DRAFT

ecoLogical Solutions
Environmental Consultants







November 2026

Live Nation Festival

Long-tailed Bat Impact Assessment

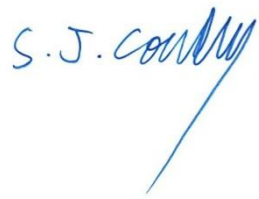
Submitted to: Live Nation NZ Limited

water fauna flora land

Quality Assurance

This report has been prepared and reviewed by the following:

Prepared by: Dr. Simon Connelly
Ecologist



Chad Croft
Senior Ecologist



Reviewed by: Dr Gary Bramley
Director



Status: DRAFT **Issued:** 5 November 2026

ecoLogical solutions

tauranga office
115 the strand, tauranga 3141.
p: 07 577 1700

auckland office
building 4/195 main highway
ellerslie, auckland, 1051

p: 021 578 726

northland office
30 leigh street, kāeo
po box 180, kāeo 0448
p: 021 403 386

nelson office
58 factory road, brightwater
p: 021 172 2091

www.ecologicalsolutions.co.nz

Table of Contents

1.0 Introduction 1
1.1 Background 1
1.2 Scope of Report 1
2.0 Ecological Setting 3
2.1 Site Description 3
2.2 Hamilton Ecological District 3
2.3 Significant Natural Areas 3
3.0 Methodology 6
3.1 Desktop Review 6
3.2 Habitat Assessment 6
3.3 Approach to assessing Ecological Values 6
3.4 Assessment of Effects Methodology 6
4.0 Results 7
4.1 Desktop Review 7
4.1.1 Bat Activity 7
4.1.2 Bat Breeding Behaviour 8
4.2 Habitat Assessment 11
5.0 Ecological Values 15
5.1 Bats and Bat Habitat 15
6.0 Assessment of Effects 17
6.1 Introduction 17
6.2 Site Occupation 17
6.3 Artificial Light 17
6.4 Noise 17
7.0 Effects Management 20
7.1 Introduction 20
7.2 Site Occupation 20
7.2.1 Event Duration 20
7.2.2 Event Layout 20
7.2.3 Pre-Festival Acoustic Survey 20
7.3 Artificial Light 21
7.4 Noise 21
7.4.1 Elimination of ultrasonic frequencies 21

DRAFT

7.4.2 Noise levels within bat habitat.....21
8.0 Residual Effects Management.....26
9.0 References.....27

Index to Tables

Table 1: Criteria for describing magnitude of effect. 7
Table 2: Criteria for describing level of effects. 7
Table 3: Summary of ecological values following the EcIAG (Roper-Lindsay et al., 2018). 16
Table 4: Magnitude and level of effects for the proposed Live Nation Festival on resident long-tailed bats before and after mitigation. 25

Index to Figures

Figure 1: Proposed Location of the Live Nation Festival Site. 2
Figure 2: Signficant Natural Areas proximal to the Live Nation Festival Site 5
Figure 3: Bat database records within 25 km of the proposed Live Nation Festival Site. 9
Figure 4: Bat databse records in the vicinity (within c. 5 km) of the proposed Live Nation Festival Site.....10
Figure 5: Bat habitat on and adjacent to the proposed Live Nation [GB1.1]Festival Site....12
Figure 6: High-risk sycamore tree within proposed Live Nation Festival Site. 13
Figure 7: High-risk trees adjacent to the proposed Live Nation Festival Site.....14
Figure 8: Indicative proposed Live Nation Festival Site Layout (Provided by LiveNation NZ Limited) 19
Figure 9: Expected noise levels that would be experienced by Japanese house bats if they were foraging near the Site.....23
Figure 10: Expected noise levels that would be experienced by red bat if they were foraging near the Site. 24

DRAFT

1.0 Introduction

1.1 Background

Live Nation NZ Limited are seeking resource consent to establish Live Nation Festival as a recurring annual event at 254–276C Hooker Road, Tamahere (the Site). The event is proposed to operate over a five-year resource consent duration.

The proposal involves the short term and limited duration use of the Site for event establishment, festival operation, pack-out and reinstatement. Most event infrastructure will be temporary and will be removed following each annual event. The proposal also includes approximately 2,000m² of permanent on-site storage for event-related infrastructure and equipment.

The proposed occupation period will run from 15 November – 15 January annually to allow infrastructure set-up, festival operation and pack down. Festival operation will involve extensive use of artificial light and loud noise during periods of darkness for approximately four consecutive nights within that period.

The Site is located in the Waikato District, approximately 9 km southeast of Hamilton and 5 km west of Cambridge along the Waikato River (Figure 1). Like much of the Waikato River corridor near Hamilton, there is a known population of long-tailed bats (LTB) (*Chalinolobus tuberculatus*) which use the river and its associated tributary gullies for commuting, foraging and roosting (Aughton 2021, Caskey and Tempero 2022, Crewther and Parsons 2017, Davidson-Watts 2019, Dekrout 2009, Dekrout, Clarkson and Parsons 2014). Long-tailed bats have a conservation threat status of 'Threatened-Nationally Critical' (O'Donnell et al., 2023). Long-tailed bats are absolutely protected under the Wildlife Act (1953).

Long-tailed bats could be affected by outdoor evening concerts due to their reliance on sound (i.e. echolocation) for navigation, foraging and social behaviour, their nocturnality, dusk emergence, and their sensitivity to artificial lighting (Schamhart et al. 2024; Brook et al., 2025).

Ecological Solutions has been engaged to assess the potential impacts of the proposed Live Nation Festival on long-tailed bats, both within and adjacent to the Site, as well as to provide guidance on appropriate impact mitigation measures.

1.2 Scope of Report

This report identifies the actual and potential ecological effects attributable to the proposed Live Nation Festival on long-tailed bats and provides recommendations for the management of adverse effects in accordance with the effects management hierarchy. This report considers both regional and national guidance, including: the National Policy Statement for Indigenous Biodiversity (NPS-IB; MfE 2025), the Hamilton City Bat Management Plan (Phoenix Ecology 2024), and the Wildlife Act 1953.

DRAFT



Figure 1: Proposed Location of the Live Nation Festival Site.

2.0 Ecological Setting

2.1 Site Description

The Site is an active farm under both cropping and grazing management regimes. The Site covers c. 72 ha and contains a single dwelling with multiple farm outbuildings located along the western boundary of the Site, perched above the Waikato River. The Te Awa River Ride trail traverses' part of the Site running roughly northeast to northwest along the northern boundary before turning south and running along the top of the river valley in behind the dwelling and farm buildings (**Error! Reference source not found.**).

2.2 Hamilton Ecological District

The Site lies within the Hamilton Ecological District which covers c.159,376 ha and is one of the most modified districts in New Zealand with only 1.6% of the original indigenous vegetation remaining (Leathwick et al. 1995). Vegetation was formerly predominantly bog, shrubland and fernland with small areas of swamp forest (McEwen 1987). Running through the centre of Hamilton Ecological District is the Waikato River, which as well as providing habitat for native fish, also provides foraging opportunities for birds and other fauna. The riparian margins of the river also contain remnant vegetation that provides habitat for native fauna (Kessels Ecology 2017) and connectivity throughout the district's gully systems.

Long-tailed bats in Hamilton have shown a preference for foraging and commuting along vegetated edges such as those of riparian areas, the districts gullies and clusters of both exotic and native trees (Davidson-Watts 2019). This is consistent with others who have characterised long-tailed bats as edge adapted foragers whereby, they hunt most efficiently along the edges and above canopies of trees (Rockell et al. 2017; O'Donnell 2001 and 2018; Parsons 2001).

There is an abundance of existing information which supports that the Waikato River is a known important commuting and foraging area for long-tailed bats (Crewther and Parsons 2017, Davidson-Watts 2019, Dekrout 2009, Dekrout, Clarkson and Parsons 2014).

The site also lies within the Waikato (territorial) District. Despite the highly modified nature of the Hamilton Ecological District, the Waikato District was found to contain 105 species classified as 'Threatened' or 'At Risk' by the Department of Conservation in 2017 (Kessels Ecology 2017). Seventy-eight percent of the land within the Waikato District was considered 'Threatened' under the Threatened Environment Classification, with approximately 16% of the land area being designated as Significant Natural Areas (SNA).

