Darwin International Airport / RAAF Base Darwin Wildlife Hazard Management Plan

VERSION 4.6 OCTOBER 2024

Darwin International Airport

Biodiversity AUSTRALIA

Contents

Foreword

Darwin International Airport (DIA) is owned and operated by Airport Development Group (ADG).

Darwin International Airport is jointly used by the Department of Defence (RAAF Base Darwin).

Darwin International Airport (DIA) is responsible for the areas leased from the Commonwealth for Civil Operations and the Department of Defence is responsible for those areas used exclusively for Military Operations. Those areas of common use are called 'Jointly Used Areas'. The formal relationship between the parties is documented in the Joint User Deed (JUD).

The Joint User Deed notes that:

a) Defence and DIA shall work towards good management practices that minimise the potential for bird hazards on airport.

b) DIA is responsible for bird and animal hazard management on both the Civil Area and the Jointly Used Area of RAAF Base Darwin.

Darwin International Airport has approximately 1.8 million passengers through the airport each year, and is committed to ensuring the safety of aircraft, aircrew and passengers using DIA; and has a commitment to monitoring and controlling wildlife hazards.

The aim of this management plan is to provide guidance to minimise the hazard to aircraft operations created by the presence of wildlife on or in the vicinity of the airport. The WHMP has been written in accordance with CASA Manual of Standards (MOS) Part 139 Chapter 17 and Part 3.11 of the DIA Aerodrome Manual and is consistent with the DIA Safety Management System approach. The management plan is developed and based on knowledge of local wildlife and the hazard that various species pose to aircraft and in consultation with RAAF Base Darwin. The procedures related to this WHMP are guidelines designed to allow the DIA Airside Operations team to concentrate their efforts where aircraft are most at risk from wildlife hazards.

Document Control

Revision History

Version	Date	Description of Change	Author	Reviewed	Approved
0.1	December 2003	Initial Release	Dan Richards	Robert Calaby	Andrew Liepa
1.0	February 2004	Final	Michelle Koulakis	Robert Calaby	Robert Calaby
2.0	July 2006	Review	BAHMS Working Group	BAHMS Working Group	Robert Calaby Dan Richards
2.1	February 2008	Update	Kym Meys	BAHMS Working Group	DIA Operations Manager
2.2	March 2009	Updated	BAHMS Working Group	Senior Airport Duty Manager	DIA Operations Manager
2.3	January 2011	Review	BAHMS Working Group	BAHMS Working Group	DIA Operations Manager
3.0	September 2014	Complete Review	DIA & EcOz Environmental	Mike Clancy	DIA Operations Manager
3.1	July 2016	Review	DIA WHM Working Group & EcOz Environmental	Mike Clancy	DIA Head of Operations
3.2	November 2018	Complete Review - Draft	Biodiversity Australia [Agatha Dolan]	Biodiversity Australia [Karl Robertson]	DIA Head of Operations
4.0	January 2019	Complete Review - Final	Biodiversity Australia [Agatha Dolan]	Mike Clancy and Nick Fewster	DIA Head of Operations
4.1	June 2020	Internal Review	N/A	Mike Clancy / Nick Fewster and WHM Working Group	DIA Head of Operations
4.2	December 2020	Update and correct set-out and duplication of some figures	N/A	AM Mike Clancy	DIA Head of Operations
4.3	July 2021	Biennial Review - Draft	Biodiversity Australia [Agatha Dolan]	Biodiversity Australia [Karl Robertson]	DIA Airside Manager
4.4	November 2021	Update	Biodiversity Australia [Kate Chant]	Mike Clancy and Nick Fewster	Rob Porter EGM Operations DIA
4.5	June 2023	Biennial Review - Draft	Biodiversity Australia [Stuart Butler]	Biodiversity Australia (Karl Robertson) Katina Croft Department of Defence Mike Clancy Airside Manager DIA	Glen Dodds Head of Airside DIA

4.6	October 2024	Annual review		Biodiversity Australia (Stuart Butler) Mike Clancy and Van Nguyen Airside Manager DIA	Glen Dodds Head of Airside DIA Stuart Butler

Distribution List

The WHMP is distributed electronically and is published on the DIA website.

Authority

This Wildlife Hazard Management Plan (WHMP) has been written in accordance with Part 3.11 of the DIA Aerodrome Manual and is consistent with the DIA Safety Management System approach. The plan provides particulars of the procedures to deal with danger to aircraft operations caused by the presence of wildlife (birds or animals) on or near the aerodrome. An objective when producing this plan has been to ensure that the documented procedures are an accurate reflection of both current and best practices.

The management plan also meets the requirements of Appendix 1 to CASR 1998 subparagraph 139.105 and the Manual of Standards Part 139 Chapter 17.

This WHMP was developed and with input and revision from the airport-appointed Biologist (Biodiversity Australia), RAAF Base Darwin (Defence) and the Wildlife Hazard Management Working Group.

The organisation responsible for implementing this plan is Darwin International Airport, who must also work with RAAF Base Darwin (Defence) to ensure that good management practices and procedures are in place to minimise the potential for bird hazards on airport.

This system has been approved and authorised by the Chief Executive Officer for Darwin International Airport (and Northern Territory Airports Pty Ltd), Commanding Officer 13 SQN RAAF Base Darwin, the Base Manager RAAF Base Darwin (Service Delivery Division – Northern & Central Zone (NT, SA & QLD)) and the Flight Commander, RAAF ATC 452 SQN DAR.

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Phrases & Acronyms

ACI	Airport Council International
ADG	Airport Development Group
AEO or EM	Airport Environment Officer
AM	Airside Manager
ARFF	Aviation Rescue and Fire Fighting
ASA	Alice Springs Airport
ASSM	Airport Safety and Standards Manager
ATC	Air Traffic Control
ATSB	Australian Transport Safety Bureau
AVCRM	Aerodrome Manager Compliance and Risk Management reporting database
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
DIA	Darwin International Airport
DoD	Department of Defence
DME	Distance Measuring Equipment
EMS	Environment Management Strategy
ERSA	En-Route Supplement Australia
FLIR	Forward Looking Infra-Red (thermal imaging)
GA	General Aviation
GS	Ground Staff
HOA	Head of Airside
ILS	Instrument Landing System
IVM	Integrated Vegetation Management
JUD	Joint User Deed
MAGS	Movement Area Guidance Signs
MOS	Manual of Standards
NDB	Non-Directional Beacon
NOTAM	Notice to Airmen
NT	Northern Territory
NTA	Northern Territory Airports.
NTAPL	Northern Territory Airports Pty Ltd
PM	Project Manager
RAAF	Royal Australian Air Force
RWY	Runway
SMS	Safety Management System
TACAN	Tactical Air Navigation
TAOO	Terminal & Airside Operations Officer
TSIR	Transport Safety Investigation Regulations 2003
TWY	Taxiway

VOR	VHF Omni Range
WHM	Wildlife Hazard Management
WHMC	Wildlife Hazard Management Committee
WHMP	Wildlife Hazard Management Plan
WHMWG	Wildlife Hazard Management Working Group

Glossary

Active Management	The use of short-term management and countermeasure techniques such as distress calls, pyrotechnics, trapping and culling to disperse or remove wildlife.
Aerodrome/Airport	A defined area intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft at DIA.
Aerodrome Operator	The holder of the aerodrome certificate for the aerodrome.
Aircraft	The term aircraft refers to fixed wing and rotary wing powered aircraft and balloons.
Aircraft Operator	A person, organisation or enterprise engaged in, or offering to engage in, an aircraft operation.
Airline Operator	The Operator of a Regular Public Transport air service. Also see Aircraft Operator.
Airside	The movement area of an airport, adjacent to terrain and buildings or portions thereof, where access is controlled.
Airport Operator	The Airport operator is Darwin International Airport Pty Ltd.
Air Traffic Control	Air traffic control services are provided by RAAF.
Anti-perching devices	Installation of a treatment to discourage and prevent birds from perching on a structure to allow for resting or assessment of the surrounding environment from an elevated position such as light pole.
Apron	That part of an airport to be used for the purpose of enabling passengers to board or disembark from an aircraft, loading of freight onto, or unloading freight from an aircraft, refuelling, parking or carrying out maintenance on aircraft.
Authorised Shooter	A person with a relevant firearms licence, who has authorisation from the Airside Manager Darwin to use firearms for the purpose of controlling birds and animals at the Airport.
Consequence	The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.

Countermeasures	Active management methods used to manage wildlife hazards, including, culling and harassment.
Firearm	A shotgun, rifle or other weapon as defined under Territory and Commonwealth legislation
Foraging	When wildlife search for and obtain food.
Habituation	The tendency for wildlife to become accustomed to certain stimulus when repeatedly exposed to it.
Hazard	A source of potential harm or a situation with potential to cause loss.
Incident	An occurrence, other than an emergency/disaster, associated with the operation of the aircraft that affects or could affect the safety of operations.
Inherent Risk	The process of eliminating the likelihood of a risk without reducing the consequence.
Integrated Vegetation Management	The application of complimentary approaches for managing vegetation in an economically, socially and environmentally sustainable.
Jointly Used Areas	Those areas including runways and taxiways that are used by both civil and military aircraft.
Joint User Airport	An airport under the control of a part of the Defence Force in respect of which an arrangement under Section 20 of the Civil Aviation Act is in force.
Landside	Those parts of an airport not considered Airside that is normally accessible to the general public.
Manoeuvring Area	Those parts of an airport used for the take-off, landing and taxiing of aircraft, excluding aprons.
Migration	When wildlife pass periodically or seasonally from one region to another.
Military Incident	Any incident involving military registered aircraft or facilities only.
Movement Area	That part of an airport used for the surface movement of aircraft, including manoeuvring areas and aprons.
Nocturnal Species	A species which is most active during the night.
Passive Management	The modification of habitat to render it less attractive to wildlife.

Probability	The likelihood of a specific event or outcome, measured by the ratio of specific events or outcomes to the total number of possible events or outcomes.
Pyrotechnic Rounds	A non-lethal projectile intended to present a very marked visual and aural stimulus to which most species of wildlife will respond. It is specifically designed for the purpose of scaring, rather than killing wildlife.
Residual Risk Assessment	The process of estimating the likelihood and consequences of a risk after controls have been put in place.
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and probability.
Risk Control	Methods employed to reduce a risk rating (and thereafter the likelihood and/ or consequence of the risk occurring).
Risk Ranking	The ranking given to a risk that has been assessed using the risk matrix. This rating is used to determine prioritisation and controls.
Risk Treatment	The process of selection and implementation of measures to modify risk.
Roosting	When birds repeatedly return to a particular place in numbers to loaf or spend the night.
Runway	A defined rectangular area on an aerodrome, prepared for the take-off and landing of aircraft.
Runway Strip	A defined area including the runway and stopway (if provided) intended to reduce the risk of damage to aircraft running off the runway; and to protect aircraft flying over it during take-off or landing operations.
Taxiway	A defined path on an aerodrome established for the taxying of aircraft and intended to provide a link between one part of the aerodrome and another.
Taxi lane	A portion of an apron designated as taxiway and intended to provide access to aircraft stands only.
Terrestrial	Wildlife living predominantly or entirely on land (e.g. Wild dogs and feral cats).
Transit	When wildlife fly from one place to another.
Undershoot	The area within the take-off and approach splays preceding the runway threshold.

Wildlife	Wildlife refers to animals that may pose hazards to aircraft when struck. This includes birds, bats and terrestrial animals.
Wildlife Count	Scheduled counts conducted by airport staff or consultants.
Wildlife strike	The collision of an aircraft with wildlife. A "**reported wildlife strike**" is deemed to have occurred whenever: • a pilot reports a strike to the ATSB, • aircraft maintenance personnel find evidence of a wildlife strike on an aircraft, • personnel on the ground report seeing an aircraft strike one or more birds or animals, or • wildlife remains are found on the runway or runway strip unless another reason for the wildlife death can be found. A "**suspected wildlife strike**" is deemed to have occurred whenever a wildlife strike has been reported by aircrew or ground personnel but upon inspection: • no wildlife carcass is found, and • there is no physical evidence on the aircraft of the strike having occurred. A "**confirmed wildlife strike**" is deemed to have occurred whenever a wildlife strike has been reported by aircrew or ground personnel and upon inspection: • when physical evidence of a wildlife strike is found on the runway or runway strip used by the aircraft involved (unless another reason for the death of the wildlife can be found). • when physical evidence of the strike is found on the aircraft involved following an inspection; and • in any other instance where it can be reasonably proved from evidence that wildlife was struck as a direct result of a moving aircraft. For example, when aircrew report they saw, heard, or smelt a wildlife strike. A "**wildlife near miss**" is deemed to have occurred whenever a pilot takes evasive action to avoid birds or animals on, or in the vicinity of an aerodrome. An **"on-aerodrome wildlife strike"** is deemed to be any strike that occurs within the boundary fence of the aerodrome; or where this is uncertain, where it occurred below 500 ft on departure and 200 ft on arrival.

	A **"bird strike in the vicinity of an aerodrome**" is deemed to have occurred whenever a bird strike occurs outside the area defined as "on aerodrome" but within an area of 15 kilometres radius from the aerodrome reference point (ARP) or up to 1,000 feet above the elevation of the aerodrome. A "**wildlife strike remote from the aerodrome**" is deemed to have occurred whenever a bird strike occurs more than 15 kilometres from an aerodrome or more than 1,000 feet above the elevation of the aerodrome. A "**significant wildlife strike**" may be deemed to have occurred when: • There is damage evident on the aircraft due to a strike • There is an effect on flight, • More than one bird is involved, or • At the discretion of the Operations Manager.
Wildlife Survey	Refers to structured surveys conducted by external consultants to assess wildlife populations.

1 Introduction

1.1 Background

Biodiversity Australia Pty Ltd (Bio Aus) was commissioned by Airport Development Group to conduct a Wildlife Hazard Management Plan (WHMP) review for Darwin International Airport (DIA), Northern Territory (NT). The intent of this plan is to provide a framework that allows DIA to minimise the hazard associated with wildlife strikes to aircraft.

Darwin International Airport is jointly used with the Department of Defence (DoD). Darwin International Airport is responsible for the areas leased from the Commonwealth for Civil Operations. The areas of common use are called 'Jointly Used Area' and are operated under the terms of the Joint User Deed (JUD). The JUD details the arrangements and obligations for each party for the safe and efficient operation of the airport and in compliance with obligations that either party has under legislation.

In accordance with the JUD, DoD and DIA shall work towards the implementation of efficient management policies that minimise the potential for wildlife-related hazards on the Airport.

Darwin International Airport is responsible for wildlife hazard management within both the Civil and the Jointly Used Areas. In accordance with these requirements, DIA has developed standard operating procedures (PROs) that provide additional detail for the day-to-day management of wildlife hazards (Appendix 1). These procedures may be reviewed and amended independently of this plan.

1.2 Purpose

The purpose of this WHMP is to define the hazard that wildlife pose to air traffic at DIA and to set objectives, performance indicators and procedures in place for the systematic management of that hazard. This WHMP aims to support the requirements of Appendix 1 to *Civil Aviation Safety Regulations* (CASR) *1998,* Part 139, subparagraph 139.105 in relation to the inclusion of procedures for bird and animal hazard management in the Aerodrome Manual. It also aims to support the requirements of the Manual of Standards (MOS) Part 139, Chapter 17, Sections 17.03 and 17.04 (made under the CASR) in relation to the preparation of a WHMP.

This WHMP has been designed to be incorporated as part of the DIA Safety Management System. This plan includes measures to manage wildlife within the Jointly Used Areas of DIA and RAAF Base Darwin, although much of the detail and associated documentation within this plan refers to the activities and procedures developed and implemented by DIA in accordance with the Joint User Deed (JUD) requirements.

1.3 Policy

Darwin International Airport is committed to ensuring the safety of aircraft using the port. While the safety of aircraft at DIA is paramount, it is not possible to prevent all wildlife strikes from occurring. As such, this WHMP aims to reduce the frequency and severity of strikes by focusing management efforts on species and habitats that constitute significant hazards to aircraft operating at DIA.

1.4 Goals and Objectives

The goal of this WHMP is to minimise hazard to passengers and flight crews by reducing hazards to aircraft and airport operations caused by wildlife activity on and in the locality of the airport.

The specific objectives of this WHMP are to:

- Define management guidelines for high-hazard species and the habitats that support them both on and off the airport.
- Ensure compliance with all relevant airport operational and environmental legislation and regulations. These include:
    - International Civil Aviation Organization (ICAO) Annex 14 – Chapter 9,
    - ICAO Airport Services Manual – Chapter 3,
    - Civil Aviation Safety Authority (CASA) – Manual of Standards – Part 139,
    - *Civil Aviation Safety Regulations 1998,*
    - *Transport Safety Investigation Act 2003,*
    - *Territory Parks and Wildlife Conservation Act 1976* and *Territory Parks and Wildlife Conservation Regulations 2001, and*
    - *Environment Protection and Biodiversity Conservation Act 1999.*
- Ensure that adequate systems are in place to define roles, responsibilities and procedures for managing wildlife hazards at DIA.
- Define the methods by which wildlife hazards are managed at DIA.
- Define performance goals and targets for management of wildlife issues and outline how these will be assessed and reviewed.

1.5 Legislative Context

There are a number of legislative instruments that define the requirement for implementation of a WHMP at airports (Table 1). Australia has international obligations as a contracting state to the International Civil Aviation Organization (ICAO). The *Civil Aviation Act 1998,* and with it the *Civil Aviation Safety Regulations* 1998 (Part 139), dictate the framework for wildlife hazard management practices in Australia. The Manual of Standards (MOS) Part 139, Chapter 17 dictates the requirements for WHMPs.

Table 1. Australian regulation and legislation relevant to wildlife hazard management at airports

Instrument	Regulatory Body	Description
Civil Aviation Act 1988	CASA	Establishes CASA functions in relation to civil aviation, with a particular emphasis on safety.
Civil Aviation Safety Regulations 1998	CASA	Details legislation regarding all aspects of civil aviation safety and establishes the regulatory framework. Part 139 (Aerodromes) contains specific requirements for wildlife hazard management.
Manual of Standards	CASA	Part 139 prescribes the aerodrome requirements. Chapter

Instrument	Regulatory Body	Description
(MOS) Part 139 Aerodromes		17 details the requirements for wildlife hazard management on aerodromes.
Transport Safety Investigation Act 2003	ATSB	The Transport Safety Investigation Act 2003 establishes the ATSB as the 'no-blame' investigator of aviation accidents and incidents, and aims to maintain and improve transport safety, by providing for the reporting of transport safety matters, independent investigations into transport accidents and other incidents, the making of safety action statements and recommendations, and the protection of certain kinds of safety information.
Territory Parks and Wildlife Conservation Act 1976 and Regulations 2001	Department of Environment, Parks and Water Security	The Territory Parks and Wildlife Conservation Act aims to provide the framework for management of parks, reserves, protection of biological diversity, and serve community needs for education and employment. It also aims to protect the interests of traditional owner groups and the wider community. Provides the framework for wildlife and their protection in the Northern Territory.
Environment Protection and Biodiversity Conservation Act 1999	Australian Department of the Environment	The EBPC Act provides the framework for the protection of Australia's natural environment and its biodiversity and establishes processes that help to protect threatened species and ecological communities and promote their recovery. Within the context of wildlife hazard management on airports, of principle consideration is the effect that management actions such as dispersal and lethal control may have on threatened species.
National Airports Safeguarding Framework - Guideline C	Department of Infrastructure and Regional Development	Aims to develop informed land use planning decisions to safeguard airports and their adjacent communities' wildlife hazards based on the international and regulatory framework.
Defence Aviation Safety Regulation – DASR 139 - Aerodromes **139.50 – Aerodrome Manual** **139.60 – Safety Management Systems**.	Department of Defence	139.50 - required the implementation and inclusion of WHMP into the Aerodrome manual to ensure a plan is in place to address the presence of wildlife at and in the vicinity of the aerodrome. 139.60 - sets out requirements for WHMP to be incorporated in Safety Management Systems (SMS) for certified aerodromes, including provision of any assistance to local authorities

1.6 Airport Context

Darwin International Airport is located in the Northern Territory within the City of Darwin, on land leased land from the Commonwealth Department of Infrastructure, Regional Development and Cities (Figure 1). The area operated by DIA is leased to the Airport Development Group Pty Ltd. Darwin International Airport is responsible for the Commonwealth-leased areas and the DoD is responsible for those areas used exclusively for military operations. Those areas of common use are call the Jointly Used Areas. The formal relationship between DIA and DoD is documented in the Joint User Deed (JUD). A general description of the airport is provided in Table 2, below.

Wildlife-attracting areas surrounding the Airport were assessed within three, eight and 13 kilometre radiuses. These distances correspond with the criteria set out in the National Airport Safeguarding Framework (NASF) – Guideline C. For the purposes of this WHMP, these areas will be defined as follows:

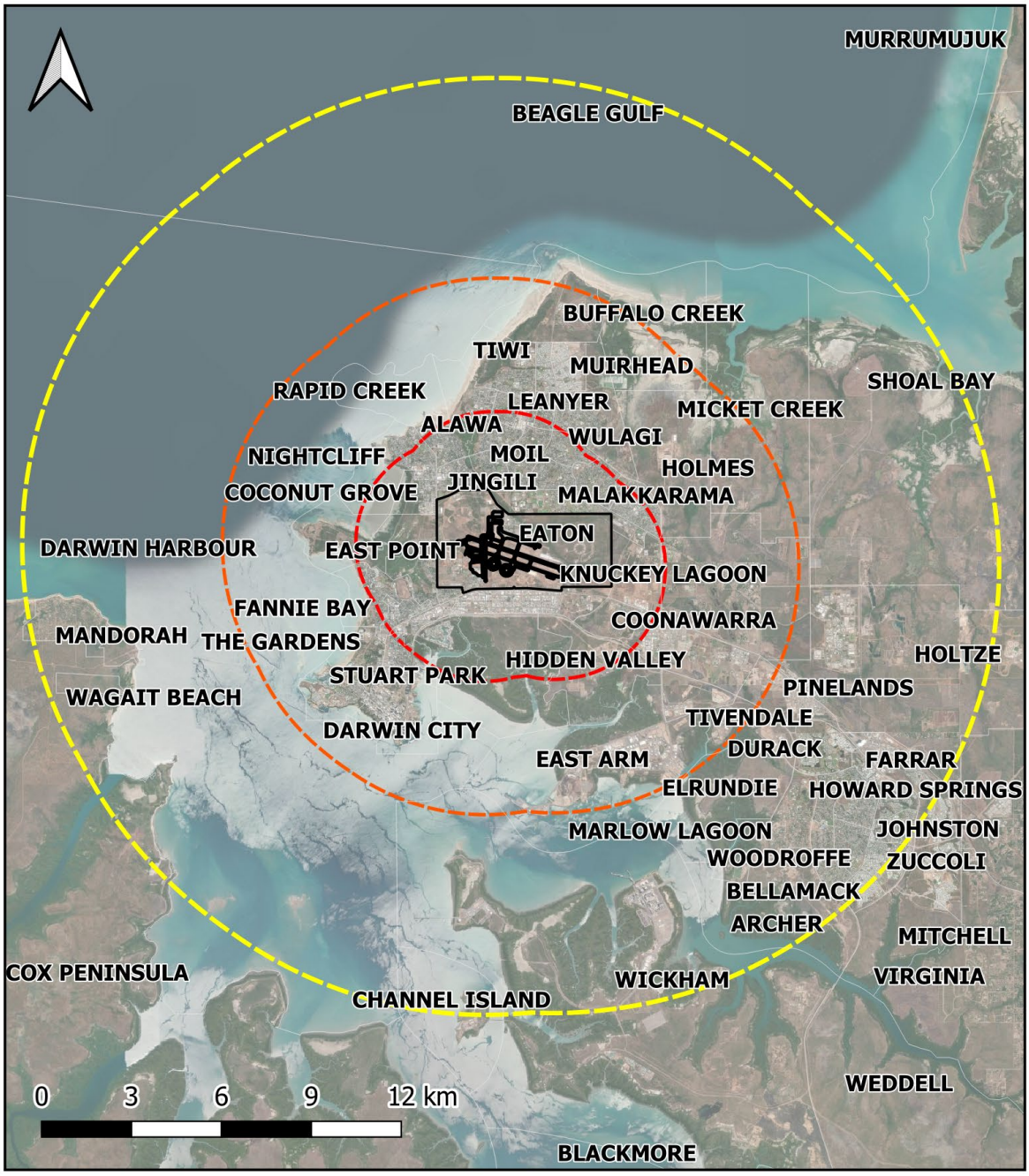
- Airport land
- 3 km radius
- 8 km radius
- 13 km radius

Table 2. DIA general information

Element	Description
Airport Location	DIA is located within the City of Darwin, adjacent to coastline to the west and the district centre of Casuarina to the north. Darwin International Airport is located 13 km north-east of the Darwin Central Business District on a 311 ha lease site plus 215 ha joint user area (civil plus military use). The Airport is a curfew-free gateway to the Northern Territory, providing international, domestic and general aviation services.
Surrounding Land use(s)	Residential areas and some open space are adjacent to DIA on its northern boundary. The land south of the Airport is predominantly open space adjoined by service commercial/light industrial in the suburb of Winnellie, the Narrows residential area and Department of Defence operations. Service commercial areas are situated west of the Airport. The northern boundary comprises of the Marrara Swamp, Rapid Creek and various sporting facilities, including Marrara Sport Complex, Golf Course and a caravan park. Rapid Creek and Marrara Swamp are considered environmentally significant as the creek is the main freshwater body in Darwin. The western boundary is bounded by a special purpose lease to an Indigenous organisation and the suburb of Ludmilla. Department of Defence (RAAF) and swampland comprises the eastern boundary.

Element	Description
Geography	DIA occupies 1526 ha, comprised of cleared grassland associated with terminal runway system, some fragments of original eucalypt woodland and part of the Rapid Creek riparian corridor. The neighbouring RAAF base has similar vegetation structure, but also includes extensive Marrara Swamp wetlands associated with the headwaters of Rapid Creek. Aviation related use is centred on the property and covers approximately 311 ha leased site plus 215 ha joint user (civilian plus military use) area and is bounded by a security fence. The remainder of the property (landside) is largely undeveloped. Historical vegetation clearing and fire and weed infestations have affected the integrity of these communities. However, climatic influence of the wet/dry tropics enables many vegetation communities to regenerate naturally. The majority of vegetation communities are comprised of regrowth, aged less than 20 – 30 years old. Approximately three-quarters of the Airport site is comprised of cleared grassland associated with the buildings and airfield systems. The remainder of surrounding vegetation communities include remnants of eucalyptus woodland and part of the Rapid Creek riverine corridor. The Airport site is located within the Rapid Creek catchment, with the exception of the north-west section which is part of the Ludmilla Creek Catchment. Rapid Creek is less than 10 km long and drains a catchment area approximately 19 km^2. The Airport site is highly modified and frequent disturbance and land clearing has enabled several weed species to thrive. Intensive weed management programs are implemented across the site and conducted in conjunction with other environmental programs such as fire management and regeneration works, to achieve an integrated approach.
Elevation	31.5 m above sea level.
Airport Ownership	DIA is owned by the Airport Development Group Pty Ltd, which through its subsidiaries acquired the lease for DIA in June 1998, as well as those for Darwin International Airport, Alice Springs Airport and Tennant Creek Airport. The lease is for a period of fifty years with the option to renew for a further forty-nine years.
Traffic Profile	Approximately 2.1 million passengers travel through Darwin International per year. There were 150, 590 aircraft movements in 2019 and 2020 combined.
Runways	The Airport has two runways – the main runway (11/29) is 3,354 m x 60 m; it is an instrument runway with precision instrument approach on runway 29. It is capable of serving all forms of civilian aircraft up to including Code F (A380). The secondary runway (18/36) is 1,524 m x 30 m. Both are sealed. The DoD's EMOS contractor (Ventia) is responsible for land management, fencing and drainage of the Jointly Used Areas; and DIA is responsible for land management, fencing and drainage of the Civil areas in accordance with Joint User Deed and cost sharing arrangements. A helipad and associated facilities are also present.

Element	Description
Navigational Aids	Air Traffic Control services are provided by the RAAF 452 SQN FLT DAR. ATC provides surface movement control to aircraft and vehicles on the runway and taxiway. Royal Australian Air Force (RAAF) are also responsible for provision and maintenance of the Tactical Air Navigation (TACAN) and radar. Airservices maintains the following NAVAIDs at DIA: • DME • VOR • NDB • ILS (Glide path and Localiser)
Communications	Airspace to 18,000 FT AMSL and to a range of 40 miles is controlled by RAAF ATC and then by Brisbane Airservices. Darwin Tower is manned 24 hours a day, 7 days a week.
Climate	Climatic conditions are characterised as distinct wet/dry seasons which is dominated by intense rainfall for approximately 4 – 6 months per annum (November to March), followed by extended periods of little to no rainfall for the remainder of the year. Minimum and maximum temperatures are relatively constant throughout the year.



This mapping is to be considered indicative only and all derivations (e.g. vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any sudsequent error losses etc. that may arise from use of this data without independent verification.

Biodiversity Australia

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Legend

- Darwin Int'l Airport
- Locality boundaries

NASF Assessment Radii

- 3km
- 8 km
- 13 km

Figure Name: Site Context		
Site: Darwin International Airport		
Client: Northern Territory Airports Pty Ltd		
Scale: 1:150000	Job Number: AV3450	Revision: 1

Figure 1. Darwin International Airport - site context.

2 Structure

2.1 Stakeholders

This section details the roles and responsibilities of the persons responsible for managing wildlife hazards at DIA.

The DIA Head of Airside (HOA) is responsible for the overall coordination, supervision and management of the WHMP. This includes allocating resources, designating responsibilities, coordinating training and reviewing performance of the WHMP's implementation.

The DIA Airside Manager (AM) is responsible for implementing this WHMP and its associated procedures. This includes obtaining permits, providing training, monitoring wildlife numbers, collating strike data, auditing conformance to the WHMP and drafting reports for review by senior management.

