

Blackalls Park

Flying-fox camp

Management Plan





Lake Macquarie City Council November 2016

Acknowledgements

This plan generally follows the Flying-fox camp Management Plan template 2015, which has been replaced by the Flying-fox camp Management Plan Template (NSW Office of Environment and Heritage 2016).

Photo credits

Symon Walpole LMCC. Cover photo: Grey-headed Flying-fox at Blackalls Park.

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Summary

Flying-foxes established a camp at Blackalls Park in 2009. The camp is primarily occupied by the grey-headed flying-fox (GHFF) with the population varying seasonally over time. The land occupied by the camp is owned by Lake Macquarie City Council.

The Blackalls Park flying-fox camp is located in reasonably close proximity to urban areas and interactions between people and flying-foxes are a potential cause of conflict and community concern.

Grey-headed flying-foxes are listed as threatened species under both NSW and Commonwealth legislation, and disturbance to flying-foxes and their habitat is limited by legislative requirements. This species is highly mobile and camp populations vary widely over time due to food resource availability.

The Blackalls Park Flying-fox camp Management Plan provides a tool to ensure appropriate management of the camp. This management plan outlines the issues of concern to the community caused by the presence of flying-foxes, Lake Macquarie City Council's response, and measures that will be taken to manage the land and reduce conflict with the local community. This approach may guide Council's approach in other locations in the local government area if flying-fox issues arise.

Experience in other areas has shown that attempts to move camps are generally unsuccessful, expensive, and likely to result in relocation of problems. Therefore, management actions proposed at Blackalls Park are primarily to discourage flying-foxes from roosting near adjoining private land and dwellings, to improve residential amenity and to avoid potential human health impacts.

Preparation of the Plan included a community survey of residents surrounding the camp and consultation with the NSW Office of Environment and Heritage.

The Camp Management Plan provides the framework for guiding Lake Macquarie City Council management actions on the land, and in responding to concerns of nearby residents.

The review undertaken has indicated that relocation of the Blackalls Park flying-fox camp is not feasible and would have a high risk of undesirable consequences such as relocation of the camp closer to residential areas.



Grey-headed Flying-foxes at Blackalls Park

Given the mobility of flying-foxes and the expected variability of the population of the camp over time, the focus of implementation actions is on:

1. Rehabilitation of the land within the site over time to create more suitable flying-fox roosting habitat away from adjoining residential properties, thereby reducing amenity impacts.
2. Supporting periodic monitoring of the flying-fox population to improve understanding of flying-fox behaviour on the site, and to enable effective management responses where significant population increases occur.
3. Community engagement and implementation of a resident assistance program where appropriate.

In the event that the flying-foxes no longer occupy the site or are present in low numbers, then many of the actions identified in the Plan will not be required. Alternatively, if the number of individuals at the camp increases, then it may be necessary to review actions.



1. Background

This management plan has been prepared by Lake Macquarie City Council to guide management of land at Blackalls Park occupied periodically by a flying-fox camp since 2009.

The Plan has been prepared to identify actions that are available to reduce the impact of flying-foxes on residents, particularly adjacent to the land occupied by the camp, while maintaining suitable habitat on the site to support the population of the grey-headed flying-fox, a listed threatened species. The Plan also provides general guidance throughout the Lake Macquarie local government area for flying-fox camps.

The Plan provides for the taking of actions to manage flying fox habitat on the land, including maintenance and regeneration of canopy vegetation and tree thinning around those parts of the land close to private residences. It has been prepared in consultation with the NSW Office of Environment and Heritage and the local community, and is consistent with relevant guidelines and practice for flying-fox camps.

Lake Macquarie City Council had no prior policy in relation to flying-foxes camp management. However, in its plans and policies, the Council is committed to the protection of biodiversity across the City. This Plan draws on the extensive experience of many other local government areas across Australia (including Queensland, NSW, and Victoria) in their dealings with flying-foxes.

Information is included in Parts 2, 3 & 4 to inform the Plan and to support the identification of relevant issues. Management actions are identified in Parts 5 & 7 of the plan.

The purpose of this Plan is to undertake camp management in accordance with the Office of Environment and Heritage (OEH) Flying-fox camp Management Policy (OEH 2015). The Plan has been prepared in consultation with OEH. If approved by OEH (in combination with other relevant license applications and legislative requirements) this Plan will enable appropriate vegetation management on the land under NSW state legislation to reduce impacts of the camp on residential areas.

The Plan outlines how the land occupied by the camp will be managed, and actions that Lake Macquarie City Council will take to reduce residential impacts as far as possible. Little or no direct impact to flying-foxes arising from the proposed management actions is anticipated, and no license is therefore expected to be required. However, the Plan will facilitate approvals and a license to reduce or remove limited native canopy vegetation on the edges of the site if required in the future.

The Plan operates for a period of 5 years.

1.1 Objectives

The objectives of the plan are to:

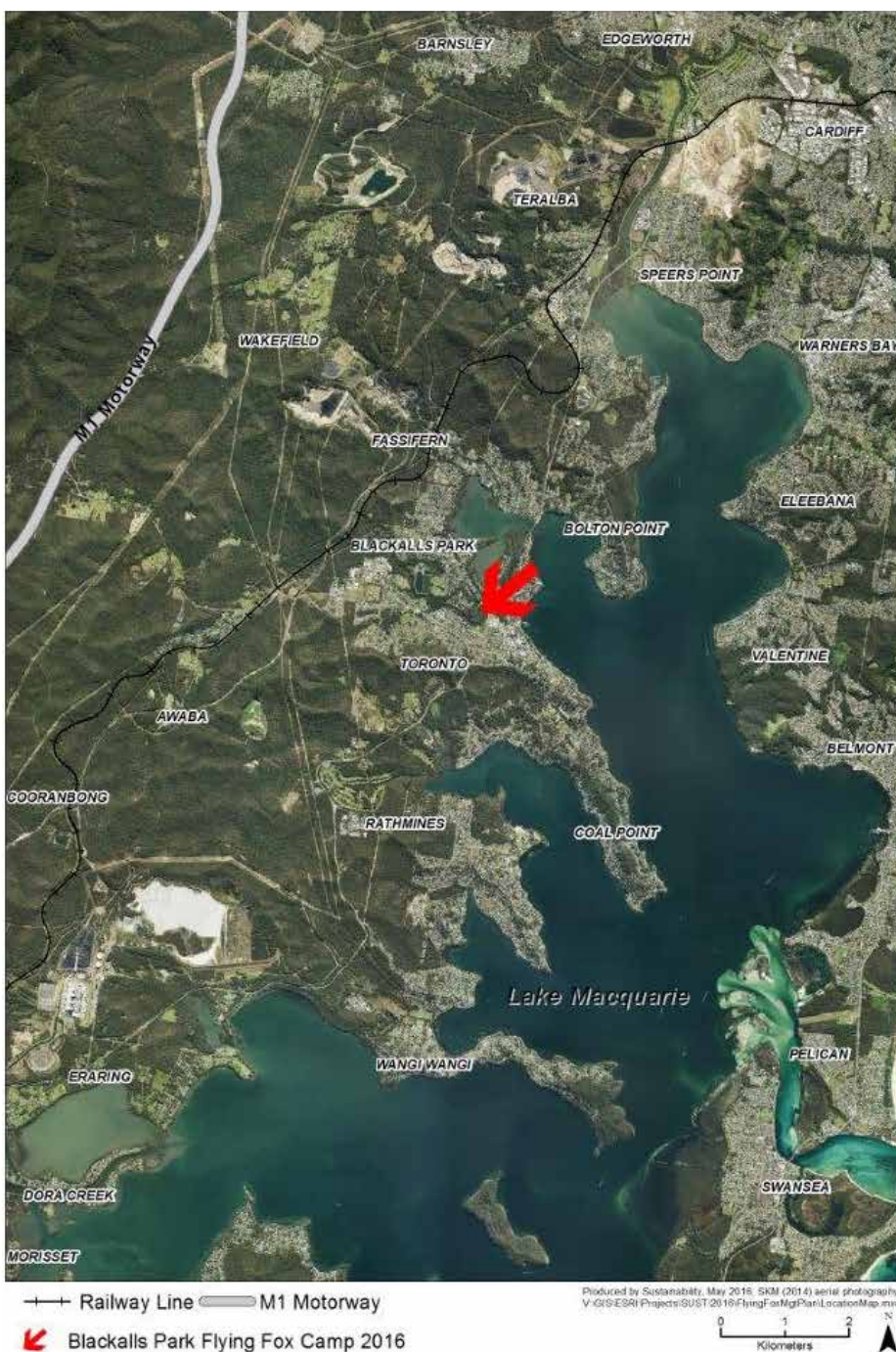
- Minimise community impacts of flying-fox occupation of the area by implementing appropriate management actions.
- Identify issues for the management of the land and the amenity of surrounding residents.
- Balance the amenity of residents within the LGA with the conservation of flying-fox habitat.
- Comply with legislative requirements, animal welfare and conservation objectives.
- Manage public health and safety risks.
- Protect the Endangered Ecological Community on the land by minimising vegetation modification and enabling suitable rehabilitation and regeneration.
- Provide community education and awareness of flying-fox and other biodiversity issues in relation to the land.

The objectives of the Plan are consistent with the Office of Environment and Heritage Flying-fox camp Management Policy (OEH 2015).



2. Context

Map 1 Location



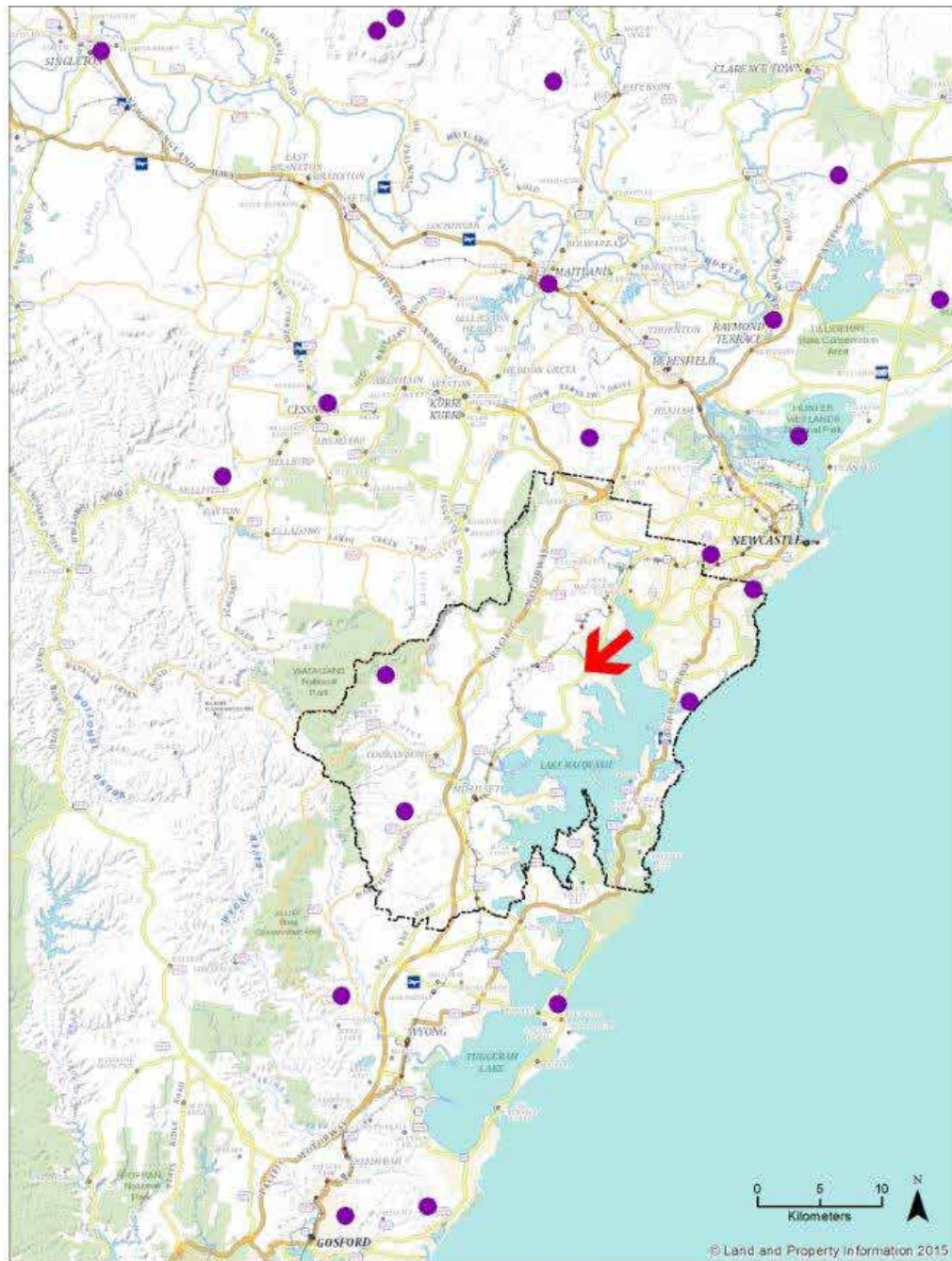
The Blackalls Park flying-fox camp is located on a number of adjoining parcels of Lake Macquarie City Council land within a primarily urban area. The camp is mostly separated from adjoining residential properties by estuaries forming part of Lake Macquarie. The location relative to the local government area is shown on Map 1.



The camp forms part of a larger regional network of over 40 camps identified in the Lower Hunter and shown in the *Grey-headed Flying-fox Management Strategy for the Lower Hunter* (Geolink 2013). This strategy identified

Blackalls Park as a new camp where its status was unclear. The location of other known camps in the Lower Hunter Region is shown on Map 2.

Map 2 Regional Context and Location of Known Flying-fox camps



- Lake Macquarie LGA boundary
 - Known Flying-fox camps identified by the Office of Environment & Heritage (February 2013)
 - Blackalls Park Flying Fox Camp 2016
- Produced by Sustainability, May 2016
V:\GIS\ESRI\Projects\SUST12016\FringFox\Map\RegionalContext.mxd



2.1 Camp area

The flying-fox camp is located on the south of Fennell Crescent, Blackalls Park between two waterways – Stony Creek and Mudd Creek. The camp is on land with remnant Swamp Oak Floodplain Forest, and a degraded former orchard now occupied by weeds, including *Lantana camara*, *Ipomoea* spp, and Bamboo. Map 3 shows the location of the site and immediately surrounding land.

The camp occupies eight (8) lots together with parts of some directly adjoining road reserves. The site is owned by Lake Macquarie City Council and includes Lot 1 DP 1123706, Lots 16 – 21 Section 3 DP 2707, and Part Lot 22 Section 3 DP 2707.

The total area of the land is 6.9 ha most of which is vegetated. Not all of the area has been occupied by the camp, and the extent of the camp has varied extensively over time, with the largest area of vegetation used for roosting being in April – May 2016. The estimated area of the camp has varied from approximately < 0.5 ha in 2009 to about 5 ha in 2016.

Other Council owned reserve in reasonably close proximity, have temporarily been occupied in part by flying-foxes in the past, and there are also reports that adjoining private land has occasionally been used for flying-fox roosting. In 2013 flying-foxes briefly occupied a larger area than in 2016 including land south of Stony Creek.

Map 3 Blackalls Park Flying-fox camp Site





2.2 Land tenure & status

The camp occurs on Lake Macquarie City Council owned land, classified as community land and categorised as bushland. Management is subject to Lake Macquarie City Council Plan of Management for Community Land (LMCC 2011).

The land is zoned E2 Environmental Conservation under Lake Macquarie Local Environmental Plan 2014.

The pre-existing deteriorated dwelling on No.103 Fennell Crescent (lot 18 section 3 DP2707) was demolished in 2015 in accordance with conditions of development consent for demolition. These conditions included the requirement for the preparation and implementation of a vegetation management plan, which is now in place on the site to inform the ongoing rehabilitation and management of the site.

2.3 History of the camp

The Blackalls Park flying-fox camp appears to have been established relatively recently in 2009, with the history of the camp outlined in Appendix 1. Since its establishment by a relatively small number of grey-headed flying-foxes, the population has steadily increased. Seasonal variation in numbers saw a large population in 2016, coinciding with a significant regional flowering event, which provided abundant food resources.

The reasons for the establishment of the camp are not clear, but appear to be associated with observed changes in the distribution of flying-fox camps across the Australian east coast and the Hunter Region. These changes include general population movement south, camps relocating to swampy and riparian areas, more camps in urban areas, and splitting of camps to reduce flying distance to foraging resources.

Although flying-foxes are nomadic and move in response to the availability of food resources, changes in the distribution of flying-fox populations are probably affected by:

- Urbanisation of the coastal plains of south-eastern Queensland and northern NSW and the removal of annually-reliable winter feeding sites.
- Climate change and a progressive annual warming trend together with more extreme weather events and drying of the landscape.
- Regular food supply in urban areas due to watering of gardens and diversity of garden plants flowering and fruiting throughout the year thereby encouraging permanent camp occupancy.

The population of the camp has been monitored as part of the CSIRO *National Flying-fox Census* since 2013. The census is currently 4 times per year in February, May,

August and November, although it is suggested that this should be more frequent (Westcott et al. 2011). Monitoring is aimed at a population census, with the total population counted, not a sample.

The camp is primarily occupied seasonally, with the highest population in March to April. Population monitoring since February 2013 shows that the grey-headed flying-fox has been recorded on the site in summer/autumn each year since 2013 with the population estimated to be up to about 10,000 individuals on occasions. During winter months, the camp is unoccupied, or populated by very few flying-foxes.

2.4 Identification of community interests and issues

Since the occupation of the camp by large numbers of flying-foxes, a number of community concerns related to loss of residential amenity have arisen, specifically:

1. Noise, particularly as flying-foxes return to the camp in the early morning.
2. Odour from the camp.
3. Faecal drop over residences, paved areas, vehicles and washing lines.
4. Managing potential health risks associated with flying-fox contact.

These have been confirmed in community consultation undertaken by Council in conjunction with the preparation of the Plan. The community engagement process is outlined in Part 3 and Appendix 2.

At times of high occupation, there is potential for a dispersed impact across broad areas used for foraging, and on residential land. This is primarily associated with faecal drop and feeding on residential properties.

Other issues associated with flying-fox camps elsewhere, but not identified at Blackalls Park are damage to power and phone infrastructure. Experience with community engagement in other locations shows that residents are interested to know what is happening and should be kept informed of relevant ecological, behavioural and safety information.

There is also community interest in the conservation of flying-foxes, and in observing animals occupying the camp. This reflects general community interest in protecting biodiversity in the area.



2.5 Land management actions

No actions have been taken to manage flying-foxes on the land to date. A vegetation management plan (LMCC 2016) for the land prepared in 2016 to guide Lake Macquarie City Council's management of the land, recognised the presence of significant native vegetation on the land and the existence of the flying-fox camp.

The vegetation management plan (LMCC 2016) followed development consent for demolition of a previously tenanted dwelling on one of the lots forming the site. The Development Application required rehabilitation and management of heritage issues associated with the site as a condition of approval.

The plan for vegetation management is to control weeds (especially Bamboo) and to restore and expand the area of native vegetation which primarily comprises Swamp Oak Floodplain Forest endangered ecological community over the whole site. In addition, the Plan focuses on addressing key threatening processes for both the Swamp Oak Floodplain Forest and the grey-headed flying-fox, and identifies heritage plantings around the old dwelling and the opportunities for the maintenance of this precinct.

The vegetation management plan identifies vegetation management zones on the land, and includes Landcare guidelines for protecting the grey-headed flying-fox. In managing vegetation on the site, it notes that:

- The grey-headed flying-fox colony occupies the Swamp Oak Floodplain Forest Endangered Ecological Community (EEC) on the site seasonally and that although subject to seasonal variation, flying-foxes leave the camp around June and begin to return in November, with numbers varying from a few hundred to an estimated peak populations of around 10,000 or more in recent years.
- The flying-fox camp exerts significant pressure on the Swamp Oak Floodplain Forest EEC by snapping branches, killing saplings and eutrophication of the soil and ephemeral water beneath the camp.
- Rehabilitation of the Swamp Oak Forest will improve the resilience of this vegetation community and provide more roosting opportunities for the flying-fox.
- Rehabilitation should be conducted in such a way as to reduce human and flying-fox conflict.
- Potential impacts upon the listed threatened grey-headed flying-fox at Fennell Crescent include loss of roosting and foraging sites, heat stress and conflict with humans.
- Flying-fox occupation of the site needs to be monitored, with weed control and revegetation to be worked around this to avoid disturbance.

- Flying-fox roost sites should be protected, particularly to avoid disturbance from September through to November during the breeding period.
- Key foraging areas should be identified and protected.
- Public awareness/ understanding and involvement in flying-fox conservation needs to increase.

This Plan should be read in conjunction with the vegetation management plan for the site. An application for grant funding to enable vegetation management works to proceed has been submitted, but no funds have been provided and no works have been undertaken to date.

Implementation of the vegetation management plan for the land is subject to the availability of funding, and is the responsibility of Council.

2.6 Legislative & regulatory context

The Blackalls Park flying-fox camp is occupied by the grey-headed flying-fox (*Pteropus poliocephalus*), listed as a threatened species under both NSW and Commonwealth threatened species legislation. Little red flying-foxes (*Pteropus scapulatus*) have also been reported occurring on the site, although only in small numbers to date, and this species is not listed as threatened, but nevertheless is protected under NSW legislation.

In NSW, the grey-headed flying-fox was listed as vulnerable under the NSW *Threatened Species Conservation Act 1995* in 2001. This listing is based on scientific evidence indicating a significant decline in the population of the species and that it is "likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate" (NSW Scientific Committee 2001). This means that if present processes continue the species could become extinct. A draft national recovery plan has also been prepared for the species (DECCW 2009, Geolink 2013).

Provisions in the *Threatened Species Conservation Act 1995*, *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979* mean that actions likely to adversely affect the species generally require approval or licensing, and that impacts on the species require assessment. The NSW Office of Environment and Heritage (OEH) has prepared the 'Flying-fox camp Management Policy' 2015, intended to empower land managers, primarily local councils, to work with their communities to manage flying-fox camps effectively. It provides the framework within which OEH will make regulatory decisions. The Policy encourages local councils and other land managers to prepare camp management plans for sites where the local community is affected.



Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* administered by the Department of the Environment (DoE) the species is listed as vulnerable (Commonwealth of Australia 2001). Under this Act, threatened species such as the grey-headed flying-fox are considered to be a matter of national environmental significance (MNES), and a referral to the Commonwealth is required for any action likely to result in a significant impact on a listed matter. This species is also considered to have a single national population. The Commonwealth has prepared referral guidelines for the grey-headed flying-fox (DoE 2015) and defines nationally important GHFF camps as those that have either:

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

Provided that management at nationally important camps follows the mitigation standards provided below, DoE 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 2013) to assist determining whether a significant impact is likely, otherwise consultation with DoE will be required.

Mitigation standards are as follows:

- 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 (heat stress event with max temperature $>38^{\circ}\text{C}$, cyclone 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, who can identify dependent young and is aware of climatic extremes and food stress events. This person must make an assessment of the relevant conditions and advise the proponent whether the activity can go ahead consistent with these standards.

Where management actions may affect flying-foxes, the provisions of the *Prevention of Cruelty to Animals Act 1979* should be considered. 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.

2.7 Plans relating to site management

This Plan must be read in conjunction with other plans applying to the site. Important plans affecting management of the site are:

1. Lake Macquarie City Council Plan of Management for Community Land (LMCC 2011) with which the management actions in this Plan is consistent, and
2. Vegetation Management Plan for land at Fennell Crescent, Blackalls Park (LMCC 2016). This Plan will prevail over the vegetation management plan in the event of any inconsistency.

2.8 Surrounding land uses

The camp is surrounded by urban development. It adjoins low density rural residential land to the west, residential development to the north and south west, and Lake Macquarie City Council sportsfields to the south across Stony Creek. A recreation club is located to the south west.





3 Community engagement

Lake Macquarie City Council undertook a community survey at Blackalls Park in May 2016. A survey questionnaire was distributed to 280 residential properties within 300 to 500 metres of the camp-site during a period when an unusually large number of flying-foxes occupied the camp site. Details of the survey method and full results are provided in Appendix 2.

The survey was undertaken to engage directly with local residents to:

- improve knowledge of the local flying-fox population;
- improve knowledge of the area impacted by the flying-fox camp roost area;
- provide insight into the immediate concerns of residents, including the impact of flying-foxes, as a direct result of the location of the flying-fox camp; and
- identify possible management actions to address community concerns and inform the preparation of the camp management plan.

There was a relatively high (>40%) response rate, well distributed across the survey area. Responses indicate widespread community interest and concern. Almost 90% of respondents stated that 2016 flying fox numbers were higher than previous years. Key issues of concern to the community were noise, odour, the impact of excrement, and potential health issues.

Key survey results are as follows:

- 70% of respondents stated the noise when flying-foxes are roosting or moving on and off the site to feed had an important-extremely important impact on their household.
- 50% of respondents felt noise was most prevalent at dawn and 70% felt noise was most prevalent at dusk. 9% of respondents stated the flying-foxes did not disturb them.
- 88% of respondents stated the odour of the flying-foxes had an important-extremely important impact on their household.
- 82% of respondents stated the impact of flying-fox excrement had an important-extremely important impact on their household.

- The proportion of survey respondents identifying direct impacts of the Blackalls Park flying-fox camp were as follows:

- 75% driveways and outdoor areas
- 60% clothesline
- 60% car
- 38% disturbed sleep
- 26% trees
- 23% rainwater tank
- 40% other - included solar panels, vegetable gardens, childrens' outdoor play areas

- 52% of respondents stated the camp impacted them all year round.
- 93% felt it was important-extremely important to ensure the risk of transmission of diseases associated with flying-foxes remains low.
- 27% felt it was important-extremely important the actions within the Camp Management Plan does not harm flying-foxes.
- 50% agree it is important-extremely important the Camp Management Plan has a low financial cost to residents and businesses in the area or Council ratepayers.
- 88% felt it was important-extremely important the Camp Management Plan can be implemented quickly.
- 92% felt it was important-extremely important the Camp Management Plan has a long term solution.
- 42% felt it is important-extremely important the Camp Management Plan does not disturb residents and businesses during implementation.

Although a reasonable number of respondents expressed a preference that flying-foxes should not be disturbed or harmed, key themes identified in open-ended survey responses were actions to:

- Reduce number of trees;
- Remove the vegetation to encourage the colony to move on;
- Relocate the flying-foxes; and
- Cull the population.

The survey results provide an important opportunity to identify what residents can do to make their home and life more comfortable. The results also highlight the need for effective management of human/flying-fox interaction as far as possible, and for effective communication with the community and government agencies.



4 Ecological considerations

Understanding the ecology of flying-foxes is important for appropriately managing flying-fox camps. In particular, seasonal movement patterns, breeding cycles and roosting and feeding habitat preferences are important considerations.

4.1 Flying-fox ecology

Detailed information on flying-fox ecology is provided below, specifically relevant to the Blackalls Park flying-fox camp and to the grey-headed flying-fox, which is the main occupant. Information on the little red flying-fox is also included, although this species has only been known to utilise the camp infrequently and in small numbers (see Table 1 opposite).

While the little red flying-fox *Pteropus scapulatus* (LRFF) has many similar characteristics to the grey-headed flying-fox, and both species jointly occupy the same camps there are important differences:

- LRFF is widely distributed throughout northern and eastern Australia, with populations occurring across northern Australia and down the east coast into Victoria. It is nomadic and follows temporal and spatial changes in its food supply across its range.
- Breeding times differ by approximately six months. LRFF conception occurs around October to November with young born between March and June. LRFF rarely birth and rear young in NSW.
- There is a general migration pattern in LRFF, where large congregations of over one million individuals can be found in northern camp sites in Queensland and NT during key breeding periods. Individuals travel south to visit the coastal areas of southeast Queensland and NSW during the summer months. Outside these periods LRFF undertake regular movements from north to south during winter-spring (July-October).
- Habitat preferences of LRFF are diverse and range from semi-arid areas to tropical and temperate areas. LRFF often move sub-continental distances in search of sporadic food supplies across diverse landscapes.
- The LRFF has a highly nomadic distribution, strongly influenced by availability of food resources (predominantly flowering Eucalypts) and the duration of their stay in any one place is generally very short. LRFF forages almost exclusively on nectar and pollen, but will eat fruit at times and occasionally raids orchards.

- When roosting, LRFF cluster 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 2016 little red flying-foxes remained in the Hunter Valley until at least early July and some gave birth to young – something that rarely happens in this part of the species range.

4.2 Regional context

Blackalls Park flying-fox camp was identified as having an unclear status in the Lower Hunter Region and was not considered to be an important camp for flying-fox conservation in the *Grey-headed Flying-fox Management Strategy for the Lower Hunter* (Geolink 2013). However, the occupancy of the camp in recent years suggests that it may meet criteria under Commonwealth guidelines as roosting habitat critical to the survival of the grey-headed flying-fox.

The regional context is provided in the *Grey-headed Flying-fox Management Strategy for the Lower Hunter* (Geolink 2013) which describes the roosting and foraging habitat of the grey-headed flying-fox in detail, together with priorities for conservation at the local level, and a review of the impacts of projected growth and development on the species. The strategy identifies typical characteristics of roosting vegetation in the region as:

- Closed canopy vegetation with an area of >1ha and ideally at least 10 ha.
- Vegetation canopy height of >8m.
- Within 50 km of the coast and at an elevation <65m.
- In close proximity to waterways, such as rivers or creeks.
- Level topography.
- Located within a nightly commuting distance (generally <20km) of sufficient food resources to support the population.

Geolink (2013) notes the seasonality of the majority of regional camps in the Lower Hunter, with numbers being highest in the warmer months of spring, summer and autumn, and most camps empty in winter. Only some camps support breeding females and their presence at Blackalls Park is not known. High numbers of individuals



Table 1 Important characteristics of Grey-headed Flying-fox *Pteropus poliocephalus*

Characteristic	Summary
LIFE CYCLE	
Reproduction	<p>Characterised by seasonal, synchronous breeding. Conception generally occurs around March to April/May, with the mating season being the period of peak camp occupancy in late summer or early autumn. A single pup is usually born six months later from September to November.</p> <p>Young are highly dependent on their mother for food and thermoregulation. They are carried by the mother until about four weeks old, after which they are left at the camp during the night in a crèche until they begin foraging with their mother in January and February. Life expectancy of up to 20 years in the wild with sexual maturity at 2 years.</p> <p>The critical reproductive period for is generally from August (when females are in final trimester) to the end of peak conception around April. Dependent pups are usually present from September to March.</p>
Behaviour	<p>Flying-foxes are nomadic and nocturnal, often travelling at night. They can be unpredictable and exhibit complex behaviour. Individuals roost communally during the day in camps where they rest and socialise. Females give birth and care for young in camps.</p>
Dietary requirements	<p>Animals feed on nectar from flowers, pollen and fruit.</p>
HABITAT	
Roosting habitat requirements	<p>Highly social animal, roosting in camps at times in vast numbers. Peak camp occupancy is generally during the mating season from around to March to May. Each flying-fox camp is unique in its location, characteristics and community, and therefore requires a site-specific response to management.</p>
Foraging habitat requirements	<p>Important role in pollination and seed dispersal for many plant species.</p>
Environmental conditions	<p>Camp occupancy has quite strict temperature and humidity requirements. In recent decades, areas with canopy vegetation in or immediately adjacent to urban areas have increasingly been used for roosting.</p>
Habitat fragmentation	<p>Flying-foxes are able to cross highly fragmented and urbanised landscapes. Land clearing and habitat fragmentation have primarily affected the availability of foraging habitat.</p>
POPULATION	
Distribution	<p>Nomadic distribution generally along Australia's east coast but moves in response to spatial changes in food supply across its range.</p>
Conservation status	<p>Listed as vulnerable under both the NSW <i>Threatened Species Conservation Act 1995</i> and the <i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>.</p>
Camp population & density	<p>Within the Hunter Region there are over 40 known flying-fox camps. Occupancy and population are highly variable, although some camps are occupied all year.</p> <p>Monitoring the size and distribution of flying-fox populations is challenging. Flying-foxes differ from most other species because they are difficult to detect away from known roost sites, and highly mobile, with individuals changing camps regularly and capable of moving hundreds of kilometres over periods of days. The distribution of the population appears to respond rapidly to changes in resource distribution with entire camps and regions being colonised or vacated in short periods.</p>
Population viability	<p>A single national population is considered to occur. There was evidence of a significant decline in abundance of the species in the period leading up to its listing as a threatened species.</p>
MOVEMENT	
Maximum travel distance	<p>Travel up to 50km per night away from roost sites to feed on suitable foraging habitat. Most foraging activity is within 20 km.</p>
Navigation	<p>Flying-foxes have excellent eyesight and smell. Navigation is visual, using landscape features including roads, rivers and valleys. It is suspected that lights of towns and roads are used to navigate to feeding locations.</p>
DISTURBANCE & THREATS	
Threats	<p>Key threatening processes for the species relevant to the Lower Hunter Region are loss of foraging habitat, loss and disturbance to roosting sites, power line and fencing entanglement and electrocution, climate change impacts and severe weather events such as storms and heat waves, and potentially disease.</p> <p>Foraging and roosting habitat critical to the survival of the species has been identified, and probably includes the Blackalls Park flying-fox camp.</p>
Disturbance response	<p>Flying-foxes are sensitive to disturbances to roosting sites, although will generally return to sites, either in the short term or following long periods with no occupancy.</p>
Disease	<p>Diseases may be of concern to individual animals in conditions of stress and are not a major threat. Flying-foxes pose no health risks to humans unless bitten or scratched. The risk of transmitting diseases to humans is extremely low, although basic hygiene measures should be taken. However, flying-foxes do carry viruses that potentially can cause serious illness in humans, horses, and potentially other mammals.</p>

Notes: The summary information in the table primarily refers to grey-headed flying-fox characteristics relevant to the Lake Macquarie LGA and may not apply across the full range of its Australian distribution. Information is sourced mainly from NSW OEH (2016), Geolink (2013) and DECCW (2009).



are associated with the irregular flowering of spotted gum *Corymbia maculata*, and it has been suggested that on occasions the Lower Hunter Region may have supported up to half the total estimated national population of the grey-headed flying-fox. There is also evidence that the region provides refuge during periods of food shortage, indicating its importance to maintaining the population of the species.

Mass flowering of Red Bloodwood *Corymbia gummifera* and Broad-leaved Paperbark *Melaleuca quinquenervia* in the local region also appear to bring in greater numbers of flying-foxes at times.

4.3 Behaviour & site specific habitat characteristics

Historically, peak camp occupancy at Blackalls Park has generally been between February and May, with minimum occupancy in August.

Appendix 1 outlines the history of the camp and summarises available population estimates over time. The camp is not known as a breeding camp for females. There appears to have been a gradual increase in the population over time, with Autumn 2016 being the largest recorded number of individuals coinciding with a regional Spotted Gum flowering event.

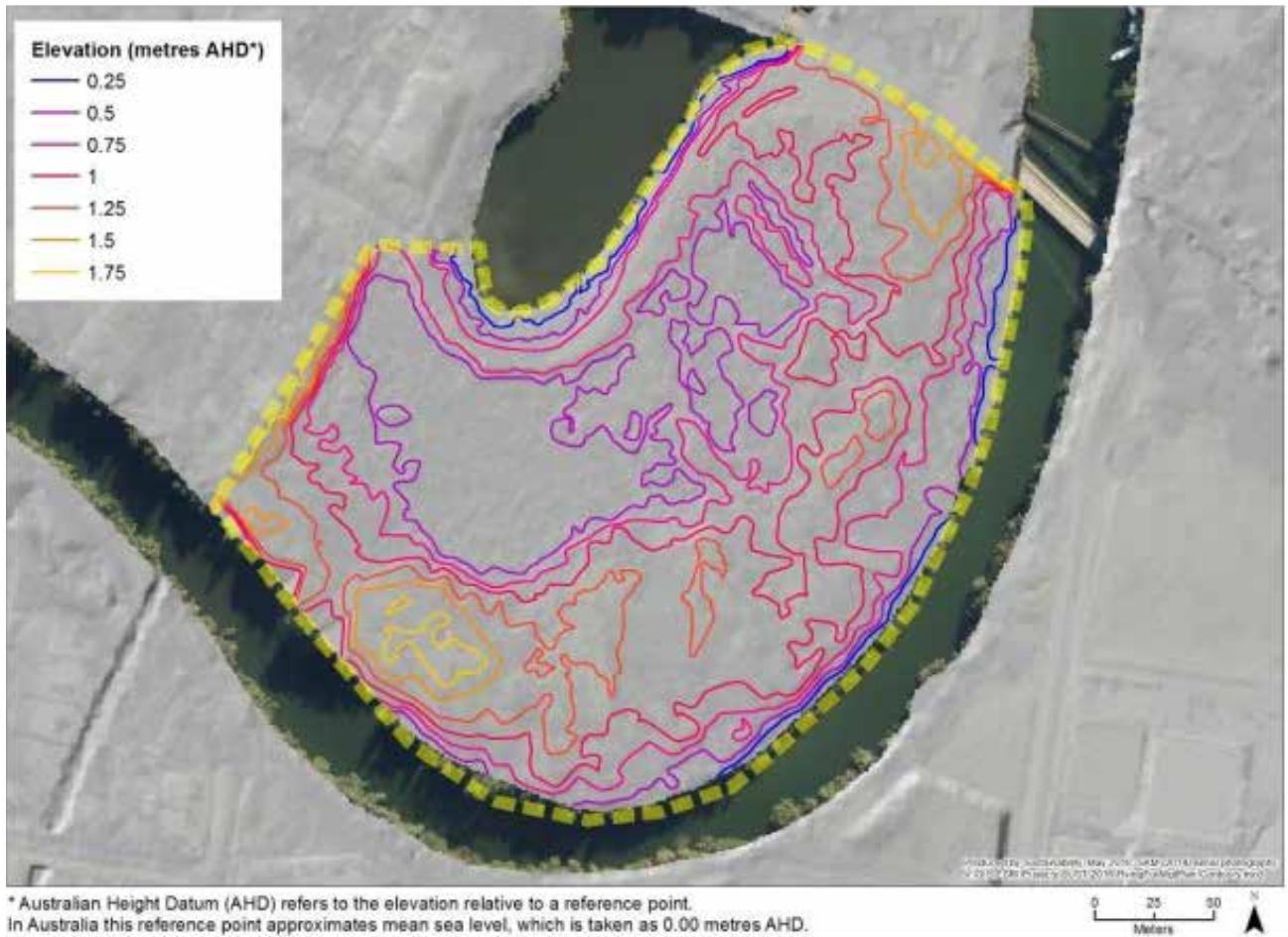
The vegetation on the site comprises both native vegetation and weedy, non-native vegetation as shown on Map 4. Vegetation canopy data shows an increase in height between 2007 and 2014 as shown in Maps 6 and 7.

Map 4 Site Vegetation



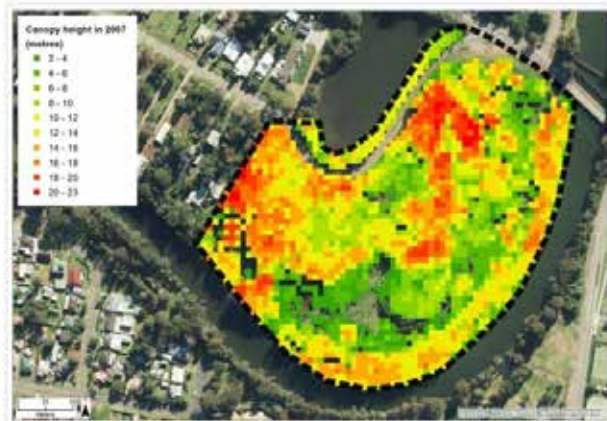


Map 5 Site Topography

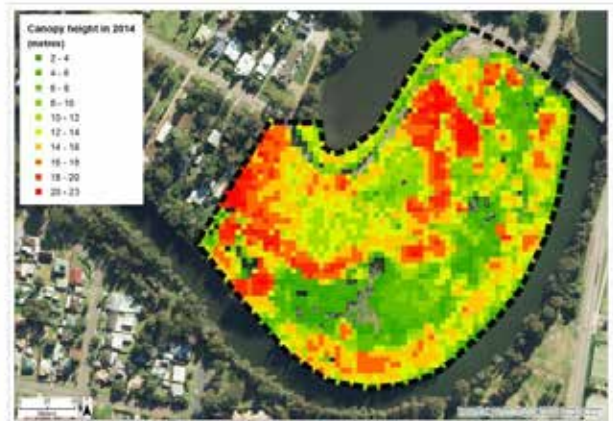


Map 6 Vegetation Canopy Height

A Lidar 2007



B Lidar 2014

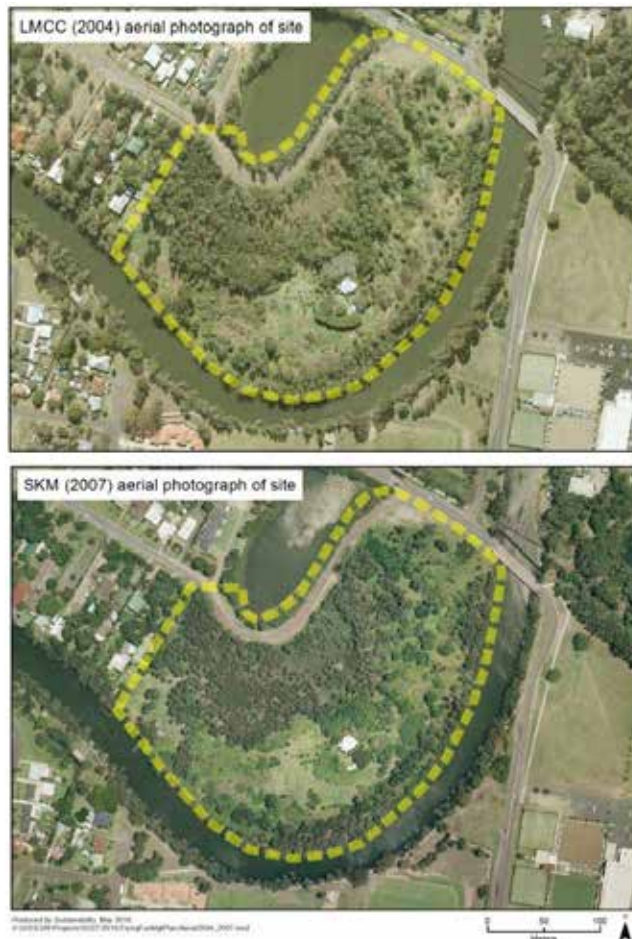


Shows substantial increase in tree canopy height over this period across the site.



Map 7 Historic Vegetation Cover

A Aerial photos 2004 & 2007



B Aerial photos 2010 & 2012



4.4 Review of camp management practice in other locations

There has been extensive experience with flying-fox camps in other locations in Australia, and this has been taken into account in the preparation of this Plan. In particular, this includes management actions, monitoring and attempts to disperse flying-fox camps.

Successful dispersal (especially entire colonies) requires:

1. Substantial vegetation removal/modification likely to incur significant long-term ecological impacts on the roost area, and/or
2. Sustained noise or other environmental disturbance at the site. Subsequent additional dispersals from newly colonised sites are also likely should the new site be unsuitable for flying-foxes.

Generally, dispersal attempts have been unsuccessful, very expensive, and have often simply shifted the problem to a different location. Therefore, the general conclusion is that dispersal is not warranted in most circumstances (NSW Office of Environment and Heritage 2016, Roberts & Eby 2013).

Destruction of camps, and killing of individual animals is not acceptable, and is associated with significant adverse environmental and ecological impacts.



