Australian White Ibis Management Plan

Draft

March 2018

CANTERBURY-BANKSTOWN COUNCIL

ecology / vegetation / wildlife / aquatic ecology / GIS

Executive Summary

In 2016, Canterbury-Bankstown Council was formed following the merger of Canterbury City Council and Bankstown City Council. These former Councils each had separate management plans for the Australian white ibis (*Threskiornis molucca*) and were each actively managing the species. This Australian White Ibis Management Plan is the result of updating and consolidating the two existing plans into one comprehensive plan that addresses roosting and nesting issues across the entire local government area.

The Australian white ibis is one of three native species of ibis found in Australia and is protected under the New South Wales *National Parks and Wildlife Act 1974*. It is a native wetland bird that has readily adapted to life in urban environments. Within the last thirty years, populations have become unsustainably large in many urban areas of Australia, predominantly due to their ability to scavenge human food waste at landfills and public parklands. Their overabundance can result in a range of negative impacts including degradation of native vegetation, reduced biodiversity, contamination of water bodies, a risk for disease transfer to livestock industries and humans, and potential risk to air safety.

As at November 2017, there were 15 known ibis colonies within the Canterbury-Bankstown Council local government area, ranging in size from just several nests in isolated trees to a large refuge colony. Sporadic and uncoordinated actions by various entities over a number of years has resulted in ibis colonies splintering into smaller colonies, which underscores the need for a coordinated approach.

Ibis colonies within the Canterbury-Bankstown Council were assessed based on set criteria including colony size, population trend, proximity to an aerodrome, proximity to food premises and number of nuisance complaints. Each site was then targeted with clear objectives and actions for management or monitoring.

The Canterbury-Bankstown Council Australian White Ibis Management Plan will be reviewed in full every five years. Progress will be evaluated internally against the Implementation Strategy at least annually on completion of the annual census, and minor updates made to the plan as required.

Glossary and acronyms

AWIMP	Australian White Ibis Management Plan
AWRC	Australian Wetlands and Rivers Centre
BC Act	*Biodiversity Conservation Act 2016* (New South Wales)
BCC	Bankstown City Council
CBD	Central Business District
CCC	Canterbury City Council
CoC	City of Canterbury
CBC	Canterbury-Bankstown Council
EEC	Endangered Ecological Community
Ibis	Australian White Ibis (*Threskiornis molucca*)
ICAO	International Civil Aviation Organisation
LGA	Local Government Area
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NASF	National Airports Safeguarding Framework
NSW	New South Wales
Medium to large ibis colonies	Greater than 50 individuals
Refuge colony	Selected ibis colonies of special significance i.e. Lake Gillawarna
Small ibis colony	Less than 50 individuals
SBP	Sydney Basin Plan

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1 Introduction

In 2016, the Canterbury-Bankstown Council (CBC) was formed following the merger of Canterbury City Council (CCC) and Bankstown City Council (BCC). These former Councils had separate Australian white ibis (*Threskiornis molucca*) management plans and were each actively managing this species. This Australian White Ibis Management Plan (AWIMP) is the result of consolidating and updating the two existing AWIMPs into one comprehensive plan that addresses roosting and nesting issues across the entire local government area (LGA).

1.1 Ibis ecology

The Australian white ibis[1] is one of three native species of ibis found in Australia and is protected in New South Wales (NSW) under the *National Parks and Wildlife Act 1974* (NPW Act) and from August 2017 under the *Biodiversity Conservation Act* 2016 (BC Act). It is a native wetland bird that has readily adapted to life in urban environments. Within the last thirty years, populations have become unsustainably large in many urban areas of Australia, predominantly due to their ability to scavenge human food waste at landfills and public parklands. Their overabundance can result in a range of negative impacts including degradation of native vegetation, reduced biodiversity, contamination of water bodies, a risk for disease transfer to livestock industries and humans, and potential risk to air safety.

In Sydney the ibis breeding season generally occurs between June and February each year resulting in clutches of between one and five eggs each (City of Canterbury 2016). Ibis can breed in a range of habitats with year-round breeding observed within Canary Island date palms (City of Canterbury 2016).

According to October annual census surveys done by the Australian Wetlands and Rivers Centre (AWRC) the abundance of ibis in (eastern) inland Australia has declined dramatically from a peak of 24,406 (1986) to a low of 277 (2015), which is the lowest number of ibis recorded since monitoring began in 1983 (Kingsford 2012, Kingsford & Porter 1983 - 2014). The importance of urban ibis populations is therefore better understood within the context of a declining inland population: urban centres provide either temporary refuge until ibis recolonise inland areas or may represent a permanent shift in species distribution (Ecosure 2015).

1.2 Purpose of the AWIMP

The purpose of this AWIMP is to provide an adaptive management tool to address ibis issues throughout the CBC LGA. It provides management options for sites currently being frequented by ibis and will also guide management and monitoring at sites that may establish in the future.

This AWIMP has been developed with reference to the Sydney Regional Ibis Management

[1] From now referred to as 'ibis'

Plan Working Draft (Australian White Ibis Taskforce 2009) which evolved from the need to manage the ibis population over the whole of the Sydney Basin, in which the CBC LGA is located.

1.3 Aims and objectives

The AWIMP aims to address a range of issues associated with ibis roosting and nesting throughout the LGA. Objectives of this plan include:

- addressing overabundance of ibis within the CBC LGA
- setting management actions to meet specific targets that will allow the long-term sustainability of the ibis population
- reducing the impacts of ibis on the community and infrastructure
- monitoring the ibis population across the whole LGA
- providing sufficient information for NSW Office of Environment and Heritage licence requirements to manage the ibis population.

2 Summary of sites

This section provides an overview of sites identified as being frequented by ibis throughout the LGA and includes location, ibis use, issues, and past and present management actions.

2.1 CBC ibis sites

CBC has identified 15 sites throughout the LGA (Table 1) which are known to be frequented by ibis. Two of these sites, Riverwood Wetland and Kelso Waste Management Facility, are ibis foraging sites only. A Bird Management Plan currently exists for the Kelso Waste Management Facility, therefore specific details on ibis populations at the facility have not been included in this AWIMP. It is important however that anthropogenic waste is managed appropriately to limit artificial population growth (Section 1.3). Actions related to implementation and monitoring of the bird management plan for the waste management facility have therefore been included in this AWIMP (Section 3). The remaining 14 sites (Table 1) are the primary focus of this AWIMP. Other known ibis colonies not included in this plan are Roselands Depot, Greenacre Town Centre, Theynes Reserve and Cup and Saucer Wetland.

Attributes of the ibis sites and use by ibis vary considerably; some are frequented by large numbers of ibis (e.g. Lake Gillawarna), some are individual trees (e.g. Canary Island date palms), stands of vegetation, or geographical locations (e.g. Riverwood Wetlands). Some sites highly impact the community/infrastructure and amenity services (Bankstown Central Business District [CBD]) while other sites have generated few, if any, complaints from the community (Appendix A). The sites therefore have differing impacts requiring a range of monitoring and management actions. Details on site values of key ibis colonies are provided in Appendix B.

Table 1 Location of ibis colonies in the CBC LGA

Site ID	Location	Nesting	Roosting	Foraging	October 2017 annual census count^^	Colony size*	Category
1	Lake Gillawarna	✓	✓	✓	1,145	Medium-large (managed as a refuge colony)	Refuge site Sensitive wetland
2	Wiley Park	✓	✓	✓	136	Medium-large	Parks and reserves
3	Riverwood Wetland			✓	40	n/a	Sensitive wetland
4a	Street trees: 5th, 7th and 8th Avenue	✓	✓	✓	Between 0-15 each area, total 58	Medium-large	Street trees
4b	Street trees: Brighton Avenue	✓	✓	✓	0	Small	Street trees
4c	Street trees: Broadway	✓	✓	✓	Between 0-10, total 12	Small	Street trees
4d	Street trees: Isolated Palms	✓	✓	✓	Between 0-15, total 43	Small	Street trees
5	Bankstown CBD#	✓	✓	✓	Between 2-30 each area, total 312	Medium-large	Town centres (State Government and Council)
6	Panania Town Centre		✓	✓	0	Small	Town centres
7	RM Campbell Reserve		✓	✓	110##	Medium-large	Parks and reserves
8	Greenacre Public School		✓	✓	50	Medium-large	State government land
9	Water Tower (cnr Hume and Stacey Streets)	✓	✓	✓	60	Medium-large	State government land
10	Lakemba Rail Corridor	✓	✓	✓	79	Medium-large	State government land
11	Ruse Park	✓	✓	✓	13	Small	Parks and reserves
12	Bankstown City Gardens	✓	✓	✓	12	Small	Parks and reserves
13	Maluga Passive Park	✓	✓	✓	11^	Small	Parks and reserves
14	Private property (various isolated palms)	✓	✓	✓	Between 1 to 15 each; total 55	Medium-large	Private property

*small = less than 50 individuals, Medium-large = equal to or more than 50 individuals. Colony size selected to align with active management licence requirements according to NPW Act

** Heritage listed Canary Island date palms (8th, 5th, Brighton, Broadway and Hillcrest Avenues)

Bankstown CBD = Bus layover, Meredith Street, Saigon Place and Marion Street car park

data from June 2015 roost count

^ data from October 2016 annual census count

^^nesting and foraging data used when roost counts were not available

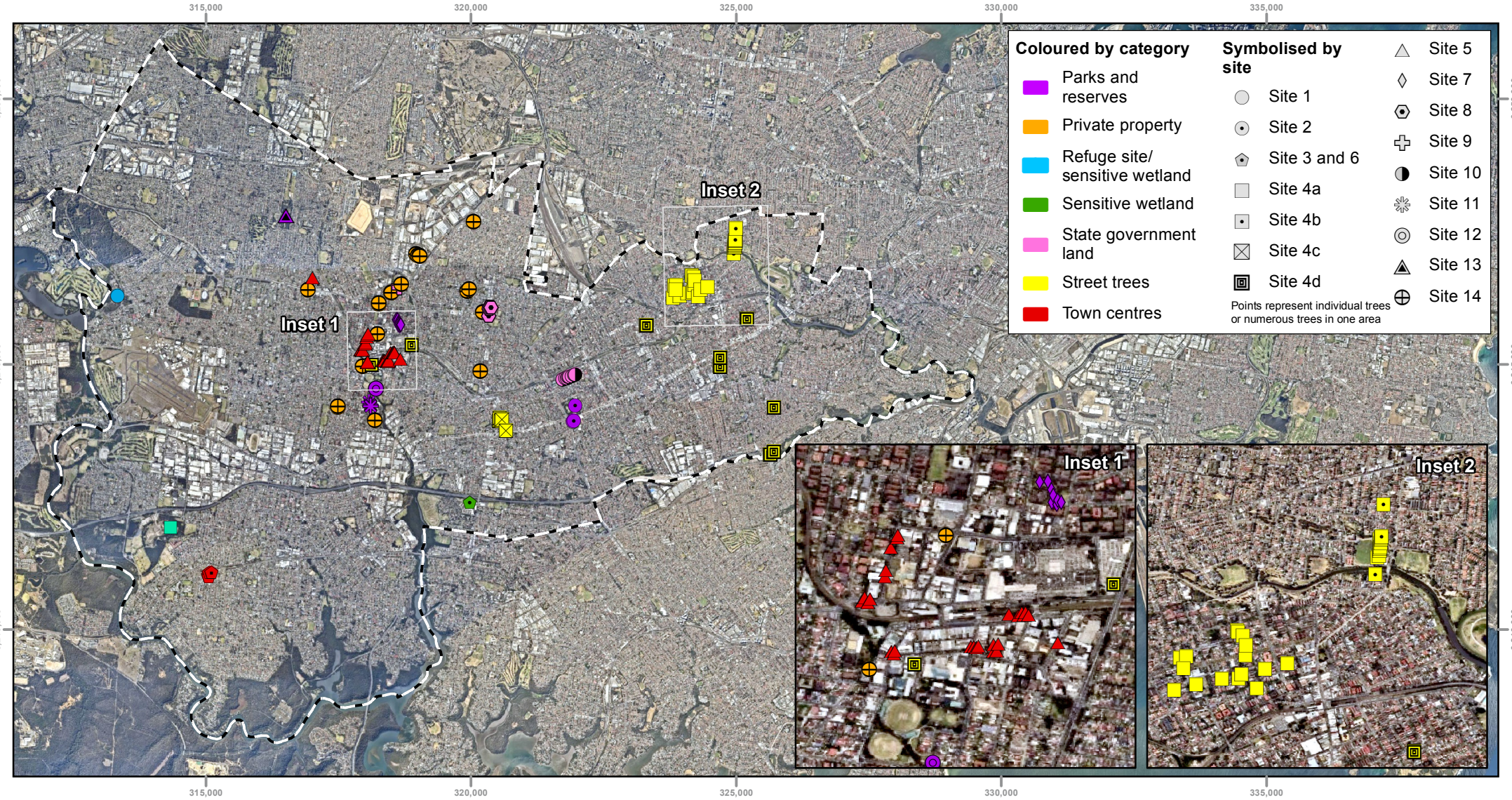

Figure 1: Known ibis colonies within Canterbury - Bankstown Council

Canterbury-Bankstown Council

Ibis management plan

Canterbury-Bankstown Council

Kelso waste management facility

ecosure

Job number: PR2887
Revision: 0
Author: DJB
Date: 29/01/2018

0 0.5 1 2
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

Data Sources: Ecosure Pty Ltd, 2017; Image
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2.2 Site issues

Overabundance of ibis populations within an urban environment can result in a range of issues/impacts, from noise and smell complaints, degradation of native vegetation and water quality, fouling of infrastructure and risk to air safety (Table 2).