The WHMP cannot work without the input and implementation from RAAF Base Darwin and all stakeholders involved in the implementation and operation of the WHMP. The stakeholders presented in Figure 2 comprise the Wildlife Hazard Management Committee (WHMC). ~~An annual meeting is held providing feedback and information to the committee and other stakeholders.~~ Regular updates and reports are provided to the committee and stakeholders

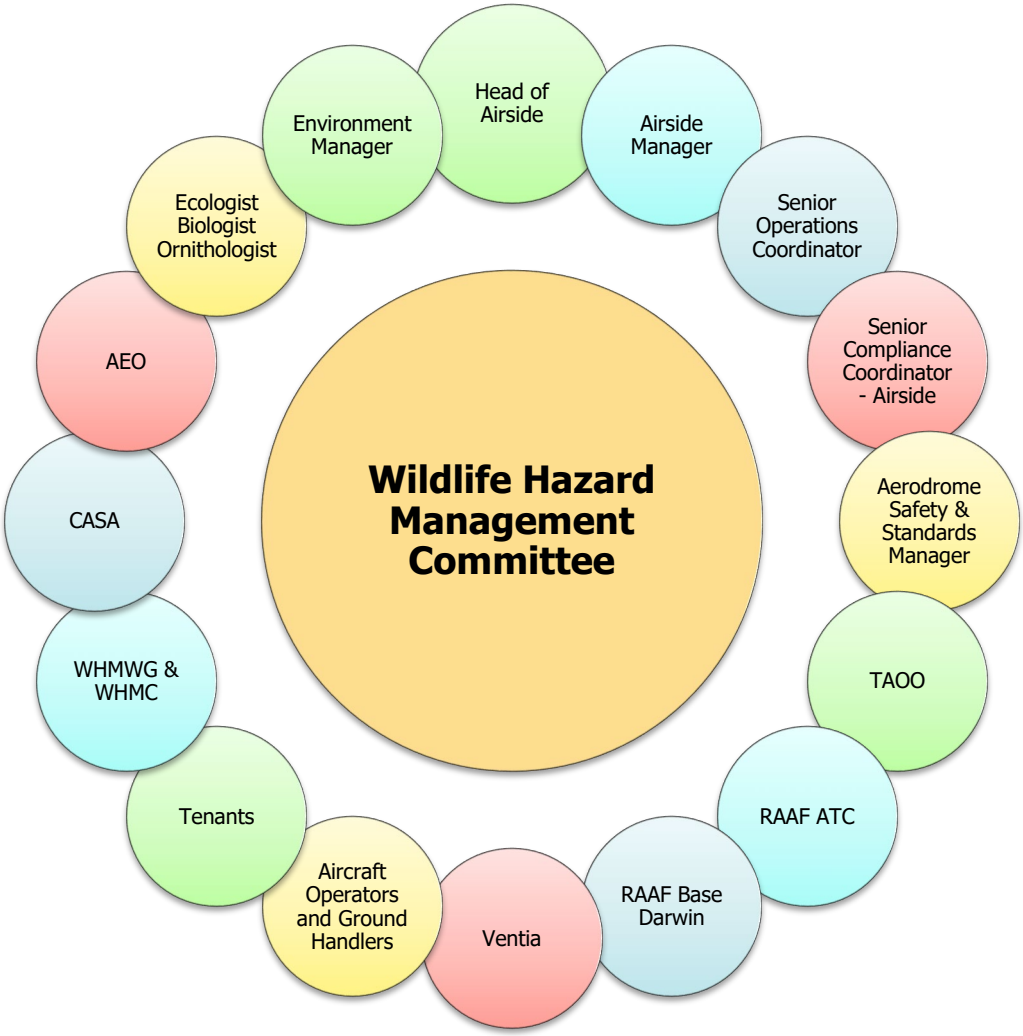


Figure 2. Stakeholders and personnel involved in the operation of the WHMP.

The Wildlife Hazard Management Working Group (WHMWG) comprises of internal DIA representatives, though it may include external invitees (such as RAAF Base and DoD personnel). The WHMWG assesses trends in wildlife activity on a regular basis. The WHMWG also provides reports and other relevant information to stakeholders. Organisational process and other strategies supporting the implementation of the WHMP are depicted within Figure 3.

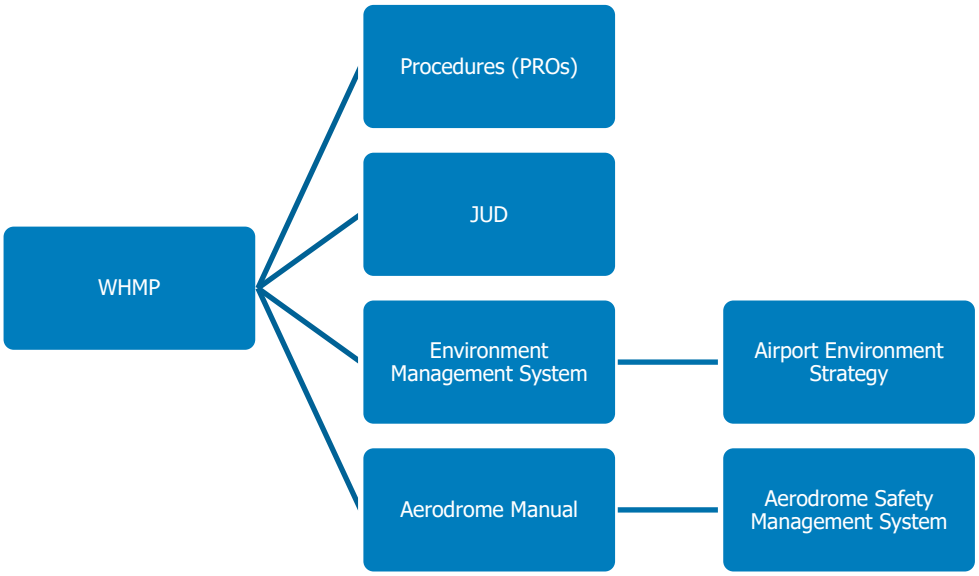


Figure 3. Documents and organizational structure supporting the implementation of the WHMP.

2.3 Review Process

Darwin International Airport has mandated an annual review of its operations. The recommended process for the review of DIA's WHMP is included in Table 3. The review involves key personnel, including executive management, and is supported, where necessary, by a suitably qualified person. The annual update of the WHMP will:

- be based on performance indicators and audit findings (Table 4);
- ensure compliance with all current legislation;
- update the assessment of risk using updated strike and monitoring data and observations;
- ensure all procedures, roles, responsibilities and associations are current and relevant; and
- ensure all management actions undertaken by DIA are appropriate and listed in the WHMP.

2.1.1 Internal Audit

An audit of the WHMP and associated procedures is conducted by the DIA Airside Manager on a yearly basis. The CASR Sections 139.230(f) (iii) and 139.230 (h) (ii) and MOS Part 139 Chapter 17, Part 17.04 both require the WHMP to be reviewed at least annually. The aim of the audit is to ensure that the processes and procedures in the WHMP are both relevant and being implemented (Table 4).

The recommendations and any findings from the audit are provided to the WHMWG which is responsible for ensuring that recommendations and findings from the audit are actioned. The WHMWG also periodically reviews the system (at least annually) to ensure continuing suitability, adequacy and effectiveness. The review includes opportunities for improvement.

2.1.2 External Audits

External audits are conducted by Airline and Aircraft Operators periodically or on an as needed basis. Recommendations are reviewed by the WHMWG and presented to the WHMC. Airline operators may carry out their own internal audits on DIA based upon their own internal company policies and

requirements. External reviews are undertaken by a suitably qualified person on a biennial basis.

Table 3. DIA WHMP review process.

Review Trigger	Frequency	Details
Initial WHMP Preparation	Required for all certified aerodromes	Must be prepared by a suitably qualified person (e.g. ornithologist or biologist) as per MOS 139 Chapter 17 (Part 17.04, subpart 1).
Internal Review	Annually	To be undertaken by the Airside Manager and Environment and Sustainability Manager once every 12 months as part of the annual technical inspection in accordance with MOS 139 Chapter 17 (Part 17.04, subpart 4). The review will be supported, where necessary, by a suitable qualified and experienced consultant. Internal review includes analysis of previous years' data and wildlife strike trends and presented to the board members, stakeholder meetings and WHM Reports as required.
Biennial Audit	Every second year	To be undertaken by a suitably qualified person every two years. The audit will include an update of the wildlife hazard assessment, updated species hazard assessment, species management plans, figures and tables, review of legislative compliance, and updates to roles and procedures.
Circumstantial	When an aircraft experiences substantial damage or ingestion due to a species not included in the current plan When an aircraft strikes a species currently identified in the WHMP as a result of insufficient procedures.	A review of the wildlife hazard management plan and/or relevant procedures should be undertaken if any of the aforementioned events occur as a result of improper wildlife management strategies as per MOS 139 Chapter 17 (Part 17.04, subpart 4).
Major Review*	Every five years	A complete rewrite and re-issue of the WHMP will occur every five years to ensure current wildlife hazards are identified and mitigated in an adaptive manner. Major reviews will take the place of biennial audits in the years that they occur.

Review Trigger	Frequency	Details
		Biennial reviews were carried out in 2021 and 2023; a major review is planned to be carried out in 2025 following the completion of the P0009 Runway 11/29 reconstruction and drainage works.

Table 4. Indicators to be considered during WHMP reviews.

Performance indicators	Monitoring	Measurement	Triggers	Improving the system
Total number of wildlife strikes	The total numbers of wildlife strikes in the vicinity of the Airport are recorded by DIA.	Wildlife strikes are represented as the number of strikes per 10,000 movements.	An increase in wildlife strikes of 10% in any comparable month may trigger a review of the implementation of the WHMP and associated PROs.	The WHMWG will review and implement where necessary recommendations for changes to the WHMP or the implementation of the system as a consequence of a trigger event.
Wildlife strikes causing damage	The total numbers of wildlife strikes in the vicinity of the Airport are recorded by DIA.	Quantifying whether strikes are damaging to aircraft is important, in that it measures the severity of the strike in monetary terms. This includes the cost or repair, lost revenue during repair, lost time for inspections etc.	Increased in damaging strikes over a 12-month period will trigger a review of the WHMP and its implementation.	The WHMWG will review and implement where necessary recommendations for changes to the WHMP or the implementation of the system as a consequence of a trigger event.
Wildlife observations	Wildlife observations (or counts) are undertaken	Wildlife species and their respective quantities are recorded in relation	Short-term changes in wildlife numbers may indicate seasonal changes in	The Airport may review long-term trends and changes in bird

Performance indicators	Monitoring	Measurement	Triggers	Improving the system
	regularly to monitor the activity of wildlife on the airfield.	to defined areas on the airfield.	populations due to breeding and migratory cycles. This may trigger a review of operational response in line with the risk. Changes from year to year may indicate changes in climatic or environmental factors or may indicate the effectiveness of WHMP management measures. Significant changes in this longer-term pattern will trigger a review of the WHMP and its implementation.	numbers to assess the efficacy of the WHMP and its implementation. Where necessary, recommendations for changes to the WHMP and its implementation will be made.

3 Assessing Wildlife Risk

Darwin International Airport has adopted a three-step approach to assessing and reducing the risk wildlife post to aircraft. These are further defined in the following sections:

1. **Hazard Identification** – including a broad assessment of the airport's hazard profile, including aircraft movements, the habitat and activities that attract wildlife both on and off airport, the species most commonly observed on and off airport, and wildlife strike trends.
2. **Wildlife Hazard Risk Assessment** – based on the data and information collected relating to wildlife numbers, behaviour, characteristics and/or strikes for each species encountered on and around the airport.
3. **Wildlife Management Plan** – addresses high-risk species as identified by airport personnel and strike data history (refer to Attachment 1). The plan provides a summary of each species' ecology and attractions to the Airport. This information can be used to inform management priorities and programs to minimise wildlife risk to airport operations.

3.1 Hazard Identification

3.1.1 Desktop Assessment and Strike Trend Analysis

All known documents and resources relating to wildlife hazard mitigation at DIA were reviewed to improve understanding of wildlife hazards, management and unique wildlife circumstances at DIA. Databases, resources and documents reviewed are listed below.

- Atlas of Living Australia (wildlife database search) – Fauna Atlas NT
- Previous strike history from the Australian Transport and Safety Bureau (ATSB)
- Northern Territory cadastral data
- Northern Territory vegetation and watercourse mapping
- Current DIA WHMP (Biodiversity Australia, 2019)
- Quarterly wildlife reports (Biodiversity Australia)
- Northern Territory Airports (NTA) Wildlife Hazard Committee Meeting minutes
- Integrated Vegetation Management (IVM) Program – Annual Report (2022-2023)
- DIA / RAAF Base Darwin – Wild Dog Risk Assessment (Biodiversity Australia, 2019)
- Darwin International Airport, species cull records
- Confirmed and suspected strike history

3.1.2 On-airport Wildlife Surveys

Darwin International Airport have assessed onsite airport attracting habitats, operational practices, and water availability that could create favourable habitat that may increase the abundance and activity of high-risk species, and consequently increase interference / collision risk with airport operations.
The on-airport field assessment component of the review utilised data collected during the triannual airside surveys that have been conducted at DIA since March 2019, these surveys are timed to coincide with the three seasons that DIA experience (Wet season, Dry season and Build-up). During these surveys, airport operational staff are queried regarding their roles in wildlife related airport standard operating procedures, understanding of wildlife hazards and other relevant information. Airside

Operating Officers (AOOs) conducted walk-throughs of their daily wildlife management routines, wildlife surveillance procedures, and associated data collection procedures.
Wildlife surveys were conducted on airport so to increase understanding of the species that typically pose risk to aviation operations on the airfield. Surveys were undertaken using the standard wildlife monitoring protocol practiced by DIA's Airside Operations Officers (AOOs). A number of external resources were reviewed to gain a more complete understanding of the different types of wildlife that may pose a threat to DIA at different times of the year.

3.1.3 Off-airport Wildlife Surveys

Darwin International Airport have assessed offsite attracting habitats in the areas surrounding the aerodrome. Sites that are known to present additional hazard to DIA are under constant review and are surveyed three times per year by subject matter experts to coincide with the Wet Season, Dry-season and Build-up to create a measurable snapshot of wildlife activity. Each site was assessed according to the NASF Guideline C, Attachment 1 – Managing the Risk of Wildlife Strikes in the Vicinity of Airports. Sites known to present a higher risk than reflected by this framework were elevated a risk category (e.g. reclassified from moderate to high).

3.2 Wildlife Hazard Risk Assessment

3.2.1 Biennial Wildlife Risk Assessment

This WHMP uses the Bird Risk Assessment Model for Airports and Aerodromes to assess the probability and consequences of a strike event in relation to a bird species body mass, flocking characteristics, flight behaviour, and abundance on or near an airfield. This method assesses the probability and consequences of a strike event in relation to a bird species' body mass, flocking characteristics, flight behaviour and abundance on or near an airport or aerodrome.[1] The Paton 'probability x consequence' matrix is provided in Table 5. The rules governing the 'consequence' and 'likelihood' classifications are provided in Attachment 2.

For the purposes of DIA's wildlife hazard risk assessment, 'relative strike frequency' (informed by DIA's internal suspected and confirmed bird strike reports from 2014 to 2023) were used to determine the likelihood of strike associated with each species (further detail is provided in Attachment 3). Previously the likelihood from strike data was correlated from using the previous two years of strike data, however due to more variable climate conditions where it is not uncommon to have two poor wet seasons or two short dry seasons in a row, to establish a better baseline the data was assessed over the 10-year period. To obtain an accurate data set of species and the hazard they may pose, data from the results of the triannual airside surveys conducted in 2022 & 2023 was also assessed and the likelihood rank was established. The results of the two likelihood ranks were compared and the highest of the two was used to form this hazard assessment. The results of the wildlife hazard risk assessment for the 2024 update is included in Table 9 – DIA Wildlife Hazard Rankings.

It is relevant to note that the results of the wildlife hazard risk assessment in this WHMP must be viewed in the context of the broader DIA SMS. The hazard rankings of individual species should be interpreted relative to one another and not relative to other non-wildlife related hazards present at DIA. Other wildlife-related hazards at DIA must be determined using the DIA Risk Management Procedure (Attachment 4). For more information on DIA's risk assessment framework, and the related wildlife activity risk assessment, see Attachment 4.

[1] *Paton, D. C., 2010.* Bird Risk Assessment Model for Airports and Aerodromes, Revision 3. *Published by Australian Aviation Wildlife Hazard Group.*

Table 5. Bird Risk Assessment model for Airports and Aerodromes risk assessment matrix.

Consequence of a strike	Probability/Likelihood of a strike			
	Very High	**High**	**Medium**	**Low**
Extreme	extreme	extreme	very high	high
Very high	very high	high	high	medium
High	high	high	medium	medium
Medium	medium	medium	low	low
Low	low	low	negligible	negligible
Very low	negligible	negligible	negligible	negligible

3.3 Wildlife Management Plan

The results of the Hazard Identification and Risk Assessment were used to inform a Wildlife Management Plan, detailed in Section 6. Individual Species Management Plans are provided in Attachment 1.

4 Hazard Identification

4.1 Desktop Assessment and Strike Trend Analysis

Data collated by DIA personnel and Biodiversity Australia were assessed on two-year (2022-2023) and ten-year (2014-2023) temporal scales. The results of these assessments are described below.

4.1.1 Species Strike Trends

The Australian pratincole was the most frequently struck species during the 2022–2023 review period, comprising approximately 21.3% of all known strikes (excluding strikes for which species was unknown). Whistling kites and black kites comprised 13.9% and 12.7% of all strikes for which the species was identified, respectively (Figure 4).

Strikes for which the species was unknown or ambiguously identified comprised 35.2% of total strikes at DIA for the 2022–2023 review period.

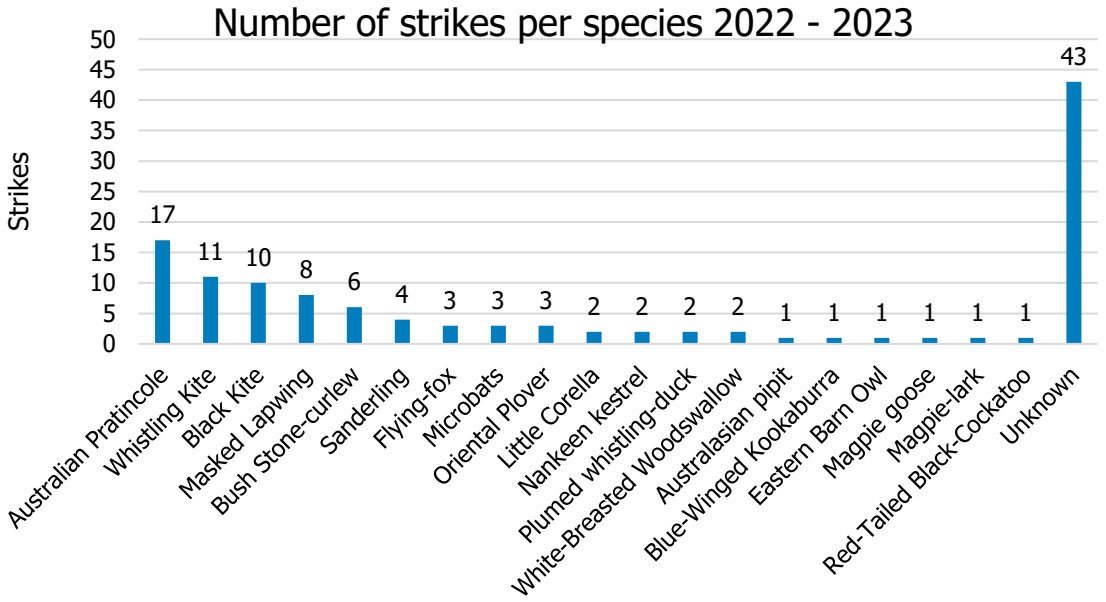


Figure 4. Species struck at DIA from 2022 and 2023.

The DIA strike register included 89 'Confirmed' and 33 'Suspected' strikes that occurred between January 2022 and December 2023 (Table 6). All but eight species exhibited a decreasing strike trend when comparisons between the two-year average and ten-year average were made. Sanderling with four strikes, plumed whistling-duck with two strikes and white-breasted woodswallow with two strikes were the only species with an increased strike trend to exhibit more than one strike within the 2022 to 2023 period. The Eastern barn owl, magpie goose, Australasian pipit and red-tailed black-cockatoo also exhibited an increasing strike trend but were only struck once over the course of the review period (Figure 5).

It should be noted that a large portion of strikes which were classified as involving an 'Unknown' species were suspected strikes/near miss events or strikes where no carcass was found.

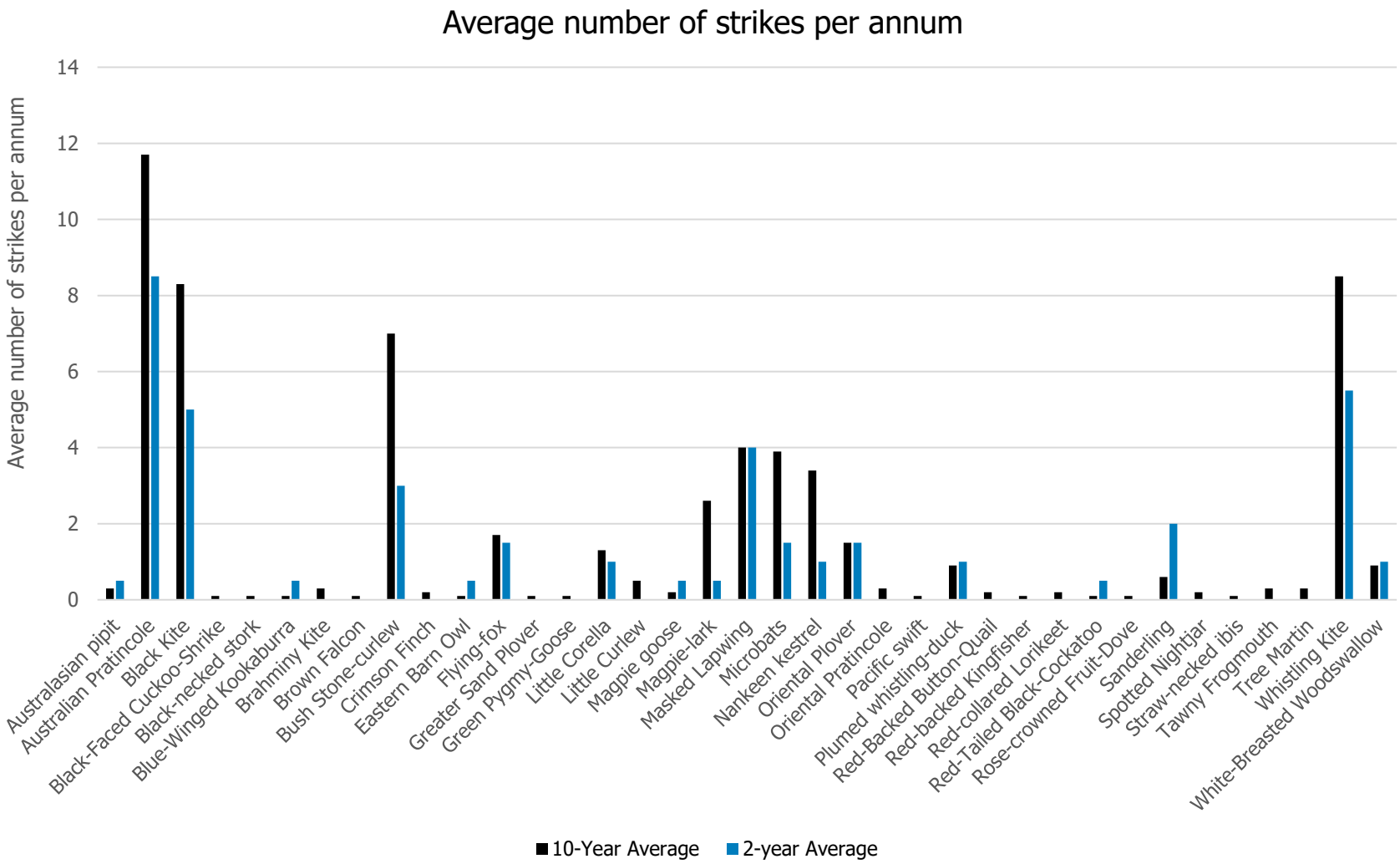


Figure 5. Average number of confirmed strikes per annum, compared on ten- and two-year temporal scales

Table 6. Species strike history 2014 – 2023.

Species Common Name	Scientific Name	Strike History				Trend (average strikes per annum)
		Strikes 2014-2023	**2014-20223Average**	**Strikes 2022-2023**	**2022-2023 Average**	
Australasian pipit	*Anthus novaeseelandiae*	3	0.30	1	0.50	Increasing
Australian Pratincole	*Stiltia isabella*	117	11.70	17	8.50	Decreasing
Black Kite	*Milvus migrans*	83	8.30	10	5.00	Decreasing
Black-Faced Cuckoo-Shrike	*Coracina novaehollandiae*	1	0.10	0	0.00	Decreasing
Black-necked stork	*Ephippiorhynchus asiaticus*	1	0.10	0	0.00	Decreasing
Blue-Winged Kookaburra	*Dacelo leachii*	1	0.10	1	0.50	Increasing
Brahminy Kite	*Haliastur indus*	3	0.30	0	0.00	Decreasing
Brown Falcon	*Falco berigora*	1	0.10	0	0.00	Decreasing
Bush Stone-curlew	*Burhinus grallarius*	70	7.00	6	3.00	Decreasing
Crimson Finch	*Neochmia phaeton*	2	0.20	0	0.00	Decreasing
Eastern Barn Owl	*Tyto javanica*	1	0.10	1	0.50	Increasing
Flying-fox	*Pteropus spp.*	17	1.70	3	1.50	Decreasing
Greater Sand Plover	*Charadrius leschenaultii*	1	0.10	0	0.00	Decreasing
Green Pygmy-Goose	*Nettapus pulchellus*	1	0.10	0	0.00	Decreasing
Little Corella	*Cacatua sanguinea*	13	1.30	2	1.00	Decreasing
Little Curlew	*Numenius minutus*	5	0.50	0	0.00	Decreasing
Magpie goose	*Anseranas semipalmata*	2	0.20	1	0.50	Increasing
Magpie-lark	*Grallina cyanoleuca*	26	2.60	1	0.50	Decreasing
Masked Lapwing	*Vanellus miles*	40	4.00	8	4.00	Decreasing
Microbats	*Microchiroptera*	39	3.90	3	1.50	Decreasing
Nankeen kestrel	*Falco cenchroides*	34	3.40	2	1.00	Decreasing

Species Common Name	Scientific Name	Strike History				Trend (average strikes per annum)
		Strikes 2014-2023	**2014-20223Average**	**Strikes 2022-2023**	**2022-2023 Average**	
Oriental Plover	*Charadrius veredus*	15	1.50	3	1.50	Decreasing
Oriental Pratincole	*Glareola maldivarum*	3	0.30	0	0.00	Decreasing
Pacific swift	*Apus pacificus*	1	0.10	0	0.00	Decreasing
Plumed whistling-duck	*Dendrocygna eytoni*	9	0.90	2	1.00	Increasing
Red-Backed Button-Quail	*Turnix maculosus*	2	0.20	0	0.00	Decreasing
Red-backed Kingfisher	*Todiramphus pyrrhopygius*	1	0.10	0	0.00	Decreasing
Red-collared Lorikeet	*Trichoglossus rubritorquis*	2	0.20	0	0.00	Decreasing
Red-Tailed Black-Cockatoo	*Calyptorhynchus banksii*	1	0.10	1	0.50	Increasing
Rose-crowned Fruit-Dove	*Ptilinopus regina*	1	0.10	0	0.00	Decreasing
Sanderling	*Calidris alba*	6	0.60	4	2.00	Increasing
Spotted Nightjar	*Eurostopodus argus*	2	0.20	0	0.00	Decreasing
Straw-necked ibis	*Threskiornis spinicollis*	1	0.10	0	0.00	Decreasing
Tawny Frogmouth	*Podargus strigoides*	3	0.30	0	0.00	Decreasing
Tree Martin	*Petrochelidon nigricans*	3	0.30	0	0.00	Decreasing
Whistling Kite	*Haliastur sphenurus*	85	8.50	11	5.50	Decreasing
White-Breasted Woodswallow	*Artamus leucorynchus*	9	0.90	2	1.00	Increasing
Unknown	-	359	35.90	43	21.50	Decreasing
Totals (less unattributed species strikes)		605	60.50	79	39.50	Decreasing
Totals (including all strikes)		**964**	**96.40**	**122**	**61.00**	**Decreasing**

4.1.2 Monthly Strike Trends

The average number of strikes per month generally peaks twice per year; once in May-June, and again in October–November (in accordance with the onset of Darwin's wet season; Figure 6). In 2022, strikes peaked in March to May and October to November. In 2023, strikes peaked in March to June and November to December. Overall, in 2023, all months registered a decrease to the 10 year-year average with the exception of December that had the same average number of strikes.

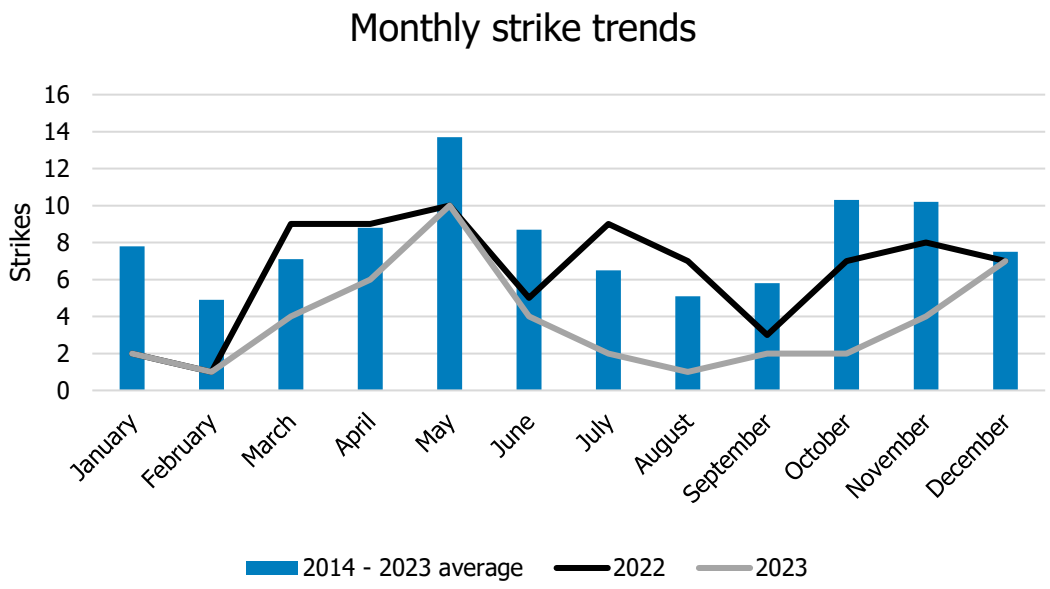
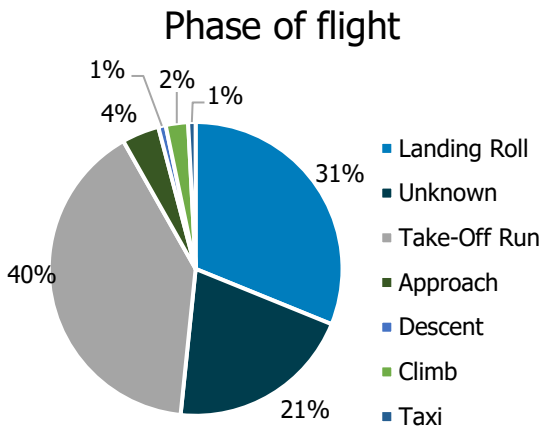


Figure 6. Average monthly wildlife strikes trends 2014 – 2023.

4.1.3 Timing and Outcomes of Strikes



During 2022 and 2023, 40% of all wildlife strikes reported occurred during either the take-off run or the landing roll (Figure 7). Several wildlife strikes also occurred during the approach, descent and climb phases. One strike involved aircraft taxiing on the airfield.

Figure 7. Phase of flight in which wildlife strikes occurred from 2022 to 2023.

The majority of strikes (94%) reported during the 24-month period preceding this review had no reported outcome (Figure 8). Of strikes that resulted in an adverse outcome, seven resulted in the affected aircraft undertaking a precautionary landing. One aircraft was grounded due to crew exceeding operational hours due to strike.

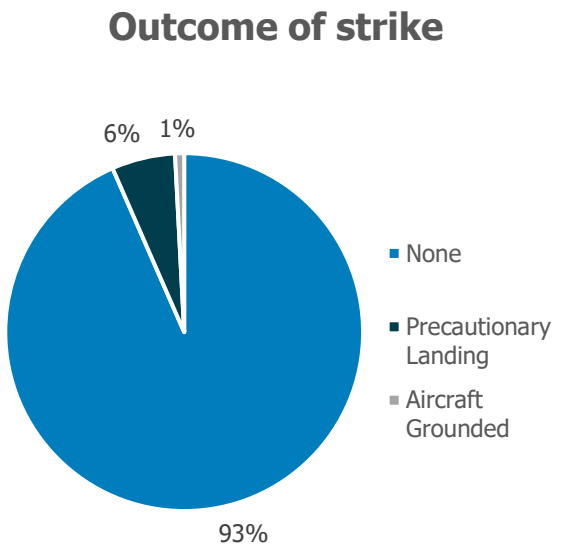


Figure 8: Outcomes of all strikes reported from 2022 to 2023.