Map 8 Historic Camp Area



Note: The approximate camp area is from flying fox-census surveys. The area occupied by flying-foxes across the site has varied widely over time.



5 Identification of camp management options & actions

This part of the Plan reviews the management options available and outlines the approach and actions that will be taken for the Blackalls Park flying-fox camp.

Issues for management were identified in Part 3 of the Plan and included a review of suggestions from the community as to how these may be able to be addressed through specific actions. Other flying-fox camp management plans prepared in Australia were reviewed, together with potential actions identified by the NSW Office of Environment and Heritage (2016).

The Flying-fox camp Management Plan Template (Office of Environment and Heritage 2016) groups potential actions in the following categories:

1. Level 1 Actions – Comprising routine camp management actions including education and awareness, revegetation, provision of artificial roosting habitat, research etc.
2. Level 2 Actions – Comprising in-situ management measures such as vegetation removal and the creation of buffers.
3. Level 3 Actions – Intended to disperse or move flying-foxes.

5.1 Review of issues & camp management measures available

A review has been undertaken of the regional habitat context and the potential availability of flying-fox roosting and foraging habitat within the Lake Macquarie LGA. Habitat suitability was assessed based on the approach used and information in Geolink (2013) using equivalent Lake Macquarie City Council vegetation communities. This shows that a substantial part of the LGA is suitable foraging habitat and that additional habitat is available in nearby local government areas within reasonable flying-fox commuting distances. The Blackalls Park camp is a relatively central location and can provide access to foraging opportunities throughout the LGA as shown on Map 9.

Potential suitable roosting habitat for the establishment of flying-fox camps within the LGA has been assessed using information on the location of known camps and Lake Macquarie City Council's vegetation mapping. This can be used to review whether potential alternative camp sites

may be available, and whether dispersal of the Blackalls Park camp to another site is a potential option. Map 10 shows the distribution of suitable roost habitat vegetation communities across the City and the limited alternative camp sites available in close proximity to Blackalls Park. Suitable vegetation has been assessed for patch sizes greater than 1 ha in area. Many of the vegetation patches shown on the map would be unsuitable due to their linear shape and narrow width.

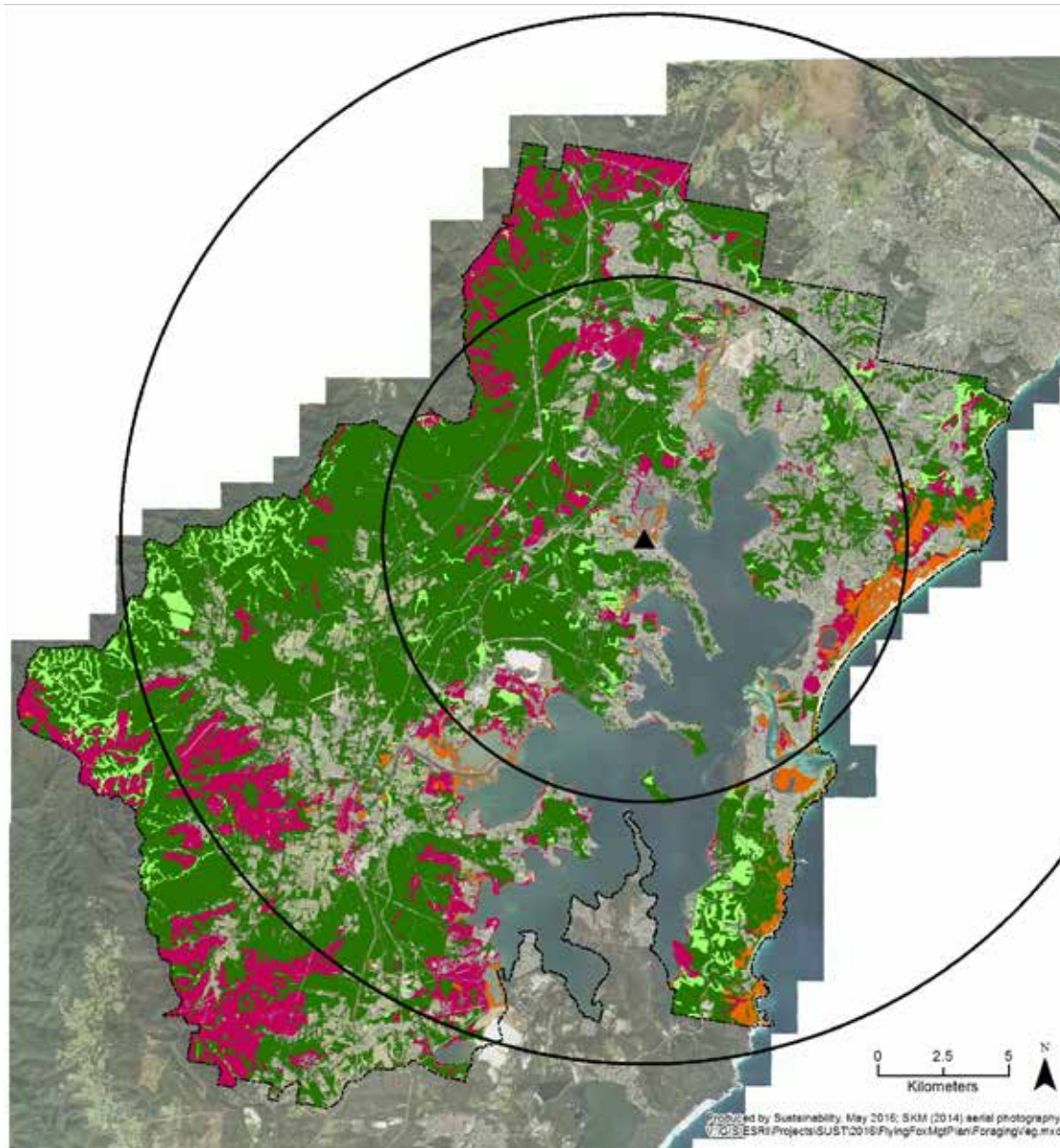
Blackalls Park camp is 6.9 ha in area and large enough to be able to provide substantial roosting habitat if the vegetation canopy can be maintained and increased. There appear to be few other similarly sized habitat patches in the vicinity that might offer suitable alternative flying-fox roosting habitat. A review of suitable vegetation in the vicinity of Blackalls Park with characteristics that could potentially be suitable for an alternate flying-fox camp has identified the following sites:

1. Marmong Point – Located 4 km north adjacent to a water body. Reasonably large habitat area close to existing and proposed residential development.
2. Stony & Mudd Creeks, Blackalls Park – Located 700 m west and upstream on private land. Has previously been occupied by flying-foxes. Reasonably close to Toronto High School.
3. Kilaben Creek, Kilaben Bay – Located 2 km south. Reasonably close to existing residential development and a school.
4. Cockle Creek – Located 8 km north. Large area of potentially suitable vegetation including Council land, although may have low canopy height. Distant from residential development and with water located nearby.

The observed preference for flying-fox roosting relatively close to urban areas and water bodies in the Hunter Region in recent years suggests that there are specific locational advantages that may outweigh vegetation suitability alone. When this is considered in conjunction with mapping of potential roost habitat in Map 10, it appears that there is little prospect of relocating the Blackalls Park flying-fox camp to another more suitable location. It also indicates that a lower risk and more practical approach would be for management actions that reduce the impacts on adjoining properties and improving the quality of roosting habitat in the centre of the site, thereby reducing conflicts with neighbouring residential properties.



Map 9 Potential Flying-fox Foraging Habitat Lake Macquarie LGA



GeoLINK (2013) Final Habitat Rank *

- Rank 1
- Rank 2
- Rank 0
- Uncertain

▲ Blackalls Park Flying-fox Camp 2016

□ 10km and 20km buffers to Blackalls Park Camp

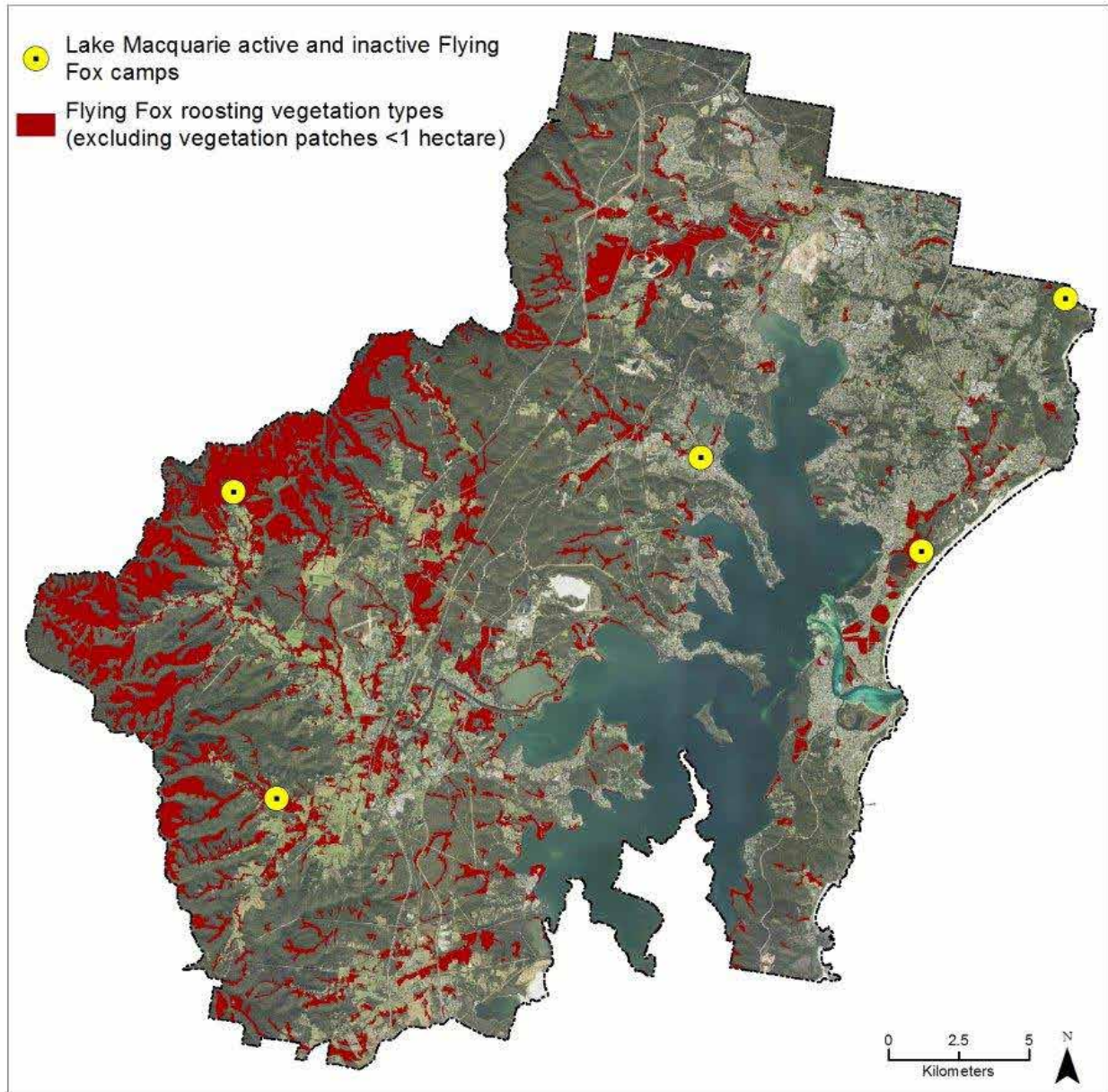
* Final Habitat Rank as defined in Section 6.2 and Table D1 of GeoLink (2103). This rank is based on spatial and temporal availability of Grey-headed Flying-fox diet plants (nectar and fruit) within the Lower Hunter.

The above map has been produced using the Lake Macquarie Vegetation Community Map (2015) where the Lake Macquarie Map Units correlate to Greater Hunter Vegetation Mapping Units, rather than from the original Greater Hunter Vegetation map layer. The "Uncertain" rank applies to Lake Macquarie vegetation communities where no correlating Greater Hunter Vegetation Map Unit has been assigned.

Map showing flying-fox foraging habitat within 20 km of Blackalls Park Camp Site based on Lake Macquarie Vegetation Mapping.



Map 10 Potential Flying-fox Roosting Habitat Lake Macquarie LGA



Produced by Sustainability, May 2016
 V:\GIS\ESRI\Projects\SUST\2016\FlyingFoxMgtPlan\RoostingVeg.mxd

Flying Fox roosting vegetation types:
 Rainforest (excluding Littoral Rainforest), Swamp Sclerophyll Forest on Coastal Floodplains EEC, River-flat Eucalypt Forest on Coastal Floodplains EEC, and Swamp Oak Floodplain Forest EEC (excluding map units 40a and 40c)

Map showing flying-fox roosting habitat. Based on Lake Macquarie Vegetation Mapping (Map Units 1, 1a, 1g, 5, 37 and 40) identified as suitable roosting habitat, confirmed by the known location of flying-fox camps. This map indicates potential habitat suitability of other sites in Lake Macquarie LGA if the Blackalls Park Camp site was to be dispersed.



5.2 Management option identification

The options available for management of the Blackalls Park flying-fox camp need to be identified and reviewed. This informs Lake Macquarie City Council's approach to the site in Section 5.3 and the proposed management actions for the camp as identified in Section 5.4.

General management options are identified and reviewed in Table 2.

Table 2 Identification and review of management options (from NSW Office of Environment and Heritage 2016)

Management option	Relevant impacts	Cost	Advantages	Disadvantages
Level 1 actions				
Education and awareness programs	Fear of disease Noise Smell Faecal drop	\$	Low cost, promotes conservation of FFs, contributes to attitude change which may reduce general need for camp intervention, increasing awareness and providing options for landholders to reduce impacts can be an effective long-term solution, can be undertaken quickly, will not impact on ecological or amenity value of the site.	Education and advice itself will not mitigate all issues, and may be seen as not doing enough.
Property modification	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	\$--\$	Property modification is one of the most effective ways to reduce amenity impacts of a camp without dispersal (and associated risks), relatively low cost, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, may add value to the property.	May be cost-prohibitive for private landholders, unlikely to fully mitigate amenity issues in outdoor areas.
Fully-fund/subsidise property modification	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	\$--\$	Potential advantages as per property modification, but also overcomes issue of cost for private landholders.	Costs to the land manager will vary depending on the criteria set for the subsidy including proximity to site, term of subsidy, level of subsidy. Potential for community conflict when developing the criteria, and may lead to expectations for similar subsidies for other issues.
Service subsidies including rate rebates	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	\$--\$	May encourage tolerance of living near a camp, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, would reduce the need for property modification.	May be costly across multiple properties and would incur ongoing costs, may set unrealistic community expectations for other community issues, effort required to determine who would receive subsidies.
Routine camp management	Health/wellbeing	\$	Will allow property maintenance, likely to improve habitat, could improve public perception of the site, will ensure safety risks of a public site can be managed. Weed removal has the potential to reduce roost availability and reduce numbers of roosting FFs. To avoid this, weed removal should be staged and alternative roost habitat planted, otherwise activities may constitute a Level 3 action.	Will not generally mitigate amenity impacts for nearby landholders.