As ibis roost throughout the CBC the issue of public nuisance, including fouling of streets and recreational/eating areas, has resulted in numerous complaints and considerable expense to CBC to clean faecal drop from infrastructure. Common issues associated with ibis roosting and nesting in urban environment are summarised in Table 2.

Table 2 Common issues associated with ibis populations

Issue	Comment
Public nuisance (including noise, smell, aggressive behaviour)	Ibis colonies often elicit complaints from nearby residents due to noise, smell and accumulated excrement. These are the primary complaints from residents where large ibis roosting and/or nesting populations have developed in suburban settings. Noise is a significant issue as the breeding season coincides with the early sunrises of spring and summer. It is common for ibis to make sleep disturbing noises from 4am onwards. The smell of droppings, carcasses and broken eggs, magnified by the summer heat also contributes to public concern. Ibis foraging in public areas may result in smell, noise, unsightliness and environmental contamination. Consequently, the recreational value of ibis populated parks may be reduced. Ibis feeding within parks, malls and outdoor eateries can aggressively seek food, causing injuries, damage and contamination of eating utensils and general nuisance. Given the opportunity, ibis will also upturn public and commercial bins whilst scavenging for food, creating further nuisance such as littering and impact public amenity.
Expense of management implementation	Due to ibis roosting and breeding behaviour in the urban environment, Councils need to implement regular vegetation management (pruning of palms) and cleaning services of footpaths due to ibis droppings.
Degraded water quality	The high nutrient content of excreta from large numbers of birds can cause eutrophication of waterbodies, increasing odour and lessening the aesthetic appeal.
Damage to vegetation	Ibis can smother foliage and defoliate branches on which they roost and nest, while their excreta, nesting materials and carcasses may inhibit seed growth in the under storey.
Reduced diversity of fauna	Overabundance of one particular species can prevent others from roosting and nesting leading to a decline in diversity and impacts on ecosystem services.
Risk to public health	Ibis are known to carry pathogens that could transmit to humans and other fauna (Epstein et al. 2006). Salmonellosis, which is associated with poor hygiene in recreation areas, presents the most likely threat to human health. Although no serious ibis related outbreaks in humans or animals have been reported to date, it is likely that as urban ibis populations increase the associated public health risk also increases. Aggressive ibis can cause minor injury to humans as they forage for food around bins and picnic tables. There are also records of bird mites causing skin irritations. The likelihood of the public being exposed to pathogens carried by ibis are low if exposure is limited and handling is avoided.
Aircraft hazard	Risk to aircraft through bird strike is considered in relation to ibis populations within the vicinity of airports. It is unknown how far ibis travel but could be up to 25 km between their foraging and roosting/breeding sites (Murray 2005). Bankstown Airport is approximately 5 km from Bankstown Central.

The main issues in the Bankstown CBD (Figure 1) relates to public nuisance including noise, odour, and fouling of cars and property and therefore the increase in vegetation management and cleaning services (BCC 2012). The amenity value of the CBD has also deteriorated due to the anecdotal evidence that ibis numbers are increasing. As the CBD is approximately 5 km from the Bankstown Airport it is also considered that ibis using this area could contribute to the risk of aircraft strike. Australian white ibis are ranked as a high risk species for Bankstown Airport (Avisure 2016). Although there are no reports of ill health associated with the proximity of ibis to humans within the CBD, risk of zoonotic disease increases with more human/ibis interactions (BCC 2012).

Issues identified at Lake Gillawarna include noise and odour, degradation of water quality, vegetation damage, and public nuisance at recreational/eating areas. Lake Gillawarna is also less than 2 km from Bankstown Airport and is along the flightpath from the lake to the Kelso Waste Management Facility, increasing the risk of bird strikes (BCC 2012).

The location of ibis in Canary Island date palms (date palms) (*Phoenix canariensis*) adjacent to residences and areas of human activity on road reserves in Campsie, Croydon Park, Punchbowl, Belmore and Earlwood, has resulted in complaints from the community regarding noise, smell and excrement. CBC has also incurred considerable expense in pruning of the palm trees and cleaning of infrastructure as a result of fouling by ibis. Some date palms have also reportedly died as a result of Fusarium Wilt (*Fusarium oxysporum*) the cause of which is not known. Potentially ibis transfer this organism between palms although no evidence exists indicating this is the case (CoC 2016). Risk to public health is also a concern among the community and although ibis can be carriers of various pathogens, no reports exist of ibis-related health issues (CoC 2016).

Although ibis frequent Wiley Park (roosting, nesting) and Riverwood Wetlands (foraging), no issues are currently apparent. However, there is potential for an increase in ibis due to anthropogenic waste and feeding of birds which may result in community complaints.

A summary of site issues at all known ibis locations is shown in Appendix A.

2.3 Management actions to date

Current and past management (and monitoring) actions have been collated for ease of reference (Table 3). There has been no management at some sites, with breeding restriction and vegetation management at others. In addition to impacts on the community and CBC property, ibis have also increasingly been impacting on private property, resulting in complaints to CBC. Although no management actions can be implemented by CBC on private land, residents have sought advice on how best to manage ibis on their properties. Impacts on adjacent CBC property including private properties have included fouling of footpaths due to roosting and breeding and subsequent noise and smell complaints from residents.

Further information about management techniques can be found in Appendix F.

Table 3 Identification of management/monitoring actions – past and current

Management/monitoring actions to date	Site ID													
	1*	2	3	4a-d	5	6	7	8	9	10	11	12	13	14
Reducing anthropogenic food sources (including use of bins designed to minimise ibis foraging)	✓				✓									
Vegetation management	✓			✓	✓									
Breeding restriction (egg and nest removal, oiling)	✓			✓	✓								✓	
Roost dispersal					✓									
Monitoring (Roost counts, foraging surveys)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community education (including signage, 'we like our parks litter free' programs/campaigns, talking to users of recreational areas, management advice)	✓	✓	✓	✓	✓		✓	✓			✓		✓	
Reactive cleaning of footpaths etc.				✓	✓	✓	✓	✓						
Ibis population surveys/information	✓	✓	✓	✓	✓	✓	✓	✓		✓				

*no management actions implemented since 2011, only monitoring

Refer to Table 1 for site details: 1=Lake Gillawarna, 2=Wiley Park, 3=Riverwood Wetland, 4=street trees (4a= 5th, 7th, 8th Avenue; 4b=Brighton Avenue; 4c=Broadway; 4d=isolated palms, 5=Bankstown CBD, 6=Panania Town Centre, 7=RM Campbell Reserve, 8=Greenacre Public School, 9=Water tower, 10= Lakemba Rail Corridor 11 = Ruse Park, 12= Bankstown City Garden, 13= Maluga Passive Park, 14= Private property

2.3.1 Reducing anthropogenic food sources

Restricting access to anthropogenic food sources, particularly at waste landfills, is one of the primary methods that should be incorporated into any AWIMP. In urban environments, landfill sites provide a food source for ibis, often resulting in large numbers flying in to forage and significantly contributing to an artificially inflated population. The Kelso Waste Management Facility Bird Management Plan has been developed to address a range of issues including reducing ibis numbers at the site. Other artificial food sources have been identified across the LGA including food being left at outdoor eating establishments, food scraps left behind in parks and reserves, and feeding of birds in recreational wetlands and parks. CBC has implemented strategies to address this issue through installation of bins designed to minimise ibis foraging and community education and awareness, particularly at including an illegal dumping monitoring program at Bankstown CBD laneways (e.g. Take away Litter Program, Greenwood Litter Free, Park Litter Free).

2.3.2 Vegetation management

Vegetation management, mainly consisting of pruning exotic Canary Island date palm fronds to a 45-degree angle, has been done in the past on palms in CBC road reserves. This pruning program has been implemented for a number of years with some success, although the presence of eggs and chicks has often prevented vegetation management from occurring due to permit restrictions. Some tree removal was also completed within Bankstown CBD and on Railcorp land. Some vegetation management to reduce suitability for ibis has also been implemented at Lake Gillawarna, including removal of fallen trees, blackberry trees (*Rubus* sp.) coral trees (*Erythrina* sp.), and planting of native species including *Callistemon* species.

2.3.3 Breeding restriction (egg and nest removal/egg oiling)

With over 3,000 ibis residing on islands in Lake Gillawarna in 2003, BCC implemented various management actions to address this overabundance. Actions included egg and/or nest removals with a total of 2,133 eggs removed and 63 nests removed (2004 – 2009). Intermittent egg and nest removal in Bankstown CBD has occurred since 2011; however, it only occurs as needed based on public complaints.

2.3.4 Roost dispersal

In the Bankstown CBD, roost dispersal techniques such as spotlighting and installation of ultrasonic deterrents and spotlights have been implemented however had little success.

2.3.5 Monitoring

i. Roost counts

Periodic roost counts and population surveys have been undertaken at Lake Gillawarna since 2003 with other sites including Wiley Park, Riverwood Wetland, heritage-listed date palms,

Bankstown CBD, Panania Town Centre, RM Campbell Reserve, Greenacre Public School, Maluga Passive Park, and the Water Tower monitored irregularly (Table 1).

ii. Foraging surveys

Periodic foraging surveys have been completed at all known ibis sites within CBC.

iii. Illegal dumping

An illegal dumping monitoring program have been implemented at Bankstown CBD laneways.

2.3.6 Community education

Litter education programs have been implemented at Lake Gillawarna, Greenacre, Campsie Anzac Mall, Lakemba, Bankstown and Padstow.

Educational signs have been implemented to deter bird feeding at Wiley Park, Ruse Park and Maluga Passive Park. CBC officers have also had conversations with users of Wiley Park and Riverwood Wetland areas regarding inappropriate disposal of food scraps.

Advertisements in local newspapers and Council newspapers have also been used to aid community education about ibis.

3 Criteria for ongoing management

Criteria for management have been determined according to the need to maintain a viable ibis population while reducing impacts on the environment, limiting negative human/ibis interactions, and creating an environment that discourages unnatural ibis foraging.

All known ibis sites were assessed against the management criteria (Section 3, Appendix A) with targeted monitoring and management requirements and timings provided in Section 4.

Note that licences are also required for most management actions on native species, as detailed in Section 3.2.

3.1 Criteria

Monitoring and management requirements are based on the following criteria:

- population within or exceeds target population range
- proximity to nearest aerodrome
- proximity to food premises
- number of nuisance complaints
- site threshold.

Site action is based on a site meeting at least one criterium (Monitoring) or at least three criteria (Management) (Table 4).

Table 4 Criteria for management

Target population range	Proximity to Aerodrome[2]	Proximity to food premises	Number of nuisance complaints[3]	Site threshold	Action*
Within target population range (1,000 – 2,200)	≤ 13 km	> 20 m	Fewer than 5 per year	Exceeds threshold	**Monitor (see Appendix A)**
Exceeds target population (>2,200)	≤ 8 km	≤ 20 m	Greater than 5 per year	Exceeds threshold	**Manage (see Appendix A)**

3.1.1 Target population

A minimum of 1,000 and maximum of 2,200 ibis is the selected target population for CBC LGA and was determined through examination of the current population size, area of preferred ibis habitat (<40m elevation) and current strike history at Bankstown Airport.

[2] Based on National Airports Safeguarding Framework - https://infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/

[3] Unique complaints from separate individuals

3.1.2 Proximity to aerodrome

Adhering to International Civil Aviation Organisation (ICAO) guidelines relating to radial distances from airports (up to 13 km), the National Airports Safeguarding Framework (NASF) allocates risk categories to incompatible land uses (very low to high) and recommends actions for both existing and proposed developments (incompatible, mitigate, monitor, no action).

