BEFORE	the Hearing Panel appointed by Waipā District Council
IN THE MATTER	of the Resource Management Act 1991 (**the Act**)
AND	
IN THE MATTER OF	of Private Plan Change 20: Titanium Park Limited and Rukuhia Properties Limited – Airport Northern Precinct Extension

---

STATEMENT OF EVIDENCE OF TERTIA THURLEY FOR THE DIRECTOR-GENERAL OF CONSERVATION

7 MARCH 2023

Counsel for the Director-General of Conservation:
Michelle Hooper
Senior Solicitor
Department of Conservation / Te Papa Atawhai
Telephone: 027 324 6314
Email: mhooper@doc.govt.nz

Contents

1. INTRODUCTION

1.1. My full name is Tertia Thurley**.**

1.2. I am employed by the Department of Conservation (DOC) as a Technical Advisor Ecology. My current role involves providing bat advice to DOC internal staff and external agencies.

1.3. My qualifications are a BSc (1987) and Master of Arts (Environmental Studies)(1996) from Victoria University of Wellington.

1.4. I have worked for DOC since 1996. Most of my work during this time has involved monitoring and management of threatened species.

1.5. I have 12 years' experience working with bats in New Zealand. I have extensive direct experience of surveying, radio-tracking, roost finding, catching and handling bats.

1.6. My work has included establishing a short-tailed bat conservation project at Pureora Forest over a 5-year period, which I continue to lead. This project involves catching, radio tracking, PIT tagging and monitoring long-term survival of short-tailed bats, thus measuring responses to our pest control regimes at Pureora.

1.7. I established, participated in and had oversight over a long-tailed bat project at Pureora, which ran from 2011 to 2017. This project involved catching and tagging long-tailed bats, radio tracking bats to their roosts, assessing tree roosts and capturing bats at roosts, again to measure their long-term responses to predator control. I have also been involved with establishing another long-tailed bat mark-recapture project in the King Country and have advised on various bat projects in Northland.

1.8. I am certified as a "Trainer" for most bat competencies by DOC's Bat Recovery Group, which means that I am considered highly competent to catch, handle and mark bats as well as undertake survey and monitoring, and to train others in these skills.

1.9. I led the New Zealand DOC Bat Recovery Group from 2019 to 2022, and I am a current Recovery Group member. As such, I have oversight of much of the research and management that involves bats in New Zealand.

1.10. I have been engaged by the Director-General to provide expert evidence for Proposed Plan Change 20 as it relates to effects on long-tailed bats.

2. CODE OF CONDUCT

2.1. I confirm I have read the code of conduct for expert witnesses as contained in the Environment Court's Practice Note 2023. I have complied with the practice note when preparing my written statement of evidence and will do so when I give oral evidence before the hearing panel.

2.2. The data, information, facts and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in the evidence.

2.3. Unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

3. SCOPE

3.1. I have been asked to provide evidence in relation to long-tailed bats. My evidence addresses:

a) The threat status of long-tailed bats;
b) What bat populations need in order to persist;
c) The current threats to the bat population in south Hamilton;
d) The prospects for the future of the bat population in south Hamilton;
e) The significance of the Plan Change 20 site for long-tailed bats;
f) The effects of the Plan Change proposal on the south Hamilton long-tailed bat population;
g) Proposed long-tailed bat monitoring; and
h) The adequacy of proposed mitigation and compensation measures.

3.2. I have reviewed and considered the following documents in forming the opinions set out in this evidence:

Titanium Park Ltd and Rukuhia Properties Ltd evidence in Chief:

a) Ms Georgia Cummings (Ecology – Long-tailed bats)
b) Mr Josh Markham (General Ecology – Offset and Compensation)
c) Mr Ben Inger (Planning – Ecology topic)

d) Mr John McKensey (Lighting)

Section 42a report

Northern Precinct Expansion Assessment of Ecological Effects June 2022. Tonkin + Taylor

Northern Precinct Section 32 Evaluation

Titanium Park Limited and Rukuhia Properties Limited – Request for Private Plan Change

4. EXECUTIVE SUMMARY

4.1. The long-tailed bat has a threat classification of Threatened – Nationally Critical. It occurs only in New Zealand and is predicted to decline by >70% over the next three generations of bats (c. 36 years).

4.2. A long-tailed bat population inhabits the southern edge of urban Hamilton and the rural land to the south. This local population is currently very vulnerable to extinction, particularly because it exists in a habitat that has been heavily modified by people. Factors contributing to this vulnerability include:

a) A small population size.
b) A relative scarcity of trees resulting in limited foraging, commuting and roosting sites. This means that the population is likely to have low productivity compared to other populations.
c) Tree-felling which, as well as further depleting the number of roost trees, can result in direct death of bats.
d) Predation from introduced predators.
e) Elevated levels of light and noise associated with roading, housing and industry.

4.3. However, in my opinion the greatest threat to the persistence of this local population into the future comes from the ongoing reduction in the space available for the bats to live in, and the continual clearance of woody vegetation, including roost trees. The most preferred habitat types (open water and tree stands) are sparse and the second-most preferred habitat types (including agricultural habitats and lifestyle blocks) will decrease significantly due to the expansion of urban and industrial areas which are

already planned (e.g. Peacocke Structure Plan Area, Airport Business Zone) within the home range of this population.

4.4. Bats cannot just move to a different, more suitable location. They stay in the same social groups and return to the same roosts and foraging grounds year after year. As habitat for them declines, they will have to find resources to survive and breed from a smaller and smaller area.

4.5. The habitat in the Plan Change area is rural i.e. the habitat type which is the second-most preferred by long-tailed bats, and the habitat type which is most rapidly disappearing in south Hamilton as it changes to urban and industrial.

4.6. The Plan Change 20 site is used by bats for commuting and foraging, and as such meets the criteria as significant habitat under Criteria 3 of the Waikato Regional Policy Statement.

4.7. The Plan Change 20 proposal will completely or almost completely exclude bats from the entire site that is industrialised (including 89ha of land re-zoned from rural to Airport Business Zone and 41ha already zoned Airport Business Zone). In my opinion there is high uncertainty whether the 5ha "Bat Habitat Area" proposed for the site will be used by bats.

4.8. The 11ha site conditionally purchased as a compensation site is positive. However, the enhancement of 16ha to mitigate and compensate for the removal of 84-89ha[1] of bat habitat is not enough in the context of the large portion of this population's habitat which is already planned to be removed.

4.9. In my opinion, continuing to rezone land within this population's home range from rural to urban and industrial is incompatible with its persistence which depends on the retention of functional habitat that is within the home range of this local population.

[1] Hectarage dependent on whether the bats use the proposed "Bat Habitat Areas", and not including the 41ha already zoned ABZ

5. LONG-TAILED BATS ARE CRITICALLY THREATENED

5.1. New Zealand has three native bat species, found only in New Zealand: the long-tailed bat (*Chalinolobus tuberculatus*), lesser short-tailed bat (*Mystacina tuberculata*) and greater short-tailed bat (*Mystacina robusta*).