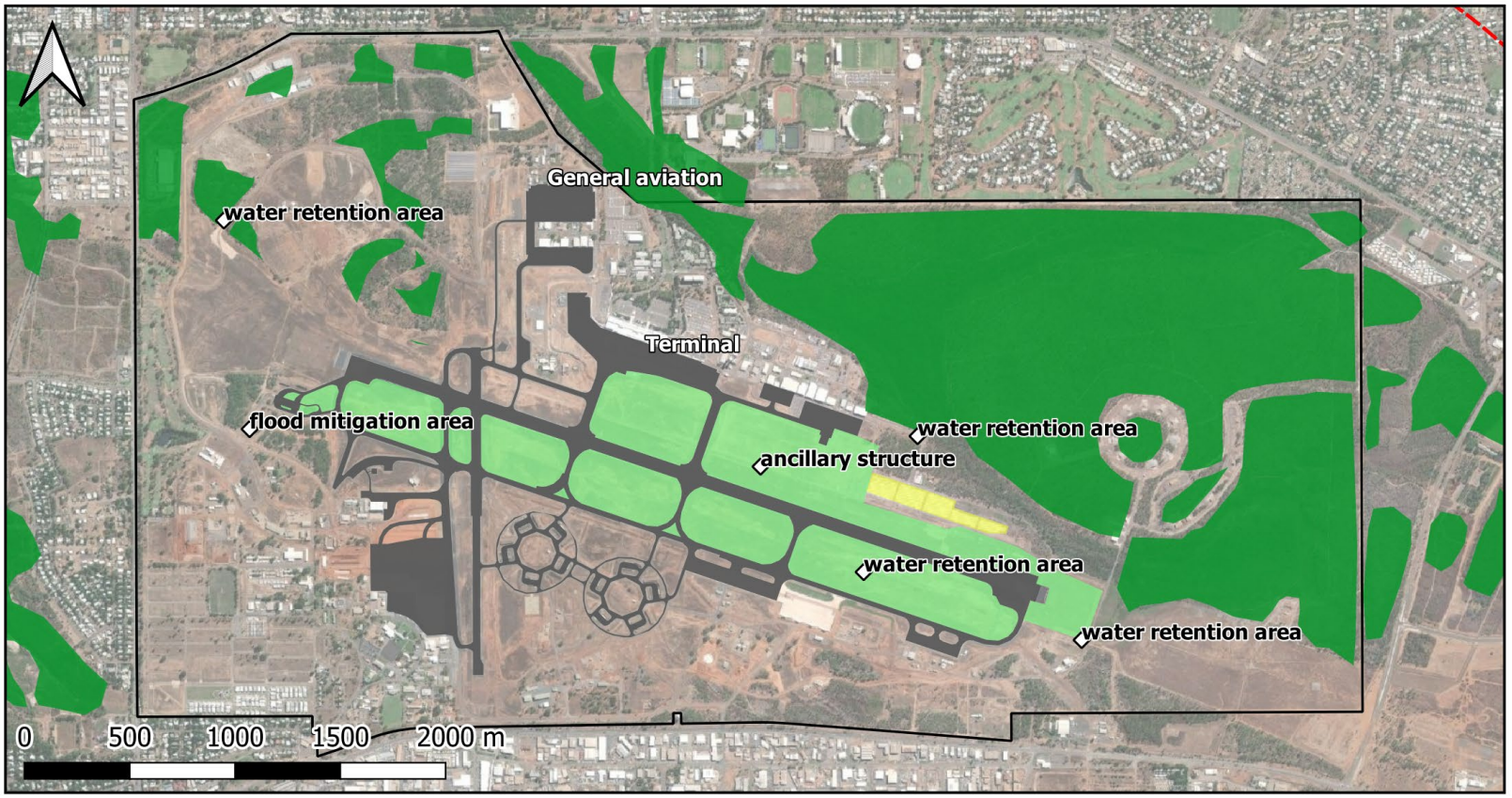
4.2 On-airport Hazards

Darwin International Airport supports a range of artificial habitats that attract a variety of wildlife species. These features include ancillary structures, power lines, water retention areas, grassed areas, stockpiles, densely wooded vegetation, and free-standing trees. Hazards identified have been listed and described in Table 7. Locations of on-airport wildlife attractants have been shown in Figure 9.

Table 7. On-airport wildlife attractants at DIA

Attractant	Description
Ancillary Structures	Fences, buildings and other infrastructure, such as gables and signage, provide perches and nesting sites for raptors and wood swallows. Anti-perching gel and spikes are applied to airfield signage and ancillary structures to deter birds perching near operational areas. Perching of birds on solar panels is not common.
Power Lines	A number of bird groups have been observed to perch on power lines along the north of the airport. Species seen utilizing these structures include corellas, magpie-larks and wood swallows.

Attractant	Description
Water retention areas	Blocked drains after rain and puddles around the New Southern Drain. These are especially attractive to seed-eating birds which require water nearby. Flocks of ducks and shorebirds have also been recorded in drains and puddles within the airside zone. There is a considerable flood retention area that attracts straw-necked ibis, Plumbed Whistling ducks, Magpie Geese and black-necked stork.
Airside grassed areas	Mown grassy areas around airstrip. This area provides habitat for a range of bird species that either forage for seeds (e.g. Little Corella) or hunt for prey (e.g. aerial hunters such as nankeen kestrel, whistling kite and black kite) and terrestrial hunters such as Australasian pipit, Australian pratincole, masked lapwing, bush stone-curlew and magpie-larks.
Stockpiles	Uncleared stockpiles consisting of leafy and woody debris may provide habitat for reptiles or small mammals. These animals may in turn attract larger predatory birds. Stockpiles should be cleared shortly after accumulation to prevent habitat usage by any wildlife.
Airside densely wooded vegetation	Mature airside vegetation, though a considerable distance from the runway, has been observed to provide habitat for a number of small woodland species as well as larger parrot species, such as cockatoos and corellas.
Free-standing trees/ stand-alone vegetation	Unlike densely wooded vegetation on site, stand-alone trees may provide perching habitat for raptors. Black kites have been observed utilizing stand-alone trees.



This mapping is to be considered indicative only and all derivations (e.g. vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any sudsequent error losses etc. that may arise from use of this data without independent verification.

Project Manager: AW
Drawn By: AD
Date: 13-06-2021
CRS: EPSG: 4326 - WGS 84

Figure Name: On-airport Hazards
Client: Northern Territory Airports Pty Ltd
Site: Darwin International Airport

Legend
- Airport boundary
- Dense vegetation
- Airside grassed areas (approx.)
- Ancillary structures
- Paved surfaces

Biodiversity AUSTRALIA

Page: 1 of 1
Job Number: AV3450
Scale: 1:22000
Revision: 1

Figure 9. On-airport hazards. Vegetation types within 3 km of DIA (excluding non-remnant vegetation).

4.3 Off-airport Hazards

Natural habitats for wildlife in the Darwin region include: remnant vegetation, wetland conservation areas, estuarine mudflats, and watercourses. Attractive modified habitat types include waste management facilities, sewage treatment facilities, golf clubs, sports ovals, and nature parks. There is considerable variation in the types of species that occupy these different habitats. A description of these sites has been provided in Table 8. The locations of each site (coloured by respective hazard ranking) are depicted in Figure 10. Darwin International Airport covers a range of vegetation types and habitats within the Rapid Creek catchment. The predominant vegetation types in the area immediate surrounding the airport include *Eucalyptus* woodland and *Melaleuca* woodland. Vegetation communities within 3km of the airport is shown in Figure 11.

Table 8. Description of off airport wildlife-attracting sites within 13km of DIA.

Site Name, Land use & NASF Risk Ranking	Distance from Airport	Level of attraction	Description	Fauna Observed	Recommended Action
Shoal Bay Waste Management Facility Classification: Putrescible waste facility **NASF Risk Ranking:** High	5 km northeast	High	Rubbish tip provides a permanent food source for scavenging raptor, ibis and heron species. Provides an artificial food source that may allow local population growth of certain species past naturally occurring thresholds.	• black kite • pied heron • Australian white ibis • plumed whistling-duck • silver gull • magpie-lark • whistling kite	**Mitigate:** Airport to maintain ongoing discourse with waste management facility and provide input into revisions to wildlife management procedures. **Monitor:** Regular monitoring is recommended to detect changes in wildlife activity, new species and changes in relative abundances.
Knuckeys Lagoons Conservation Area Classification: Wildlife sanctuary / conservation area - wetland **NASF Risk Ranking:** High	5 km east	High	Large lagoon (varying seasonally in extent) providing habitat for waterbirds provides habitat for waders and a variety of large waterbirds. Large populations of high-risk species are regularly observed utilizing this water source.	• plumed whistling-duck • magpie goose • pied heron • white-necked heron • intermediate egret • pied stilt • magpie-lark • pacific black duck • masked lapwing • Australian white ibis • straw-necked ibis • little black cormorant • Australian pelican	**Mitigate:** Mitigation is typically recommended for wetlands in close proximity of airports; however, mitigation is difficult given the size and protected status of this waterbody. Regular monitoring of this site is recommended (particularly during the breeding season) to quantify the risk level that this site poses to airport operations.

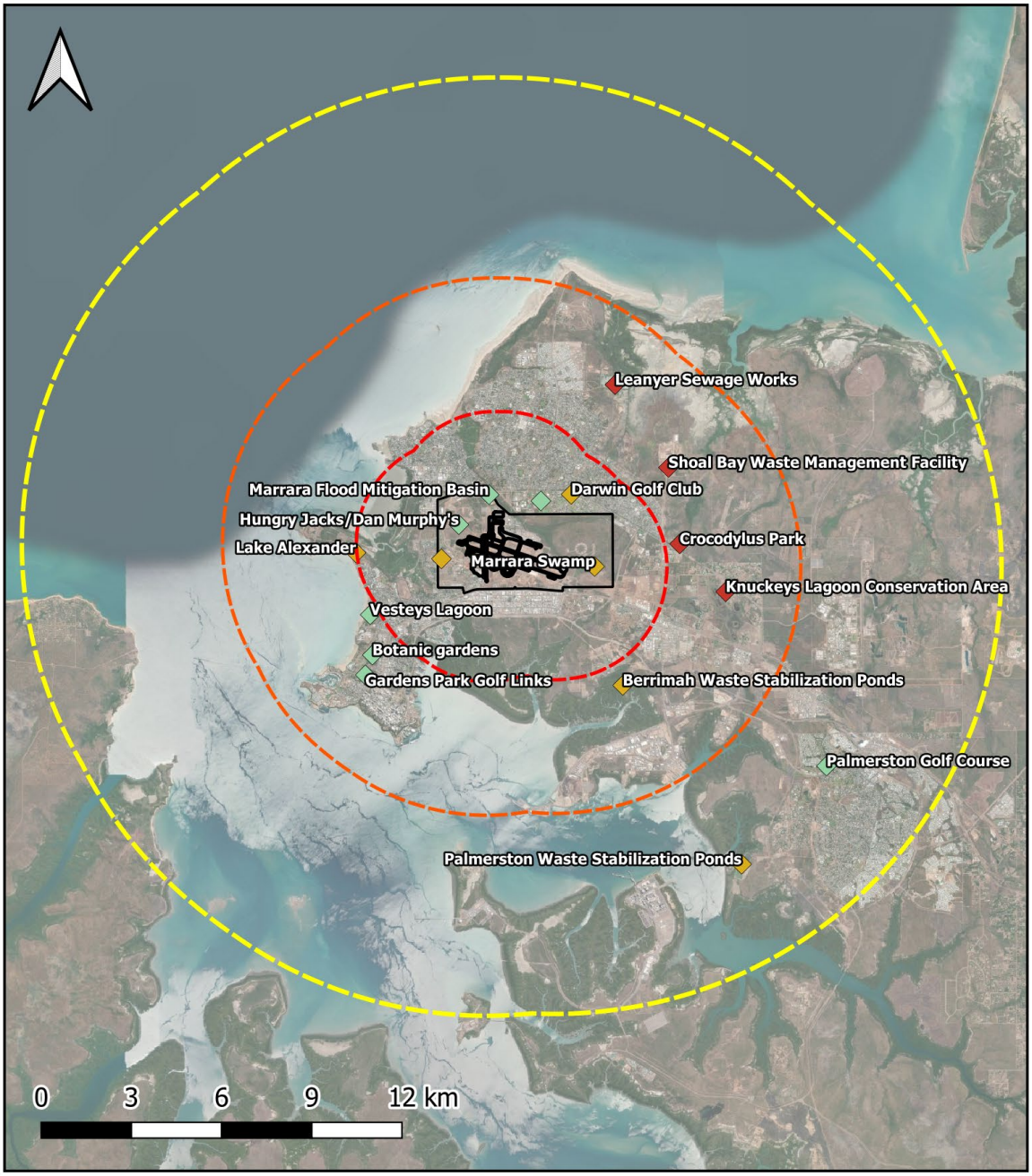
Site Name, Land use & NASF Risk Ranking	Distance from Airport	Level of attraction	Description	Fauna Observed	Recommended Action
				• Australasian grebe • noisy friarbird • fairy martin • crimson finch	
<u>Crocodylus Park</u> Classification: Conservation area - wetland **NASF Risk Ranking:** High	4 km east	High	Artificial water body providing significant habitat for waterbirds and raptors. Open water source with dense fringing vegetation provides ideal habitat for nesting and roosting of large waterbirds. While this site is unlikely to harbor large populations of these species by itself, it may act synergistically with the nearby landfill to sustain large populations of high-risk species, such as corellas.	• little corella • pied heron • Australian white ibis • cattle egret • black kite • intermediate egret • red-collared lorikeet • red-tailed black-cockatoo • magpie-lark • blue-faced honeyeater • fairy martin	**Mitigate:** The proximity of this site to the local landfill and waterbodies mean that large local populations are likely to utilize this area. These three sites may interact together to fulfil all habitat requirements of high-risk species in this area. DIA should have extensive input into land-use revisions in this area.

Site Name, Land use & NASF Risk Ranking	Distance from Airport	Level of attraction	Description	Fauna Observed	Recommended Action
Vesteys Lagoon Wildlife Sanctuary / conservation area - wetland **NASF Risk Ranking:** High	4 km southwest	High	Lawns attract small grassland species. The waterbody itself is too deep for foraging by large waterbird species. Risk may be heightened during dry periods when water levels are shallower and wildlife travel greater distances in search of resources.	• blue-faced honeyeater • orange-footed scrubfowl • red-collared lorikeet • Australian white ibis • black kite • magpie-lark • masked lapwing • straw-necked ibis • little corella	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.
Leanyer Sewage Works Classification: Sewage/ wastewater treatment facility **NASF Risk Ranking:** Moderate - reclassified as 'high' due to high volume of wildlife observed.	5.5 km northeast	High	This site provides ideal habitat for waterbird feeding due to shallow water conditions and presence of significant invertebrate life. Sewage pond is able to sustain large populations of high-risk species (e.g.; plumed whistling duck). Recent construction works may cause increased disturbances and activity at this site.	• black kite • plumed whistling duck • wandering whistling-duck • rajah shelduck • white-winged black tern • fairy martin • straw-necked ibis • pied heron • pied stilt • magpie-lark • sulphur crested cockatoo • masked lapwing • black-necked stork	**Mitigate:** Maintain ongoing discourse with Power and Water regarding revisions to existing land-uses. **Monitor:** Monitor ongoing construction works at the site to assess changes in wildlife activity.

Site Name, Land use & NASF Risk Ranking	Distance from Airport	Level of attraction	Description	Fauna Observed	Recommended Action
Berrimah Waste Stabilization Ponds Classification: Sewage / wastewater treatment facility **NASF Risk Ranking:** Moderate	4 km southeast	Moderate	Three waste stabilization ponds that operate in series. Treated effluent is later discharged into Bleesers Creek.	• common tern • magpie-lark • rainbow bee-eater	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.
Palmerston Waste Stabilization Ponds Classification: Sewage / wastewater treatment facility **NASF Risk Ranking:** Moderate	11 km southeast	Moderate	Waste stabilization ponds that operate in series. Treated effluent is later discharged into Myrmidon creek via a gravity fed outfall pipe.	• common tern	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.
Darwin Golf Club (North Lakes Golf Course) Classification: Golf course **NASF Risk Ranking:** Moderate	2 km north	Moderate	Ponds provide habitat for waterbirds and irrigated lawns attracts small numbers of grassland species.	• masked lapwing • magpie goose • little corella • red-collared lorikeet • magpie-lark • rajah shelduck • straw-necked ibis • bush stone-curlew	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.
Lake Alexander Classification: Recreational wetland	3.3 km west	Moderate	Large open waterbody. Predominant land use is recreation. Human activity in the area makes this site unattractive	• Australasian figbird • Magpie-lark • masked lapwing • black kite • common tern • red-collared lorikeet	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.

Site Name, Land use & NASF Risk Ranking	Distance from Airport	Level of attraction	Description	Fauna Observed	Recommended Action
NASF Risk Ranking: Moderate			to waterbirds, but they do have potential to occur during periods of low activity (e.g., dawn, dusk, overnight etc.)	• magpie goose • Australian white ibis • straw-necked ibis • Also known to occur: great egret and striated heron	
Marrara Swamp Conservation Area Classification: Dryland **NASF Risk Ranking:** Moderate	0.9 km east	Moderate	Melaleuca and mixed eucalypt woodland - attractive to small woodland bird species and parrots	• red-collared lorikeet • red-tailed black-cockatoo • Brown honeyeater • Rufous whistler • galah	**Monitor:** Ongoing monitoring of this site is recommended due to its proximity to DIA. Ongoing monitoring will enable detection in population changes of macropods and other vertebrate pest species.
Palmerston Golf Course Classification: Golf course **NASF Risk Ranking**: Moderate	11 km southeast	Moderate	Lawns attract small numbers of grassland species.	• Nil observed	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.
Botanic Gardens & Gardens Park Golf Links Classification: Wildlife Sanctuary / conservation area – dryland & Golf course **NASF Risk Ranking:** Moderate	5 km southwest	Moderate	Lawns attract small numbers of grassland species.	• red-collared lorikeet • Australian white ibis • brown honeyeater • blue-faced honeyeater • straw-necked ibis • masked lapwing • magpie-lark	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.

Site Name, Land use & NASF Risk Ranking	Distance from Airport	Level of attraction	Description	Fauna Observed	Recommended Action
Marrara sporting ovals (Indicative of other sites containing irrigated grasslands (e.g.; Berrimah power station, Berrimah farm) Classification: Various **NASF Risk Ranking:** Moderate	1.2 km north	Moderate	Irrigated lawns attract grassland species. May be potential for increased risk following period of heavy rainfall as this site has potential be ideal foraging habitat for straw-necked ibis	• magpie-lark • galah • masked lapwing • straw-necked ibis • red-collared lorikeet • black kite • magpie goose • white-breasted woodswallow • peaceful dove	**Monitor:** Wildlife activity is unlikely to increase at this site; however, it should be continually monitored to detect and adapt to potential increases to wildlife abundances.
Marrara Flood Mitigation Basin Classification: Anthropogenic wetland	1.6 km north	Low	The proposed development consists of a large detention basin. Airport risk assessment determined that this site would present a low/minor level of attraction.	• Nil observed	**Monitor:** regularly during construction and following completion of development. Monitoring of site following periods of heavy rainfall may be particularly important in establishing the extent of intermittent and/or seasonal hazards.
Estuarine mudflats and nearby watercourses Classification: Wildlife Sanctuary / conservation area – wetland	Various	Periodic	Estuarine mudflats attract seasonal waders and raptors. These changing conditions presents a management challenge as efforts needs to be adjusted according to these surrounding conditions	• Various	**Monitor:** Monitoring of nearby waterbodies for increased in wildlife activity is recommended on an ongoing basis.



This mapping is to be considered indicative only and all derivations (e.g. vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to Bio Aus where were not independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc. should be placed upon this map without independent validation of the information by the user. Bio Aus takes no responsibility for any sudsequent error losses etc. that may arise from use of this data without independent verification.

Biodiversity Australia

Project Manager: AW

Drawn By: AD

Date: 13-06-2021

CRS: EPSG: 4326 - WGS 84

Legend

Darwin Int'l Airport

NASF Assessment Radii

3km

8 km

13 km

NASF Rankings

Low

Moderate

High

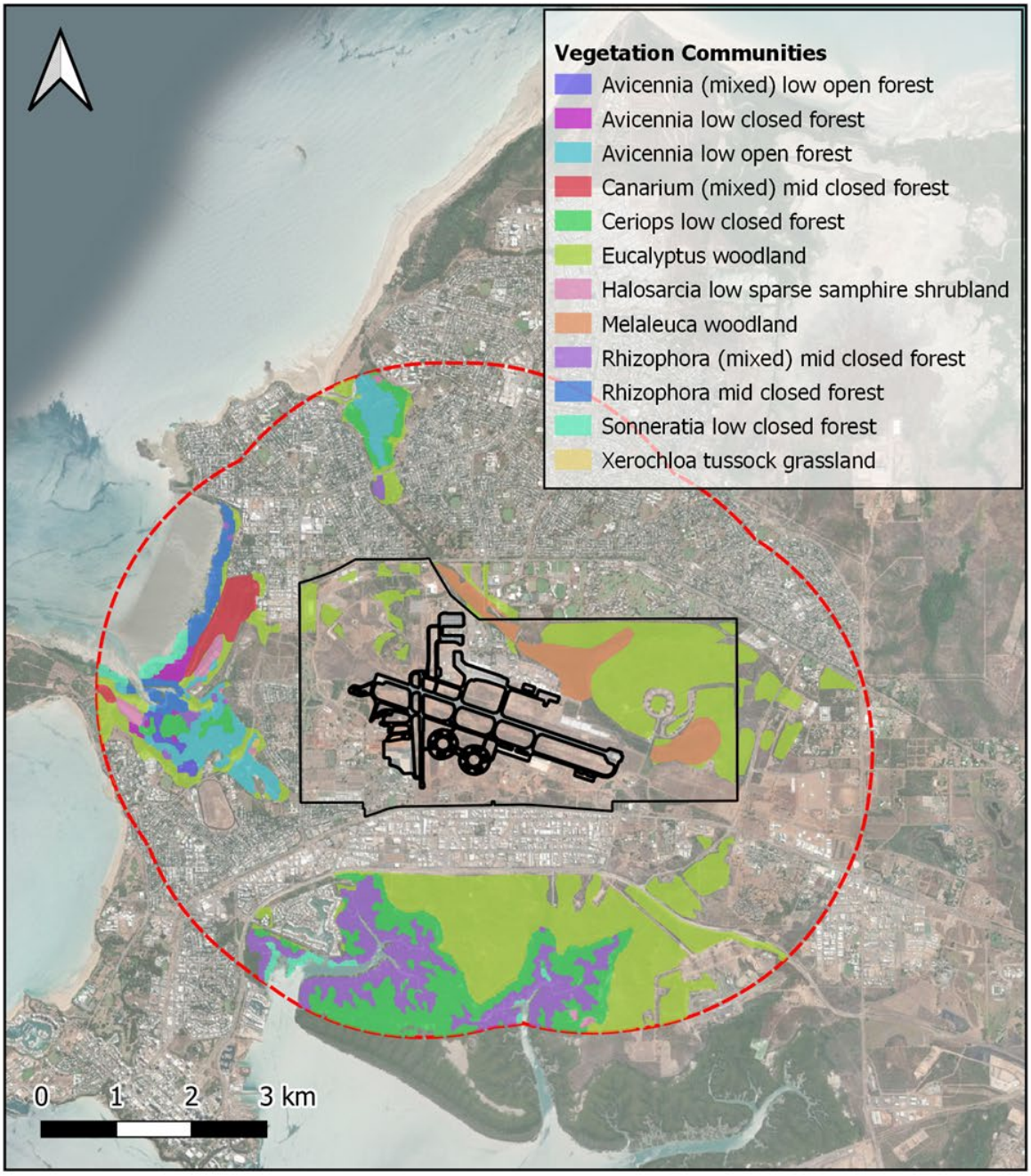
Figure Name: Off-airport hazards

Site: Darwin International Airport

Client: Northern Territory Airports Pty Ltd

Scale:	Job Number:	Revision:
1:150000	AV3450	1

Figure 10. Off-airport hazards.



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Biodiversity Australia

Project Manager:	AW
Drawn By:	AD
Date:	13-06-2021
CRS:	EPSG: 4326 - WGS 84

Legend

- Darwin Int'l Airport
- 3km

Figure Name: Vegetation communities		
Site: Darwin International Airport		
Client: Northern Territory Airports Pty Ltd		
Scale: 1:60000	Job Number: AV3450	Revision: 1

Figure 11. Vegetation within 3km of DIA (excluding non-remnant vegetation).

5 Wildlife Hazard Risk Assessment

5.1 Biennial Wildlife Risk Assessment

Wildlife strike records are an important source of information for determining the hazards present at airports. The information collected allows an assessment of species struck and trends across years, seasons, months and time of the day. For more information on how DIA's wildlife risk assessment model was conducted, refer Attachment 3: Bird Risk Assessment model for Airports and Aerodromes.

In 2022, there were 57 confirmed strikes and 20 suspected strikes; and in 2023, there were 32 confirmed strikes and 13 suspected strikes.

In 2022, the total confirmed strikes per 10,000 aircraft movements was 7.88 (assuming 72,306 aircraft movements). In 2023, the total confirmed strikes per 10,000 movement was 3.75 (assuming 85,228). When combining 2022 and 2023 the total confirmed strike averages at 5.65 per 10,000 movements (assuming 157, 534 aircraft movements). This represents a reduction when compared to the number of strikes per 10,000 movements for the previous 3 years 2019 to 2021 which was approximately 6.40 (assuming total of 235,884 movements).

Due to ongoing inconsistency with data reported by Airservices Australia, movement data for 2022 and 2023 has been sourced from AVDATA.

The complete risk assessment is shown in Table 9. Six species have been removed due to recording no strikes between 2014 and 2023 and not being observed during triennial wildlife surveys, these species are barking owl, black-shouldered kite, grey fantail, Pacific-golden plover, Torresian imperial pigeon and whimbrel. Thirteen species had an increase in hazard ranking due to changes in overall strike percentages and incorporating survey data. A further twelve species were included in the hazard table primarily from the triennial survey data, of all these species, they all have a hazard rank of medium or lower with the exception of galah with a hazard rank of very-high.

5.2 Wild Dog Risk Assessment

Following an increase in the number of wild dog sightings during 2018 and 2019 Biodiversity Australia conducted a Wild Dog Risk Assessment.

Although there have been no recorded strikes or incidents involving wild dogs at DIA / RAAF Base Darwin over the ten-year period 2014 to 2023, wild dogs are regularly sighted on and around the airport.

Over a four-year period, dog observations averaged 35.75 observations per year and have been trending downward from a peak of 41 in 2020 (Figure 12). The number of dogs counted in each observation ranges from a single dog up to five dogs with an average of 1.4 dogs recorded. 2021 recorded the most individual dogs counted at 59 (Figure 13) with multiple observations of between three and four dogs observed.

Management of wild dogs has included day-to-day monitoring and systematic monitoring by animal management specialist and management programs, including trapping.

DIA and RAAF Base Darwin continue to work together to manage wild dog issues. RAAF Base Darwin is included within the Vertebrate Biosecurity and Overabundant Native Species (VBONS) Management

Program for Pests on NT Defence Estates. Defence contractor Ventia arranged for a camera monitoring program to be carried out by consultants (EcOz) in December 2019.

Following review of the camera monitoring program and data from wildlife observations a monitoring and trapping program has been carried out by wildlife management specialist Wild Science; this program was successful in identifying the presence and removal of a number of wild dogs with a trapping program completed in the 2nd half of 2020. Follow-up trapping has been conducted in May-June 2021 and July 2022.

Monitoring and reporting the presence of wild dogs is ongoing and trapping programs are being implemented on DIA and RAAF Base areas during 2023. Management programs were implemented in 2023 on three occasions with seven (7) wild dogs removed.

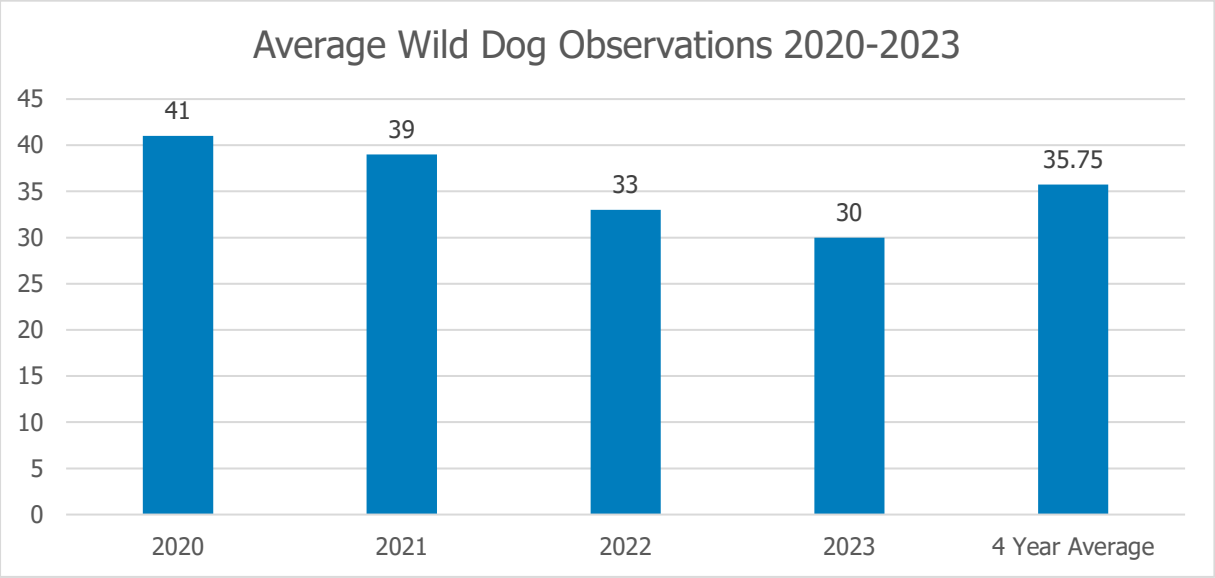


Figure 12: Average wild dog observations 2020 -2023 DIA

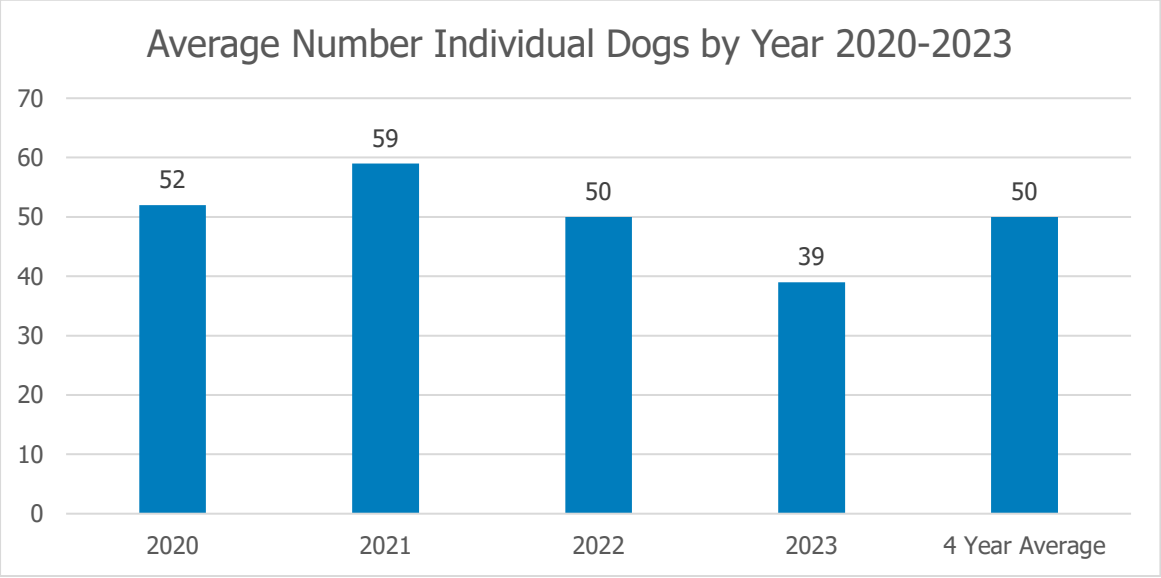


Figure 13: Total number individual dogs by year 2020-2023

Table 9. DIA wildlife hazard rankings 2014 – 2023.

Species Common Name	Scientific Name	Mass (g)	Mass Score	Flock Score	Flight Score	Consequence Score	Consequence Rank	10 Year Strike History (2014 - 2023)	% representation in known strikes 2014 - 2023	Strike History (2022-2023)	% representation in known strikes 2022-2023	Strike Trend	Strike Likelihood Rank	Survey Likelihood Rank	Highest Likelihood Rank	Hazard Rank
		Consequence						Likelihood								
Flying-fox	*Pteropus spp.*	680	8	4	2	64	**EX**	17	2.81%	3	3.80%	**Increasing**	H	L	**H**	**EX**
Magpie goose	*Anseranas semipalmata*	2800	16	4	1	64	**EX**	2	0.33%	1	1.27%	**Increasing**	M	H	**H**	**EX**
Plumed whistling-duck	*Dendrocygna eytoni*	1000	16	4	1	64	**EX**	9	1.49%	2	2.53%	**Increasing**	H	M	**H**	**EX**
Straw-necked ibis	*Threskiornis spinicollis*	1465	16	4	1	64	**EX**	1	0.17%	0	0.00%	**Decreasing**	M	H	**H**	**EX**
Bush Stone-curlew	*Burhinus grallarius*	1200	16	2	1	32	**VH**	70	11.57%	6	7.59%	**Decreasing**	VH	VH	**VH**	**VH**
Dog	*Canis lupus familiaris*	20000	32	1	2	64	**EX**	0	0.00%	0	0.00%	**-**	-	H	**H**	**VH**
Galah	*Eolophus roseicapilla*	330	8	4	2	64	**EX**	0	0.00%	0	0.00%	**-**	-	M	**M**	**VH**
Masked Lapwing	*Vanellus miles*	360	8	2	2	32	**VH**	40	6.61%	8	10.13%	**Increasing**	VH	VH	**VH**	**VH**
Red-Tailed Black-Cockatoo	*Calyptorhynchus banksii*	720	8	2	2	32	**VH**	1	0.17%	1	1.27%	**Increasing**	M	VH	**VH**	**VH**
Black Kite	*Milvus migrans*	625	8	1	2	16	**H**	83	13.72%	10	12.66%	**Decreasing**	VH	VH	**VH**	**H**
Black-necked stork	*Ephippiorhynchus asiaticus*	4100	16	1	2	32	**VH**	1	0.17%	0	0.00%	**Decreasing**	M	M	**M**	**H**
Green Pygmy-Goose	*Nettapus pulchellus*	430	8	4	1	32	**VH**	1	0.17%	0	0.00%	**Decreasing**	M	-	**M**	**H**
Little Corella	*Cacatua sanguinea*	560	8	4	1	32	**VH**	13	2.15%	2	2.53%	**Increasing**	H	H	**H**	**H**
Magpie-lark	*Grallina cyanoleuca*	90	4	2	2	16	**H**	26	4.30%	1	1.27%	**Decreasing**	H	VH	**VH**	**H**
Nankeen kestrel	*Falco cenchroides*	185	4	2	2	16	**H**	34	5.62%	2	2.53%	**Decreasing**	VH	VH	**VH**	**H**
Oriental Plover	*Charadrius veredus*	95	4	4	1	16	**H**	15	2.48%	3	3.80%	**Increasing**	H	H	**H**	**H**

Red-collared Lorikeet	*Trichoglossus rubritorquis*	125	4	4	1	16	**H**	2	0.33%	0	0.00%	**Decreasing**	M	H	**H**	**H**
Whistling Kite	*Haliastur sphenurus*	910	8	1	2	16	**H**	85	14.05%	11	13.92%	**Decreasing**	VH	L	**VH**	**H**
Australian Pratincole	*Stiltia isabella*	65	4	2	1	8	**M**	117	19.34%	17	21.52%	**Increasing**	VH	H	**VH**	**M**
Blue-Winged Kookaburra	*Dacelo leachii*	310	8	1	2	16	**H**	1	0.17%	1	1.27%	**Increasing**	M	M	**M**	**M**
Greater Sand Plover	*Charadrius leschenaultii*	75	4	4	1	16	**H**	1	0.17%	0	0.00%	**Decreasing**	M	L	**M**	**M**
Intermediate egret	*Ardea intermedia*	400	8	1	2	16	**H**	0	0.00%	0	0.00%	**-**	-	L	**L**	**M**
Pacific swift	*Apus pacificus*	40	2	4	2	16	**H**	1	0.17%	0	0.00%	**Decreasing**	M	-	**M**	**M**
Sanderling	*Calidris alba*	60	4	4	1	16	**H**	6	0.99%	4	5.06%	**Increasing**	M	-	**M**	**M**
White-Breasted Woodswallow	*Artamus leucorynchus*	40	2	2	2	8	**M**	9	1.49%	2	2.53%	**Increasing**	H	M	**H**	**M**
Brahminy Kite	*Haliastur indus*	530	8	1	1	8	**M**	3	0.50%	0	0.00%	**Decreasing**	M	-	**M**	**L**
Brown Falcon	*Falco berigora*	625	8	1	1	8	**M**	1	0.17%	0	0.00%	**Decreasing**	M	L	**M**	**L**
Eastern Barn Owl	*Tyto javanica*	355	8	1	1	8	**M**	1	0.17%	1	1.27%	**Increasing**	M	-	**M**	**L**
Little Curlew	*Numenius minutus*	170	4	2	1	8	**M**	5	0.83%	0	0.00%	**Decreasing**	M	L	**M**	**L**
Microbats	*Microchiroptera*	10	1	2	2	4	**L**	39	6.45%	3	3.80%	**Decreasing**	VH	M	**VH**	**L**
Oriental Pratincole	*Glareola maldivarum*	75	4	2	1	8	**M**	3	0.50%	0	0.00%	**Decreasing**	M	L	**M**	**L**
Pied butcherbird	*Cracticus nigrogularis*	140	4	2	1	8	**M**	0	0.00%	0	0.00%	**-**	-	M	**M**	**L**
Spangled drongo	*Dicrurus bracteatus*	79	4	1	2	8	**M**	0	0.00%	0	0.00%	**-**	-	M	**M**	**L**
Tawny Frogmouth	*Podargus strigoides*	680	8	1	1	8	**M**	3	0.50%	0	0.00%	**Decreasing**	M	-	**M**	**L**
White-bellied cuckooshrike	*Coracina papuensis*	110	4	1	2	8	**M**	0	0.00%	0	0.00%	**-**	-	M	**M**	**L**
Australasian pipit	*Anthus novaeseelandiae*	32	2	1	1	2	**VL**	3	0.50%	1	1.27%	**Increasing**	M	VH	**VH**	**N**
Black-Faced Cuckoo-Shrike	*Coracina novaehollandiae*	115	4	1	1	4	**L**	1	0.17%	0	0.00%	**Decreasing**	M	M	**M**	**N**
Crimson Finch	*Neochmia phaeton*	10	1	2	1	2	**VL**	2	0.33%	0	0.00%	**Decreasing**	M	-	**M**	**N**
Double-barred finch	*Taeniopygia bichenovii*	10	1	4	1	4	**L**	0	0.00%	0	0.00%	**-**	-	L	**L**	**N**
Little friarbird	*Philemon citreogularis*	67	4	1	1	4	**L**	0	0.00%	0	0.00%	**-**	-	L	**L**	**N**
Olive-backed oriole	*Oriolus sagittatus*	96	4	1	1	4	**L**	0	0.00%	0	0.00%	**-**	-	L	**L**	**N**
Peaceful dove	*Geopelia striata*	55	4	1	1	4	**L**	0	0.00%	0	0.00%	**-**	-	M	**M**	**N**
Rainbow bee-eater	*Merops ornatus*	35	2	1	1	2	**VL**	0	0.00%	0	0.00%	**-**	-	H	**H**	**N**
Red-Backed Button-Quail	*Turnix maculosus*	51	4	1	1	4	**L**	2	0.33%	0	0.00%	**Decreasing**	M	-	**M**	**N**
Red-backed Kingfisher	*Todiramphus pyrrhopygius*	70	4	1	1	4	**L**	1	0.17%	0	0.00%	**Decreasing**	M	-	**M**	**N**

Rose-crowned Fruit-Dove	*Ptilinopus regina*	125	4	1	1	4	**L**	1	0.17%	0	0.00%	**Decreasing**	M	-	**M**	**N**
Rufous whistler	*Pachycephala rufiventris*	25	2	1	1	2	**VL**	0	0.00%	0	0.00%	**-**	-	L	**L**	**N**
Spotted Nightjar	*Eurostopodus argus*	130	4	1	1	4	**L**	2	0.33%	0	0.00%	**Decreasing**	M	L	**M**	**N**
Tree Martin	*Petrochelidon nigricans*	15	1	2	2	4	**L**	3	0.50%	0	0.00%	**Decreasing**	M	-	**M**	**N**

6 Wildlife Management Plan

Darwin International Airport employs a number or techniques for both active and passive management of wildlife at the Airport. A brief summary of each is provided below. The persons responsible for the implementation of wildlife management at DIA are detailed in Attachment 5.

Procedures (PROs) have been developed to provide the details and background for correct and safe implementation. A brief summary of each has been provided in Table 10.

Table 10. Summary of wildlife management procedures.

Procedure & Delegation	Description	Frequency
WMP 01 - Wildlife Detection, Monitoring and Observation **TAOO**	Wildlife hazard detection, monitoring and observation is carried out daily during serviceability inspections and throughout the day monitoring and recording wildlife observations in AVCRM reporting database.	Daily 24/7
WMP 02 - Wildlife Hazard Level **TAOO**	The Wildlife Hazard Level is determined following review of historical wildlife strike data and the Wildlife Species Risk Calendar. The Wildlife Hazard Level is reviewed each month (and as required). The Wildlife Hazard Level will determine the expected Wildlife Management activities appropriate for the Hazard Level, in accordance with the relevant procedures detailed within the procedure.	Monthly and as required
WMP 03 – Wildlife Confirmed Strikes – Monthly Target **AM**	The monthly target is based on the historical monthly hazard levels and is an indicator that the wildlife hazard management procedures are meeting key performance indicators and/or a trigger for review of procedures or risk assessment due changes in wildlife numbers and/or species that are present resulting in an increase of wildlife strikes.	Monthly
WMP 04 – Issuing a NOTAM **AM / TAOO**	In the event of identified hazard on or in the near vicinity of the airport steps are taken to remove the hazard, or alternatively advise pilots of the hazard via NOTAM.	As required

Procedure & Delegation	Description	Frequency
WMP 05 – Wildlife Countermeasure (Harassment) Procedures **TAOO**	This procedure details the procedures and guidelines for active management of wildlife hazards, and to assess the most effective countermeasure (harassment) and tools available for dispersing/removing wildlife from the vicinity of runways (including culling (lethal control) of wildlife).	Before aircraft movements or as required
WMP 06 – Culling (Lethal Control) of Wildlife **TAOO**	Culling (lethal control) of wildlife is an important wildlife management tool and should be considered when trying to remove Moderate to Very High-risk species, in particular when other methods have been carried out with no effect. It can also be used to reinforce other methods.	As required during periods of unusually high wildlife activity involving difficult to disperse species.
WMP 07 – Egg and Nest Removal **TAOO**	Wildlife that establishes breeding and nesting territories airside may behave territorially and create strike hazards. The removal of eggs and nests deters birds from establishing territories airside while limiting breeding success. This process may apply to territorial, ground-nesting species such as masked lapwing and bush-stone curlew.	As required – during breeding season
WMP 08 – Trapping and Snaring Wildlife **AM / TAOO** **External Consultant / Defence**	Terrestrial wildlife may present a considerable hazard to aircraft operations. Where an increased risk is identified during monitoring, external contractors may be required to manage the hazard. The AM will liaise with Defence Contractors. Ventia, regarding implementation of procedures in accordance with RAAF Base Darwin Vertebrate BONS Management Program (Refer NT Vertebrate BONS Program 2018-2022 Section 5.7).	As required

Procedure & Delegation	Description	Frequency
WMP 09 – Wildlife Strike Procedure and Reporting **TAOO & AM**	Wildlife strikes are classed as routine reportable incidents under the Transport Safety Investigation Regulations 2003 (Section 2) and must be reported to the ATSB within 72 hours of occurring. Accurate reporting of wildlife strikes is an important aspect of wildlife hazard management, and species identification assists with collating statistical information, risk assessments and effective hazard management. Struck wildlife should always be identified as close to the species level as possible. Wildlife strikes are recorded in AVCRM.	After wildlife strikes
WMP 10 - Significant Strike Investigation & Reporting (SSIR) **TAOO, AM & HOA**	A Significant Strike Investigation is a detailed analysis of a wildlife strike that attempts to identify why a strike occurred. Determining the exact sequence of events may reduce the chances of incident recurrence. A Significant Strike Investigation is generally instigated by the Airside Manager or other senior Operations Staff in response to significant strike event(s).	After significant strike events
WMP 11 - Safe Handling of Wildlife **TAOO**	All wildlife has the potential to carry disease; as such, safe handling of injured or sick wildlife and their remains is essential to ensure that personnel are not at risk of injury or illness.	When handling, injured or deceased wildlife
WMP 12 - DNA Collection Procedure **TAOO**	When struck wildlife cannot be identified, a DNA sample must be collected to confirm the species involved in the incident. The general wildlife handling procedures detailed in WMP10 - Safe Handling of Wildlife - must also followed prior to collecting DNA samples.	When a strike occurs
WMP 13 – Wildlife Hazard Management Procedures – Airfield Works **AM**	Airfield works may impact and/or restrict access to portion(s) of the movement area. Issued when it is assessed that works will impact the daily wildlife hazard management activities.	Issued as required

WMP Procedures issued as Appendix 1 to this plan.

6.1 Passive Management

6.1.1 Exclusion

The management of animals is a high priority for DIA due to the extreme safety issues associated with wildlife on the airfield. Darwin International Airport and RAAF Base Darwin monitor the airside perimeter fences to ensure that they are maintained in good order and to reduce the opportunity for feral dogs entering the aerodrome.

All gates and access points to the airfield require swipe card access and/or controlled locks and are otherwise kept closed at all times.

6.1.2 Deterrence

The most effective method used to reduce wildlife numbers at Darwin Airport is to reduce the number of attractants available to the wildlife. Due to the variety of environments in the Top End region of the Northern Territory, environmental management measures aimed at reducing the desirability of on-site habitat needs to be considered on a case-by-case basis. Such management measures are listed below.

- Airside mowing
- Drain clearing
- Burn programs
- Waste disposal

6.1.3 IVM Program

Following a successful Integrated Vegetation Management (IVM) Program conducted in 2018-2019 the program was jointly implemented by DIA and Defence (RAAF Base Darwin) in 2020.

There have been positive changes to the vegetation and insect activity during the first 3 years of IVM Program 2020-21,2021-22 and 2022-23, including the following observations during 2022-23:

- An average 80% reduction in grasshopper activity around Runway 11/29 when compared with untreated areas;
- A 74 % reduction in the cover of broadleaf weeds around Runway 11/29 by the end of the wet season in 2022 when compared with the nearby untreated areas; and
- A 28% increase in cover of low growing desirable and acceptable grasses around Runway 11/29 by the end of the wet season in 2022 when compared with nearby untreated areas.

The following changes to bird activity at Darwin Airport have been observed since the start of the IVM Program:

- An average 39% reduction in bird numbers in the critical areas around Runway 11/29 during the first three years of the IVM Program compared to the average of the previous three years;
- An average 32% reduction in the number of birds harassed around the Runway 11/29 during the first three years of the IVM Program compared to the average of the previous three years;
- An average 33% reduction in the number of birds harassed around the Runway 11/29 during the first three years of the IVM Program compared to the average of the previous three years;
- An average 44% reduction in ammunition use around the Runway 11/29 during the first three years of the IVM Program compared to the average of the previous three years;
- An average 75% reduction in the number of birds culled around the Runway 11/29 during the first three years of the IVM Program compared to the average of the previous three years.

The goal of the IVM program has been to reduce the attractiveness of the area around Runway 11/29 to birds and reduce the number of bird strikes occurring at Darwin Airport, and the IVM Program has assisted in achieving the following outcome:

- An average 44% reduction in bird strike rate at DIA during the first three years of the IVM Program compared to the average of the previous three years.

6.1.4 Detection

The ability to see and avoid wildlife on an airport may vary depending on the size and coloration of the species, operational limitations of aircraft, and environmental factors. The following list outlines the wildlife detection measures undertaken by DIA personnel.

- Assessment of wildlife attracting developments;
- Regular inspections of the airfield;
- Additional inspections (RWY 'bird checks') during increased bird activity;
- Wildlife observations and monitoring on airport; and
- Provision of materials aimed at increasing accuracy of wildlife detection.

6.2 Active Management

6.2.1 Wildlife Hazard Management Countermeasures - Harassment & Culling

The active management of wildlife hazards from runways and surrounding airfield is one of the most effective means of wildlife hazard management. Control activities should be based on a priority system with a concentric approach from the runway. The runway and associated undershoots are the main priority for wildlife hazard mitigation. The runway strips are the second priority, the surrounding area the third priority, and so forth.

The TAOO will assess the situation and decide upon the safest and most effective countermeasure to deploy when wildlife hazards are observed during airfield inspections and patrols. Wildlife hazard countermeasures include:

- *Vehicle, sirens/horns, and lights*: Provides a negative auditory stimulus that acts as an immediate method for harassing birds and terrestrial animals (e.g. feral dogs) from the manoeuvring areas (runways or taxiways).
- *Bird Distress Calls*: Scarecrow Patrol or megaphone type equipment with distress calls and other noises.
- *Pyrotechnic Cartridges*: Non-lethal rounds that produce both negative auditory and visual stimuli. Can deployed at short notice and used as a long-range dispersal method.
- *Gas Canon/Shotgun Simulator*: Handheld/portable 'gas powered' device that produces a simulated shotgun sound. Safe and easy to deploy and can be used in situations, locations or conditions (e.g. at night) that are not suitable for firearms to be used. Note that use of this method does not require a Firearms Licence.
- *Live Rounds*: Culling with live rounds is used to reinforce the effects of other methods or to remove an imminent hazard. DIA's Firearms Procedures dictate the guidelines for storage and general use of firearms on the airfield.

- *Trapping*: Used when an increase of sightings and/or reports of animals, particularly terrestrial species has occurred. Trapping activity is carried out by specialist contractors and in accordance with DIA's protected wildlife permit.

6.2.2 Species Management Plans

Species management plans have been provided to aid in the active and passive management of high-risk species (Attachment 1).

6.3 Recording and Reporting

6.3.1 Data Recording

The purpose of wildlife data collection is to provide evidence-based justification for management actions and to demonstrate WHMP processes are in place to routinely detect and, where feasible, remove hazards. The wildlife hazard management is recorded in the AVCRM database and is managed and overseen by the Airside Manager (AM). The use of a mobile tablet application has improved wildlife management data collection by increasing the ease of systematic data collection. Data relating to wildlife presence and abundances can be used to generate graphs and figures within the program. TAOO's are responsible for entering data into the AVCRM database, including strikes, observations and countermeasures to harass and/or cull wildlife. If a DNA sample is taken, the results are entered by the AM once received.

Reports, documents and other information is accessible through SharePoint in the Operations Library.

6.3.2 Reporting

Routine reporting ensures that all staff and managers are equipped with the information needed to adapt hazard management activities and the WHMP when required. The following reports and documentation outlined in Table 11 are completed and distributed (as required) by the relevant staff. Operations Staff also have informal reporting and discussions about local conditions and wildlife management updates.

Table 11. Regular reporting documents and requirements.

Reporting	Frequency	Comments	Responsibility
Aerodrome Serviceability Inspections	Daily	Information is recorded in AVCRM and is used to determine minimum harassment methods/resources required.	TAOO
NOTAM	When an unusually high wildlife hazard is present	A NOTAM is issued when an unusually high wildlife hazard is present at the Airport. The NOTAM must include species details. The relevant PRO for issuing NOTAMs must be followed.	TAOO or AM

Reporting	Frequency	Comments	Responsibility
Wildlife Observations	Continuously during inspections and airside patrols	Data to be collected and entered into AVCRM database.	TAOO
Wildlife Surveys	Seasonal	On-airport and off-airport surveys conducted by a subject-matter expert to assess wildlife populations. Surveys are timed to assess wildlife populations around the Top End seasons – dry season, wet season and transition (build-up) from dry to wet season	Subject-matter expert
Wildlife countermeasures (harassment and dispersal)	As required	Data relating to countermeasure methods used to harass, disperse or cull wildlife are entered into the AVCRM database. Resultant data is used to investigate effectiveness of methods used to manage wildlife hazards and providing information to Parks and Wildlife as dictated by permit requirements.	TAOO AM
Wildlife strike reporting	Refer to strike definitions for reporting	Wildlife strikes to aircraft are reported to the Australian Transport Safety Bureau (ATSB) within 72 hours of the incident. Wildlife strikes are to be reported to the ATSB and the Aircraft operator (when known) when carcasses or remains are found on the movement area. If any incident or accident has eventuated due to wildlife strike, an ATSB incident form must also be completed.	Engineers Pilots TAOO AM Ground staff

Reporting	Frequency	Comments	Responsibility
Significant Strike Reporting	As required	A "significant wildlife strike" may be deemed to have occurred when there is damage evident on the aircraft due to a strike, there is an effect on the flight, more than one bird is involved in a strike, or at the discretion of the AM.	AM
WHMP Reports	As required	WHMP Reports are compiled and distributed to stakeholders detailing wildlife strikes and other activity during the relevant reporting period. Quarterly reports detailing harassment and removal activity are also provided to NT Parks and Wildlife.	AM

6.3.2.1 Airline Reporting Requirements

It is essential to ensure that all data collected are correct and accurate. Airlines and aircraft operators must ensure that they check data provided to them through strike reports, (whether confirmed or suspected) and notify DIA of any changes or corrections required. WHMP09 provides wildlife strike reporting requirements.

7 Further Investigations

7.1 Trials

The Airport will consider all application for trials to reduce wildlife activity at the Airport. A trial application must include (but not limited to):

- measurable outcomes;
- risk assessment including ensuring CASA compliance with MOS 139 throughout the trial;
- implementation and management of the trial; and
- trial period and costs.

The Airside Manager (and/or Aerodrome Safety & Standards Manager or Head of Operations) have the authority to stop the trial if at any time aircraft safety is at risk. Trial applications are evaluated against the risk matrix priority species and the projected outcomes/benefits as well as risks.

7.2 Research Projects

7.2.1 Integrated Vegetation Management

In 2018, an Integrated Vegetation Management (IVM) program commenced at DIA. This program aimed to mitigate the wildlife hazards associated with recurrent mowing activities on the airfield. The primary objective of the trial was to facilitate growth of "desirable" grass species at the airport, while restricting growth of "undesirable" species. It was anticipated that the success of this program will reduce the required regularity of mowing and maintenance events, and result in fewer wildlife attracting activities (e.g. predatory species are attracted to mowing events due to the displacement of smaller fauna and invertebrates). This was DIA's first research program aimed at increasing the efficacy of the airport's passive management strategies. The IVM Program was completed mid-2019. The trail results showed that it achieved the objectives that were set at the beginning of the trial, despite some difficulties that were encountered during the trial due to adverse climatic conditions. Objectives of the trial that were met included:

- reduce general bird activity and mitigate wildlife risk;
- reduce the need for post-mowing wildlife harassment;
- reduce frequency of mowing/slashing rotations;
- reduce operational man-hours spent on mowing/slashing; and
  reduce vegetation biomass and post-mowing clip debris.
- reduce the number of wildlife strikes

Following the successful completion of the trial in 2019, DIA consulted with Defence (RAAF Base Darwin) and Ventia to analyse the findings of the trial, and the IVM Program was implemented in 2020 with the program treating the areas around Runway 11/29 – refer 6.1.3.

DIA continues to engage with Defence and Ventia to review the effectiveness of the program and analyse the data and work with IVM to investigate options to vary or expand the program.

Following a review of the IVM Program and outcomes, Defence and DIA have agreed to expand IVM product application to include additional insect control, suppression of grass growth and seed head control for year 4 – 2023/2024 to reduce the attractiveness of the IVM areas to Little Corella and other see-feeding birds.

Ongoing data analysis will be carried out to assist with measuring the outcomes of the IVM program and will continue to be reviewed and assessed through regular site surveys and analysing wildlife management data.

7.2.2 Terrestrial Macro-invertebrate Surveys – Airside

Dry season field survey aimed at providing scientific evidence and insights regarding the IVM program.

The diversity and relative abundance of terrestrial macro-invertebrates occurring with the airside areas adjacent to Runway 11/29 will be documented in the surveys.

The survey will establish survey six sites in the IVM treated zones, and six sites in untreated areas, to compare macro-invertebrate diversity in relation to pesticide and herbicide treatments.

The initial survey will be carried out in July/August 2024.

8 Recommendations

The relationship between wildlife hazards, strike risks at DIA are generally very well understood and managed. Operational staff are able to accurately identify wildlife, associated hazards, and appropriate management strategies.

The environmental context of DIA, including its proximity to the coastline, intertidal areas, and various high-risk surrounding sites, means that high-risk species frequently occur within the vicinity of the airport. In addition, the habitat within DIA (including the various grasslands and wooded habitats) can be highly attractive to wildlife. The biggest environmental contributor to wildlife strikes at DIA is the seasonal variability that can cause unpredictably high volumes of wildlife to frequent the airport at certain times of year (usually following the wet season).

For the 2022 – 2023 review period, DIA achieved 100% compliance against the relevant legislative instruments and best practice standards governing wildlife hazard management at airports (Attachment 6). A previous recommendation for nocturnal hazard monitoring has been implemented this review period, with the addition of thermal imagery equipment now utilised at DIA. Further recommendations for improving wildlife hazard management practices at DIA are included in Table 12.

Table 12. Recommendations for the improvement of wildlife hazard management at DIA.

Recommendation	Justification	Delegation	Timeframe
Data Management			
Provide framework for future data analysis and record keeping	There were multiple discrepancies noted in the wildlife strike data (e.g.; more reported strikes per species than confirmed). The use of mobile reporting database will increase accuracy of strike report records, although the practicality of collating data a database will need to be further explored.	Organization: HOA / AM	Complete
Stakeholder Relations			
Increase collaboration between DoD land managers and DIA	The need for an increase in collaboration environmental management between JUD parties will assist in reducing the wildlife hazard levels at DIA and RAAF Darwin. DIA fulfils their duty of care	Organization and Execution: DoD and DIA	Medium to long term

Recommendation	Justification	Delegation	Timeframe
	by hosting and planning stakeholder engagement sessions (e.g. Airport Safety & Operations Committee Meetings). Increased communications as required, and during airfield works.		

9 Reference Documentation

The following documents provide further background to the WHMP:

Peter M. Davidson, Vanellus Pty Ltd, July 2001, "Darwin International Airport Bird Hazard Management Program Review May 2001".

Ronald Firth and James Smith, Indicus Biological Consultants Pty Ltd, March 2004, "Darwin International Airport Pty Ltd Terrestrial and Aquatic Fauna Assessment".

James Smith and Chris Brady, Indicus Biological Consultants Pty Ltd, July 2004, "Dingo Control Report for Darwin International Airport".

ABS Scrofa (Aus.) Pty Ltd, January 2005. "Report on the 2004 Feral Dog Control Program for Darwin International Airport".

Chris Brady and James Smith, Indicus Biological Consultants Pty Ltd, October 2005, "Bird Hazard Management Review of Darwin International Airport".

Chris Brady, Indicus Biological Consultants Pty Ltd, October 2005, "DIA Grass Length Trials Bird Hazard Management Progress Report".

Chris Brady, Indicus Biological Consultants Pty Ltd, January 2006, "DIA Grass Length Trials Bird Hazard Management Progress Report".

Chris Brady, James Smith and Ronald Firth, Indicus Biological Consultants Pty Ltd, May 2006, "DIA Grass Length Trial April 2005 – April 2006 Final Report May 2006".

Ecosure, May 2006, "Darwin International Airport Bird Strike Risk Assessment, Grass Trial Review".
ABS Scrofa (Australia) Pty Ltd, 21 May 2006 "Report on the 2005 – 2006 Feral Dog Control Program for Darwin International Airport".

Avisure DIA Wildlife Hazard Management System – Survey, and Risk Assessment – November 2009
Avisure DIA Wildlife Hazard Management System Audit – January 2010".

Tom Reilly, EcOz Environmental Services, May 2012, "DIA Pocket Guide for Bird ID – Internal Use only".
NTAPL Environment Manager, September 2013 "DIA Wildlife Species Strike Risk Calendar"

Glen Ewers, EcOz Environmental Services, June 2013, "Darwin International Airport Species Management Plan".

Glen Ewers, EcOz Environmental Services, January 2013, "Report on Gut analysis of Birds Collected at DIA".

Australian Airports Association (AAA) Airport Practice Note 6- Managing Bird Strike Risk – Species Information Sheets

Australian Airports Association (AAA) Airport Practice Note 9 – Wildlife Hazard Management at Airports
Paton, D. C. (2010). Bird risk assessment model for airports and aerodromes. Australia: The University of Adelaide.