Based on the NASF, if an ibis colony (closest category is Wildlife Sanctuary / Conservation area - wetland) is located within eight kilometres of an aerodrome, management actions are recommended to be implemented to reduce risk of bird strike. Regular monitoring (quarterly at minimum) is recommended for ibis colonies between eight and 13 kilometres from an aerodrome (Figure 2).

3.1.3 Proximity to food premises

Any food premises (e.g. food stall or restaurant with outdoor seating) within 20 metres of an ibis site can attract ibis and could potentially cause issues with defecation, aggressive behaviour and increased likelihood for surrounding roosting/nesting behaviour. In addition to monitoring and management, it is recommended that food premises clean up tables soon after customers have left and install bird exclusions and deterrents where possible to prevent scavenging behaviour of ibis (see Appendix D for options).

3.1.4 Number of nuisance complaints

The number of complaints received from the public with regards to an ibis colony can determine if management and/or monitoring is required, as well as the priority of management.

3.1.5 Site threshold

Based on quarterly monitoring, if an ibis colony exceeds its threshold monitoring then management may be required. Population threshold for each ibis colony is shown in Appendix A.

3.2 Legislative requirements

At the time of writing, a reform to conservation and land management legislation in NSW was underway. The reform includes repeal and consolidation of some legislation with the *Biodiversity Conservation Act 2016*, with implementation planned to occur progressively during 2018.

3.2.1 *National Parks and Wildlife Act 1974*

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the conservation of nature, objects, places or features of cultural value and the management of land reserved under this Act. All native animals and many species of native plants are protected under the NPW Act. All native fauna, including ibis, are specifically protected under section 98.

Under this Act, licences can be issued for actions such as harming or obtaining any protected fauna for specified purposes, picking protected plants or damaging habitat of a threatened species, population or ecological community. This includes egg and nest removal/oiling, for which contractors must have a licence. CBC also requires an Occupiers Licence for activities on Council-managed land. In alignment with the Sydney Basin Plan (SBP), relevant licence requirements for ibis management have been defined in this AWIMP as per Table 5 below. Management actions to be implemented will determine the relevant license requirements.

3.2.2 Biodiversity Conservation Act 2016

Transition to the new bioreforms will see minimal change to the way licences are issued for managing wildlife. Existing licences will remain valid under savings, transitional and other provisions (Schedule 9) of the new Act. New Biodiversity Conservation licences will be issued that will apply specific conditions.

Licence requirements as at November 2017 are summarised in Table 5. These management actions should be conducted in combination with restricting access to anthropogenic food sources.

Table 5 Definition of ibis colonies and relevant licencing requirements (Australian White Ibis Taskforce 2009)

Ibis colony definition	Active management licence requirements	Ibis site ID	Site location within CBC
Small colonies (less than 50 individuals)	Australian White Ibis General (120) and Occupiers (121) licence	4b	Street trees: Brighton Avenue
		4c	Street trees: Broadway
		4d	Street trees: Isolated Palms
		6	Panania Town Centre
		11	Ruse Park
		12	Bankstown City Gardens
		13	Maluga Passive Park
Medium to large colonies (greater than 50 individuals)	Australian White Ibis General (120) and Occupiers (121) licence with accompanying site management plan	2	Wiley Park
		4a	Street trees: 5th, 7th, 8th Avenue
		5	Bankstown CBD#
		7	RM Campbell Reserve
		8	Greenacre Public School
		9	Water Tower (cnr Hume and Stacey Streets)
		10	Lakemba Rail Corridor
		14	Private property (various isolated palms)
Refuge colony	Australian White Ibis General (120) and Occupiers (121) licence with accompanying site management plan which indicates that at least 50% of active nests will be left undisturbed.	1	Lake Gillawarna

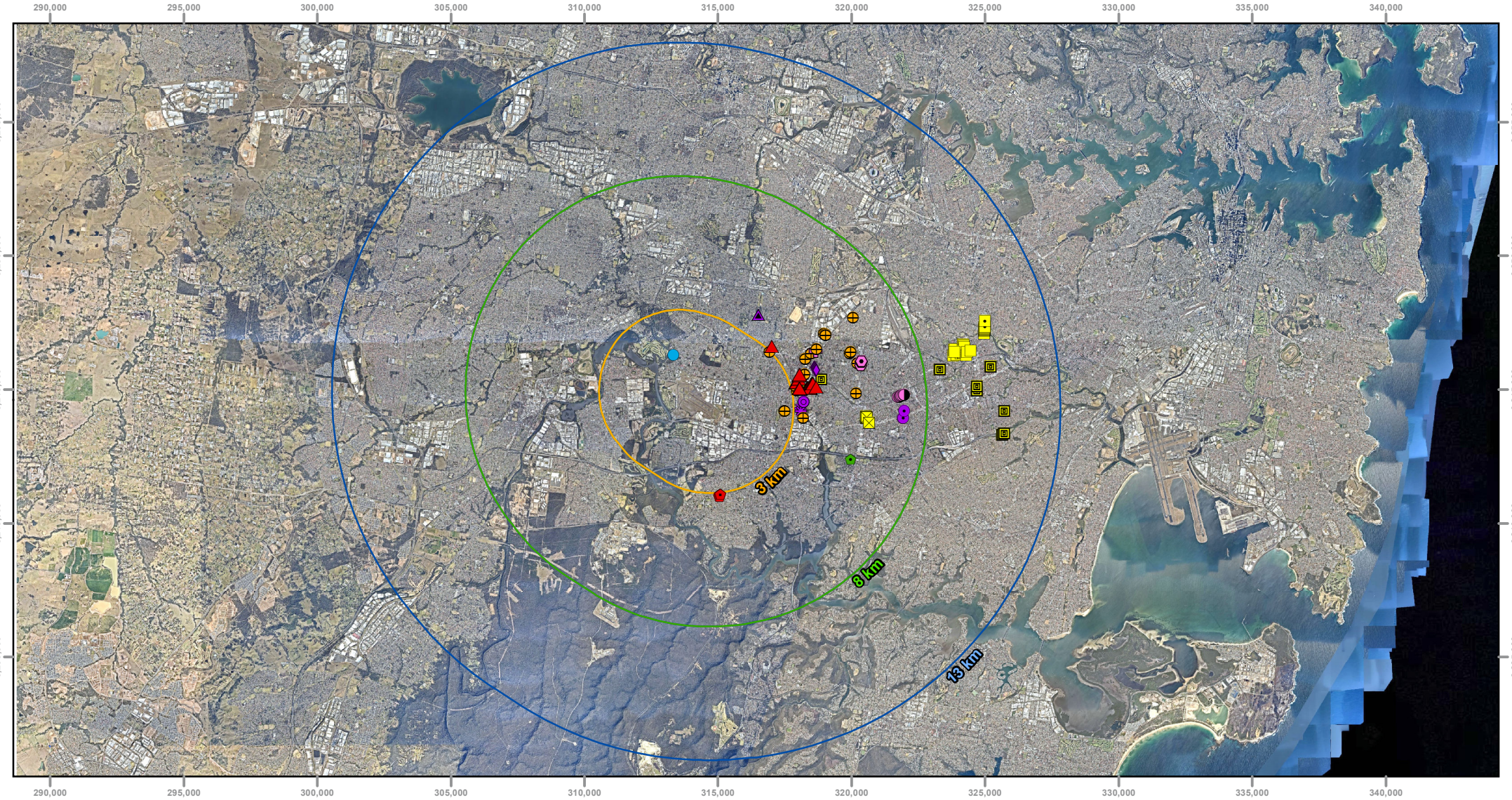

Figure 2: CBC ibis sites within NASF defined 13 km radius of Bankstown Airport

Canterbury-Bankstown Council

Ibis management plan

Airport boundary

Canterbury-Bankstown Council

Kelso waste management facility

Symbolised by site

Site 1
Site 2
Site 3 & 6
Site 4a
Site 4b
Site 5
Site 7
Site 8
Site 9
Site 10
Site 11
Site 12
Site 13
Site 14

Coloured by category

Parks and reserves
Private property
Refuge site/ sensitive wetland
Sensitive wetland
State government land
Street trees
Town centres

ecosure

Job number: PR2887
Revision: 0
Author: DJB
Date: 29/01/2018

0 1 2 4
Kilometers

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
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Data Sources: Ecosure Pty Ltd, 2017; Image
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4 Implementation strategy

All known ibis colonies were assessed against management criteria, with eight colonies to be monitored and five to be managed (Table 6). Private properties cannot be managed directly by CBC, however landholders are encouraged to manage vegetation to discourage ibis from roosting or breeding. Note that private landholders must obtain relevant licences (as per Table 5) if management may disturb a colony or engage a suitably qualified and licenced contractor.

Detailed assessment of ibis colonies can be found in Appendix A with best practice guidelines for ibis management in Appendix F and protocol in Appendix C. Additional passive bird exclusion measures and deterrents recommended for consideration in ibis management is provided in Appendix D.

CBC will ensure budget is allocated for monitoring and management requirements at ibis sites according to Table 6 within Council jurisdiction. Monitoring and management requirements include but are not limited to vegetation pruning, footpath cleaning, public education, ibis monitoring, liaising with State Government, commercial and private land holders where required. All monitoring and management activities will also occur according to appropriate licences and permits.

Table 6 Summary of management and implementation strategy.

Objectives	Monitoring actions	Monitoring timing	Management Actions	Management timing	By whom	Site Location	Performance indicator
Maintain ibis population below threshold	Ibis monitoring (evening roost counts[4] or daytime inspections[5], as appropriate for each site)	Quarterly	If population exceeds threshold, consider applying management actions to reduce ibis (see below)	As required	Sustainable Future Unit	All sites within CBC jurisdiction that are below ibis population threshold, including but not limited to: 1 – Lake Gillawarna; 2 – Wiley Park; 6 – Panania Town Centre; 8 – Greenacre Public School (Council land only); 11 – Ruse Park; 12 – Bankstown City Gardens; 13 – Maluga Passive Park	Ibis population maintained below threshold Total ibis numbers within the target population
Maintain as ibis foraging site only	Ibis monitoring (daytime inspection)	Quarterly	If any nesting behaviour is observed, consider egg and nest removal/egg oiling If any roosting behaviour is observed, consider dispersal techniques	As required	Sustainable Future Unit	3 – Riverwood Wetland	No roosting and/or nesting activities Total ibis numbers within the target population
Reduce ibis to population threshold	Ibis monitoring (evening roost counts)	Quarterly	Egg and nest removal Egg oiling	As required Fortnightly during breeding season	Sustainable Future Unit	All sites within CBC jurisdiction that exceed ibis population threshold, including but not limited to: 4 – Street trees;	Total ibis numbers within the target population

[4] Evening roost counts is to be undertaken for refuge sites i.e. Lake Gillawarna
[5] Daytime inspections involves assessing site for active nests and fouling below roost trees. If excessive fouling is observed, site monitoring may be followed by an evening roost count to determine population size.

Objectives	Monitoring actions	Monitoring timing	Management Actions	Management timing	By whom	Site Location	Performance indicator
			Consider installing bird exclusion and deterrents	As soon as possible		5 – Bankstown CBD; 7 – RM Campbell Reserve	
			Roost dispersal[6]	Twice per week at minimum when chicks are not present			
			Vegetation management	Annual, as required or in conjunction with egg and nest removal	Parks Unit		
Improve odour and public health risk	n/a	n/a	Remove dead ibis	Ongoing or as required	Waste Operations Unit	All sites within CBC jurisdiction	< 5 public complaints per year
			Clean footpath and furniture				
Reduce impact of ibis on water quality	n/a	n/a	If ibis population exceeds threshold, consider applying management actions to reduce ibis	As required	Sustainable Future Unit	All sites within CBC jurisdiction that are adjacent to water bodies, including but not limited to: 1 – Lake Gillawarna; 2 – Wiley Park	Total ibis numbers within the target population No excess weed or algal growth
			Water quality improvement project (designed to extract excess nutrients)	As required	City Design Unit		

[6] Roost dispersal should be used as to supplement to egg and nest removal, as roost dispersal alone is unlikely to prevent ibis from nesting. Roost dispersal should also only be considered in small ibis colonies so not to cause splintering of medium to large ibis colonies.