5.2. The greater short-tailed bat may be extinct. The lesser short-tailed bat is confined to relatively large forests and flies and feeds under the canopy within the forest. The threat classification of the three subspecies of lesser short-tailed bat is: Northern short-tailed bat (Threatened-Nationally Vulnerable), Central short-tailed bat (At Risk-Declining), and Southern short-tailed bat (At Risk-Recovering)[2]. The predominant current threat to short-tailed bats comes from predation.

5.3. Long-tailed bats roost within forest but are adapted for foraging in the open along forest margins and above the canopy. This has enabled the long-tailed bat to persist in human-modified environments, however the threats to bats in these environments are many. A population of long-tailed bats persists in south Hamilton and is the subject of this evidence.

5.4. Long-tailed bats are predicted to decline by >70% over the next three generations of bats (c. 36 years). As such they have the highest threat ranking of Threatened-Nationally Critical.[3]

5.5. Threats to long-tailed bats include predation from introduced predators, habitat destruction, habitat modification and habitat fragmentation. While long-tailed bats once occurred throughout NZ and were reported in their hundreds and thousands[4] their current distribution is widespread but fragmented. An example of the ongoing decline comes from Fiordland, where the colony collapsed between 1999 and 2001, thought to be due to predation[5]. Another example is from Geraldine between 2006 and

---

2 O'Donnell, C.F.J.; Borkin, K.M.; Christie, J.E.; Lloyd, B.; Parsons, S.; Hitchmough, R.A. 2018: Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington. 4 p. http://www.doc.govt.nz/Documents/science-and-technical/nztcs21.pdf

3 O'Donnell, C.F.J.; Borkin, K.M.; Christie, J.E.; Lloyd, B.; Parsons, S.; Hitchmough, R.A. 2018: Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington. 4 p. http://www.doc.govt.nz/Documents/science-and-technical/nztcs21.pdf

4 O'Donnell CFJ 2000b. Conservation status and causes of decline of the threatened New Zealand Long-tailed Bat *Chalinolobus tuberculatus* (Chiroptera: Vespertilionidae). Mammal Review 30: 89–106.

5 Monk JM, O'Donnell CFJ 2017. Social implications of a colony collapse in a highly structured vertebrate species (long-tailed bat, *Chalinolobus tuberculatus*) Animal Conservation 20. Pp360-369

2013, with the collapse of the colony associated with tree felling and draining of a wetland habitat.[6]

6. WHAT DO BATS NEED? – ROOSTS, FOOD, DARK, QUIET, SPACE, PROTECTION FROM PREDATION AND ROUTES TO TRAVEL THROUGH THE ENVIRONMENT.

6.1. Long-tailed bats need suitable trees to roost in. Long-tailed bats shelter and breed in trees (termed roost trees), most frequently in the forest, but also in isolated trees in the open[7]. Roosting cavities used by bats have very specific thermal properties and are generally very rare in the landscape even when in indigenous forest. For example, maternity roosts, where females raise their young, allow for juvenile bats to stay warm at night while female bats leave to forage. In a study in the Eglinton Valley in Fiordland only 1.3% of random trees above 20cm diameter at breast height (DBH) had optimum characteristics for breeding[8]. At different times of the year bats need roosts with different thermal characteristics, and males select roosts with different thermal characteristics than female bats[9]. In the Hamilton context, this makes any existing trees very important for long-tailed bats.

6.2. Long-tailed bats need food. They eat flying insects – flies, moths and beetles - which they take on the wing. They are edge-foragers, typically feeding close to forest edges, using for example the forest/pasture edge for foraging.[10] However, they also use pasture around small groups of trees or single and scattered trees.[11] In the Hamilton context, given the comparative lack of trees, this makes any existing trees and hedges, along with the pasture that surrounds them, very important for long-tailed bats. It may also mean that pasture is more important than in a forested landscape, though even in a forested landscape bats forage over open

---

6 DOC Unpublished data

7 Sedgeley JA, O'Donnell CFJ 2004. Roost use by long-tailed bats in South Canterbury: examining predictions of roost site selection in a highly fragmented landscape. NZ J Ecol 24(1):1-18

8 Sedgeley JA, O'Donnell CFJ 1999. Roost selection by the long-tailed bat, *Chalinolobus tuberculatus*, in temperate NewZealand rainforest and its implications for the conservation of bats in managed forests. Biological Conservation 88:261–276.

9 Borkin KM, Parsons S. 2011. Sex-specific Roost Selection by Bats in Clearfell Harvested Plantation Forest: Improved Knowledge Advises Management. Acta Chiropterologica, 13(2):373-383

10 O'Donnell CFJ, Borkin KM 2021.*Chalinolobus tuberculatus.* In: King CM, Forsyth DM. The Handbook of New Zealand Mammals. Third Edition. CSIRO Publishing, Melbourne

11 Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

pasture away from trees[12]. If the area of open pasture is too great it may act as a barrier to movement.

6.3. Long-tailed bats need dark spaces. Bats, being nocturnal, are extremely sensitive to artificial light at night.[13] Several Hamilton studies have suggested that this includes long-tailed bats. DeKrout et al found that lower levels of bat activity were associated with higher housing and street light density.[14] Le Roux and Le Roux found that activity levels were consistently highest at habitats where houses, roads and streetlights were lowest. Even slight increases in the number of streetlights resulted in decreased pass rates of 70%.[15] A baseline survey for the Hamilton Southern Links roading project found that "Highest bat activity rates occurred at sites with low light (≤0.5 average lux), suggesting that long-tailed bats may avoid or use areas with higher light levels less frequently."[16] More recently, in an experimental study at Tamahere, Schamhart found less long-tailed bat activity when sites were lit compared to when they were unlit.[17]

6.4. Long-tailed bats may need quiet places. One study in Hamilton found no apparent relationship between noise and bat activity,[18] another found that aircraft noise may not have major impacts on long-tailed bat activity.[19] However recent experimental work investigating the effect of road noise appears to have found a negative effect of noise on long-tailed bat activity.[20] I have witnessed long-tailed bats leaving roosts during the daytime when people were being noisy near the roost trees.

---

12 Bennett RS 2019. Understanding movement and habitat selection of the lesser short-tailed bat to infer potential encounters with anticoagulant bait. MSc Zoology, Massey University, NZ

13 Voigt, C.C, C. Azam, J. Dekker, J. Ferguson, M. Fritze, S. Gazaryan, F. Hölker, G. Jones, N. Leader, D. Lewanzik, H.J.G.A. Limpens, F. Mathews, J. Rydell, H. Schofield, K. Spoelstra, M. Zagmajster (2018): Guidelines for consideration of bats in lighting projects. EUROBATS Publication Series No. 8. UNEP/EUROBATS Secretariat, Bonn, Germany, 62 pp

14 DeKrout AS, Clarkson BD, Parsons S 2014. Temporal and spatial distribution and habitat associations of an urban population of New Zealand long-tailed bats (Chalinolobus tuberculatus). New Zealand Journal of Ecology 41(4):285-295.