2.3 Significant Natural Areas

The Site lies within the Waikato District, and is separated from the Waipa District by the Waikato River to the west. The riparian margin along the Waikato River and the gully system that adjoin the site to the south and west are designated as a Significant Natural Area in the operative Waikato District Plan. In the technical report recommending areas for SNA designation, this area was designated as being regionally significant, which means it contains habitat for fauna species that are assessed as 'Threatened' (Kessels Ecology 2017).

The riparian margin of the Waikato River within Waipa district is also listed within the Waipa District Plan as an SNA. Other SNAs near the Site include the Managawhero Stream

riparian margin south of the Waikato River, the Pukeroro and St Peter's College kahikatea remnants east of the Site, and several areas associated with the Mystery Creek gully system to the West of the Site. The proximity of Significant Natural Areas to the Site are shown in Figure 2.

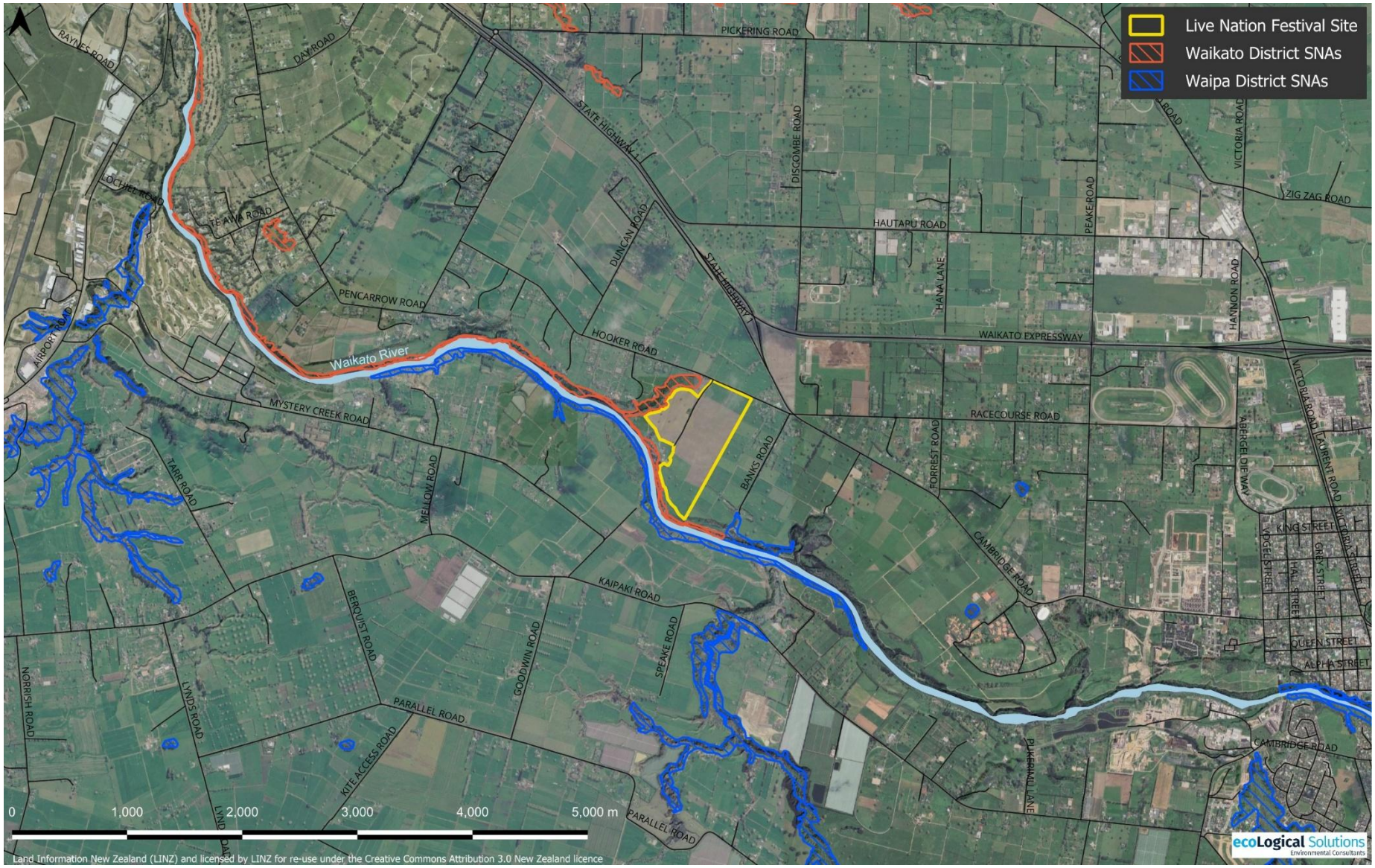


Figure 2: Signficant Natural Areas proximal to the Live Nation Festival Site

3.0 Methodology

3.1 Desktop Review

A search of the Department of Conservation national bat database was undertaken for records within 25 km of the Site. Data were issued by the Department of Conservation on 15 May 2026. In addition, the Waikato Region Bat Distribution data[1] were reviewed. These include three bat spatial planning layers (A, B and C) indicating differing spatial and content aspects for identifying bat habitat. These layers were prepared for the Bat Alliance group consisting of Waikato, Hamilton, and Waipa Districts. Layer A covers bat roost areas; Layer B covers connections including foraging and commuting corridors as bats fly across landscapes between roosts and foraging areas using waterways and linear features. Layer C covers areas of opportunity for habitat connectivity and identified gaps. While these spatial layers have no regulatory function, the distribution of these layers in relation to the Site were examined to better understand the bat habitat values present.

3.2 Habitat Assessment

Potential bat habitat within and adjacent to the Site was identified and assessed during a site visit on 10 September 2026. The Site was surveyed by Ecological Solutions' Chad Croft and Tou-Roa's Mike Jones for trees bearing potential bat roost features (high-risk trees), as well as areas of high-value foraging habitat. High-risk roost trees and foraging areas were inspected from the ground and mapped.

3.3 Approach to assessing Ecological Values

Ecological values were assigned following the approach outlined in the Environment Institute of Australia and New Zealand's (EIANZ) Ecological Impact Assessment guidelines (EcIAG) (Roper-Lindsay et al. 2018). The EcIAG outline a standardised approach for defining ecological values. The approach involves assessing four matters including representativeness, rarity/distinctiveness, diversity/pattern and ecological context with consideration of the attributes outlined in Tables 4 and 5 of the EcIAG. The overall ecological values within the site and vicinity were assigned based on the four matters outlined above and using the scoring system outlined in Table 6 of the EcIAG.

3.4 Assessment of Effects Methodology

The level of effects was assessed using the method recommended by the EcIAG (Roper-Lindsay et al. 2018). This method involves assigning ecological values as above and determining the magnitude of effects based on criteria outlined in Table 8 of the EcIAG (reproduced in Table 1 below) and assigning the overall level of effect using the matrix in Table 10 of the EcIAG (reproduced in Table 2 below). The magnitude of the effects was considered at the site and ecological district scale with consideration given to the regional and national scale influences.

[1] https://maps.waikatoregion.govt.nz/arcgis/rest/services/WRCMAPS/Waikato_Region_Bats_Distribution/MapServer

Table 1: Criteria for describing magnitude of effect.

Magnitude	Description
Very high	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns; AND/OR having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation; AND/OR having negligible effect on the known population or range of the element/feature.

Table 2: Criteria for describing level of effects.

Effect level	Ecological value				
	Very high	**High**	**Moderate**	**Low**	**Negligible**
Very high	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

4.0 Results

4.1 Desktop Review

4.1.1 Bat Activity

A search of the DOC bat database found c. 3,500 records of long-tailed bats within 25 km of the Site from the last ten years. These records are concentrated in the south of Hamilton

and the south of Cambridge (Figure 3). The Site is located between these two areas, where fewer surveys have been performed.

Despite the relatively low level of surveying compared to other areas in the region, long-tailed bats have been detected less than 1 km from the Site to the west and north (Figure 4). Records to the west date from 2015 and record up to c. 0.67 passes per survey night (i.e. a very low detection rate). Records from the north date from 2016 to 2025 and record up to c. 300 passes per survey night (i.e., a high detection rate). There are also records within 5 km of the Site in every direction other than directly south.