Management option	Relevant impacts	Cost	Advantages	Disadvantages
Alternative habitat creation	All	\$\$-\$\$\$	If successful in attracting FFs away from high conflict areas, dedicated habitat in low conflict areas will mitigate all impacts, promotes FF conservation. Rehabilitation of degraded habitat that is likely to be suitable for FF use could be a more practical and faster approach than habitat creation.	Generally costly - long-term approach so cannot be undertaken quickly, previous attempts to attract FFs to a new site have not been known to succeed.
Provision of artificial roosting habitat	All	\$\$-\$\$	If successful in attracting FFs away from high conflict areas, artificial roosting habitat in low conflict areas will assist in mitigating all impacts, generally low cost, can be undertaken quickly, promotes FF conservation.	Would need to be combined with other measures (e.g. buffers/alternative habitat creation) to mitigate impacts, previous attempts have had limited success.
Protocols to manage incidents	Health/wellbeing	\$	Low cost, will reduce actual risk of negative human/pet-FF interactions, promotes conservation of FFs, can be undertaken quickly, will not impact the site.	Will not generally mitigate amenity impacts.
Research	All	\$	Supporting research to improve understanding may contribute to more effectively mitigating all impacts, promotes FF conservation.	Generally cannot be undertaken quickly, management trials may require further cost input.
Appropriate land-use planning	All	\$	Likely to reduce future conflict, promotes FF conservation. Identification of degraded sites that may be suitable for long-term rehabilitation for FFs could facilitate offset strategies should clearing be required under Level 2 actions.	Will not generally mitigate current impacts, land-use restrictions may impact the landholder.
Property acquisition	All for specific property owners Nil for broader community	\$\$\$	Will reduce future conflict with the owners of acquired property.	Owners may not want to move, only improves amenity for those who fit criteria for acquisition, very expensive.
Do nothing	Nil	Nil	No resource expenditure.	Will not mitigate impacts and unlikely to be considered acceptable by the community.
Level 2 actions				
Buffers through vegetation removal	Noise Smell Health/wellbeing Property devaluation Lost rental return	\$\$-\$\$	Will reduce impacts, promotes FF conservation, can be undertaken quickly, limited maintenance costs.	Will impact the site, will not generally eliminate impacts, vegetation removal may not be favoured by the community.
Buffers without vegetation removal	Noise Smell Health/wellbeing Damage to vegetation Property devaluation Lost rental return	\$\$	Successful creation of a buffer will reduce impacts, promotes FF 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.
Noise attenuation fencing	Noise Smell Health/wellbeing Property devaluation Lost rental return	\$\$	Will eliminate/significantly reduce noise impacts, will reduce other impacts, limited maintenance costs.	Costly, likely to impact visual amenity of the site, will not eliminate all impacts, may impact other wildlife at the site.



Management option	Relevant impacts	Cost	Advantages	Disadvantages
Level 3 actions				
Nudging	All	\$\$-\$\$\$	If nudging is successful this may mitigate all impacts.	Costly, FFs will continue attempting to recolonise the area unless combined with habitat modification/ deterrents.
Passive dispersal through vegetation management	All at that site but not generally appropriate for amenity impacts only (see Section 8)	\$\$-\$\$\$	If successful can mitigate all impacts at that site, compared with active dispersal: less stress on FFs, less ongoing cost, less restrictive in timing with ability for evening vegetation removal.	Costly, will impact site, risk of removing habitat before outcome known, potential to splinter the camp creating problems at other locations (although less than active dispersal), potential welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see Section 7.1), potential to impact on aircraft safety.
Passive dispersal through water management	All at that site but not generally appropriate for amenity impacts only (see Section 8)	\$\$-\$\$\$	Potential advantages as per with passive dispersal through vegetation removal, however likelihood of success unknown.	Potential disadvantages as per passive dispersal through vegetation removal, however likelihood of success unknown.
Active dispersal	All at that site but not generally appropriate for amenity impacts only (see Section 8)	\$\$\$	If successful can mitigate all impacts at that site, often stated as the preferred method for impacted community members.	May be very costly, often unsuccessful, ongoing dispersal generally required unless combined with habitat modification, potential to splinter the camp creating problems in other locations, potential for significant animal welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see Section 7.1), potential to impact on aircraft safety.
Early dispersal before a camp is established at a new location	All at that site	\$\$-\$\$\$	Potential advantages as per other dispersal methods, but more likely to be successful than dispersal of a historic camp.	Potential disadvantages as per other dispersal methods, but possibly less costly and slightly lower risk than dispersing a historic camp. Potential to increase pressure on FFs that may have relocated from another dispersed camp, which may exacerbate impacts on these individuals.

Note: This table is based on the Flying-fox camp Management Plan Template (OEH 2016) which includes terms and definitions.



At Blackalls Park, the options range from doing nothing, to relocating the camp. These need to have regard to cost, risk, chances of success, practicality and the ecological impacts of the action, as well as other considerations such as community impacts. It is also important to recognise short-term measures and long-term planning issues.

Potential actions that could reasonably be implemented are as follows:

1. Flying-fox education and awareness program for residents (immediate)
2. Facilitating modification to nearby properties to reduce flying-fox impacts, by tree removal or other measures (short term)
3. Preparing and implementing health and safety protocols for people working on the camp area, and for surrounding residents (eg picking up dead animals and appropriate disposal) (short term)
4. Preparing protocols for operations and activities adjacent to the camp (eg mowing, clearing, watering, etc) (short term)
5. Undertaking site specific research and monitoring to improve understanding of flying-fox behaviour and ecology (medium to long term)
6. Tree planting and site rehabilitation to improve the quality and quantity of roosting habitat on the site, outside the buffer area, and away from nearby dwellings. (medium to long term benefit only)
7. Provision of artificial roosting habitat (eg dead trees or timber structures) (medium term)
8. Noise attenuation measures at boundaries or on windows of nearby residences (medium term)
9. Measures to inform residents and land purchasers of the occupation of the camp (eg signs and other information) (medium term)
10. Pruning, trimming or clearing vegetation at the camp boundary to thin the tree canopy and create a buffer between the camp and adjoining dwellings (short term)
11. Tree pruning, trimming or clearing on neighbouring properties (short term)

The preferred roost management approach is to create and maintain (where needed) non-roosting buffer areas between roosts and adjacent residential, commercial and high public use areas to reduce human/flying-fox conflicts. This is to be accomplished through appropriate vegetation modification or removal.

Where works are needed due to flying-fox nuisance (e.g. noise, mess, smell), a staged approach is recommended commencing with minor vegetation works (e.g. trimming) to remove roost vegetation that overhangs residential or commercial structures and then if nuisance is not reduced to acceptable levels, these works may be followed by the creation of non-roosting buffer areas (by modifying vegetation). A staged approach is considered appropriate given that most risks/impacts can be mitigated to acceptable levels without undertaking substantial vegetation modification and/or dispersals.

It is also important to ensure that the camp is taken into account in the consideration of development impacts where consent is sought for development applications on nearby properties.

Longer-term strategies are also needed to reduce the dependency of flying-foxes on resources in urban areas and orchards by conserving and establishing flying-fox habitat elsewhere.

5.3 Lake Macquarie City Council approach

Local policy and strategic directions must be consistent with Commonwealth and NSW Government approaches and the applicable legislative requirements. Grey-headed flying-foxes are listed as threatened species, meaning that they have been recognised as having a declining national population by an independent scientific assessment. If current threats continue, the species could potentially become extinct.

Lake Macquarie City Council's approach for the Blackalls Park flying-fox camp takes into account scientific understanding of flying-fox behaviour and habitat requirements, practical experience with flying-fox camp management plans in NSW and the review of management options available.

The principle that will be applied is that Council will not generally support or undertake activities aimed at dispersing flying-foxes from roosts and the management objective will be to find long term solutions that:

- avoid dispersing a camp and causing another (potentially worse) problem elsewhere; and
- do not harm flying-foxes, either individually or as a population; and
- improve the natural values of the site occupied by a camp; and
- reduce and minimise conflict between flying-foxes and people.



The approach to camp management recognises that:

- The camp population is expected to fluctuate widely and seasonally depending on the availability of food resources. For significant periods each year, low numbers of animals will occupy the site.
- No potential alternative flying-fox camp sites have been identified in reasonable proximity to Blackalls Park (approx. 5 – 10 km) to which flying-foxes could be dispersed and relocated.
- It is likely that the 6.9 ha Council owned site is a large enough area to confine most direct impacts to within the site for most of the year.
- From time to time some nearby residents are expected to be adversely affected by the camp, particularly odour and noise, and measures to assist directly impacted residents in dealing with adverse impacts are appropriate.
- Significant potential exists to regenerate and revegetate the centre of the site (together with potential artificial roost habitat) to concentrate preferred roosting habitat away from residential properties.
- Measures to discourage spill-over of flying-foxes to nearby residential properties are feasible and appropriate, including thinning of tree canopy and removal of species that encourage flying-foxes (eg Cocos Palm) to enter residential properties.
- Most vegetation on the site is a listed Endangered Ecological Community with high biodiversity values and cannot be cleared.
- Dispersal of the colony is not feasible. This could only be achieved by clearing the site, or incurring a high and unquantifiable economic cost, estimated to be in the millions of dollars based on experience in other locations, and no outcome could be guaranteed. Experience elsewhere demonstrates that relocation attempts have a low success rate.
- The prevention of transmission of diseases from flying-foxes to humans and domestic pets is an absolute priority, and can best be achieved by physical separation and public education.

- It is important to work with local residents and the community to follow up the results of Council's community engagement survey of May 2016.
- Improved scientific understanding of flying-fox use of the site and species' biology would assist management of the site.
- Flying-fox roost locations on the site vary widely over time and may change quickly.
- The preferred approach to management actions is to apply low risk, low cost adaptive management practice.

The community survey undertaken is an essential basis for determining management actions that are appropriate and can be implemented by the Plan. While widespread community concern and impact has been demonstrated, significant continuing problems are largely confined to directly adjacent residential properties (generally less than 100m from the roosting site boundary). The highest priority measures are those to improve residential amenity on these properties and these measures are:

1. Managed buffers to adjacent properties. This measure can be implemented in the short term.
2. Vegetation management and restoration on the site to encourage preferred roosting location away from the edges of the site, and towards the centre where impacts are lower. This is a longer-term option, and reasonably likely to be effective over a 5 – 10+ year period.

Additional measures to support the community in responding to community concerns are desirable during periods of high camp occupancy, such as assistance in coping with the impacts of excrement, cleaning, public health education, etc.



5.4 Management actions

Management actions are a key part of the Plan. These actions are grouped according to the following themes:

1. Site governance - refers to the administrative framework and responsibilities
2. Site infrastructure – includes access tracks, fences, water and power supplies, etc.
3. Restoration and revegetation – On-site vegetation management measures including rehabilitation, weeding, etc.
4. Flying-fox monitoring – measures to review and understand the behaviour and ecology of flying-foxes on the site, to inform management and community engagement.
5. Buffer and off-site vegetation management – measures to manage camp edges and vegetation on nearby land.
6. Community engagement – communication with nearby residents and landowners and the general community to discuss issues and provide information.
7. Resident assistance program – measures to be implemented when necessary to support residents where amenity is significantly affected by the flying-fox camp.

Lake Macquarie City Council is responsible for the actions outlined in the Plan. Specific actions, responsibilities and the projected budget is shown in the table below.

Action ID	Issue	Actions & guidelines	Priority	Timeframe for Commencement	Budget (external funding options)
1. Site governance – the land is classified as Community under the <i>Local Government Act 1993</i> .					
1.1	Vegetation management	Establish and support a Landcare group specifically for the purpose of managing the camp vegetation. Implementation and review of vegetation management plan.	High	Medium Term	\$2,000 pa (LGNSW Flying-fox Grant program)
1.2	Land use planning measures	Review land use planning options and development assessment guidelines to recognise the existence of the camp and potential measures to limit land use conflict (eg s149 certificate advice, guidelines for nearby development, identification of an impact area, potential measures for new development close to the camp, such as requirements for undercover car parking and clothes lines, air conditioning, noise rated windows, odour management, noise barriers, and variation of water tank requirements, etc).	Medium	Medium term	Existing staff time
1.3	Adjoining landowner	Liaise with directly adjoining neighbour (Lot 4 DP 310136) to discuss buffer management measures	High	Short Term	Existing staff time
1.4	Camp management plan review	Review and update camp management plan every 2 – 3 years or as required.	\$1,000	Longer Term	Existing staff time



Action ID	Issue	Actions & guidelines	Priority	Timeframe for Commencement	Budget (external funding options)
2. Site infrastructure					
2.1	Fencing	Fencing to exclude inappropriate access. Barbed wire fences should not be used.	Low	Medium Term	\$2,000
2.2	Signs	Design and construct an information sign for the site with information about flying-fox biology, health messages and site management. To complement community education information.	Medium	Short Term	\$5,000 (LGNSW Flying-fox Grant program)
2.3	Roads & tracks	Maintain existing vehicular track to the centre of the site.	Medium	Medium Term	\$1,000 pa
3. Restoration and revegetation – A vegetation management plan for the site has been prepared (LMCC 2015) and identifies six broad management units as shown in the map in Appendix 6.					
3.1	On-site vegetation management	<p>Implement vegetation management plan for the site.</p> <p>Vegetation management works are to be carried out so that flying-foxes are not disturbed. Particularly avoid disturbance to flying-foxes between September and November during the breeding season.</p> <p>Preferred timing of works is between June and September when flying-fox numbers are low.</p> <p>Vegetation management works are to be carried out by qualified bush regenerators.</p> <p>Recognise the broad management units identified in the vegetation management plan:</p> <ol style="list-style-type: none"> Existing Swamp Oak Floodplain Forest where bush regeneration/weeding program will occur. The Swamp Oak Floodplain Forest extension/restoration site including orchard/selective tree removal (primarily the overgrown orchard site) where funding will be sought for restoration. Bamboo removal zone where initial weeding has been completed. The heritage zone immediately around the site of the former homestead. Buffer/transition area to adjacent residential land Road verge transition area <p>Replace weed and former orchard areas with suitable tree canopy species over the long term.</p>	High	Short/Medium Term	\$15,000 pa (LGNSW Flying-fox Grant program) (NSW Environmental Trust)
3.2	On-site vegetation management	Review and update vegetation management plan as required	High	Medium Term	Existing staff time
3.3	Species selection for habitat restoration	For vegetation restoration of the centre of the site, select tree canopy species that are preferred for flying-fox roosting such as locally indigenous rainforest species, Ficus spp., etc.	High	Short Term	Existing staff time



Action ID	Issue	Actions & guidelines	Priority	Timeframe for Commencement	Budget (external funding options)
3.4	Protection of endangered ecological community (EEC)	Protect and restore existing areas of endangered ecological community on the site in accordance with the vegetation management plan, while allowing removal of canopy vegetation within 40 m of dwelling house on Lot 4 DP 310136.	High	Medium Term	\$15,000 pa (LGNSW Flying-fox Grant program) (NSW Environmental Trust)
3.5	Weeds	Remove all noxious weeds, weeds of national significance and transformer species by 2020 and commence and control of all other minor weed species	High	Long Term	\$5,000 pa
4. Flying-fox monitoring					
4.1	Monitor flying fox occupation of the site	<p>Support establishment of a local bat support group and/or professional observers to research and monitor the site outside regular national census survey times or separately fund a Council program.</p> <p>Undertake a monthly flying-fox monitoring program to:</p> <ol style="list-style-type: none"> 1. Identify presence/absence 2. Map the boundary of the area of occupancy 3. Count numbers 4. Determine species present 5. Document condition of animals 6. Identify presence of pregnant females with young <p>For monitoring, refer to Office of Environment and Heritage flying-fox monitoring guidelines and data sheet.</p>	High	Short Term	\$10,000 pa (LGNSW Flying-fox Grant program)
4.2	Review opportunities for site micro climate monitoring	<p>Review hourly weather data available for irrigation monitoring for Lyall Peacock Oval, Toronto about 100 m south of the site to determine suitability for linking with flying-fox monitoring.</p> <p>Consider on-site weather monitoring, to seek to understand temperature and humidity variation across the site, and flying-fox responses to changing micro-climate and extreme temperature events.</p>	High	Short term	Existing staff time
4.3	Independent scientific research	Make the site available as a research site for academic study, and provide research grant funding for projects that support management.	Medium	Medium/Long Term	\$6,000 (Lake Macquarie Research Grants Program)
4.4	Heat stress events	During heat waves where temperatures are expected to be >37 degrees Celsius, observer monitoring of the site is to be a priority.	High	Ongoing	Existing staff time



Action ID	Issue	Actions & guidelines	Priority	Timeframe for Commencement	Budget (external funding options)
5. On-site buffer and off-site vegetation management					
5.1	On-site buffer to residential property	<p>Ensure no trees on the site where flying-foxes can roost overhang adjoining private land.</p> <p>Thin or remove canopy vegetation on the site to maintain a buffer between flying-fox roost habitat on the site and the adjoining residence on Lot 4 DP 310136 for the purpose of reducing noise and bush fire hazard reduction.</p> <p>Allow for removal of trees within 25 m of dwelling house on Lot 4 DP 310136 while retaining native groundcover on the site.</p>	Medium	Medium Term	\$5,000 (LGNSW Flying-fox Grant program)
6. Community engagement					
6.1	Vegetation in residential areas	<p>Allow for removal of non-native flying-fox feeding habitat in residential areas surrounding the site to reduce impacts on residents.</p> <p>The preferred times for residential vegetation thinning/removal to discourage flying-foxes are September/October annually.</p> <p>Support and facilitate removal of Cocos Palms (<i>Syagrus romanzoffiana</i>) on private properties. Removal of this species does not require approval, and can be carried out at any time at the owner's expense.</p> <p>Investigate flying-fox food species in gardens, how these can be discouraged or managed, and make this information available to the community through engagement programs.</p>	Medium	Medium Term	\$5,000 (LGNSW Flying-fox Grant program)
6.2	Residential planting guide	<p>Provide information to identify garden species that residents should not plant as they are attractive to flying-foxes.</p>	High	Short Term	\$5,000 (LGNSW Flying-fox Grant program)
6.3	Ongoing engagement program	<p>Maintain an annual program of community engagement to support understanding of the biology and management issues associated with the site. The preferred time is October of each year, possibly co-ordinated with a Council clean up or green waste removal program.</p> <p>Encourage public involvement in revegetation of the site through a Landcare group.</p> <p>Integrate signage on the land with community engagement.</p>	High	Short/Medium Term	Existing staff time
6.4	Health and safety	<p>Provide good community health information.</p> <p>Make available and apply guidelines/protocols for dealing with dead bats, especially on extreme heat days.</p>	High	Short Term	Existing staff time



Action ID	Issue	Actions & guidelines	Priority	Timeframe for Commencement	Budget (external funding options)
7. Resident assistance program – This program is to help the community deal with periodic loss of amenity resulting from the proximity of the flying-fox camp and is generally for residents within 250 – 300m radius from site boundary. This provides contingency funding and is not an annual allocation.					
7.1	Green waste removal	Assistance with removing Cocos Palms (<i>Syagrus romanzoffiana</i>) including replacement plant offer, and waste concession such as free tip entry, up to a maximum value of \$200.	Medium	Medium Term	\$10,000 (LGNSW Flying-fox Grant program)
7.2	Emergency assistance	Discretionary emergency assistance during periods of high camp occupancy including measures to provide clothes line covers, car covers, high pressure cleaning, etc. This would only be applied where a loss of amenity or hardship can be demonstrated, and is limited to defined circumstances.	High	As required	\$10,000 (LGNSW Flying-fox Grant program)

6 Assessment of impacts to flying-foxes

The measures outlined in the Plan provide for habitat restoration to improve roosting habitat towards the centre of the site, thereby encouraging flying-foxes to move away from the margins of the site and nearby residential properties. The Plan also provides for clearing of buffer vegetation around the residence located along the western boundary of the site. These measures can be implemented at a time when flying-foxes are not present, and therefore will not disturb or harm individual flying-foxes.

Clearing of buffer canopy vegetation will potentially affect an area of about 700 square metres out of a total site area of 6.9ha (approximately 1% of the site). The proposed measures will not affect flying-foxes other than by preventing them from roosting on the site in close proximity to the adjoining residence. Therefore, no approval or licensing is required, apart from complying with Lake Macquarie City Council's tree preservation provisions. There is therefore no requirement to assess the significance of impacts on threatened species, nor do animal welfare issues or approvals apply.





7 Implementation of camp management actions

The Camp Management Plan provides the framework for guiding Lake Macquarie City Council management actions on the land, and in responding to concerns of nearby residents.

The review undertaken has indicated that relocation of the Blackalls Park flying-fox camp is not feasible and would have a high risk of undesirable consequences such as relocation of the camp closer to residential areas.

Given the mobility of flying-foxes and the expected variability of the population of the camp over time, the focus of implementation actions is on:

1. Rehabilitation of the land within the site over time to create more suitable flying-fox roosting habitat away from adjoining residential properties, thereby reducing amenity impacts.
2. Supporting periodic monitoring of the flying-fox population to improve understanding of flying-fox behaviour on the site, and to enable effective management responses where significant population increases occur.
3. Community engagement and implementation of a resident assistance program where appropriate.

In the event that the flying-foxes no longer occupy the site or are present in low numbers, then many of the actions identified in the Plan will not be required. Alternatively, if the number of individuals at the camp increases, then it may be necessary to review actions. Unless these circumstances are triggered, then the measures outlined in Part 5.4 of the plan will be implemented, with some of the actions subject to external funding being received by the Council.



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Maps

- Map 1 Location**
- Map 2 Regional Context and Location of Known Flying-fox camps**
- Map 3 Blackalls Park Flying-fox camp Site**
- Map 4 Site Vegetation**
- Map 5 Site Topography**
- Map 6 Vegetation Canopy Height**
- Map 7 Historic Vegetation Cover**
- Map 8 Historic Camp Area**
- Map 9 Potential Flying-fox Foraging Habitat Lake Macquarie LGA**
- Map 10 Potential Flying-fox Roosting Habitat Lake Macquarie LGA**



Appendices



Appendix 1 **History of the Blackalls Park Camp Site**

Date	Event
Spring 2009	It appears that the camp commenced in Spring 2009 as a small group of 20-50 flying-foxes. The first roost was in a coral tree at the northern end of the reserve and only stayed until early Autumn and then moved on.
Spring 2010	They returned around the same time in 2010 in similar numbers but by the end of the season the colony is estimated to have been around 500 - 1000 flying-foxes.
Spring 2011	The flying-foxes again returned in Spring 2011 and numbers started at about 1000. The numbers then grew more rapidly and by summer 2011 Council received some complaints.
2012	The bats were also in large numbers in 2012. This was the first year many residents were aware that the bats were occupying the site.
2013	Bats arrived in the first week of February 2013 and departed on 1 May 2013. In February 2013 the area occupied included the south side of Stony Creek, part of the Toronto Wetland Reserve, and the southern edge of the Water Board War Memorial Oval. This influx appears to have been related to a local mass flowering event in surrounding forests.
2014	Bats arrived in the first week of January 2014 and departed between 8 – 14 June 2014.
2015	Bats arrived 12 December 2014 and departed on 15 June 2015.
2016	Bats arrived in the first week of November 2015, numbers significantly declined by end June 2016, and they all departed on 12 July.

Note: The table is based on information provided by a number of local residents and bat carers. Information is also available from the Department of the Environment Interactive Flying-fox Web Viewer <https://www.environment.gov.au/biodiversity/threatened/species/flying-fox-monitoring>



Appendix 2 - Community survey & results

Blackalls Park Flying-fox camp - Community Survey

Why did grey-headed flying-foxes come to camp at Blackalls Park?

Following community concerns about the impacts of the Blackalls Park flying-fox camp, Lake Macquarie City Council undertook a community survey of residents around the camp in May 2016. The survey was undertaken during a period when an unusually large number of flying-foxes occupied the camp site at Fennell Crescent, Blackalls Park.

The survey was undertaken to engage directly with local residents to:

- Improve knowledge of the permanence and any seasonal fluctuations of the local flying-fox population;
- improve knowledge of the spatial area impacted by the flying fox-camp roost area;
- provide insight into the immediate concerns of residents, including the impact of flying-foxes, as a direct result of the location of the flying-fox camp; and
- identify possible management actions to address community concerns and inform the preparation of the Blackalls Park Flying-fox camp Management Plan.

Survey methodology

An area around the camp was identified within which residents could potentially be directly impacted, generally within 300 to 500m from the boundary of the camp site. Residents within this area were surveyed using the following method:

1. Lake Macquarie City Council staff prepared a two page hard copy survey questionnaire. The format was based on the community survey undertaken by Eurobodalla Shire Council in September 2015.
2. The survey questionnaire was distributed to 280 letter boxes within the area, together with a reply paid envelope and an Office of Environment and Heritage information sheet *Living with Grey-headed Flying-foxes*.
3. Residents were given 10 days to return the completed survey forms by mail.
4. Results were analysed using Survey Monkey, giving details of the responses to each question.
5. Additional information was compiled and summarised.

Results

One hundred and sixteen (116) responses were received; a response rate of 41%. Respondents were relatively well distributed across the survey area.

Sixty surveys were returned from households in Fennell Crescent, Lake St and Railway Parade / Railway Parade North. In the survey planning, these streets were identified as being potentially impacted by the increase in the size of the colony, so the return rate and responses from these households, reflected the initial assumptions.

Survey results Summary

Impact on Residents

- 70% stated the noise when flying-foxes are roosting or moving on and off the site to feed was had an important-extremely important impact on their household
- 50% of respondents felt noise was most prevalent at dawn and 70% felt noise was most prevalent at dusk. 9% of respondents stated the flying-foxes did not disturb them.
- 88% of respondents stated the odour of the flying-foxes had an important-extremely important impact on their household.
- 82% of respondents stated the impact of flying-fox excrement had an important-extremely important impact on their household.
- In response to how they were directly impacted by the Blackalls Park flying-fox camp
 - 75% driveways and outdoor areas
 - 60% clothesline
 - 60% car
 - 38% disturbed sleep
 - 26% trees
 - 23% rainwater tanks
 - 40% other - included solar panels, vegetable gardens, childrens' outdoor play areas
- 52% of respondents stated the camp impacted them all year round.

Observations by residents in the camp population

- 48% noticing a change /increase in summer and 55% noticed a change in Autumn.
- Almost 90% stated this year's numbers were higher when compared to previous years, 8% did not know.



Community Input into Preparation of Flying-fox Management Plan

- 93% felt it was important-extremely important to ensure the risk of transmission of diseases associated with flying-foxes remains low
- 27% felt it was important-extremely important the actions within the Camp Management Plan does not harm flying-foxes
- 50% agree it is important-extremely important the Camp Management Plan has a low financial cost to residents and businesses in the area or Council ratepayers
- 88% felt it was important-extremely important the Camp Management Plan can be implemented quickly
- 92% felt it was important-extremely important the Camp Management Plan has a long term solution
- 42% felt it is important-extremely important the Camp Management Plan does not disturb residents and businesses during implementation

Residents in the survey area have been in the area for a relatively long time with 48% living at their current address for over ten years and a further 19% in residence for 6-10 years.

In response to the open-ended question, 'What steps do you think Council could take to help you address these issues?' 95% of respondents provided comment. The question provided an avenue for respondents to outline their concerns and ideas. Overall, the answers provided were high level, included actions that had taken place in other areas eg lights, sprinklers, culls, etc. Some comment was provided on implications of some options.

'Have been told high pressure hoses have moved them on. Don't agree in chopping down the trees. Recently passed Singleton colony where trees were down. The bats squeezed into the remaining trees. If this happens here they could move into my trees'

'Leave the flying-foxes in their natural habitat and begin extending consideration to where future developments are being made so as not to disturb them and drive them into areas where they are forced to have to live.'

'Try to remove the bats without killing them'

'Attempt to coach bats into a non-urban area.'

'Make the mines regeneration program include trees that attract flying-foxes and stop destroying their habitat elsewhere'

A few practical actions were included:

'Free car washing services and complimentary air freshener'

'Free cleaning of solar panels/power panels/loss of energy. Free car wash once a week, provide bleach or cleaning vouchers for driveways, have voucher for roof cleaning twice a year, water vouchers for loss of drinking water from water tanks.'

Many respondents had an understanding that relocation was not a simple action, stating they could not provide any solutions, yet were frustrated with the impact the flying-fox camp had on their quality of life.

'Council needs to find a way to move these animals to a more suitable habitat. Due to issues with these animals we are moving out of the area which is a shame but best for our family.'

The key themes were:

- to reduce number of trees;
- remove the vegetation to encourage the colony to move on;
- relocation of the fly foxes; and
- general cull.

A number of respondents noted the important role of flying-foxes stating they should not be disturbed.

