APPENDIX 34

CAPE WINELANDS AIRPORT BIRD STRIKE RISK ASSESSMENT

Cape Winelands Airport

Bird Strike Risk Assessment

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Executive Summary

Bird strikes are a serious safety concern in aviation, costing the industry over 1 billion US dollars per year and leading to accidents and the loss of human lives (Allan, 2000). The most famous example is the emergency landing of US Airways Flight 1549 in the Hudson River in 2009 due to a bird strike. Airport authorities and landowners near airports should consider bird strike hazards in their land use planning. Liability concerns also urge landowners and operators to cooperate in addressing bird strike risks. To assess proposed developments near airports, an Airport Bird-hazard Risk Analysis is required. Through the risk analysis hazard zones, problem bird populations, and unsuitable land use in the area are identified. For example, existing land use or planned developments near the proposed Cape Winelands Airport (CWA) that fall within the primary bird hazard zone (PBHZ), are to be identified and taken into consideration when developing the airport wildlife hazard management plan. Data from the South African Bird Atlas Project 2 (SABAP2) indicates at least 20 bird species in the study area that could pose a bird strike hazard, and their associated habitats i.e. grasslands (agriculture and cultivated lands) and water bodies are identified as high-risk habitats.

To mitigate the risk that birds could pose to aviation safety at CWA, this study makes several recommendations on how the final landscaping design and layout should be implemented, to make it less attractive to hazardous bird species. All vegetation established on the airport precinct, be it in public open space areas and on the airfield itself, should be indigenous. Short grass areas, e.g. mown lawns, should be entirely eliminated, or kept to a bare minimum, as this habitat will attract large numbers of hazardous birds such as Hadada Ibises and Egyptian Goose. A unique opportunity, therefore, exists where natural fynbos vegetation could be established instead of typical grass and, in doing so, minimise (or to a large degree eliminate) the bird strike risk. Establishing natural renosterveld and fynbos could also contribute towards the conservation of a critically endangered vegetation type. If short growing renosterveld and fynbos species are selected and cultivated for this purpose, maintenance costs (i.e. grass cutting) can be eliminated or at least greatly reduced.

During the construction phase, birds could also be attracted if temporary water ponds are unintentionally created during earth-moving activities or when areas of topsoil are disturbed, and invertebrates are exposed for the birds to feed on. The concern is that certain high-risk bird species can become habituated to these new, albeit temporary, environments which could lead to an increase in their abundance and their habitat use on and around the proposed airport (during operations), and further pose a risk to aviation safety. The creation of temporary water ponds should, therefore, be avoided, and construction companies and environmental control officers should monitor the situation closely and when noticed, areas should be drained immediately. If large numbers of birds are feeding in areas where initial clearing of topsoil is taking place it may be required that such excavation activities be suspended and completed at night when it is less likely that the birds will be attracted.

Due to the large numbers of birds that pose a risk to aircraft that are already resident in the general area, there is a requirement for an Airport Wildlife Hazard Management programme. To evaluate the effectiveness of the programme, an ongoing avifaunal monitoring programme should be put in place. The monitoring programme should detect any changes in bird activity in the area and could be utilised to implement management measures to make the area less attractive to birds. Furthermore, this programme should be developed by an avifaunal specialist with demonstrable experience in aviation safety. The Airport Wildlife Hazard Management programme should be established in collaboration with the airport authority, its wildlife control and environmental staff as well as all relevant stakeholders at and around the aerodrome.

Implementing design changes that eliminate suitable habitat for hazardous bird species at the proposed airport will ensure that bird strike incidents are kept to a minimum. This means that the economic benefits of the development can still be realized while maintaining aviation safety standards, while also minimizing maintenance costs.

The presence and abundance of high-risk bird species are primarily associated with agricultural land use and water bodies within the primary bird hazard zone surrounding the proposed airfield. The movement of birds between these habitats warrants attention. Specific attention should be given to managing the wastewater treatment works (WWTW), its expansion, and the surrounding livestock feedlots and lawn cultivation areas. Additionally, the large open water body to the southeast of the airfield requires careful oversight.

Effective management will necessitate engagement with landowners in the vicinity to mitigate the attractiveness of agricultural and farming activities to birds. Notably, given that most high-risk bird species are drawn to grasslands, establishing grassed areas directly on the airfield and adjacent to manoeuvring zones is not advisable. For further details, please refer to Appendix 1, which contains the Bird and Wildlife Hazard Management Landscape and Open Space Planning Guideline document compiled for the proposed Cape Winelands Airport.