Objectives	Monitoring actions	Monitoring timing	Management Actions	Management timing	By whom	Site Location	Performance indicator
			Prepare a plan for maintenance of macrophyte beds (to remove excess nutrients)	Annual or as required	Sustainable Future Unit		
Reduce impact of ibis nesting or roosting adjacent to Council land	n/a	n/a	If ibis population exceeds threshold and complaints exceed five per year, liaise with landholder (e.g. State Government Agency) to implement actions to reduce ibis	As required	Sustainable Future Unit	Sites within CBC jurisdiction that are adjacent state government land, including but not limited to: 5 – Bankstown CBD (rail corridor); 8 – Greenacre Public School; 9 – Water Tower; 10 – Lakemba rail corridor	< 5 public complaints per year
Reduce ibis foraging ability on anthropogenic food sources	n/a	n/a	Education to reduce public littering, reduce bird feeding and minimise business littering and bin overflow	Ongoing	Sustainable Future Unit	All sites within CBC jurisdiction (especially Bankstown CBD and other town centres)	Ibis population maintained below threshold
			Maintain litter picking and collection of park and street bins		Waste Operations Unit/ Parks Unit		
			Coordinate installation of park and street bins designed to minimise ibis access		Sustainable Future Unit		
Improve community understanding of ibis	n/a	n/a	Educate public through engagement and positive media	Ongoing	Sustainable Future Unit	All sites within CBC jurisdiction	Fewer public complaints per year that has previously been received

Objectives	Monitoring actions	Monitoring timing	Management Actions	Management timing	By whom	Site Location	Performance indicator
Maintain Council requirements for protection of native wildlife	n/a	n/a	If egg and nest removal, egg oiling or roost dispersal[7] is required, obtain a 'licence to harm' from NSW OEH	As required	Sustainable Future Unit	All sites within CBC jurisdiction	Reports submitted to NSW OEH
			If egg and nest removal, egg oiling or roost dispersal is required, engage contractor with appropriate licence				
	Ibis monitoring (evening roost counts[8] or daytime inspections[9], as appropriate for each site)	Annually	Undertake ibis counts as part of the 'National Australian white ibis community survey'	October each year	Sustainable Future Unit	All sites within CBC jurisdiction	Survey results submitted to relevant authority

[7] Roost dispersal should be used as to supplement to egg and nest removal, as roost dispersal alone is unlikely to prevent ibis from nesting. Roost dispersal should also only be considered in small ibis colonies so not to cause splintering of medium to large ibis colonies

[8] Evening roost counts are to be undertaken for refuge sites i.e. Lake Gillawarna

[9] Daytime inspections involve assessing site for active nests and fouling below roost trees. If excessive fouling is observed, site monitoring may be followed by an evening roost count to determine population size.

5 Program review

The ibis management program will be reviewed annually, with a full review of the AWIMP every five years (Table 7).

Table 7 Ibis Management Program Review

Review item	Details	Timing	Responsible person
Review of existing ibis sites	All ibis sites to be monitored quarterly with any new sites added to the monitoring schedule.	Quarterly	CBC or qualified contractor
Addition of new ibis sites	New ibis sites need to be assessed based on criteria for management (section 3.1 and Appendix A).	As required	CBC or qualified contractor
Review of site-specific management strategies	Quarterly and annual monitoring data to be reassessed against management criteria with management actions amended if required. Any new ibis sites assessed and to be included in the management program must be added in accordance to the management flow chart (Appendix E).	Annually (November each year)	CBC or qualified contractor
Full review of AWIMP including criteria	This plan including criteria for management is to be reviewed with any new sites added and redundant sites removed. Any new ibis management techniques will also be included in Appendix F.	Every 5 years	CBC or qualified contractor

The flow chart in Appendix E can be used as a guide for any new ibis colonies considered for management within CBC.

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Appendix A Site management assessment

Site ID	Location	Colony size	Behaviour			Site issues						Management criteria					Management outcome
			Nesting	Roosting	Foraging	Public nuisance	Degraded water quality and visual amenity	Vegetation damage	Reduced fauna diversity	Public health risk	Aircraft hazard[#]	Target population range 1,000 – 2,200 – monitor >2,200 - manage	Proximity to aerodrome ≤ 13 km – monitor ≤ 8 km – manage	Proximity to food premises >20 m – monitor ≤ 20 m - manage	Public complaints <5 – monitor >5 - manage	Site population threshold See individual threshold below	
1	Lake Gillawarna	Refuge (1,145)	✓	✓	✓	✓	✓	✓	✓	✓	✓					1,200	Monitor
2	Wiley Park	Medium (136)	✓	✓*	✓	✓	✓	✓	✓	✓	✓					140	Monitor
3	Riverwood Wetland	Medium (40)	×	×	✓	✓	×	×	×	✓	✓					50	Monitor
4a	Street trees: 5th, 7th and 8th Avenue	Medium (total 58)	✓	✓*	✓*	✓	×	✓	×*	✓	✓					30	Manage targeted trees
4b	Street trees: Brighton Ave	Small (0)	✓	✓*	✓	✓*	×	✓	×*	✓	✓					10	Monitor
4c	Street trees: Broadway	Small (total 12)	✓	✓*	✓	✓*	×	✓	×*	✓	✓					10	Manage targeted trees
4d	Street trees: Isolated Palms	Small (total 43)	✓	✓*	✓	✓*	×	✓	×*	✓	✓					30	Manage targeted trees
5	Bankstown CBD	Medium (total 312)	✓	✓	✓	✓	×	✓	×*	✓	✓					150	Manage targeted trees
6	Panania Town Centre	Small (0)	×	✓	✓*	✓	×	×*	×*	✓	✓					10	Monitor
7	RM Campbell Reserve	Medium (110)	×	✓	✓	✓	×	×*	×*	✓	✓					80	Manage
8	Greenacre Public School	Medium (50)	×	✓	✓	✓	×	×*	×*	✓	✓					50	Monitor
9	Water Tower (cnr Hume and Stacey Streets)	Medium (60)	✓	✓*	✓	×*	×	×*	×*	✓	✓					40	Manage only on council land
10	Lakemba Rail Corridor	Medium (79)	✓	✓*	✓	✓	×	×*	×*	✓	✓					40	Manage only on council land
11	Ruse Park	Small (13)	✓	✓*	✓	✓	×	×*	×*	✓	✓					20	Monitor
12	Bankstown City Gardens	Small (12)	✓	✓*	✓	×*	×	×*	×*	✓	✓					20	Monitor
13	Maluga Passive Park	Small (11)	✓	✓*	✓	×*	×	×*	×*	✓	✓					20	Monitor
14	Private property (various isolated palms)	Medium (total 55)	✓	✓*	✓	✓	×	×*	×*	✓	✓					100	n/a as not jurisdiction at private properties
15																	
16																	
17																	
18																	

Site ID	Location	Colony size	Behaviour			Site issues						Management criteria					Management outcome
			Nesting	Roosting	Foraging	Public nuisance	Degraded water quality and visual amenity	Vegetation damage	Reduced fauna diversity	Public health risk	Aircraft hazard#	Target population range 1,000 – 2,200 – monitor >2,200 - manage	Proximity to aerodrome ≤ 13 km – monitor ≤ 8 km – manage	Proximity to food premises >20 m – monitor ≤ 20 m - manage	Public complaints <5 – monitor >5 - manage	Site population threshold See individual threshold below	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
32																	

#ibis colony within 13km of an aerodrome may increase the likelihood of a bird strike (orange).
*no assessment has been undertaken or insufficient information available to determine ibis impact on attribute
Green: site meets criteria for monitoring only; Orange: site meets criteria for management.

Appendix B Site values of key ibis colonies

The below site values have been copied from the Management Plan for Australian White Ibis in the Bankstown Local Government Area (Bankstown City Council 2012) and the Draft Australian White Ibis Management Plan (City of Canterbury 2016). Note that any references to figures have been removed.

1.1 Lake Gillawarna (Site 1)

Lake Gillawarna in the Mirambeena Regional Park is an artificial freshwater wetland that was created in 1973, consisting of two large water bodies separated by a 10m wide channel. The Lake flows into Prospect Creek over a system of weirs and is situated downstream of Amaroo Wetland.

The south node of Lake Gillawarna contains two islands, one large island of approximately 0.45 hectares ("main island") and a smaller island in the southeast corner of the lake of approximately 0.03 hectares ("small island"). The north node of Lake Gillawarna contains another island of approximately 0.18 hectares ("north island").

The vegetation on the islands is a mix of native and exotic trees and grasses. The main island contains native Casuarina species and exotic Coral trees (Erythrina spp.) with large areas of Alligator weed, *Alternanthera philoxeroides*, and a mix of native and exotic grasses. The small island consists of Coral trees and a few Melaleuca species. The north island is dominated by Paperbark trees (Melaleuca spp.).

2.1.2 Site significance

2.1.1.1 Biological

Under the Local Government Act 1993, the reserve is classified as "community land". Landscape consists of natural areas of bushland and watercourse/wetland, as well as open grassed park area. Stands of remnant Cumberland Plain Woodland, an endangered ecological community, occur to the north and south of Lake Gillawarna, with dominant tree species *Eucalyptus moluccana* and *Eucalyptus tereticornis*. Sydney Coastal River Flat Forest, also an endangered ecological community, containing dominant tree species *Eucalyptus bauerana* and *Casuarina glauca* and dominant shrub species *Melaleuca ericifolia* and *Callistemon* spp. is located to the west of Lake Gillawarna along Prospect Creek.

At least 46 bird species have been recorded in the immediate vicinity of Lake Gillawarna (refer to Appendix 5), including 9 native waterbirds that breed successfully alongside the ibis. A number of these are regionally significant including the Great Egret (*Ardea alba*) which is listed on JAMBA/CAMBA. McKay and Nordstrom (1997) identified the Regent Honeyeater (*Xanthomyza phrygia*) and Bush Stone-curlew (*Buirhinus grallanus*) at Lake Gillawarna, both of which are listed as endangered on the NSW Threatened Species Conservation Act 1995 (TSC Act). There have been no recent site-specific fauna surveys; however, the extensive

Cumberland Plain Woodland remnants and other vegetation associations in relatively healthy condition provide suitable habitats for a diverse range of species.

2.1.1.2 Aboriginal

NPWS Aboriginal Sites Register did not identify any known Aboriginal sites within Mirambeena Reserve and the land is not categorised as culturally significant. However, Prospect Creek may have been used by Aboriginal people for fishing, so Mirambeena Reserve may contain artefacts along its banks.

2.1.1.3 Historical

The original owner of the Lansdowne Reserve was Lieutenant John Shortland. He received an initial grant of 100 acres over the northern part, which he increased to 380 acres (154ha) in 1800. The estate incorporates what is now known as Mirambeena, Lansdowne, Boggabilla and Amaroo Reserves. The reserves contain Cumberland Plain Woodland that once stretched from Sydney to the Hawkesbury River. In 1922, plans were devised to sub-divide the entire estate. In 1948, the Cumberland Planning Scheme recommended the reserves be included as part of a web of open space. BCC has managed these reserves as open space for the purpose of passive recreation activities. Artificial ponds were created at Lake Gillawarna in the mid 1970's.

2.1.1.4 Recreational

Mirambeena Reserve contains extensive recreation facilities, including exercise track, barbeques, and shade shelters with tables, playground equipment, car park and public toilets, which are frequently used by picnickers, cyclists, walkers and joggers. The natural areas and wildlife of Lake Gillawarna enhance the passive recreational values of the reserve.

1.2 Bankstown CBD (Site 5)

The Bankstown CBD, for the purpose of this management plan, is defined as bounded by Marion Street, North Terrace, West Terrace, South Terrace, Old Town Centre Plaza, Chapel Road South and Olympic Parade Bankstown. The CBD Site is 5.3km from Lake Gillawarna where there is a recognised refuge breeding colony. Ibis were first noticed in the CBD during the 2004/05 breeding season. Locations where Ibis are nesting and roosting in various trees around the CBD, including on Council land and also RailCorp land.

2.2.2 Site Significance

2.2.1.1 Biological

The Bankstown CBD area contains mainly planted landscape street and park trees. Whilst there may be some remnant vegetation in the surrounding suburbs no comprehensive fauna or flora survey has been undertaken. There are date palms *(Phoenix canariensis*) in the Council operated Marion Street Car Park that Ibis have previously used as nesting trees. The

rail corridor and land adjacent to the stormwater canal contains a variety of native and exotic trees including date palms *(Phoenix canariensis)* which are particularly attractive as nesting sites for Ibis. No comprehensive fauna surveys have been undertaken in the CBD area.

2.2.1.2 Landscape

The landscape includes the Bankstown Railway station and surrounding pedestrian areas, CBD offices, street level retail areas, residential medium and high rise and bus interchange. There are a large number of office buildings to the north and residential high-rise to the south of the rail station. To the north is the Civic Precinct with a large open grassed area adjacent to the Bankstown Town Hall (Paul Keating Park). Ibis have been reported roosting in trees in residential streets south of the rail station as well as in trees in Marion Street. There is ample evidence of droppings on footpaths in these areas as well as nearer to the rail station

2.2.1.3 Aboriginal

No assessment of Aboriginal history of the Bankstown CBD has been undertaken by Council.