15 Le Roux DS and Le Roux NN. 2012. Hamilton City Bat Survey 2011-2012. Project Echo and Kessels & Associates Ltd.

16 Wildlands 2019. Baseline acoustic monitoring of long-tailed bats for the Southern Links Roading Project, Hamilton: 2017 and 2018. Contract report No. 4192d. Prepared for AECOM.

17 Schamhart T, Tempero G, Browne C, Borkin K, Ling N, Pattemore D. Artificial light at night: does it affect long-tailed bats activity? Abstract from NZ Ecological Society Conference, 28 Nov – 2 Dec 2022, Dunedin, NZ.

18 Wildlands 2019. Baseline Acoustic monitoring of long-tailed bats for the Southern Links roading project, Hamilton: 2017 and 2018. Prepared for AECOM.

19 Le Roux DS, Waas JR 2012. Do long-tailed bats alter their evening activity in response to aircraft noise? Acta Chiropterologica 14(1):111-120.

20 Hart A. in prep. Assessing the effects of anthropogenic (traffic) noise on native wildlife.

6.5. Roads bring both noise and artificial light as well as the danger of moving vehicles. Studies on long-tailed bats have shown the negative impact of roads on bat activity: a New Zealand-wide study found that as traffic volume increases, bat activity decreases,[21] and two Hamilton studies have shown that long-tailed bat activity deceases in the presence of roads.[22] Long-tailed bat collisions with vehicles have been reported.[23]

6.6. Long-tailed bats need space. Long-tailed bat populations exist at a landscape scale, with individuals spread out across thousands of hectares. In Hamilton, Dekrout found male long-tailed bats with home ranges from 25.9ha to 871ha, and 0.8 to 7.3km across.[24] Davidson-Watts found long-tailed bats in the southern Hamilton area used areas from 134ha to 1609ha, and 2.5 to 7.0km across.[25] Because of the short timeframe over which these studies took place, it is very likely that they will not have captured the entire home ranges of the bats which were tracked, and because only a small number of bats were sampled relative to the entire population, other bats may have larger home ranges than those sampled. These large home ranges are required so the bats can find sufficient food, water and roost sites, with individual bats foraging in different parts of the landscape to reduce competition (O'Donnell 2001).[26] Figure 1 is from a report relating to the Southern Links Roading project[27] and shows how a sample of 24 bats are spread out across south Hamilton. The green areas represent the 'core' areas (where the bats spent most of their time) and the green lines represent the home ranges. Because the sample includes a minority of the population (only 24 bats) and because bats spread themselves out, the combined core area for all bats would likely cover a greater area than is shown here.

---

21 Borkin K, Smith DHV, Shaw WB, McQueen JC. More traffic, less bat activity: the relationship between overnight traffic volumes an Chalinolobus tuberculatus activity along New Zealand highways. Acta Chiropterologica 21(2):321-329

22 Wildlands 2019. Baseline acoustic monitoring of long-tailed bats for the Southern Links Roading Project, Hamilton: 2017 and 2018. Contract report No. 4192d. Prepared for AECOM.
Le Roux DS and Le Roux NN. 2012. Hamilton City Bat Survey 2011-2012. Project Echo and Kessels & Associates Ltd.

23 Jones C, Borkin K, Smith D 2019. Roads and wildlife: the need for evidence-based decisions; New Zealand bats as a case study. New Zealand Journal of Ecology 43(2):3376

24 Dekrout A.S. 2009: Monitoring New Zealand long-tailed bats (*Chalinolobus tuberculatus*) in urban habitats: ecology, physiology and genetics. *Unpublished PhD thesis*. University of Auckland, Auckland, New Zealand. 168 pp.

25 Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

26 O'Donnell CFJ 2001. Home range and use of space by *Chalinolobus tuberculatus*, a temperate rainforest bat from New Zealand. Journal of Zoology (London) 253: 253-264.

27 Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

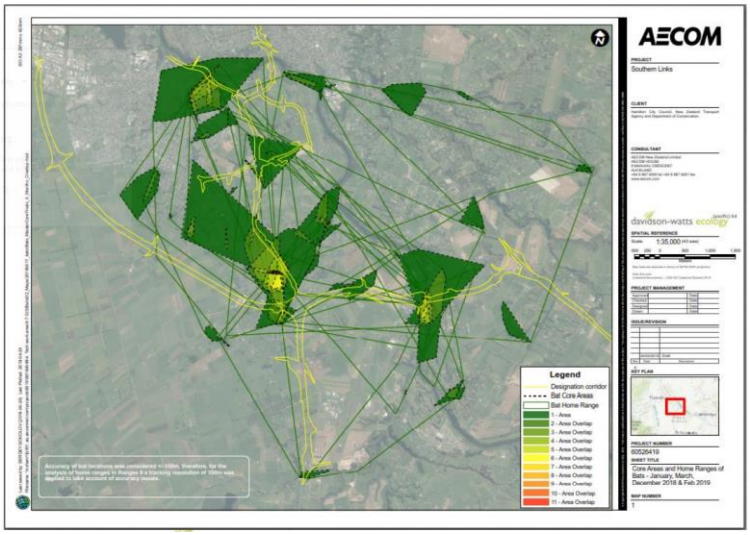

Figure 1. Home ranges and core areas of a sample of 24 long-tailed bats followed for 1-15 days, using radio-telemetry, in south Hamilton.

6.7. Long-tailed bats need to be able to move through the landscape between roosting sites, foraging sites, drinking sites and socialising sites. Because these can be separated by kilometres, pathways that connect them are vital. Things that may deter bats from using these pathways are light, noise and roads, and urban and industrial development.

6.8. Long-tailed bats need protection from predation. Ship rats, possums, stoats and cats have all been implicated in the decline of long-tailed bat populations.[28] Control of these predators in locations where there has been intensive monitoring of long-tailed bats (Fiordland, Geraldine, Piopio and Pureora) indicates that to protect populations from introduced predators, effective pest control must cover all maternity roosts. In Fiordland, recovery of the bat population only happened when all maternity roosts were protected and the pest control area was expanded to over 3000ha,[29] in Geraldine and Piopio bat populations were declining with no pest control,[30] and at Pureora data indicated a declining population with 900ha of pest control.[31] There have been no studies on what predator control is required in urban or rural landscapes to protect

[28] O'Donnell CFJ, Christie, Hitchmough RA, Lloyd B and Parsons S. 2010. The conservation status of New Zealand bats, 2009. New Zealand Journal of Zoology, 37:4, 297-311

[29] O'Donnell, C.F.J.; Pryde, M.A.; van Dam-Bates, P. Elliott, G.P. 2017. Controlling invasive predators enhances the long-term survival of endangered New Zealand long-tailed bats (Chalinolobus tuberculatus): Implications for conservation of bats on oceanic islands. Biological Conservation 214: 156-167.

[30] Pryde MA, Lettlink M, O'Donnell CFJ 2006. Survivorship in two populations of long-tailed bats *(Chalinolobus tuberculatus*) in New Zealand. New Zealand Journal of Zoology, Vol 33:85-95.