The WRC bat distribution layers indicate potential roosting habitat along the Waikato River and within the SNA adjoining the Site. There is also potential roosting habitat in several other locations near the Site, including less than 1 km to the north where the DOC bat database indicates high levels of bat activity. This is reflected in the WRC bat distribution spatial planning layer B. The 50m buffer off this planning layer intersects with the Site boundary along the Waikato River corridor.

This existing understanding of the available habitat and evidence of bat presence is sufficient to conclude that there are likely high levels of bat activity in the immediate vicinity of the Site.

4.1.2 Bat Breeding Behaviour

The breeding behaviour of long-tailed bats has not been well studied; however, most mating is thought to occur in autumn. The ability to delay the onset of gestation and the lack of knowledge regarding length of time required for embryonic development means the time of actual birth likely varies. However, it is generally understood that females congregate in maternity roosts to give birth (parturition) and raise their young between mid-November and mid-December. The post-parturition period is when adult females are lactating and young pups become volant (capable of flight) from mid-December in to February (O'Donnell 2002; Dekrout 2009; Davidson-Watts 2019). It is during this time that female adult energy demands are high and frequent and regular active foraging is essential. In addition, as young pups mature and become volant it is expected that adults are teaching their young how to navigate, where foraging habitat is located, how to locate prey. Both adults and young return to the maternity roost during this period.

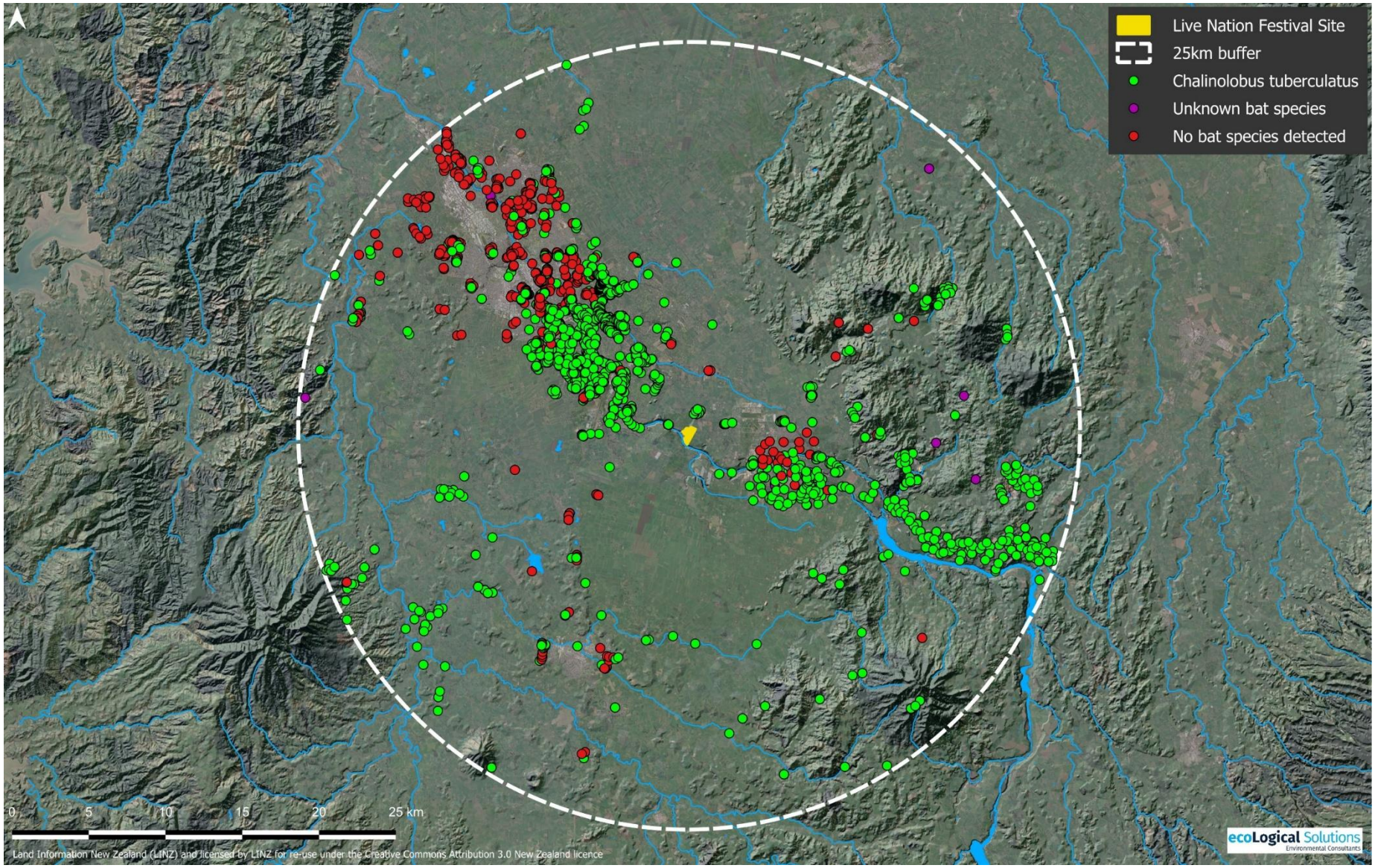


Figure 3: Bat database records within 25 km of the proposed Live Nation Festival Site.

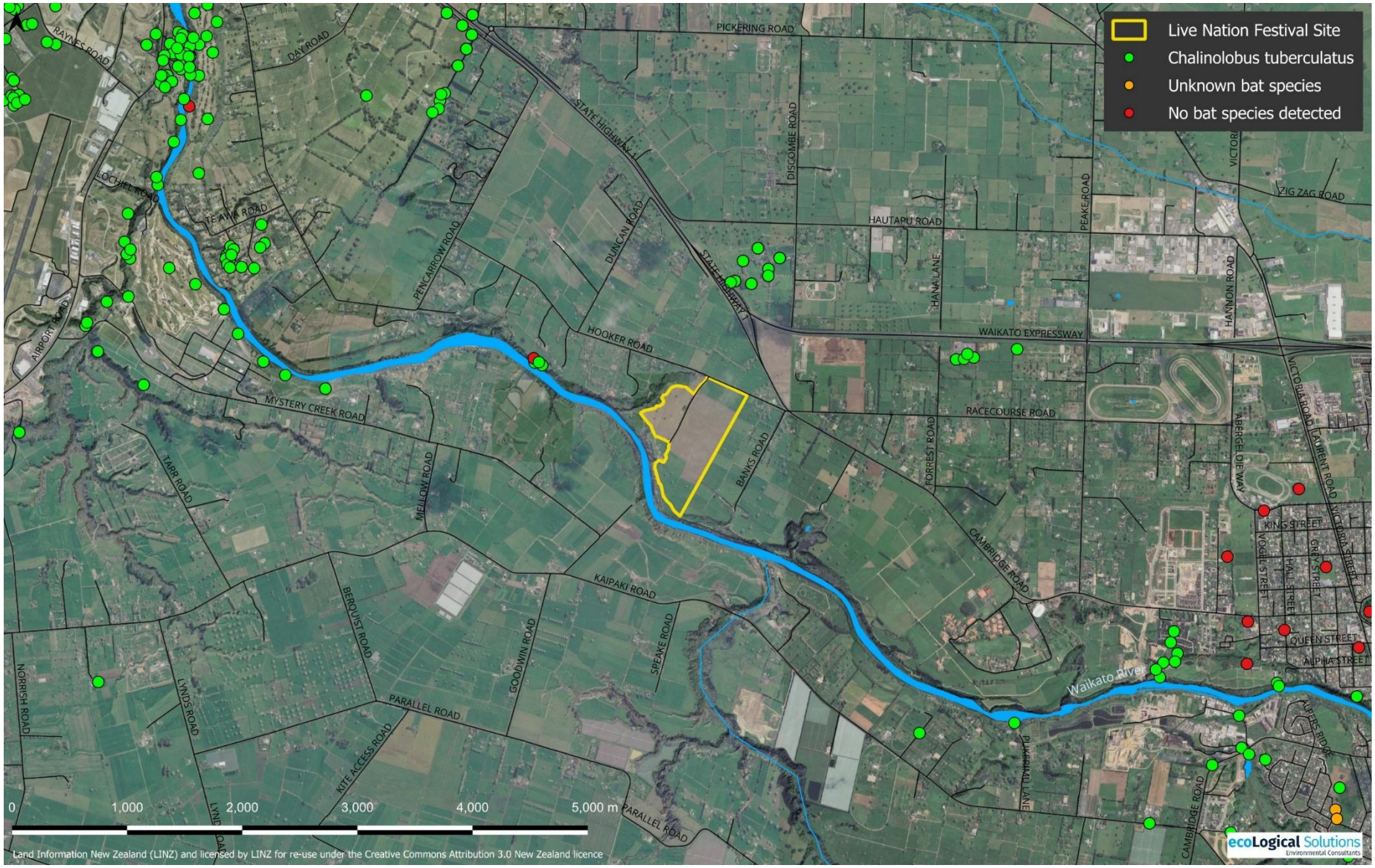


Figure 4: Bat databse records in the vicinity (within c. 5 km) of the proposed Live Nation Festival Site.

4.2 Habitat Assessment

Long-tailed bats are found in a variety of habitats, including mosaic pastureland as they will often use forest edges and riparian margins for foraging and commuting (O'Donnell et al 2006) and use open pasture for foraging due to high invertebrate prey numbers there (Page-Corney 2024). They are highly mobile and therefore have large home ranges (e.g. Griffiths 2007). Communal and solitary roosts are often found in tree cavities and under loose bark, and may change frequently (Sedgeley and O'Donnell 1999).

High value foraging habitat was identified at several locations within or adjacent to the Site. These included three small ponds (two on Site and one adjacent to the Site), and the gully habitat within the SNA along the western edge. The Waikato River also constitutes an important foraging and commuting habitat, as evidenced by the abundance of existing activity records and the WRC Bat Distribution layers. Mapping of bat habitat within and adjacent to the Site is shown in Figure 5.

One high-risk tree was detected within the Site near the western boundary. This tree was a sycamore (*Acer pseudoplatanus*) bearing large knot holes which provide potential roost features (Figure 6). There was also many high-risk potential roost trees adjacent to the Site to the west and south along the SNA and Waikato River corridor. These trees included a variety of species including: gum (*Eucalyptus* sp.), oak (*Quercus* sp.), kahikatea (*Dacrycarpus dacrydioides*), and poplar (*Populus* sp.). Potential roost features included flaking bark, knot-holes, dead standing wood with hollows/crevices, and broken/split branches (Figure 7).

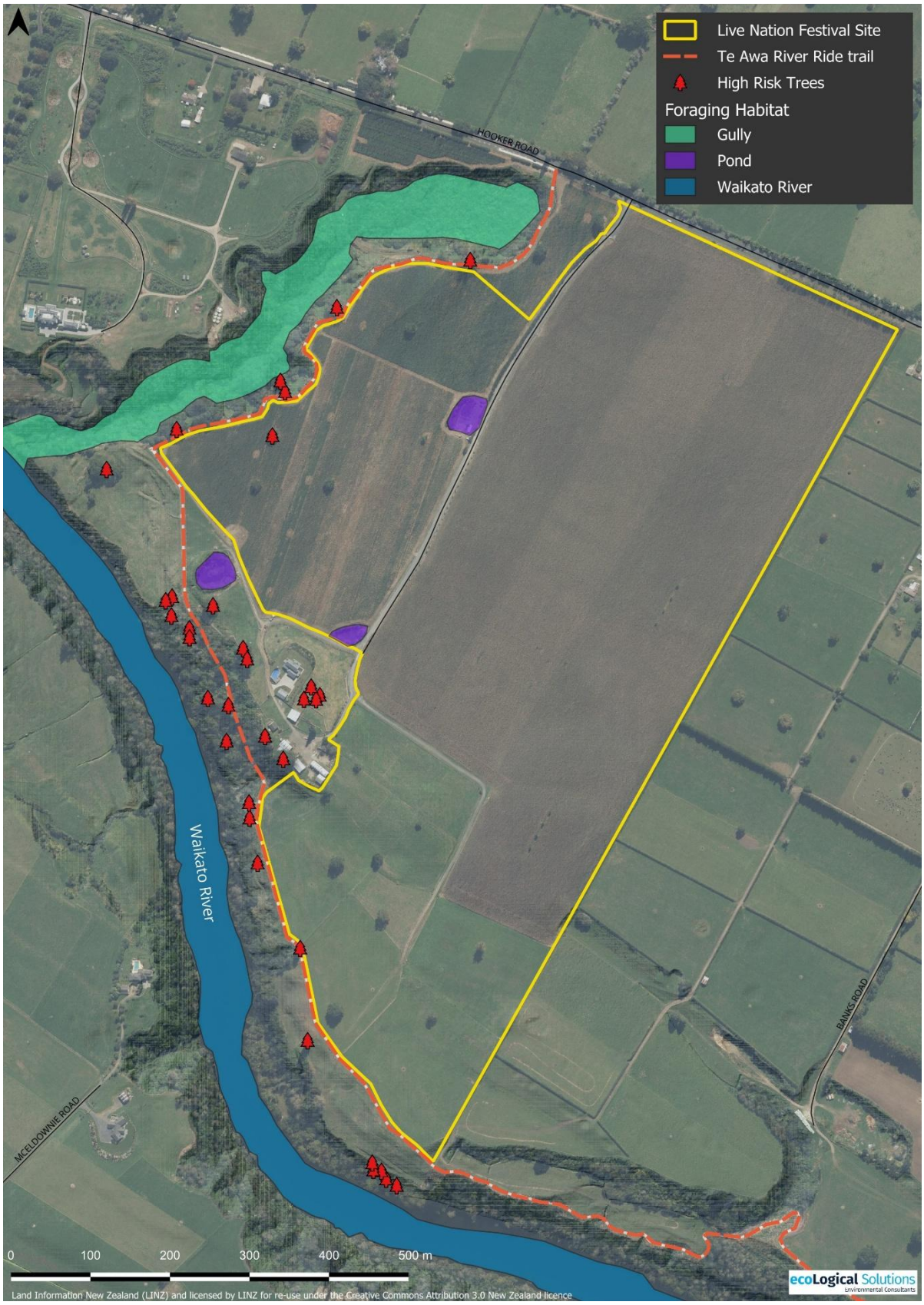


Figure 5: Bat habitat on and adjacent to the proposed Live Nation [GB1.1]Festival Site.



Figure 6: High-risk sycamore tree within proposed Live Nation Festival Site.



Figure 7: High-risk trees adjacent to the proposed Live Nation Festival Site.

5.0 Ecological Values

5.1 Bats and Bat Habitat

Ecological values of bats and bat habitat on and adjacent to the Site are summarised in Table 3.

Based on existing database records, and the presence of abundant potential roosting habitat less than 1 km away, long-tailed bats are presumed to be present and using the Site.

Due to their threat status of 'Threatened-Nationally Critical', any long-tailed bats within or adjacent to Site has a 'very high' ecological value in accordance with the EcIAG (Table 3).

Because of their preference for edge habitat, the SNA and Waikato River corridor were assessed as having a 'high' – 'very high' ecological value as long-tailed bat foraging and commuting habitat (Table 3).

Davidson-Watts (2019) found that Hamilton bats flew over open parklands, agricultural habitats, and lifestyle blocks to access core areas. While some bats would spend extended time in these habitats; there was no significant preference for these habitats over any other habitat type (Griffiths 2007; Davidson-Watts 2019). Pasture habitat at the Site was therefore assessed as having a 'low' ecological value as long-tailed bat habitat (Table 3).

Potential roost trees were identified within and adjacent to the Site. Given the large amount of bat activity in the surrounding area, the proximity of these potential roosts to the commuting and foraging habitat of the Waikato River and adjacent SNA gully, it is reasonable to assume some of these potential roosts may be occupied for at least part of the year. On this basis bat roost habitat within and adjacent to the Site was assessed as having a 'high' ecological value (Table 3).

The gully (SNA) to the west of the Site and the Waikato River are considered to be of 'high' - 'very high' value respectively for foraging and commuting habitat considering the proximity of high value roost trees and the abundance of bat activity in the surrounding area. The small ponds on Site were of lower quality, due to their small size and lack of continuity with any habitat edges or linear features for commuting corridors. Foraging habitat in and around the ponds was considered to have 'low' ecological value as long-tailed bat habitat(Table 3).

Table 3: Summary of ecological values following the EcIAG (Roper-Lindsay et al., 2018).