2.2.1.4 Historical

The Bankstown 'Parcels Office' is located to the south of the railway. This building is owned and managed by RailCorp and is vacant apart for some ad-hoc storage. The building is listed on Council's Local Environment Plan (LEP) as locally significant. The building has suffered through lack of active use and regular maintenance. Although highly intact, the building is in a poor physical condition. From a recent heritage study undertaken by Bankstown City Council:

"The large (date) palm at the east end of the building and the ivy on the south façade need to be removed to help conserve the building" (Godden Mackay Logan - Heritage Consultants for BCC, 2007)

RailCorp removed the date palm in 2011.

2.2.1.5 Recreational

The area around the Bankstown Railway station is generally most busy during peak hours. It is a central pedestrian area and hub for public transport to the Sydney CBD and also to the north and south of Bankstown. The area mainly supports the general functions of the CBD, shops, offices, walkways, outdoor seating, bus terminus, parking, bike storage and commuter access. There are a number of food shops and cafes that provide outdoor seating. Additionally, on the south side of the rail line there are two large grassed areas with outdoor seating.

In August each year Council holds a food festival on the south side of the rail station. The festival takes place on a weekend over a period of 8 hours and approximately 30,000 visitors attend annually.

To the north of the Rail station is the Civic Precinct containing Paul Keating Park, a large open

grassed area and playground of approximately 1 ha, surrounded by a variety of native trees. Ibis have occasionally been seen in this park, usually after rain.

There are additional park lands and playing fields within 1 - 2 kilometres south of the CBD. These include the Memorial Oval Precinct and Bankstown City Gardens where Ibis can often be seen, particularly after rain.

1.3 Canary Island date palms (Site 4)

A total of 207 Canary Island date palms (*Phoenix canariensis*) are located on the road reserves throughout the City. No survey has been undertaken on the number of Canary Island date palms located in the City's parks, Council and private property.

Of these 207 palms, 191 are listed as heritage items under the Canterbury Local Environment Plan 2012 and have Conservation Management Strategies in place to promote longevity and conservation. The palms are thought to have been planted as part of memorial plantings during the early twentieth century through to the interwar period.

The location of the heritage listed Canary Island date palms are:

Eighth Avenue, Campsie – 65 palms
Fifth Avenue, Campsie – 94 palms
Brighton Avenue, Croydon Park – 10 palms
Broadway and Hillcrest Avenue, Punchbowl – 22 palms

The location of the non-heritage listed Canary Island date palms are:

Bexley Road, Campsie -1 palm
Forrest Avenue, Campsie – 4 pams
Nicholas Avenue, Campsie – 3 palms
Oswald Street, Campsie – 2 palms
Seventh Avenue, Campsie – 2 palms
Albert Street, Belmore – 3 palms
Hood Avenue, Earlwood – 1 palm

In the past five years, four palms have died as a result of Fusarium Wilt (*Fusarium oxysporum*). The exact cause of the infection is not known, however it is thought to have been through contaminated pruning equipment, movement of contaminated vegetative material or the transfer of contaminated soil. Anecdotally it is also believed that the movement of ibis between trees used for nesting and roosting may transfer the organism between palms, however there is no scientific evidence for this route of infection.

1.4 Wiley Park (Site 2)

Wiley Park, 1071 Canterbury Road Wiley Park, is a large multipurpose park, in a high density residential area. The park is landscaped and takes in formal, structural, water and natural elements. Ibis forage throughout the park and only recently began to nest in trees around the top pond; three nests are located in two Casuarina Trees. The ponds are a haven for ducks and other water birds that have arrived naturally or been released by local residents.

A large number of park users and nearby residents feed the birds. This has been an ongoing issue for a number of years, however in more recent years the amount of food left has increased significantly.

Council considers the current size of the ibis colony in Wiley Park is appropriate.

1.5 Riverwood Wetlands (Site 3)

In 2005 Council opened the newly constructed Riverwood Wetlands at 151 Belmore Road, Riverwood. The wetland park consists of a large lake, islands, playgrounds, skateboard park, picnic and barbeque areas.

Ibis forage throughout the park and feed on food provided by the public. No signs have been provided advising not to feed the birds.

Council does not consider Riverwood Wetlands as a suitable location for the establishment of an ibis colony.

Appendix C Protocol

Precautions for working *in situ* with native birds.

If individual birds appear sick, particularly if they show symptoms (such as excessively watery eyes, swelling of the head and eyelids, ruffled feathers, etc.), consult with a veterinarian before handling them or bringing them into any facility. If necessary, use biohazard handling procedures with moribund or dead birds – secure them and get them to post mortem ASAP.

Do not approach large “die-offs”. Seal off the area and consult either the State Department Primary Industries or the local veterinarian. If possible record the following: time, coordinates, weather conditions, species and estimated numbers involved (observe remotely) and contact details of nearby local residents. Take note of predator/scavenger activity and record the observations of local residents if available. The higher risk wild species include ducks, geese, swans, gulls, terns, shore birds, waders, egrets, herons, spoonbills, ibis and migratory or semi-nomadic species within these groups – BUT “die offs” of any species should be treated with caution.

In rescue and rehabilitation centres all incoming birds should be quarantined before mixing with resident birds. Avoid mixing species and birds from different regions, and unnecessary bird-to-bird contact.

Protect yourself when handling birds. Wear heavy gloves when handling birds that can pierce skin with beak or claws; otherwise, wear dish gloves or disposable gloves. Wear protective overalls that can be easily and regularly changed/cleaned or preferably use non-absorbable disposable barrier suits.

When cleaning equipment, collecting samples, or handling faeces or faecal contaminated feed and water, wear disposable gloves, then discard and wash hands with warm soapy water/disinfectant immediately.

Avoid conducting post mortems on birds in the field unless you have an adequate portable facility. Transport the birds to an appropriate regional post mortem facility. Use protective clothing including biohazard mask.

When working with wild populations routinely collect blood, cloacae and choanal smears. Process and bank these samples – they may be useful for future disease tracking.

If collecting blood, faecal, or tissue samples, wear gloves and protective clothing. Handle samples and sharps according to established bio-safety protocols.

Do not eat, drink or smoke while handling birds or cleaning contaminated equipment.

During any procedure regularly change gloves and wash your hands with warm soapy water or disinfectant followed by 70% alcohol rinse.

Use appropriate disinfectants to wash equipment (e.g. sampling tools, bird restraint, holding,

and transportation devices, banding tools or bird bags) or any potentially contaminated surface.

Always work in a well-ventilated environment. If working outdoors, remain upwind of birds and avoid inhaling dust and feather aerosols. If you are working in an environment where splash or aerosols are generated (using high pressure hoses, or in ponds), consider wearing eye protection and a face mask to prevent contact with eyes, nose and mouth.

Dispose of all potentially contaminated material immediately in an appropriate manner.

If you are ill, particularly if you have viral respiratory tract disease, avoid working with wild avian species until fully recovered. If you become ill after handling birds consult your doctor and inform your doctor that you have been in contact with wild birds.

Be diligent with insect protection (long sleeves, long trousers and repellent) especially when working in swampy water-bird habitat (arbovirus protection).

Appendix D Passive bird exclusion measures and deterrents

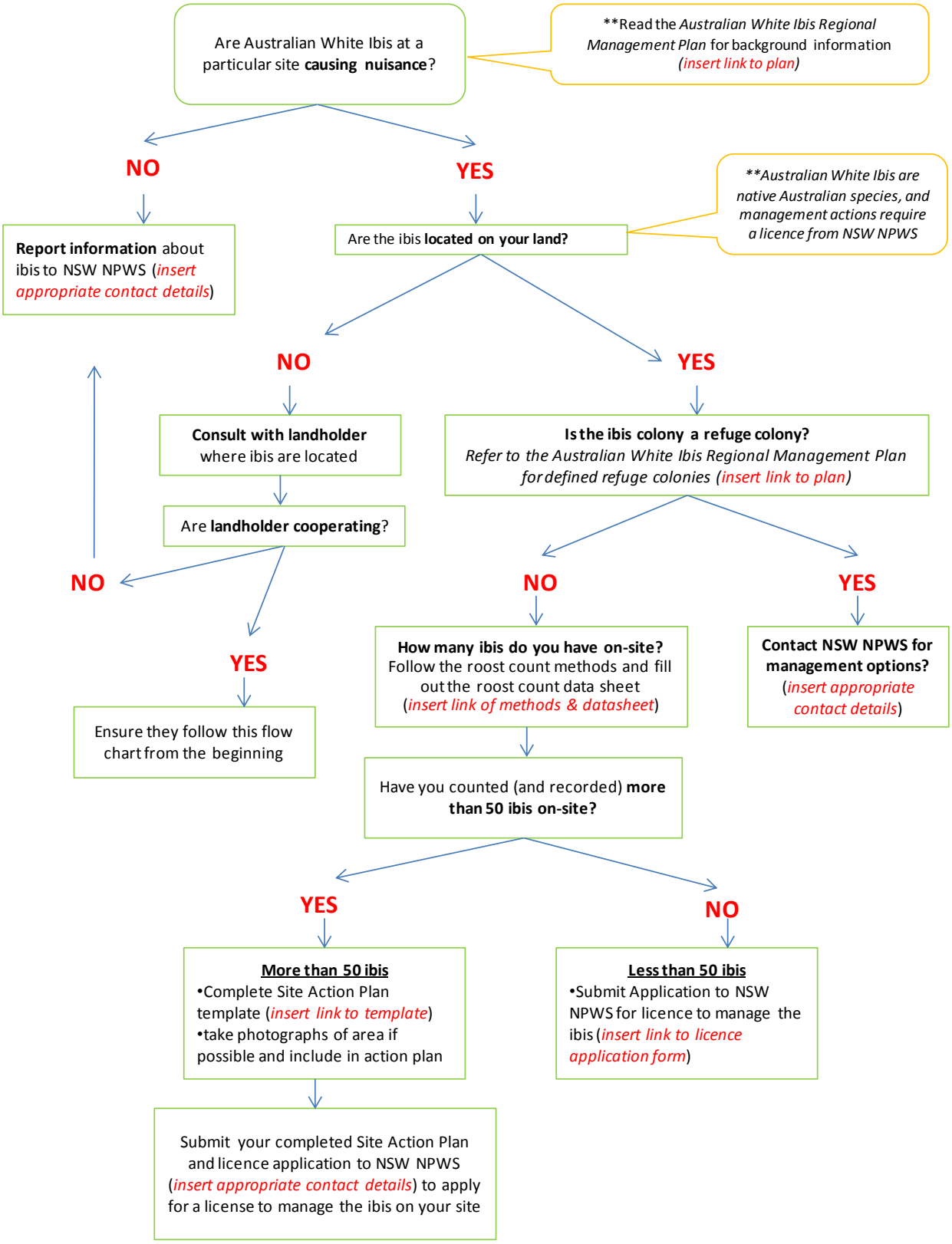
The following bird exclusion measures and deterrents should be considered where ibis issue areas are identified (i.e. based on results of quarterly monitoring). Many of these are readily available, and others have been custom-designed based on our understanding of bird physiology and behaviour. An analysis of each option and their suitability is described below.

Mitigation method	Design intent	Advantages	Disadvantages
Bird spikes	Install on surfaces to deter birds from landing. Spike configuration and diameter need to consider target species. Spikes must always have rounded ends to ensure animal welfare should a bird attempt to land on them.	Easy to install. Long lasting. Non-harmful. Minimal replacement/maintenance requirements.	Negative public perception at some sites, although educational signage could overcome this. May trap debris (vegetative material, etc) - when built up this may create suitable nesting conditions. May require bolting into concrete which will require relevant engineering approval.
Netting/ wire mesh	Excludes birds from undesirable areas, particularly useful to prevent access to nest sites.	Humane if appropriate mesh size selected and correctly installed and maintained (to avoid entanglement). Cost effective. Relatively simple to install.	May trap debris. Material netting will degrade requiring regular replacement and potential to pollute the environment. Metal netting more difficult to install (although has greater durability).
Wires	Wire strand(s) to make perching areas unstable.	Cost effective. Easy to install. Market available wire suitable for large birds only but could possibly use two sets of wire to target small and large birds. Discreet.	Fine wire required for small birds would need to be replaced regularly. Broken wire may pollute the environment.
Canopy- mounted water sprinklers	Low pressure sprinkler system installed on target surface/high pressure sprinkler system directed at target surface (i.e. installed in or around target trees).	Humane. No negative public perception. Can be logistically difficult (installation and water sourcing)	Slip hazard for staff and public Pump and system moderately expensive. Would need to be on a random timer to avoid birds habituating. An operational plan should be developed to ensure that design and use of sprinklers is considerate of human safety, animal welfare and features of the site (i.e. slip hazard and/or could impact environmental values of the site)
Bird Shock Track or Flex Track	Electrified track emits an irritating pulse to deter perching. This could be installed on perching points around the affected areas. Appropriate voltage must be used to ensure shocks do not cause significant pain or injury (including in wet weather).	May have negative public perception Flex Track can be installed on flat and curved hard surfaces Low profile. If tracks can't be personally inspected a mobile phone application to monitor tracks condition and voltage is available. An alarm can notify user via text message of any fence related issue.	Needs regular power source. Tracks are glued to surfaces – maintenance requirements uncertain due to exposure to weather. Potential welfare impacts. Public perception issues.