[31] DOC unpublished data

bats, however it is clear from the studies in other habitat types that in order to be effective pest control would need to be intensive and include the entire roosting range.

7. THE POPULATION OF LONG-TAILED BATS IN SOUTH HAMILTON IS VERY VULNERABLE TO EXTINCTION

7.1. The long-tailed bat population which remains in Hamilton is concentrated south of the city. Figure 2 shows where bats have been recorded (blue dots) and where bats have been surveyed for and not recorded (black dots). This tells an incomplete picture of bats in Hamilton because there are areas where bats have not been looked for. However, it does show that bats are not often found in the most developed part of the city (even where gullies remain), but are in the south of Hamilton, predominantly on the urban/rural fringe and the rural land beyond, and using the river and gully systems.

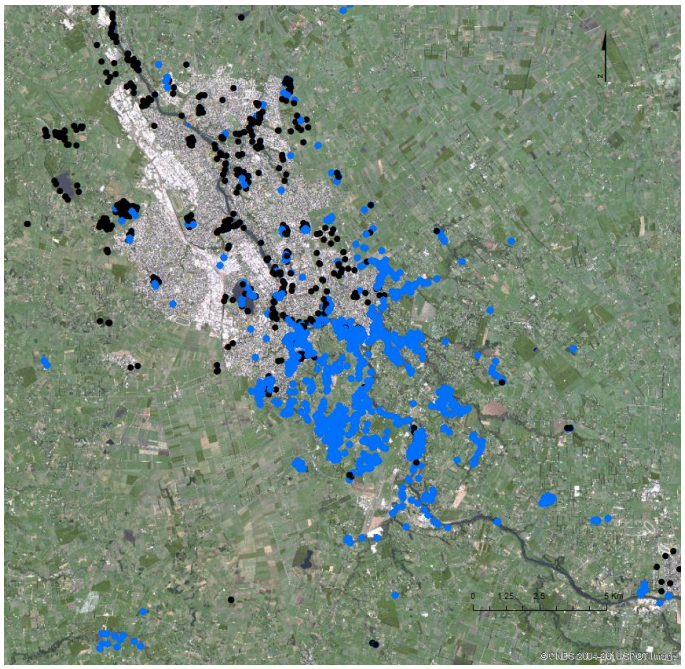

Fig 2. Map of known bat distribution in Hamilton. Blue circles = surveys that found bats, black circles = surveys that did not find bats.

7.2. The presence of long-tailed bats in a city is rare as they have disappeared from almost all other cities in New Zealand. The vegetated river and gully system and the accompanying rural farmland is likely a key reason why bats are still present to the south of Hamilton.

7.3. The original ecosystem types in and around Hamilton city were predominantly wetland and dense podocarp forest. These would have provided an ideal habitat for long-tailed bats. However, less than one percent of these ecosystems remain.[32] The habitat that remains is vastly depleted and heavily modified. This poses challenges for the long-tailed bat population in south Hamilton.

7.4. A minimum population estimate of 61 bats was obtained in 2018,[33] and although the population is likely to be larger than this, it is still an indication that the population is small. Small populations are vulnerable to extinction. This is because events such as the felling of a single tree occupied by bats could kill a high proportion of the population.

7.5. Because bats have very specific roost requirements and there are very few trees remaining in which to roost, bats are likely using sub-optimal trees in which to roost and raise their young.[34] This means that Hamilton bats likely have lower survival and reproductive rates than bats in mature forest.[35]

7.6. Trees are being felled from the landscape. An example of recent tree removal was the removal of two necklace poplar shelterbelts from the Titanium Properties Ltd site in November 2021.[36] Tree removal reduces the edge habitat that bats feed alongside, decreases connectivity across the landscape for bats to move between their roosting and their foraging areas, and reduces the number of roost trees available. There are also examples in the Waikato of direct killing of bats which were roosting in trees as they were felled. Figure 3 shows a bat wing which was severed as a result of tree felling at Tamahere in 2021.

[32] Harding M 1997. Waikato Protection Strategy: A report to the Forest Heritage Fund Committee. Forest Heritage Fund, Wellington.

[33] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

[34] Dekrout A 2009. Monitoring New Zealand Long-tailed Bats (Chalinolobus tuberculatus) in Urban Habitats: Ecology, Physiology and Genetics. PhD thesis. University of Auckland.

[35] Sedgeley JA, O'Donnell CFJ 2004. Roost use by long-tailed bats in South Canterbury: examining predictions of roost site selection in a highly fragmented landscape. NZ J Ecol 24(1):1-18

[36] Tonkin & Taylor June 2022. Northern Precinct Expansion Assessment of Ecological Effects.

Figure 3: Bat wing which was severed from a bat during tree felling at Tamahere

7.7. Long-tailed bats are being preyed upon by rats, possums, stoats and cats.[37] Large areas of pest control are required to protect bat populations from these predators.[38] As far as I am aware there are no pest control operations in Hamilton that cover the thousands of hectares thought to be required.

7.8. A radio-tracking study in Hamilton[39] divided habitat into three categories according to preferences by long-tailed bats:

a) **Most preferred habitats.** These are tree stands and river/open water habitats. They are also the least common, being confined to the river and associated gullies, and to very isolated patches elsewhere.

b) **Second-most preferred habitats**. These were the Parklands, agricultural habitats and lifestyle blocks. These habitats include limited housing, lighting, noise, roads – all of which may deter bats to some degree. These habitat types are now common to the south of Hamilton but are declining as the city grows.

[37] O'Donnell CFJ, Christie, Hitchmough RA, Lloyd B and Parsons S. 2010. The conservation status of New Zealand bats, 2009. New Zealand Journal of Zoology, 37:4, 297-311

[38] O'Donnell, C.F.J.; Pryde, M.A.; van Dam-Bates, P. Elliott, G.P. 2017. Controlling invasive predators enhances the long-term survival of endangered New Zealand long-tailed bats (Chalinolobus tuberculatus): Implications for conservation of bats on oceanic islands. Biological Conservation 214: 156-167.

[39] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

c) **Least preferred habitats.** These were urban and industrial. They are the least used by bats i.e. bats avoid these areas. Where roosts occurred in/close to urban areas the bats, when they emerged from their roosts, mostly flew away from these areas to rural/agricultural areas for foraging. This study supports the pattern shown in Figure 2 where it can be seen that urban and industrial habitats almost completely exclude bats. These habitat types are increasing south of Hamilton.

7.9. The same study found that the female home-range size of Hamilton bats was larger than the male home-range size. This contrasts with a study in an unmodified forest where male bats had larger home ranges than female bats.[40] The difference could be because, in the heavily modified habitat of Hamilton, female bats have to move longer distances to find enough food when they are breeding.[41] Moving longer distances to find food increases the energetic cost to the females and may influence growth and survival of young bats.[42]

8. WHAT ARE THE PROSPECTS FOR THE LONG-TAILED BAT POPULATION IN SOUTH HAMILTON

8.1. In my opinion the greatest threats to this bat population come from the ongoing reduction in the space available for the bats to live in, and the continual clearance of woody vegetation, including roost trees. This population is under increasing pressure from the urban and industrial expansion of Hamilton City and the area to the south of Hamilton City located in the Waipā District, with the more preferred bat habitats planned to significantly decrease in area and the less preferred habitats to increase.