Feature	Representativeness	Rarity and Distinctiveness	Diversity and pattern	Ecological Context	Overall score	Comments
Bat habitat – Pasture foraging	Very Low	Low	Low	Low	Low	LTB will commute and forage over pasture but show no preference compared to other habitats.
Bat habitat – Pond foraging	Low	Moderate	Low	Low	Low	The small isolated ponds on Site provide foraging habitat for LTB. Are not contiguous with habitat edges for commuting and will provide comparatively low foraging opportunities in relation to other higher quality foraging habitats nearby.
Bat habitat – Potential roosts	Moderate	Moderate	Moderate	High	High	Numerous high risk potential roost trees noted bordering the site along the edge of SNA gully and Waikato River corridor. Abundance of previously recorded LTB activity nearby and proximity to high value commuting/foraging habitat.
Bat habitat – Waikato River corridor foraging/commuting	Moderate. Riparian margins are heavily modified (willow, poplar, restoration plantings), but this is the typical habitat of a major riverine flyway.	High. Supports Nationally Critical LTB population, with large trees and productive insect habitat over water.	Moderate-High. A linear corridor with high insect productivity, but limited structural diversity.	High. The main spine linking urban and rural bat populations and gullies. Lit bridges and riverbank development fragment it.	Very High	The Waikato River corridor is the main commuting and foraging route across the landscape. It provides connectivity to a range of other habitats and despite modified riparian habitat it is somewhat representative of its natural state, from the point of view of a foraging and commuting bat. Confirmed LTB use.
Bat habitat – Gully foraging/commuting	Moderate. A mix of native remnants and young exotic trees, typical of peri-urban gully systems in the Hamilton Ecological District.	High. Supports a Nationally Critical LTP population, with dark, incised terrain and productive insect habitat over wetland and stream.	Moderate. Gully floors (wetland or stream), slopes and canopy offer layered structure and edges for foraging and commuting.	High. Provides foraging and connects to the river, and the incised landform buffers it from ALAN.	High	The gully SNA contains functional foraging and commuting habitat features and provides a habitat corridor linking the Waikato River to distant forest patches. Unconfirmed LTB use.
Bats	High	High	High	High	Very High	Long tailed activity high in surrounding areas based on existing records. Potential roosting within 1 km of the Site.

6.0 Assessment of Effects

6.1 Introduction

The actual and potential adverse effects on long-tailed bats attributable to the Live Nation Festival are associated with site occupation, light, and noise.

6.2 Site Occupation

The festival is proposed to accommodate over 35,000 people per night, with onsite parking, camping, five stages, vendor stalls, temporary toilet blocks and other facilities (Figure 8). The festival will include live and amplified music across the five stages with festival lighting including temporary, high-intensity, highly dynamic moving heads (spot, wash and beam fixtures), LED wash bars, strobes and blinders. In addition, there will be service and safety lighting associated with the various facilities such as the toilet blocks, vendor outlets and camping area.

The main festival arena will operate from approximately 1:00pm each day. Stages will generally operate from approximately 2:00pm, with staggered closing times. On 28 December stages will operate from 2:00pm to 01:00am, on 29 and 30 December, most stages will close by approximately 01:00am, with one stage operating until approximately 2:30am. On 31 December, most stages will close by approximately 01:00am, with one or two stages operating until approximately 3:30am. The festival arena is expected to close at approximately 3:00am on 28, 29 and 30 December, and approximately 4:30am on 31 December. The 28 December event day will be a camper-only day.

No fireworks are proposed and no fireworks are intended to be permitted at the event.

Application of the effects management hierarchy for managing adverse effects of site occupation on long-tailed bats is discussed in Section 7.0

6.3 Artificial Light

Artificial Light at Night (ALAN) has the potential to disrupt bat behaviour resulting in adverse effects on bats and their ability to use habitats (Schamhart et al. 2024). The level of effect on bats and their habitats will depend on the timing and extent of ALAN reaching into bat habitat areas, and the locations of bats within these habitats. ALAN within bat habitat areas could make bats less likely to leave their roosts to forage, teach their young to forage or otherwise interact with important resource areas. This potential for disruption to critical bat behaviour and the potential for the displacement of bats suggests ALAN may have a ‘high’ level of effect pre-effects management.

Application of the effects management hierarchy to manage adverse effects of ALAN on long-tailed bats is discussed in Section 7.0.

6.4 Noise

Anthropogenic noise can create novel soundscapes that wildlife are ill equipped to deal with. These novel soundscapes can hinder animals like bats’ ability to recognise and differentiate between natural acoustic cues (such as running water), as well as altering or disrupting critical functional behaviours associated with ultrasonic navigation, foraging and communication between individuals (Francis & Barber, 2013).

There is no known research on the sensitivity of bats to ambient noise or the effect(s) of sound on long-tailed bat behaviour in New Zealand specifically. However, bats overseas are known to have their foraging behaviour supressed by exposure to noise wavelengths within their ultrasonic echolocation range (Gilmour et al., 2021). This is due to the noise overlapping these frequencies and “jamming” or “masking” the echolocation calls of bats, rendering them unable to discern their own calls and therefore less able to locate prey or navigate. Long-tailed bat echolocation calls span a dynamic frequency range of 20 – 80 kHz, above the range of human hearing.

Extended periods of loud noise (i.e. 60–80 dBA) in the audible range have also been shown to alter the activity patterns of UK bats in the same family as long-tailed bats (*Vespertilionidae*) and affect emergence times, potentially adversely affecting foraging and other necessary activities (Brook et al., 2025, Hooker et al., 2023).

Application of the effects management hierarchy to manage adverse effects of noise on long-tailed bats is discussed in Section 7.0.

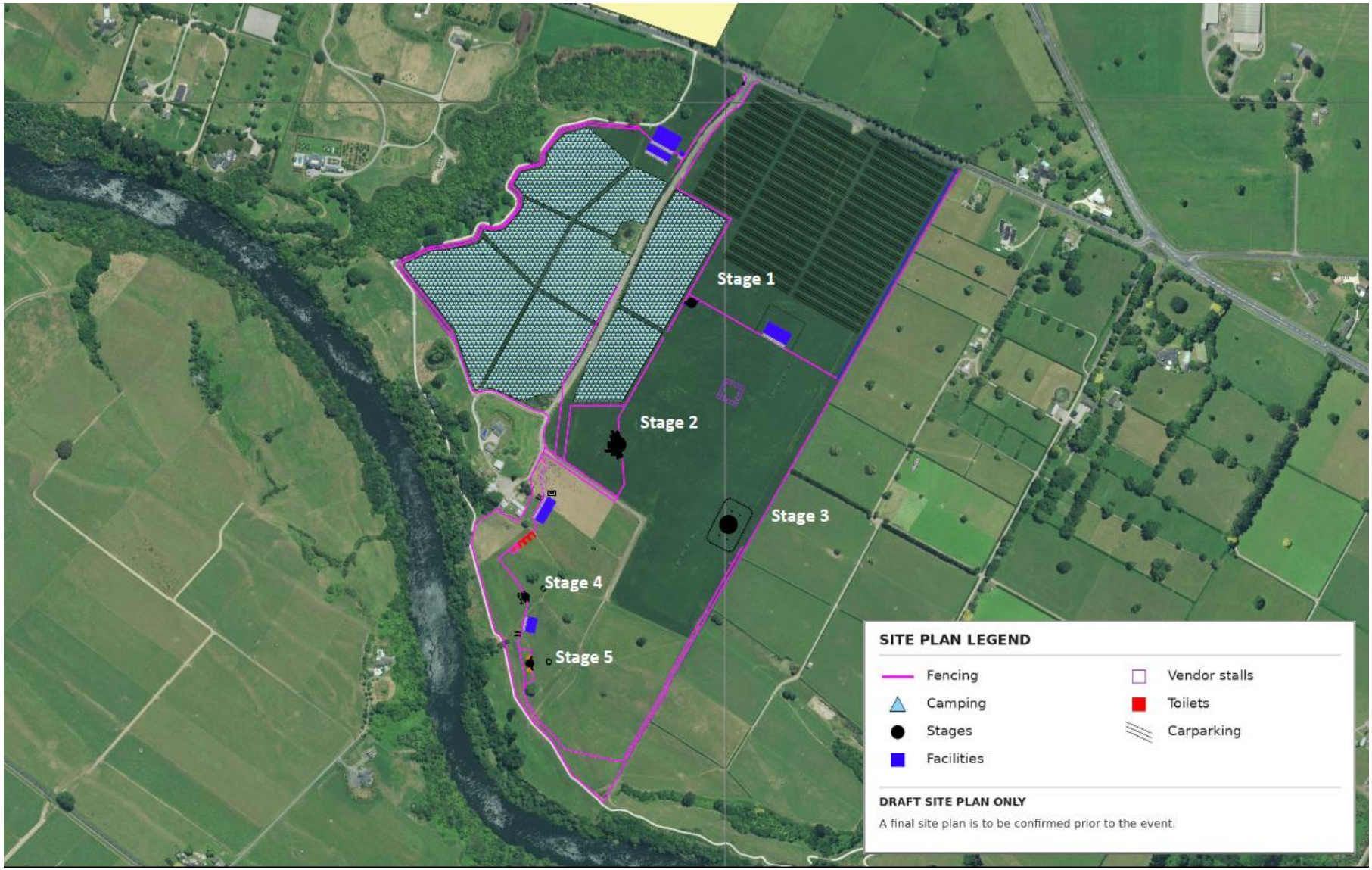


Figure 8: Indicative proposed Live Nation Festival Site Layout (Provided by LiveNation NZ Limited)

7.0 Effects Management

7.1 Introduction

In accordance with the NPS-IB the effects management hierarchy has been applied to avoid, minimise, remedy and where more than minor residual adverse effects cannot be avoided, minimised or remedied biodiversity offsetting and compensation is considered (see Section 8 Residual Effects Management). The following mitigation tool box will be applied to ensure any foreseeable actual and potential adverse effects on long-tailed bats are adequately managed.

7.2 Site Occupation

7.2.1 Event Duration

The Live Nation Festival proposes to operate as a temporary four-night event on an annual basis for five years. During the four nights of operation, sundown will be c. 8:45 pm (Royal Astronomical Society of New Zealand). The number hours of festival operation during darkness will therefore be c. 5 – 7 hrs each night. As a result, there will be up to c. 2.5 hrs of darkness each night after festival operations shutdown when bats could emerge and forage before sunrise. The short event duration will aid in minimising the adverse effects on bats and bat habitat.

7.2.2 Event Layout

If the project proceeds at this Site, complete avoidance of bat habitat is not practicable within and adjacent to the Site. The specific layout of the event facilities and amenities has been designed to minimise the actual and potential adverse effects on long-tailed bats by:

- The five performance stages and main festival operating grounds have been positioned on the eastern portion of the Site to maximise the set-back distance from the SNA gully along the north western boundary of the Site
- The performance stages have been orientated so that they face away from the SNA and Waikato River corridor directing sound and light away from the highest value bat habitat areas.
- The camping area is expected to have the least and most controllable activity and as such has been located in closer proximity to the boundary.

7.2.3 Pre-Festival Acoustic Survey

It is proposed to undertake an acoustic survey across the Site up to 11 weeks before 28 December (festival commencement) using automatic bat monitors. The pre-festival survey will provide an indication of the level and distribution of bat activity within and adjacent to the Site. This will for in event layout adjustments if required to further minimise adverse effects on higher bat activity areas by increasing the setback or adjusting the directionality of lights and speakers etc. based on current bat activity. Live Nation Festival NZ Ltd has indicated this is the minimum amount of pre-event lead time needed to make such adjustments.

Recognising the event's short duration and small footprint in relation to the expanse of bat habitat along the Waikato River, if the above effects management measures are applied the overall level of effect of site occupation on bats and bat habitat is considered 'low" (Table 4).

7.3 Artificial Light

Bat sensitive lighting design will be applied to areas located immediately adjacent to the SNA gully and Waikato River corridor. Currently, there are no New Zealand-specific guidelines for lighting design that minimises effects on bats. However, guidelines developed overseas provide a meaningful framework to minimise the effects of ALAN on bats and have been incorporated in to the Hamilton City Operative District Plan (Chapter 25.6 Lighting and Glare) in practice. This guidance provides a best practice approach to bat sensitive lighting design (Phoenix Ecology 2024). The following design principles will be adopted to minimise adverse effects of ALAN on bats during festival operation.

- ALAN will only be used when and where required for performances and operational safety and security;
- Adaptive lighting controls, such as motion sensors controlled via timers to activate for less than 5 minutes, will be used where possible, such as:
    - for security lighting near temporary toilet blocks and camping area;
- Keeping lighting intensity as low as possible at all event set boundaries facing any potential bat roosting areas, such as the SNA and identified bat habitat.;
- Using warmer colour lighting with a colour temperature of no more than 2700 K for public lighting, unless there are other lighting requirements for providing public health and safety;
- Using downwards facing lighting that is as close to the ground as possible and directional lighting (baffled and angled) so as to avoid upwards light spill; and
- Avoiding bright, reflective surfaces, if they are likely to cause upward obtrusive light.

In conjunction with the event's short duration and small footprint in relation to the expansive areas of bat habitat along the Waikato River implementation of the above measures is expected to reduce the impact of ALAN on bats and bat habitat to a 'moderate' overall level of effect (Table 4). Consequently, these residual adverse effects are proposed to be managed via ecological offset/compensation measures. See Section 8 – Residual Effects Management.

7.4 Noise

7.4.1 Elimination of ultrasonic frequencies

Noise generated during festival operation will be electronically controlled to eliminate the emission of frequencies within the echolocation range of long-tailed bats as these frequencies are above the hearing range of humans (Styles Group 2026). This means that the frequency range of the amplified sound will not overlap with the echo location frequency range of long-tailed bats and the separation between them will be as great as possible; thereby reducing the potential for "jamming" or "masking" of echolocation cues.

7.4.2 Noise levels within bat habitat

There have been no specific studies of the effects of noise within audible frequency ranges at an intensity of 60–80 dB on long-tailed bats, but overseas research on members of the

same family (Vespertilionidae) has demonstrated that comparable volumes can alter bat behaviour in terms of timing of emergence and foraging (Brook et al., 2025). The sensitivity of long-tailed bat hearing at frequencies below their echo-location range is not known as there are no published audiograms available (Styles Group 2026). As a result, weighted curve calculations were performed by the Styles Group (2026) based on published audiograms for two bat species in the Vespertilionidae family. Audiograms for the Japanese house bat, (*Pipistrellus abramus*), from Boku et al. (2015), and the eastern red bat (*Lasiurus borealis*), from Obrist and Wenstrup (1998) were used as proxies for long-tailed bats.

The relative sensitivity-weighted results indicated the highest predicted noise levels likely to be heard by long-tailed bats in the SNA and Waikato River corridor based on the site layout shown in Figure 8 were 48 dB using the House Bat weighting and 52 dB using the Red Bat weighting. Visualisations of the predicted noise grids for both bat weightings are provided below in Figure 9 and Figure 10.

These weightings do not, by themselves, establish an absolute audibility or disturbance threshold for long-tailed bats but may serve as a reasonable proxy for the level of sound to be heard (Styles Group 2026). It is still unknown how or if long-tailed bats will react to this level of sound.

These sensitivity weightings are below the 60 dB threshold whereby the activity of bats in the same family was supressed and delayed in response to outdoor festival activities in the UK. In this regard it is somewhat reasonable to assume that long-tailed bats may react similarly and therefore not alter their behaviour significantly.

Consequently, the overall effect of noise/sound on bats and bat habitat is considered ‘moderate’ noting that the certainty of this categorisation is low, but noting that there would be no f frequency overlap and the uncertainty of the correlation between the sensitivity weighted results for the Japanese House Bat and European Red Bat with that of New Zealand’s long-tailed bat. These residual adverse effects are proposed to be managed via ecological offset/compensation measures. See Section 8 – Residual Effects Management.

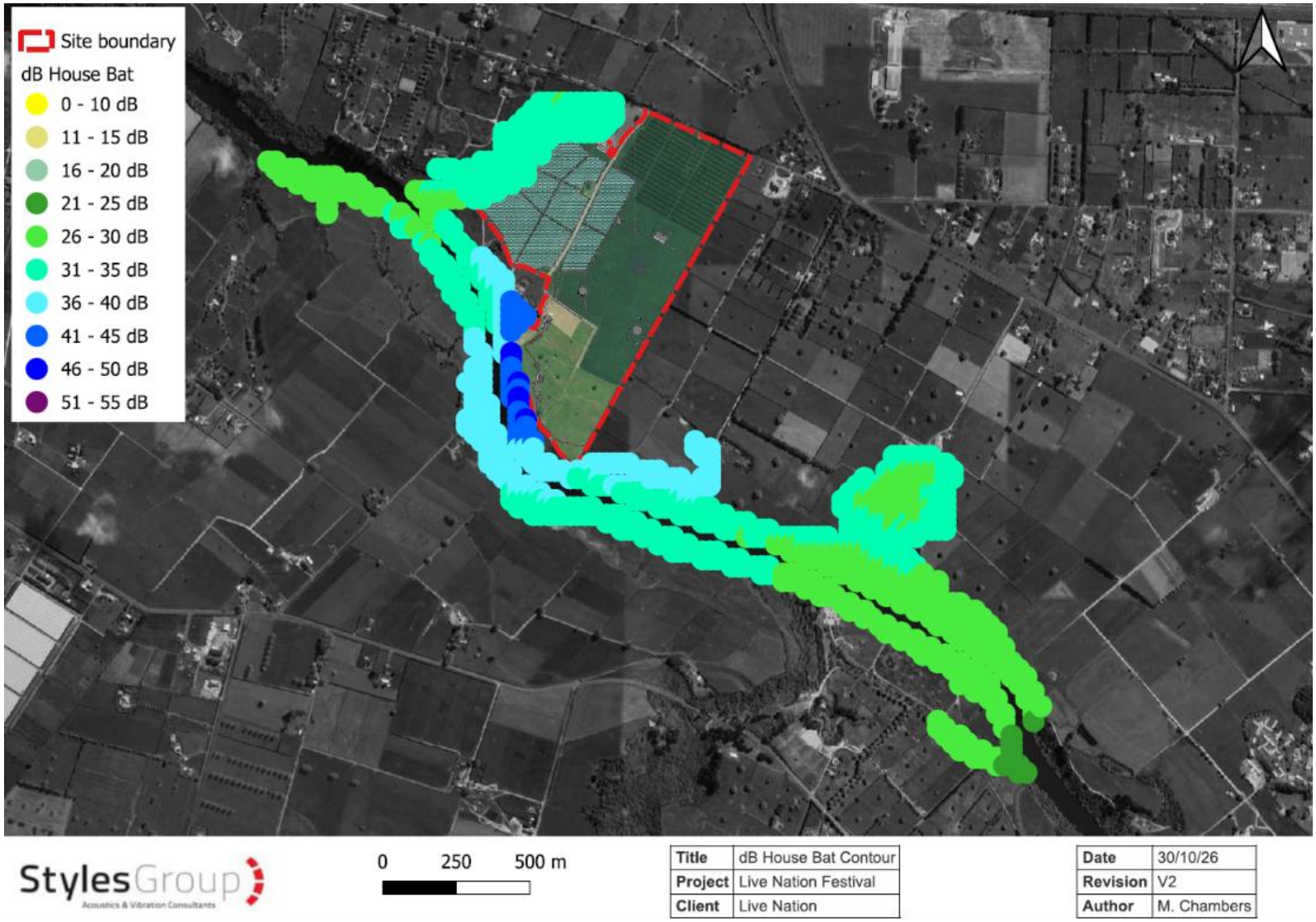


Figure 9: Expected noise levels that would be experienced by Japanese house bats if they were foraging near the Site.

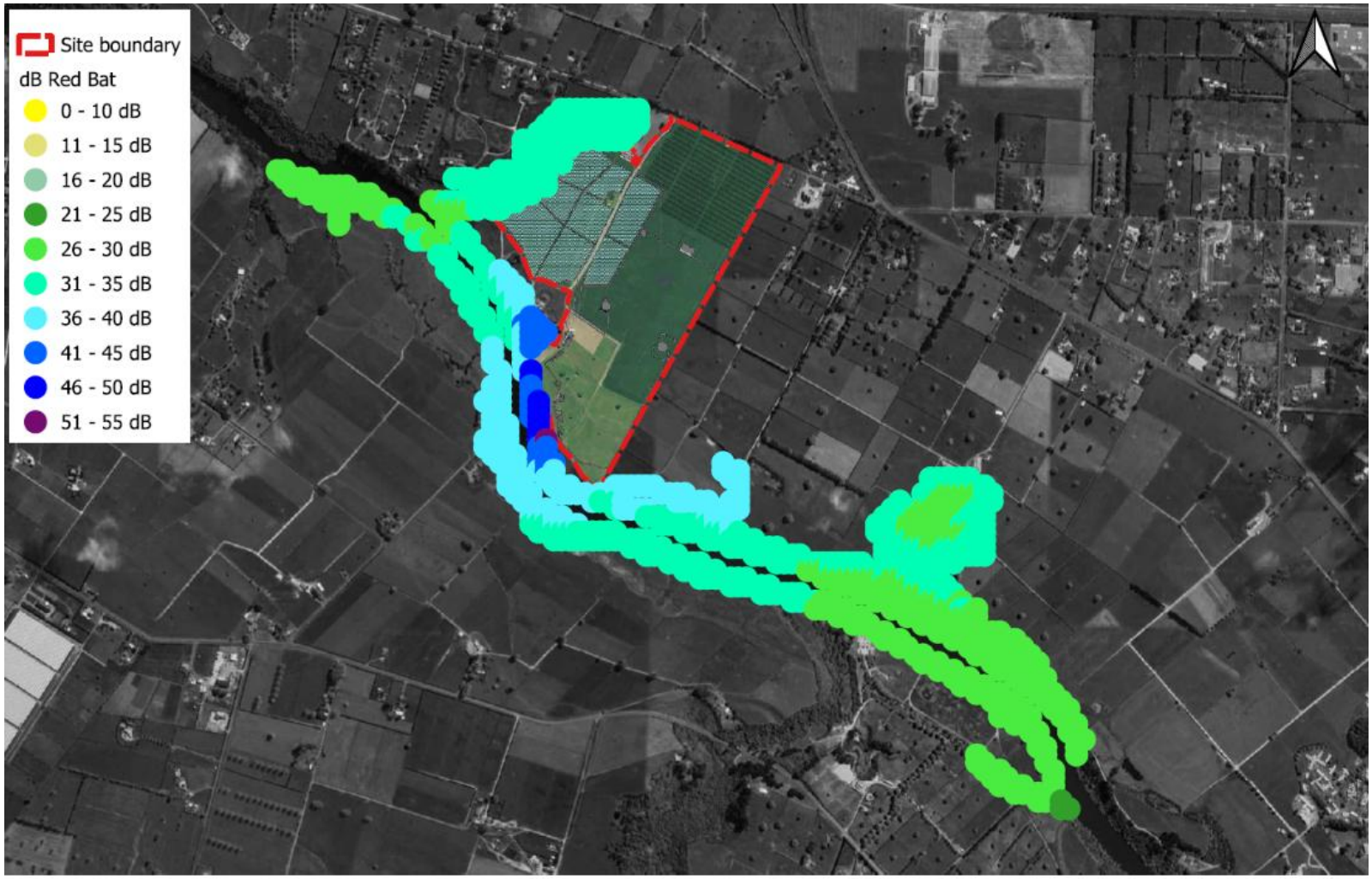


Figure 10: Expected noise levels that would be experienced by red bat if they were foraging near the Site.

Table 4: Magnitude and level of effects for the proposed Live Nation Festival on resident long-tailed bats before and after mitigation.

Activity	Effect	Ecological value	Magnitude of effect	Level of effect (no mitigation)	Proposed mitigation measures	Level of effect (with mitigation)
Site occupation	Four-night disruption of on-site foraging habitat	Moderate	Low	Low	Low levels of effect are not normally of concern.	Low
Artificial lighting	Four-night disruption of bat behaviour	Very High	Moderate	High	Implementation of bat sensitive lighting design in proximity to key habitats. Covering of bat roosts to avoid bats entering roosts where other mitigations cannot be implemented.	Moderate Residual effects management proposed
	Reduction of bat habitat quality.	High – Very High	Low	Low-Moderate	Implementation of bat sensitive lighting design in proximity to key at habitats.	Moderate-Low Residual effects management proposed
Noise generation	Four-night disruption of bat behaviour	Very High	Moderate	High	Elimination of frequencies above 20 kHz to avoid “jamming” of bat echolocation. Highest predicted noise levels at edge of SNA and Waikato Corridor of 48 - 52 dB.	Moderate Residual effects management proposed
	Reduction of bat habitat quality.	High – Very High	Moderate-High	High	Elimination of frequencies above 20 kHz to avoid “jamming” of bat echolocation. Highest predicted noise levels at edge of SNA and Waikato Corridor of 48 - 52 dB.	Moderate Residual effects management proposed

8.0 Residual Effects Management

The management of adverse effects outlined above includes a suite of potential effects management measures; however, there is considerable uncertainty as to the level of effectiveness of these activities in reducing the effects of ALAN and in particular noise, attributable to the Live Nation Festival, on long-tailed bats and bat habitat. As a result there are likely residual adverse effects to be managed. In accordance with the effects management hierarchy, once measures to avoid, minimise and remedy adverse effects have been applied, any residual adverse effects are proposed to be offset or compensated for through additional habitat creation, restoration, enhancement or financial contributions (MfE 2025b).