Mitigation method	Design intent	Advantages	Disadvantages
Lasers	Scares birds when pointed at them	Easy to use. No installation costs.	Restrictions on power of laser under Weapons Act 1990. Not effective during the day.
Bright lights installed in roosting areas	Aimed at reducing attractiveness of evening roosting areas. Care must be taken to ensure all areas are lit, and ibis may habituate to lighting if alternative roosts are not readily available. Exclusion (e.g. netting) is preferred over deterrents.	Permits not required provided not interfering with an animal breeding place.	Floodlights in roost trees may deter ibis; however, they will readily find an alternative roost nearby
Ultrasonic speakers in roosting and foraging areas	Aimed at interrupting acoustic communication for bird species at roosting and foraging sites.	If effective could reduce ibis roosting and foraging at sites.	Permits may be required. May cause noise complaints by the public Limited trials regarding ibis

Appendix E Flow Chart

The following flow chart can be used as a guide for any new ibis colonies considered for management within CBC.



Appendix F Best practice guidelines for ibis management and equipment use

Australian White Ibis Management

Best Practice Guidelines 2017

Ibis Management Coordination Group

Acronyms

AWIMP	Australian White Ibis Management Program
DMP	Damage mitigation permit
EHP	Department of Environment and Heritage Protection
IMCG	Ibis Management Coordination Group
NSW	New South Wales
QLD	Queensland
SEQ	South East Queensland

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Overview

The following guiding principles should be considered prior implementation of ibis management:

- Acknowledge that Australian white ibis (*Threskiornis molucca*) is an important Australian native species that has suffered declines in its traditional inland breeding habitat and has since adapted in urban and peri-urban environments.
- Management actions should be applied with consideration of the national, regional and local ibis population context, with a target population range established for each region where management occurs.
- Overabundant Australian white ibis and their management can impact various stakeholders and these stakeholders should be consulted prior to implementation of management actions
- Recognise that human derived food sources are the main driving force of urban ibis population growth and eliminating these is the key to Australian white ibis management.
- Australian white ibis management should be completed under the coordination of a stakeholder group such as the Ibis Management Coordination Group (IMCG) and according to a Regional Ibis Management Plan prepared by a suitably qualified and experienced person

1 Introduction

The Australian white ibis is a large, colonial wetland bird that has readily adapted to life in urban environments. Unnaturally large ibis populations are now found in many urban areas along the east coast of Australia, primarily because of easy access to abundant food sources such as some waste landfills. Large numbers of ibis in urban environments result in public complaints, present an aircraft safety hazard and impact negatively on biodiversity. There are also risks to public health and animal production species.

To address these issues, the Ibis Management Coordination Group (IMCG; now known as the Southern Ibis Management Coordination Group) initiated an Australian White Ibis Management Program (AWIMP) in 1996, to coordinate a regional approach to ibis management on the Gold and Tweed Coasts. Based on successful outcomes in both these coasts, several local government areas to the north of the Gold Coast implemented an AWIMP during the early 2000s. For ease of coordinating these programs, in 2005/06 the Northern IMCG was formed, incorporating stakeholders located within Sunshine Coast, Moreton, Brisbane, Redland and Logan local government areas. See Appendix A for the history of the IMCG and AWIMP.

The purpose of this document is to provide general information and best practice methods for managing Australian white ibis in Queensland (QLD) and northern New South Wales (NSW).

2 Species profile

The Australian white ibis is one of three native species of ibis found in Australia. It is a native wetland bird that is protected under both the QLD *Nature Conservation Act 1992* and NSW *National Parks and Wildlife Act 1974*. According to Shaw (2006) Australian white ibis have readily adapted to life within the urban environment. The geographic range of this species has expanded since European settlement, initially benefiting from the conversion of the natural environment to agricultural areas. It has further extended its range into urban areas, clearly demonstrating an ability to opportunistically utilise resources in a new environment (Shirreffs, et al. 1997).

Urban populations of ibis are known to exploit a range of natural and anthropogenic food sources. Natural feeding occurs primarily in wetlands, grasslands and mudflats, and natural diet is largely comprised of aquatic invertebrates (Marchant and Higgins, 1990). Studies by Murray (2005) identified that there are two relatively distinct urban ibis populations; those that forage primarily at landfills and those that forage in areas such as parks, theme parks, schools and foreshores. Landfill foraging ibis make up approximately 70% of the overall population (Ecosure unpublished). Murray (2005) found that non-landfill foraging ibis have a very small home range and rarely venture more than three kilometres from their roosting colonies, while landfill foraging ibis can travel up to 25 kilometres one way for easy access to abundant food sources provided at landfills.

Ibis are colonial species, which breed in a wide variety of habitats. They typically nest in low vegetation on wetland islands. However, in urban areas may use all strata of vegetation in close range of their feeding grounds (Ecosure personal observation). Breeding sites are often used year after year. Ibis typically breed in serially monogamous pairs, nesting between July and March. The duration of the breeding season depends on access to vital resources, and may be extended within urban environments due to constant water and food supplied from anthropogenic sources (Ecosure personal observation). There can be hundreds, or sometimes thousands, of breeding pairs in a single ibis colony. A breeding pair usually produces one to two young per year, but where resources are abundant a second or third clutch of one to four chicks can be produced (Ecosure unpublished). It is this opportunistic breeding ability that has contributed to an extended distribution and artificially high population within its range.

Figure 1 Typical ibis breeding colony; Black Swamp, September 2003

Populations in marginal areas are semi-nomadic following recent rainfall along watercourses. Juvenile ibis usually disperse from their birth colony, often travelling thousands of kilometres to join unrelated colonies or to congregate with other juveniles. Ibis tend to be sedentary in areas where resources are stable and satisfy their requirements, such as in urban environments. There may be reduced juvenile dispersal from urban colonies, although banding studies in Sydney (Ross 2006, Martin et al 2010) suggest that some juveniles still emigrate over sub-continental distances. The following table summarises the biological attributes of the ibis.

Table 1 Summary of the Australian white ibis' biology (Marchant and Higgins 1990)

Attribute	Ibis Profile
Name	Australian white ibis (*Threskiornis molucca*) Family Threskiornithidae
Range	Northern Indonesia, New Guinea, and all states and territories of Australia (irregular visitor to Tas), excluding very arid inland areas. Occasional vagrant to New Zealand.
Natural nesting habitat	Marine and fresh water wetlands.
Urban nesting habitat	Remnant wetlands, remnant bushland, botanic gardens, residential yards.
Natural foraging habitat	Marine and fresh water wetlands, coastal mudflats, wet grasslands.
Artificial foraging habitat	Irrigated croplands, urban picnic areas, sports ovals, schools and landfills; also, intensive poultry, pig and cattle enterprises.

Attribute	Ibis Profile
Natural diet	Aquatic and terrestrial invertebrates, although frogs, small mammals and fish will also be eaten.
Artificial diet	Ibis are opportunistic feeders and will feed on most food wastes.
Breeding season South East Queensland (SEQ)	July to March (peaking September to December). Ibis have been known to nest in April and May in urban settings where food resources are abundant (Ecosure personal observation), although this is rare. Variations of breeding season in natural populations are dependent on latitude and rainfall.
Weight	Approximately 1.4-2.5 kg; males larger.
Length	65-75 cm
Wingspan	1.10-1.25 m
Status	Common

3 The ibis issue

Within their natural foraging habitat, ibis play a vital role in consuming and controlling pasture grubs and wetland invertebrates. However anthropogenic food sources have redistributed and concentrated (e.g. at landfills) which has contributed to significantly increased urban ibis populations, resulting in them becoming a community 'pest'. Pest species can be defined as "any animal that has a detrimental impact on economic, social or conservation values or resources" (Bomford & Sinclair 2002). In accordance with this definition, ibis in urban areas can be considered a 'pest species' at times due to documented adverse effects on public aesthetics, aircraft safety, native flora and fauna and real and perceived risks to public health and animal production industries (Murray 2006).

3.1 Public nuisance

Ibis colonies often elicit complaints from nearby residents due to noise, smell and accumulated excrement. Noise is a significant issue as the breeding season coincides with the early sunrises of spring and summer. It is common for ibis to make sleep disturbing noise from 0400 hrs onwards. The smell of droppings, carcasses and broken eggs, magnified by the summer heat, also contributes to public concern.

The main problems caused by ibis foraging in public areas include smell, noise, aggressive food solicitation, unsightliness and environmental contamination. Consequently, the recreational value of ibis-populated parks may be reduced and urban ibis may cause injury, damage and contamination of eating areas or utensils. Given the opportunity, ibis will also upturn bins and scatter rubbish whilst scavenging food, creating further nuisance.

3.2 Fauna displacement

High numbers of native bird species can harm other native species (Bomford and Sinclair 2002). The presence of large breeding congregations of ibis in fragmented urban habitats may physically exclude other fauna species. Ultimately this may result in decreased biodiversity and interrupt ecosystem processes. A study at Currumbin Hill Conservation Park on the Gold Coast found that the establishment of an ibis colony in the park coincided with the decrease in numbers of the endangered Richmond Birdwing Butterfly (*Ornithoptera richmondia*) (McKee & Lees 1995). Shaw (1997) reported that as ibis numbers declined following persistent management strategies implemented by the IMCG, butterfly abundance started to increase.

3.3 Damage to vegetation

The loss of nesting habitat within breeding colonies due to structural damage and effects of excrement may influence the long-term suitability of sites for ibis breeding (Kentish 1999). Ibis collect nesting material from living trees, smother foliage when establishing nests and can defoliate branches upon which they roost. Ibis deposit excreta, carcasses and nesting material, which may suppress seedlings in the understorey. Whilst long-term damage may

move ibis populations to healthier breeding sites, the degradation of the habitat induced by ibis may act to exclude populations of other fauna groups. The below photograph taken in Bundaberg City Botanical Gardens shows an unnaturally abundant ibis population severely damaging supporting vegetation.

Figure 2 Defoliated branches and smothered vegetation; Bundaberg City Botanic Gardens, October 2006

3.4 Water pollution

Colonial roosting and nesting habits of water birds can contribute to reduced water quality through nutrient loading by the nitrogen and phosphorus content of their excrement (Post *et al.* 1998). This in turn leads to reduced aesthetic appeal, increased smell and public health concerns and in extreme cases fish kills.

3.5 Risk to public health and production species

Ibis are known to carry a range of pathogens that are potentially transmissible to humans and production species (Epstein et al. 2006). Salmonellosis, which is associated with poor hygiene in recreation areas, presents the most likely threat to human health. Aggressively scavenging ibis have caused minor injuries to humans and cause distress to children and their parents (McKee & Lees 1995). Several viral diseases that may be transmitted to humans or production species are detected in urban ibis populations (Legoe 2004, McKee 2006). Of these, avian influenza virus and Newcastle disease are potential problems for the production animal industries. Although no serious ibis related outbreaks in humans or animals have been reported to date, it is likely that as urban ibis populations increase the associated public health risk also increases.

3.6 Risk of aircraft strike

The initial motivation for the formation of the IMCG, and subsequent population management programs on the Gold Coast, stemmed from the ingestion of an ibis into a Qantas Airbus engine causing several million dollars' worth of damage. The extent to which ibis will travel is not yet fully understood, however they are known to travel up to 25 km in and out of roosting/nesting sites and their feeding grounds (Murray 2005). Based on Murray (2005), Ibis therefore from a number colonies within the Region may pose a threat to operations at surrounding airports. The Australian Transport Safety Bureau (2017) found that ibis were the nineteenth most commonly struck bird from 2006 to 2015. However, due to the relative size of the ibis and the potential damage to a plane struck by such a large bird, they ranked thirteenth on the damaging bird strikes to aeroplanes from 2006 to 2015.