8.2. Figure 4a shows the combined home range of 24 bats which were radio-tracked during 2018 and 2019.[43] This is only a sample of the population, however it provides a starting point to examine on a coarse scale how

[40] O'Donnell CFJ, Christie JE, Simpson W 2006. Habitat use and nocturnal activity of lesser short-tailed bats (*Mystacina tuberculata*) in comparison with long-tailed bats (*Chalinolobus tuberculatus*) in temperate rainforest. New Zealand Journal of Zoology 33:113-124

[41] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

[42] Tuttle MD 1976. Population Ecology of the Gray Bat (Myotis Grisescens): Factors Influencing Growth and Survival of Newly Volant Young. Ecological Society of America 57(3)

[43] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

much habitat will be excluded from use by bats through intensification of land use from rural to urban or industrial. Currently, within the combined home range of c. 5413ha, there is c. 4,927ha (91%) of habitat which is either most preferred (forest stand or open water) or second-most preferred (rural, 'country living' or 'large lot residential'). The remaining 9% is least preferred (urban or industrial, including the airport runway/buildings).

The maternity range of the population (where females roost and rear their young) appears to be to the west of the Waikato River.[44] When considering the land to the west of the Waikato River (c. 3152 ha), there is currently 2754ha (87%) of habitat which is most or second-most preferred, and 13% least preferred.

8.3. Figure 4b shows the same combined home range, and includes all the areas shown on Council maps as zoned or planned to change from rural (second-most preferred) to urban or industrial (least preferred), or roading. The 'least preferred' habitat is planned to increase from 9% to 25% of the total combined range of the bat population.

To the west of the Waikato River the least preferred habitat is planned to increase from 13% to 43% of the combined home range on that side of the Waikato River.

8.4. I have included the Southern Links roading designation as 'least preferred habitat' because while there may be additional planting around the road and lighting controls to mitigate the effect of the road, roading, as discussed above, is considered to have a negative impact on bat activity.

[44] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

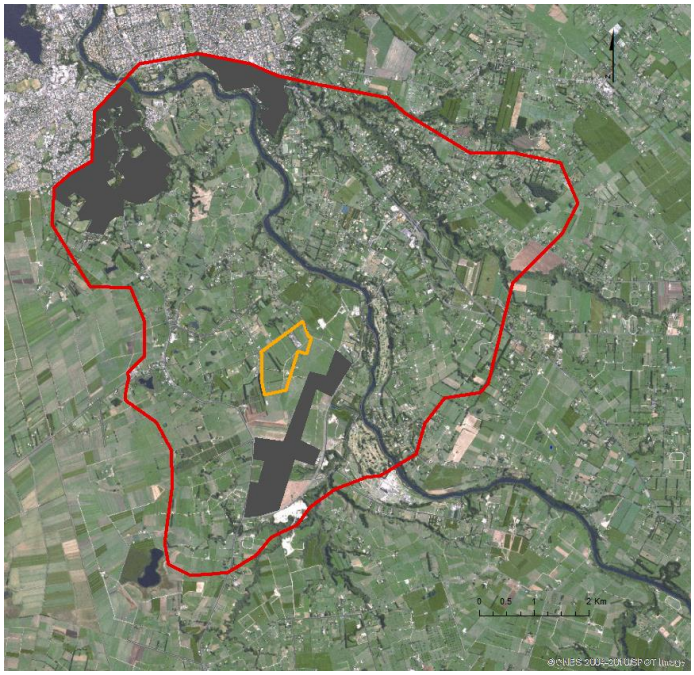

Fig 4a. *Grey = current area of least preferred bat habitat (urban, industrial).* Red line = Combined home range of 22 bats radio-tracked during 2018-2019. Orange = proposed Plan Change 20

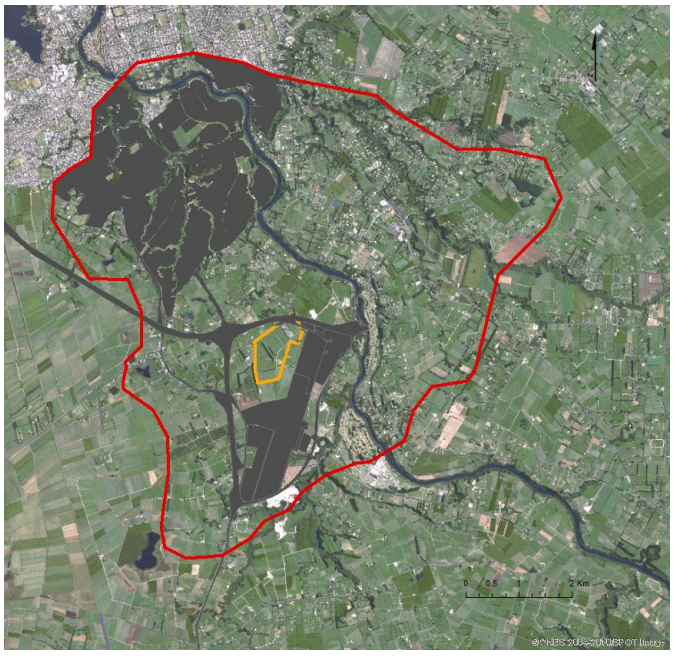

Fig 4b. *Grey = future planned area of least preferred bat habitat (urban, industrial, plus roading designation).* Red line = combined home range of 22 bats radio-tracked during 2018-2019. Orange = proposed Plan Change 20

8.5. This is likely an underestimation of the land from which bats will be excluded because it does not include any plans for intensification which have not yet reached council planning maps. For example, the Draft Ahu Ake Waipā Community Spatial Plan identifies the area within which Plan Change 20 applies as an 'employment high growth area' and an 'area under pressure from future development'.[45] I note that this plan does not seem to consider the south Hamilton long-tailed bat population. The Submission to Plan Change 20 from the Hamilton City Council also refers to Future Growth Areas SL1 and SL2 as suggested future growth areas (Figure 5). These areas "have been identified for further investigation by the Future Proof Implementation Committee in 2022 for possible inclusion in the upcoming Future Development Strategy" for future urban development. The map also includes the area west of the Plan Change 20 site as a "Suggested Future Industrial Growth Area". If implemented this will remove a large portion of the remaining habitat available to the long-tailed bat population, particularly the maternity population.