'We dont have issues, a bit more noise but OK. We would hate to see them harmed in any way'

'Loss of habitat has forced these creatures to roost in our area. Any measure to take will probably be futile simply because they have nowhere else to go.'

'I understand relocating all the bats would be a huge job but if it is in the best interest of both bats & residents, I am for it.'

'If there was a way of decreasing numbers without any harm, we are happy to support Council.'

'Nothing. Let nature take its course'

Key words

Health Less Noise Steps Roost Bush Land Smell
 Open Our Windows Council House Remove
 Residents Trees Excrement
 Flying Foxes Near Residential Areas
 Relocate Problem Rid Bush Area Reduce Eradicate
 Colony Unable Clean

Conclusion

The commitment by Lake Macquarie City Council to engage with the local residents has been very informative in highlighting key concerns and management options available to LMCC. The response rate of 40% indicates there is widespread, yet varied impact on the local area with opportunities based on the results obtained to provide interim actions, in line with Eurobodalla Shire Council's Level 1 actions.

It has assisted in defining the impact area in the event that LMCC is able to implement measures to assist residents during periods of high camp occupancy.



Attachment A Survey questionnaire

Have your say

on the management of flying foxes





Lake Macquarie City Council is in the process of developing a Flying Fox Camp Management Plan for Blackalls Park. It is important for Council to ensure we understand how neighbouring residents are being impacted, and work together to provide some short and long-term solutions.

Please circle the answers most relevant to you/your house, using the scale where 1=not important and 5=extremely important

Impact of Blackalls Park flying fox camp on local residents

In relation to flying fox behaviour, how much impact do the following have on you or your property:

1) The noise when they are roosting or moving on and off the site to feed?

1 2 3 4 5

2) At what time/s of day is the noise most prevalent? Please circle as many as applicable to you.

Dawn Dusk 3am-5am During the day During night They don't disturb me

Other – please specify _____

3) The odour of their excrement?

1 2 3 4 5

4) The impact of flying fox excrement?

1 2 3 4 5

5) How are you directly impacted? Please circle as many as applicable to you.

Disturbed sleep Clothesline Car Rainwater tank Swimming pool Driveway/outdoor ares Trees

Other _____

6) Does the Blackalls Park flying fox camp impact you all year round?

Yes No

If it is seasonal or transitional, when have you noticed a change/increase in their population?

Spring Summer Autumn Winter
(Sept. Oct. Nov.) (Dec. Jan. Feb.) (Mar. Apr. May) (June. Jul. Aug.)

Other _____



7) How do flying fox numbers this year compare to previous years?

Same number Less individuals More individuals Not aware before this year Don't know

Flying Fox Camp Management Plan

A Flying Fox Camp Management Plan is required by the NSW Government prior to undertaking any actions which will disturb habitat or animals in the camp. In preparing the Plan, how important to you is it that the Camp Management Plan:

8) Ensures the risk of transmission of diseases associated with flying foxes remains low?

1 2 3 4 5

9) Does not harm the flying foxes?

1 2 3 4 5

10) Has a low financial cost to residents and business in the area or Council ratepayers?

1 2 3 4 5

11) Can be implemented quickly?

1 2 3 4 5

12) Has a long-term solution?

1 2 3 4 5

13) Does not disturb residents and businesses during the implementation?

1 2 3 4 5

About you

14) Which street is your house located on?

15) How long have you lived at your current address?

0-1 year 1-5 years 6-10 years 10+ years

16) Considering your biggest area of concern, and questions 1-13, what steps do you think Council could take to help you address these issues?

Would you be happy for Council to contact you for more information or to keep you updated?

Name: _____

Address: _____

Phone: _____

Email: _____


Please return this survey using reply paid envelope before **31 May 2016**
For further information, contact Council on **4921 0333**.

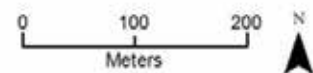


Attachment B
Map showing survey area and Blackalls Park Flying Fox camp



 Blackalls Park Flying Fox Camp 2016

 Area of survey, May 2016



Produced by Sustainability, May 2016, SKM (2014) aerial photography
 V:\GIS\ESRI\Projects\SUST\2016\FlyingFoxMgtPlan\SurveyArea.mxd



Attachment C Open Ended Question

Considering your biggest area of concern, and questions 1-13, what steps do you think Council could take to help you address these issues?

95% of respondents provided comment (n=102)

Summary

Health Loss Noise Steps Roost Bush Land Smell
Open Our Windows Council House Remove
Residents Trees Excrement
Flying Foxes Near Residential Areas
Relocate Problem Rid Bush Area Reduce Eradicate
Colony Unable Clean

I don't know the solution but if they lose their home they will just become someone else's problem.

Get rid of them, they stink !!

I don't know what steps they can take but I'm sick & tired of the noise & smell & having to shut doors and windows.

To eliminate the increasing numbers of bats and their stench. 'LMCC' to remove and control the noxious weeds at the Blackalls Park camp.

The quickest most efficient way of resolving & controlling the matter.

Eradicate the bats from the area

Get rid of the bats!!!

Make the Mines Regeneration program include trees that attract flying-foxes and stop destroying their habitat elsewhere

Smoke them out (without harming them) Cutting some trees Noising them away

About October when warm and before bats return have controlled strong burn to kill trees. Trees will reshoot from bottom etc

The bats need to be relocated

We dont have issues, a bit more noise but OK. We would hate to see them harmed in any way

Leave them alone

Shoot the whole lot of the pests

I have no idea. What can be done if flying-foxes are protected?

Reduce trees in their area - cull numbers to low

Relocate them as every year the situation is becoming worse. That is the only solution.

Identify bat's food source and decrease their food source. This will naturally cull numbers and additionally half the nesting trees will disperse to smaller groups of bats

Unable to assist with steps to take however the number of them needed to be decreased from the area in which they roost

Reduce food available to flying-foxes

1. removal of bats by culling numbers. 2. removal of roosting area trees 3. Pollution into Stony Creek is huge from this flying fox habitat

Remove trees from this area (which is destroyed anyway) Plant fauna which bats are not attracted to so they wont colonise here!

The use of fire drums to produce smoke would have no impact on the environment or harm the flying-foxes and could be implemented cheaply & managed safely.

Gas them !!!!

Get rid of them completely, the smell is unbearable

To reduce their numbers

Move colony onward to another, less human populated area.

Reduction of trees in camp area

To take action to remove any future flying fox colonies in the Blackalls Park / Toronto areas in / near residential areas



Council needs to find a solution to move them on so residents of this area can live happily & healthy without the stench & residue of their droppings and we are able to open our windows and walk down the street !!!

Thin out the trees along Fennell Crescent where they roost

I heard that if you disturb their sleep time (daytime) by using fire hose (fire brigade) hose the trees to move them on.

Loss of habitat has forced these creatures to roost in our area. Any measure to take will probably be futile simply because they have nowhere else to go

I understand relocating all the bats would be a huge job but if it is in the best interest of both bats & residents, I am for it.

Relocating the bats to a larger area away from neighbourhoods. My biggest concern are the significant life threatening health risks and the everyday toll it takes on use including sleep.

Remove the nesting trees or cull bat numbers. Bats are very resilient and will move as there is plenty of bush area around Mt Sugarloaf.

Devaluation of house, no BBQ, grandchildren outside, unable to get veggies & fruit clean, paths, two ear infections because of ear plugs on shift work.

Level the area of all the trees they have killed. Remove all the excrement from the ground to help stop the constant stench. Put barriers up to help keep Stoney Creek clean.

Reduce the numbers, move them on

Address the problem & let us have our life back before it totally devalues our properties & somebody dies.

Free car washing services and complimentary air freshener

Free cleaning of solar panels/power panels/loss of energy. Free car wash once a week, provide bleach or cleaning vouchers for driveways, have voucher for roof cleaning twice a year, water vouchers for loss of drinking water from water tanks

Move them into uninhabited areas or cull numbers

I think they need to be moved out of the residential areas. There are days we cannot open our windows.

Honestly I dont know how possible it would be to relocate these creatures. The smell & excrement they create is a real problem.

Remove existing trees (they are mostly dead), replace with smaller shrubs

Encourage the flying-foxes to live somewhere else. I dont know how to but I am sure there is some wise person in Council who will know.

For the health & well being of residents this is a very serious concern and the removal of the flying-foxes must be actioned

Take whatever appropriate action deemed necessary to ensure bat population does not roost in/ near residential areas eg. Blackalls Park

Kill 75% of the bats or cut down the trees and make a park

Rehoming to uninhabited bush land and the removal of nesting trees from Council land

The stench, devaluing of property, decreased population by removal of some of the trees so that the colony can be controlled.

Relocate or remove the flying fox colony

No trees would result in no flying-foxes

Nothing, let nature take its course

Reduce the height of the damaged Casuarina trees along the creek banks and wherever they were roosting before they moved to the waterfront area.

If there was a way of decreasing numbers without any harm, we are happy to support Council.

Reduce population

The stench is dreadful & overpowering & sickening. They need to be culled & moved to a less populated place by thinning or removing the habitat.



Residents health (particularly children) playing in the yard where they may come into contact with excrement. Children do not always apply basic hygiene.

I have a granddaughter attending Toronto High School, the mess and smell she said is really bad - there seems to be a lot more ill people around - I worry when my great grandchildren come to visit as they are only 5 years old

The bats need to go & the bush is a lot of lantana & looks terrible. Get rid of the bush & also burn through it to get rid of the disgusting smell.

Eradicate the camp. I have great concerns about ongoing health problems associated with flying fox excrement.

Move them to a more suitable people free area. If the bush area is burned when the scout comes next time they will find another place.

Council needs to find a way to move these animals to a more suitable habitat. Due to issues with these animals we are moving out of the area which is a shame but best for our family.

Remove habitat (trees)

Clean the area & fill land, maybe Council could sell to pay for cost of getting rid of flying-foxes.

We live about 700m from the colony so are not affected as much. Those closer are living in hell, something needs to be done asap for their sake.

Thin out the bush land by 2/3 & back burn through it.

Ensure health & noise - pollution

Cut down the trees and stop (pollution) in creek and lake as it isn't good for the lake.

Reducing/trimming back trees to reduce the amount of space available for the camp to roost.

Relocation. Removal of percentage of trees required to discourage return of bats next brooding season.

Either clear the land to make it clean again or put something in there to disturb them so they won't come back each year.

Ensure they do not return after Council has addressed this issue.

The odour is our biggest concern in a morning I have vomited because of the smell We play lawn bowls at Toronto Workers Club and the smell there is atrocious.

Remove 2/3 of the trees on this site or sell land off for housing.

Put bright lights on at night so they will leave & go somewhere else - it worked in Qld.

Have been told high pressure hoses have moved them on. Don't agree in chopping down the trees. Recently passed Singleton colony where trees were down. The bats squeezed into the remaining trees. If this happens here they could move into my trees.

If possible relocate without harm as they are necessary for the eco system.

Council to set long plan/strategy that would lessen the impact on our community & flying-foxes alike.

Although I am not far from them, the only time I hear or smell them is when walking past.

Other Council's have had little success ie: Singleton. Perhaps removing the habitat trees is necessary. The stench at local club is disgusting!

Move the flying-foxes on

Remove & relocate the flying-foxes. The noise and odour are the biggest area of concern.

Get rid of them!! We pay Council rates! we deserve a healthy environment to live in. The bats don't pay.

Noise disruption as in Botanic Gardens, Sydney (I'm quite concerned about impact on native bird breeding in wetlands to NE of present site)



Cut down all the cassuarina trees down along Stoney Creek where they camp.

clear the area entirely of all the trees associated with what they eat and like to roost. Make sure the land is kept clear (it is Council land) do a cull. Due to the increased numbers I do not consider them to be a vulnerable species!

Relocation, relocation, relocation !

the smell is unbearable have to keep windows closed, we like them open (wake up choking on their smell) devalues our land values.

sonic equipment to deter nesting (camping) near residential areas.

Burn or cut trees down

To start doing something as soon as possible.

Move them to an area away from houses, cars and people. We are also concerned for the resale value of our house.

Try to remove the bats without killing them

this form is a waste of money and time for 2 years trying to get help get rid of Council and bats hopefully

Attempt to coach bats into a non-urban area.

Remove habitat to provide permanent solution. These colony's cannot co-exist in residential areas.

Leave the flying-foxes in their natural habitat and begin extending consideration to where future developments are being made so as not to disturb them and drive them into areas where they are forced to have to live.

Get rid of the bats: there is no need for them to be in a residential area. Same as minor birds

We live 5 houses down from them. Just leave them alone. They don't bother us at all. If the trees are removed they will just come to our trees. What about the other fauna?



Appendix 3 - Monitoring program

The proposed flying-fox monitoring program is intended to inform and support management of the camp, with the most important component being documentation of the population and its change over time.

The proposed monitoring program elements are outlined in Table 1:

Table 1 Proposed monitoring program

Characteristic	Guideline
1 Flying-fox population monitoring	
Monthly population estimates	Regular monthly estimates of population are to be carried out at the camp, with results being provided to Lake Macquarie City Council. The methodology is to be consistent with the National Flying-fox Monitoring Program and Office of Environment and Heritage guidelines as outlined in the Monitoring fact sheet link. The area of occupancy is also to be recorded. Technological options for remote or automated population monitoring are to be investigated.
Presence/absence of flying-fox species	The presence of different flying-fox species is to be noted.
Presence/absence of breeding females	Observed presence of breeding females on the site is to be recorded.
2 Weed and native vegetation monitoring	
Tree canopy change (increase/decline)	Map 6 of the Plan shows the change in vegetation canopy height on the site between 2007 and 2014 using Lidar data. Continuing vegetation canopy monitoring may assist with assessing the extent and suitability of flying-fox roost habitat on the site.
Weed distribution and abundance	Weed distribution and abundance monitoring forms part of the vegetation management plan for the site (LMCC 2016).
Restoration and rehabilitation success	The success of rehabilitation plantings and natural regeneration should be evaluated using appropriate methods, consistent with the vegetation management plan (LMCC 2016).
3 Weather monitoring	
Local microclimate	Use temperature/humidity data from Lyall Peacock Reserve or consider feasibility of installation of a weather station and temperature/humidity sensors
Extreme heat events	Heat stress is likely to occur where temperatures are above 40 degrees and it is desirable for the population to be observed during these periods, with Office of Environment and Heritage guidelines applied as described in the following link - Responding to heat stress in flying-fox camps

Management and research questions that can potentially be answered by carrying out the monitoring program are as follows:

1. Is there a pattern of flying-fox occupancy of the site annually and seasonally?
2. Is the revegetation program succeeding in concentrating flying-fox roosting away from adjacent residential properties?
3. To what extent does revegetation and restoration of vegetation affect flying-fox roost behaviour?
4. What climatic extremes are experienced on the site, how does microclimate vary across the site, and how does this affect flying-fox behaviour?
5. Is there a relationship between the location and size of the flying-fox population on the site and the temperature/humidity on the site?
6. Is there a relationship between the location and size of the flying-fox population on the site and the vegetation canopy on the site?