Further information on wildlife hazard management can also be obtained from the following websites:

- The Australian Airports Association- Industry Resources: https://www.airports.asn.au/public/member-centre/industry-resources
- The Australian Wildlife Hazard Group: http://www.aawhg.org
- The International Civil Aviation Organisation (ICAO) has produced information on bird control and reduction in ICAO Doc 9137: Airport Services Manual – Part 3 http://icao.int/icao/en/m_publications.html
- ATSB collects aviation safety data through mandatory reporting requirements: http://www.atsb.gov.au/avdata
- International Bird Strike Committee: http://www.int-birdstrike.org
- Federal Aviation Administration – Wildlife Strike Database: http://wildlife-mitigation.tc.faa.gov/eildlife/database.aspx

10 Attachments and Appendices

Attachments

Attachment 1: Species Management Plans

Attachment 2: Strike History

Attachment 3: Bird Risk Assessment Model for Airports and Aerodromes

Attachment 4: ADG Risk Register – WHMP DIA

Attachment 5: Roles and Responsibilities

Attachment 6: WHMP Internal Audit Table

Appendices

Appendix 1: Wildlife Hazard Management Procedures

Attachment 1: Species Management Plans

Extreme Hazard Rank

- Flying-fox
- Magpie goose
- Plumed whistling-duck
- Straw-necked ibis

Very-high Hazard Rank

- Bush stone-curlew
- Dog
- Galah
- Masked lapwing
- Red-tailed black-cockatoo

High Hazard Rank

- Black kite
- Black-necked stork
- Green pygmy-goose
- Little corella
- Magpie-lark
- Nankeen kestrel
- Oriental plover
- Red-collared lorikeet
- Whistling kite

Flying-fox

Pteropus alecto (Black flying-fox) & *Pteropus scapulatus* (Little red flying-fox)

Image source: www.littleaussiebat.com.au

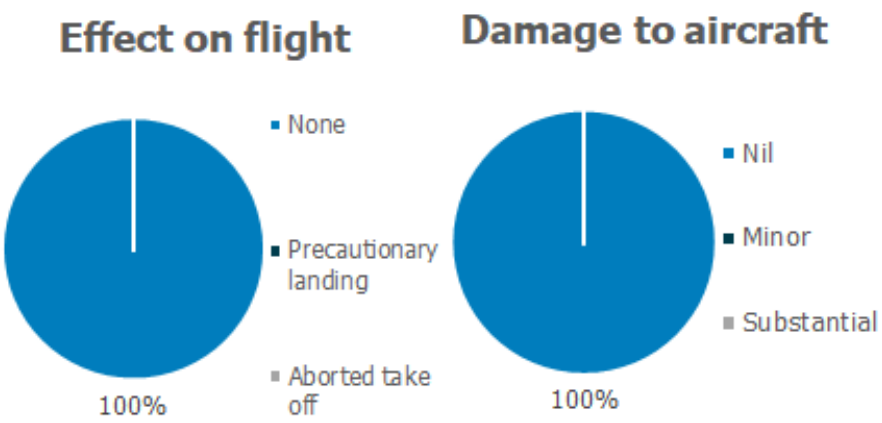
Hazard Ranking:	EX
Mass (g):	680
Strikes 20212 - 2023:	3
Flocking tendency:	Forages during night time hours and may transit in large numbers to and from feeding sites at dawn and dusk. Little red flying-foxes are nomadic in nature and tend to travel in larger groups.
Preferred habitat:	Will roost in a variety of natural and modified habitats and feed on fruiting vegetation after daylight.
Breeding season:	Young born from January to March (Black flying-fox) and April to May (Little red flying-fox).
Diet:	Both species favour the nectar and pollen of eucalypt blossom. May also consume fruit and flowers.

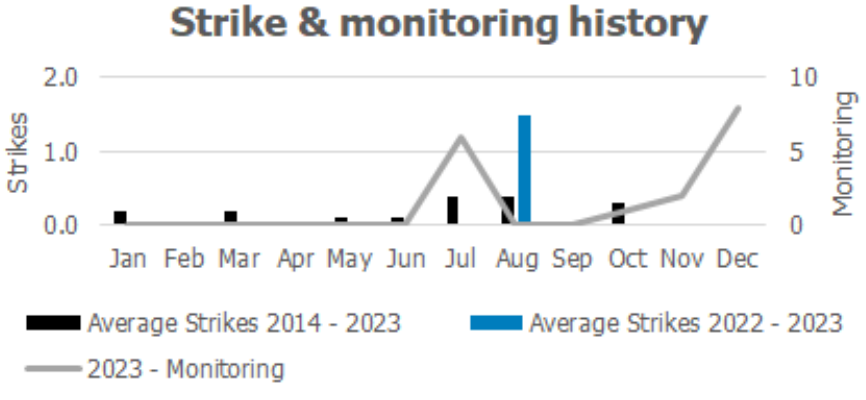
Active Management: Small numbers on site may be dispersed, but relocation of a large camp (should one form in close proximity of the airport) should be carefully planned in consultation with local government authorities.

Passive Management: Monitoring flying-fox transit paths and communicating hazards to airlines and aircraft operators. Managing and reducing presence of fruiting vegetation species on site. Ongoing monitoring of known roost sites (e.g. fly-out surveillance once per month to assess direction of travel).

Monitoring: Flying-foxes are rarely detected in monitoring data for DIA, due to their nocturnal nature. As such, increases in numbers can be difficult to detect prior to wildlife strikes occurring.

General Recommendations: Conduct targeted monitoring of camps and fly-outs on a regular basis. Notify pilots and aircraft of hazards using NOTAMs if necessary. Issue of an ERSA may be required if a persistent seasonal hazard remains.





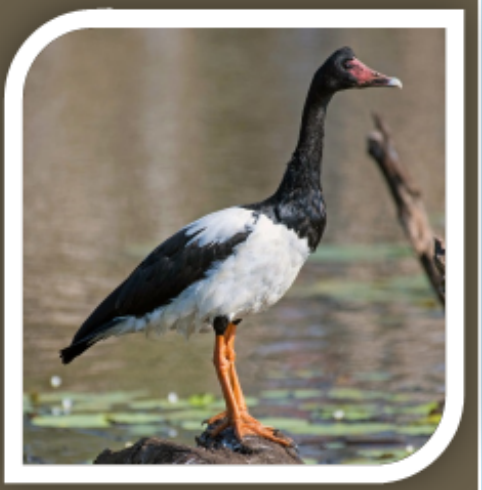


Image source: www.ebird.org

Magpie goose

Anseranas semipalmata

Hazard Ranking:	EX
Mass (g):	2800
Strikes 2022 - 2023:	1
Flocking tendency:	May congregate in large flocks, sometimes comprising thousands of birds. Widespread throughout most of northern Australia.
Preferred habitat:	Floodplains and wet grasslands.
Breeding season:	February to April. Breeds in large colonies during the late wet season.
Diet:	Feeds on aquatic vegetation. Specialized feeder with wild rice, *Oryza,* Paspalum, Panicum and spike-rush, *Eleocharis,* forming the bulk of its diet.

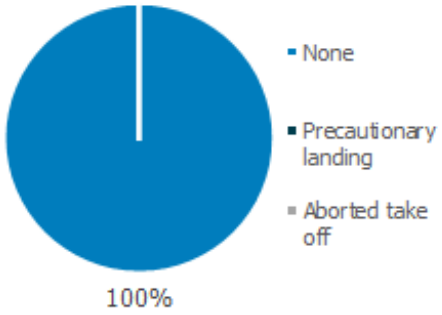
Active Management: This species may be struck while transiting between sites, or while using habitat at DIA (although this is less likely given this species' habitat requirements).

Passive Management: This species may be attracted to areas of pooling water on the airport following periods of rainfall. Limiting access to water by back-filling areas known to pond. If they are observed in large numbers, grating or netting may be an option for larger areas.

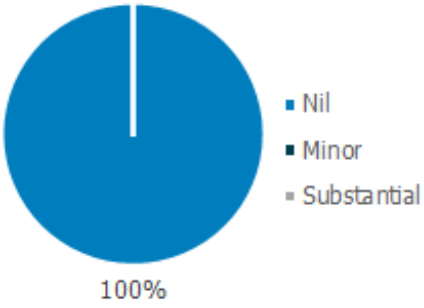
Monitoring: This species, while not regularly seen at DIA, is seen in high numbers at a number of off-airport sites (including both Leanyer Sewage Works and Knuckey's lagoon). Monitoring of transit paths in the latter half of the year (e.g. November onwards) can help inform locations of roosting sites.

General Recommendations: Issue of a NOTAM if this species is present and cannot be dispersed from the airfield.

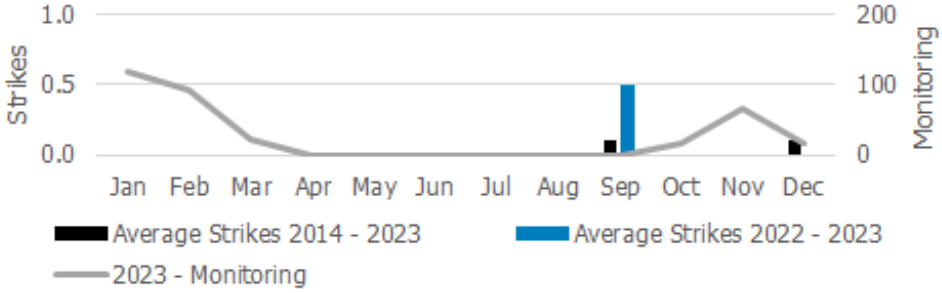
Effect on flight



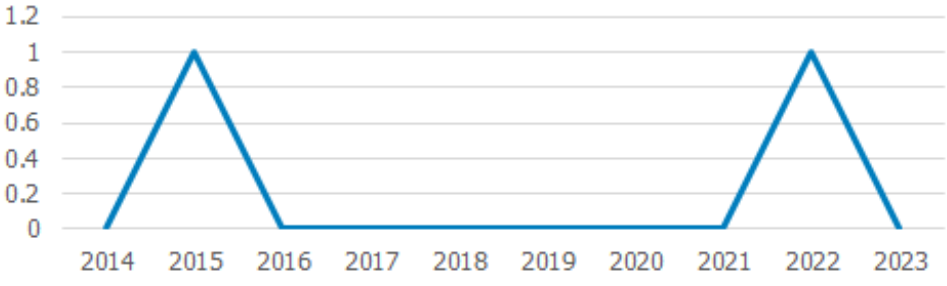
Damage to aircraft



Strike & monitoring history



Ten-year strike history



Plumed whistling-duck

Dendrocygna eytoni

Image source: www.ebird.org

Hazard Ranking:	EX
Mass (g):	1000
Strikes 2022 - 2023:	2
Flocking tendency:	Tends to flock in large groups. They are monogamous and form pair bonds with mates.
Preferred habitat:	This species congregates around natural and artificial waterbodies including dams, swamps and mangrove creeks.
Breeding season:	During tropical wet season - typically from January to March.
Diet:	Graze on tropical grasses. They feed nocturnally on grasslands and may also take food by dabbing from the surfaces of waterbodies.

Active Management: This species is most likely to utilize airport habitat during non-daylight hours. Harassment is best targeted during feeding times (at least an hour before aircraft movements).

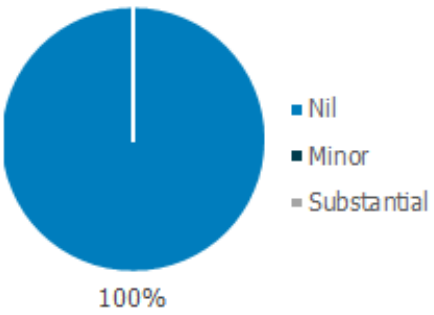
Passive Management: This species feeds nocturnally on grasslands, and is likely to be attracted to areas of pooling water on the airport following periods of rainfall. Limit access to water by back-filling areas known to pond. If they are observed in large numbers near water-logged areas, grating or netting may be an option for larger water sources.

Monitoring: This species is seen in high numbers at a number of off airport sites (including Leanyer Sewage Works and Knuckey's lagoon). Monitoring of transit paths in the latter half of the year (e.g. July onwards) can help inform airport of roost locations.

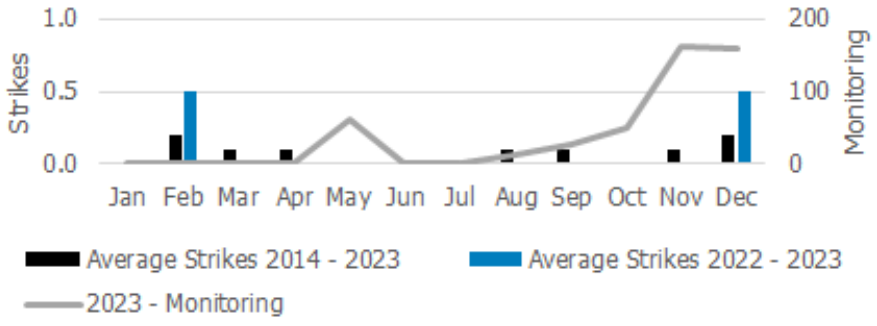
General Recommendations: Conduct persistent harassment during night-time foraging. Harassment should occur well before aircraft movements (e.g. commencing one hour before movements) to ensure birds do not circle the aerodrome or re-land once dispersed.

Effect on flight

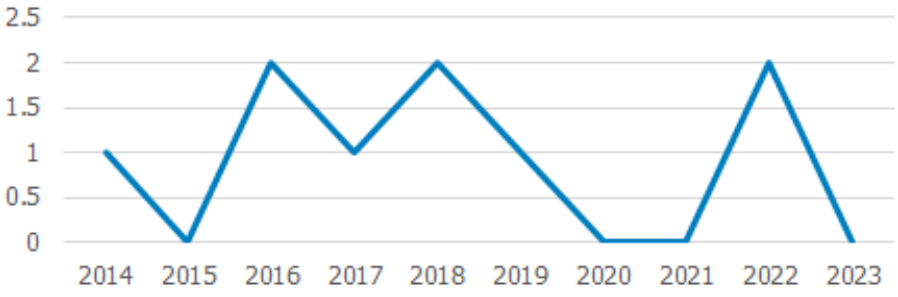
Damage to aircraft



Strike & monitoring history



Ten-year strike history



Straw-necked ibis

Threskiornis spinicollis

Image source: www.ebird.org

Hazard Ranking:	EX
Mass (g):	1465
Strikes 2022 - 2023:	0
Flocking tendency:	Flocks and feeds in large groups. Flocks maintain 'V' formation in flight. Will settle in flocks to forage. Flocks may perch conspicuously in trees.
Preferred habitat:	Grasslands (with a preference for cultivated and irrigated pastures) and terrestrial wetlands.
Breeding season:	August to January.
Diet:	Insects, molluscs, crustaceans, frogs, fish. May also consume anthropogenic food waste.

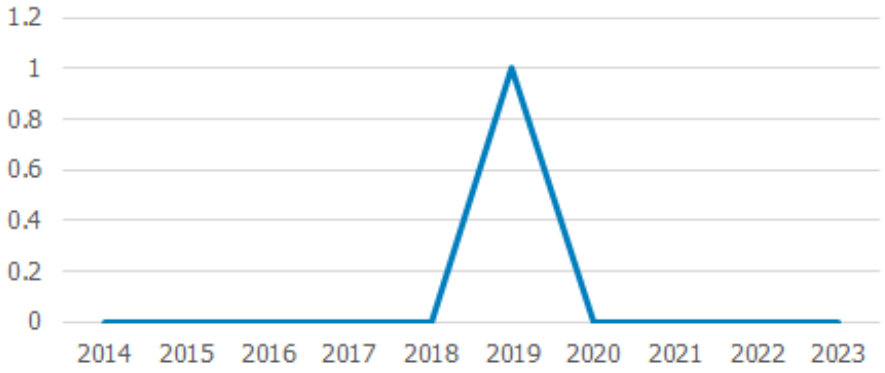
Active Management: Dispersal of ibis prior to congregation of flocks will assist in mitigating potential strike consequence. Use of a variety of harassment methods, including pyrotechnics (short and long-range), stock whips, on-foot approach, portable distress callers, sirens, lights, starter pistols, and vehicular approach will help prevent habituation to any one particular method.

Passive Management: Maintain grass heights between 150 and 300 mm, and manage flowering weed species. Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1).

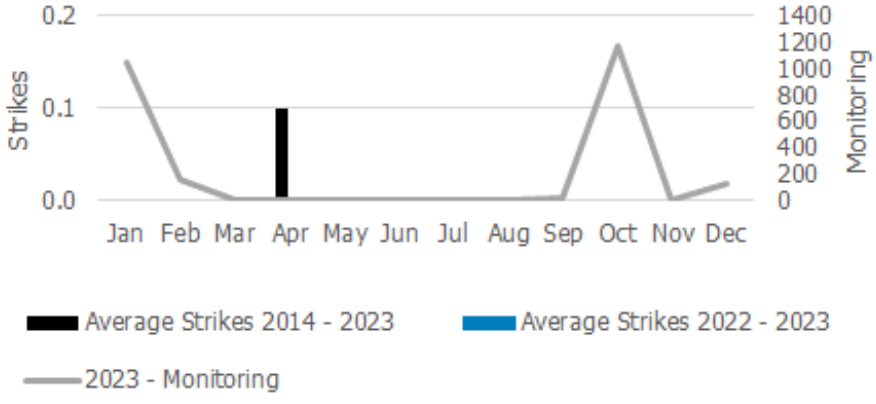
Monitoring: This species is present at DIA throughout most of the year (with the exception of February to March). The most recent strike occurred in April of 2019.

General Recommendations: Maintain mowed heights at 150 to 300 mm to help prevent ground foraging. Review airfield drainage and reduce pooling water around the airfield.

Ten-year strike history



Strike & monitoring history



*The most recent strike involving this species occurred in 2019. No strikes with this species have occurred during the 2022 - 2023 review period.

Bush Stone-curlew

Burhinus grallarius

Image source: www.birdlife.org.au

Hazard Ranking:	VH
Mass (g):	1200
Strikes 2022 - 2023:	6
Flocking tendency:	May be solitary; however, during breeding season, they may congregate in large groups (sometimes up to 20 animals).
Preferred habitat:	Prefers lightly timbered open forest and woodland. Often commonly seen in modified grasslands adjoining wooded areas.
Breeding season:	August to October and November to January.
Diet:	Feeds on insects, molluscs, small lizards and seeds.

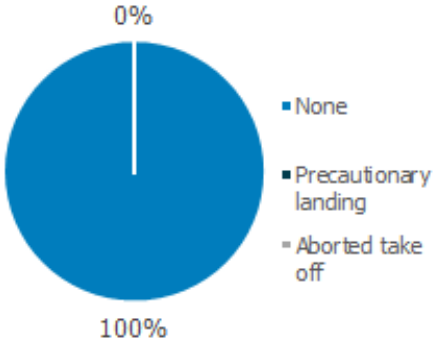
Active Management: Removal of nests and eggs (in accordance with permit requirements). Active dispersal (including nocturnal breeding space disturbance) may lower this species' preference for airport land.

Passive Management: This species is likely to utilize areas with short grass cover in close proximity to wooded areas. Removal of breeding sites (e.g. nest destruction) will assist in long term population management and preferential site use.

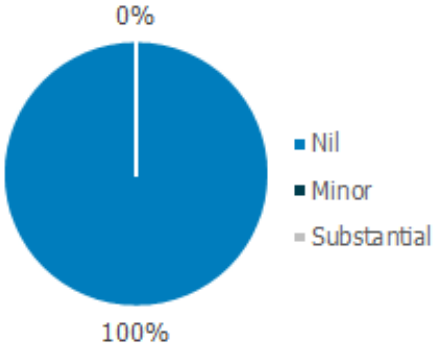
Monitoring: Bush stone curlews are abundant at DIA throughout the year (with a mid-year dip). Strike events with this species follow the same trend.

General Recommendations: Persistent day-time and night-time harassment activities are likely to limit this species' use of airport land.
Use of thermal imagery to aid in detection of this species' movements during nighttime hours may increase accuracy of harassment efforts at night - when this species is most active.

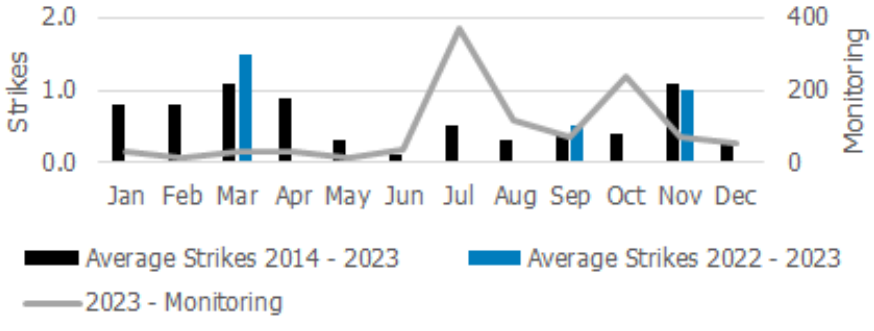
Effect on flight



Damage to aircraft



Strike & monitoring history



Ten-year strike history

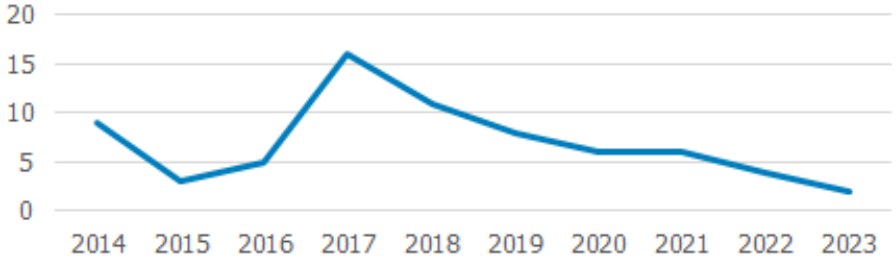


Image source: www.animalia.bio

Dog

Canis lupus familiaris

Hazard Ranking:	VH
Mass (g):	20000
Strikes 2022 - 2023:	0
Flocking tendency:	Often forms social groups of three to 12 members, but may also hunt singly or in pairs. Females begin breeding in their second year, and may breed up to twice per year with litter sizes of up to 11 pups. Pack size may depend on local resource availability
Preferred habitat:	Flexible habitat requirements and can persist in a broad range of environments. This species is limited more by food availability, than by habitat restrictions.
Breeding season:	May breed year-round, but generally from April to June.
Diet:	Opportunistic hunters and scavengers, feeding on reptiles, small birds and mammals. Also feeds opportunistically on carrion.

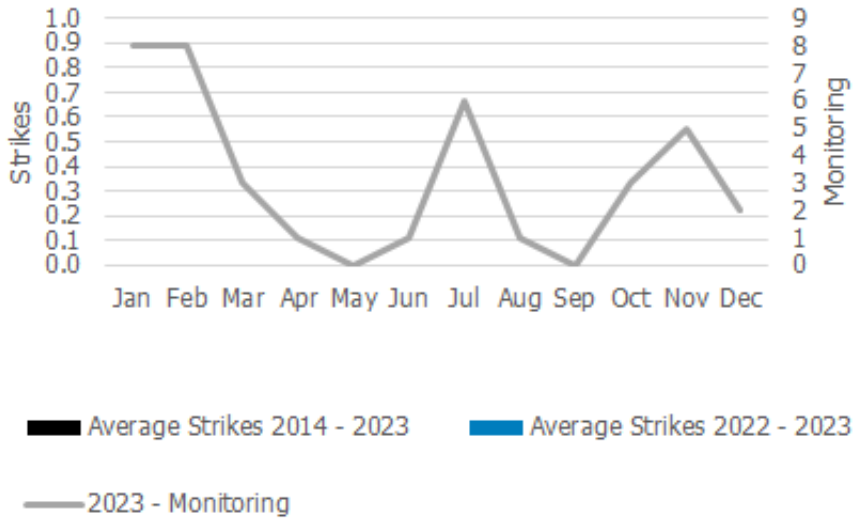
Active Management: Slow approach from a vehicle with horn or siren is likely to be the most effective approach. On-foot harassment is not recommended.

Passive Management: Implementation of a broad continual monitoring and management program. Exclude access to the airfield with secure perimeter fencing. Reduce availability of food scraps during operations through the provision of fully covered and secured waste bins. Reduce food availability through the immediate removal of carrion and other dead wildlife.

Monitoring: This species is sometimes detected during routine monitoring at DIA, including as many as 31 individual dogs in 16 observations during January-February 2021.

General Recommendations: Regular monitoring of fencing to prevent wild dog incursion to the airfield. Implementation of a continual monitoring and management program. Although a terrestrial species, wild dogs may present a considerable wildlife hazard and have been struck by aircraft at DIA in the past.

Strike and monitoring history



*No strikes with this species have occurred during the 2022 - 2023 review period, nor in the 2014 - 2023 data analysis period.

Image source: www.animalia.bio

Galah

Eolophus roseicapillus

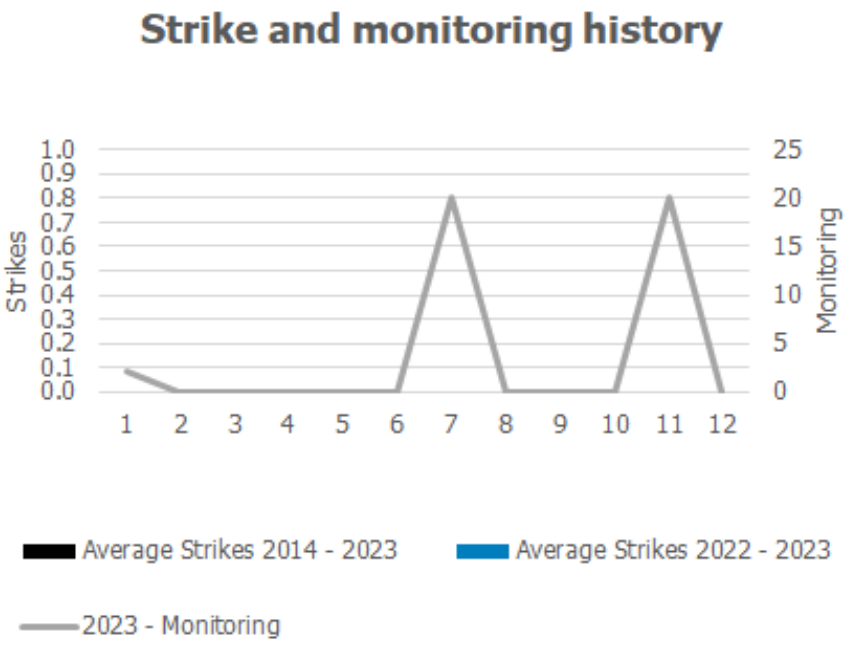
Hazard Ranking:	VH
Mass (g):	330
Strikes 2022 - 2023:	0
Flocking tendency:	Flocks and feeds in large groups. Can be observed in high numbers when present around the airfield. Flocks may be more than 1000 individuals, however in the Darwin area typically below 50 individuals.
Preferred habitat:	Timbered and grassed habitats, usually near water.
Breeding season:	February to July.
Diet:	Ground seeds, such as grass seeds.

Active Management: Immediate harassment (i.e. before flocks congregate) will assist in mitigating imminent strike risks. Harassment methods proven effective for this species include: pyrotechnics (short- and long-range), stock whips, on-foot approach (loud claps help), portable distress callers, sirens, lights, starter pistols, and vehicular approach.

Passive Management: Maintain grass heights between 150 and 300 mm, and manage flowering weed species.
Time mowing to ensure grass seed heads are regularly removed.
Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1).

Monitoring: This species is only encountered occasionally airside when compared to the more frequent little corella.

General Recommendations: Maintain mowed grass at 150 to 300 mm, without seed heads. Review airfield drainage and reduce waterbodies around the airfield. Initiate harassment activities prior to aircraft movements if large numbers of galahs are present.



*No strikes with this species have occurred during the 2022 - 2023 review period, nor in the 2014 - 2023 data analysis period.

Masked lapwing

Vanellus miles

Image source: www.birdlife.org.au

Hazard Ranking:	VH
Mass (g):	360
Strikes 2022 - 2023:	8
Flocking tendency:	Normally reside in pairs, but will form large flocks outside of the breeding season.
Preferred habitat:	Prefer to breed in modified grasslands, including airport environments. Inhabits marshes, mudflats, beaches and grasslands.
Breeding season:	November to May.
Diet:	Primarily insectivorous - most food is obtained just below the surface of the ground.

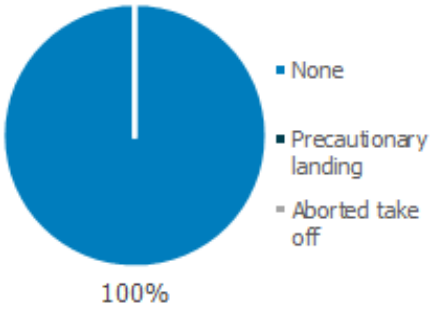
Active Management: This species may become very territorial during the breeding season. Territorial behaviour can be mitigated through the implementation of an egg and nest removal regime (although permit allowances should be considered prior to beginning such a program) in tandem with normal harassment activities.

Passive Management: Maintaining grass heights ~300 mm may help discourage Masked lapwings from utilizing airside grasslands. Increasing grass height will lower this species' ability to detect predators, nest and forage. Discourage breeding behaviour and nesting (removal of egg and nests should be conducted as early as possible to reduce territorial behaviour).

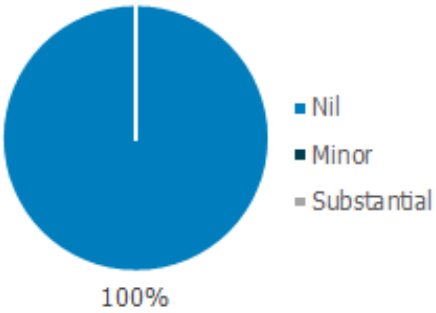
Monitoring: Masked lapwings are abundant at DIA throughout the year (with a mid-year dip).

General Recommendations: Persistent day-time and night-time harassment activities - including egg and nest destruction - are likely to limit this species' use of airport land. Use of thermal imagery to aid in detection of this species' movements during nighttime hours and increase accuracy of harassment efforts when this species is most active.

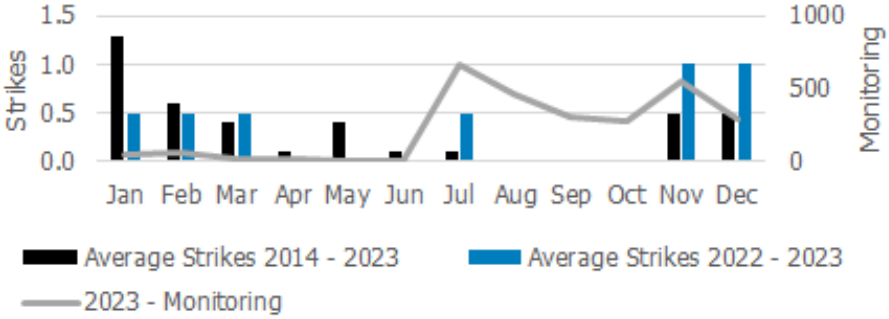
Effect on flight



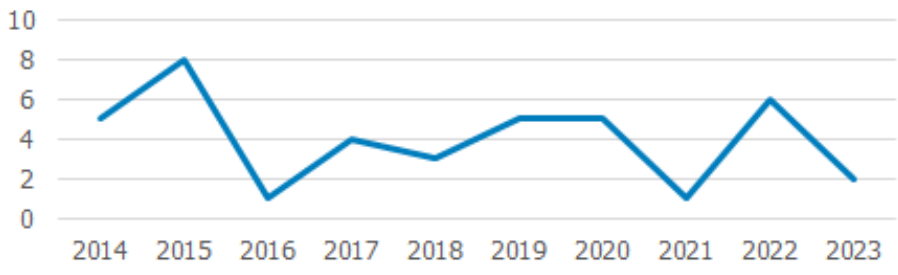
Damage to aircraft



Strike & monitoring history



Ten-year strike history



age source: https://commons.wikimedia.o

Red-Tailed Black-Cockatoo

Calyptorhynchus banksii

Hazard Ranking:	VH
Mass (g):	720
Strikes 2022 - 2023:	1
Flocking tendency:	Typically flocks in small to large flocks.
Preferred habitat:	Variety of habitats but favours eucalypt woodland. Often seen in urban areas including golf courses and parks. Eucalypt forests used for roosting.
Breeding season:	March - July. Breeds in large colonies during the late wet season.
Diet:	Feeds primarily on seeds, but will also eat fruits and nectar. Occasionally insects and larvae.

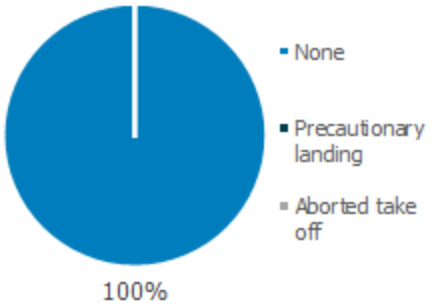
Active Management: Immediate harassment (i.e. before flocks congregate) will assist in mitigating imminent strike risks. Harassment methods proven effective for this species include pyrotechnics (short- and long-range), stock whips, on-foot approach (loud claps help), portable distress callers, sirens, lights, starter pistols, and vehicular approach.

Passive Management: Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1). Removal of airside and surround vegetation providing a foraging source for the species.

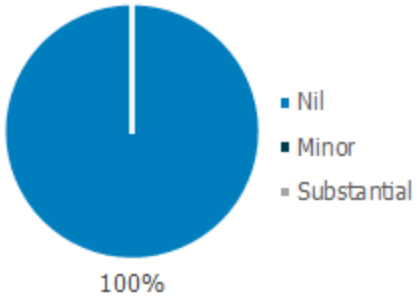
Monitoring: This species will typically only be observed transiting over the airspace from foraging to roost location. Transiting can be predictable and enable monitoring at peak times and hazard alerts to ATC/aircraft as required.

General Recommendations: Monitoring and recording peak transiting times. Use of pyrotechnics to discourage transiting in approaches/departures. Known to roost in trees at the eastern side of the airfield in the approach.

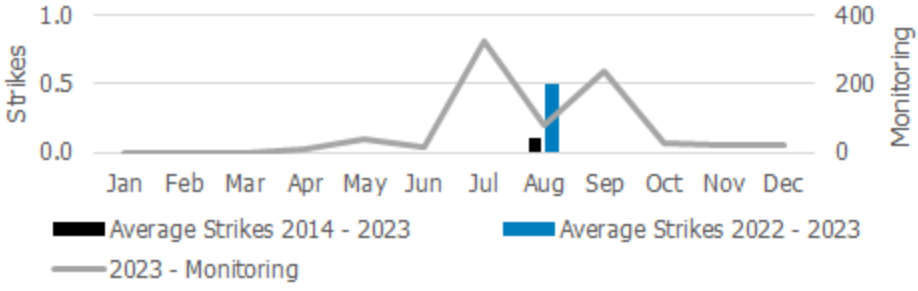
Effect on flight



Damage to aircraft



Strike & monitoring history



Ten-year strike history

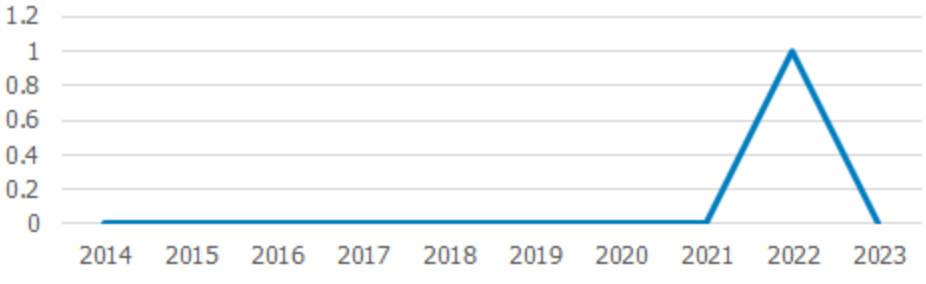


Image source: www.birdsinbackyards.net

Black kite

Milvus migrans

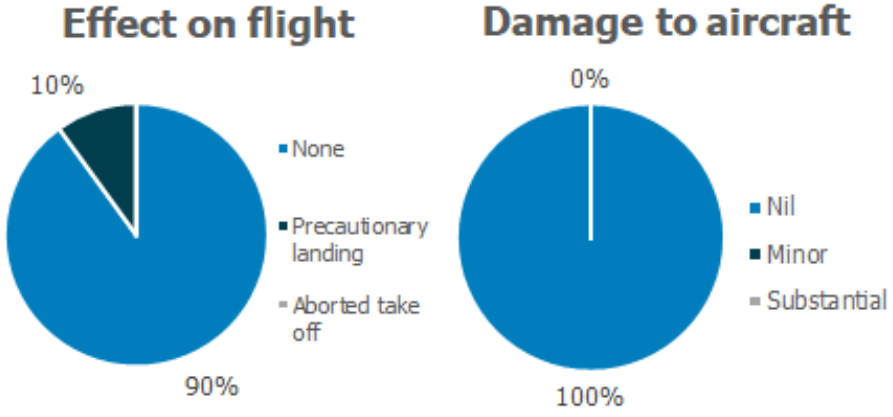
Hazard Ranking:	H
Mass (g):	625
Strikes 2022 - 2023:	10
Flocking tendency:	Normally solitary or in pairs, but may display gregarious behaviour and form large flocks, particularly for feeding.
Preferred habitat:	Open or partially wooded areas, typically near water. Often observed in large numbers near farmlands, abattoirs and landfills.
Breeding season:	Opportunistic can be year round but specifically from June to December.
Diet:	Opportunistic hunters and scavengers, feeding on fish, small birds, reptiles, mammals as well as insects and frogs.

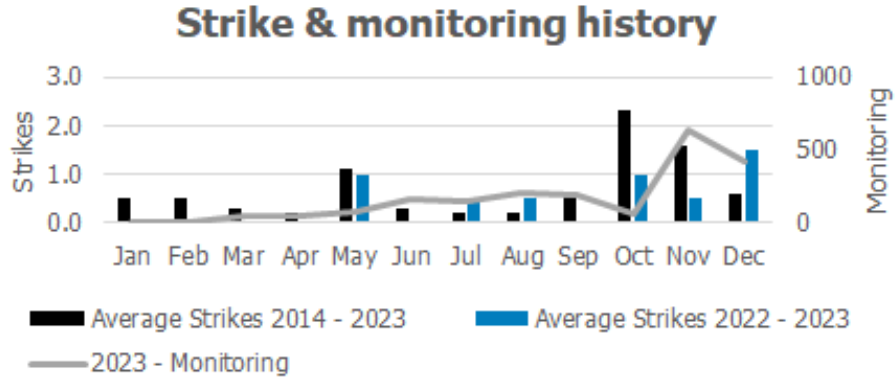
Active Management: Use of long-range pyrotechnics coupled with persistent negative audio and visual cues.

Passive Management: Remove carrion from airfield or from areas surrounding the airport immediately. Conduct of controlled burning and grass cutting at night, when this species is not active. Increase harassment activities during and after controlled burns (to mitigate bird attraction to prey). Removal of perching infrastructure (particularly if it is observed to be in use by kites).

Monitoring: Differentiating black kites and whistling kites may be difficult due to their similar appearances. Black kites more commonly form large groups, and are slightly smaller in body size that Whistling kites; although the wooded habitat at the airport may make it attractive to whistling kites as well. Peaks at DIA occur between October-November.

General Recommendations: Reduce potential for aerial activity (e.g. foraging and thermalling) through use of long-range dispersal methods. All stakeholders should restrict mowing times to after daylight hours.





https://commons.wikimedia.org/

Black-necked stork

Ephippiorhynchus asiaticus

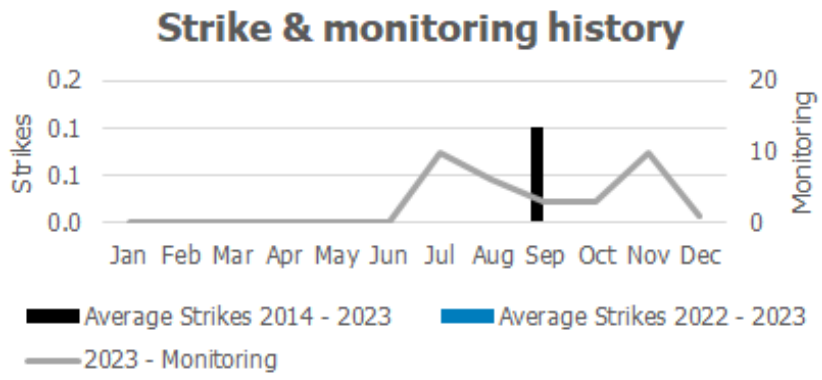
Hazard Ranking:	H
Mass (g):	4100
Strikes 2022 - 2023:	0
Flocking tendency:	Typically solo, form long term possibly lifelong pairing.
Preferred habitat:	Typically wetlands and floodplains however will forage in open grassland for food.
Breeding season:	March - August
Diet:	Frogs, fish, large invertebrates and insects.

Active Management: Intense dispersal once detected on the airfield is recommended to dissuade from establishing, vehicle, horn, siren and pyrotechnics are effective.

Passive Management: Maintain grass heights between 150 and 300 mm. Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1).

Monitoring: During periods of wet weather monitor for activity in drains and lower areas that retain water.

General Recommendations: Aggressive dispersal when sighted, will often return to similar areas to forage daily and can be active at night.



Green Pygmy-Goose

Nettapus pulchellus

https://commons.wikimedia.org/

Hazard Ranking:	H
Mass (g):	430
Strikes 2022 - 2023:	0
Flocking tendency:	Typically solo or in small flocks, can form large flocks but rarely observed in the Darwin area
Preferred habitat:	Typically wetlands areas with floating vegetation, there is no habitat on the airfield that would attract this species. Has been observed in the lagoon at the Darwin Golf Club at Northlakes.
Breeding season:	November - April
Diet:	Herbivore - Aquatic plants and seeds/fruit

Active Management: Unlikely to be observed on the airfield foraging or roosting, if observed harassment using most tools will disperse.

Passive Management: Maintain grass heights between 150 and 300 mm. Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1).

Monitoring: During periods of wet weather monitor for activity in drains and lower areas that retain water. Typically will only be observed transiting over the airfield to and from water sources.

General Recommendations: Disperse if observed on the airfield, they are a rarely observed bird on an airfield and there have been no strikes recorded by the ATSB in the previous 10 years.

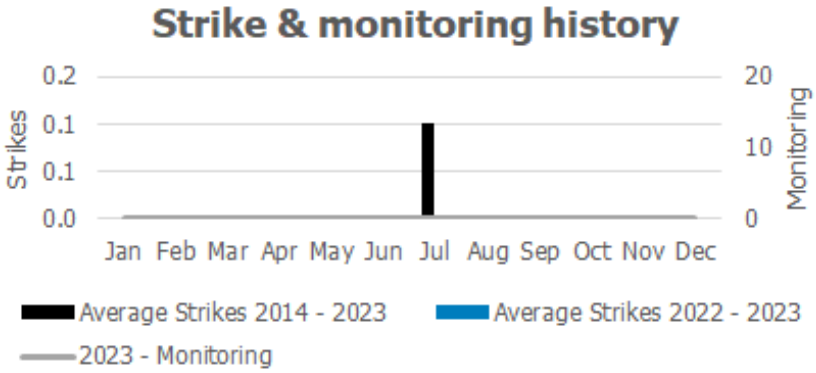


Image source: www.ebird.org

Little Corella

Cacatua sanguinea

Hazard Ranking:	H
Mass (g):	560
Strikes 2022 - 2023:	2
Flocking tendency:	Flocks and feeds in large groups.
Preferred habitat:	Sites with seeding grasses, particularly along waterways. Thrive in agricultural and urban settings.
Breeding season:	March to August.
Diet:	Seeds, especially grass seeds.

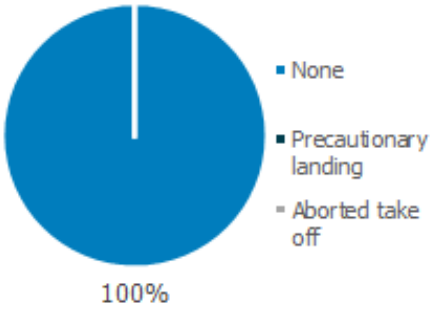
Active Management: Immediate harassment (i.e. before flocks congregate) will assist in mitigating imminent strike risks.
Harassment methods proven effective for this species include: pyrotechnics (short- and long-range), stock whips, on-foot approach, portable distress callers, sirens, lights, starter pistols, and vehicular approach.

Passive Management: Maintain grass heights between 150 and 300 mm, and manage flowering weed species.
Time mowing to ensure grass seed heads are regularly removed.
Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1).

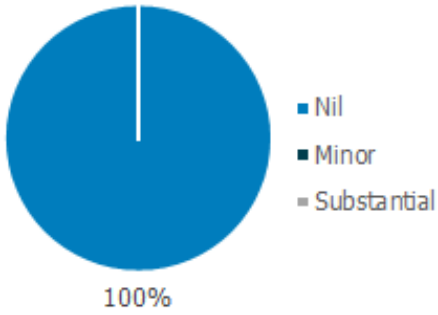
Monitoring: Little corella are present in high numbers November to March with smaller numbers present throughout the year.

General Recommendations: Maintain mowed grass at 150 to 300 mm, without seed heads.
Review airfield drainage and reduce waterbodies around the airfield.
Initiate harassment activities prior to aircraft movements if large numbers of corellas are present.

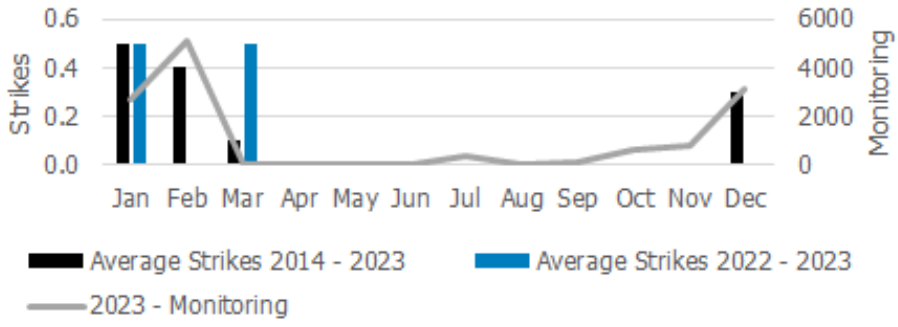
Effect on flight



Damage to aircraft



Strike & monitoring history



Ten-year strike history

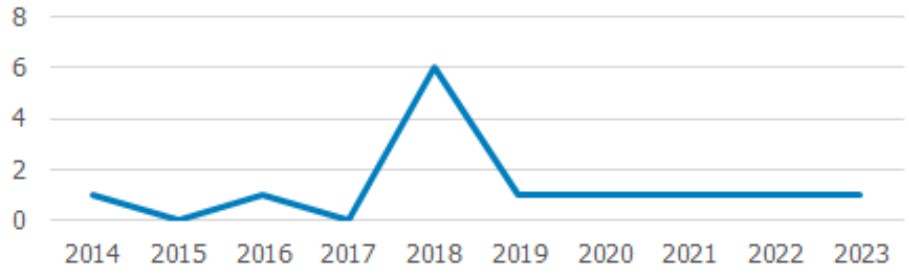


Image source: www.ebird.org

Magpie-lark

Grallina cyanoleuca

Hazard Ranking:	H
Mass (g):	90
Strikes 2022 - 2023:	1
Flocking tendency:	Often in pairs and can range up to large flocks
Preferred habitat:	Bushlands, parks and farmlands, urban areas
Breeding season:	August to October
Diet:	Insects, spiders, lizards and fresh-water invertebrates

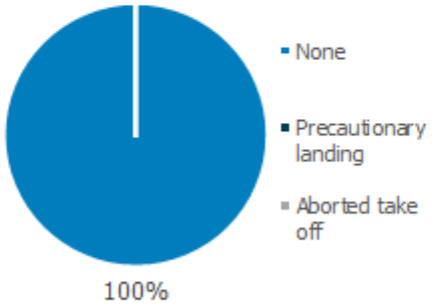
Active Management: Harassment methods proven effective for this species include: vehicular approach, siren, on-foot approach, stock whips and pyrotechnics (short- and long-range) for extra stubborn birds or large flocks. Monitor the grasslands surrounding the airfield and anthropogenic structures for nests and remove nests and eggs

Passive Management: Maintain grass heights below 150mm within gable markers and maximum 300 mm around the airfield and manage flowering weed species. Bird spikes on airfield signage and infrastructure to reduce increased site utilisation. Review drainage to ensure minimal pooling of water or waterlogged areas (by filling depressions and increasing slope of drainage sides to 4:1).

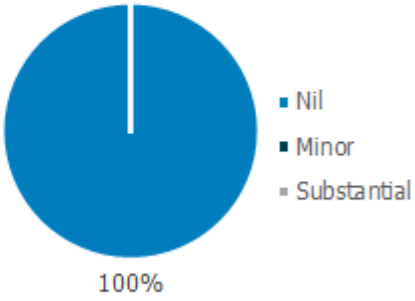
Monitoring: This species is typically observed in flocks of 2-15 individuals, they are territorial and will often return to the same area regularly. During breeding season territorial squabbles can increase the strike hazard.

General Recommendations: Regular and aggressive harassment, reducing shaded areas and perching opportunities in critical areas will reduce the hazard.

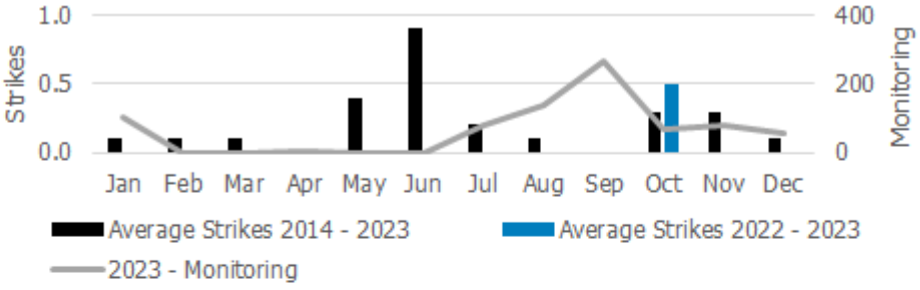
Effect on flight



Damage to aircraft



Strike & monitoring history



Ten-year strike history

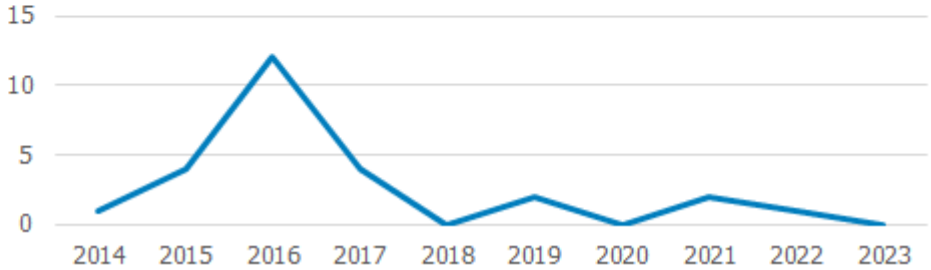


Image source: www.birdlife.org.au

Nankeen kestrel

Falco cenchroides

Hazard Ranking:	H
Mass (g):	185
Strikes 2022 - 2023:	2
Flocking tendency:	Generally a solitary raptor, unless in breeding pairs - although they may occur in high abundance in some habitats, such as airports.
Preferred habitat:	Open grasslands and woodlands, croplands and low shrublands. This species also has an affinity for modified grasslands, including airport environments.
Breeding season:	Eggs are laid in late winter and incubated by the female.
Diet:	Feeds on small mammals, birds and insects.

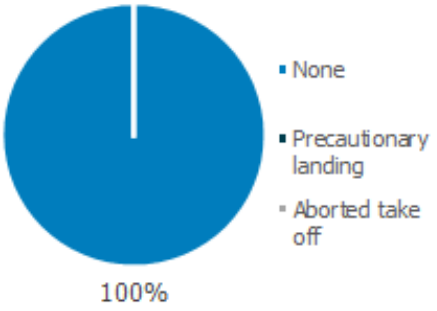
Active Management: Use of long-range dispersal methods coupled with persistent negative audio and visual cues. May be difficult to disperse due to their high intelligence.

Passive Management: Remove carrion from airfield or from areas surrounding the airport immediately. Conduct of controlled burning and grass-cutting at night. Increase harassment activities during and after controlled burns (to mitigate bird attraction to prey). Removal of perching infrastructure, or provision of bird spikes in popular perching areas.

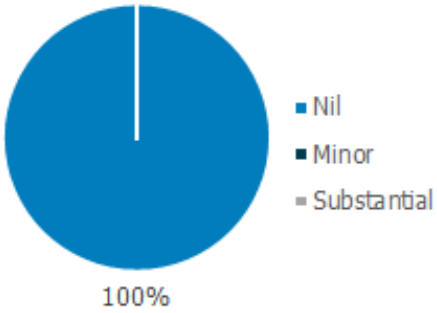
Monitoring: Abundant at the airport throughout the year. Strikes also occur throughout the year, with a mid-year peak.

General Recommendations: Maintenance of grass heights between 150 - 300 mm will make it difficult for Nankeen kestrels to detect prey; although all stakeholders should restrict mowing times to after daylight hours. Removal or management of popular perching sites will also help reduce foraging opportunities for this species.

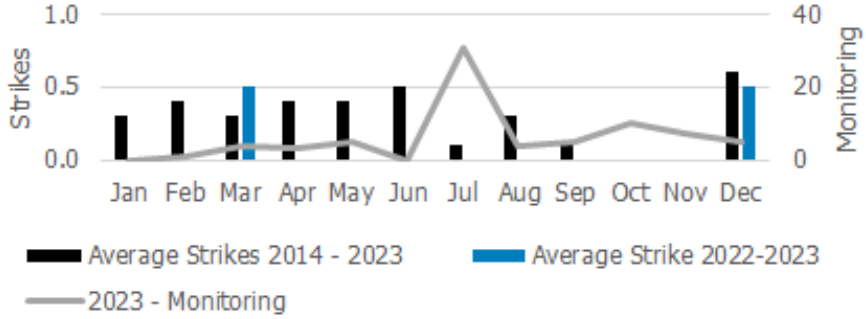
Effect on flight



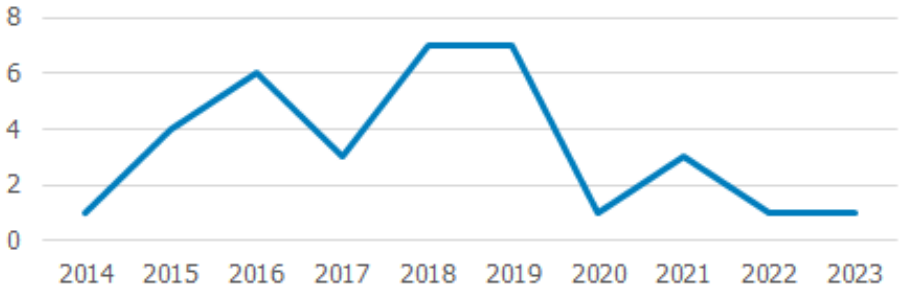
Damage to aircraft



Strike & monitoring history



Ten-year strike history



Oriental plover

Charadrius veredus

mage source: https://upload.wikimedia.or

Hazard Ranking:	H
Mass (g):	95
Strikes 2022 - 2023:	3
Flocking tendency:	Often in flocks of under 5 individuals but can number up to 30 individuals at DIA
Preferred habitat:	Open grasslands with sparsely vegetated short grass
Breeding season:	April - July(Mongolia)
Diet:	Insects

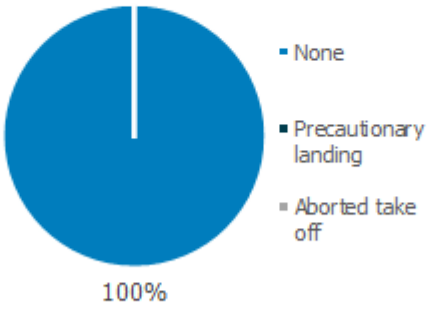
Active Management: Harassment methods proven effective for managing the Oriental Plover at airports include: vehicular approach, sirens, on-foot approach, stock whips, and pyrotechnics (both short- and long-range) for more persistent birds or larger flocks.

Passive Management: Maintain grass heights below 150mm within gable markers and maximum 300 mm around the airfield to aide in detection. Areas where they are observed to regularly congregate review IVM treatment as they will only remain while there is ample insect supply.

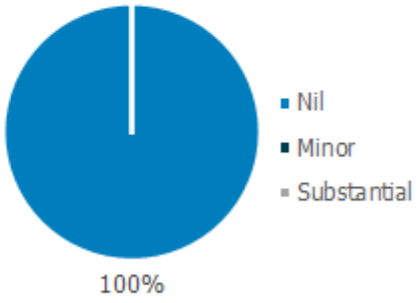
Monitoring: This species is typically observed in flocks of 1-30 individuals, they prefer the grassed area opposed to the sealed surface but whilst transiting or if spooked the hazard of strike is increased.

General Recommendations: Regular and aggressive harassment if they are established. When first detected heavy and intense dispersal to encourage to continue to an alternative location to feed is recommended. Once established they can be difficult to move on whilst there is an abundant food source.

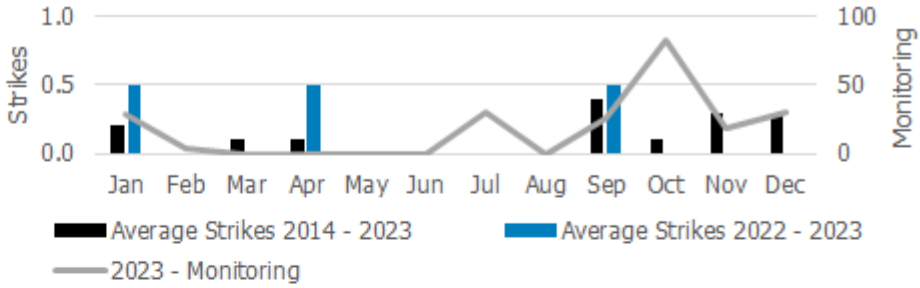
Effect on flight



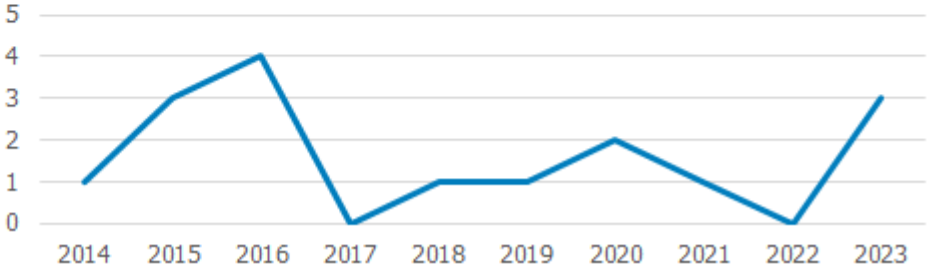
Damage to aircraft



Strike & monitoring history



Ten-year strike history



Red-collared Lorikeet

Trichoglossus rubritorquis

ce: https://en.wikipedia.org/wiki/Red-colla

Hazard Ranking:	H
Mass (g):	125
Strikes 2022 - 2023:	0
Flocking tendency:	Typically observed transiting in numbers ranging from 2-25, large flocks will congregate at feeding sites and roosts.
Preferred habitat:	Open woodland and urban environments
Breeding season:	April - May
Diet:	Nectarivores, feeds on nectar

Active Management: Active management of this species is difficult as they are not actively feeding on the airfield itself and are transiting to feed sources surrounding the airfield. If nightly roosts are present at DIA disruption and dispersal of the roost can be initiated.

Passive Management: Consideration of attractiveness of and planting of vegetation on the airport grounds to reduce available food sources.

Monitoring: Monitoring their transit times over the airfield and directions to inform aircraft/ATC and establish possible roost locations.

General Recommendations: Disperse any roosts on DIA land to reduce the numbers in the surrounds, monitor flight paths and timings to inform ATC and aircraft. Consider any landscaping on the airfield for wildlife attractant.

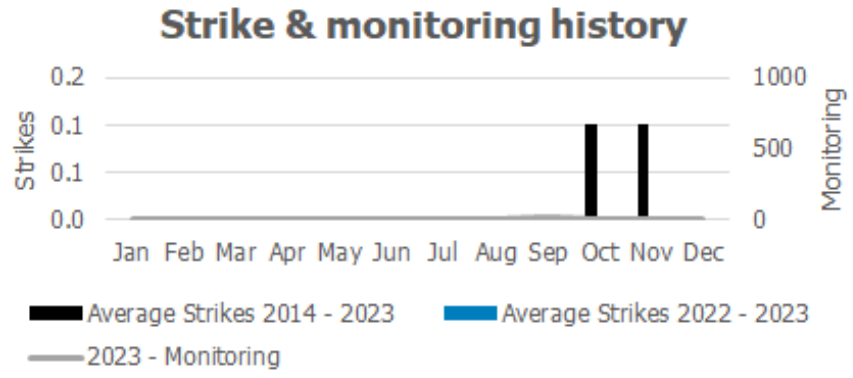


Image source: www.birdlife.org.au

Whistling kite

Haliastur sphenurus

Hazard Ranking:	H
Mass (g):	910
Strikes 2022 - 2023:	11
Flocking tendency:	Usually solitary, but forms monogamous pairs during breeding season. May form large flocks, although less likely to form large flocks than the black kite.
Preferred habitat:	Open or partially wooded areas, typically near water. Often observed near farmlands, abattoirs and landfills.
Breeding season:	From April to June.
Diet:	Opportunistic hunters and scavengers, feeding on fish, small birds, reptiles, mammals as well as insects and frogs

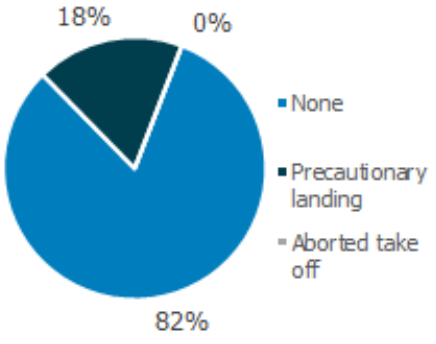
Active Management: Use of long-range dispersal methods coupled with persistent negative audio and visual cues.

Passive Management: Remove carrion from airfield or from areas immediately surrounding the airport. Conduct of controlled burning and grass cutting at night. Increase harassment activities during and following controlled burns (to mitigate bird attraction to prey). Removal of perching infrastructure (particularly if observed to be in use by kites).

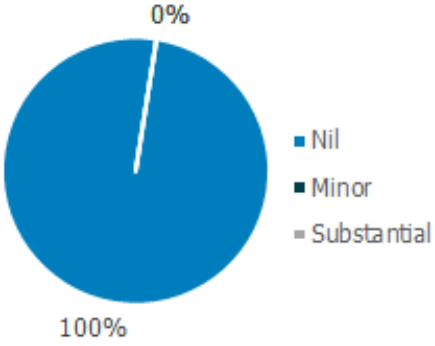
Monitoring: Differentiating black kites and whistling kites may be difficult due to their similar appearances. Whistling kites are less often seen in large groups, although the wooded habitat at the airport may make the airport more attractive to whistling kites. They are also larger in body size. This species peaks in abundance at DIA around November.

General Recommendations: Reduce potential for aerial activity (e.g. foraging and thermalling) through use of long-range dispersal methods. All stakeholders should restrict mowing times to after daylight hours.