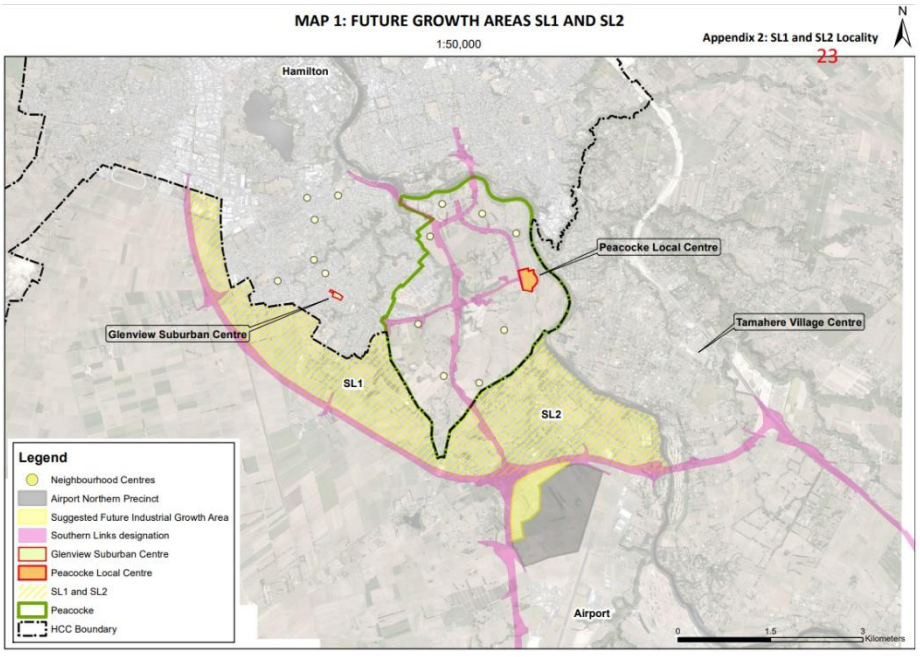

Figure 5. Map from Hamilton City Council Submission on Plan Change 20 showing SL1 and SL2 areas being considered for urbanisation.

[45] Waipā District Council 2022. Ahu Ake, Waipā Community Spatial Plan. Future Scenario for the Interim Draft Spatial Plan. SP&P Committee approved [29 Nov.]

8.6. This illustrates that the long-tailed bat population is being squeezed from the north and south. As a best-case scenario for the bats, if only the development which is already shown on council maps happens, the maternity population may have 43% less available habitat than they have now to find the resources to live and raise young.

8.7. This bat population cannot just move to a more suitable new location. They have high fidelity to their home range, using the same resources in the same areas year after year. This may be because long-tailed bats maintain a social structure where individual bats remain part of the same social group,[46] and because they are familiar with the roosts and foraging areas within their home range.[47] Borkin found that even when tree clearance removed a large part of the bats home range, home range is decreased rather than the bats moving to a new area.[48]

8.8. Rezoning a further 89ha of land from rural to industrial removes 8% of the remaining rural land of the bat population's home range to the west of the river (if development only occurs as is already in council planning maps). This population, as explained above, is already very vulnerable to extinction, therefore in my opinion establishing further urban or industrial areas additional to what is already planned may result in the extinction of the bat population from southern Hamilton.

8.9. From an ecological perspective it is within this context of a very vulnerable population facing increasing pressures from urbanisation, industrialisation and roading that Plan Change 20 must be considered.

9. THE VALUE OF THE PLAN CHANGE 20 SITE FOR LONG-TAILED BATS

9.1. I understand that the Plan Change 20 site covers c. 130ha, comprising 41ha of land currently zoned Airport Business Zone (ABZ) and 89ha rural zoned land which is proposed for rezoning to ABZ. The land is currently owned by Titanium Properties Ltd and Rukuhia Properties Ltd.

---

[46] O'Donnell 2000. Cryptic local populations in a temperate rainforest bat Chalinolobus tuberculatus in New Zealand. Animal Conservation (3):287-297

[47] Law BS 1996 Residency and site fidelity of marked populations of the Common blossom bat Syconycteris australis in relation to the availability of Banksia inflorescences in New South Wales, Australia, Oikos 77(3) 447-458

[48] Borkin KM and Parsons S. 2014. Effects of clear-fell harvest on bat home range. PLoS ONE 9(1):e86163 doi:10.137/journal.pone.0086163

9.2. The entire habitat area that is within the Plan Change 20 site (apart from that with buildings) meets the Waikato Regional Policy Statement criteria for Significance under Criteria 3 as habitat that is currently habitat for indigenous species that are classed as threatened or at risk.

9.3. Five acoustic surveys undertaken by the Applicant show that the PC20 site is used by bats for commuting and foraging. From 44 acoustic recorder locations throughout the site, bats were recorded at all except 3, with 2 of these 3 locations having equipment failure after 7 nights. [49]

9.4. In November 2021, after the first two surveys, two necklace poplar shelterbelts were felled on land owned by Titanium Properties Ltd.[50] Subsequent surveys found an overall lower level of bat activity on Titanium Properties Ltd property[51], which is likely to be a result of the loss of the shelterbelts, however, bat activity levels are often variable.[52] Surveys done post-felling, which included surveying in open areas as well as beside woody vegetation, indicate that bats are still present over the entire site.

9.5. The habitat in the Plan Change area is rural i.e. the habitat type which is the second-most preferred by long-tailed bats,[53] and the habitat type which is most rapidly disappearing in south Hamilton as it changes to urban and industrial (Figs 4a and 4b). The area provides part of the rural area which bats move out from their roosting sites to forage in.[54] The site, including the woody vegetation and the open pasture, make up the habitat matrix which provides for bats to use this area for foraging and commuting.

9.6. The site is not ideal long-tailed bat habitat – it is subject to noise (particularly by aircraft) and limited by having few trees – I consider that the recent felling of the two shelterbelts is very likely to have negatively

---

[49] From survey results provided in Tonkin & Taylor Northern Precinct Expansion Assessment of Ecological Effects June 22 Table 3.2 Appendix A Fig2; and Cummings EIC Annexure B Table 1 and Figure 1. I grouped some survey locations as they appeared from the maps to be in approximately the same position as follows: B08 grouped with 6A; A03 grouped with B03, D6, D7; D3 grouped with 08A; D4 grouped with 07A; D8 grouped with 09A; B05 grouped with 09B; C01 grouped with 19. 11, 12, 13, 02B, A07 not included as off-site.

[50] Tonkin & Taylor Northern Precinct Expansion Assessment of Ecological Effects June 22

[51] Cummings EIC at [47]

[52] Law BS, Gonsalves L, Tap P, Penan T, Chidel M 2015. Optimizing ultrasonic sampling effort for monitoring forest bats. Austral Ecology 40:886-897

[53] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

[54] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

impacted on its use by bats. However, the surveys by the Applicant show that bats still use the area, and it is still habitat for this Critically Threatened species.

9.7. The importance of the site is elevated by the current and planned urbanisation and industrialisation that is occurring in southern Hamilton. This is because the 89ha planned for rezoning will comprise c. 8% of remaining bat habitat west of the Waikato River after planned changes from rural to urban/industrial are enacted (paras 8.1 to 8.9).

10. WILL BATS CONTINUE TO USE THE PLAN CHANGE 20 SITE UNDER THE CURRENT PROPOSAL

10.1. As an industrial area I consider that the site will completely or almost completely exclude bats from the entire site that is industrialised (including retail).

