the east-west shelter belt should be retained and enhanced to maintain a movement corridor for bats. The design includes a 20 m buffer on the northern edge of the east-west corridor but no buffer on the southern edge. The south western boundary of the shelter belt is on the boundary of the proposed residential area and so will be subject to artificial light from the houses and the threats described by Dekrout (2009). Buffers are a minimum requirement around the whole habitat area, and I think it unlikely that such a narrow buffer will shield the bat habitat from disturbance, noise and light spill nor does it meet the experimental 100 m requirement proposed by Kessels (2019).

8.5 Condition 87 states that a bat sensitive lighting regime will be implemented along the roads but does not mention the pathways or the housing. The effects of the paths and the housing need to be taken into account when measuring light levels and the effectiveness of buffers. There are solutions to reducing lighting including central monitoring systems which allow for remote switching off or dimming when human activity is low or when bat activity is high (Stone et al 2015). The implementation of a lighting system needs to be a collaborative process between a bat ecologist and a lighting specialist and would have to be seen as an experimental process (Bat Conservation Trust 2018) with monitoring to assess the effectiveness. I agree with the reference from Dr Borkin's evidence that the light levels should not exceed 0.1 lux.(paragraph 70).

8.6 Condition 89 states that bat roost removal will be avoided or minimized. In my opinion roost removal should be completely avoided, as felling breeding roosts could be catastrophic for the bat population. The tree habitat that is proposed to be removed include the shelter belts to the north west and the single and groups of trees in the north which has been described as "low quality habitat" (Boffa Miskell 2019). Clearly these areas are <u>not</u> low - quality habitat for long-tailed bats as demonstrated by recent radio tracking studies.

There has already been one roost found in this area during the short radio tracking sessions undertaken and it is likely that there are more.

8.7 Condition 90 refers to bat management of roosts and habitat loss. As stated in 8.6, roost removal should be avoided and therefore setting up tree felling procedures is contrary to this. I am reluctant to promote the use of tree felling protocols. The loss of a single roost could be catastrophic for this population when there has been incremental loss of roosting habitat over time from other development projects in Hamilton City. Bats do not just choose any tree to roost and breed in, but trees that provide for their specialised requirements. Therefore, each and every tree available is important to allow them choice. Given the already fragmented nature of the landscape, it is likely these roosts are rare and precious habitats to the bats.

8.8 Condition 93 states that there will be annual monitoring over 15 years using acoustic recorders. The monitoring would need to be carefully designed with a pilot study if the aim is to show whether there is a change in the activity over the Amberfield site. Changes in activity, however, may mean population changes but it could also mean a behavioural change where bats may have moved to a new area. As bats have a large home range, any population changes mean monitoring would have to cover the combined home range and include an adequate number of acoustic monitors to detect a change. This would be determined by a power analysis with preliminary data. Wildlands (2018) has given some guidance for a monitoring design for the Southern Links roading project Hamilton. I would advise that any monitoring for bats should be designed by a DOC approved statistician in consultation with Wildlands.

8.9 There is no specific condition for pest control. It is clear from research that predator control in perpetuity is required for management of long-tailed bats. Current recommendations from DOC include control of stoats, rats, cats to low levels (rats to below 5% tracking rate) in perpetuity over an area of 3350 ha. Cats are major predators of New Zealand bats (O'Donnell 2000; Scrimgeour et al. 2012). Predator

control needs to be considered at a landscape level but the Amberfield subdivision should include a no-cats bylaw and on-site pest control should include cat control in the subdivision and control of all pests along the river margins, the shelter belt and any other vegetated area likely to be used by bats.

8.9 Overall, I agree with Mr Riddell that the proposal does not give enough assurance that there will be no significant adverse residual effects to the bat population, and it should be significantly redesigned.

9. CONCLUSIONS

9.1 The Amberfield subdivision contains significant habitat for a population of the critically threatened long-tailed bat making it significant under the RMA. Sustaining populations of threatened species is of national importance.

9.2 Sustaining wildlife populations is defined as ensuring the persistence of sufficient foraging, roosting and breeding sites for species to maintain viable populations in perpetuity There needs to be sufficient habitat available so that bats can disperse and still thrive if conditions change.

9.3 I have outlined the potential negative effects of the development and would describe the mitigation proposed as inadequate and experimental leaving significant adverse residual effects.

9.4 Long-tailed bats may have the capacity to survive in urban areas if enough forest or woodland habitat remains with suitable roosting and breeding habitats, if there is good connectivity between habitats, if predation by introduced predators is minimised and there is a reduction in lighting to below 0.1 lux.

9.5 The strategy of planting is experimental and involves a time delay before you know if it is working. Avoiding the loss of any mature vegetation will be preferable rather than trying to grow it again, as

the bat population may not persist over the time it takes to grow new habitat of suitable quality.

9.7 I agree with Mr Riddell that the proposal needs to be significantly revised.

Moira Anne Pryde

23rd April 2019

10. REFERENCES

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