Appendix 4 - Frequent questions

Why did grey-headed flying-foxes come to camp at Blackalls Park?

Habitat in and near urban areas has been created that is suitable for flying-foxes. Site characteristics may include:

- Protection from predators (eg snakes)
- Suitable humidity, temperature and shade
- Legible navigation (eg roads, lights and rivers that are highly visible and can be followed at night)
- Suitable foraging habitat in surrounding urban areas (due to a wide range of flowering and fruiting plants in urban gardens)
- Suitable habitat structure (eg tree species, branches & canopy)

How many species of flying-foxes occur at Blackalls Park?

Two species of flying-foxes have been observed at the site. The overwhelming majority are grey-headed flying-foxes, but little red flying-foxes have been observed on at least one occasion. Both species frequently occur concurrently.

Are flying-foxes in urban areas a new concern?

The Blackalls Park flying-fox camp is the first known case of a flying-fox camp located close to an urban area in Lake Macquarie local government area. However, there are many similar cases in other locations in NSW and Queensland where flying-foxes have camped in suitable vegetation in or near urban areas, including Maclean, Maitland, Singleton, Coffs Harbour, Sydney and Batemans Bay. Some of these camps have been established for long periods of time.

Therefore, Lake Macquarie City Council is not the first local government authority to have dealt with flying-fox related issues, and there is considerable experience with measures that work and do not work to manage camps and to avoid conflict between flying-foxes and human populations.

What are the key issues affecting people living around the camp?

Historically, people have had to live with flying-foxes, particularly in Queensland and Northern NSW. There have been a particular concern to orchardists, damaging and eating fruit during foraging although they are known to feed primarily on flowering trees. Garden plants such as Cocos Palms are known to attract flying-foxes and probably encourage them to roost close to urban areas. The key issues affecting residents near flying-fox camps are odour, noise and faecal drop, which can significantly adversely affect residential amenity.

Many solutions for dispersing and discouraging flying-foxes have been tried, and these generally appear unsuccessful, only work in the short term, or are difficult to evaluate. These 'solutions' range from placing stuffed cats or hanging disco balls in trees, to spreading bags of Diamond Python excrement, or beating pots and pans loudly at night. More information is available on <http://www.dontshootbats.com/urban-bats.html>

How do I stop flying-foxes coming on my property?

Flying-foxes are highly mobile and travel long distances. The best way of preventing them coming onto your property is to ensure that there are no food sources that attract them to come and feed. Some plants such as Cocos Palms are known to attract flying-foxes, and it is advisable to remove these. Thinning the vegetation canopy when the flying-foxes are not roosting may also make the vegetation less attractive for roosting, although the flying-foxes must not be disturbed in the process.

Is it possible to disperse flying-fox camps?

Although dispersing camps has been achieved in a small number of cases, typically they only move a short distance and less than 500m from the original location. Relocation is also extremely time consuming and expensive, and has uncertain outcomes. This can lead to more difficult management problems and more people being affected. Some government agencies have spent millions of dollars in unsuccessfully relocating camps.

Flying-foxes also return to camps over time, so permanent dispersal is likely to be required at considerable cost.

Dispersal attempts should only be considered at certain times of year and appropriate weather conditions. Dispersal also causes significant distress to the animals, and it has been suggested that this increases vulnerability to disease, which can potentially be spread to humans. This is expected to negatively impact on species conservation.



Appendix 5 - Animal rescue protocol

Reference documents:

OEH 2012, NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes, Office of Environment and Heritage, Sydney.

OEH 2011, NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna, Office of Environment and Heritage, Sydney.

Purpose

These work instructions are intended for Australian bat lyssavirus (ABLV)-vaccinated fauna spotter catchers (FSCs) or wildlife rescue personnel on site during dispersal activities to monitor, capture or provide first aid treatment for sick or injured flying-foxes that may require human intervention for their survival. Flying-fox rescue must only be attempted by personnel trained and experienced in flying-fox rescue and handling.

This work instruction provides rescuers with information regarding capture and first aid until a flying-fox is in the specialist care of a veterinarian or person qualified in wildlife rehabilitation.

Requirements

FSC and wildlife rescue personnel involved in flying-fox rescue must:

- be trained and experienced in rescue and handling
- be vaccinated against ABLV (titre levels checked at least once every two years)
- be aware of the hazards and risks of coming into contact with all bats
- utilise appropriate PPE and equipment for capture, transport and treatment of flying-foxes
- undertake a risk assessment before carrying out a rescue – do not endanger yourself or others during a rescue
- have the contact details for a local veterinarian or bat carer who will accept the sick or injured flying-fox.

Human first aid

All bats in Australia should be viewed as potentially infected with ABLV. If bitten or scratched by a bat, immediately wash the wound with soap and water (do not scrub) and continue for at least five minutes, followed by application of an antiseptic with anti-viral action (e.g. Betadine), and immediate medical attention (post-exposure vaccinations may be required). Similarly medical attention should be immediately sought if exposed to an animal's saliva or excreta through the eyes, nose or mouth.

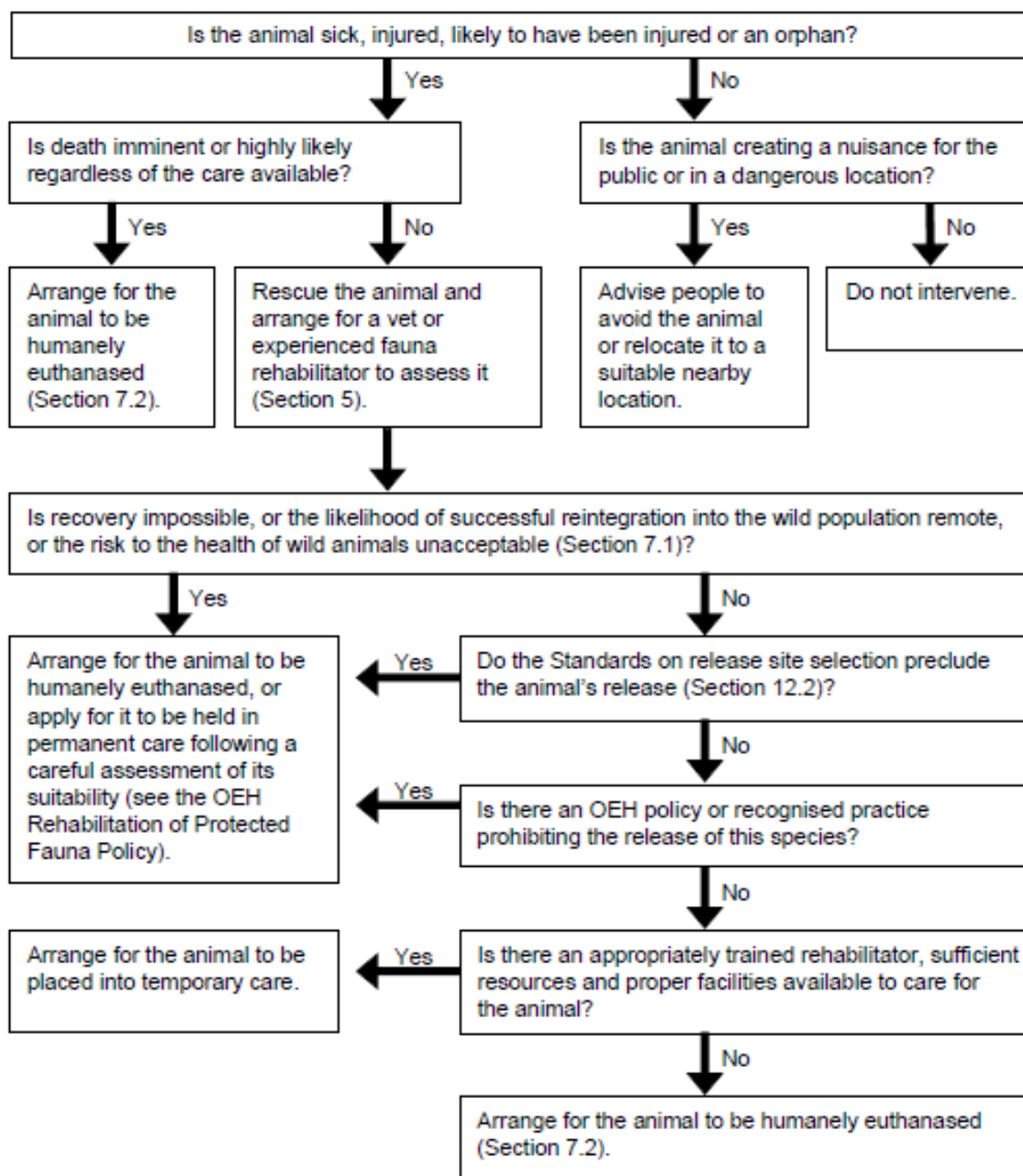
Equipment

- lidded plastic carry basket or 'pet-pack' with bedding (juveniles) / transport container with hanging perch, tall enough for bat to hang without hitting its head (in accordance with Section 5.1 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012))
- warm water bottle / cold brick
- wraps /towels
- teats for small bottle
- extension pole or broom
- bat first aid kit – juice drink/glucose powder, syringes, cloths for wounds, Betadine/saline, dummy for baby bats. FFs only to be offered liquids under advice from a licensed wildlife carer.

Work instructions

Case assessment

Observe, assess and then determine if/what intervention is required using the decision tree in the NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna (OEH 2011), included below.



Personnel should approach stressed flying-foxes cautiously. If flying-foxes panic or fly this will waste energy; retreat and continue to monitor behaviour.

1. Dehydration: Eyes dull or depressed in skull, change to skin elasticity, skin stays pinched, animal cold, wing membranes dry, mouth dry.
2. Heat stress: wing fanning, shade seeking, clustering/clumping, salivating, panting, roosting at the base of trees, on the ground, falling from tree.
3. Obvious injury: bleeding, broken bones.

Rescue instructions

As per Section 4 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012):

- i. The objective is to rescue a flying-fox while minimising further stress and injury to the animal.
- ii. Before a rescue attempt, rescuers must assess the risks to the flying-fox from environmental hazards and from capture.
- iii. Rescuers must employ the correct rescue equipment for the condition and location of the flying-fox, and be trained in its use.



Example scenarios

1. Bat low in tree:

- quickly place towel around bat before it can move away
- grab hold of feet, toes may curl over rescuers fingers
- place in carry basket / transport container.

2. Bat high in tree:

- place pole wrapped in towel in front of bat
- coax bat onto towel
- once on towel, quickly move away from branches and lower to ground
- once on ground, cover with towel and place into carry basket / transport container.

3. A bat caught on barbed wire fence:

- two people only – one to restrain with towel, while the other untangles
- put towels on the wire strands under or around to avoid further entanglement
- if the membrane has dried onto wire, syringe or spray water onto wing
- use pliers or wire cutter if necessary.

Animal first aid

Physical assessment: Keep animal wrapped and head covered, only expose one part at a time. Examine head. Unwrap one wing and extend. Wrap and extend other wing. Check legs. Examine front and back of body.

Dehydration: Offer water/juice (low acid juice only, e.g. apple/mango) orally with syringe (under supervision/advice from licensed wildlife carer ONLY).

Heat stress: Reduce temperature in heat exhausted bats by spraying wings with tepid water.

Hypothermia: May be seen in pups separated from mother – keep head covered and warm core body temperature slowly by placing near (not on) warm water bottle covered by towel.

Bleeding: Clean wounds with room temperature saline or diluted Betadine.

Transport to veterinarian / wildlife carer

See Section 5 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012) summarised below.

Objective

To transport a flying-fox so as to minimise further stress and injury to the animal.

Standards

- a. The transport container must be tall enough for the flying-fox to hang by its feet without hitting its head on the floor.
- b. The container must be designed, set up and secured to prevent injuries to the flying-fox. The sides of the container must prevent the flying-fox from poking its head or wings out.
- c. The container must be designed to prevent the flying-fox from escaping.
- d. The flying-fox must be allowed to hang by its feet from the top of the container or if it is unable to hang, wrapped in material (e.g. sheet or flannel) and placed in a sling so its feet are higher than its head.
- e. The container must be kept at a temperature which is appropriate for the age and condition of the flying-fox. A range of 25–27°C is appropriate for an adult. A temperature of 28°C is appropriate for an orphan. A cool or warm water bottle may be required.
- f. The container must be ventilated so air can circulate around the flying-fox.
- g. The container must minimise light, noise and vibrations and prevent contact with young children and pets.
- h. During transport, a container holding a flying-fox must have a clearly visible warning label that says 'Warning – live bat'.
- i. A flying-fox must not be transported in the back of an uncovered utility vehicle or a car boot that is separate from the main cabin.

Guidelines

- Flying-fox transport should be the sole purpose of the trip and undertaken in the shortest possible time.
- The fauna rehabilitation group's contact details should be written on the transport container in case of an emergency.



Appendix 6 - Vegetation Management Zones

From Vegetation Management Plan (LMCC 2016).





Appendix 7 - Human and animal health information

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 (DPI 2013) 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 (NSW Health 2013).

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 (NSW Health 2013).

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 bat roosting areas (NSW Health 2013).

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, and 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 Hendra virus (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 (DPI 2014). There is no evidence that the virus can be passed directly from flying-foxes to humans or to dogs (AVA 2015). Clinical studies have shown cats, pigs, ferrets and guinea pigs can carry the infection (DPI 2015a).

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 (CDC 2014).

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 greater than 70% (DPI 2014). Since 1994, 81 horses have died and four of the seven people infected with HeV have lost their lives (DPI 2014).

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 (DPI 2014), 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 PPE (e.g. respiratory filters), and potentially dampening down dry dusty substrate.

Menangle virus

Menangle virus (also known as bat paramyxovirus no. 2) was first isolated from stillborn piglets from a NSW piggery in 1997. Little is known about the epidemiology of this virus, except that it has been recorded in flying-foxes, pigs and humans (AVA 2015). The virus caused reproductive failure in pigs and severe febrile (flu-like) illness in two piggery workers employed at the same Menangle piggery where the virus was recorded (AVA 2015). The virus is thought to have been transmitted to the pigs from flying-foxes via an oral-faecal matter route (AVA 2015). Flying-foxes had been recorded flying over the pig yards prior to the occurrence of disease symptoms. The two infected piggery workers made a full recovery and this has been the only case of Menangle virus recorded in Australia.

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. Direct contact with faecal material should be avoided and general hygiene measures taken to reduce the low risk of gastrointestinal and other disease.

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.



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