10.2. The Applicant proposes to retain 4.9ha of the site (including some on the area already zoned industrial) based on existing vegetation features. This area is called a "Bat Habitat Area" and includes a 50m wide corridor which ends within the industrial area at an "Amenity Hub". The Amenity Hub enables "a concentration of retail and supporting amenities for the business park".[55] The "Bat Habitat Area" will be enhanced by planting trees and the effects of light on bats mitigated through minimising light spill into the area.[56] The corridor part of the "Bat Habitat Area" is crossed by a 'Primary Road', and the Amenity Hub part of the "Bat Habitat Area" is bordered by roads on three sides. In my opinion there is very high uncertainty that bats will use the "Bat Habitat Area" for the following reasons:

a) Both the corridor and the Amenity Hub area will be surrounded by industry and retail. The only similar site that I am aware of, where there is a narrow corridor surrounded by urbanisation which is used by bats is the Mangakōtukutuku Gully system on the southern fringe of Hamilton city. However, this gully system is generally a lot wider than 50m, and when bats emerge from roosts in theses gullies they move away through the gully system to the wide areas of rural

[55] Coles EIC (Urban Design) at [36a]
[56] Cummings EIC at [100-101 and Annexure "C"]

habitat where they spend most of their time[57]. Whether they will use a 50m wide corridor to access 2.7ha is very uncertain.

b) As discussed in para 6.5 above, roading deters bats. This "Bat Habitat Area" starts at a road, is bisected by a road, and has roads on three sides of the Amenity Area.

c) The immediate surrounds of the Bat Habitat Area are industrial, which bats avoid.

d) Long-tailed bat activity may be negatively impacted by increased noise levels (see para 6.4)

11. PRELIMINARY COMPENSATION PACKAGE

11.1. The proposal will change 125ha[58] of second-most preferred habitat (rural) to least preferred habitat (industrial), effectively excluding bats from this area. There is also high uncertainty whether the 4.9ha "Bat Habitat Area" onsite will be used.

11.2. The Applicant proposes a preliminary compensation package including 11ha of off-site vegetation restoration and/or enhancement at a site which has been conditionally purchased by Titanium Properties Ltd (the 'compensation site'), and 80ha of pest animal control over a 10 year period.[59]

11.3. The 11ha compensation site is adjacent to the Waikato River, therefore connected to preferred habitat and with potential to become preferred habitat in time. This is important because there is very little preferred habitat in the landscape. It also offers connectivity from the river to surrounding rural land, providing the rural land does not become urbanised or industrialised. The protection of this site from future development is also an important factor.

11.4. To my knowledge there have been no surveys on the compensation site, however given its location bordering the Waikato River which is known to be used by bats, and given the vegetation on-site as described in Ms Cumming's evidence,[60] the compensation site is already very likely commuting and foraging habitat. Therefore, the stated purpose of the site

---

57 Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

58 89ha of land re-zoned from rural to ABZ and 41ha already zoned ABZ, less c5ha of "Bat Habitat Area"

59 Cummings EIC at [104]. Markham EIC at [58]

60 Cummings EIC at [106-109]

as "establishment of commuting and foraging corridors"[61] is not appropriate as it is likely used for that already.

11.5. The main pressure on this population is lack of space – they are being squeezed out. This project adds to that squeezing. With less habitat to forage and move over, the population of bats will need to find the same amount of resources that it needs to survive from a smaller area. This may result in a lower survival rate in a population which is already very vulnerable. 11ha of restoration in a suitable location, while I consider positive, does not adequately compensate for the removal of 125 - 130ha of habitat (or even the 89ha currently zoned rural).

11.6. Results from a study on the effects of urbanisation on bats in the UK suggests that "urban expansion accompanied by strategies such as creating bat-friendly habitat of an area of at least equal to any new urban settlement could provide mitigation for negative effects of urbanisation".[62]

11.7. 80ha of pest control becomes meaningless if the primary pressure of habitat availability is not addressed.

12. MONITORING

12.1. I agree with Ms Cummings that, because the bats range over a wide area and because there are multiple development-related pressures, monitoring the effect on bats from this project in isolation would be extremely difficult. I therefore support monitoring of the population using acoustic monitoring and radio-tracking over the wider landscape in collaboration with other developers with the purpose of understanding the effects of the combined pressures and management actions on the population.

12.2. In my opinion, given the high uncertainty of whether the "Bat Habitat Area" within the site will be used for foraging and commuting by bats, monitoring to answer this question should be undertaken. The term "used" would need to be defined in the Bat Management Plan.

12.3. If the "Bat Habitat Areas" are not used reassessment of residual adverse effects will be required.

---

[61] Cummings EIC at [104(a)]

[62] Gili F, Newson SE, Gillings S, Chamberlain DE, Border JA. Bats in urbanising landscapes: habitat selection and recommendations for a sustainable future. Biological Conservation 241 (2020) 108343

13. RESPONSE TO EVIDENCE OF GEORGIA CUMMINGS – MAIN AREAS OF DISAGREEMENT

13.1. Ms Cummings considers that the PC20 site does not meet the 'threshold' of significant habitat of indigenous fauna under the WRPS[63]. However, there are no 'thresholds' in the WRPS. As Ms Cummings points out in her evidence, the habitat is significant under Criteria 3 of the WRPS if:

> "It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:
>
> - Classed as threatened or at risk, or
> - Endemic to the Waikato region, or
> - At the limit of their natural range"

13.2. I consider that the PC20 site meets Criteria 3 for the following reasons:

a) Long-tailed bats are Threatened – nationally critical.[64]

b) As stated above (para 9.2), acoustic recorders found bats throughout the site both before and after the two shelterbelts were felled.

c) If there is any further doubt about whether this is bat habitat, the Waikato Bat Alliance[65] defines bat habitat as a "collection of locations that provide the resources and conditions needed for bats to be present, and will include, but may not be limited to, areas that provide for breeding, roosting, foraging, and commuting".[66] The surveys tell us that the PC20 area provides the conditions for bats to be present for at least foraging and commuting and is therefore bat habitat under this definition.

13.3. Instead of using the criteria provided in the WRPS, Ms Cummings uses a modified approach of the professional judgment of Mueller et al[67] to

---

63 Cummings EIC at [68]

64 O'Donnell, C.F.J.; Borkin, K.M.; Christie, J.E.; Lloyd, B.; Parsons, S.; Hitchmough, R.A. 2018: Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington. 4 p. http://www.doc.govt.nz/Documents/science-and-technical/nztcs21.pdf

65 The Waikato Bat Alliance is a partnership of Waikato-Tainui, Te Haa o te Whenua o Kirikiriroa (THaWK), Ngā Iwi Tōpū O Waipā (NITOW), Waikato Regional Council, Hamilton City Council, Waipā District Council, Waikato District Council, and Department of Conservation.

66 Alternative Endings 4 November 2021. Framing a bat strategy for the Waikato Region. Themes, outcomes and engaging stakeholders. A discussion document for the Waikato Bat Alliance.