Introduction

PHS Consulting (PHS) was appointed by Cape winelands Aero (Pty) Ltd, to undertake the Environmental Impact Assessment (EIA) process, required in terms of the National Environmental Management Act 107 of 1998 (NEMA) and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, in support of an application for Environmental Authorisation (EA). Cape Winelands Airport was formerly known as Fisantekraal Airfield (FAFK). The site is located approximately 10.5km northeast of Durbanville and 25km northeast of Cape Town International Airport (CTIA), and the current airport site is 150ha in size. The proposed project entails the expansion of the existing Cape Winelands Airport in a phased development approach based on market demand, which will include the realignment of a primary runway (3.5km) and the initial retention and refurbishment of a secondary cross runway (700m). Landside and airside infrastructure is also proposed as part of the airport expansion.

Background

Bird and wildlife management on an aerodrome is a critical part of the airport safety management system and an integrated approach is required to adequately address this risk. Globally, wildlife strikes killed more than 464 people and destroyed over 305 aircraft from 1988-2022 according to a report by the Federal Aviation Authority (FAA) (Dolbeer et al, 2021). This author noted that factors that contribute to this increasing threat are increasing populations of large birds and increasing air traffic by quieter, turbofan-powered aircraft. Wildlife Management at airports is essential to maintain an adequate level of safety for aircraft operations.

In the international aviation industry, safety is of paramount concern and collisions between aircraft and birds (termed bird strikes), or with other wildlife, pose a very real and serious threat for both passenger and crew safety. The threats posed by individuals, and also by flocks of birds, are regularly reviewed by an international panel: The World Bird Strike Association (formerly known as the International Bird Strike Committee**).** Birds are attracted to airport grounds because of the habitats created and maintained provide opportunities to forage or to roost. Birds will also fly over the aerodrome when moving between roosting and other feedings sites. In the commercial aviation industry, most bird strikes occur during the crucial phases of take-off (departure) and landing (approach), this is when aircraft are at a lower altitude (Dolbeer & Wright, 2008).

Aviation safety regulations, however, do not address the risk of bird or other wildlife strikes that occur beyond the airport boundary. Airports are often bordered by urban and industrial developments as well as agricultural fields and some of these adjacent areas and industries may regularly attract scavenging birds such as gulls. The International Civil Aviation Organisation (ICAO) has developed specific guidance on land-use where there is a high potential for wildlife attractions and these includes: food garbage disposal, sewage treatment, artificial and natural waterbodies; abattoirs; agricultural activities; and bird

sanctuaries. Dolbeer (2021) recognised that birds in the vicinity of airports are becoming more problematic for the aviation industry. Through the analyses of strike data collected over many years, it became apparent that >70% of bird strikes with civil aircraft occurred at just below 150m (<500 feet) above ground level. This puts the majority of strikes in the take-off and landing phases of flight.

Similarly, Martin et al. (2011) commented on the effectiveness of wildlife-strike mitigation techniques in that it is wholly dependent on the surrounding landscape, and that of the ecology of species that are involved. The authors noted that airports are landscapes that intercept migratory paths of many animals, and they used an example of how waterfowl used a river as a migratory pathway within the buffer zones created for airports. It was also noted that the full collaboration with surrounding landowners, although difficult to achieve, is integral to achieving a reduction in strike rates.

The International Civil Aviation Organisation (ICAO) formulates standards and recommendations for the aviation industry. Member states (of which South Africa is one) are then obliged, through their local civil aviation authority, to adopt and implement such measures. The ICAO recognises the importance of bird hazard control and wildlife management at airports and requires airports to have a management plan in place to address bird and wildlife presence at an aerodrome. According to the provisions (standards) contained in ICAO Annex 14 (ICAO, 2018) there is a need for ICAO member states to adopt measures, as necessary, for discouraging the presence of birds on, and also in the vicinity of an airport; especially if the birds constitute a hazard to safe aircraft operations.

In South Africa the Civil Aviation Regulations (CARS) Licensing and Operation of Aerodromes (CARS, 2011) states that the applicant shall, in the area within its authority where birds and wildlife presents, or are likely to present a hazard to aircraft operating to or from the aerodrome, establish an aerodrome environment management programme to minimise the effects of such hazard or potential hazard, taking due cognisance of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989), and the regulations made thereunder. It continues to further state that environmental issues within the boundaries of the aerodrome and in the immediate vicinity, up to a radius of 10 kilometres that might affect the aerodrome operations negatively, should be addressed.

Purpose of this specialist assessment

The purpose of this document is to provide guidance on managing bird and wildlife hazards through landscape and open space planning at and around the proposed Cape Winelands Airport, which is situated within the Fynbos Biome. The aerodrome site mainly consists of the critically endangered Swartland Granite Renosterveld vegetation type, with almost 80% of this type transformed due to agriculture and urban sprawl.

The terms of reference of this aviation safety related avifaunal specialist assessment have therefore been outlined as:

- Conduct a legislative and regulatory review of land use practices in the vicinity of the proposed airport and how land use planning and proposed developments should take these into consideration
- