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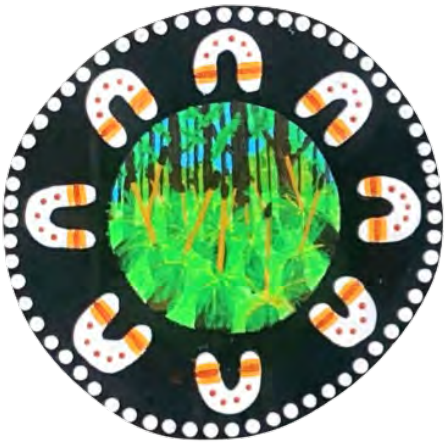
REGENT STREET FLYING-FOX CAMP MANAGEMENT PLAN

December 2024

MAITLAND CITY COUNCIL

Acknowledgements



Ecosure acknowledge the Traditional Custodians of the lands and waters where we work. We pay deep respect to Elders past and present who hold the Songlines and Dreaming of this Country. We honour and support the continuation of educational, cultural, and spiritual customs of First Nations peoples.

We would like to thank the residents of Regent Street, Maitland and Will Brown from Maitland City Council for their assistance during development of this Flying-fox Camp Management Plan. We also thank Bill Dowling and CSIRO for sharing count data.

Acronyms and abbreviations

BC Act	*Biodiversity Conservation Act 2016* (New South Wales)
BFF	Black flying-fox (*Pteropus alecto*)
COP	NSW Flying-fox Camp Management Code of Practice 2018
Council	Maitland City Council
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DCP	Development Control Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
GHFF	Grey-headed flying-fox (*P. poliocephalus*)
HSE	Heat stress event
LEP	Local Environmental Plan
LGA	Local government area
LRFF	Little red flying-fox (*P. scapulatus*)
NFFMP	National Flying-Fox Monitoring Program
NSW	New South Wales
NSW DCCEEW	Department of Climate Change, Energy, the Environment and Water (New South Wales)
the Plan	Regent Street Flying-fox Camp Management Plan 2024
the Policy	NSW Flying-fox Camp Management Policy 2015
SEPP	State Environmental Planning Policy

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1 Introduction

The Regent Street Flying-fox Camp Management Plan (the Plan) provides Maitland City Council (Council) with the framework to work with residents to manage the flying-fox camp located across several private properties. The Regent Street camp is located in Maitland; this flying-fox camp forms part of a network of camps located across the Hunter region (Figure 1) and eastern Australia (Welbergen et al. 2020, Vanderduys et al. 2024). Flying-foxes are highly mobile, moving between camps at the local and national scale. This high mobility is why flying-foxes are ecologically important, no other native pollinator (e.g. bees, birds) is as mobile.

Grey-headed flying-foxes (*Pteropus poliocephalus*; GHFF) were formally recorded roosting at the Regent Street camp in 2019. During 2022 the population periodically increased up to an estimated 20,000 flying-foxes. Uniquely, this camp is located on private property, spreading across several residencies depending upon the number of flying-foxes present. Council and the New South Wales Department of Climate Change Energy, the Environment and Water (NSW DCCEEW) are co-funding this plan, acknowledging the difficult situation for the residents.

The GHFF was listed as vulnerable to extinction in 2001 in NSW (Richards 2000) and nationally (TSSC 2001). The species was assessed to be eligible due to loss of habitat and population decline. Population counts over the previous decade suggested that the national population may have declined by up to 30%. A recent reassessment of the national GHFF population, incorporating extensive survey data collected over a decade as part of the National Flying-Fox Monitoring Program (NFFMP). This research found that the GHFF population has been stable between 2012 and 2022 (Vanderduys et al. 2024). These data support the listing as vulnerable to extinction as the population was not found to be increasing, which would suggest recovery, and the threat of past and ongoing habitat loss remains.

Black (*P. alecto*; BFF, Figure 2), GHFF (Figure 3), and little red flying-fox (*P. scapulatus*; LRFF, Figure 4) have been recorded within the local government area (LGA) (see Appendix 1 for more detail on each species). These three species have been recorded at the Regent Street camp. Three other flying-fox camps (Figure 1) have been recorded within the Maitland LGA.

This Plan focuses on the Regent Street camp. The Plan includes a range of short-term options to support the camp in situ, including identifying management actions aimed at minimising conflict and fostering awareness and tolerance. Long-term actions have also been identified, including planting an alternate roost site. Collectively, these actions aim to conserve flying-foxes and the critical ecosystem services they provide while improving daily amenity for the Regent Street residents. The draft Plan will be on public exhibition at Council for 28 days, providing the community an opportunity to comment.

An assessment of the natural foraging habitat within 50 km of the Regent Street flying-fox camp highlights the extensive potential habitat (Eby et al. 2019) (Figure 5). We note that the figure presents natural habitat mapped at a state level; habitat within urban and agricultural areas warrants an equally detailed assessment. It is recognised that urban and agricultural areas provide valuable foraging habitat for flying-foxes (Timmiss et al. 2021, Yabsley et al. 2021).

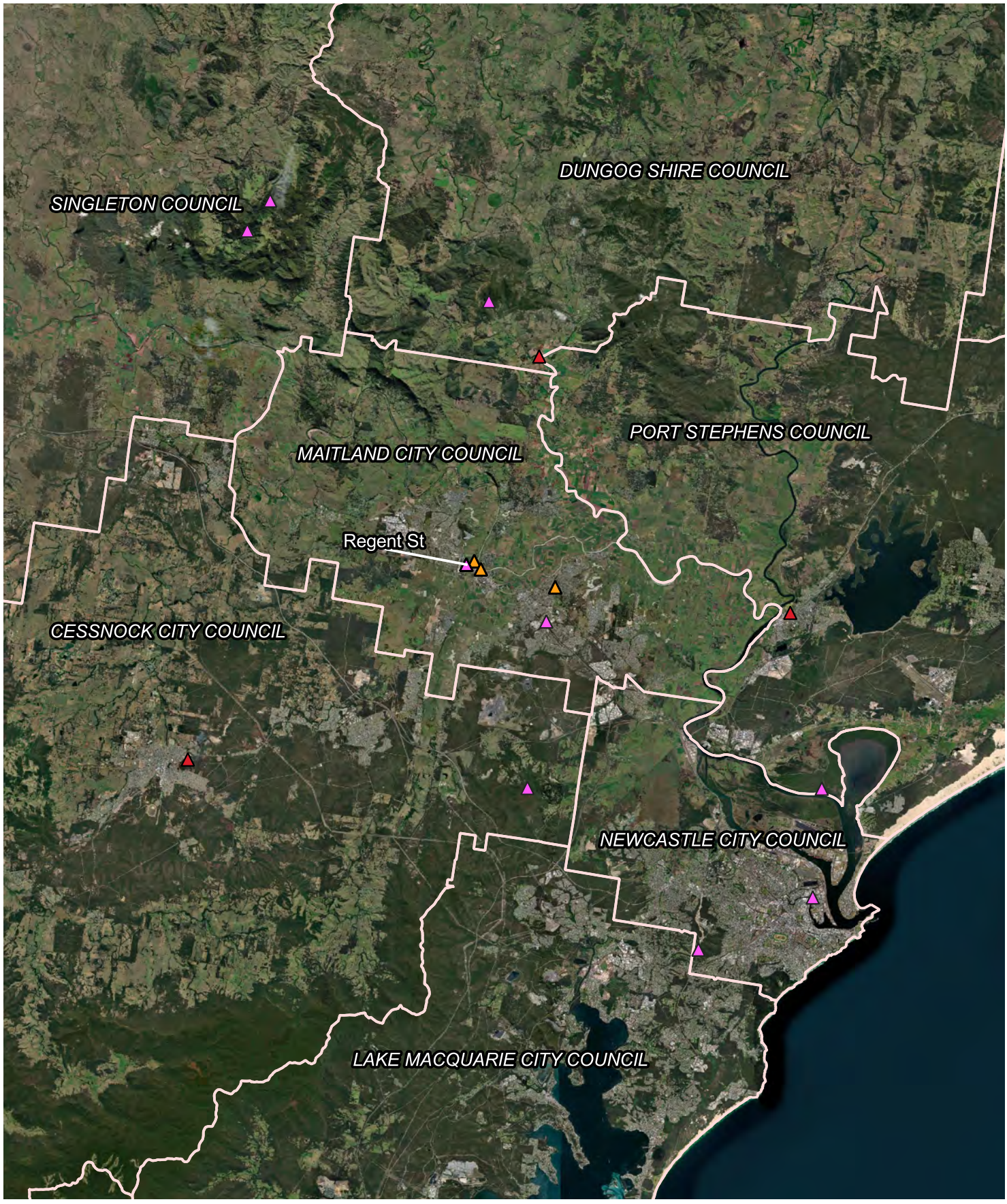

Figure 1: Regional context of Regent Street flying-fox camp, NSW

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- Flying-fox roost
- Nationally important roost
- Historic flying-fox camp
- LGA boundary

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Author: AS
Date: 20/12/2024

0 5 10 km

GDA 2020 MGA Zone 56
Projection: Transverse Mercator
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Figure 2 Black flying-fox indicative species distribution (DPE 2023)

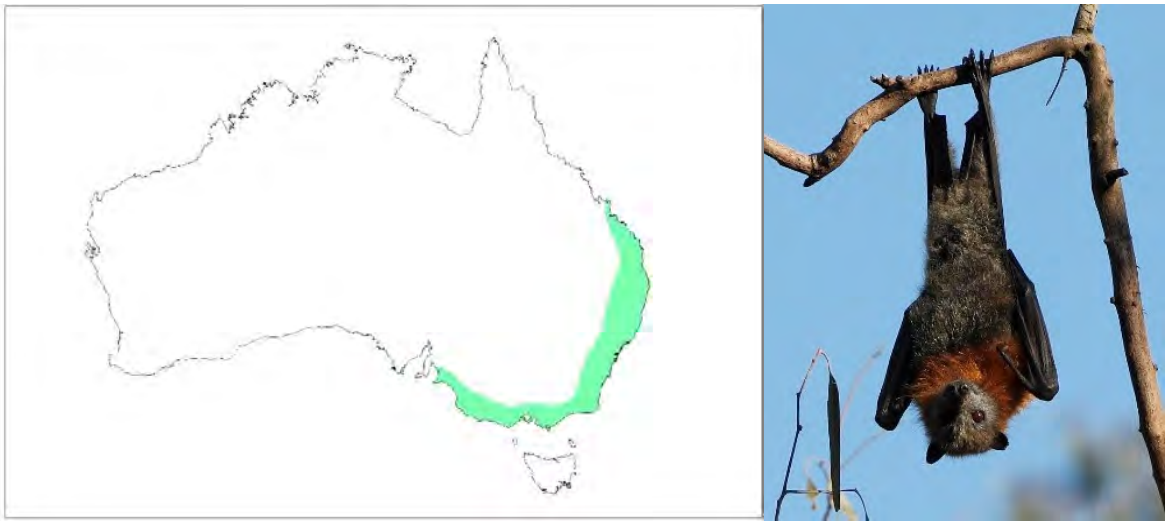


Figure 3 Grey-headed flying-fox indicative species distribution (DPE 2023)

Figure 4 Little red flying-fox indicative species distribution (DPE 2023)

1.1 Flying-fox ecology, conflict, and management

Flying-foxes are highly nomadic, moving across their range between a network of camps (Welbergen et al. 2020). Camp occupancy may be permanent, seasonal, temporary, or sporadic (Roberts 2005) and numbers can fluctuate significantly on a daily/seasonal basis (Vanderduys et al. 2024). Flying-foxes may travel up to 100 km a night in search of food resources (nectar, pollen, and fruit), and their occurrence within the LGA is tightly linked to flowering and fruiting of foraging trees. Flying-foxes high mobility is why they are ecologically important, no other native pollinator (e.g. bees, birds) is as mobile. Typically, the abundance of resources within a 20 km radius of a camp site is a key determinant of the size of a camp (SEQ Catchments 2012). However, understanding the availability of foraging resources is difficult because flowering and fruiting are not reliable every year and vary between locations (SEQ Catchments 2012). See Appendix 2 for additional information on flying-fox ecology.

Mapping flying-fox foraging habitat combined data on vegetation community types and preferred diet trees to identify areas of high foraging suitability in NSW (Eby et al. 2019). The variability of foraging resources and the corresponding variability of the number of flying-foxes in a camp highlights the need for a multi-faceted approach to management. Flying-fox management requires continual adaptation as situations change or further research improves our understanding of these species and the management options available.

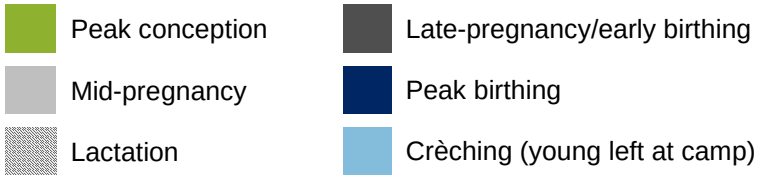
Living near a flying-fox camp can be challenging, with potential impacts associated with noise, odour, mess, damage to vegetation, and health concerns. There are also challenges associated with management. State approval is required under legislation to manage a camp, this includes site management aiming to retain the roosting habitat and flying-foxes. Commonwealth approval may also be required, pending if the management being considered may have a negative impact on GHFF. Management actions are categorised by the NSW DCCEEW as Level 1, Level 2, and Level 3 (OEH 2015). Examples of management aiming to retain the flying-foxes in situ and reduce impacts include education (Level 1) and/or creating buffers by removing vegetation (Level 2). Attempting to disperse a flying-fox camp is a Level 3 action. Camp dispersal has been shown to be extremely costly, often resulting with splintered camps to multiple undesirable locations that are difficult to predict (Roberts et al. 2021). Flying-foxes will also regularly attempt to recolonise their preferred camp site when resources are available, and it is not appropriate or possible to remove all flowering and fruiting trees that attract them to the LGA.

Flying-foxes appear to be roosting and foraging in urban areas more frequently. An assessment of the NFFMP) (Vanderduys et al. 2024) camp occupation data found that of the 654 known national flying-fox camps, 55% occurred in urban areas and a further 23% in agricultural areas. Only 7% occurred in national parks (Timmiss et al. 2021).

Conflict resolution is challenging as management of flying-fox camps has proven to be difficult for various reasons. Firstly, there are limited periods of time where active management is appropriate due to flying-foxes breeding biology (Table 1). If LRFF increasingly remain in NSW during winter camp management is likely to become more complicated (Table 1). Secondly, the most successful management actions aim to retain flying-foxes in situ, with small adjustments aimed at moving them short distances away from sensitive areas. Camp dispersals have been shown to be highly unsuccessful (Roberts et al. 2021).

Table 1 Indicative flying-fox reproductive cycle

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GHFF												
BFF												
LRFF												



1.2 Plan objectives

The Plan has been prepared in accordance with the NSW Flying-fox Camp Management Policy 2015 (the Policy), administered by the NSW DCCEEW. The Plan addresses the 2019 updates to the camp management plan template and changes to State legislation around threatened species.

The purpose of this Plan is to guide management, outline potential actions, increase awareness about flying-foxes, promote conservation, and reduce negative impacts for residents and communities near the Regent Street camp. Council is limited in how it can assist with the impacts of foraging flying-foxes, however, will provide advice about how landholders can reduce these impacts.

Objectives of this Plan are to:

- guide management of the Regent Street flying-fox camp in accordance with the Policy
- minimise current and future impacts to residents, adjoining neighbours, and the community
- improve community understanding and appreciation of flying-foxes including their ecological role
- conserve flying-foxes and their habitat
- support ways for the community to coexist with flying-foxes
- clearly define roles and responsibilities for management actions
- ensure actions are in accordance with relevant legislation.

1.3 Legislation

Flying-foxes are protected native wildlife that provide a critical ecological role in seed dispersal and pollination (see Appendix 1). The GHFF is listed as vulnerable to extinction at State and Commonwealth levels. The BFF and LRFF are not listed as threatened, however, as they are native wildlife they are protected species. The main threat to flying-foxes in NSW is clearing native vegetation. This threatening process removes roosting and breeding habitat and limits the availability of natural food resources, particularly winter–spring feeding habitat in north-eastern NSW. There is a range of legislation and policy that governs how flying-foxes and their habitat can be managed. Key legislation specific to flying-fox camp management is summarised in Table 2 (further detail in Appendix 3).

Table 2 Summary of key legislation

Level	Instrument	Relevance to the Plan
Commonwealth	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	Approval under the EPBC Act may be required for any action likely to impact a Matter of National Environmental Significance e.g. nationally threatened species (such as the GHFF) or ecological communities, world heritage sites, wetlands of international importance. The Referral guideline for management actions in GHFF and spectacled flying-fox (*P. conspicillatus*) camps (DoE 2015) specifies requirements for camp management, and when referral is required.
State	Flying-fox Camp Management Policy 2015 (the Policy)	The Policy specifies which actions are permissible without NSW DCCEEW approval, with actions categorised as Level 1, Level 2, or Level 3. The Policy specifies a hierarchical approach to management based on the principle of using the lowest form of intervention. This Plan is aligned with the Policy.
	Biodiversity Conservation Act 2016 (BC Act) and Flying-fox Camp Management Code of Practice 2018 (COP)	Camp management activities not specified as routine camp management' in the Policy require the landholder (Council or private) to obtain a licence under the BC Act. Managers of public land (e.g. Council) are able to undertake some actions on that land without the need for a licence, provided they are done in accordance with the COP. Private landholders will still require a licence.
	Local Government Act 1993	Provides a framework for local government to act in an effective, efficient, environmentally responsible and open manner, and encourages community participation in Council affairs.
	National Parks and Wildlife Act 1974	Provides for the conservation of nature, objects, places, or features of cultural value. Approval may be required if actions are likely to impact any of these values.
	Prevention of Cruelty to Animals Act 1979	It may be an offence under the *Prevention of Cruelty to Animals Act 1979* if there is evidence of animal torment or suffering as a result of management.
	Environmental Planning and Assessment Act 1979	Sets the framework for appropriate management and conservation of resources for the community and environment. Development control plans under the *Environmental Planning and Assessment Act 1979* should consider appropriate provisions for development near a flying-fox camp, and to protect flying-fox habitat.
	State Environmental Planning Policy (Biodiversity and Conservation) 2021	Landholders require approval under the BC Act to cut down, fell, root, kill, poison, ringbark, burn, or otherwise destroy vegetation, or lop or otherwise remove a substantial part of the vegetation to which the Biodiversity and Conservation State Environmental Planning Policy applies (known as a SEPP).
Local	Maitland Local Environmental Plan (known as an LEP) and Development Control Plan (known as a DCP)	Council has a Local Environmental Plan and Development Control Plan to guide planning decisions on development and land use within the LGA.

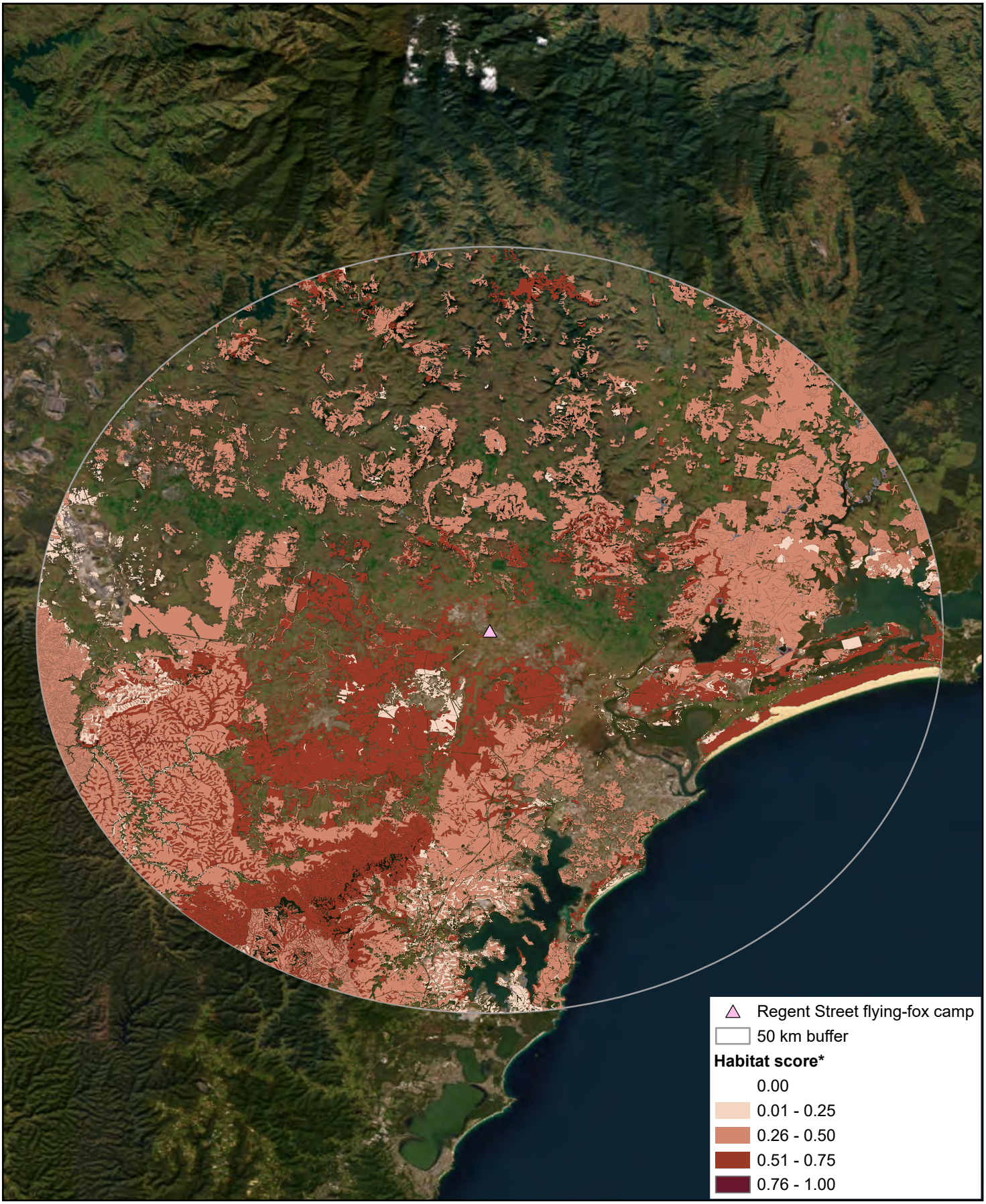


Figure 5: Natural flying-fox foraging habitat within 50 km of the Regent Street Camp

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* weighted productivity X reliability scores of flying-fox diet plants (nectar habitat). Higher scores represent higher foraging value.
Data Source: Eby et al. 2019.

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Author: TD
Date: 22/08/2024

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Kilometers

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2 Potential impacts from flying-foxes

Flying-foxes in urban areas can come into conflict with the community where their camps neighbour residential dwellings. Conflict can also occur at foraging sites, many kilometres from a camp. This Plan aims to provide Council with management actions to reduce impacts on the residents neighbouring the Regent Street camp.

2.1 Noise

A highly social and vocal animal, the activity heard from flying-foxes at camps includes courting, parenting, and establishing and defending mating territories. Noise is often most disturbing to people pre-dawn. Throughout the year noise is made as the flying-foxes return to the camp pre-dawn. This noise is often exacerbated during pup rearing (spring/summer) as adult female flying-foxes return to the camp to feed their pups during the night. Often, the largest number of complaints occur from January to May, peaking during the mating season (mid-March to mid-May). At this time males vocalise to defend their mating territories and may stay at the camp through the night (Welbergen 2011).

2.2 Odour

Flying-foxes use pheromones to communicate with each other, which is the source of the characteristic musky smell around their camps and some foraging trees. There are several factors that affect odour detectability and intensity, such as the number of flying-foxes, time of year, weather conditions, wind direction, and site characteristics.

Odour may be more intense at camps during the breeding and rearing season as female flying-foxes use scent to find their pups after foraging, and males regularly mark their territories (Wagner 2008). Likewise, odour is stronger after rain as males remark branches in their territories.

2.3 Human and animal health concerns

Flying-foxes, like all animals, may carry pathogens which can be harmful to humans. These risks can be effectively mitigated through education, protocols, personal protective equipment (PPE; e.g. gloves), and basic hygiene measures. The key human and animal health risks associated with flying-foxes are Australian bat lyssavirus and Hendra virus (NSW Health 2024). Australian bat lyssavirus is communicated directly from a sick bat through saliva transfer from a bite or scratch. This virus is exceptionally rare in bats; the rabies vaccine is available and is also used as a post-exposure treatment. Hendra virus is particularly important for flying-fox camps located near horse paddocks. The NSW government encourages the vaccination of horses to reduce the risk of exposure to Hendra virus. Further information on flying-foxes and human/animal health is provided in Appendix 4. The key guidance is do not touch sick or injured flying-foxes, contact a trained, vaccinated person with PPE.

2.4 Faecal drop

Flying-foxes have an extremely fast digestive process with only 15-20 minutes between eating and excreting (SEQ Catchments 2012). Given that flying-foxes regularly forage up to 20 km from their camp (Meade et al. 2021) and establish new camps within 600 m – 6 km when dispersed (Ecosure 2014, Roberts et al. 2021), attempting to disperse a camp will not reduce

this impact. As such, faecal drop impacts are best managed at an individual property level.

Faecal droppings can cause health concerns, reduced amenity, create a slip hazard, require time and resources to clean, and can damage paint if not promptly removed. Appropriate personal protective equipment and hygiene measures are required when cleaning any animal excrement. High-pressure hoses and specific cleaning products are available to assist cleaning. Flying-fox impacts may be able to be mitigated around areas of concern, such as picnic tables and play equipment, by installing covered areas (e.g. with a shade canopy). Further information on flying-foxes and human health is provided in Appendix 4.

2.5 Water quality concerns

Contamination of water supplies by any animal excreta (birds, amphibians, and mammals such as flying-foxes) poses health risks to humans. This is particularly relevant for any residents who rely on rainwater tanks for drinking water (see NSW Health website). There is no known risk of contracting bat-related viruses from contact with faecal drop or urine (DPE 2023). Household water tanks can be designed to minimise potential contamination, such as using first flush diverters to divert contaminants before they enter water tanks. Information is available on the NSW DCCEEW website: Living near a flying-fox colony.

Pool maintenance practices (e.g. filtration, chlorination, skimming, vacuuming) should remove general contamination associated with wildlife droppings. Public water supplies are regularly monitored for harmful bacteria and are filtered and disinfected before being distributed. Management plans for community supplies should consider whether any large congregation of animals, including flying-foxes, occurs near the supply or catchment area. Should this occur, increased frequency of monitoring should be considered to facilitate early detection and management of contaminants if required.

2.6 Damage to vegetation

Large numbers of roosting flying-foxes can damage vegetation. Most native vegetation is somewhat resilient and generally recovers well (e.g. casuarina and eucalypts) and flying-foxes naturally move within a camp allowing the vegetation to recover. However, damage can be significant and permanent, particularly in small patches of vegetation. Intervention may be required to protect tree health if permanent damage is likely.

2.7 Flying-foxes and aircraft

Flying-foxes are large (~800g) animals that transit in large numbers at relatively low altitudes. Consequently, in terminal airspace, where aircraft are operating at low altitudes, they may present a significant risk to air safety particularly prior to first light and around sunset, daily. Between 2008 and 2017, flying-foxes and bats[1] were involved in 1,303 strikes in Australia and accounted for 10% of damaging strikes (ATSB 2019). Most notably, between 2016 and 2017 flying-foxes were the most struck flying animal.

1 Due to inconsistent species reporting, species reported to the Australian Transport Safety Bureau (ATSB) include: flying-fox, bat, fruit bat, micro bat, freetail bat, eastern freetail bat, mouse-eared bat, and spectacled flying-fox. ATSB reported that it is likely that many of the strikes involving animals reported as 'bats' actually involved flying-foxes.

3 Camp assessment

The Regent Street flying-fox camp context, history, ecological values, and sensitive receptors are outlined. Sensitive receptors are those locations that host people and/or animals where risks need to be managed. Sensitive receptors include schools, childcare centres, hospitals, helipads and airports, and equine facilities. Identifying sensitive receptors is necessary with regards to any management actions that could inadvertently cause the camp to splinter to undesirable or sensitive locations surrounding the camp.

Management options are considered for the Regent Street camp with consideration to the legislation and the site. Management options are outlined in Section 5 and planned actions are outlined in Section 6.

3.1 Regent Street camp

3.1.1 Camp description

The camp is located across several properties along the eastern side of Regent Street, Maitland (Figure 6). Much of the camp occurs on one property, a 5 acre block that extends behind 31 – 37 Regent Street. Flying-foxes roost in discrete areas of 23 Regent Street and the neighbouring properties of 19 and 31 Regent Street. The core area of the camp covers ~0.65 ha. At times the camp has extended across the backyards of 9 – 31 Regent Street (~1.8 ha); we note that flying-foxes commonly roost behind 31 – 37 Regent Street, on part of the 5 acres of 23 Regent Street (Figure 6).

3.1.2 Land tenure

The Regent Street camp is on land zoned as R1 – General Residential and RU1 – Primary Production.

3.1.3 Ecological values

The ecological values within 1 km of the Regent Street camp have been identified (Figure 7). There are no mapped Plant Community Types within the camp extent. There are also no Biodiversity Values mapped within the camp extent.

Six threatened species have been recorded within 1 km of the Regent Street camp since 2004 (BioNet 2024; see Appendix 5 for details), including:

- Grey-headed flying-fox (*P. poliocephalus*)
- Koala (*Phascolarctos cinereus*)
- Magpie goose (*Anseranas semipalmata*)
- Short-tailed shearwater (*Puffinus tenuirostris*)
- Wedge-tailed shearwater (*Ardenna pacifica*)
- Wompoo fruit dove (*Ptilinopus magnificus*).

Figure 6: Regent Street flying-fox camp

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Core camp extent
Maximum camp extent
Property boundary

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Meters

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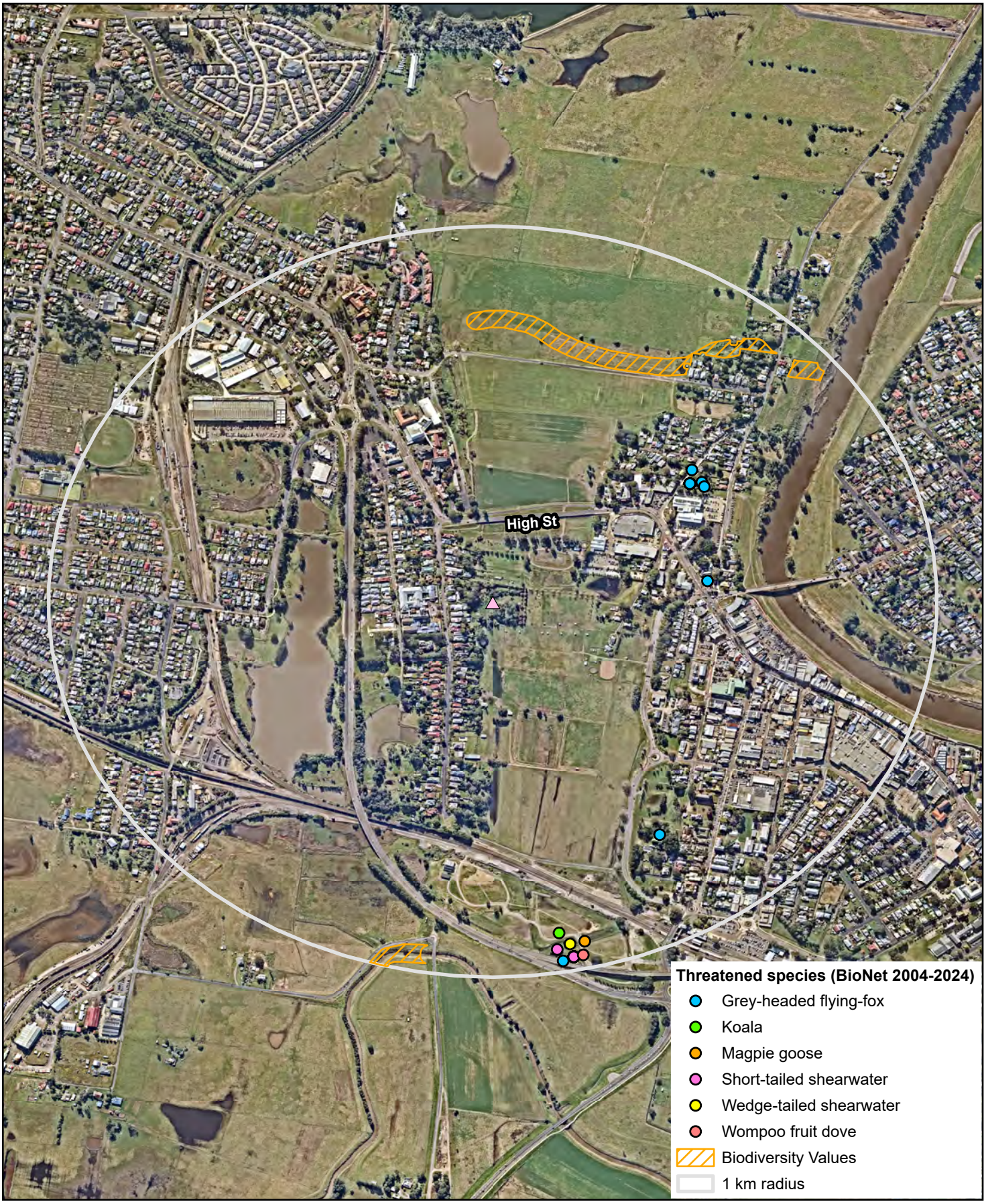

Figure 7: Ecological values within 1 km of the Regent Street camp

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Date: 14/08/2024

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Datum: GDA2020
Units: Degree

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3.1.4 Flying-fox occupancy and camp extent

Grey-headed flying-foxes were first recorded roosting at the Regent Street in 2019 (Figure 8). The small number of GHFF were initially thought to be temporary visitors, however the numbers increased during 2022. BFF and LRFF were observed at this camp during 2024.

Temporary roosting in novel locations has been confirmed through satellite tracking (Welbergen et al. 2020); this behaviour has been reported in association with stochastic events including bushfires, food shortages, and mass flowering events.

3.2 Regional flying-fox context

Historically, a flying-fox camp in Lorn was mentioned in the local newspaper in 1844 (GeoLink 2012). Then, to our knowledge, there is a long gap until flying-foxes were recorded during December 2009 to March 2010 roosting along the Hunter River, near Lorn (GeoLink 2012). The camp included GHFF and LRFF and up to 20,000 flying-foxes were reported to have roosted.

Data collated by the NFFMP covering 2012 to 2024 records flying-foxes use of the four camps across the Maitland LGA (Figure 9). Initially, almost 2000 GHFF and 50 BFF were recorded roosting at Lorn during 2012-2013. Flying-foxes weren't recorded at this camp again until February 2022 when there was a regional influx. Note, it is unclear if the Lorn camp was consistently surveyed since 2012.

The Hannan Street, Maitland camp was then established in 2014 and used periodically through to 2016 (Figure 9). Up to 5600 GHFF were recorded at this site. Flying-foxes weren't recorded at this camp again until February 2022 when there was a regional influx. Note, it is unclear if the Hannan Street camp was consistently surveyed since 2014.

The Tenambit camp was then established in 2017 and used consistently through to 2020 and then periodically in 2021 and 2022 (Figure 9). Up to 2000 GHFF and 50 BFF were recorded at this site. Note, it is unclear if the Tenambit camp was consistently surveyed since 2017.

Over the past 12 years, across the Maitland LGA a few thousand GHFF were consistently recorded across the four known camps. In general, zero or smaller numbers of flying-foxes were recorded during winter. At two periods, February 2015 and 2022, around 5000 GHFF were recorded. During February 2022 they were recorded across three of the camps. Uncharacteristically, during May 2024 over 10,000 flying-foxes were recorded at the Regent Street camp, this included approximately 5000 LRFF; this is infrequently observed in NSW. LRFF have been recorded within the Maitland LGA previously. The Lorn camp was reported to have over 20,000 GHFF and LRFF roosting in 2010 (GeoLink 2012), thus, larger numbers of flying-foxes are likely to occur again in the future.

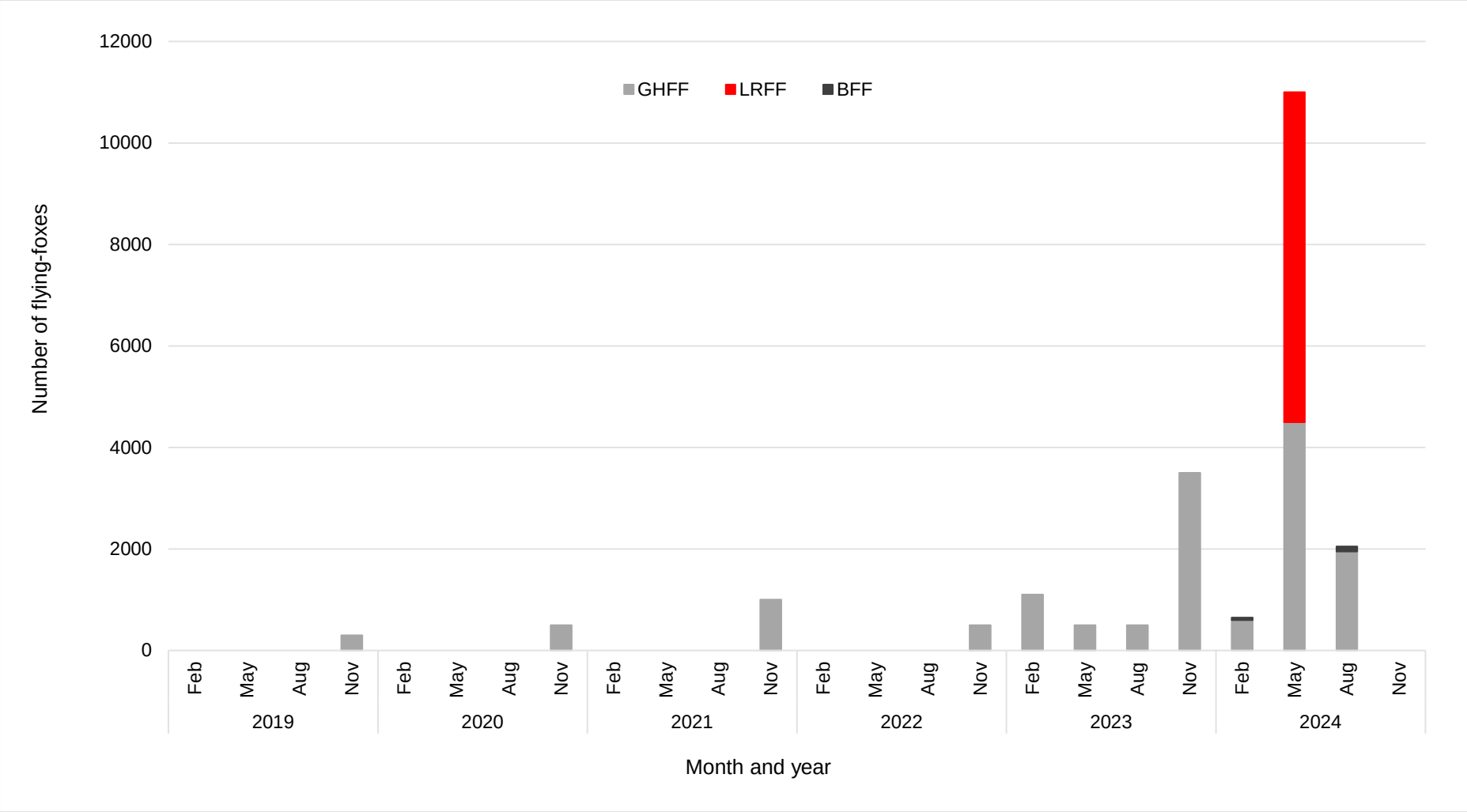

Figure 8 Regent Street flying-fox count data; zero counts may be due to missing surveys (source: Bill Dowling, NSW DCCEEW, Maitland City Council)

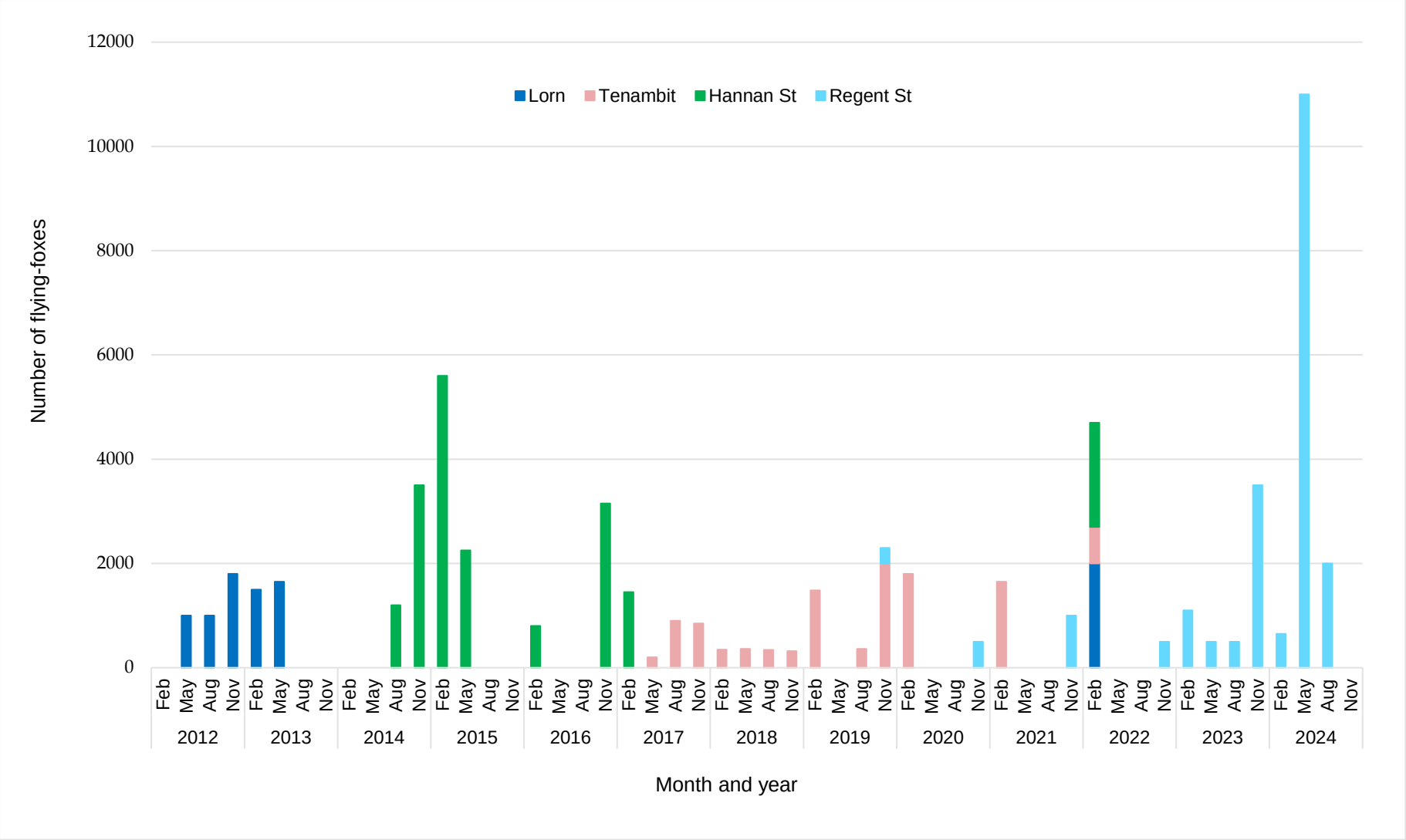

Figure 9 Maitland local government area regional flying-fox count data; individual species are not presented, and zero counts may be due to missing surveys (source: Bill Dowling, NSW DCCEEW, and Maitland City Council)

The Regent Street GHFF camp does not currently meet the Commonwealth criteria as a nationally important camp (DoE 2015) (see Appendix 3). The key criteria are noted below; nationally important camps are given an increased level of protect, requiring additional approvals to implement management that may negatively impact the roosting habitat provided:

- contained ≥10,000 GHFF in more than one year in the last 10 years, or
- has been occupied by ≥ 2,500 GHFF permanently or seasonally every year for the last 10 years.

3.2.1 Sensitive receptors

There are six sensitive receptors located within 1 km of the Regent Street camp (Figure 10), including:

- Bright Beginnings Child Care
- Busy Bees at Maitland
- Cavalry Mt Carmel Aged Care and Retirement Living
- Kinda Kapers Maitland
- Maitland Public School
- RFBI Benhome Masonic Village.

Additional sensitive receptors >1 km from the Regent Street camp include the Maitland Showground (approximately 2 km to the south-east), and Maitland Airport (approximately 5.5 km to the north-west).

Council will consult with land managers of these sites about management of impacts if/when required (see Section 6 and Section 7).

3.2.2 Management responses to date

Council has liaised with residents and the NSW DCCEEW aiming to inform the community about flying-fox ecology, management, and to understand residents preferred outcomes. Council has advised residents that dispersal is unlikely to be effective. The flying-foxes are located on private land, as such Council has no formal management responsibility. NSW DCCEEW facilitated vegetation management and the resident installed canopy-mounted sprinklers (CMS) on 23 and 31 Regent Street (Figure 11), aiming to create a buffer between the roosting flying-foxes and residential dwellings.

Information about flying-foxes and a range of topics, including management, health, living with flying-foxes, and more can be found on the NSW DCCEEW website. This website includes information on education, wildlife care, and wildlife friendly netting. An example of one educational initiative is informing the community about the issue of wildlife friendly fruit-tree netting. Flying-fox entanglement in loose netting over fruit trees is a significant issue that can be quickly and easily addressed through education.

Figure 10: Sensitive receptors within 1 km of the Regent Street camp

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School
Early childhood centre
Aged care centre
1 km radius

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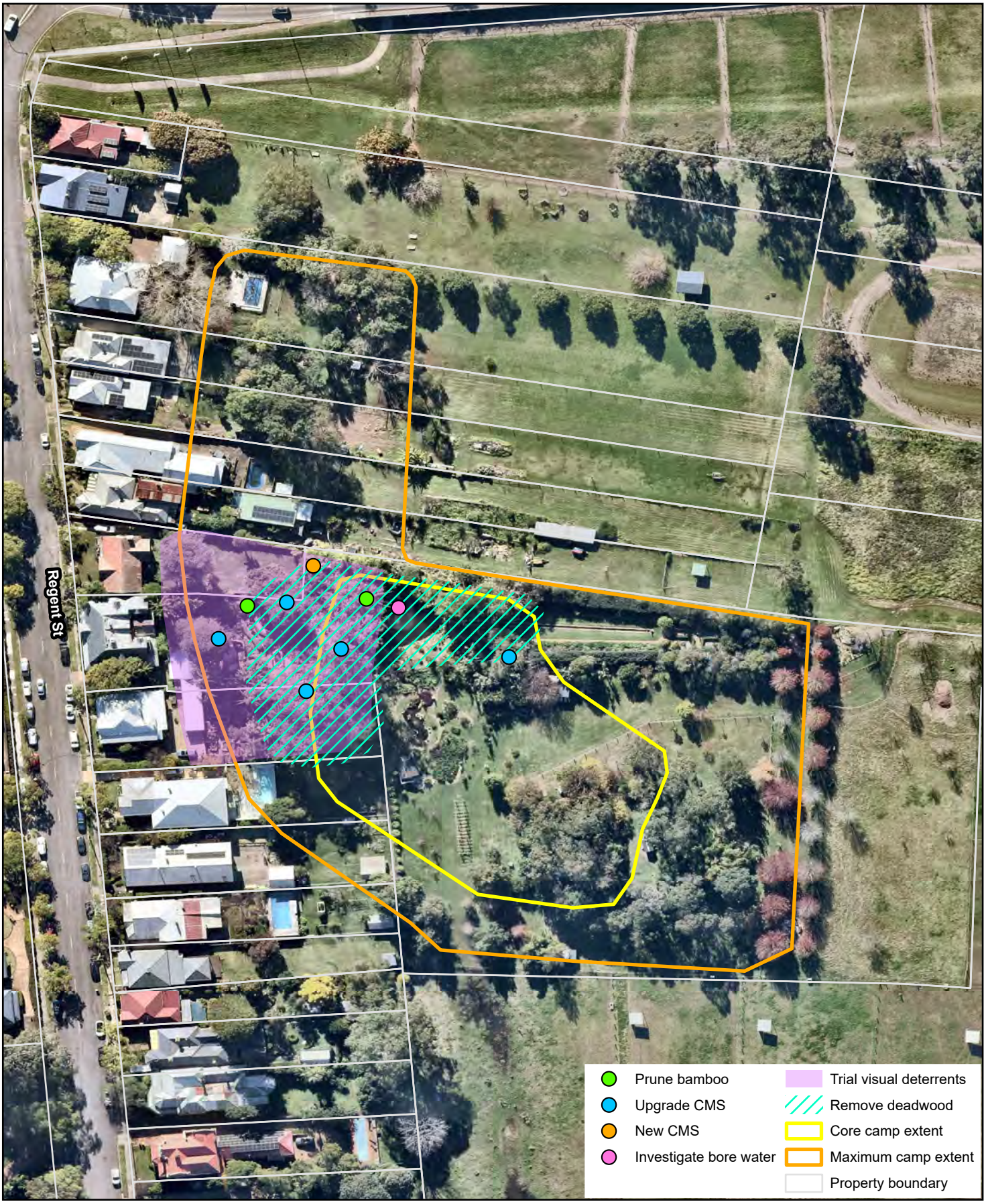

Figure 11: Regent Street flying-fox camp indicative management actions

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PR8790 Regent Street Flying-fox Camp Management Plan

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Job number: PR8970
Revision: 0
Author: TD
Date: 22/08/2024

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Meters

GDA2020
Datum: GDA2020
Units: Degree

Figure 12: Regent Street flying-fox camp proposed revegetation area

Maitland City Council

PR8790 Regent Street Flying-fox Camp Management Plan

Revegetation area
Core camp extent
Maximum camp extent
Property boundary

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Job number: PR8970
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Author: TD
Date: 20/08/2024

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Meters

GDA2020
Datum: GDA2020
Units: Degree

PR8790_MPX_RevegetationArea
A4

4 Community Engagement

Early and effective community engagement and education has benefits for both communities and land managers. These benefits include increasing community understanding and awareness of flying-foxes, their critical ecological role, and factors that need to be considered in developing a management approach. Engaging with the community is equally important to ensure land managers understand potential management impacts associated with a camp to effectively manage community concerns.

This Plan was developed following a site assessment with Council. Community engagement was undertaken through a paper questionnaire, that was hand-delivered to targeted residents' mailboxes, while the draft Plan was being reviewed and exhibited for public comment.

4.1 Resident liaison and education

Council has liaised with impacted residents and has provided information such as answers to frequently asked questions, a flying-fox fact sheet, and the contact details of council officers who can answer enquiries about the camp and the flying-foxes. Council has met with Regent Street residents and continues to work with the community.

4.2 Community survey

The survey was completed by 11 residents. Most survey respondents (73%) lived within 100 m of the Regent Street flying-fox camp, with the remaining 23% living 100-300 m from the camp.

Majority of respondents (82%) were home at all hours of the day. Times where residents were most affected by flying-foxes were morning (dawn onwards) and early evening (after sunset). More than 50% of respondents also reported impacts in the afternoon and at sunset.

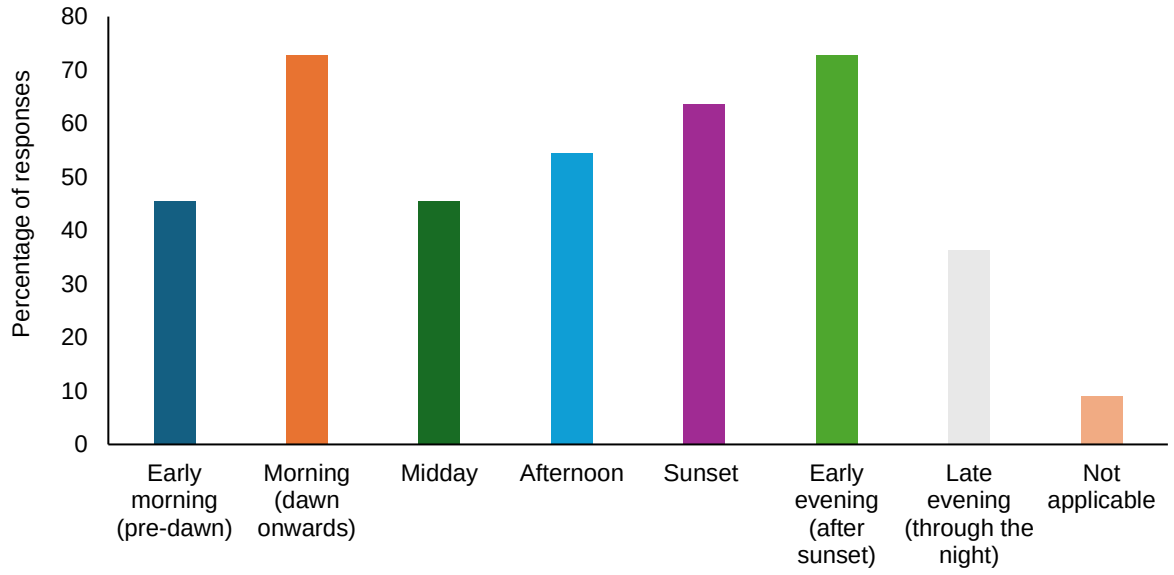

Figure 13 Percentage of responses to the question 'What time are you being impacted by flying-foxes?' (n = 11)

All respondents were aware that flying-foxes are native to Australia, with majority aware that flying-foxes are protected under legislation. Majority of participants believed it false (45%) or did not know (27%) that flying-foxes are nomadic, moving across LGAs. Majority of respondents (64%) did not know if flying-foxes are decreasing in Australia and believed that flying-foxes are increasing in the Maitland LGA (73%). Answers were very mixed when asked about flying-foxes and disease, with most respondents not knowing if disease carried by flying-foxes can be easily prevented in humans (55%). Majority of respondents did not know (27%) or thought flying-foxes carry disease that is easily transmitted to animals (36%). Conversely, most participants were aware than humans cannot easily catch disease from flying-foxes (64%). Majority of participants (55%) did not know if camp dispersal works, with 45% answering that flying-fox camp dispersal often does not work.

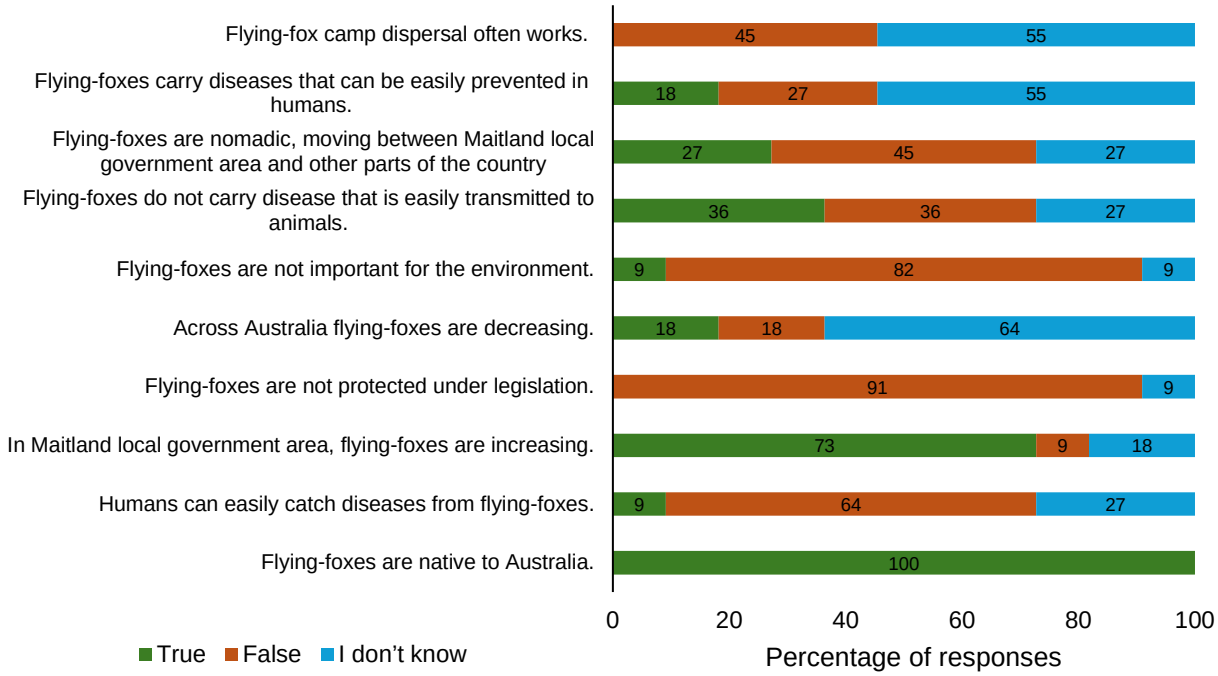

Figure 14 Questions and percentage of responses to general knowledge about flying-foxes (n = 11)

Majority of respondents agreed that living next to bushland presents some challenged in relation to wildlife. Majority of the respondents did not like when flying-foxes visited their neighbourhood and believe that humans and flying-foxes should not share the urban environment. Majority of respondents believe that flying-foxes are important to the environment and that flying-foxes should be managed. Majority also believe that Council should seek to balance conservation and resident amenity.

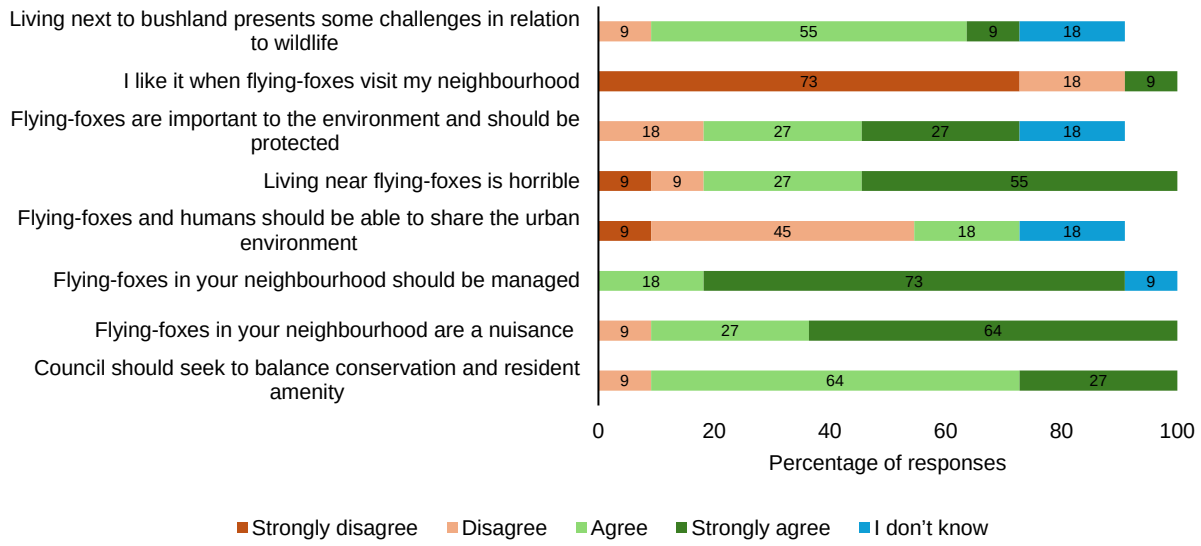

Figure 15 Questions and percentage of responses of general views about flying-foxes (n = 11)

Majority of respondents reported negative experiences with flying-foxes (91%). Most respondents (55%) also answered that they enjoy watching flying-foxes fly-out at sunset.

The main issues reported by respondents associated with flying-foxes were mess from droppings (91%), noise and smell (73%). However lots of responses also mentioned vegetation damage and loss of fruits from their backyard trees as a major concern.

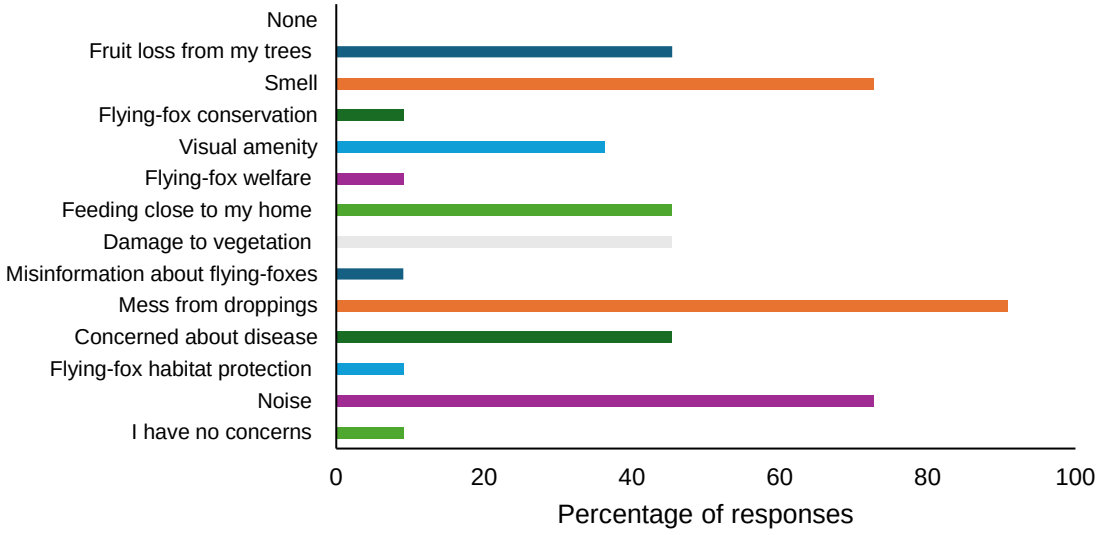

Figure 16 Percentage of responses to the question 'Are any of the following topics an issue around your home in relation to flying-foxes?' (n = 11)

Majority of respondents (73%) thought it very important that Council assists in managing impacts associated with flying-foxes. Majority of respondents (73%) thought it somewhat important that Council protects flying-foxes. Most respondents though it important that Council protects vegetation and other environmental values in parkland and bush areas (73%).

Most respondents did not find it important that Council does not disturb flying-foxes, or that community members do not disturb flying-foxes without a permit (73%).

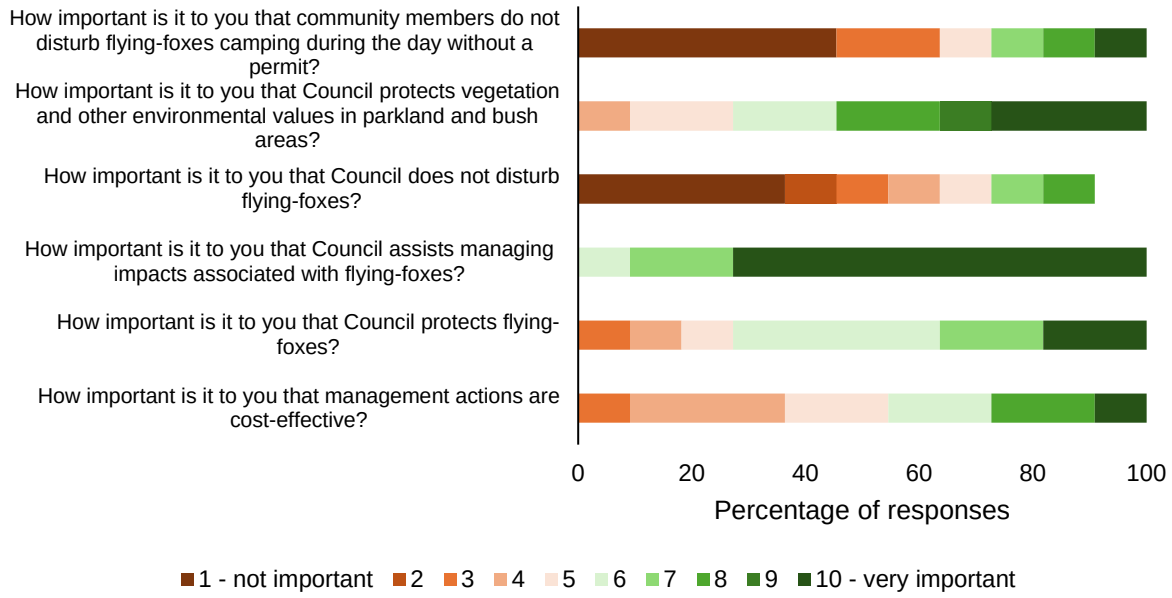

Figure 17 Question and percentage of responses to the degree of importance of various topics in relation to flying-fox management (n = 11)

Eighty two percent of respondents answered that receiving a subsidy would assist in reducing flying-fox impacts on their property. Majority of respondents (64%) believed that more $6,000 per impacted household was an appropriate amount from Council to support impact management. Of the subsidy options listed, the highest voted subsidy options were periodic cleaning, backyard tree replacement, car covers and double glazing windows.

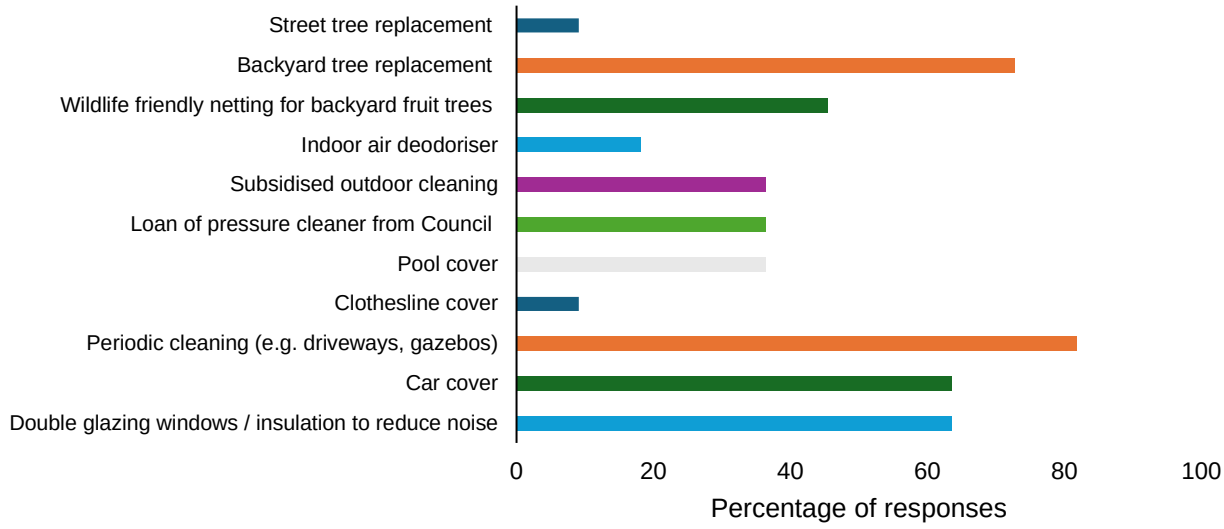

Figure 18 Percentage of responses to the prompt 'Select options you would like considered for a subsidy program that could assist you' (n = 11)

When answering free text options, some of the subsidy suggestions listed by respondents were:

- Subsidisation to water bills, council rates. Reimbursement for green waste disposal and arborist costs for work caused by flying-fox damage.

- Funding to repair the tree damage and to install water spray to the affected trees to nudge them away when the numbers get too big.
- Tree trimming.

The top tree management options supported by respondents were use of plants that flying-foxes don't like to create buffers between the camp and dwellings (82%), targeted noise to nudge flying-foxes away from dwellings (73%), and use of deterrents (such as CMS) to nudge flying-foxes away from dwellings (73%). Dispersal and tree trimming to create buffers were also highly supported (64%).

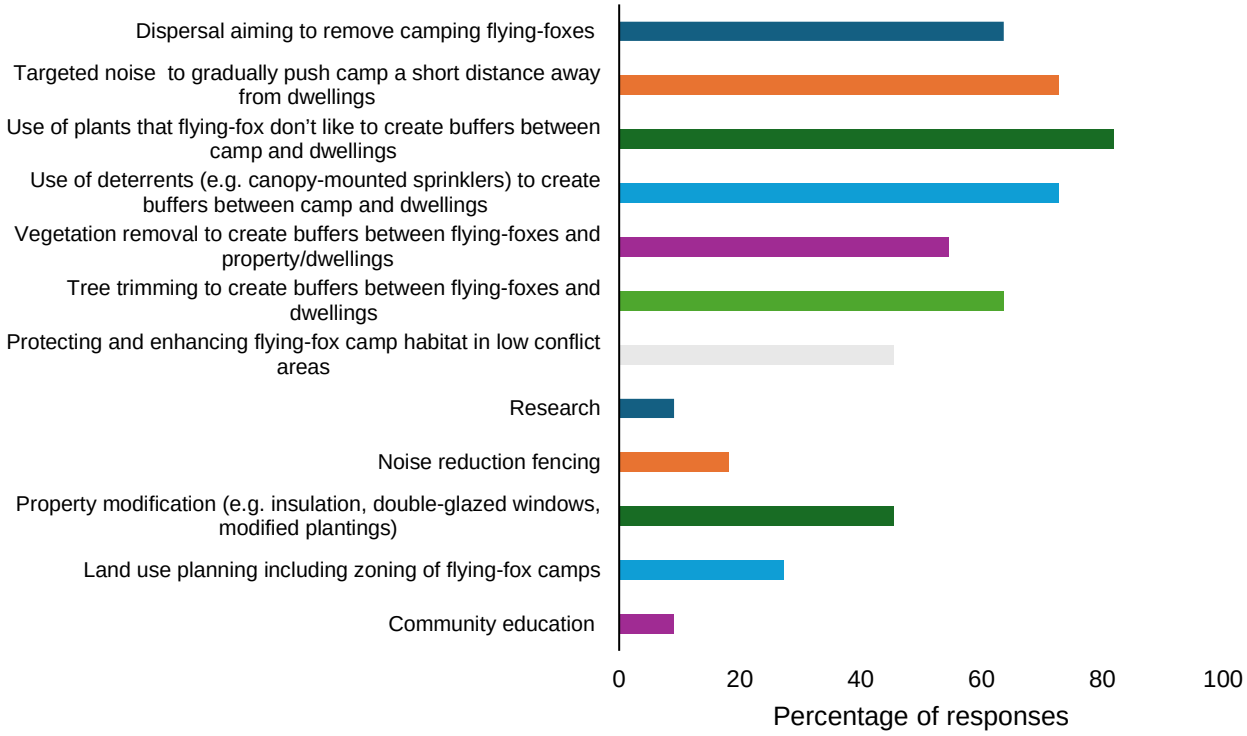

Figure 19 Percentage of responses to the question 'Which of the following management options do you support?' (n = 11)

Most respondents did not respond to questions about what education options they thought most appropriate, with many respondents citing that education will not resolve the issues.

When asked what actions respondents felt appropriate to protect flying-foxes in parkland and bush areas, most respondents (73%) answered reducing heat stress events, supporting wildlife carers and habitat restoration were the most appropriate actions to protect flying-foxes.

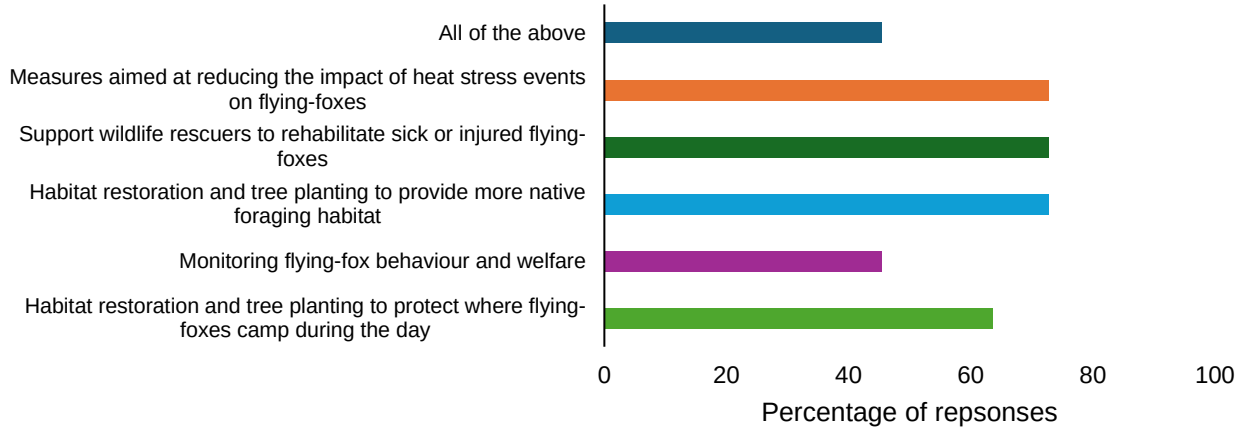

Figure 20 Percentage of responses to the question 'Which of the following actions do you feel are appropriate to protect flying-foxes in parkland and bush areas?' (n = 11)

Overall, respondents conveyed a variety of opinions about flying-foxes at the Regent Street camp. Some of the comments made by respondents were:

- As I've said previously, no person or body has taken my individual plight into serious consideration. It remains absolutely unfair and unreasonable that I have been provided with zero assistance. It is not my sole responsibility to protect the vulnerable FF and bear the financial burden for property devaluation.
- Thank you for taking this initiative. We understand the issues. We also understand other creatures and trees also matter, as does the amenity of being able to go outdoors in your own yard between Nov and May. Please put the cause not just the amelioration of the impacts.
- Education and awareness is key.
- the issue of flying foxes in our neighbourhood and garden backyards stems from widespread housing development which is destroying their habitat.

5 Management option analysis

This section provides an overview of camp management options commonly used in NSW and Australia which have been considered in the development of this Plan. These are categorised in accordance with the NSW Flying-fox Camp Management Policy 2015 as Level 1: Routine camp management; Level 2: Creation of buffers; Level 3: Camp disturbance or dispersal.

A site-specific analysis of management options for the Regent Street camp are presented below (Table 3). An appraisal, based on this analysis, is provided for options to be either: adopt, investigate, or disregard noting that implementation is dependent upon available funding. Management actions based on this analysis are provided in Section 6.

Table 3 Analysis of camp management options

Management option	Relevant impacts	Cost $-$$$	Advantages	Disadvantages	Suitability for Regent Street
Level 1 options					
Education and awareness programs	Fear of disease Noise Smell Faecal drop Water contamination	$	Low cost, increasing awareness will help the community understand the ecology of flying-foxes, providing options for landholders to reduce impacts. This is an important short- and long-term solution. Education can be undertaken on an ongoing basis and in response to community concerns/needs.	Education and advice alone may not mitigate all issues, and on its own may not be acceptable to the community.	Education, advice, and awareness programs are key components of any plan to manage flying-foxes and their camps. Council should continue to provide up to date information to the community (in the form of letter drops, update Council website, social media posts, etc.), especially during times of increased numbers of flying-foxes roosting. Community engagement sessions to convey Councils' management intentions and provide advice to affected residents, especially during times with large influxes, and support land managers of sensitive sites as required. Appraisal: Adopt.
Camp monitoring	Noise Smell Faecal drop	$	Relatively inexpensive. Allows for an understanding of population dynamics over time which is important to inform community engagement actions. Allows for data to be used	This action will not minimise impacts.	Undertake quarterly monitoring, feeding this information to the NFFMP; monthly monitoring (or more frequent) is encouraged when increased numbers are present. Detailed monitoring allows for the collection of key information. Including: camp extent, camp numbers, seasonal trends, flying-fox demographics (species present, age), and can assist in informing when

Management option	Relevant impacts	Cost $-$$$	Advantages	Disadvantages	Suitability for Regent Street
			to determine the efficacy of management actions e.g. presence of flying-foxes in high-conflict areas.		management actions can be implemented and allows for data to be collected over time to assess management efficacy. Appraisal: Adopt. Drone monitoring (thermal) could be considered as a complimentary method of obtaining count and camp extent data. Appraisal: Investigate.
Property modification / service subsidies	Noise Smell Faecal drop Health/wellbeing	$$$	Property modification is one of the most effective ways to reduce amenity impacts of a camp. Property modification can promote conservation of flying-foxes, provide long-term outcomes, can be undertaken quickly, will not impact on the site, and may add value to the property.	May be cost-prohibitive for private landholders, however subsidies would assist.	Funding is recommended to be allocated using a tiered approach based on distance to the camp. For example, the first tier may include houses with flying-foxes regularly on their property, the second tier may include houses with flying-foxes previously recorded on their property, the final tier may include adjacent houses. Eligibility criteria will need to be applied and amount available per house per tier will be funding-dependent. Property modification, such as double-glazed windows or installing noise attenuating insulation/fencing, can greatly assist with noise impacts inside residences and businesses. Installing shade sails, car ports, pool covers, or covering other affected areas will reduce the impacts of faecal drop. Appraisal: Investigate.
Routine camp maintenance	Health/well-being	$$	This action is not aimed at managing flying-foxes, it allows the landholder to undertake routine maintenance at or near the flying-fox camp (in line with the Policy). Examples of routine camp management actions are provided in the Policy. Note, weed removal	Will not, in general, mitigate amenity impacts for nearby landholders.	The Regent Street camp is located across private backyards, as such this management action is being implemented by residents. Resident education should be undertaken regarding carrying out backyard maintenance in a conscientious way. Protocols could be developed for residents; as maintenance actions disturbing the flying-foxes could exacerbate issues such as noise and faeces through disturbance.

Management option	Relevant impacts	Cost $-$$$	Advantages	Disadvantages	Suitability for Regent Street
			has the potential to reduce habitat at a camp and reduce numbers of roosting flying-foxes.		Appraisal: Adopt.
Alternative habitat creation	Noise Smell Faecal drop Health/wellbeing	$$$	If successful in attracting flying-foxes away from high conflict areas, dedicated habitat in low conflict areas will mitigate most impacts and help flying-fox conservation. Rehabilitation of degraded habitat that is likely to be suitable for flying-fox use could be a more practical and a faster approach than habitat creation. Improving potential alternative camp habitat should be part of a medium-to long-term plan.	Generally costly, long-term (~5-10 years for roost tree growth) approach so cannot be undertaken quickly, previous attempts to attract flying-foxes to a new site have not been known to succeed. NSW DCCEEW approval is required to encourage flying-foxes to move along a vegetated corridor to a new roost.	The Regent Street camp is unlikely to be sustainable in the long-term, creating suitable alternative roosting options is essential (Figure 12). Council should consider long-term vegetation creation/enhancement options. Selected revegetation sites need to balance community expectations, safety, and habitat suitability for flying-foxes. Planting roost trees to enhance the existing corridor from the current camp extent to the proposed site should be considered. Appraisal: Investigate.
Odour reducing / masking plants	Noise Smell Health/wellbeing	$	Planting dense screens and fragrant plants to assist with odour and noise and trim tall trees to less than 5 m high and/or use wildlife friendly netting to prevent occupation by flying-foxes.	May take time for plants to provide the desired effect, and unlikely to mitigate odour during large influxes.	Residents could plant dense screens and fragrant plants. This information can be provided in an education program. Wildlife friendly netting could be installed to exclude flying-foxes from strategic areas or from priority plants. Appraisal: Adopt.
Indoor neutralising pots	Smell	$	Indoor odour neutralising pots (Hostogel™) contain a gel-based formula to chemically mask odour have been shown to have a localised positive effect in reducing odour. Has been trialled for neutralising indoor odour.	If residents rely on keeping windows open for airflow in warmer months, this may not be a suitable option for minimising odour.	Indoor odour neutralising pots could be trialled by residents. This could be considered as part of a subsidy program (outlined above). Appraisal: Investigate.

Management option	Relevant impacts	Cost $-$$$	Advantages	Disadvantages	Suitability for Regent Street
Provision of artificial roosting habitat	Noise Smell Faecal drop Health/wellbeing	$$$$$	Artificial roosting habitat could be considered to supplement vegetation damaged by large numbers of flying-foxes.	No guarantee that flying-foxes would use artificial habitat, but collaborating with a researcher on varying design options would increase the likelihood of success.	There is currently not enough evidence at this stage to adopt. This may be a tool in the future following experimental research into design, evaluation, and construction. Appraisal: Disregard.
Protocols to manage incidents	Health/wellbeing Fear of disease	$	Low cost will reduce actual risk of negative human/pet–flying-fox interactions, promotes conservation of flying-foxes, can be undertaken quickly.	Will not mitigate amenity impacts but will reduce fear of disease.	Council to continue community education regarding the low disease risk to humans and pets, and how disease transmission can be avoided. Council to maintain/develop (where required) standard internal procedures for operations, response to heat-stress events (HSE), and other potential incidents. Appraisal: Adopt.
Support flying-fox carers	Health/wellbeing Flying-fox welfare	$	Low cost, fosters relationship between Council and wildlife carers, can decrease risk of negative human/pet/flying-fox interactions with early intervention of carer support during HSEs, food shortages, etc.	Will not mitigate amenity impacts.	Council to maintain good working relationship and support flying-fox carers, especially during times of increased likelihood of HSEs, food shortages, and during pupping and crèching periods. Appraisal: Adopt.
Research	Noise Smell Faecal drop Health/wellbeing	$-$$$	Support research that improves understanding and more effectively mitigates impacts. Develop understanding of local flowering.	Generally cannot be undertaken quickly and likely to be expensive.	Council should stay up-to-date with contemporary research and review this Plan as required. Analysis of scats to assess foraging diet species. Monitoring the timing, distribution, and extent of flowering across the LGA. Drone surveys provide increased accuracy over ground count methods. GPS tracking movements in your LGA would inform community engagement and an assessment of foraging habitat. Appraisal: Investigate.

Management option	Relevant impacts	Cost $-$$$	Advantages	Disadvantages	Suitability for Regent Street
Appropriate land-use planning	Noise Smell Faecal drop Health/wellbeing	$	Suitable planning for future development will reduce potential for future conflict.	Will not mitigate current impacts.	Not relevant. Appraisal: Disregard.
Property acquisition	All for specific property owners Nil for broader community	$$$$$$$	Mitigation for directly impacted residents.	Cost prohibitive.	Currently not an option. Requires NSW government support. Appraisal: Disregard.
Do nothing	Nil	Nil	No resource expenditure.	Will not mitigate impacts and would not be considered acceptable by impacted members of the community.	Not appropriate. Appraisal: Disregard.
Level 2 options					
Buffers through vegetation modification (implement under the Code of Practice 2018)	Noise Smell Health/wellbeing	$$	Any vegetation modification should be done using a staged approach, with the aim of changing the vegetation as little as possible and only if flying-foxes' use of this vegetation is directly affecting residents.	Modifying vegetation can increase noise issues for residents which may create further conflict. Vegetation removed too quickly could cause inadvertent movement to less desirable locations within/adjoining the camp or dispersal of the camp.	A vegetative buffer would be useful to discourage roosting within close proximity to the dwellings (Figure 11). Appraisal: Adopt.
Buffers through visual deterrents, canopy-mounted sprinklers	Noise Smell Health/wellbeing Damage to vegetation	$$$$	Successful creation of a buffer will reduce impacts, promotes flying-fox conservation, can be undertaken quickly, options without vegetation removal may be preferred by the community.	May impact the site, buffers will not generally eliminate impacts, maintenance costs may be significant, often logistically difficult, limited trials so likely effectiveness unknown. Council has identified that water would need to be plumbed or a bore dug to	Canopy-mounted sprinklers (CMS) have been installed at Regent Street (Figure 11 and Figure 14). Upgrading the water supply and sprinklers may enhance the effectiveness of this deterrent. (For more detail on CMS see Appendix 6.) Note, the use of CMS could be considered as favourable compared with a vegetative buffer in some locations. Equally, both methods could be complementary, particularly close to dwellings. Visual deterrents, including spotlights and sound

Management option	Relevant impacts	Cost $-$$$	Advantages	Disadvantages	Suitability for Regent Street
				improve low water pressure and reduce water bills. These factors increase the installation cost of canopy-mounted sprinklers (CMS).	(outdoor speakers) could be trialled, aiming to discourage roosting close to dwellings and/or in sensitive areas (e.g. specific trees). Appraisal: Adopt.
Noise attenuation fencing	Noise Smell Health/wellbeing	$$$$	Noise attenuation fencing is intended to alleviate amenity issues for residents. Advice from an acoustic consultant may provide site-specific alternatives.	Noise attenuation fencing is costly and can be considered unsightly for property fencing. Unlikely to be effective when large numbers of flying-foxes are roosting.	This tool may be appropriate to reduce conflict at dwellings, a short distance from the camp (e.g. 33 – 37 Regent Street). Appraisal: Investigate.
Level 3 options					
Nudging	All	$$$$$	Can encourage flying-foxes to shift away from high conflict areas next to residential areas.	May lead to inadvertent dispersal and splintering of the camp if not done at the correct time, frequency, or duration. Requires NSW DCCEEW approval.	This option could be appropriate in the future if the flying-foxes naturally spread along the suggested corridor to the suggested revegetation site (future camp). However, if the flying-foxes have not independently spread to these areas moving the camp would be assessed as a dispersal. Appraisal: Disregard.
Active dispersal	All (generally appropriate for amenity impacts only)	$$$$$	Can mitigate all impacts at the site. It is important to note that the outcomes of dispersal are generally temporary, and repeat dispersal is likely to be required as flying-foxes attempt to re-establish the camp.	Dispersal is rarely successful without significant vegetation removal or ongoing effort and excessive expenditure (e.g. several years and $1M for Sydney Botanic Gardens). Flying-foxes will almost always continue to roost in the area (generally within 600 m), and often splinter into several locations nearby. See Appendix 7 for further information of dispersal attempts.	This option is unlikely to be successful, would be expensive, and may result with a worse outcome for the community. Appraisal: Disregard.

6 Planned management actions

Actions to reduce impacts associated with the Regent Street flying-fox camp are outlined (Table 4; see Figure 11 and Figure 12). The actions align with legislation (Section 1.3 and Appendix 3), camp assessment (Section 3), and consultation with Council. Implementation of management actions must be considerate of approvals potentially required, site values, and in accordance with measures to avoid impacts (Appendix 8). Evaluation measures are provided for each action which will be used to evaluate action progress and success. Details of how the Plan and actions below will be implemented are in Section 7.

Table 4 Planned management actions for Regent Street flying-fox camp

Strategy	Action / Responsible parties	Details	Approvals required	Timeframe / Progress	Evaluation measure
Impact mitigation	Camp monitoring Responsible parties (RP): Council, DCCEEW, volunteers	Regular monitoring (e.g. monthly, quarterly); information shared with the NFFMP and NSW DCCEEW, including records of camp spatial extents. Drone monitoring can provide more accurate results on camp extent and numbers and should be considered for inclusion in ongoing monitoring. Thermal drone surveys have been trialled to monitor pup creching, this could form part of a new regional to national monitoring program.	Operating under NSW DCCEEW permit, as part of the NFFMP.	Ongoing	Regular monitoring undertaken.
	Community Assistance Program and offer property modification /service subsidies. RP: Council	Council to investigate a Community Assistance Program that offers distance-scaled subsidies for affected residents. Subsidies may cover property modification and/or services to manage impacts associated with flying-foxes (see Appendix 6 for further information).	Public notification requirements under the *Local Government Act 1993.*	Short- and long-term	Community Assistance Program investigated. If funded, subsidies offered to residents where appropriate and feasible.
	Routine camp maintenance RP: Council, residents	Continue routine camp maintenance. Educate residents to conscientiously undertake garden maintenance. Significant works, depending on the timing (Table 1) may require night works. Disturbance can increase impacts to residents through noise and smell and can create flying-fox welfare issues (e.g. dropped pups).	Implement under the Code of Practice 2018.	Ongoing	Minimise disturbance to flying-foxes through education.

Strategy	Action / Responsible parties	Details	Approvals required	Timeframe / Progress	Evaluation measure
	Alternative habitat creation and succession planning RP: Council, residents	Flying-fox roosting behaviour damages their roost trees. As such, for long-term sustainability it is recommended to enhance the vegetation in situ and, where possible, plant adjoining future roosting habitat. Given the conflict associated with the Regent Street camp, in situ successional planting may not be adopted by residents. Instead, plant to enhance the existing corridor to the revegetation site (Figure 12). Revegetation and the corridor to include increasing the density of the mid- and upper-canopy. Identify additional low-conflict habitat; extensive opportunities existing across the Maitland LGA.	No	Short- and long-term	Alternative habitat location identified, restoration commenced and ongoing.
	Odour reducing / masking plants RP: Council, residents	Plant a scented boundary between the flying-foxes and dwellings, selecting species that produce fragrant flowers to create an odour barrier/buffer to reduce odour impacts.	No	Long-term	Reduced odour impacts for residents.
	Indoor odour neutralising pots RP: residents	Trial indoor odour neutralising pots to determine effectiveness in reducing odour impacts. Consider incorporating into subsidy program.	No	Short-term and ongoing if effective	Reduced odour impacts for residents.
Community engagement and awareness	Ensure clear and up-to-date information available regarding legislation and human and animal health. RP: Council	Education should be delivered in the form of events, online material and/or hardcopy brochures, and should include up-to-date health information, impact mitigation options available at a property level (e.g. odour-neutralising gel pots and noise attenuation fencing), and legislative responsibilities. One-on-one engagement may be required for primary-affected residents. Ensure the community is aware of legislation around flying-foxes, and that management affecting flying-foxes is illegal without relevant approvals.	No	Short-term and ongoing	Community informed and engaged.
	Keep community informed of flying-fox numbers and up-coming management. RP: Council	Engagement platforms including social media, websites, media release, and digital/hard copy mail (e.g. brochures, fact sheets) will be utilised to maintain awareness and keep the community updated and informed. Support land managers of sensitive sites as required.	No	Short-term and ongoing	Community informed and engaged.

Strategy	Action / Responsible parties	Details	Approvals required	Timeframe / Progress	Evaluation measure
Avoiding future conflict, conservation	Protocols to manage incidents RP: Council, DCCEEW	Collaborate with wildlife care organisations to monitor potential HSEs during predicted hot weather. Council's Heat Stress Response Plan should be regularly updated as new information becomes available. The Heat Stress Response Plan outlines information on the factors that contribute to HSEs, how to monitor flying-fox stress, the importance of having a camp-specific response plan, personnel know their roles if attending a HSE, active spraying of flying-foxes (if possible), recovery, and response to mortalities, as well as the importance of collecting data on HSEs.	No	Short-term and ongoing	Council will develop a Heat Stress Response Plan. Ongoing communication with wildlife rescue and care organisations.
	Support flying-fox carers RP: Council, DCCEEW	Support the ongoing rescue, care, and conservation efforts of local wildlife carers, particularly during flying-fox influxes in the LGA and HSEs.	No	Ongoing	Council and carers working together.
Avoiding future conflict	Support research RP: Council, DCCEEW	Support research, particularly projects which will assist in understanding local flying-fox movements (e.g. GPS tracking) and ways to mitigate impacts on the community (e.g. quantify outcomes of management actions). A priority area of research is to better understand foraging resources in the area to allow proactive management in preparation for future influxes. An example is a genetic analysis of scats to identify forage diet species.	No	Long-term and ongoing	Council up-to-date on contemporary research and relevant outcomes used to inform camp management.
	Appropriate land use planning RP: Council	Engage Council's Town Planning team to investigate implementing measures to avoid future conflict between camps and the community when assessing development applications. Identify potential buffer areas to zone as biodiversity/flying-fox management areas to mitigate impacts to residents. Consider habitat protection measures (zoning, Biodiversity Agreements).	No	Long-term	Flying-fox camp management areas incorporated into planning instruments.
Impact mitigation	Consult with residents about vegetation management (trimming/removal) RP: Council, DCCEEW	Bamboo has been trimmed at the back of 23 Regent Street; the trimmed height should be maintained. Option to trim a second stand of bamboo near the pond; this action aims to reduce the number of flying-foxes within the typical backyard area of 23 Regent Street. Remove deadwood across the backyard area of the properties (19 – 33) and around the pond at 23 Regent Street. Removing deadwood could discourage roosting within typical backyards (Figure 11).	Implement under the Code of Practice 2018 or a threatened species licence required for protected vegetation.	Ongoing	Management of vegetation implemented.
	Consult with residents about potential buffer	Council to investigate upgrading the water pressure for the operation of CMS; currently only one of the five CMS can be operated at a time due to insufficient water pressure. Council to investigate the functionality of the	Implement under the Code of Practice	Short-term and on-going	Upgrade water supply to CMS; investigate

Strategy	Action / Responsible parties	Details	Approvals required	Timeframe / Progress	Evaluation measure
	creation through visual deterrents, canopy-mounted sprinklers (CMS) RP: Council, DCCEEW	existing CMS, upgrading the equipment may improve the effective spray radius (e.g. up to 15 m). As may installing additional CMS, aiming to decrease flying-fox roosting across the typical backyard area (19 – 33 Regent Street; Figure 11). Council to work with the landowner to investigate installing bore water to offset the cost of potable water; this may also improve water pressure. Alternatively, Council to investigate subsidising residents' operation costs (e.g. water bills). Residents to investigate trialling visual deterrents aiming to decrease flying-fox roosting across the typical backyard area (Figure 11).	2018.		installing additional CMS; trial visual deterrents.
	Noise attenuating fencing RP: residents	Investigate feasibility of noise attenuating fencing (e.g. 35 and 37 Regent Street). Inform residents of this action that could be undertaken at a property level and consider incorporation into a subsidy program.	Implement under the Code of Practice 2018.	Long-term	Noise attenuation fencing investigated.
Impact mitigation	Nudging RP: N/A	This tool would be investigated following the establishment of the revegetation site (planted roost), e.g. ~10 years (Figure 12). It is preferable for the flying-foxes to roost within the vegetation corridor and revegetation site without encouragement. This may occur in association with influxes of large numbers of flying-foxes. If these areas are naturally used, then nudging can be assessed and licenced by NSW DCCEEW to attempt to shift the flying-foxes to the lower-conflict roost trees (i.e. the planted roost). If the flying-foxes don't naturally roost at the revegetated site, then the NSW DCCEEW would assess a program to move the flying-foxes as a dispersal.	Threatened species licence required.	Long-term	Not relevant to this Plan, requires establishment of the revegetation site.

6.1 Alternative habitat creation

The creation of alternative roosting habitat (Figure 12) to the east of the Regent Street camp requires community consultation and securing a funding commitment. Critically, this is a long-term strategy given the time required to grow roost trees, even when fast growing species are planted to facilitate rapid establishment. Council will liaise with neighbouring landowners and land managers. In addition, Council will liaise with neighbours regarding whether their horses are vaccinated for Hendra virus (see Appendix 4). It is worth noting that the proximity of the Regent Street camp and the proposed alternative roosting habitat is likely to be negligible with respect to the risk of Hendra exposure to horses in the immediate area.

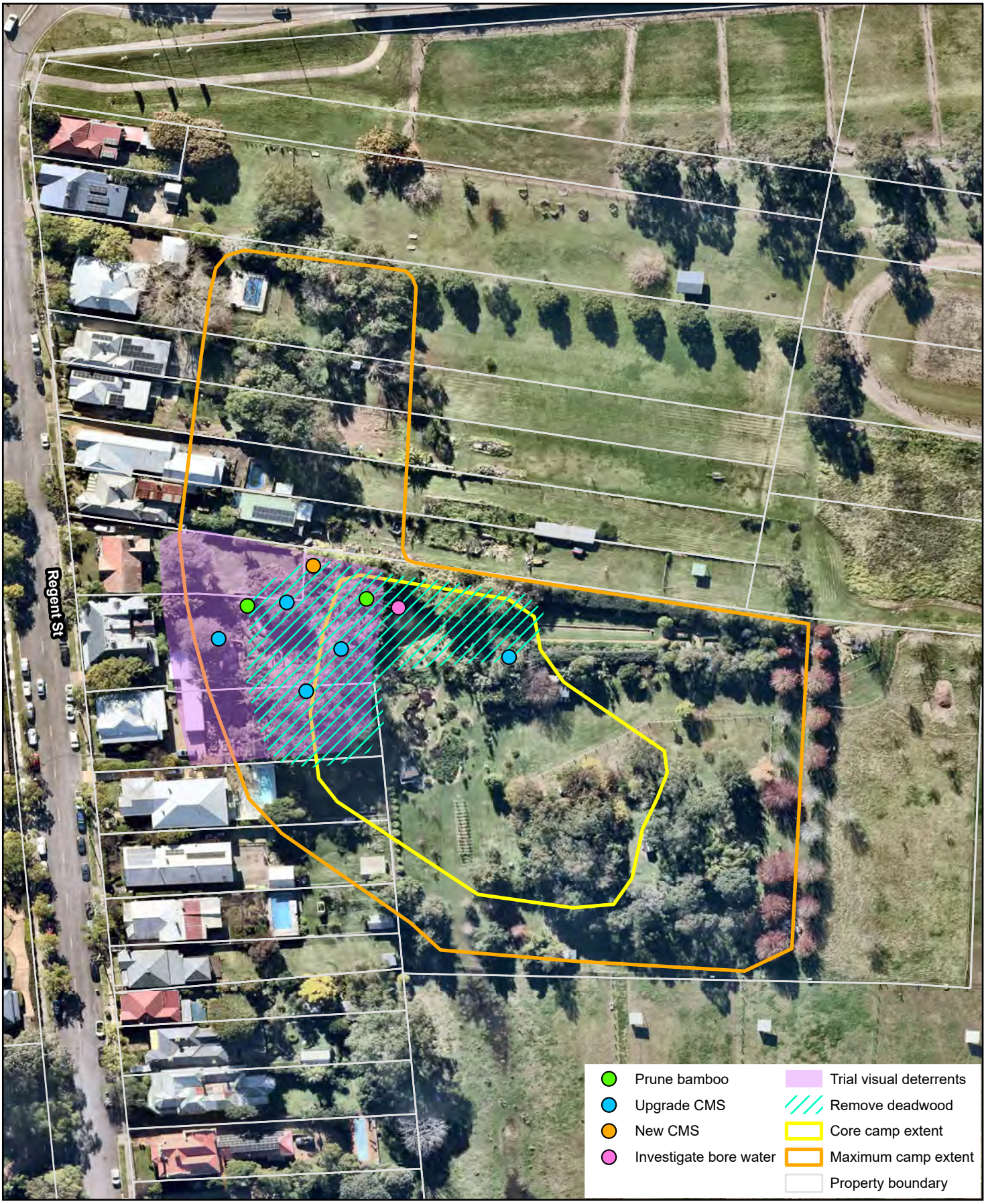

Figure 21: Regent Street flying-fox camp indicative management actions

Maitland City Council

PR8790 Regent Street Flying-fox Camp Management Plan

ecosure
improving ecosystems

Job number: PR8970
Revision: 0
Author: TD
Date: 22/08/2024

0 5 10 20
Meters

GDA2020
Datum: GDA2020
Units: Degree

Figure 22: Regent Street flying-fox camp proposed revegetation area

Maitland City Council

PR8790 Regent Street Flying-fox Camp Management Plan

Revegetation area
Core camp extent
Maximum camp extent
Property boundary

ecosure
improving ecosystems

Job number: PR8970
Revision: 0
Author: TD
Date: 20/08/2024

0 12.5 25 50
Meters

GDA2020
Datum: GDA2020
Units: Degree

PR8790_MPX_RevegetationArea
A4

Figure 23 Bamboo adjacent to the pond that could be trimmed to reduce flying-fox roosting habitat

Figure 24 Canopy-mounted sprinkler (hose) installed to deter flying-foxes roosting in the typical backyard area of 23 Regent Street

7 Plan evaluation and review

7.1 Plan administration

The Plan will be a living document, informing routine management, and requiring at least annual revision to allow ongoing evaluation of the strategies in Table 4 and assess/priorities management actions. The following may trigger an earlier review of the Plan:

- completion of a significant action (Level 2 or above)
- changes to relevant policy/legislation
- new management techniques becoming available
- any negative incident associated with roosting or foraging flying-foxes
- dramatic increase in flying-foxes roosting at the Regent Street camp.

It is recommended that the Plan be updated after five years.

7.2 Monitoring

Council will monitor and keep internal records to allow the effectiveness of each management action to be evaluated and inform future planning. Monitoring of the camp will be undertaken quarterly, or more frequently where possible, informing the NFFMP. Monitoring should determine the extent of the camp as well as the number of flying-foxes and composition (e.g. species, breeding). Council is encouraged to report this monitoring data to the NSW DCCEEW to inform the NFFMP.

If possible, more frequent monitoring is recommended, especially if increased numbers of roosting flying-foxes are causing conflict with the community.

Council staff are to ensure management actions and results are recorded to inform future planning. See NSW DCCEEW webpage for datasheets for Level 3 monitoring, evaluating, and reporting on flying-fox camp management actions.

7.3 Reporting

Reports for Level 1 actions that comply with the Plan are not required to be submitted to NSW DCCEEW. Reporting for Level 2 or Level 3 actions are to be submitted to NSW DCCEEW in accordance with the licence criteria. The licence may require, for example, reporting one month after commencement of works and then quarterly in periods where works have occurred. Reporting is to be consistent with the NSW Flying-fox Camp Management Code of Practice 2018 or the stated conditions of the licence. Example information to report includes:

- results of pre- and post-work population monitoring
- any information on new camps that have formed in the area
- further management actions planned to include a schedule of works
- an assessment of how the community responded to the works, including details on the number and nature of customer enquiries before and after the works
- detail on any compensatory planting

- expenditure and contributors
- outcomes from evaluation and review.

7.4 Responsibilities

Council is responsible for the implementation and review of the Plan. It is an option to submit the final plan to NSW DCCEEW for review and endorsement under the Code of Practice. Council is advised to seek advice from NSW DCCEEW and flying-fox experts as required during the implementation of the Plan. Specific roles and responsibilities are identified in Table 5.

This Plan does not endorse the community to undertake flying-fox management. Council and private landholders will need to comply with the Policy or apply to NSW DCCEEW for a licence. If flying-foxes are being unlawfully and intentionally disturbed, this is to be reported to NSW's Environment Line by calling 131 555.

Table 5 Roles and responsibilities

Role	Required experience/approvals	Responsibilities/authority	Communication lines
Program Coordinator	Project management Human resource management Community engagement Reporting	Inform and consult with stakeholders and interested parties Community engagement Evaluate program Submit reports to DCCEEW Ensure all landowners have provided consent prior to works	Direct reports: Project Manager
Project Manager	Project management Team leadership and coordination Data management	Coordinate field teams and ensure all personnel are appropriately experienced and trained for their roles Induct all personnel to the program Collect and collate data Liaise with DCCEEW Liaise with wildlife carers/veterinarians (for orphaned/injured wildlife only)	Reports to: Program Coordinator Direct reports: Supervisor, Contractor
Supervisor	Knowledgeable in flying-fox biology, behaviour and camp management (Appendix 1 - 4 for detail) ABLV-vaccinated and trained in flying-fox rescue Team training, leadership and supervision	Pre- and post-management monitoring Surrounding camp monitoring Coordinate daily site briefings Coordinate daily activities Monitor flying-fox behaviour Rescue flying-foxes if required (and no carer/vet on-site) Determine daily works end point Participate in management activities	Reports to: Project Manager Direct reports: Team members, Observers/support
Team member	Recommended ABLV-vaccinated (employer to assess risk) Ideally, all team knowledgeable in flying-fox biology, behaviour and camp management; however, not required	Attend daily site briefings Participate in relevant management activities	Reports to: Supervisor Direct reports: Nil

Role	Required experience/approvals	Responsibilities/authority	Communication lines
Contractor	Relevant licences and experience in field	Conduct specified activities (e.g. tree trimming, roost counts) Adhere to all directions given by Supervisor	Reports to: Project Manager Direct reports: Nil
Observer/support	Approval to access site Appropriately licensed	Provide care of injured/orphaned wildlife (under licence) if required	Reports to: Supervisor Direct reports: Nil
Flying-fox expert	Appropriately experienced person	On-site population assessment, monitor flying-fox behaviour and ensure compliance with the Plan	Reports to: Supervisor Direct reports: Nil

7.5 Avoid impacts to flying-foxes

Actions outlined in the Plan do not include dispersal. Any on ground works are to be undertaken in accordance with standard measures to avoid impacts (Appendix 7) and in accordance with the NSW Code of Practice and relevant permits. Works outside the Code of Practice require a licence under the BC Act. This aims to ensure the welfare of flying-foxes during proposed works and the safety of personnel working in the camp. With compliant implementation of actions, it is expected that minimal impact to the flying-foxes will occur.

The Code of Practice states:

- no actions during or within the five days after a severe weather event
- no actions during or within 21 days of the end of a heat stress event
- no removal of more than 10% of the vegetation historically occupied
- no removal of tree limbs or trees within 30 m of flying-foxes
- no removal of threatened species or habitat of flying-foxes.

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Appendix 1 Species profiles

Black flying-fox (*Pteropus alecto*)

The BFF has traditionally occurred throughout coastal areas from Shark Bay in Western Australia, across Northern Australia, down through Queensland and into northern NSW (Churchill 2008). Since it was first described there has been a substantial southerly shift by BFF (Roberts et al. 2012). This shift has consequently led to an increase in indirect competition with the threatened GHFF, which appears to be favouring the BFF (DCCEEW 2021).

The BFF and GHFF foraging behaviour overlaps, feeding on the fruit and blossoms of native and introduced plants (Churchill 2008), including orchard species at times. BFF are largely nomadic animals with movement and local distribution influenced by climatic variability and the flowering and fruiting patterns of their preferred food plants. Feeding commonly occurs within 20 km of the camp site (Markus & Hall 2004).

BFF usually camp beside a creek or river in a wide range of warm and moist habitats, including lowland rainforest gullies, coastal stringybark forests and mangroves. Camp sizes can change significantly in response to the availability of food and the arrival of animals from other areas.

Grey-headed flying-fox (*Pteropus poliocephalus*)

The GHFF is found throughout eastern Australia, generally within 200 kilometres of the coast, from Finch Hatton in Queensland to the north to Melbourne, Victoria (DPE 2023). This species now ranges into South Australia and individual flying-foxes have been reported on the Bass Islands and mainland Tasmania (Driessen et al. 2011). It requires foraging resources and camp sites within rainforests, open forests, closed and open woodlands (including melaleuca swamps and banksia woodlands). This species is also found throughout urban and agricultural areas where food trees exist and will feed in orchards at times, especially when other food is scarce (DPE 2023).

All the GHFF in Australia are regarded as one population that moves around freely within its entire national range (Webb and Tidemann 1996, DCCEEW 2021). GHFF may travel up to 300 kilometres in a single night (Welbergen et al. 2020) with a foraging radius of up to 20 kilometres from their camp (Meade et al. 2021). They have been recorded travelling over 500 kilometres over 48 hours when moving from one camp to another (Roberts et al. 2012). GHFF generally show a high level of fidelity to camp sites, returning year after year to the same site, and have been recorded returning to the same branch of a particular tree (SEQ Catchments 2012). This may be one of the reasons flying-foxes continue to return to small urban bushland blocks that may be remnants of historically used larger tracts of vegetation.

The GHFF population has a generally annual southerly movement in spring and summer, with their return to the coastal forests of north-east NSW and south-east Queensland in winter (Ratcliffe 1932, Eby 1991, Parry-Jones & Augee 1992, Roberts et al. 2012). This results in large fluctuations in the number of GHFF in New South Wales, ranging from as few as 20% of the total population in winter up to around 75% of the total population in summer (Eby 2000). They are widespread throughout their range during summer, but in spring and winter are uncommon in the south. In autumn they occupy primarily coastal lowland camps and are uncommon inland and on the south coast of New South Wales (DECCW 2009).

There is evidence the GHFF population declined by up to 30% between 1989 and 2000 (Birt 2000, DCCEEW 2023, Richards 2000). There is a wide range of ongoing threats to the

survival of the GHFF, including habitat loss and degradation, culling in orchards, conflict with humans, infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, and power line electrocution) (DECCW 2009). For these reasons it is listed as vulnerable to extinction under NSW and federal legislation.

Little red flying-fox (*Pteropus scapulatus*)

The LRFF is widely distributed throughout northern and eastern Australia, with populations occurring across northern Australia and down the east coast into Victoria. LRFF have been observed in the Sydney region but not at the Regent Street or the other camps within the Maitland LGA.

The LRFF forages almost exclusively on nectar and pollen, although will eat fruit at times and occasionally raids orchards (Australian Museum 2020). LRFF often move sub-continental distances in search of sporadic food supplies. The LRFF has the most nomadic distribution, strongly influenced by availability of food resources (predominantly the flowering of eucalypt species) (Churchill 2008), which means the duration of their stay in any one place is generally very short.

Habitat preferences of this species are quite diverse and range from semi-arid areas to tropical and temperate areas, and can include sclerophyll woodland, melaleuca swamplands, bamboo, mangroves and occasionally orchards (Australian Museum 2020). LRFF are frequently associated with other *Pteropus* species. In some colonies, LRFF individuals can number many hundreds of thousands, and they are unique among *Pteropus* species in their habit of clustering in dense bunches on a single branch. As a result, the weight of roosting individuals can break large branches and cause significant structural damage to roost trees, in addition to elevating soil nutrient levels through faecal material (SEQ Catchments 2012).

Throughout its range, populations within an area or occupying a camp can fluctuate widely. There is a general migration pattern in LRFF, whereby large congregations of over one million individuals can be found in northern camp sites (e.g. Northern Territory, North Queensland) during key breeding periods (Vardon & Tidemann 1999). LRFF travel south to visit the coastal areas of south-east Queensland and NSW during the summer months. Outside these periods LRFF undertake regular movements from north to south during winter–spring (July–October) (Milne & Pavey 2011).

Appendix 2 Flying-fox Ecology

Ecological role

Flying-foxes, along with some birds, make a unique contribution to ecosystem health through their ability to move seeds and pollen over long distances (Southerton et al. 2004, OEH 2016, DES 2020). This contributes directly to reproduction, regeneration, and the viability of forest ecosystems (DCCEEW 2021). It is estimated that a single flying-fox can disperse up to 60,000 seeds in one night (DELWP 2015). Some plants, particularly *Corymbia* spp., have adaptations suggesting they rely more heavily on nocturnal visitors such as bats for pollination than daytime pollinators (Southerton et al. 2004).

Flying-foxes are highly mobile and nomadic, both the GHFF and BFF are considered to have a single national population. They move across their national distribution between a network of camps. Flying-foxes may travel 300 km in a single night (Welbergen et al. 2020) and have been recorded travelling over 500 km in two days between camps (Roberts et al. 2012). Each night, flying-foxes readily forage up to 20 km from the camp where they are roosting (Meade et al. 2021), however they may travel greater distances and return to roost within the same camp. In comparison, bees, another important pollinator, move much shorter foraging distances of generally less than one kilometre (Zurbuchen et al. 2010).

Long-distance seed dispersal and pollination make flying-foxes critical to the long-term persistence of many plant communities (Westcott et al. 2008, McConkey et al. 2012), including eucalypt forests, rainforests, woodlands, and wetlands (Roberts 2006). Seeds that are dispersed away from their parent plant that germinate have a greater chance of growing into a mature plant (Ruxton & Schaefer 2012). Long-distance dispersal also allows genetic material to be spread between forest patches that would normally be geographically isolated (Parry-Jones & Augee 1992, Eby 1991, SEQ Catchments 2012). This genetic diversity allows species to adapt to environmental change and respond to disease pathogens. Transfer of genetic material between forest patches is particularly important in the context of contemporary fragmented landscapes.

Flying-foxes are considered ‘keystone’ species given their contribution to the health, longevity, and diversity among and between vegetation communities. These ecological services ultimately protect the long-term health and biodiversity of Australia’s bushland and wetlands. In turn, native forests act as carbon sinks (Roxburgh et al. 2006), provide habitat for animals and plants, stabilise river catchments, and add value to the production of hardwood timber, honey, and fruit (NSW Wildlife Council 2010). Native forests also provide recreational and tourism opportunities worth millions of dollars each year (DES 2020).

Flying-foxes in urban areas

Flying-foxes appear to be roosting and foraging in urban areas more frequently. An analysis of the NFFMP data found that of the 310 GHFF camps identified, 59% were in urban land use, 23% agricultural, and 7% protected areas (e.g. national park) (Timmiss et al. 2021). Of 291 BFF camps, 59% were in urban land use, 28% agricultural, and 6% protected areas. Furthermore, higher densities of camps occurred in areas with greater human population densities (up to ~4000 people per km^2) (Timmiss 2017). There are many possible drivers for this urbanising trend, as proposed by Tait et al. (2014):

- loss of native habitat due to urban expansion and agriculture

- food availability from native and exotic species found in urban areas
- disturbance events such as drought, fires, cyclones
- human disturbance at non-urban camps
- urban effects on local climate
- refuge from predation
- movement advantages, e.g. ease of manoeuvring in flight due to the open nature of habitat or ease of navigation due to landmarks and lighting.

Camp preferences

Little is known about flying-fox camp preferences; however, research indicates that in addition to the proximity to food sources, flying-foxes choose to form camps in vegetation with at least some of the following general characteristics (SEQ Catchments 2012):

- closed canopy > 5 m high
- dense vegetation with complex structure (upper, mid, and understorey layers)
- within 500 m of permanent water source
- within 50 km of the coastline or at an elevation < 65m above sea level
- level topography (< 5° incline)
- ideally greater than one hectare to accommodate and sustain large numbers of flying-foxes and allow the camp to shift its extent so vegetation can recover (note this does not appear to be a strong flying-fox preference, but more a consideration in camp habitat creation/improvement).

Similarly, recent research into LRFF habitat preferences revealed that camps were most often associated with the following attributes (MacDonald et al. 2021):

- taller canopy; mean height of canopy trees was 19.9 m (± 8.9 m) and of subcanopy trees was 9.9 m ± 4.8 m
- greater canopy and subcanopy cover/complexity
- marginally taller shrub layer with greater cover
- shorter, less dense ground cover layer
- preference for ten tree species (accounting for 68% of camp habitats), including *Eucalyptus*, *Melaleuca*, *Rhizophora*, *Avicennia*, *Corymbia*, and *Tamarandus* species
- generally located within 200 m of watercourse (50% of camps).

Proximity to water is a key attribute in camp location (Hall & Richards 2000, Roberts 2005, MacDonald et al. 2021) with one study suggesting that 94% of GHFF camps in NSW were (at that time) located adjacent to or on a waterway or waterbody (Eby & Lunney 2002).

These are general findings and flying-foxes have been known to camp in a variety of habitats outside the above criteria.

Flying-fox breeding cycle

Flying-foxes reach reproductive maturity in their second year of life, with most individuals breeding from their third year. Reproductive cycles detailed below are indicative and can vary by several weeks between regions, are annually influenced by climatic variables, and births can occur at any time of the year. The breeding cycle must be considered when assessing implement management actions (OEH 2015). Expert assessment is required to accurately determine the phase in the breeding cycle to inform the timing and suitability of management.

Mating can occur at any time of year, however for GHFF & BFF peak conception occurs between mid-March to mid-May (Churchill 2008; Welbergen 2011). Young (usually a single pup) are born six months later from August to November (Churchill 2008). The birthing season becomes progressively earlier, albeit by a few weeks, in more northerly populations (McGuckin & Blackshaw 1991), however out of season breeding is not unusual and births may occur at any time of the year (Ecosure pers. obs. 2015-2023).

Young are dependent on their mother for food and thermoregulation. Young are suckled and carried by the mother until approximately four weeks of age (Markus & Blackshaw 2002). After four weeks they are left at the camp during the night, a behaviour known as crèching, until they begin foraging locally in January and February (Churchill 2008). Young are weaned between five to six months of age during February and March. The average life expectancy has been calculated to be between 5-7 years (Divljan et al. 2006, Fox et al. 2008), however further research is warranted given the availability of new information. For example, individuals have been recorded to live to 18 years of age in the wild (Tidemann & Nelson 2011, Mo et al. 2023).

The critical reproductive period for GHFF and BFF is generally from August/September (when females are in late stages of pregnancy) to the end of peak conception around April/May. Dependent pups are usually present from September/October to February (Table 1). As such, consideration needs to be given to their reproductive cycle when planning site management.

Little red flying-fox

The LRFF breeding cycle is approximately six months out of phase with BFF and GHFF (Table 1). Conception occurs around October to November, with peak birthing in April-June (McGuckin & Blackshaw 1991, Churchill 2008). Young are carried by their mother for approximately one month then left at the roost while she forages (Churchill 2008). Suckling occurs for several months while young are learning how to forage.

LRFF are infrequent visitors to the Hunter region and rarely birth/rear young in NSW, yet this may change. LRFF pups are particularly vulnerable to cold weather and can suffer hypothermia and fall from their crèche trees requiring wildlife care.

Local and regional context

Flying-fox camps may be occupied continuously, annually, irregularly, or rarely and the number of individuals can fluctuate significantly on a daily, seasonal, or annual basis (Welbergen et al. 2020, Vanderduys et al. 2024). Based on the movements of satellite tracked GHFF and BFF, the number of flying-foxes changing within each colony was estimated to be 17% every day (Welbergen et al. 2020). Being highly mobile and nomadic, flying-fox camps should be thought of as a network of temporary accommodation across their range. The use of a camp is primarily thought to be associated with the local availability of foraging resources (pollen, nectar, fruit) (Yabsley et al. 2021). A study of satellite tracked individuals over a 60-month period and found that GHFF (n=109), BFF (n=80), and LRFF (n=12) roosted at 546, 173, and 89 camps, respectively (Welbergen et al. 2020). This data highlights the mobility of flying-foxes and their transient use of camps.

One active flying-fox camp occurs within the Maitland LGA. Four other camps have been recorded over the past 20 years or so (Figure 2). The flying-fox camps across the Hunter region (Figure 4) form part of the network of camps across NSW and Australia. Again, satellite tracking found that GHFF readily moved between camps across most of the species' distribution, e.g. south to Melbourne, west to Dubbo, and north to Bundaberg (Welbergen et al. 2020).

Flying-fox occupancy in certain areas can be influenced by a multitude of factors but is generally driven by resource availability in the local area. Between 2019 and 2020, flying-foxes experienced significant challenges across the east coast of Australia due to a range of extreme weather events. A prolonged drought period caused a mass food shortage from Coffs Harbour to Gladstone, in which thousands of flying-foxes perished from starvation (Cox 2019, Huntsdale & Millington 2019). Following this, bushfires across the country resulted in the loss of an estimated 34% of GHFF habitat across their range (Baranowski et al. 2021), these areas provided roosting (Mo et al. 2024) and foraging habitat for flying-foxes. These types of events have the potential to severely impact natural areas, increasing the importance of foraging and roosting resources in urban areas for flying-fox conservation.

Appendix 3 Legislation

State

Flying-fox Camp Management Policy 2015

The Flying-fox Camp Management Policy 2015 (the Policy) has been developed to empower land managers, primarily local councils, to work with their communities to manage flying-fox camps effectively. It provides the framework within which NSW DCCEEW will make regulatory decisions. In particular, the Policy strongly encourages local councils and other land managers to prepare Camp Management Plans for sites where the local community is affected.

Flying-fox Camp Management Code of Practice 2018

NSW DCCEEW has prepared a Code of Practice under the Biodiversity Conservation Regulation 2017 authorising camp management actions on public land. The code defines standards for effective and humane management of flying-fox camps.

Camp management actions can only be implemented under the Code in accordance with a Camp Management Plan endorsed by the Environment Agency Head (i.e. NSW DCCEEW).

The objective of the code is to enable camp managers to act quickly if flying-fox camps are causing a concern on public land. If camp management actions are consistent with the code, a Biodiversity Conservation licence will not be required.

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) replaced the *Threatened Species Conservation Act 1995* on 25 August 2017.

The purpose of the BC Act includes to conserve biodiversity at the bioregional and state scales. Under this Act, a person who harms or attempts to harm an animal of a threatened species, an animal that is part of a threatened ecological community, or a protected animal, is guilty of an offence.

The GHFF is listed as threatened under the BC Act (DPE 2023).

A biodiversity conservation licence under Part 2 of the BC Act may be required if the proposed action is likely to result in one or more of the following:

a. harm to an animal that is a threatened species, or part of a threatened population
b. the picking of a plant that is a threatened species, or part of a threatened population or ecological community
c. damage to habitat of a threatened species, population or ecological community
d. damage to a declared area of outstanding biodiversity conservation value.

If the NSW DCCEEW assesses a biodiversity conservation licence application and determines that a significant impact is unlikely, a biodiversity conservation licence will be granted (the appendix to the Policy lists standard conditions for flying-fox management approvals).

NSW DCCEEW regulates flying-fox camp management through two options provided to land managers:

- authorisation under the Flying-fox Camp Management Code of Practice for public land managers
- licensing for public and private land managers.

The Code of Practice provides a defence under the BC Act for public land managers, as long as camp management actions are carried out in accordance with the Code of Practice.

Proposed actions that would otherwise constitute an offence under the BC Act can be authorised under another law.

Local Government Act 1993

The primary purpose of this Act is to provide the legal framework for an effective, efficient and environmentally responsible, open system of local government. Most relevant to flying-fox management is that it also provides encouragement for the effective participation of local communities in the affairs of local government and sets out guidance on the use and management of community land which may be applicable to land which requires management of flying-foxes.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the conservation of nature, objects, places or features of cultural value and the management of land reserved under this Act. The Act protects Aboriginal objects and declared Aboriginal Places. An Aboriginal Heritage Impact Permit may be required under this Act to authorise camp management actions that may harm Aboriginal objects or declared Aboriginal Places.

Prevention of Cruelty to Animals Act 1979

It may be an offence under this Act if there is evidence of unreasonable/unnecessary torment associated with management activities. Adhering to welfare and conservation measures provided in the Plan will ensure compliance with this Act.

Environmental Planning and Assessment Act 1979

The objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act) are to encourage proper management, development, and conservation of resources, for the purposes of the social and economic welfare of the community and a better environment. It also aims to share responsibility for environmental planning between different levels of government and promote public participation in environmental planning and assessment.

The EP&A Act is administered by the NSW DCCEEW. Development control plans under the EP&A Act should consider flying-fox camps so that planning, design, and construction of future land uses is appropriate to avoid future conflict. Development under Part 4 of the Act does not require licensing under the BC Act, however it must be assessed and undertaken in accordance with the provisions of the BC Act.

Where public authorities such as local councils undertake development under Part 5 of the EP&A Act (known as ‘development without consent’ or ‘activity’), assessment and licensing under the BC Act may not be required; however, a full consideration of the development’s potential impacts on threatened species will be required in all cases.

Where flying-fox camps occur on private land, landowners are not eligible to apply for development under Part 5 of the EP&A Act. Private landowners should contact council to explore management options for camps that occur on private land.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

This policy consolidates 11 previous pieces of NSW legislation, including the SEPP for Vegetation in Non-rural Areas (2017), SEPP Koala Habitat Protection (2020 and 2021), and SEPP No. 19 – Bushland in Urban Areas. The Biodiversity and Conservation SEPP aims to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and encourage the proper conservation and management of natural vegetation that provide habitat for koalas, among other aims. A person must not cut down, fell, uproot, kill, poison, ringbark, burn or otherwise destroy the vegetation, or lop or otherwise remove a substantial part of the vegetation to which the Biodiversity and Conservation SEPP applies without a permit granted by council, or in the case of vegetation clearing exceeding the biodiversity offset thresholds (as stated in Part 7 of the Biodiversity Conservation Regulation 2017), approval by the Native Vegetation Panel.

Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth's EPBC Act provides protection for the environment, specifically matters of national environmental significance (MNES). A referral to the Commonwealth DCCEEW is required under the EPBC Act for any action that is likely to significantly impact on an MNES.

MNES under the EPBC Act that relate to flying-foxes include:

- world heritage sites (where those sites contain flying-fox camps or foraging habitat)
- wetlands of international importance (where those wetlands contain flying-fox camps or foraging habitat)
- nationally threatened species and ecological communities.

The GHFF is listed as a vulnerable species under the EPBC Act, meaning it is an MNES. It is also considered to have a single national population. DCCEEW has developed the Referral guideline for management actions in GHFF and spectacled flying-fox camps (DoE 2015) (the Guideline) to guide whether referral is required for actions pertaining to the GHFF.

The Guideline defines a nationally important GHFF camp as one that has either:

- contained ≥10,000 GHFF in more than one year in the last 10 years, or
- been occupied by ≥ 2,500 GHFF permanently or seasonally every year for the last 10 years.

Provided that management at nationally important camps follows the mitigation standards below, DCCEEW has determined that a significant impact to the population is unlikely, and referral is not likely to be required.

Referral will be required if a significant impact to any other MNES is considered likely as a result of management actions outlined in the Plan. Self-assessable criteria are available in the Significant Impact Guidelines 1.1 (DoE 2015) to assist in determining whether a significant impact is likely; otherwise consultation with DCCEEW will be required. If a significant impact is likely, Council will liaise with the NSW DCCEEW and the Commonwealth DCCEEW.

Mitigation standards:

- The action must not occur if the camp contains females that are in the late stages of

pregnancy or have dependent young that cannot fly on their own.

- The action must not occur during or immediately after climatic extremes (HSE, flood event), or during a period of significant food stress.
- Disturbance must be carried out using non-lethal means, such as acoustic, visual, and/or physical disturbance or use of smoke.
- Disturbance activities must be limited to a maximum of 2.5 hours in any 12-hour period, preferably at or before sunrise or at sunset.
- Trees are not felled, lopped, or have large branches removed when flying-foxes are in or near to a tree and likely to be harmed.
- The action must be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat (see Appendix 8), who can identify dependent young and is aware of climatic extremes and food stress events. This person must assess the relevant conditions and advise the proponent whether the activity can go ahead consistent with these standards.
- The action must not involve the clearing of all vegetation supporting a nationally-important flying-fox camp. Sufficient vegetation must be retained to support the maximum number of flying-foxes ever recorded in the camp of interest.

If actions cannot comply with these mitigation measures, referral for activities at nationally important camps is likely to be required.

Appendix 4 Human and animal health

Flying-foxes, like all animals, carry pathogens that may pose human health risks. Many of these are viruses which cause only asymptomatic infections in flying-foxes themselves but may cause significant disease in humans or other animals that are exposed. In Australia, the most well-defined of these include Australian bat lyssavirus (ABLV) and Hendra Virus (HeV). Specific information on these viruses is provided below.

Excluding those people whose occupations require contact with bats, such as wildlife carers and vets, human exposure to ABLV and HeV, their transmission and frequency of infection is extremely rare. HeV infection in humans requires transfer from an infected intermediate equine host (i.e. close contact with an infected horse) and spread of the virus directly from bats to humans has not been reported.

These diseases are also easily prevented through vaccination, personal protective equipment, safe flying-fox handling (by trained and vaccinated personnel only) and appropriate horse husbandry. Therefore, even though human infection with these agents can be fatal, the probability of infection is extremely low, and the overall public health risk is also judged to be low (Health Direct 2023).

Below is current information at the time of writing. Please refer regularly to NSW Health for up-to-date information on bats and health.

Australian bat lyssavirus

ABLV is a rabies-like virus that may be found in all flying-fox species on mainland Australia. It has also been found in an insectivorous microbat and it is assumed it may be carried by any bat species. The probability of human infection with ABLV is very low with less than 1% of the flying-fox population being affected (WHA 2023) and transmission requiring direct contact with an infected animal that is secreting the virus. In Australia three people have died from ABLV infection since the virus was identified in 1996 (WHA 2023).

Domestic animals are also at risk if exposed to ABLV. In 2013, ABLV infections were identified in two horses (Shinwari et al. 2014). There have been no confirmed cases of ABLV in dogs in Australia; however, transmission is possible (McCall et al. 2005) and consultation with a veterinarian should be sought if exposure is suspected.

Transmission of the virus from bats to humans is through a bite or scratch but may have potential to be transferred if bat saliva directly contacts the eyes, nose, mouth or broken skin. ABLV is unlikely to survive in the environment for more than a few hours, especially in dry environments that are exposed to sunlight (WHA 2023).

Transmission of closely related viruses suggests that contact or exposure to bat faeces, urine or blood does not pose a risk of exposure to ABLV, nor does living, playing or walking near flying-fox roosting areas (DPE 2023).

The incubation period in humans is assumed similar to rabies and variable between two weeks and several years. Similarly, the disease in humans presents essentially the same clinical picture as classical rabies. Once clinical signs have developed the infection is invariably fatal. However, infection can easily be prevented by avoiding direct contact with bats (i.e. handling). Pre-exposure vaccination provides reliable protection from the disease for people who are likely to have direct contact with bats. It is generally a mandatory workplace health and safety requirement that all persons working with bats receive pre-vaccination and have their level of

protection regularly assessed. Like classical rabies, ABLV infection in humans also appears to be effectively treated using post-exposure vaccination and so any person who suspects they have been exposed should seek immediate medical treatment. Post-exposure vaccination is usually ineffective once clinical manifestations of the disease have commenced.

If a person is bitten or scratched by a bat they should:

- wash the wound with soap and water for at least five minutes (do not scrub)
- contact their doctor immediately to arrange for post-exposure vaccinations.
- If bat saliva contacts the eyes, nose, mouth or an open wound, flush thoroughly with water and seek immediate medical advice.

Hendra virus

Flying-foxes are the natural host for HeV, which can be transmitted from flying-foxes to horses. Infected horses sometimes amplify the virus and can then transmit it to other horses, humans and on two occasions, dogs (WHA 2024). There is no evidence that the virus can be passed directly from flying-foxes to humans or to dogs (NSW Health 2019). Clinical studies have shown cats, pigs, ferrets, and guinea pigs can carry the infection (WHA 2024).

Although the virus is periodically present in flying-fox populations across Australia, the likelihood of horses becoming infected is low and consequently human infection is extremely rare. Horses are thought to contract the disease after ingesting forage or water contaminated primarily with flying-fox urine (WHA 2024).

Humans may contract the disease after close contact with an infected horse. HeV infection in humans presents as a serious and often fatal respiratory and/or neurological disease and there is currently no effective post-exposure treatment or vaccine available for people. The mortality rate in horses is estimated to be 90% (WHA 2024). Since 1994, over 100 horses have died, and four of the seven people infected with HeV have lost their lives (WHA 2024, Australian Government 2022).

Previous studies have shown that HeV spillover events have been associated with foraging flying-foxes rather than camp locations. Therefore, risk is considered similar at any location within the range of flying-fox species and all horse owners should be vigilant. Vaccination of horses can protect horses and subsequently humans from infection (WHA 2024), as can appropriate horse husbandry (e.g. covering food and water troughs, fencing flying-fox foraging trees in paddocks, etc.).

Although all human cases of HeV to date have been contracted from infected horses and direct transmission from bats to humans has not yet been reported, particular care should be taken by select occupational groups that could be uniquely exposed. For example, persons who may be exposed to high levels of HeV via aerosol of heavily contaminated substrate should consider additional personal protective equipment (PPE; e.g. respiratory filters), and potentially dampening down dry dusty substrate.

Coronaviruses

Coronaviruses are found in bats, birds and other wildlife worldwide. While SARS-CoV-1 (SARS), MERS-CoV (MERS) and SARS-CoV-2 (COVID-19) have caused serious disease in humans, coronaviruses isolated from Australian bats are not closely related to these and no human health implications have been identified (WHA 2020).

Ectoparasites

Bat flies are highly specialised ectoparasites that feed on the blood of bats. There are two families of bat flies; *Nycteribiidae* and *Streblidae*, though only species belonging to *Nycteribiidae* have been observed on flying-foxes in Australia (Wildlife Health Australia (WHA) Bat Focus Group members, pers. comm. 2020). They are generally considered to be highly host-specific and are usually only found on or near bats. This is predominantly due to them being obligate parasites, meaning they need regular blood meals to remain viable (WHA Bat Focus Group members, pers. comm.). There is limited available literature on the relationship between bat flies and flying-foxes in Australia. However, ectoparasite loads appear to be higher in little-red flying-fox camps, perhaps due to their very close roosting style/structure (Ecosure pers. obs.).

To date, there has been limited research on the effect of bat fly bites on humans, though the risk of transmitting diseases to humans is considered low (WHA Bat Focus Group members, pers. comm.). Firstly, bat flies tend to remain very close to flying-fox camps, and rarely remain after flying-foxes have left. As such, the only opportunity for contact between bat flies and humans would be if someone were to walk directly underneath a camp. The chance of this contact occurring will increase if the camp contains LRFF, is large, or if the flying-foxes are highly mobile (Ecosure pers. obs.) but is generally considered low. While bat flies generally do not cause issues for humans and they do not burrow into the skin the way a tick does, some people can react to bites (Dick & Patterson 2006).

There is no evidence to show that bat flies (in the *Cyclopodia* genus) can transmit diseases that Australian flying-foxes may carry, even those found feeding on virus positive black flying-foxes (Vidgen et al. 2016). There is some evidence to suggest that bat flies may be vectors for *Bartonella spp*. overseas (Moskaluk et al. 2018). There appears to be no reports of zoonotic pathogens in Australian bat flies, indicating either a lack of presence or very low prevalence.

Overall, the risk of disease transmission from bat fly to human is considered very low as it relies on three infrequent factors; a bat fly carrying a zoonotic pathogen, contact between a bat fly and human, and the bat fly burrowing sufficiently into the skin to transfer the pathogen (WHA Bat Focus Group members, pers. comm.).

Measures to avoid bat fly bites are:

- Avoid walking directly under dense groups of roosting flying-foxes.
- If possible, postpone manual cleaning of fallen vegetation and debris under a camp for 1-2 weeks after it has emptied at which time flies without a bat host should have died. If this is not possible, consider machine clean-up options.
- Follow protective measures used to avoid tick bites, such as applying insect repellent, long pants and sleeves, and double-sided tape around wrists and ankles to trap biting insects.
- If bitten and a reaction occurs, seek medical advice.

General health considerations

Flying-foxes, like all animals, carry bacteria and other microorganisms in their guts, some of which are potentially pathogenic to other species.

Bat urine and faeces should be treated like any other animal excrement. Viruses are not transferred to humans from bat urine or faeces. As with any accumulation of animal faeces (bird, bat, domestic animals), fungi or bacteria may be present in bat droppings or urine. While

considered very unlikely, there is a risk of contracting histoplasmosis and leptospirosis through direct contact with flying-fox droppings and urine, i.e. ingestion of fungal spores from bat droppings (histoplasmosis) and contact of infected urine with open cuts/eyes/mouth/nose (leptospirosis). As such, care should be taken when cleaning bat faeces or urine. This includes wetting dried faeces before cleaning or mowing, wearing appropriate PPE and maintaining appropriate hygiene. If disturbing dried bird or bat droppings, particulate respirators should be worn to prevent inhalation of dust and aerosols. See 'Work with bird and bat droppings' for detail.

Contamination of water supplies by any animal excreta (birds, amphibians, and mammals such as flying-foxes) poses a health risk to humans. Household tanks should be designed to minimise potential contamination, such as using first-flush diverters to divert contaminants before they enter water tanks. Trimming vegetation overhanging the catchment area (e.g. the roof of a house) will also reduce wildlife activity and associated potential contamination. Tanks should also be appropriately maintained and flushed, and catchment areas regularly cleaned to remove potential contaminants.

Public water supplies are regularly monitored for harmful microorganisms and are filtered and disinfected before being distributed. Management plans for community supplies should consider whether any large congregation of animals, including flying-foxes, occurs near the supply or catchment area. Where they do occur, increased frequency of monitoring should be considered to ensure early detection and management of contaminants.

Appendix 5 BioNet species search results

The NSW and Commonwealth species status are: V – vulnerable, E – endangered, C – CAMBA (China-Australia Migratory Bird Agreement), J – JAMBA (Japan-Australia Migratory Brid Agreement) and K – ROKAMBA (Republic of Korea-Australia Migratory Bird Agreement).

Dataset name	Species code	Scientific name	Common name	NSW status	Commonwealth status	Latitude	Longitude
Wildlife Rehab Database	199	*Anseranas semipalmata*	Magpie goose	V		-32.7384	151.5492
Wildlife Rehab Database	25	*Ptilinopus magnificus*	Wompoo fruit-dove	V		-32.7384	151.5492
Wildlife Rehab Database	69	*Ardenna pacifica*	Wedge-tailed shearwater		J	-32.7384	151.5492
Wildlife Rehab Database	71	*Ardenna tenuirostris*	Short-tailed shearwater		C,J,K	-32.7384	151.5492
Wildlife Rehab Database	71	*Ardenna tenuirostris*	Short-tailed shearwater		C,J,K	-32.7384	151.5492
Wildlife Rehab Database	1162	*Phascolarctos cinereus*	Koala	E	E	-32.7384	151.5492
DPIE Default Sightings	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.727	151.5523
DPIE Default Sightings	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7271	151.5523
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7355	151.5513
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7267	151.552
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7294	151.5524
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7384	151.5492
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7384	151.5492
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7384	151.5492
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7384	151.5492
Wildlife Rehab Database	1280	*Pteropus poliocephalus*	Grey-headed flying-fox	V	V	-32.7384	151.5492

Appendix 6 Management options

Level 1 actions: routine camp management

Education and awareness programs

This management option involves undertaking a comprehensive and targeted flying-fox education and awareness program to provide accurate information to the local community about flying-foxes.

Such a program would include information about managing risk and alleviating concern about health and safety issues associated with flying-foxes, options available to reduce impacts from roosting and foraging flying-foxes, an up-to-date program of works being undertaken at the camp, and information about flying-fox numbers and flying-fox behaviour at the camp.

Residents should also be made aware that faecal drop and noise at night is mainly associated with plants that provide food, independent of camp location. Staged removal of foraging species such as fruit trees and palms from residential yards, or management of fruit (e.g. bagging, pruning) will greatly assist in mitigating this issue. Approval from Council may be required for the removal of some trees.

Collecting and providing information should always be the first response to community concerns in an attempt to alleviate issues without the need to actively manage flying-foxes or their habitat. Where it is determined that management is required, education should similarly be a key component of any approach.

The likelihood of improving community understanding of flying-fox issues is high. However, the extent to which that understanding will help alleviate conflict issues is probably less so. Extensive education for decision-makers, the media and the broader community may be required to overcome negative attitudes towards flying-foxes.

It should be stressed that a long-term solution to the issue resides with better understanding flying-fox ecology and applying that understanding to careful urban planning and development.

An education program may include components shown below.

Property modification

The managers of land on which a flying-fox camp is located could promote or encourage the adoption of certain actions on properties adjacent to or near the camp to minimise impacts from roosting and foraging flying-foxes. Actions may include:

- Create visual/sound/smell barriers with fencing or hedges. To avoid attracting flying-foxes, species selected for hedging should not produce edible fruit or nectar-exuding flowers, should grow in dense formation between 2–5 m (Roberts 2006) (or be maintained at less than five metres). Vegetation that produces fragrant flowers can assist in masking camp odour where this is of concern.
- Manage foraging trees (i.e. plants that produce fruit/nectar-exuding flowers) within properties through pruning/covering with bags or wildlife friendly netting, early removal of fruit, or tree replacement.
- Cover vehicles, structures, and clothes lines where faecal contamination is an issue, or remove washing from the line before dawn/dusk.
- Move or cover eating areas (e.g. BBQs and tables) within close proximity to a camp or foraging tree to avoid contamination by flying-foxes.
- Install double-glazed windows, insulation and use air-conditioners when needed to reduce noise disturbance and smell associated with a nearby camp.

- Include suitable buffers and other provisions (e.g. covered car parks) in planning of new developments.
- Turn off lighting at night which may assist flying-fox navigation and decrease fly-over impacts.
- Consider removable covers for swimming pools and ensure working filter and regular chlorine treatment.
- Appropriately manage rainwater tanks, including installing first-flush systems.
- Avoid disturbing flying-foxes during the day as this will increase camp noise.

The cost would be borne by the person or organisation who modifies the property; however, opportunities for funding assistance (e.g. environment grants) may be available for management activities that reduce the need to actively manage a camp (see subsidy programs below).

Odour neutralising

Odour neutralising systems (which modify odour-causing chemicals at the molecular level rather than just masking them) are commonly used in contexts such as waste management, food processing, and water treatment. They have the potential to be a powerful tool for managing odour impacts associated with flying-foxes. Two trials have been undertaken that utilised two different odour-neutralising systems. The indoor system uses a Hostogel™ pot containing a gel-based formula for neutralising indoor odour. These are inexpensive, only require replacement every few months, and may be sufficient to mitigate odour impacts in houses affected by flying-fox camps. Initial results suggest there may be a positive localised effect in reducing flying-fox odour within homes. This option may be useful for affected residents (particularly those directly adjacent to the camp), as residents could choose whether or not they wish to have a gel-pot in their living space and can simply put the lid back on the pot when the odour is not impacting on them.

The outdoor system consists of a Vapourgard™ unit that dispenses an odour-neutralising vapour through diffuser pipes that are installed on boundary fences. A world-first trial was undertaken in April – June 2021 with the participation of residents living near a flying-fox camp at Porter Park, Sunshine Coast. The system followed a predetermined schedule (alternating on / off cycles) for 9 weeks and residents were asked to rate the flying-fox odour every day throughout the trial.

The trial identified that the odour-neutralising technique has the potential to be effective. However, objective results were difficult to obtain due to the significant negative experience of residents as a consequence of the large influxes of flying-fox numbers during the trial. If future trials confirm this technique is effective, the odour-neutralising system could be installed at one or more camps where odour impacts have been reported.

Approval to use this method is required from the NSW DCCEEW.

Subsidy programs

Subsidy programs provide Council with an opportunity to support impacted residents living near flying-fox camps. There are a number of factors to consider when establishing a subsidy program, including who to offer subsidies to (e.g. who is eligible and how is this determined), what subsidies to offer (e.g. service-based or property-based), how subsidies should be offered (e.g. reimbursements for purchases or upfront funding), and how the program will be evaluated to determine effectiveness for reducing flying-fox impacts to residents. The implementation and efficacy of subsidy programs was described for five councils in NSW: Eurobodalla, Ku-ring-gai, Cessnock, Tamworth, and Maitland councils (Mo et al. 2020). This report provides insight into the aforementioned factors for Council's consideration, if a subsidy program is to be adopted for residents neighbouring the Regent Street camp.

Government initiatives that provide financial assistance commonly assess residents' eligibility based on a number of variables, including property distance from a camp, and deliver subsidies as partial or full reimbursements for purchases. It is important to consider that the popularity of certain subsidies likely varies across different communities, so affected residents should be consulted in the process of establishing an effective subsidy program. The NSW subsidy study (Mo et al. 2020) found managers who design programs that best meet community needs have an increased probability of alleviating human-wildlife conflicts. Critical thresholds of flying-fox numbers at a camp and distance to a camp may also be used to determine when subsidies would apply. However, distance measures must be used with care as the extent to which a resident feels impacted is not a simple function of how close they live, as shown in a large-scale survey of 8,000 residents where there was no correlation between distance and level of bother within 300 m of a flying-fox camp (Lentini et al. 2020).

While subsidies have the potential to alleviate flying-fox impacts within a community, they can be negatively received if residents believe there are broader issues associated with flying-foxes that are not being addressed (Mo et al. 2020). As such, it is important (as with any community-based program) to assess the needs of residents and have open, ongoing communication throughout the program to ensure the subsidies are effectively reducing impacts, and if not, how the program can be adapted to address these needs.

A brief description and examples of property and service-based subsidies is provided below.

Property modification/item subsidies

Fully funding or providing subsidies to property owners for property modifications can be used to manage the impacts of the flying-foxes. Providing subsidies to install infrastructure may improve the value of the property, which may also offset concerns regarding perceived or actual property value or rental return losses. Focusing funds towards manipulating the existing built environment also reduces the need for modification and removal of vegetation. Examples of property modification subsidies include vehicle covers, carports, clothesline covers, clothes dryers, pool/spa covers, shade cloths, rainwater first-flush diverters, high-pressure water cleaners, air conditioners, fragrance dispensers or deodorisers, double-glazing of windows, door seals, screen planting, tree netting, and lighting (to discourage flying-foxes). Of these, vehicle and clothesline covers and high-pressure water cleaners were the most common subsidies taken by residents (Mo et al. 2020).

When offered, double-glazing windows was popular amongst residents and was able to achieve a 65% reduction in flying-fox noise (Mo et al. 2020). Furthermore, in a study by Pearson & Cheng (2018), it was found using infrastructure such as double-glazing windows significantly reduced the external noise level measured inside a house adjacent to a camp. This finding was supported by post-subsidy surveys undertaken by Port Macquarie Hastings Council that showed that double-glazed windows were rated as being more effective in

mitigating impacts than any other subsidised option (e.g. high-pressure cleaners, clothesline covers, shade cloth, etc.) (Reynolds 2021).

Sunshine Coast Council (Queensland) undertook several rounds of a private property grant trial in 2021-2022. The trial was used to facilitate property improvement or impact reduction infrastructure on eligible private properties. Feedback from this round confirmed that residents that have lived nearby a camp long-term are more likely to participate in the trial and experience more positive outcomes. It is acknowledged that residents that have only experienced short-term impacts may not be ready yet for this intervention. Sunshine Coast Council subsequently implemented Round 2 of their grant program where they trialled a one-off grant to eligible residents. There subsidy programs are supported by ongoing camp management, education, research, and monitoring.

Service subsidies

This management option involves providing property owners with a subsidy to help manage impacts on the property and lifestyle of residents. The types of services that could be subsidised include clothes washing, cleaning outside areas and property, solar panel cleaning, car washing, removing exotic trees, or contributing to water/electricity bills. The NSW subsidy study showed that while many property modification subsidies proved popular amongst residents (e.g. high-pressure cleaners, air conditioners), many raised concerns over the increase in water/electricity bills. Increases in bills can be difficult to quantify and justify, and has not yet been effectively offered by a council in a subsidy program.

Routine camp maintenance and operational activities

Examples of routine camp management actions are provided in the Code of Practice. Approval (e.g. a licence) or endorsement of the Plan by NSW DCCEEW is required. Routine camp management actions include:

- removal of tree limbs or whole trees that pose a genuine health and safety risk, as determined by a qualified arborist
- weed removal, including removal of removal of environmental weeds and priority weeds under the NSW *Biosecurity Act 2015*
- trimming of understorey vegetation
- the planting of vegetation
- minor habitat augmentation for the benefit of the roosting animals
- mowing of grass and similar grounds-keeping actions that will not create a major disturbance to roosting flying-foxes
- application of mulch or
- removal of leaf litter or other material on the ground.

Protocols should be developed for carrying out operations that may disturb flying-foxes, which can result in excess camp noise. Such protocols could include limiting the use of disturbing activities to certain days or certain times of day in the areas adjacent to the camp and advising adjacent residents of activity days. Such activities could include lawn-mowing, using chainsaws, whipper-snippers, using generators and testing alarms or sirens.

Revegetation and land management to create alternative habitat

This management option involves revegetating and managing land to create alternative flying-fox roosting and foraging habitat through improving and extending existing low-conflict camps or developing new roosting habitat in areas away from human settlement. Council to recommended to investigate suitable options.

Selecting new sites and attempting to attract flying-foxes to them has had limited success in the past, and ideally habitat at known camp sites would be dedicated as a flying-fox reserve. However, if a staged and long-term approach is used to make unsuitable current camps less attractive, whilst concurrently improving appropriate sites, it is a viable option (particularly for the transient and less selective LRFF). Supporting further research into flying-fox camp preferences may improve the potential to create new flying-fox habitat.

Foraging trees planted amongst and surrounding camp trees (excluding in/near horse paddocks) may help to attract flying-foxes to a desired site. They will also assist with reducing foraging impacts in residential areas. Consideration should be given to tree species that will provide year-round food, increasing the attractiveness of the designated site. Depending on the site, the potential negative impacts to a natural area will need to be considered if introducing non-indigenous plant species. Ideally, any alternative habitat creation should consider NSW Government's 'Planting to conserve threatened nomadic pollinators in NSW' (OEH 2016) and include appropriate species for site-specific conditions and ecological communities.

The presence of a water source is likely to increase the attractiveness of an alternative camp location. Supply of an artificial water source should be considered if unavailable naturally, however this may be cost-prohibitive.

Potential habitat mapping using camp preferences and suitable land tenure can assist in initial alternative site selection. A feasibility study would then be required prior to site designation to assess likelihood of success and determine the warranted level of resource allocated to habitat improvement.

Provision of artificial roosting habitat

This management option involves constructing artificial structures to augment roosting habitat in current camp sites or to provide new roosting habitat. Trials using suspended ropes have been of limited success as flying-foxes only used the structures that were very close to the available natural roosting habitat. It is thought that the structure of the vegetation below and around the ropes is important.

Protocols to manage incidents

This management option involves implementing protocols for managing incidents or situations specific to particular camps. Such protocols may include monitoring at sites within the vicinity of aged care or childcare facilities, management of compatible uses such as dog walking or sites susceptible to HSEs (when the camp is subjected to extremely high temperatures leading to flying-foxes changing their behaviour and/or dying).

The following is an example for emergency tree works: if an unforeseen tree failure poses an immediate risk to public safety, flying-foxes, infrastructure and/or adjacent properties then works must be done to the minimum extent necessary to prevent the immediate risk e.g. by removing a dangerous limb but leaving it in place on the ground for removal at a later time. The NSW DCCEEW will be notified that the works are going ahead, as soon as practicable, preferably before works commence.

Participation in research

This management option involves participating in research to improve knowledge of flying-fox ecology to address the large gaps in our knowledge about flying-fox habits and behaviours and why they choose certain sites for roosting. Further research and knowledge sharing at local, regional, and national levels will enhance our understanding and management of flying-fox camps. A key knowledge gaps exists around local foraging behaviour within Councils' LGA. Similarly, a key knowledge gaps exists around the implementation of management actions. Rigorous evaluation of the outcomes of management actions are encouraged, this includes collecting detailed data "before management actions are implemented.

Appropriate land-use planning

Land-use planning instruments may be able to be used to ensure adequate distances are maintained between future residential developments and existing or historical flying-fox camps. While this management option will not assist in the resolution of existing land-use conflict, it may prevent issues for future residents.

Property acquisition

Property acquisition may be considered if negative impacts cannot be sufficiently mitigated using other measures. This option will clearly be extremely expensive, however is likely to be more effective than dispersal and in the long-term may be less costly.

Do nothing

The management option to 'do nothing' involves not undertaking any management actions in relation to the flying-fox camp and leaving the situation and site in its current state.

Level 2 actions: in-situ management

Buffers

Buffers can be created through vegetation removal and/or the installation of permanent/semi-permanent deterrents.

Creating buffers may involve planting low-growing or spiky plants between residents or other conflict areas and the flying-fox camp. Such plantings can create a visual buffer between the camp and residences or make areas of the camp inaccessible to humans.

Previous studies have recommended that vegetation buffers consisting of habitat not used by flying-foxes, should be 300 m or as wide as the site allows to mitigate amenity impacts for a community (SEQ Catchments 2012). Buffers need to take into consideration the variable use of a camp by flying-foxes within and across years, including large, seasonal influxes of flying-foxes.

Buffers through vegetation removal

Vegetation removal aims to alter the area of the buffer habitat sufficiently so that it is no longer suitable as a camp (Mo et al. 2019). The amount required to be removed varies between sites and camps, ranging from some weed removal to removal of most of the canopy vegetation.

Any vegetation removal should be done using a staged approach, with the aim of removing as little native vegetation as possible. This is of particular importance at sites with other values (e.g. ecological or amenity), and in some instances the removal of any native vegetation will

not be appropriate. Thorough site assessment will inform whether vegetation management is suitable (e.g. can impacts to other wildlife and/or the community be avoided?).

Removing vegetation can also increase visibility into the camp and noise issues for neighbouring residents which may create further conflict.

Suitable experts should be consulted to assist selective vegetation trimming/removal to minimise vegetation loss and associated impacts. The importance of under- and mid-storey vegetation in the buffer area for flying-foxes during HSEs also requires consideration.

Buffers without vegetation removal

Permanent or semi-permanent deterrents can be used to make buffer areas unattractive to flying-foxes for roosting, without the need for vegetation removal. This is often an attractive option where vegetation has high ecological or amenity value.

While many deterrents have been trialled in the past with limited success, there are some options worthy of further investigation:

Visual deterrents – Visual deterrents such as plastic bags, fluoro vests (GeoLINK 2012), and balloons (Ecosure, pers. comm.) in roosting trees have shown to have localised effects, with flying-foxes deterred from roosting within 1–10 m of the deterrents. The type and placement of visual deterrents would need to be varied regularly to avoid habituation. Potential for litter pollution should be considered and managed when selecting the type and placement of visual deterrents. In the absence of effective maintenance, this option could potentially lead to an increase in rubbish in the natural environment.

Noise emitters on timers – Noise needs to be random, varied and unexpected to avoid flying-foxes habituating. As such these emitters would need to be portable, on varying timers and a diverse array of noises would be required. It is likely to require some level of additional disturbance to maintain its effectiveness, and ways to avoid disturbing flying-foxes from desirable areas would need to be identified. This is also likely to be disruptive to nearby residents.

Smell deterrents – For example, bagged python excrement hung in trees has previously had a short-term localised effect (GeoLINK 2012). The smell of certain deterrents may also impact nearby residents, and there is potential for flying-foxes to habituate.

Canopy-mounted water sprinklers – This method has been effective in deterring flying-foxes during dispersals (Ecosure personal experience), and current trials in Queensland are showing promise for keeping flying-foxes out of designated buffer zones. This option can be logistically difficult (installation and water sourcing) and may be cost-prohibitive. Design and use of sprinklers need to be considerate of animal welfare and features of the site. For example, misting may increase humidity and exacerbate HSEs, and overuse may impact other environmental values of the site. Further information regarding canopy-mounted sprinklers is detailed below.

Screening plants – A ‘screen’ can be created by planting a row of trees along the edge of a camp, with the aim of reducing visual impacts associated with flying-foxes. This technique can be particularly useful in cases where residents can suffer extreme reactions triggered by the mere sight of flying-foxes.

Note that any deterrent with a high risk of causing inadvertent dispersal may be considered a Level 3 action.

Canopy-mounted sprinklers

Installation of canopy-mounted sprinklers (CMS) requires approval from NSW DCCEEW, this tool can be used to create a buffer by deter flying-foxes from roosting. CMS can be installed either:

- without any camp tree trimming/removal or
- accompanied by selective camp tree trimming/removal.

Canopy-mounted sprinklers installed by Sunshine Coast Council (source: National Flying-fox Forum 2016, Ecosure).

CMS may be designed to be operated by residents; this requires clear guidelines on sprinkler use. To date, CMS have been successful at other locations at discouraging flying-foxes from roosting in the buffer zone and enabling residents to have more control over flying-foxes near their properties.

CMS can be installed and effectively operated without the need for any vegetation removal, as long as the vegetation is not so thick as to restrict the extent of water spray. If vegetation thinning is required to allow sprinklers to operate effectively in some areas, approval may be required under relevant legislation.

Water pressure must be firm so it is sufficient to deter flying-foxes, however, must not risk injuring flying-foxes (or other fauna) or knocking an animal from the tree. Water misting should be minimised as this is unlikely to deter flying-foxes and could exacerbate HSE effects. Flying-fox heat stroke generally occurs when the temperature reaches 42°C, however, can occur at lower temperatures in more humid conditions (Bishop 2015). Given that humidity is likely to increase with water in the environment, sprinklers may need to be turned off in higher temperatures (e.g. >30°C) to avoid exacerbating heat stress (N.B. NSW DCCEEW has funded research through Western Sydney University to determine if sprinklers increase humidity and potential heat stress impacts; results should be considered for sprinkler usage).

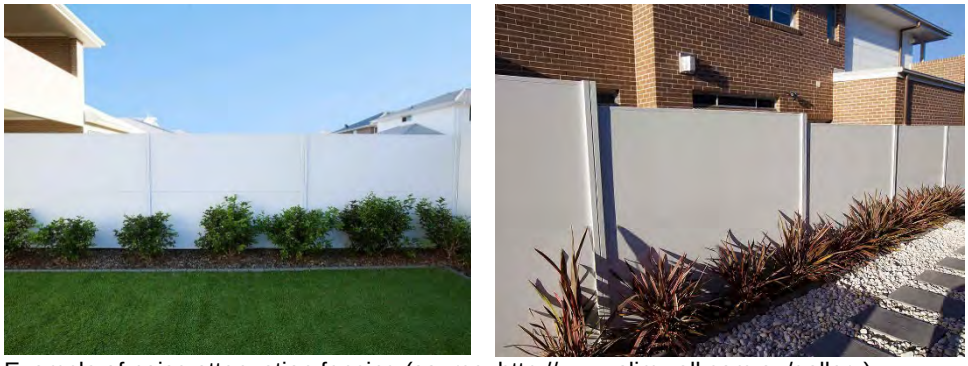
Sprinklers should release a jet of air prior to water, as an additional deterrent and to cue animals to move prior to water being released. The intention of the sprinklers is to make the buffer unattractive, and effectively ‘train’ individuals to stay out of the buffer area. If installed,

sprinklers should be programmed to operate on a random schedule and in a staggered manner (i.e. not all sprinklers operating at the same time, to avoid excessive disturbance). Each activation should be for approximately 30-45 seconds per sprinkler. Each sprinkler should be activated up to five times between 0630 and 1600 avoiding critical fly-in or fly-out periods. To avoid flying-foxes habituating to the stimuli, sprinklers should only be operated by residents when flying-foxes are within range. Sprinkler settings would also need to account for seasonal changes (e.g. not in the heat of the day during summer when they may be an attractant, and/or could increase humidity and exacerbate heat events). Individual sprinklers may also need to be temporarily turned off depending on location of creching young, or if it appears likely that animals will be displaced to undesirable locations.

Infrastructure should ideally be designed to accommodate additional sprinklers should they be required in the future. Sprinklers should be designed and attached in a way that allows for future maintenance, replacement, and sprinkler head adjustments, with consideration given to vandalism if located in a publicly accessible area.

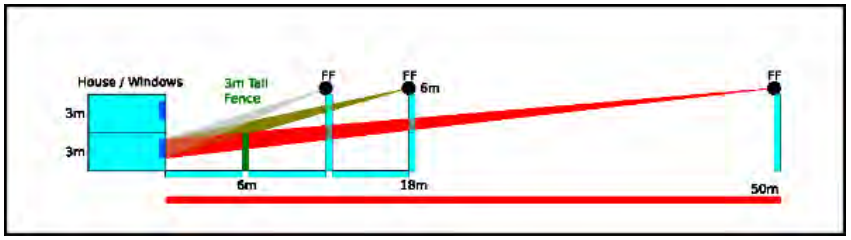
Noise attenuation fencing

Noise attenuation fencing aims to reduce noise and potentially odour where the camp is close to residents.



Example of noise attenuation fencing (source: http://www.slimwall.com.au/gallery)

This may also assist with odour reduction, and Perspex fencing could be investigated to assist fence amenity. Although expensive to install, this option could negate the need for habitat modification, maintaining the ecological values of the site, and may be more cost-effective than ongoing management. If flying-fox camps are located directly adjacent (or very close) to residential properties, fencing may need to be relatively tall, as indicated below.



Indicative scaled distances to achieve shielding for bats approximately 6 m elevated, to a typical window height (Air Noise Environment 2019). Image is indicative only with further investigation required.

To avoid the high costs associated with permanent acoustic fencing, and where flying-fox presence is transient, temporary fencing can be erected in property backyards (below). Residents/businesses can have the ability to fold down the acoustic fence when there are no flying-foxes present and erect it when flying-foxes return to the site (highly likely during melaleuca flowering periods).

Sound Block Acoustic Barrier (source: https://fortressfencing.com.au/sound-block-acoustic-barrier-noise-barrier)

Level 3 actions: disturbance or dispersal

Nudging

Noise and other low intensity active disturbance restricted to certain areas of the camp can be used to encourage flying-foxes away from high conflict areas. This technique aims to actively 'nudge' flying-foxes from one area to another, while allowing them to remain at the camp site.

Unless the area of the camp is very large, nudging should not be done early in the morning as this may lead to inadvertent dispersal of flying-foxes from the entire camp site. Disturbance during the day should be limited in frequency and duration (e.g. up to four times per day for up to 10 minutes each) to avoid welfare impacts. As with dispersal, it is also critical to avoid periods when dependent young are present (as identified by a flying-fox expert).

Dispersal

Dispersal aims to encourage a flying-fox camp to move to another location. Dispersing flying-foxes may be achieved in two ways:

- actively disturbing the camp pre-dawn as flying-foxes attempt to return from nightly foraging
- passively, by removal of all roosting habitat.

Dispersal via disturbance has been shown to reduce concerns and improve amenity in the short-term, however, camps are usually recolonised, and the conflict remains (Roberts & Eby 2013, Currey et al. 2018, Roberts et al. 2021). Data from these and more recent studies show that in 95% of cases, dispersal did not reduce the number of flying-foxes from the local area (Roberts et al. 2021). For further information on the effectiveness of dispersal attempts in Australia, see Appendix 6. Note, dispersals require long-term management to maintain no roosting. Consequently, this method requires significant initial financial investment and long-term financial and organisational commitment.

Despite the risks associated with dispersal, there are some situations where camp dispersal may be considered. 'Passive' or 'active' is described further below.

Passive dispersal

Removing vegetation in a staged manner can be used to passively disperse a camp, by gradually making the habitat unattractive so that flying-foxes will disperse of their own accord over time with little stress (rather than being more forcefully moved with noise, smoke, etc.). This is less stressful to flying-foxes, and greatly reduces the risk of splinter colonies forming

in other locations (as flying-foxes are more likely to move to other known sites within their camp network when not being forced to move immediately, as in active dispersal).

Generally, a significant proportion of vegetation needs to be removed in order to achieve dispersal of flying-foxes from a camp or to prevent camp re-establishment. For example, flying-foxes abandoned a camp in Bundall, Queensland once 70% of the canopy/midstorey and 90% of the understorey had been removed (Ecosure 2011). Ongoing maintenance of the site is required to prevent vegetation structure returning to levels favourable for colonisation by flying-foxes. Importantly, at nationally important camps (Appendix 2), sufficient vegetation must be retained to accommodate the maximum number of flying-foxes recorded at the site.

This option may be preferable in situations where the vegetation is of relatively low ecological and amenity value, and alternative known permanent camps are located nearby with capacity to absorb the additional flying-foxes. While the likelihood of splinter colonies forming is lower than with active dispersal, if they do form following vegetation modification there will no longer be an option to encourage flying-foxes back to the original site. This must be carefully considered before modifying habitat.

There is also potential to make a camp site unattractive by removing access to water sources. However, at the time of writing this method had not been trialled so the likelihood of this causing a camp to be abandoned is unknown. It would also likely only be effective where there are no alternative water sources in the vicinity of the camp.

Active dispersal through disturbance

Dispersal is more effective when a wide range of tools are used on a randomised schedule with animals less likely to habituate (Ecosure pers. obs. 1997–2015). Each dispersal team member should have at least one visual and one aural tool that can be used at different locations on different days (and preferably swapped regularly for alternate tools). Exact location of these and positioning of personnel will need to be determined on a daily basis in response to flying-fox movement and behaviour, as well as prevailing weather conditions (e.g. wind direction for smoke drums).

Active dispersal will be disruptive for nearby residents given the timing and nature of activities, and this needs to be considered during planning and community consultation.

This method does not explicitly use habitat modification as a means to disperse the camp, however if dispersal is successful, some level of habitat modification should be considered (Mo et al. 2019). This will reduce the likelihood of flying-foxes attempting to re-establish the camp and the need for follow-up dispersal as a result. Ecological and aesthetic values will need to be considered for the site, with options for modifying habitat the same as those detailed for buffers above.

Early dispersal before a camp is established at a new location

This management option involves monitoring local vegetation for signs of flying-foxes roosting in the daylight hours and then undertaking active or passive dispersal options to discourage the animals from establishing a new camp. Even though there may only be a few animals initially using the site, this option is still treated as a dispersal activity, however it may be simpler to achieve dispersal at these new sites than it would in an established camp. It may also avoid considerable issues and management effort required should the camp be allowed to establish in an inappropriate location.

It is important that flying-foxes feeding overnight in vegetation are not mistaken for animals establishing a camp.

Maintenance dispersal

Maintenance dispersal refers to active disturbance following a successful dispersal to prevent the camp from re-establishing (Mo et al. 2019). It differs from initial dispersal by aiming to discourage occasional over-flying individuals from returning, rather than attempting to actively disperse animals that have been recently roosting at the site. As such, maintenance dispersal may have fewer timing restrictions than initial dispersal, provided that appropriate mitigation measures are in place.

Unlawful activities

Culling

Culling is addressed here as it is often raised by community members as a preferred management method**;** however, culling is contrary to the object of the *BC Act* and will not be permitted as a method to manage flying-foxes or their camps.

Appendix 7 Dispersal summary results

Multiple studies have clearly demonstrated the long-term ineffectiveness of flying-fox camp dispersals. Dispersal via disturbance has been shown to reduce concerns and improve amenity in the short-term, however, camps are usually recolonised, and the conflict remains (Roberts & Eby 2013, Currey et al. 2018).

Roberts & Eby (2013) summarised 17 known flying-fox dispersals between 1990 and 2013, and made the following conclusions:

- In all cases, dispersed animals did not abandon the local area[2].
- In 16 of the 17 cases, dispersals did not reduce the number of flying-foxes in the local area.
- Dispersed animals did not move far (in approx. 63% of cases the animals only moved < 600 m from the original site, contingent on the distribution of available vegetation). In 85% of cases, new camps were established nearby.
- In all cases, it was not possible to predict where replacement camps would form.
- Conflict was often not resolved. In 71% of cases, conflict was still being reported either at the original site or within the local area years after the initial dispersal actions.
- Repeat dispersal actions were generally required (all cases except where extensive vegetation removal occurred).
- The financial costs of all dispersal attempts were high, ranging from tens of thousands of dollars for vegetation removal to hundreds of thousands for active dispersals (e.g. using noise, smoke, etc.).

Ecosure, in collaboration with a Griffith University Industry Affiliates Program student, researched outcomes of management in Queensland between November 2013 and November 2014 (the first year since the current Queensland state flying-fox management framework was adopted on 29 November 2013).

An overview of findings[3] is summarised below.

- There were attempts to disperse 25 separate camps in Queensland (compared with nine ,camps between 1990 and June 2013 analysed in Roberts & Eby [2013]). Compared with the historical average (less than 0.4 camps/year) the number of camp dispersed in the year since the framework was introduced has increased by 6250%.
- Dispersal methods included fog[4], birdfrite, lights, noise, physical deterrents, smoke, extensive vegetation modification, water (including cannons), paintball guns and helicopters.
- The most common dispersal methods were extensive vegetation modification alone and extensive vegetation modification combined with other methods.
- In nine of the 24 camps dispersed, dispersal actions did not reduce the number of flying-foxes in the LGA.

[2] Local area is defined as the area within a 20-kilometre radius of the original site = typical feeding area of a flying-fox.
[3] This was based on responses to questionnaires sent to councils; some did not respond and some omitted responses to some questions.
[4] Fog refers to artificial smoke or vapours generated by smoke/fog machines. Many chemical substances used to generate smoke/fog in these machines are considered toxic.

- In all cases, it was not possible to predict where new camps would form.
- When flying-foxes were dispersed, they did not move further than six kilometres away.
- As at November 2014 repeat actions had already been required in 18 cases.
- Conflict for the council and community was resolved in 60% of cases, but with many councils stating they feel this resolution is only temporary.
- The financial costs of all dispersal attempts were considerable, regardless of methods used, ranging from $7,500 to more than $400,000 (with costs ongoing).
- Newly published research investigating the effectiveness of dispersal attempts (Roberts et al. 2021) has shown similar findings which are summarised below:
- In 95% of cases, dispersal did not reduce the number of flying-foxes from the local area.
- Of the 48 camp dispersals attempted, only 23% were deemed a success at reducing conflict with communities, and this generally only occurred after extensive destruction of camp habitat.
- No project with a budget less than A$250,000 was deemed successful.
- Repeat actions were required in 58% of cases, some for months and years following the initial activities.
- In 88% of cases, replacement camps were established within one kilometre of the original camp, transferring conflict to neighbouring communities.

Appendix 8 Standard measures to avoid impacts to flying-foxes

The following mitigation measures will be complied with at all times during implementation of any activities within or immediately adjacent to a camp. It is acknowledged that some of these measures may not be able to be applied or adhered to for works such as emergency tree removals.

- All personnel will be appropriately experienced, trained, and inducted. Induction will include each person's responsibilities under this Plan.
- All personnel will be briefed prior to the action commencing each day and debriefed at the end of the day.
- Works will cease and NSW DCCEEW consulted in accordance with the 'stop work triggers' section of the Plan (below).
- Large crews will be avoided where possible.
- The use of loud machinery and equipment that produces sudden impacts/noise will be limited. Where loud equipment (e.g. chainsaws) is required, they will be started away from the camp and allowed to run for a short time to allow flying-foxes to adjust.
- Activities that may disturb flying-foxes at any time during the year will begin as far from the camp as possible, working towards the camp gradually to allow flying-foxes to habituate.
- Any activity likely to disturb flying-foxes so that they take flight will be avoided during the day during the sensitive GHFF/BFF birthing period (i.e. when females are in final trimester or the majority are carrying pups, generally August – December) and avoided altogether during crèching (generally November/December to February).
- Where works cannot be done at night after fly-out during these periods, it is preferable they are undertaken in the late afternoon close to or at fly-out. If this is also not possible, a person experienced in flying-fox behaviour will monitor the camp for at least the first two scheduled actions (or as otherwise deemed to be required by that person) to ensure impacts are not excessive and advise on the most appropriate methods (e.g. required buffer distances, approach, etc.).
- NSW DCCEEW will be contacted if LRFF are present between March and October or are identified as being in final trimester / with dependent young as LRFF breeding is uncharacteristic in New South Wales and may also affect management action timing.
- Non-critical maintenance activities will ideally be scheduled when the camp is naturally empty, or after fly-out if there are no creching young within the camp. Where this is not possible (e.g. at permanently occupied camps) they will be scheduled for the best period for that camp (e.g. when the camp is seasonally lower in numbers and breeding will not be interrupted, or during the non-breeding season, generally May to July).
- Works will not take place in periods of adverse weather including strong winds, sustained heavy rains, extreme heat, in cold temperatures or during periods of likely population stress (e.g. food shortages). Wildlife carers will be consulted where required to determine whether the population appears to be under stress.
- Works will be postponed on days predicted to exceed 35°C (or ideally 30°C), and for one day following a day that reached ≥35°C. If an actual HSE has been recorded at the camp or at nearby camps, a rest period of several weeks will be scheduled to

allow affected flying-foxes to fully recover. See the NSW Government website for more information on responding to heat stress in flying-fox camps.

- Evening works may commence after fly-out. Noise generated by the works should create a first stage disturbance, with any remaining flying-foxes taking flight. Works should be paused at this stage to monitor for any remaining flying-foxes (including crèching young, although December – February should be avoided for this reason) and ensure they will not be impacted. All Level 1 and 2 works (including pack-up) will cease by 0100 to ensure flying-foxes returning early in the morning are not inadvertently dispersed. Works associated with Level 3 actions may continue provided flying-foxes are not at risk of being harmed.
- If impacts at other sites are considered, in NSW DCCEEW's opinion, to be a result of management actions under this Plan, assistance will be provided by the proponent to the relevant land manager to ameliorate impacts. Details of this assistance are to be developed in consultation with NSW DCCEEW.
- Ensure management actions and results are recorded to inform future planning.

Human safety

The following measures are minimum requirements to ensure human health and safety during the implementation of flying-fox management activities. It is up to the land manager and contractors to conduct a risk assessment and determine health and safety requirements prior to works.

- All personnel to wear protective clothing including long sleeves and pants; additional items such as eye protection and a hat are also recommended. People working under the camp should wash their clothes daily. Appropriate hygiene practices will be adopted such as washing hands with soap and water before eating/smoking.
- All personnel who may come into contact with flying-foxes will be vaccinated against ABLV with current titre.
- A wash station will be available on-site during works along with an anti-viral antiseptic (e.g. Betadine) should someone be bitten or scratched.
- Details of the nearest hospital or doctor who can provide post-exposure prophylaxis will be kept on-site.

All Level 2 and 3 actions

Prior to works

- Residents adjacent to the camp will be individually notified one week prior to on-ground works commencing. This will include information on what to do if an injured or orphaned flying-fox is observed, a reminder not to participate in or interfere with the program, and details on how to report unusual flying-fox behaviour/daytime sightings. Relevant contact details will be provided (e.g. Program Coordinator). Resident requests for retention of vegetation and other concerns relating to the program will be taken into consideration.
- Where the Plan is being implemented by council, information will be placed on council's website along with contact information.
- The Department will be notified at least 48 hours before works commence.
- A protocol for flying-fox rescue, in accordance with the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (DPIE 2021), will be developed including contact details of rescue and rehabilitation organisations. This protocol will be made

available to all relevant staff, residents and volunteers prior to the action commencing.

- A licenced wildlife carer trained in flying-fox rescue and appropriately vaccinated will be notified prior to beginning works in the event that rescue/care is required.

Monitoring

A flying-fox expert (identified in Appendix 9) will undertake an on-site population assessment prior to, during works and after works have been completed, including:

- number of each species
- ratio of females in their final trimester
- approximate age of any pups present including whether they are attached or likely to be crèched
- visual health assessment
- mortalities.
- Counts will be done at least:
- once immediately prior to works
- daily during works
- immediately following completion
- one month following completion
- 12 months following completion.

During works

- A flying-fox expert will attend the site as often as NSW DCCEEW considers necessary to monitor flying-fox behaviour and ensure compliance with the Plan and the Policy. They must also be able to identify pregnant females, flightless young, individuals in poor health and be aware of climatic extremes and food stress events. This person will assess the relevant conditions and advise the supervisor/proponent whether the activity can go ahead.
- Deterrents in buffer areas will be assessed by a flying-fox expert so those that may cause inadvertent dispersal (e.g. CMS) are not used during fly-in.
- At least one flying-fox rest day with no active management will be scheduled fortnightly, preferably weekly. Static deterrents (e.g. CMS) may still be used on rest days.

Vegetation trimming/removal (if required)

- Dead wood and hollows will be retained on site where possible as habitat.
- Vegetation chipping/mulching is to be undertaken as far away from roosting flying-foxes as possible (at least 100 m).
- Vegetation removal will not involve the clearing of all vegetation supporting a nationally important flying-fox camp. Sufficient vegetation will be retained to support the maximum number of flying-foxes ever recorded in the camp.

Canopy vegetation trimming/removal (if required)

Prior to works

- Trees to be removed or lopped will be clearly marked (e.g. with flagging tape) prior to works commencing, to avoid unintentionally impacting trees to be retained.

During works

- Any tree lopping, trimming or removal is undertaken under the supervision of a suitably qualified arborist (minimum qualification of Certificate III in Horticulture (Arboriculture) who is a member of an appropriate professional body such as Arboriculture Australia).
- Trimming will be in accordance with relevant Australian Standards (e.g. AS4373 Pruning of Amenity Trees), and best practice techniques used to remove vegetation in a way that avoids impacting other fauna and remaining habitat.
- No tree in which a flying-fox is roosting will be trimmed or removed. Works may continue in trees adjacent to camp trees only where a person experienced in flying-fox behaviour assesses that no flying-foxes are at risk of being harmed. A person experienced in flying-fox behaviour is to remain on site to monitor, when canopy trimming/removal is required within 50 m of roosting flying-foxes.
- While most females are likely to be carrying young (generally September – January) vegetation removal within 50 m of the camp will only be done in the evening after fly-out, unless otherwise advised by a flying-fox expert.
- Tree removal as part of management will be offset at a ratio of at least 2:1.

Bush regeneration

- All works will be carried out by suitably qualified and experienced bush regenerators (i.e. Landcare groups), with at least one supervisor knowledgeable about flying-fox habitat requirements (and how to retain them for Level 1 and 2 actions) with experience working under a camp, or having been trained in working under a camp.
- Vegetation modification, including weed removal, will not alter the conditions of the site such that it becomes unsuitable flying-fox habitat for Level 1 and 2 actions.
- Weed removal should follow a mosaic pattern, maintaining refuges in the mid- and lower storeys at all times.
- Weed control in the core habitat area will be undertaken using hand tools only (or in the evening after fly-out while crèching young are not present).
- Species selected for revegetation will be consistent with the habitat on site, and in buffer areas or conflict areas should be restricted to small shrubs/understorey species to reduce the need for further camp tree management in the future.

Additional mitigation measures for any activity at a nationally important grey-headed flying-fox camp

In addition to those detailed above, the following measures are required for any activity other than routine camp management (Level 1 actions) at a nationally important GHFF camp. In circumstances where mitigation standards are not applied, significant impacts are likely, and the proposed action is more likely to require referral under the EPBC Act.

- No Level 2 or 3 actions will occur if the camp contains females that are in the late stages of pregnancy or have dependent young that cannot fly on their own (generally August to February).
- Disturbance activities will be limited to a maximum of 2.5 hours in any 12-hour period, preferably at or before sunrise or at sunset. Disturbance activities can be defined as any activity, other than routine activities, that disturbs the camp and therefore this may apply to both Level 2 and 3 activities.
- The action will not involve the clearing of all vegetation supporting a nationally important flying-fox camp. Sufficient vegetation will be retained to support the maximum number of flying-foxes ever recorded in the camp of interest.

Stop work triggers

Management activities in or near camps will cease and will not recommence without consulting NSW DCCEEW if:

- any of the animal welfare triggers occur on more than two days during the program, such as unacceptable levels of stress (see table below)
- there is a flying-fox injury or death
- a new camp/camps appear to be establishing
- impacts are created or exacerbated at other locations
- there appears to be potential for conservation impacts (e.g. reduction in breeding success identified through independent monitoring)
- standard measures to avoid impacts cannot be met.
- Management may also be terminated at any time if:
- unintended impacts are created for the community around the camp
- allocated resources are exhausted.

Welfare trigger	Signs	Action
Unacceptable levels of stress	If any individual is observed: panting saliva spreading located on or within two metres of the ground	Works to cease for the day
Fatigue	In situ management more than 30% of the camp takes flight individuals are in flight for more than five minutes flying-foxes appear to be leaving the camp	In situ management Works to cease and recommence only when flying-foxes have settled* / move to alternative locations at least 50 m from roosting animals

Welfare trigger	Signs	Action
	Dispersal low flying laboured flight settling despite dispersal efforts	Dispersal Works to cease for the day
Injury/death	a flying-fox appears to have been injured/killed on-site (including aborted foetuses) any flying-fox death is reported within one kilometre of the dispersal site that appears to be related to the dispersal loss of condition evident	Works to cease immediately and the Department notified Rescheduled Adapted sufficiently so that significant impacts (e.g. death/injury) are highly unlikely to occur, as confirmed by an independent expert (see Appendix 9) Stopped indefinitely and alternative management options investigated.
Reproductive condition	females in final trimester dependent/crèching young present	Works to cease immediately and the Department notified Rescheduled Stopped indefinitely and alternative management options investigated.

*maximum of two unsuccessful attempts to recommence work before ceasing for the day.

Appendix 9 Flying-fox expert definition

The following are the minimum required skills and experience which must be demonstrated by a person with experience in flying-fox behaviour (as per Appendix 1 of the Flying-fox Camp Management Plan template, DPE 2019):

Essential:

- Knowledge of flying-fox habitat requirements.
- Knowledge and experience in flying-fox camp management.
- Knowledge of flying-fox behaviour, including ability to identify signs of flying-fox stress.
- Ability to differentiate between breeding and non-breeding females.
- Ability to identify females in final trimester.
- Ability to estimate age of juveniles.
- Experienced in flying-fox population monitoring including static and fly-out counts, demographics and visual health assessments.

Desirable:

- It is strongly recommended that the expert is independent of the CMP owner to ensure transparency and objectivity. NSW DCCEEW may be able to help with finding flying-fox experts.
- ABLV-vaccinated (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Trained in flying-fox rescue (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Local knowledge and experience.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	23/08/2024	Regent Street Flying-fox Camp Management Plan Draft	Dr John Martin, Senior Ecologist Tegan Dinsdale, Ecologist	Dr John Martin, Senior Ecologist	Jess Bracks, Principal Wildlife Biologist
01	20/12/2024	Regent Street Flying-fox Camp Management Plan	Adam Stone, Ecologist	Dr John Martin, Senior Ecologist	

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