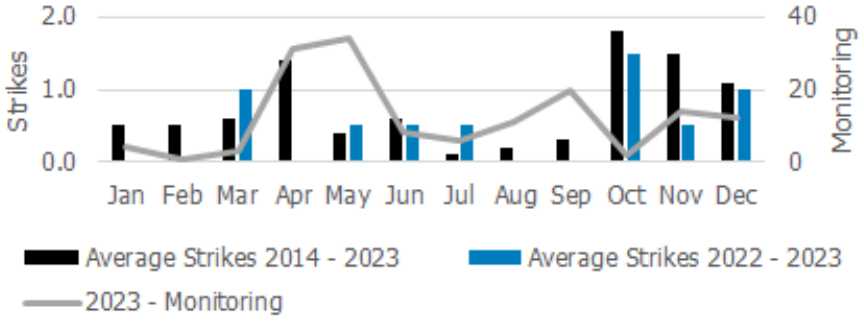
Effect on flight



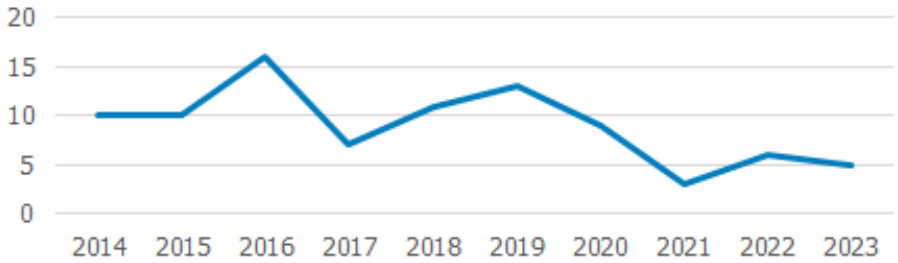
Damage to aircraft



Strike & monitoring history



Ten-year strike history



Attachment 2: Strike history

DIA annual wildlife strike trend summary for calendar years 2003-2023

Year	Total No. Confirmed Strikes	No. Strikes / 10,000 aircraft movements	Total No. Damaging Strikes	**Comments** (e.g. species most frequently struck, changes to Airport reporting processes that may influence data)
2003	20	2.82	3	Mixture of most commonly hit species.
2004	43	5.53	0	All most commonly hit species.
2005	49	6.29	2	Including a strike involving a Pelican.
2006	63	7.81	0	Bush Stone-curlew strike doubled from previous year, 10 unknown species strikes.
2007	78	8.66	0	Large number of Australian Pratincole, Bush Stone-curlew numbers increased again. 14 unknown species strikes.
2008	65	7.91	0	One White-bellied Sea-eagle struck. 12 unknown species strikes
2009	86	10.07	2	General increase in all species struck. Highest yearly strike rate for Flying Fox with 18. One Magpie Goose struck. Six unknown species strikes.
2010	69	8.82	0	Six unknown species strikes.
2011	67	7.16	2	One Brahminy Kite struck. Six unknown species strikes
2012	67	7.00	2	Decrease in Australian Pratincole strikes. 17 unknown species strikes.

Year	Total No. Confirmed Strikes	No. Strikes / 10,000 aircraft movements	Total No. Damaging Strikes	**Comments** (e.g. species most frequently struck, changes to Airport reporting processes that may influence data)
2013	119	14.53	3	45 Black Kites struck. Highest number of strikes over a 10-year recording period. Black Kite numbers were the highest ever observed and were present all year round, rather seasonally. Five unknown species strikes. Year with the highest number of different species struck.
2014	59	6.37	10	Four unknown species strikes. First recorded strike of a Black-necked Stork (Jabiru).
2015	95	12.04	5	High numbers of Black Kites present during peak periods May/June and Oct/Nov. Black Kite and Australian Pratincole most struck species. Six unknown species strikes.
2016	85	9.97	0	12 black kites and 16 whistling kites struck with strikes occurring throughout the year. Whistling kite was the most frequently struck species, followed by the black kite and magpie lark (12). Three Australian pratincoles struck.
2017	88	9.86	3	Australian pratincoles most frequently struck species (33), followed by bush stone curlews (12) and black kites (10).
2018	80	9.44	3	Kites (8 black and 11 whistling) were most frequently struck species group, followed by bush-stone curlew (11) and Australian pratincole (11). Nankeen kestrels (7) were also frequently struck.

Year	Total No. Confirmed Strikes	No. Strikes / 10,000 aircraft movements	Total No. Damaging Strikes	**Comments** (e.g. species most frequently struck, changes to Airport reporting processes that may influence data)
2019	75	8.99	0	Whistling Kite (13) were the most frequently struck species and Bush-stone Curlew (8), Black Kite (7), Nankeen Kestrel (7) and various Bat/Flying Fox species were included in the most frequently struck species.
2020	60	8.94		Whistling kite was the most frequently struck species (9), followed by Bush-stone curlew (6), Masked lapwing (5), Australian pratincole (5), and Black kite (4).
2021	36	4.22	4	Australian pratincole (9) was the most frequently struck species followed by whistling kite (6), masked lapwing (5) and bush-stone curlew (4). Lowest confirmed strikes since 2003.
2022	57	7.88	3	Australian pratincole (9) was the most frequently struck species followed by whistling kite (6), Magpie Lark (5) bush-stone curlew (4), and combined various bat species (8).
2023	32	3.75	1	Australian Pratincole (7) was the most frequently struck species. Whistling Kite (5), and Black Kite (6) – majority of strikes occurred between Nov and Dec 2023 and March to June 2023. Lowest confirmed strikes since 2003.

Attachment 3: Bird Risk Assessment Model for Airports and Aerodromes

Consequence

Body Mass	Examples	Body Mass Score
< 20 g	Welcome Swallow	1
21-50 g	House Sparrow, Skylark	2
51-200 g	Common Starling, Magpie-Lark, Nankeen Kestrel	4
201-1000 g	Domestic Pigeon, Galah, Silver Gull, Australian Magpie, Masked Lapwing, small ducks	8
1-5 kg	White Ibis, Straw-necked Ibis, large duck	16
> 5 kg	Australian Pelican, Cape Barren Goose	32

Flock Size	Examples	Flock Score
Usually solitary or widely spaced	Nankeen Kestrel, Skylark	1
Often in loose flocks	Australian Magpie, Little Raven, Magpie-Lark, Welcome Swallow, Silver Gull	2
Often in tight flock	House Sparrow, Galah, Little Corella, lorikeets, ducks, ibis	4

Flight Behaviour	Examples	Flight Score
Rapid direct	Little Raven, Australian Magpie, ducks, ibis	1
Slow, meandering, erratic, hovering, manoeuvrable	Nankeen Kestrel, Galah, Common Starling, swallows, Magpie lark, Silver Gull, Australian Pelican, Masked Lapwing	2

Consequence Category	Consequence Score*
Extreme	64-128
Very High	32
High	16
Medium	8
Low	4
Very Low	1-2

* = body mass score x flock score x flight score

Likelihood

Abundance	Very High	High	Medium	Low
Quantitative				
Relative abundance (% of total birds counted)	>1	>0.1	>0.01	<0.01
Frequency of occurrence (% surveys species scored)	>75	50-75	25-50	<25
Area of occurrence (% airport land used)	>75	50-75	25-50	<25
Qualitative				
Abundance	Many	Some	Few	Occasional
Frequency of Occurrence	Most	Some	Few	Occasional
Area of Occupation	Most	Some	Few	Occasional
Seen close to runways	Often	Some	Occasionally	Rarely

Bird Strikes	Very High	High	Medium	Low
Quantitative				
Relative Frequency*	>10%	5 – 10%	2 – 5%	<2%
Qualitative				
Apparent Frequency	Often	Some	Occasional	Rare/none

*Relative frequency of bird strikes at the airport from 2021 – 2022 was used for determining likelihood for the wildlife risk assessment for the 2021 – 2022 review period. The categories for 'likelihood' were determined based off of the percentage of each species' representation in the overall number of bird strikes for which the species was identified at DIA (i.e., strikes involving 'unknown' species were omitted from the risk assessment). Thresholds for 'likelihood' have been determined in accordance with the Paton method, which stipulates that approximately ten species should be allocated "very high" or "high" hazard rankings.

Attachment 4: ADG Risk Register – DIA

The below risk assessment (Table 1) is based upon ADG risk register format using consequence/ likelihood matrix following ADG Risk Management Procedure (Tables 2-4; available on SharePoint). When undertaking a risk assessment, a reasonable worst-case scenario must be considered as the consequence. Therefore, for this table the 'consequence' ranking of Major (MJ) has been used (Table 4). (The justification for this is that DIA – in all its years of operating involving millions of movements – has never experienced a Catastrophic (C) strike event.) The 'likelihood' is the chance that each risk will occur (rather than the likelihood of a wildlife strike occurring).

The broader wildlife risk (encompassing all species) at DIA should be assessed using the ADG Risk Management Procedure. It is relevant to note that the below risk assessment should be viewed separately to the wildlife risk assessment presented in the WHMP. The hazard rankings for individual species provided in the WHMP should be viewed relative to other species only.

Table 1. Wildlife activity risk assessment.

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
1	To reduce wildlife strikes to aircraft	**Grass Cutting** Some areas requiring grass cutting are located airside and are close to aircraft operations. Grass cutting may attract wildlife (e.g.; species that forage for seeds to hunt for exposed prey, such as black kites or other raptors)	DoD DIA	-Grass cutting is undertaken (including critical areas – RWY strips at night) when aircraft activity is low -RWY inspections and wildlife observations carried out during slashing activities -TAOOs monitor and harass as required -Grass cutting is stopped if an increased in wildlife strike risk is identified	MJ	U	18.8	M	-Regular liaison meetings held with DoD; wildlife issues are standing agenda items -Participation by DoD (or relevant contractor) in stakeholder meetings - DoD and DIA agreed to expand IVM product application to include suppression of grass growth and seed head control for 23/24 Yr which is expected to further lower this risk. - P0009 Runway and drainage works impacted grass cutting in some areas.	-	HOA / AM	-	MJ	U	18.8	M
2	To reduce wildlife strikes to aircraft	**Airside Waste Disposal** Improper use and/ or maintenance of airside and landside waste bins by tenants and operational staff can attract scavenging species	AM	-TAOO inspect bins daily -Operations team are informed by maintenance / cleaning contractor if bins are overfilled	MJ	R	7.5	L	-Assess waste disposal protocols for proposed developments	-	-	-	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
3	To reduce wildlife strikes to aircraft	**Food Resources** certain plants and grasses at DIA / RAAF Base Darwin may be a favoured source of fodder for high-risk species – they may support invertebrate life which in turn attracts predators	EM	-Implementation of weed management programs (conducted by either contractors or ground-staff) -Regular grass cutting occurs prior to seeding Note: At DIA, weeds are currently managed as part of Fire and Weed Management Risk	MJ	U	18.8	M	-IVM Program reduces broadleaf weeds around RWY 11/29 -Use of Macrofauna survey results to inform future weed control and vegetation selections	IVM Program ongoing	EM	Ongoing	MJ	R	7.5	L
4	To reduce wildlife strikes to aircraft	**Earthworks** wildlife may be attracted to stockpiles which provides foraging habitat and shelter for some species	PM EM ASSM	-Construction Environment Management Plan and/or methods of Work Plans for all airfield works are required to assess chance of increased wildlife activity	MJ	R	7.5	L	-Management and monitoring off stockpiles - P0009 Runway and drainage works requires earthworks and stockpilies – ongoing management and observations for changes in wildlife activity.	-	PM EM ASSM	Ongoing	MJ	R	7.5	L
5	To reduce wildlife strikes to aircraft	**Clearing** clearing at the airport or in surrounding areas may result in wildlife displacement & predatory species may be attracted to these activities due to increased prey availability.	PM EM ASSM	-During clearing operations inspections, should be conducted by both relevant PM and airport EM -AOO to conduct monitoring and inspections to detect wildlife issues during clearing activities	MJ	R	7.5	L	-	-	-	-	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
6	To reduce wildlife strikes to aircraft	**Controlled Burns** during controlled burns, raptors are attracted to fauna displaced by fire	AM ASSM EM DoD	-Controlled burns only undertaken when necessary -EM informs all relevant stakeholders of activities -Burns conducted from late afternoon and night to minimize wildlife attraction - Risk Assessment is completed by DIA/RAAF Base prescribed burns following stakeholder consultation -TAOOS monitor for increased wildlife activity during burns -Burn Implementation Plan developed -AM to send ARFF to manage smoke -RAAF Contractor to conduct separate risk assessment immediately prior to burn and reschedule if necessary	MJ	U	18.8	M	-Liaise with Ventia to confirm times and dates -Follow up in meetings to discuss any issues -Review risk assessment as required using findings from previous burn -Regular Bushfire Mitigation Works Schedule (BMWS) Workshops facilitated for airport stakeholders.	Future action as required	AM ASSM EM DoD	-	MJ	R	7.5	L
7	To reduce wildlife strikes to aircraft	**Uncontrolled burns** during uncontrolled conditions, raptors are attracted to fauna displaced by fire	AM ASSM EM DoD	-TAOOs to monitor for smoke and or fire -AM will send ARFF to manage fire -Controlled burns reduce likelihood of uncontrolled burns -ATC manage aircraft movements	MJ	U	18.8	M	-Liaison with nearby landholders regarding timing of controlled burns as a means of reducing risk to airside operations -Prescribed burns plan RAAF Base developed to reduce likelihood of uncontrolled burns -Gamba grass management	Future action as required	AM ASSM EM DoD	Ongoing	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
8	To reduce wildlife strikes to aircraft	**Fire Training** (smoke production) - ARFF training includes burning, which attracts raptors (e.g.; kites)	EM	-ARFF notify EM, AEO and HOO regarding smoke production -Timing of burns scheduled to avoid peak flight times -Burns are of short duration	MJ	U	18.8	M	-Communication process and notification process in place regarding smoke production -Monitor changes in wildlife during activities		EM	Ongoing	MJ	R	7.5	L
9	To reduce wildlife strikes to aircraft	**Perches** buildings and other infrastructure provide perching habitat for a variety of species	AM ASSM	-Anti-perching devices are installed around the airport -Provision of perching infrastructure considered in development of new designs	MJ	U	18.8	M	-Audit on airfield to be conducted following P0009 Project to ensure perching controls on airside infrastructure. -Additional installation of spikes provided where necessary	Future action	Technical Team	Ongoing	MJ	R	7.5	L
10	To reduce wildlife strikes to aircraft	**Nesting** animals nesting in operational areas increases likelihood of strikes	AM AOO	-Removal and destruction of nests from operational areas	MJ	R	7.5	L	-	-	-	-	MJ	R	7.5	L
11	To reduce wildlife strikes to aircraft	**Wild dogs** feral dogs on site present a strike risk	AM AOO DoD	-Fence is configured to restrict entrance of dogs to airfield -Control programs are implemented if a need is identified	MJ	R	7.5	L	-RAAF Base Darwin fence upgrade project 2019 -2020	-	-	-	MJ	R	7.5	L
12	To reduce wildlife strikes to aircraft	**Fencing** inadequate perimeter fencing can result in increased terrestrial wildlife hazard	ASSM EM AM AOO	-TAOOs regularly inspect DIA perimeter fence -Perimeter fence is repaired and maintained as needed -All perimeter fence access points are closed unless in use	MJ	R	7.5	L	-RAAF Base Darwin Perimeter Security Works including replacing/upgrading perimeter fencing in progress.	-	-	-	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
13	To reduce wildlife strikes to aircraft	**Lighting** airport lighting attracts insects which attract predatory species (e.g.; microbats and insectivorous birds)	ASSM HOO	-Lighting designs must meet CASA regulations	MJ	R	7.5	L	-	-	-	-	MJ	R	7.5	L
14	To reduce wildlife strikes to aircraft	**Drainage** temporary waterbodies, including blocked waterways, provide a necessary resource for wildlife and provide potential for wading birds	ASSM PM ASPM DoD	-Runway design includes grooving and a one-way flow water gradient -Daily inspections undertaken by TAOOs -Vegetation that may block drains is regularly removed	MJ	U	18.8	M	-Ongoing inspections and monitoring are conducted -P0009 drainage works south side of RWY 11/29 has increased the likelihood of temporary waterbodies attracting increased numbers of birds, including Magpie Geese and Plumed Whistling Duck. Increased monitoring and reporting following periods of heavy rain and assessing the potential for increased risk of wildlife hazards.	Future Action	ASSM AM ASPM DoD	-	MJ	R	18.8	M
15	To reduce wildlife strikes to aircraft	**Decommissioned Aircraft and Unutilized Storage** may provide perching or other habitat for wildlife	AM HOO ASSM Property Manager	-TAOOs conduct regular monitoring for wildlife -Liaison occurs with aircraft operators as required	MJ	R	7.5	L	- Decommissioned / derelict aircraft removed from airside.	-	-	-	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
16	To reduce wildlife strikes to aircraft	**Anthropogenic Sites** may provide artificial resources for local wildlife populations, resulting in inflated risk for some high-risk wildlife	EM External Consultant	-Off airport monitoring carried out by external consultants at selected high-risk sites -Changes in population sizes are reported to AM	MJ	R	7.5	L	-	-	EM External consultant	Ongoing	MJ	R	7.5	L
17	To reduce wildlife strikes to aircraft	**Landscaping On Airport** select landscaped areas on airport may attract wildlife to the vicinity of the airport	EM	-Modifications are made to landscaped areas where wildlife are regularly observed -Landscaped designs use non-attractive vegetation species -Liaison with external consultants occurs where advice is required	MJ	R	7.5	L	-	-	EM	Ongoing	MJ	R	7.5	L
18	To reduce wildlife strikes to aircraft	**Carrion** scavenging or opportunistic wildlife may be attracted to carcasses on airport land. Likely species include wild dogs, raptors and magpies	AM AOO	-Removal of any carrion from airfield in accordance with WHMP PROs -Regular Aerodrome serviceability inspections -Installation of visual cues (e.g., bunting) to prevent flying fox entanglement in airport fencing	MJ	R	7.5	L	-Regular review of WHM PROs -Regular Serviceability Inspections -Wild dog management	-	AM	Ongoing	MJ	R	7.7	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
19	To reduce wildlife strikes to aircraft & Execution of effective wildlife management	**Wildlife Count Data** inaccurate or incorrect data obtained as a result of management may result in the implementation of poor management practices	AM	-TAOO carries out wildlife observations in accordance with WHM Procedures -TAOO carries out daily checks to determine risk ranking of strike -Wildlife Hazard Training -Bird ID Guide DIA -Wildlife Species Strike Risk Calendar	MJ	R	7.5	L	-Refresher wildlife hazard management training -Internal assessment / training of TAOOs -Regular analysis of wildlife trends	-	AM TAOO	Ongoing	MJ	R	7.5	L
20	To reduce wildlife strikes to aircraft & Execution of effective wildlife management	**Wildlife Identification** incorrect identification of species struck or utilizing DIA may result in misallocation of resources	AM	-Species that are not identifiable following strikes may be sampled for DNA or photo taken to identify -TAOO carries out daily checks to determine risk ranking of strike -Wildlife Hazard Training (March 2020) -Bird ID Guide DIA -Wildlife Species Strike Risk Calendar	MJ	R	7.5	L	-Refresher wildlife hazard management training -Internal assessment of TAOOs knowledge / accompany SME during seasonal surveys -Regular analysis of wildlife trends -Seasonal surveys completed by subject matter expert	-	AM TAOO	-	MJ	R	7.5	L
21	To reduce wildlife strikes to aircraft	**Stakeholder Engagement** lack of effective communication with airport stakeholders may lead to ineffective management of the locality surrounding the airport	DIA DoD Estate Services Local Government Local landholders WHMC	-Ensure all stakeholders in the locality are included in the WHMC / Airport Safety & Operations Committee Meetings -Provide feedback to local authorities regarding new developments and revised land-uses -WHMP reports distributed to key stakeholders -Regular WHMWG meetings (agenda item ASOC Meetings)	MJ	U	18.8	M	-Increase communication with DoD and contractors -Regular DIA & DoD liaison meetings to discuss standing wildlife hazard management issues	-	AM ASSM EM DoD	-	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
22	To reduce wildlife strikes to aircraft	**Aircraft Communications** absence of adequate warning systems may result in unsafe conditions for aircraft	DIA DoD Estate Services Local Government Local landholders WHMC	-TAOO determination of Daily Wildlife Hazard Level procedure -TAOO inform ATC of local wildlife hazards -ATC provide pilots information regarding local conditions -Issue of NOTAM is conditions ensure for an extended period of time -Provision of relevant ERSA Aerodrome Serviceability checklist -Use of AVCRM informs staff handover between shifts	MJ	U	18.8	M	-Review PROs for determining and communicating Daily/Weekly Wildlife Hazard Level	-	HOA AM ASSM DoD		MJ	R	7.5	L
23	To reduce wildlife strikes to aircraft & Execution of effective wildlife management	**Wildlife Harassment and Dispersal** ineffective harassment may not mitigate or may increase the wildlife hazard in a particular area	AM TAOO	-Wildlife Hazard Management Training; and Firearms Safety Training and Licencing -Development and use of relevant PROs -Culling implemented as required -Implementation of trials and use of new equipment and research -Development of Species Management Plans -Increased resource allocation during periods of increased risk -Liaison with external consultants -Provision of harassment equipment and tools	MJ	U	18.8	M	-Regular updates to Wildlife Harassment and Dispersal Techniques - PROs to ensure details remain current -Monthly WHM updated provided to operations staff -Continual review of harassment technique efficacy -Continued research into alternative harassment methods - Biodiversity training	-	AM	-	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
24	To reduce wildlife strikes to aircraft	**Wildlife Management Training** inadequate training for staff could result in poor management of wildlife-related hazards	HOO AM	-24h/day rostering of competent staff -Additional support available from other operations staff -WHM PROs includes detailed wildlife management instructions	MJ	U	18.8	M	-Authorization of overtime and additional resources as required -Additional training and monitoring by Supervisors -Specialist training/assistance available	-	AM HOA TAOO	-	MJ	R	7.5	L
25	Execution of effective wildlife management	**Inter-Departmental Communication** lack of company-wide engagement would lead to ineffective wildlife hazard management (e.g.; PMs do not fully consider wildlife in project planning or operational staff become unaware of hazards associated with certain activities)	ALL DIA Department Managers PMs DoD	-Risk assessments for new projects/ developments include issues relating to wildlife hazard management -Operations staff are consulted regarding proposed airside and landside developments -DIA provides feedback as required for any projects and developments	MJ	U	18.8	M	-Operations staff attend project meetings and provide feedback -Operations staff participate in risk assessment procedures		All	Ongoing	MJ	R	7.5	L
26	Execution of effective wildlife management	**Wildlife Hazard Management Equipment** failure to identify resourcing shortfalls may lead to inability to manage urgent wildlife hazards in a timely manner	AM TAOO	-Firearms provided for lethal and non-lethal control -Equipment regularly updated and improved following liaison with key suppliers, including maintenance /repairs carried out by local gunsmith	MJ	U	18.8	M	-Use of thermal imagery technology -Member of AAA Networking Group and other industry forums		AM	Ongoing	MJ	R	7.5	L

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Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
27	Execution of effective wildlife management	**Inadequate Staff Training** may result in staff injury and ineffective wildlife management	HOA AM TAOO	-Completion of Airside Operations training - Wildlife Module -Biodiversity Wildlife Management training 2020 -AAA online Wildlife module -Use of relevant PROs -Completion of airside driver training and inductions	MJ	U	18.8	M	-ARO Refresher or initial training sessions in 2023 and 2024.	-	AM HOA	Ongoing	MJ	R	7.5	L
28	Execution of effective wildlife management	**Firearm Use** incorrect use of firearms for purposes of wildlife management may result in injury to staff or others	AM WHS Advisor	-PROs for firearms and ammunition storage established -PPE requirements mitigate severity of potential injuries -All users are licensed to use firearms -Firearm Safety Training -Review of firearms equipment	MJ	U	18.8	M	-Refresher training course -Compliance with NT firearms -Firearms training planned every two years – all TAOOs completed training in 2024.	Review of PROs	AM	Ongoing	MJ	R	7.5	L
29	Execution of effective wildlife management	**Culling of Protected Animals** incorrect species ID could result in culling of protected species and breach of relevant permits	AM	-PROs in place for identification of wildlife -Current permit for lethal take of wildlife -Materials provided to aid in accurate identification of animals - Firearms Training	MJ	U	18.8	M	-Annual renewal of lethal take permit -Quarterly returns reporting wildlife culled on airport -Annual review of wildlife culls	Parks and Wildlife Permit renewal	AM	Annually	MJ	R	7.5	L

Context		Risk Description		Risk Details					Risk Controls	Action Tracking	Action Officer	Due Date	Revised Risk Score			
Risk Number	Objective - What is the business objective / KPI?	Risk - what could prevent achievement of this objective?	Risk Owner - who is accountable for managing this risk?	Existing Controls	Risk Analysis Consequence (C) and Likelihood (L)				Proposed Controls - What more can be done to manage the risk	Status on implementation of proposed controls	Who is to finalize the action?	Finalization Date	Risk Analysis (Consequence and Likelihood			
					C	L	Score	Level of Risk					C	L	Score	Level of Risk
30	Execution of effective wildlife management	**Wildlife Hazard Management procedures during airfield works** Airfield works in progress impacts the management of wildlife hazards.	AM TAOO DoD	-WHMP and PROs issued detailing procedures for wildlife hazard management. - Appropriate equipment to manage wildlife hazards -DIA & RAAF Liaison/Weekly meetings	MJ	U	18.75	M	-MOWP issued for airfield works -NOTAM issued for works stages -Regular briefings and updates provided to DIA Operations personnel -Tool box meetings with Contractors and WSO -Communications between TAOO, WSO and ATC	Issued as required when airfield works impacts Wildlife Hazard Management	AM HOA DoD	As required	MJ	R	7.5	L

Abbreviations:

AM – Airside Manager
ARFF – Aircraft Rescue and Firefighting
ASPM – Assets & Project Manager
ASSM – Aerodrome Safety and Standards Manager
DoD – Department of Defence
HOA– Head of Airside
EM – Environment Manager
PM – Project Manager
TAOO – Terminal & Airside Operations Officer
WHMC – Wildlife Hazard Management Committee
WHMP – Wildlife Hazard Management Plan
WHMWG – Wildlife Hazard Management Working Group

Risk Assessment Framework

Table 2. DIA Risk Assessment Matrix.

		Negligible (NG)	Minor (MR)	Moderate (M)	Major (MJ)	Catastrophic (C)
		1	2.5	5	7.5	10
Almost certain	10	10	25	50	75	100
Likely	7.5	7.5	18.75	37.5	56.25	75
Possible	5	5	12.5	25	37.5	50
Unlikely	2.5	2.5	6.25	12.5	18.75	25
Rare	1	1	2.5	5	7.5	10

Table 3. DIA Risk Assessment framework for defining likelihood'.

Likelihood of risk materialising	Abbreviation	Value	Probability	Definition
Almost certain	AC	10	> 90%	Expected to occur; almost inevitable
Likely	L	7.5	60% - 90%	Expected to occur in most circumstances; not surprised if it happens
Possible	P	5	40% - 60%	Might occur in some circumstances
Unlikely	U	2.5	10% - 40%	Could occur in some circumstances; surprised if it happens
Rare	R	1	< 10%	May occur but only in exceptional circumstances; it would be highly unexpected

Table 4. DIA Risk Assessment framework for defining 'consequence'.

Score	Consequence categories				
	General description of consequence	Safety	Compliance	Corporate Image	Financial
Catastrophic 10	• Closure of whole or significant part of business, Board and/or executive resignations likely. • It will take more than 5 years for the business to recover. • Extensive attention from the Board and Executive required to resolve disruption. Extensive use of Consultants Likely.	Multiple high profile fatalities	Very serious regulatory outcome leading to cancellation of trading licences or criminal prosecution of directors/ officers of the organisation	Serious adverse public or media attention with ongoing national, international and local coverage. Long term damage to image.	Impact on annual profit will exceed $20m
Major 7.5	• Significant business continuity challenges for some activities • It will take between 3 and 5 years for the business to recover. • Extensive attention from the Board and Executive required to resolve the disruption. Use of consultants likely.	Multiple fatalities and/or severe disability	Serious regulatory outcome leading to regulatory sanction and large fines being imposed. Unlikely to include criminal prosecution	Loss of credibility and confidence in organisation. National press interest. Significant public/political concern.	Impact on annual profit will exceed $8m but will be less than $20m
Moderate 5	• Significant disruption to some activities • It will take between 1 and 3 years for the business to recover. • Ongoing oversight from the Board and extensive inputs required from the Executive. Possible use of consultants to help resolve.	Preventable fatalities and/or severe permanent disabilities (>30%)	Threats of sanctions from regulatory body.	Limited damage to reputation Extended local press interest/regional press interest. Regional public/political concern.	Impact on annual profit will exceed $1m but will be less than $8m
Minor 2.5	• Some disruption to daily activities • It will take between 3 and 12 months for the business to recover • Board will be informed of Executive oversight and management initiatives. Consultants probably not required.	Localised incident with potential for hospitalisation	Fine or warning from regulators.	Minor adverse local public or media attention.	Impact on annual profit will exceed $0.5m but will be less than $1m
Negligible 1.0	• Minimal business impact • It will take less than 3 months for the business to recover. • Board: no need to be informed. Issue resolved at an operational level without the use of consultants.	Onsite first aid required	Small fine	Minimal public attention. No external damage to image and reputation.	Impact on annual profit will be less than $0.5m

Attachment 5: Roles and Responsibilities

Position (or entity)	Responsibilities
DIA Executive General Manager - Operations	Overseeing the operations and maintenance of the Airport. Giving consideration to advice from the Airside Manager or Head of Airside, and the WHMWG to minimise the risk of wildlife strikes to aircraft.
Head of Airside (HOA)	Overseeing the implementation of the WHMP. Ensuring the wildlife hazard management system complies with all relevant legislation. Identifying resource requirements and seek budget allocation for identifying and managing wildlife hazards. Ensuring the WHMP aligns with the Aerodrome SMS. Collecting, filing, considering and incorporating recommendations from audits conducted. Member of the WHMWG. Attend Defence and DIA Liaison Meetings. Analysing wildlife hazard data. Reviewing and signing off on the Wildlife Hazard Management Plan, in consultation with the WHMWG.
DIA Aerodrome Safety & Standards Manager	Managing the risk associated with wildlife hazards to ensure safe airport operations. Conduct audits wildlife management activities, policies and system. Ensuring Wildlife Hazard Management is conducted in accordance with Safety Management System (SMS) approach. Auditing training records. Member of the WHMC. Member of the WHMWG. Attend Defence and DIA Liaison Meetings. Assessing any proposed new land use in the vicinity of the Airport (within 13 km) for any risk associated with wildlife hazards. Liaising and maintaining working relationships with land use planning authorities as required.
Airside Manager (AM)	Member of the WHMC. Chairing the WHMC (meetings may be incorporated with the Airside Safety & Operations Committee meeting). Member of the WHMWG. Attend Defence and DIA Liaison Meetings.

Position (or entity)	Responsibilities
	Overseeing the day-to-day implementation of wildlife management activities. Ensuring vegetation and grass lengths on the airfield are maintained in accordance with WHMP recommendations. Liaising with DoD in regard to the administration of the mowing maintenance. Ensuring drains are clear of vegetation and/or water. Maintaining fences to ensure that there are no holes to enable animal access. Development of company procedures (PROs) Managing required permits and licences. Maintaining appropriate reporting system. Ensuring that appropriate data and records of bird strikes are maintained. Ensuring that all wildlife strikes notified to the Airport are reported to ATSB. Arranging for DNA samples to be sent to Australian Museum for analysis. Collating and analysing wildlife hazard data. Produce WHMP reports. Forwarding data to responsible authorities and stakeholders as required. Ensuring that TAOO's are adequately trained and training records maintained. Developing wildlife risk assessment in accordance with a safety management system approach. Reviewing WHMP and associated procedures as required. Liaise with RAAF/Defence re airfield works regarding any impacts and/or restrictions to wildlife management activities and issue amended procedures as required.
Compliance Coordinator	Assist with recording and managing wildlife information in AVCRM database. Assist with arranging for DNA samples to be processed. Assist with training and maintaining records in database. Assist Head of Airside and Airside Manager implementing WHMP. Assist collating and preparing WHM reports. Attend meetings.
Terminal and Airside Operations Officers	Member of the WHMC. Member of the WHMWG.