Biodiversity offsetting and ecological compensation proposals are characterised by adherence to demonstratable core principles as outlined in the NPS-IB (MfE 2025b). Specifically, offsetting differs from compensation, in that offsetting relates to a measurable outcome, that has been quantified through a robust and transparent process, whereas compensation relies on qualitative data and professional expertise and opinion.

Offsetting is preferable to compensation, as reflected in the effects management hierarchy. Compensation is to be considered only after the potential for offsetting effects has been assessed and the level of certainty in the outcome or 'trade-off' is determined to be inadequate.

While offsetting is preferential, because of the short duration and biologically important timing of the festival and therefore the residual adverse effects attributable to it, the operation cannot be demonstrably offset with adequate certainty. This is a result of the complexity and dynamic nature of long tailed bats, their behaviours and use of different habitats which are too difficult to measure within a suitable timeframe. In addition, long-tailed bats are highly mobile, cryptic, and difficult to capture, monitor or measure, and therefore, acquiring the necessary data to secure adequate certainty in their response to festival light and sounds is problematic. Where these situations persist, compensation measures are typically proposed.

Consequently, the it is proposed to compensate for the identified residual effects through the implementation of a comprehensive and targeted predator control programme within the SNA for the period of the consent (5 yrs). The predator control programme will target mammalian predators known to prey on long-tailed bats. Predation of long-tailed bats by rats, stoats, possums and cats is a major threat to long-tailed bat populations (O'Donnell et al., 2023; Pryde et al. 2005).

Implementation of the predator control programme across a portion of the SNA is expected to assist in minimising the overall level of effect on long-tailed bats and bat habitat attributable to the Live Nation Festival is 'low'.

9.0 References

Aughton H. 2021. Project Echo 2021 Hamilton City wide bat survey. Go Eco. Hamilton.

Boku, S., Riquimaroux, H., Simmons, A. M., & Simmons, J. A. (2015). Auditory brainstem response of the Japanese house bat (Pipistrellus abramus). The Journal of the Acoustical Society of America, 137(3), 1063–1068. https://doi.org/10.1121/1.4908212

Brook, T.S., Pearce, H., Waage, J., 2025. Behavioural shifts of bats during urban music festivals. Ecol Sol and Evidence 6, e70151. https://doi.org/10.1002/2688-8319.70151

Caskey L and Tempero G. 2022. Hamilton City Long-tailed Bat Survey: Annual monitoring report, 2022. ERI report number 165. Prepared for Project Echo.

Crewther, K. and Parsons, S. 2017. Predictive modelling of long-tailed bat distribution in the Hamilton area. Walking Bats Consultancy report prepared for Project Echo (a collaboration between Hamilton City Council, Department of Conservation, Waikato Regional Council, and Riverlea Environment Society Inc.).

Davidson-Watts Ecology (Pacific). (2019). Long-tailed bat trapping and radio tracking baseline report 2018 and 2019. Southern Links, Hamilton. Report prepared for Aecom NZ Ltd.

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, New Zealand.

Dekrout, A.S., Clarkson, B.D., 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 Zoology, 41(4), 285-295.

Department of Conservation 2024. Protocols for minimising the risk of felling occupied bat roosts (Bat Roost Protocols): Version 4, DOC Bat Recovery Group, October 2024.

Francis, C. D., & Barber, J. R. (2013). A framework for understanding noise impacts on wildlife: An urgent conservation priority. Frontiers in Ecology and the Environment, 11, 305–313. https://doi.org/10.1890/120183

Gilmour, L.R.V., Holderied, M.W., Pickering, S.P.C., Jones, G., 2021. Acoustic deterrents influence foraging activity, flight and echolocation behaviour of free-flying bats. Journal of Experimental Biology 224, jeb242715. https://doi.org/10.1242/jeb.242715

Griffiths, R. W. 2007. Activity patterns of long-tailed bats (Chalinolobus tuberculatus) in a rural landscape, South Canterbury, New Zealand. New Zealand Journal of Zoology, 34(3), 247-258. https://doi.org/10.1080/03014220709510083

Hooker, J., Daley, E., Stone, E., Lintott, P., 2023. Assessing the impact of festival music on bat activity. Ecol Sol and Evidence 4, e12250. https://doi.org/10.1002/2688-8319.12250

Kessels Ecology. 2017. Significant natural areas of the Waikato District: terrestrial and wetland ecosystems. Prepared for Waikato Regional Council

Leathwick, J. Clarkson, B. and Whaley, P. 1995: Vegetation of the Waikato Region: Current and Historic Perspectives. Landcare Research Contract Report LC9596/022. Landcare Research, Hamilton.

McEwen, M., 1987. Ecological regions and districts of New Zealand. New Zealand Biological Resources Centre.

Obrist, M. K., & Wenstrup, J. J. (1998). Hearing and hunting in red bats (Lasiurus borealis, Vespertilionidae): Audiogram and ear properties. Journal of Experimental Biology, 201(1), 143–154. https://doi.org/10.1242/jeb.201.1.143

O'Donnell C.F.J. 2000. Influence of season, habitat, temperature, and invertebrate availability on nocturnal activity by the New Zealand long-tailed bat (*Chalinolobus tuberculatus*). New Zealand Journal of Zoology 27: 207-221.

O'Donnell, C.F.J. 2002. Timing of breeding, productivity and survival of long-tailed bats Chalinolobus tuberculatus (Chiroptera: Vespertilionidae) in cold-temperate rainforest in New Zealand. J. Zool., Lond. (2002) 257, 311-323.

O'Donnell C.F.J., Christie, J.E., 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, 33:2, 113-124.

O'Donnell, C.F.J. 2018. "Evidence on behalf of the Director-General of Conservation (Bats)" (Statement of Evidence to the New Plymouth District and Taranaki Regional Councils, 24 July 2018)

O'Donnell, C.F.J., Borkin, K.M., Christie, J., Davidson-Watts, I., Dennis, G., Pryde, M., Michel, P., 2023. Conservation status of bats in Aotearoa New Zealand, 2022.

Page-Corney J. 2024. Investigating Habitat Structure and Prey Availability as Predictors of Long-Tailed Bat Activity in Fragmented Landscapes. MSc Thesis, The University of Auckland.

Parsons, S., 2001. Identification of New Zealand bats in flight from analysis of echolocation calls by artificial neural networks. Journal of Zoology (London), 253: 447-456.

Pryde, M.A.; O'Donnell, C.F.J.; Barker, R.J. 2005. Factors influencing survival and long-term population viability of New Zealand long-tailed bats (Chalinolobus tuberculatus): implications for conservation. Biological Conservation 126: 175–185.

Phoenix Ecology. 2024. Hamilton City Bat Management Plan. Submitted to Hamilton City Council. Final version, November 2024.

Roper-Lindsay, J., Fuller, S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition. Environment Institute of Australia and New Zealand, Wellington. 119pp

Schamhart, T., Browne, C., Borkin, K.M., Ling, N., Pattemore, D.E., Tempero, G.W., 2024. Detection rates of long-tailed bats (*Chalinolobus tuberculatus*) decline in the presence of artificial light. New Zealand Journal of Zoology 51, 200–210. https://doi.org/10.1080/03014223.2023.2245760

Sedgeley J.A., and O'Donnell, C.F.J. 1999. Roost selection by the long-tailed bat, *Chalinolobus tuberculatu*s, in temperate New Zealand rainforest and its implications for the conservation of bats in managed forests. Biological Conservation. 88:261–276.

Styles Group 2026. Sound report

DRAFT

Appendix A Enter the title