In May 2012, the Department of Infrastructure and Regional Development released the National Airports Safeguarding Framework (NASF) which provides informed land use planning regimes to safeguard airports and adjacent communities. Guideline C of the NASF, *Managing the Risk of Wildlife Strikes in the Vicinity of Airports*, guides land managers and decision-makers in the management of wildlife hazards. Adhering to International Civil Aviation Organisation (ICAO) guidelines relating to radial distances from airports (up to 13 km), the NASF allocates risk categories to incompatible land uses (very low to high) and recommends actions for both existing and proposed developments (incompatible, mitigate, monitor, no action).

Table 2 National Airports Safeguarding Framework Guideline C: Managing the Risk of Wildlife Strikes in the Vicinity

Land Use	Wildlife Attraction Risk	Actions for Existing Developments			Actions for Proposed Developments/ Changes to Existing Developments		
		3 km radius (Area A)	8 km radius (Area B)	13 km radius (Area C)	3 km radius (Area A)	8 km radius (Area B)	13 km radius (Area C)
Agriculture							
Turf farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Piggery	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fruit tree farm	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Fish processing /packing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Cattle /dairy farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Poultry farm	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Forestry	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Plant nursery	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Conservation							
Wildlife sanctuary / conservation area - wetland	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Wildlife sanctuary / conservation area - dryland	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Recreation							
Showground	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Racetrack / horse riding school	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Golf course	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sports facility (tennis, bowls, etc)	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Park / Playground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Picnic / camping ground	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Commercial							
Food processing plant	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Warehouse (food storage)	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Fast food / drive-in / outdoor restaurant	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Shopping centre	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action
Office building	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Hotel / motel	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Car park	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Cinemas	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Warehouse (non-food storage)	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Petrol station	Very Low	Monitor	No Action	No Action	Monitor	No Action	No Action
Utilities							
Food / organic waste facility	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Putrescible waste facility - landfill	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Putrescible waste facility - transfer station	High	Mitigate	Mitigate	Monitor	Incompatible	Mitigate	Monitor
Non-putrescible waste facility - landfill	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Non-putrescible waste facility - transfer station	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Sewage / wastewater treatment facility	Moderate	Mitigate	Monitor	Monitor	Mitigate	Mitigate	Monitor
Potable water treatment facility	Low	Monitor	Monitor	No Action	Monitor	Monitor	No Action

4 Status and legislation

The Australian white ibis is a native Australian species protected in QLD under the *Nature Conservation Act 1992* and in NSW under the *National Parks and Wildlife Act 1974*.

In QLD, a Damage Mitigation Permit (DMP) authorised by the Department of Environment and Heritage Protection (EHP) is required to manage ibis breeding colonies. A DMP is only issued on the basis of an ethical, multi-facetted management plan.

In NSW, a General Licence (under Section 120 of the Act) must be obtained for an individual or an organisation to perform ibis egg and nest removal. A site-specific Occupiers Licence (under Section 121 of the Act), including landholder authorisation, is also required for management activities at each site.

A permit is not generally required for landfill dispersal or roost dispersal. However, it is important to note that roost dispersal must not disturb non-target native species, or any breeding adults where dependent young may be impacted. Such disturbance may constitute a breach under animal welfare legislation.

5 Management methods

5.1 Restricting food

5.1.1 Landfill dispersal

Restricting the abundant food resource available from landfills is the key to managing ibis population growth. Over the years Ecosure has developed a variety of tools to ensure effective dispersal by reducing ibis habituation to any single stimuli including:

- sling shot
- gas cannon (see picture)
- ibis distress calls
- stock whip
- car horn
- siren
- kites
- balloons
- arm wave
- trained dog
- starter pistol
- remote controlled airplanes and cars.

Figure 3 Gas cannon being used for landfill dispersal

The application of an individual or combination of tools is based on effectiveness, including ongoing monitoring and review across the regional management program and the integration of new techniques. Dispersal tools should be selected with consideration of human safety and animal welfare along with individual client requirements.

The dispersal program should ideally be performed at waste management facilities sunrise to sunset for 12 months of the year and include an intensive dispersal period at the beginning of the breeding season, as suggested through the IMCG. The objective of this initiative is to completely deny ibis access to artificial food at landfills at the beginning of the breeding season. This is undertaken to reduce breeding capacity which will limit recruitment at unmanaged sites and the breeding restriction effort required at managed sites (along with associated costs).

5.1.2 Enclosed waste systems

An enclosed putrescible waste system should be considered as the ultimate long-term solution for any waste management system. By unloading and processing waste in an appropriately designed enclosed area, ibis will not be able to access the food matter.

Enclosing the tip face

This option involves developing a large, fully enclosed structure where all the waste is processed. This may be suitable for use at transfer stations. Doors on the entrances and exits should be remotely activated so that doors only open when machinery approaches and then close immediately after the vehicle has driven through. All the waste is dumped into a central pit where it is pushed into a compactor or bailing system. The bails of waste can either be transported off-site or promptly buried outside the enclosure on-site to limit access by wildlife.

Figure 4 An enclosed waste compacting system; Bundaberg Landfill, November 2007

Implementing landfill lid system

Landfill lids cover the active tip face, which creates a physical barrier and prevents ibis from accessing the rubbish. This system can easily be picked up (by all landfill machinery) to allow the rubbish to be dumped and can be relocated as the active tip face moves. Landfill Lids also operate well when combined with an enclosed waste compacting system. Additional benefits of this system include; reducing odour, vermin, flies, windblown rubbish, dust and fire hazard. Landfill lid systems are being used at numerous landfills in Australia (WasteWell 2012).

Figure 5 Landfill lids used at Staplyton Landfill, Gold Coast, April 2008

Netting the tip face

Placing a large net over the active cell will prevent ibis access. The entrances and exits require special consideration to allow vehicles through but prevent ibis access to ensure that ibis (and other wildlife) do not get trapped inside. The net has to be large enough to allow the trucks tipping room without getting tangled and the net has to be moved to each additional active cell as the former cells reach capacity. This approach has been adopted with limited success at Ballina Landfill.

Figure 6 Net covering active cell; Ballina Landfill, April 2005

Horizontal wires

Horizontal wires positioned over the active area are a less expensive approach to bird management at landfills. This has been adopted with some success for managing gulls at landfills in the United Kingdom but is yet to be trialled in Australia. As a flock of birds lift from the tip-face as a flock, some individuals will touch the wires, causing interruption to flight. This will result in the emission of distress calls which will cause them and surrounding birds to associate the area with danger. In conjunction with some level of dispersal activity this may be an appropriate way to reduce ibis numbers at the landfill and a trial should be considered by council.

If enclosed waste systems are not viable, maintain a tip face as small as possible to minimise foraging opportunities and thus reduce the number of ibis on site.

There is a discernible relationship between the size of the tip face and number of birds foraging on-site. The greater the exposed area of the tip face, the easier the food is to access and the higher the numbers of birds that are able to forage.

Small scale ibis exclusions and deterrents

Exclusions and deterrents may be considered to prevent perching in inappropriate locations. Many of these are readily available, and others may be custom-designed based on an understanding of bird physiology and behaviour. Many products on the market are ineffective, and careful consideration is required to ensure the correct type of material or deterrent is used.

5.2 Restricting breeding success

5.2.1 Egg and nest removal

Ibis eggs and nests are removed using extension poles with pronged attachments fitted to the end. The adult ibis then have to re-invest energy to continually build new nests and lay fresh eggs through the breeding season. This restricts breeding success of ibis colonies, which in turn slows population growth. The DMP only allows the removal or oiling of unhatched ibis eggs and their nests. The risk of disturbing live young is minimised by:

- commencing the program at the first sign of ibis breeding activity
- ensuring eggs are removed fortnightly (which is less than the incubation period of 21 days or less)
- examining ibis nests before they are removed (using a wireless closed-circuit television camera fitted to the end of the extension poles), so that only nests without chicks are targeted for removal.

Figure 7 Removing ibis eggs and nests

5.2.2 Egg oiling

Egg oiling is the preferred method at sites where the nests are at ground level and the eggs are easily accessible. When an ibis egg is oiled, the semi permeable membrane of the egg shell is sealed, preventing the development of the embryo. This remains largely undetected by the incubating adult who vigilantly tends to the redundant eggs, rather than seeking greater reproductive success at another location (or re-laying eggs at the existing site).

The airtight seal around the egg shell is achieved using any type of oil. However to protect the environment, vegetable cooking oil is used and applied with a small hand held spray bottle to minimise runoff and spillage. Brightly coloured food dye is added to the spray bottle mix to identify old nests with treated eggs from recently established nests with fresh eggs. This minimises time and effort involved in subsequent visits.

Figure 8 Ibis egg oiling

5.3 Roost dispersal

Roost dispersal disrupts the normal overnight roosting patterns of ibis and limits attachment to a particular location. Ibis are disturbed after sunset by shining spotlights and laser lights, noisily cracking stock whips and sounding ibis specific distress calls.

It is essential that a diverse range of tools are used on a variable schedule to prevent ibis habituating, rendering dispersal methods ineffective. It is also important that dispersal is not undertaken when chicks are present to ensure they are not scared out of the nest. Dispersal must also not impact on other native species and must not cause excessive levels of stress in ibis.

5.4 Monitoring

5.4.1 Landfill counts

Counts of ibis at waste facilities are used to determine the number of ibis utilising anthropogenic food sources as their primary dietary intake, as well as to compliment the roost count dataset to help determine the regional population. Landfill counts are to encompass all birds on the entire landfill site, as well as individuals perched in areas surrounding the landfill (to give a true indication of the number of ibis attracted to the landfill, and the lasting effects of management i.e. landfill dispersal) and is categorised according to ibis behaviour, such as loafing, foraging and perching. To maintain consistency with the AWIMP's from surrounding local government areas, these counts are performed at the same time of day in each surrounding government area.

Figure 9 Ibis loafing at a landfill

Landfill counts are conducted on a day when there has been no dispersal to ensure that the number recorded reflects the lasting impact of a dispersal program. The count encompasses all ibis on the entire landfill site.

A regional perspective of ibis numbers at landfills was developed by compiling landfill count data collected across the IMCG regions. This comparison was developed by adding the region's landfill counts together and then normalising the data by dividing by the number of landfills.

5.4.2 Roost counts

Roost counts are designed to establish the number of ibis roosting overnight at each site. The data from the region's sites are integrated into data sets from other sites in SEQ. As drivers of the IMCG, Ecosure interprets the combined datasets to determine the success of the program and to assess the future direction of the regional AWIMP's. To provide an appropriate resolution of data, and to allow for easy integration, this activity should be performed once per month. The preferred method involves:

1. *On-site count* - Estimating the number of adults and chicks on-site approximately one and a half hours prior to sunset.
2. *Incoming and outgoing counts* - Both incoming and outgoing ibis are counted from an hour and a half before sunset until the last ibis has returned.
3. *Overall population estimate* - The on-site count is added to the incoming ibis, less the outgoing ibis. This provides an estimation of the complete roosting population.

5.4.3 Foraging survey

Foraging surveys refer to daytime foraging counts incorporating all favoured foraging locations within the local area.

These are used to assess trends in the foraging population, assess the potential for disease transfer to humans and to assess public harassment. This is of particular interest during landfill dispersal, as it allows assessment of ibis moving to other potentially problematic sites.

Counts are performed on a monthly basis and follow a set transect through the area incorporating representative urban parks, wetlands, schools and commercial areas (excluding the landfill). The number of ibis at each site as well as the following information is noted:

- behaviour (e.g. foraging, loafing, perching)
- macro-habitat (e.g. parkland, water body)
- habitat sub-category (e.g. urban park, picnic area, pond, lake)
- micro-habitat (e.g. grass, fence).

5.4.4 Annual census

An annual census is used as a snapshot assessment of the regional ibis population. It incorporates monitoring of ibis roost sites from the air (in a plane) and on the ground. The aerial component is used to identify and investigate any new sites in the region. It is performed at first light for up to 120 minutes, prior to the dispersal of the majority of birds from the colonies for the day's foraging. Ground truthing surveys are then used to more accurately determine the population at each site, similar to roost counts, but incorporating sites not included in the monthly counts. The census is performed in October as this time aligns with:

- the peak of the ibis breeding season when the majority of the ibis population are grouped together at breeding sites
- similar surveys performed throughout other local government areas in both QLD and NSW
- aerial surveys of inland wetland bird populations performed by Professor Richard Kingsford Smith (Kingsford 2012, Kingsford & Porter 1983-2015).

Data obtained from these surveys is compared with previous years to identify population trends and is also used to help assess the ibis population along the east coast of Australia.