67 Mueller et al 2021. Peacocke Structure Area Plan Change: Long-tailed bat report.

classify the "relative value of habitats". In my opinion this approach is flawed for several reasons:

a) It considers that areas of open pasture and scattered trees "may provide occasional foraging or commuting habitat for bats"[68]. This undervalues the importance of "scattered trees". Davidson-Watts found that, although the use of habitat was likely related to trees being present, bats used isolated trees for extended periods.[69]

b) It also undervalues the importance of open pasture in the context of the home range of this population. The value of open pasture in this context is that it is part of the matrix of habitats in the rural landscape which contribute to rural land being the second-most preferred habitat for this population. It allows bats to forage and move alongside the taller vegetation as well as into the open pasture. Even when large forests are nearby, bats regularly forage in open spaces away from the forest edge.[70] In Eglinton, Fiordland, 15% of bat activity was located 200m away from the forest margin.[71]

c) It doesn't recognise exotic forest stands as 'high value'. These have been identified as 'preferred habitat' by a radio-tracking study, and important areas for roosts.[72]

d) The identification of "high value habitats" has in part been determined by whether an area has been suggested as core habitat from landscape-level surveys (e.g. city-wide bat surveys and radio-tracking studies). However, it is likely that core habitat has been missed because the radio tracking studies were limited to following 11 bats in 2004-2007 for 3 to 19 nights each; and following 24 bats in 2018-19 for one to 15 nights each. This is only a sample of bats for a short snapshot in time, so is unlikely to reveal all core areas used by the bat population.

---

[68] Cummings EIC at [63(c)]

[69] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.

[70] Bennett RS 2019. Understanding movement and habitat selection of the lesser short-tailed bat to infer potential encounters with anticoagulant bait. MSc Zoology, Massey University, NZ

[71] O'Donnell CFJ, Christie JE, Simpson W 2006. Habitat use and nocturnal activity of lesser short-tailed bats (*Mystacina tuberculata*) in comparison with long-tailed bats (*Chalinolobus tuberculatus*) in temperate rainforest. New Zealand Journal of Zoology 33:113-124

[72] Davidson-Watts Ecology (Pacific) Ltd. 2019 Long-tailed bat trapping and radio tracking baseline report. Southern Links, Hamilton. Report for AECOM, Auckland.
Dekrout A 2009. Monitoring New Zealand Long-tailed Bats (Chalinolobus tuberculatus) in Urban Habitats: Ecology, Physiology and Genetics. PhD thesis. University of Auckland.

e) Most importantly, assigning relative values to habitat types which are all used by long-tailed bats (as demonstrated by the surveys on the PC20 site where almost all acoustic recorder locations had bat activity) is misleading as it implies that bats don't need all the habitat that they are using. Identifying only a few "high value" and "moderate value" areas which make up only a small percent of the bats' home range doesn't recognise the bat population's spatial requirements. It logically leads to the situation, as it has in the Peacock Structure Plan,[73] of very narrow corridors connecting a few small and scattered forest stands to the narrow gully systems of the Waikato River. The result if developers continue to use this method is that the south Hamilton population will be expected to exist primarily within narrow corridors. This contrasts to the current situation where the corridors of the Mangakōtukutuku Gully that the bats are using make up only a small part of the northern home range of these bats which move out from the gullies to forage and move across the rural landscapes to the south.

13.4. Ms Cummings concludes that there is no evidence to suggest that the noise associated with the plan change will negatively impact bats.[74] This is based on three studies. One looked at the impact of aircraft noise in Hamilton and suggested that aircraft activity may not have major impacts on long-tailed bat activity. Another found no clear correlation between long-tailed bat activity and noise. The third was an overseas study which found that compressor noise did not impact bat activity levels for bats in their study echolocating at greater than 35kHz (as do long-tailed bats). However, there are multiple overseas papers demonstrating the negative impacts of noise on bat activity and foraging, including those with bats who overlap with long-tailed bats in echolocation frequency.[75] As I have said above (para 6.4), there has also been recent experimental work which indicates a negative impact of noise playback on long tailed bat

[73] Plan Change 5 | Hamilton City Council

[74] Cummings EIC at [38,132,133]

[75] Wang W, Gao H, Li C, Deng Y, Zhou D, Li Y, Zhou W, Luo B, Liang H, Liu W, Wu P Jing W, Feng J 2022 Airport noise disturbs foraging behaviour of Japanese pipistrelle bats. Ecology and Evolution. https://doi.org/10.1002/ece3.8976
Luo J, Siemers B, Koselj K 2015. How anthropogenic noise affects foraging. Global Change Biology 21:3278-3289
Finch D, Schofield H, Mathews F 2020. Traffic noise playback reduces the activity and feeding behaviour of free-living bats. Environmental Pollution 263 (2020) 114405

activity. Given this, it would be prudent to recognise anthropogenic noise as a possible negative effect on bats' utilisation of "Bat Habitat Areas".

13.5. I disagree that Biodiversity Compensation Models are a "reputable compensation tool" as stated by Ms Cummings and Mr Markham.[76] This tool has not been published and therefore not subject to robust peer review. Some of the criticisms from experts in this area are the lack of transparency, it's high sensitivity to input error, and the meaningless structure of the output.[77]

13.6. I therefore disagree that the preliminary compensation package is adequate.

14. CONCLUSION

14.1. **The long-tailed bat as a species is critically threatened with extinction. The population in south Hamilton, living on the margin between urban and rural land, is being squeezed out by land development as Hamilton city expands southwards and industry around Hamilton Airport expands northwards.**

14.2. **The urban and industrial expansion already planned is going to remove a large part of the rural habitat that this population currently occupies. Current development plans (e.g. Peacocke Structure Plan and this proposal) to protect narrow corridors for bats to move through urban/industrial areas will leave the population largely restricted to these corridors instead of dispersed over the landscape.**

14.3. **The bat population cannot just move elsewhere. Any more removal of habitat over and above what is already planned, including this proposal to remove another 84-89ha, with mitigation and**

---

[76] Cummings EIC at [113], Markham EIC at [58]

[77] Evidence of Dr Justyna Giejssztowt 20 May 2022. In the matter of an appeal under section 120 of the RMA 1991 between the Royal Forest and Bird Protection Society of NZ Inc Appellant and West Coast Regional Council and Buller District Council Respondents and Stevenson Mining Ltd Applicant
Evidence of Dr Laurence Barea 26 April 2022 In the matter of an appeal under section 120 of the RMA 1991 and in the matter of an application by Waste Management NZ LTD for resource consents to construct and operate a new regional landfill at 1232, State Highway 1, Wayby Valley between Te Rūnanga o Ngāti Whātua, Royal Forest and Bird Protection Society of NZ
Evidence of Dr Ilse Corkery 16 September 2022 Before the Independent Hearing Panel appointed by the Hamilton City Council under the Resource Management Act And in the matter of Proposed Plan Change 5 – Peacocke Structure Plan by Hamilton City Council

compensation measures proposed to enhance only 16ha of habitat, could result in the extinction of the population from south Hamilton.

Dated 7 March 2023

Tertia Thurley