Position (or entity)	Responsibilities
(TAOO)	Conducting wildlife observations. Conducting wildlife dispersal and control. Reporting of Wildlife Observations; strikes; wildlife management activities and ammunition usage. Removing carcases from the airfield. Collecting DNA sampling of blood or feathers if species cannot be identified, complete request for DNA Identification form. Monitoring of wildlife activity and strike statistics and advising the Airside Manager when a change in wildlife level occurs. Generating NOTAM to warn pilots of increase in wildlife hazard. Notifying ATC of specific wildlife hazards and any carcasses found on the movement area. Liaising with Airline Ground Staff and/or Operations, passing on details of wildlife strikes. Liaise with WSO and Works Contractors re wildlife hazard management during airfield works as required. Operating in accordance with WHMP and relevant company procedures. Recording WHM activity in AVCRM database.
Senior Operations Coordinator	Member of WHMC. Member of WHMWG. Assist and carry out duties of TAOO as required. Assist with arranging for DNA samples to be processed.
Ground Staff	Ensuring garbage is disposed of appropriately and all bins are lidded on airport. Operating in accordance with relevant company procedures. Maintaining vegetation and appropriate grass lengths at the Airport. Ensuring drains are clear of vegetation and/or water.
Environment & Sustainability Manager	Member of the WHMC. Member of WHMWG. Attend Defence and DIA Liaison Meetings. Assisting Airside Manager and the Operations team with developing wildlife management plans and studies. Facilitate habitat and wildlife studies to assist the understanding and management of wildlife hazards. Liaising and maintain working relationship with land use planning authorities in conjunction with the Aerodrome Safety & Standards Manager and WHMWG.

Position (or entity)	Responsibilities
	Implementation of weed management programs.
Wildlife Hazard Management Working Group (WHMWG)	Reviewing the WHMP and procedures, ensuring system is effective and up to date. Actively ensuring that wildlife activities do not affect the safe operation of aircraft by implementing approved recommendations to the system. Reviewing risk assessments on wildlife species and of on-airport and off airport facilities. Providing updates on wildlife activity and trends to the WHMC. Analysing of wildlife data collected. Conducting and reviewing internal audits. Reviewing external audit. Reviewing recommendations to WHMP. Investigating new technology to aid in the deterrence, detection and removal of wildlife.
Airport-appointed Biologist	Member of the WHMC. Assist and meet with WHMWG. Providing expert advice on environmental aspects to the WHMC and advice the group of environmental issues. Conduct surveys at DIA and surrounding wildlife attractions on a regular basis to assess wildlife populations and risks; vegetation and surveys. Reviewing and recommending changes to WHMP as required. Assessing and reviewing airport facilities when requested. Assist with an annual audit of the WHMP and provide recommendations to improve wildlife management and reduce risks. Assist to review data, trends and hazards, including risk assessments.
Commanding Officer 13 Squadron **RAAF Base Darwin**	Overseeing RAAF Base operations, working towards minimising the potential for wildlife hazards on the Airport in accordance with the Joint User Deed. Responsible for WHMP implementation for all Defence personnel on RAAF Base Darwin. Endorse the final version of the WHMP.
Base Aviation Safety Officer (BASO) **RAAF Base Darwin**	Work with DIA Operations towards good management practices that minimise the potential for bird hazards on the airport. Monitor Defence contractors' performance.

Position (or entity)	Responsibilities
	Ensure any Wildlife Management contractors and other staff deal with wildlife and their habitats in safe and consistent manner in accordance with the WHMP. Providing information regarding wildlife hazard and its management at RAAF Base Darwin; and ensure other staff deal with wildlife and their habitats in as safe and consistent manner as described in the WHMP. Member of the WHMC.
RAAF Air Traffic Control – 452 SQN	Endorse the final version of the WHMP. Attend Defence and DIA Liaison Meetings. Providing a member to the WHMC. Notifying the TAOO's of specific wildlife hazards. Liaising with TAOO when significant wildlife harassment activities are necessary on the airfield. Giving priority for TAOO's wildlife control activities except in case of an operational emergency. Passing on all reports of aircraft wildlife strikes to the TAOO's immediately, including those involving military aircraft. Issuing/cancelling wildlife hazard warning via ATIS and ground/tower frequencies when severe wildlife activity/level is observed.
Base Manager **Service Delivery Division – Northern & Central Zone (NT, SA, NT & QLD) Estate & Infrastructure Group RAAF Base Darwin**	Endorse final version of the WHMP. Attend Defence and DIA Liaison Meetings. Providing member to the WHMC. Responsible for WHMP implementation for all Defence civilians on RAAF Base Darwin. Ensure all relevant staff are trained and demonstrate competency to implement wildlife hazard management effectively as required. Providing DIA staff and or contactors permission to access areas on Defence land for wildlife control activities. Liaising with appropriate personnel for DIA wildlife hazard management. Passing on reports to AOO on wildlife activities. Maintaining fences to ensure that there are no holes to enable animal access. Manage Defence contractors to ensure vegetation and airfield grass lengths are maintained in accordance with CASA requirements. Including ensuring grass cutting is undertaken at night as required. Ensuring Defence controlled gates and access points to the airfield are kept closed at all times.

Position (or entity)	Responsibilities
Environment Manager **Service Delivery Division – Northern & Central Zone (NT, SA & QLD) Estate & Infrastructure Group RAAF Base Darwin**	Member of WHMC Attend Defence and DIA Liaison Meetings. Provide feedback or any comments re updates or reviews of the WHMP. Ensure that the principles of the WHMP are consistent with the RAAF Base Darwin Environmental Management System. Consulting with DIA to implement
Ventia Defence Base Services – RAAF Darwin	Member of WHMC Attend Defence and DIA Liaison Meetings. Maintain vegetation and grass lengths in accordance with RAAF Base Darwin specifications, including ensuring airfield mowing of the immediate area between runway and gable markers is carried out at night to minimise bird-strike hazards (e.g. Kites). Drain clearing Ensure wildlife hazards are considered and stakeholders consulted prior to implementing Bushfire Mitigation Program. Implement Feral Animal Management Plan as required.
Aircraft Operators	Providing a representative to the WHMC. Aircraft Crew passing on reports of wildlife strikes to ATC immediately to facilitate TAOO control of the wildlife hazard Engineering and Ramp staff passing on reports of wildlife strikes to ATC and TAOO immediately to facilitate AOO control of the wildlife hazard. Submitting reports to the Operations department of the known wildlife strike information and damage to aircraft. Providing WHMWG with updated strike data including damage information. Completing DNA sampling when blood or feathers are evident on aircraft.
Other Airport Operators	Reporting hazardous wildlife activity observed at or near the airfield to the ATC or the TAOO. Delivering all wildlife remains to the TAOO. Reporting all wildlife strikes to ATC and the TAOO. Limiting wildlife attractants on the airfield.
Local Government & Council Authorities	Consider the potential for bird and animal hazard in the vicinity of the Airport.

Position (or entity)	Responsibilities
and land managers in the vicinity of Darwin Airport	Provide details of development proposals and land use changes within 13 km of Darwin Airport and consider potential of creation of potential wildlife hazards. Attend annual WHMC.
Defence Consultants, Works Contractors and WSOs	Liaise with DIA when airfield works may impact and/or restrict access to portion(s) of the movement area to effectively carry out wildlife hazard management. Communicate on a daily basis with DIA Operations.
Wildlife Hazard Management Committee (WHMC)	Review wildlife strike data. Review wildlife hazard management. Forum for discussing recommendations from research and expert reports. Assist in the development of strategies to minimise off airport bird and wildlife issues. Present Airline and Consultant Reports. Review and recommend changes to the WHMP.

Attachment 6: WHMP Audit Tables – 2023-2024

Table 1. CASA MOS 139 Part 17 Compliance audit

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
CASA MOS Part 17.01 - Detection, monitoring and observation					
(1) The aerodrome operator must monitor and record at least the following: a) The presence and behaviour of wildlife on the aerodrome; b) Wildlife activity that is visible i. in the vicinity of the aerodrome; or ii. from the aerodrome; Note: For aerodromes with considerable wildlife hazards, a dedicated wildlife inspection, including wildlife counts, is recommended.	PRO – WMO 01	TAOO	As required – ongoing	□ N/A □ Non-compliant ■ Compliant	
(2) The aerodrome operator, in consultation with the local planning authority, must attempt to monitor sites within 13 km of the aerodrome reference point that attract wildlife.	Seasonal off-airport wildlife monitoring conducted during Darwin dry season, wet season and build-up period.	AM	Quarterly	□ N/A □ Non-compliant ■ Compliant	Off-airport sites within 13km of the aerodrome are monitored by an external consultant.
(3) The aerodrome operator must attempt to monitor any reported wildlife aircraft strike events at, or in the vicinity of, the aerodrome.	PRO – WMP 09 PRO – WMP 10	TAOO	After strikes or near misses occur	□ N/A □ Non-compliant ■ Compliant	
CASA MOS Part 17.02 - Wildlife hazard assessment and trigger criteria					
(1) Any detected wildlife hazard must be assessed for its potential risk to aircraft operations.	This plan	AM	Annually (internal audit)		Wildlife risk assessment completed as part of this WHMP.

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
		SME	Biennially (external audit)	□ N/A □ Non-compliant ■ Compliant	
(2) If the aerodrome operator has a safety management system, or a risk management plan, mentioned in Chapter 25 or 26 respectively, the assessment must be conducted in accordance with the system or the plan.	Attachment 4 of this plan	AM	-	□ N/A □ Non-compliant ■ Compliant	
(3) When conducting a wildlife hazard assessment, available data from the following must be considered: a) wildlife observations; b) reported aircraft strike events; c) reported aircraft near miss events. Note: If multiple wildlife hazards are identified, CASA recommends that wildlife species be ranked in their order of risk.	PRO - WMP 01 PRO - WMP 05 PRO - WMP 09 PRO – WMP 10	AM	Annually (internal audit)	□ N/A □ Non-compliant ■ Compliant	The wildlife hazard assessment contained herein incorporates data from wildlife observations, harassments, surveys, wildlife strike and near miss events.
		SME	Biennially (external audit)		
CASA MOS Part 17.03 - Wildlife hazard management plan triggers					
(1) For an aerodrome that, in the course of a financial year, has: a) 50,000 or more air transport passenger movements; or b) 100,000 or more aircraft movements; the aerodrome operator must prepare and implement a wildlife hazard management plan.	-	-	-	□ N/A □ Non-compliant ■ Compliant	

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
(2) The plan must be prepared and implemented not later than 6 months after: a) for paragraph (1) (a) — the date of publication, by the Department, of the air transport passenger movement numbers indicating that, for the first time under this MOS, there have been 50 000 or more air transport passenger movements for the aerodrome for the financial year; or b) for paragraph (1) (b) — the date the aerodrome operator becomes aware of information indicating that, for the first time under this MOS, there have been 100 000 or more aircraft movements at the aerodrome in the course of the financial year.	-	-	-	■ N/A □ Non-compliant ¨ Compliant	
(3) If paragraph (2) (a) or (2) (b): a) applied to an aerodrome operator; and b) subsequently ceased to apply to the operator; and c) subsequently would have applied to the operator again if such application were deemed to be for the first time under this MOS; then the paragraph applies to the operator as if it were for the first time under this MOS.	-	-	-	■ N/A □ Non-compliant ¨ Compliant	
(4) Subsection (1) does not apply if: a) for aerodromes without scheduled international operations — wildlife hazard assessment demonstrates, using statistical and other data, that the wildlife hazard risk is low; and b) CASA, in writing, approves the assessment subject to conditions (if any). Note: For an aerodrome to which subsection (1) does not apply, but which has a high wildlife hazard management risk, CASA recommends the development of a wildlife hazard management plan.	-	-	Ongoing	■ N/A □ Non-compliant ¨ Compliant	

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
(5) CASA may direct an aerodrome operator in writing to prepare and implement a wildlife hazard management plan if CASA considers that this is necessary in the interests of aviation safety. Note: For CASA directions see regulation 11.245 of CASR. If required in the interests of aviation safety, CASA may revoke an approval given under paragraph (4) (b) and issue a direction under this subsection.	-	-	-	■ N/A □ Non-compliant ¨ Compliant	
(6) A wildlife hazard management plan must be included in, or referenced in, the aerodrome manual.	Aerodrome Manual	AM / ASSM	As required	□ N/A □ Non-compliant ■ Compliant	
CASA MOS Part 17.04 - Preparation of a wildlife hazard management plan					
(1) A wildlife hazard management plan must be prepared in consultation with a suitably qualified or experienced person, for example: a) an ornithologist, zoologist, biologist, ecologist; or b) a person with demonstrated expertise in the management of wildlife hazards to aviation.	This plan	AM	As required	□ N/A □ Non-compliant ■ Compliant	The WHMP is prepared in consultation with Biodiversity Australia

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
(2) The wildlife hazard management plan must at least: a) identify the key aerodrome or contracted personnel and define their responsibilities or functions in the plan; and b) identify sources and locations of wildlife attraction: i. on the aerodrome; and ii. in the vicinity of the aerodrome; iii. which are likely to cause wildlife to transit the take-off, approach and transitional surfaces; and c) set out the procedures for the following in relation to wildlife hazards: i. detection; ii. monitoring; iii. risk assessment and analysis; iv. reporting to pilots through the AIP, NOTAM and ATC (if applicable); v. mitigation, including passive and active strategies; and d) specify the liaison arrangements for local planning authorities within a radius of at least 13 km from the aerodrome reference point; e) set out the aerodrome operator's strategy for wildlife hazard reduction; and f) include records of the qualifications and experience of key personnel identified in the plan.	This plan	EMOS SME	Not applicable	□ N/A □ Non-compliant ■ Compliant	Roles and responsibilities are identified in this table and summarised in Attachment 5. Sources and locations of wildlife attraction on and in the vicinity of the aerodrome are defined in Section 4 of this plan. Procedures for detection, monitoring and risk assessment, analysis, reporting to pilots, passive and active mitigation strategies and provided in Appendix 1. Sites within 13km radius surrounding DIA are monitored seasonally. Records of the qualifications for experience of key personnel are maintained by the AM.

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
(3) The aerodrome operator must: a) implement the wildlife hazard management plan; and b) keep the plan under continuous review.	This plan	AM	Ongoing	□ N/A □ Non-compliant ■ Compliant	
(4) For subsection (3), a review of the wildlife hazard management plan must be conducted in each of the following circumstances: a) if an aircraft experiences multiple wildlife strikes; b) if an aircraft experiences substantial damage following any wildlife strike; c) if an aircraft experiences an engine ingestion of wildlife; d) if the ongoing presence of wildlife is observed on the aerodrome in size or in numbers reasonably capable of causing an event mentioned in paragraph (a), (b) or (c); e) at least every 12 months, but if during a period of 12 months the plan was reviewed under paragraph (a), (b), (c) or (d), at least every 12 months after that review.	This plan	AM	As required	□ N/A □ Non-compliant ■ Compliant	This review has been prepared as part of the DIA WHMP review process. This plan outlines the specifications for WHMP review.
CASA MOS Part 17.05 - Wildlife Hazard Reporting					
(1) If the presence of wildlife is assessed as constituting an ongoing hazard to aircraft, the aerodrome operator must advise the AIS provider in writing to include an appropriate warning notice in the AIP-ERSA in accordance with Chapter 5 of this MOS. Note: Reports to the Australian Transport Safety Bureau following a wildlife strike event are also required in accordance with the Transport Safety Investigation Regulations 2003.	PRO – WMP 04	AM TAOO	As required	□ N/A □ Non-compliant ■ Compliant	DIA has a standing ERSA in place for wildlife hazards.

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
(2) Without affecting subsection (1), if a wildlife hazard is assessed as being: a) at a higher risk than usual; and b) of a short-term or seasonal nature; i. then the aerodrome operator must ensure that a timely NOTAM warning of the hazard is given to pilots using the aerodrome. Note: See CASA Advisory Circular (AC) 139.C-16: Wildlife Hazard Management at aerodromes, as existing from time to time and freely available on the CASA website, for details on what information CASA recommends should be included in the NOTAM.	PRO – WMP 04	AM TAOO	As required	□ N/A □ Non-compliant ■ Compliant	NOTAM issued as required,
(3) Without affecting subsection (1) or (2), if a wildlife hazard is assessed as being a serious and imminent threat to aviation safety at an aerodrome, the aerodrome operator must ensure that pilots using the aerodrome are directly advised on CTAF or UNICOM.	PRO – WMP 01 PRO – WMP 04 PRO – WMP 05 PRO – WMP 09	TAOO	As required	□ N/A □ Non-compliant ■ Compliant	TAOO communicates with ATC with wildlife hazard information advised by ATIS.
CASA MOS Part 17.06 - Wildlife Hazard Mitigation					
The aerodrome operator must implement controls to mitigate wildlife hazard risks within the boundary of the aerodrome. Note 1: For the management of hazards outside of the aerodrome boundary, see subsection 17.01 (2) and paragraph 17.04 (2) (d). Note 2: For the management of hazards from land-based wildlife CASA recommends continuous fencing around the aerodrome boundary, or otherwise containing the movement area.	This plan	AM	Ongoing	□ N/A □ Non-compliant ■ Compliant	It is recommended that a fence inspection schedule and procedure be formalised and form part of the AOO's regular duties.

Legislative Requirement or Competency	Related Tasks or Procedures	Responsibility	Timeframe	Compliance	Comments
CASA MOS Part 17.07 - Training					
(1) Wildlife hazard monitoring and reporting personnel must be trained to competently do the following: a) conduct wildlife observations and identify high-risk species; b) assess wildlife populations and describe their behaviour; c) record information; d) collect any remains of a wildlife strike on the aerodrome; e) attempt to facilitate the identification of: i. any wildlife involved in a strike event; and ii. any resulting damage to an aircraft; f) report the outcomes of observation, monitoring and strike collection activities. Note: To perform their roles properly, CASA recommends that monitoring personnel have access to wildlife identification materials and equipment such as a field guides, identification books, scopes or binoculars, active management tools, carcass handling tools, identification kits and relevant PPE.	This plan PRO WMP 01 – 11	AM TAOO	Ongoing	□ N/A □ Non-compliant ■ Compliant	TAOOs at DIA undertook Wildlife Hazard Management training in March 2020; ongoing training includes AAA online modules; and ongoing 'on the job' training. Wildlife Management Training sessions planned for 2nd half 2024. ARO Refresher or Initial training courses were held August 2023; and January 2024.
(2) Personnel engaged in wildlife hazard mitigation must be trained to competently: a) engage in active wildlife management without causing a hazard to aviation safety; and b) assess the effectiveness of any mitigation measures that are taken.	This plan	AM AOO	Ongoing	□ N/A □ Non-compliant ■ Compliant	
(3) The aerodrome operator must create training records for its monitoring and reporting personnel to show compliance with subsections (1) and (2). Each record must be kept in safe custody for a period of at least 3 years after the record was created.	-	AM Training provider	Ongoing	□ N/A □ Non-compliant ■ Compliant	

Table 2. International Bird Strike Committee (IBSC) – Best Practice Standards compliance audit

IBSC Standard (2006)	Compliance	Comments
Standard 1 A named member of the senior management team at the airport should be responsible for the implementation of the bird control programme, including both habitat management and active bird control.	□ N/A □ Non-compliant ■ Compliant	The HOA is responsible for the implementation of the bird control program.
Standard 2 An airport should undertake a review of the features on its property that attract hazardous birds/wildlife. The precise nature of the resource that they are attracted to should be identified and a management plan developed to eliminate or reduce the quantity of that resource, or to deny birds access to it as far as is practicable. Where necessary, support from a professional bird/wildlife strike prevention specialist should be sought. Documentary evidence of this process, its implementation and outcomes should be kept.	□ N/A □ Non-compliant ■ Compliant	This WHMP consists of a review of features on and surrounding the airfield that may attract hazardous birds and/or wildlife.
Standard 3 A properly trained and equipped bird/wildlife controller should be present on the airfield for at least 15 minutes prior to any aircraft departure or arrival. Thus, if aircraft are landing or taking of at intervals of less than 15 minutes there should be a continuous presence on the airfield throughout daylight hours. The controller should not be required to undertake any duties other than bird control during this time. Note that for aerodromes with infrequent aircraft movements, 15 minutes may not be long enough to disperse all hazardous birds/wildlife from the vicinity of the runway. In this case the controller should be deployed sufficiently in advance of the aircraft movement to allow full dispersal to be achieved. At night, active runways and taxiways should be checked for the presence of birds/wildlife at regular intervals and the dispersal action taken as needed.	□ N/A □ Non-compliant ■ Compliant	A team of TAOOs undertake wildlife management activities on a daily basis 24/7. DIA TAOOs underwent training in March 2020, ongoing training includes AAA online modules and ARO/WSO training 2023 & 2024. Firearms Safety Training for all TAOOs carried out over 3 x sessions May, June & July 2024.
Standard 4 Bird control staff should be equipped with bird deterrent devices appropriate to the bird species encountered, the numbers of birds present, and to the area that they need to control. Staff should have access to appropriate devices for removal of birds/wildlife, such as firearms or traps, or the means of calling on expert support to supply these techniques at short notice. All staff should receive proper training in the use of bird control devices.	□ N/A □ Non-compliant ■ Compliant	TAOOs are equipped to manage wildlife as per PRO – WMP 05.

IBSC Standard (2006)	Compliance	Comments
Standard 5 Airport bird/wildlife controllers should record the following at least every 30 minutes (if air traffic is sufficiently infrequent that bird patrols are more than 30 minutes apart, an entry should be made for each patrol carried out). • areas of the airport patrolled, • numbers, location and species of birds/wildlife seen, • action taken to disperse the birds/wildlife, • results of the action. More general information such as the name of the bird controller on duty, time on and off duty, weather conditions etc should be recorded at the start of a duty period.	□ N/A □ Non-compliant ■ Compliant	Entries are made in AVCRM (previously Tracker Airside).
Standard 6 Bird/wildlife incidents should be defined in three categories: • Confirmed strikes - Any reported collision between a bird or other wildlife and an aircraft for which evidence in the form of a carcass, remains or damage to the aircraft is found. Any bird/wildlife found dead on an airfield where there is no other obvious cause of death (e.g. struck by a car, flew into a window etc.). • Unconfirmed strikes - Any reported collision between a bird or other wildlife and an aircraft for which no physical evidence is found. • Serious incidents - Incidents where the presence of birds/wildlife on or around the airfield has any effect on a flight whether or not evidence of a strike can be found.	□ N/A □ Non-compliant ■ Compliant	DIA records strikes as 'confirmed' or 'suspected' and conducts Significant Strike Investigation & Reporting in accordance with PRO WMP 10.
Standard 7 Airports should establish a mechanism to ensure that they are informed of all bird/wildlife strikes reported on or near their property. The total number of bird strikes should never be used as a measure of risk or of the performance of the bird control measures at an airport. Airports should ensure that the identification of the species involved in bird strikes is as complete as possible. Airports should record all bird strikes and include, as far as they are able, the data required for the standard ICAO reporting form. National Regulators should collate bird strike data and submit this to ICAO annually.	□ N/A □ Non-compliant ■ Compliant	Bird strikes are reported to the ATSB and reviewed by the AM.

IBSC Standard (2006)	Compliance	Comments
Standard 8 Airports should conduct a formal risk assessment of their bird strike situation and use the results to help target their bird management measures and to monitor their effectiveness. Risk assessments should be updated at regular intervals, preferably annually.	□ N/A □ Non-compliant ■ Compliant	This WHMP includes a formal risk assessment used to help target bird management measures carried out by TAOOs. Risk assessments are reviewed on an annual and biennial basis.
Standard 9 Airports should conduct an inventory of bird attracting sites within the ICAO defined 13km bird circle, paying particular attention to sites close to the airfield and the approach and departure corridors. A basic risk assessment should be carried out to determine whether the movement patterns of birds/wildlife attracted to these sites means that they cause, or may cause, a risk to air traffic. If this is the case, options for bird management at the site(s) concerned should be developed and a more detailed risk assessment performed to determine if it is possible and/or cost effective to implement management processes at the site(s) concerned. This process should be repeated annually to identify new sites or changes in the risk levels produced by existing sites. Where national laws permit, airports, or airport authorities, should seek to have an input into planning decisions and land use practices within the 13km bird circle for any development that may attract significant numbers of hazardous birds/wildlife. Such developments should be subjected to a similar risk assessment process as described above and changes sought, or the proposal opposed, if a significant increase in bird strike risk is likely to result.	□ N/A □ Non-compliant ■ Compliant	This WHMP has identified features surrounding the airfield that may attract hazardous birds and/or wildlife. Surveys of these sites are conduct seasonally – wet season, dry season and build-up transition period. DIA provides comment regarding bird hazard to DIPL Development Assessment Services for Proposed Development Applications.

Table 3. DIA System Requirements compliance audit

System Requirement	Details	Responsibility	Frequency	Performance Indicator	Compliance	Comments
WHMP meetings	Meetings held annually and minuted	AM	Annually - ongoing	Annual meetings (or as agreed)	Yes	WHMP updates and reports included in Airside Safety & Operations Committee Meetings.
Bird strike reporting	All bird strikes delivered to Darwin WHMC and ATSB	AM TAOO ADM	As required	All strikes entered into database with all available information	Yes	Entered into AVCRM (previously Tracker Airside)
Bird strike analysis	All bird strike trends analysed	AM WHMWG / Defence External Consultant	Monthly - ongoing Annually	Bird strike data analysed and communicated to the TAOO	Yes	Review of monthly trends / comparisons to previous years.
Bird Management Training	Yearly training sessions for relevant personnel conducted?	AM	Yearly - ongoing	1 training session per year for system and procedures	Yes	AAA online training course 2022 / Training sessions conducted by Biodiversity Australia in March 2020. Ongoing 'on the job' training. ARO/WSO training, including Wildlife Module August 2023; and January 2024. Wildlife Management Training sessions planned for 2nd half 2024.
Firearm Safety Training	Firearm safety training undertaken biennially?	AM	As required	1 training session undertaken every 3 years (valid for 5 years)	Yes	Firearms Safety Training Sessions held in May, June and July 2024.
Permit and Licensing	All permits of wildlife management activities kept valid	AM	As required - ongoing Permit yearly	All permits kept valid	Yes	Current Permit # 74561 valid to 30 June 2025

System Requirement	Details	Responsibility	Frequency	Performance Indicator	Compliance	Comments
Record of Activities	All records kept in database?	AM TAOO	Daily	All records entered into database, strikes, observations, harassment	Yes	All Wildlife Management activities recorded AVCRM (previously TrackerAIRSIDE)
Update Aerodrome Manual	Aerodrome Manual updated to reflect plan?	ASSM AM	Annually - ongoing	Aerodrome operations manual updated once per year or as required	Yes	Aerodrome Manual V5 – May 2024
Review Proposed Land-use Changes	All proposed land-use changes within 15 km of DIA with potential to increase the risk of bird strike are scrutinized appropriately	ASSM EM	As required	Where risk increase is likely, proposals are modified or refused. ASSM retains documentation.	YES	ASSM reviews and comments on Development Applications / Environment Manager reviews and assesses land changes e.g. Marrara Detention Basin
Duty Airside Operations Officer - Bird Counts	Bird counts are undertaken as per procedure and recorded in database	TAOO	As specified in procedures	All data entered into database	Yes	Recorded AVCRM (previously TrackerAIRSIDE)
Professional bird surveys	Professional bird surveys undertaken as required	AM EM	As required - ongoing	All professional surveys conducted and analysed	Yes	Seasonal surveys conducted by Biodiversity Australia
Off-airport surveys / assessment	All off-airport surveys undertaken	EM	Yearly	Off airport survey / assessment conducted and documented	Yes	Biodiversity Australia
Runway Inspections and bird checks	All wildlife hazards detected and managed according to procedures	TAOO Other operational staff as required	Daily - ongoing	All hazards detected and removed	Yes	Inspections carried out in accordance with PRO

System Requirement	Details	Responsibility	Frequency	Performance Indicator	Compliance	Comments
Records	Records of wildlife related activities kept in AVCRM (previously TrackerAIRSIDE)	AM	As required - ongoing	All records entered into AVCRM (previously TrackerAIRSIDE)	Yes	
Wildlife remains	All wildlife carcasses on or adjacent to movement areas detected, removed, and reported. DNA sample collected as required.	TAOO	As required - ongoing	All carcasses detected, removed, and recorded	Yes	Carcasses disposed of in 'bird bin' – DNA samples sent to Australia Museum as required
Aerodrome boundary inspections	Daily perimeter fence line, roads and gate inspections.	TAOO	Daily - ongoing	Nil breaches of fence by large and medium-sized animals	Yes	
Grassland Areas	Trail grassland areas being maintained at 200 to 300 mm (Darwin only)	TAOO AM / HOA	As required - ongoing	Grass length greater that 200mm and less than 300mm	Yes	Liaise with Ventia / Defence regarding any grass length issues in JUA. Weekly RAAF Meetings.
Drainage	Monitor drains for attractiveness to birds during periods of high rainfall	TAOO	As required - ongoing	Drains monitored	Yes	P0009 Project constructing new drain south side of RWY 11/29.
Buildings	Monitor buildings for bird perching	TAOO	As required - ongoing	No major bird perches are allowed to form on buildings	Yes	
Update Wildlife Hazard Management Plan	Update Wildlife Hazard Management Plan in accordance with Table 3 of this Plan.	AM HOA WHMWG	Annually - ongoing	Wildlife Hazard Management Plan updated	Yes	Previous review 2023.
Records of Review	Records of review and audits documented	AM	Annually - ongoing	Records kept yearly	Yes	Maintained DIA Operations SharePoint.

Appendix 1: WHMP Procedures (PROs)

DIA have developed a number of operating procedures (PROs) that provide additional detail and guidelines for the day-to-day implementation of wildlife hazard management and other airside operating procedures.

These procedures may be reviewed and amended at any time.

Procedures include:

WMP 01 – Wildlife Detection, Monitoring and Observation

Attachments

- Wildlife Count Zones, Survey Points and Route

WMP 02 - Wildlife Hazard Level

- **Attachments**
  - Wildlife Species Strike Risk Calendar

WMP 03 – Wildlife Confirmed Strikes – Monthly Target

WHM 04 - Issuing a NOTAM

WMP 05 – Wildlife Countermeasure (Harassment) Procedures

WMP 06 – Culling (Lethal Control) of Wildlife

- **Attachments**
  - Protected wildlife – Parks & Wildlife Permit

WMP 07 – Egg and Nest Removal

WMP 08 – Trapping and Snaring Wildlife

WMP 09 – Wildlife Strike Procedure and Reporting

WMP 10 - Significant Strike Investigation & Reporting (SSIR)

WMP 11 - Safe Handling of Wildlife

WMP 12 - DNA Collection Procedure

- **Attachments**
- DNA Kit – Instructions for Sample Collection
  - Australian Museum – Request for Wildlife Airstrike DNA Identification

WMP 13 – Wildlife Hazard Management Procedures – Airfield Works (issued as required)