5.5 Habitat Management

5.5.1 Management of artificial waterbodies

Embankment gradient

Australian white ibis are waders that enjoy spending time in shallow water drinking, foraging, cooling off and preening their feathers. They are not very capable swimmers and are not confident entering water that is deeper than the length of their legs (about 25 cm). A minimised zone of shallow water accessible to ibis makes a waterbody less attractive. This can be achieved by steepening the gradient of the banks. It is recommended to have an embankment gradient ratio of 4:1 (rise over run) for all artificial waterbodies to reduce the attractiveness to ibis.

Physical exclusion

It is acknowledged that there are physical limitations to the steepness of embankments of on-site water bodies. To further reduce the attractiveness of water bodies, given these limitations, there are alternative options outlined below.

a) Netting water bodies. Similar to netting the active tip face, netting water bodies physically excludes access to ibis and therefore reduces the attractiveness of the facility. This option is suitable for water retention ponds that are not moved as frequently as the active tip face. Ongoing costs are reduced as the netting does not have to be relocated as often.

b) Erecting barrier fencing around the water line. Ibis will not fly directly into deep water. Rather, they tend to fly to the edge of the water body and cautiously wade into the shallows. To prevent this, barrier fencing can be erected to neatly follow the waterline around the banks of any on-site water body. To be effective, the fence has to be of a temporary yet sturdy nature so that the fencing can be moved in and out as the water level rises and falls.

Figure 10 Net covering water retention pond; Bundaberg Landfill, February 2008

c) Suspending fine wires. This option can be used in conjunction with the barrier fencing. In this instance, the barrier fence is placed around the edge of the high water mark. When the pond has less water in it and the fence is not moved in, ibis are able to fly in and land on the bank on the inside of the barrier. To prevent this, several fine wires with reflective streamers attached can be suspended from the top of the barrier fence to the opposite side of the bank in a criss-cross pattern. The ibis can see the reflective streamers that move with the wind and are not inclined to enter the area. Those that try to fly in often make contact with the wires and emit verbal distress calls which scare off other ibis in the area and identify the pond as a hazard.

d) Planting dense vegetation around the waterline. This is an aesthetically more appealing version of the barrier fencing option. As the vegetation is unable to be moved like the fence, the selection of plant species is limited to those that are capable of withstanding inundation when the water body floods. In addition, the vegetation needs to be of a dense clumping nature and able to be planted close together to prevent the ibis from simply pushing their way through. The water level of the pond will have to be strictly regulated to ensure that shallow banks do not form along the inside edge of the vegetation. Steeper banks will make it easier to prevent this from happening. To prevent a mono cultured landscape it is recommended to include a varied distribution of multiple native species.

5.5.2 Vegetation Management

The presence of dense vegetated areas increases the attractiveness to ibis for breeding, particularly native and exotic vines and exotic palms such as Canary Island date palms (*Phoenix canariensis*).

Pruning vegetation

Ibis frequently nests in exotic Canary Island date palms and dense vegetation containing vines. Regular vegetation checks and subsequent trimming of palms and other dense vegetation prior to and during the ibis breeding season will reduce the likelihood of ibis roosting or nesting.

Open grassland area management

Ibis are frequently observed foraging on the open grassland areas of closed landfill cells, particularly during and after rain. Good drainage of waste facility sites is important to prevent small ponds of water forming which provide a source of water and also food for ibis when macro invertebrates come to the surface. Irrigation of these areas should be tightly controlled to maintain an appropriate balance between keeping dust levels acceptable while avoiding excessive ponding of water. Grass management plans with appropriate mowing schedules may also assist reducing the attractiveness of grassy areas.

Suitable plant species

Plant species should be selected to reduce the attractiveness for ibis nesting/roosting at the landfill (e.g. low hedges).

It is recommended that a Vegetation Management Plan (VMP) be developed to ensure species selection is most suitable to the location and environment type. This VMP aims to:

- reduce weed infestation
- provide practical and clear guidance on how to construct the site to create a modified environment based on locally occurring native vegetation
- create a stable natural system that is less attractive to nesting/roosting ibis
- designate zones to facilitate a staged recovery that is practical, efficient and safe, which takes into account the habitat requirements of resident bird populations
- provide information on the control of weeds, planting of native species, and site maintenance so it causes minimal disturbance to resident and migratory birds
- provide information to better ensure ongoing monitoring is undertaken to assess the progress of the site.

5.6 Education

The persistence of ibis utilising non-landfill foraging sites over the last breeding season supports the need for community education. Coordinated programs across the region with consistent messaging will be more effective than separate unique programs.

Creating community awareness of public feeding and general ibis issues can also be integral in communicating important and useful information about foraging, roosting and breeding sites within the area. It will also aid in community acceptance of the AWIMP.

Key aspects of the education program are:

- develop and distribute education material (such as brochures, stickers for bins, schools package and media articles) to ensure local residents and businesses are up to date with ibis management in their area
- educate people who are known to feed wildlife on a regular basis or allow birds to feed from industrial bins. It should be emphasised that they are contributing to the potential growth of the ibis population
- create a template letter to be sent to residents who are known to feed ibis
- enclose outdoor dining areas where ibis are a known problem
- install rubbish bins that exclude wildlife from food
- empty all bins regularly to prevent overflow of rubbish.

Figure 11 Public Park Signage; Brisbane City Council, 2006

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Appendix A
History of the IMCG and AWIMP

In October 1995, Currumbin Wildlife Sanctuary, in conjunction with City of Gold Coast and Federal Airports Corporation, the then owner of Gold Coast Airport, commissioned a report from Ric Brown, an environmental consultant from Banule City Council, Victoria. Brown (1995) outlined the status of the Gold Coast ibis population and proposed measures for effective management.

The Australian White Ibis Management Program (AWIMP) on the Gold and Tweed Coast was initiated by the Ibis Management Coordination Group (IMCG) after an ibis was ingested into a Qantas Airbus engine at the Gold Coast Airport in December 1995. Ecosure Pty Ltd was engaged by the IMCG in 1996 to develop, implement and assess an AWIMP for ibis populations across the region.

During the 1996/97 breeding season, a pilot ibis management program was conducted at the Currumbin Hill Conservation Park and Currumbin Wildlife Sanctuary colony. This was the largest known colony in the region with over 2000 breeding pairs and contributed most to the aircraft hazard at Gold Coast Airport. Following success at Currumbin, the AWIMP was gradually expanded to incorporate other major colonies. Education has been a pivotal component of the management strategy adopted by the IMCG since its inception. John Campbell Communication was engaged by the IMCG to run a very successful community education program between 1996 and 1999.

In October 2000, Ecosure was contracted by City of Gold Coast to commence a phased dispersal of ibis from Suntown Landfill prior to the redirection of putrescible waste to Stapylton and Molendinar Landfills. The result of this dispersal of ibis, and the subsequent closure of the Suntown putrescible waste facility in December 2000 greatly affected breeding behaviour and resulted in the greatest redistribution of ibis since the program commenced in 1996. In October 2001, City of Gold Coast employed staff on a full-time basis to use a variety of tools to disperse ibis foraging at the Stapylton Landfill and eliminated the majority of putrescible waste available to birds at the Molendinar facility. These events coupled with the ongoing breeding restriction program have resulted in a population estimated to be lower than that recorded in 1995 during Ric Brown's initial assessment. In 2005-06 dispersal of ibis from Stotts Creek Landfill commenced during the peak of the breeding season (July to January). The Tweed foraging survey was initiated in conjunction with this program in order to assess the effect the dispersal was having on the surrounding parks and suburbs.

During the early 2000's several council areas to the north of the Gold Coast began ibis management programs. Increased coverage of ibis management in the region will improve population management. In 2005/06 two subgroups of the IMCG were formed, a southern subgroup which includes Gold and Tweed Coast council areas and a northern subgroup which includes Sunshine Coast, Moreton, Brisbane, Redland and Logan local government areas.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	21/02/2017	Best practice guidelines for Ibis management	Nicola Catanzariti, Ecologist Ecosure	Jess Bracks, Principal Wildlife Biologist Ecosure	
01	10/03/2017	Best practice guidelines for Ibis management	Nicola Catanzariti, Ecologist Ecosure	Phil Saw, Managing Director Ecosure/Avisure	
02	22/05/2017	Best practice guidelines for Ibis management - Final	Nicola Catanzariti, Ecologist Ecosure	Phil Saw, Managing Director Ecosure/Avisure	

Citation: Ecosure (2017), Best Practice Guidelines for Ibis Management, Report to Northern and Southern IMCG Stakeholders, Publication Location Burleigh Heads

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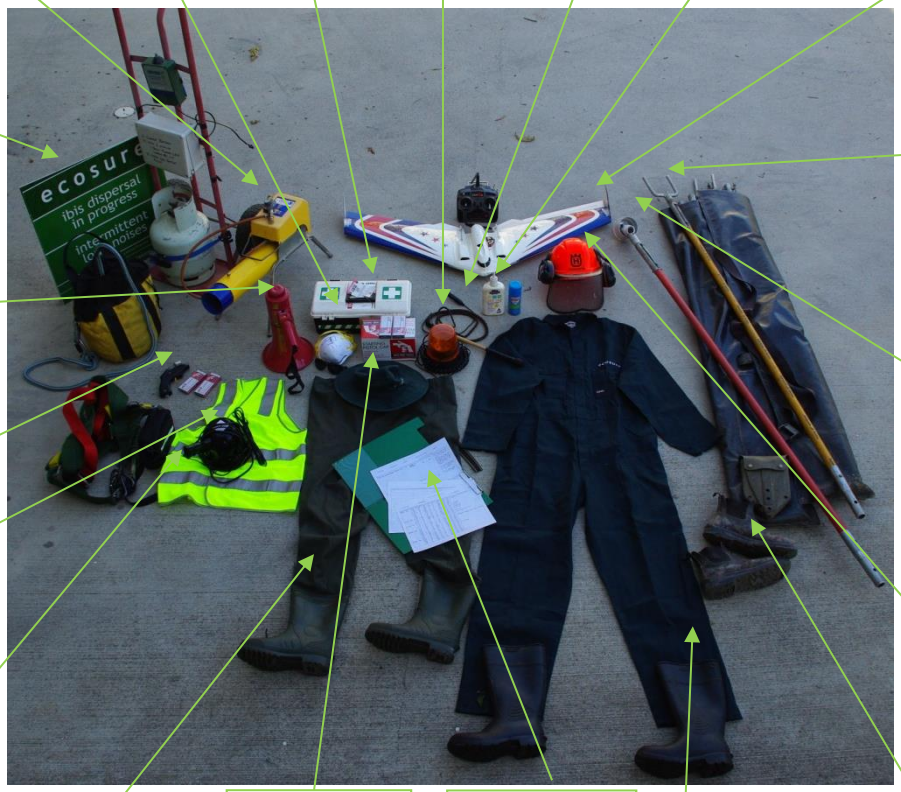
Tools and Personal Protective Equipment (PPE) used for ibis management



Remote control gas cannon used for dispersal at landfills

Dust mask

First aid kit

Flashing light for vehicles

Whip used for dispersal

Sunscreen and insect repellent

Remote control plane used for landfill dispersal

Signage used when roost dispersal is occurring

Egg & nest removal poles (with pronged attachments)

Ibis specific distress caller used for dispersal

Wireless CCTV camera fitted to the end an extension pole used for inspecting nests

Starters pistol used for dispersal

Spotlight used for dispersal

Hard hat and ear muffs

High visibility vest

Steel capped boots

Waders used when working in swamps, wetlands etc

Wide brimmed hat & sunglasses

Data sheets and clipboard

Overalls and gumboots

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	27/11/2017	Australian White Ibis Management Plan for Canterbury-Bankstown Council - Draft	Trudy Thompson, Senior Environmental Scientist	Nicola Catanzariti, Senior Ecologist; Jess Bracks, Principal Wildlife Biologist	Jeff Follett, Senior Wildlife Biologist
01	29/01/2018	Australian White Ibis Management Plan for Canterbury-Bankstown Council - Draft	Nicola Catanzariti, Senior Ecologist	Jeff Follett, Senior Wildlife Biologist	Julie Whelan, Senior Environmental Scientist
02	23/03/2018	Australian White Ibis Management Plan for Canterbury-Bankstown Council – Draft	Nicola Catanzariti, Senior Ecologist	Julie Whelan, Senior Environmental Scientist	

Citation: Ecosure (2018), Australian White Ibis Management Plan for Canterbury-Bankstown Council - Draft, Report to Canterbury-Bankstown Council, Publication Location –Burleigh Heads

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Certified System Environment ISO 14001 SAI GLOBAL
Certified System Quality ISO 9001 SAI GLOBAL
Certified System Health & Safety AS 4801 SAI GLOBAL

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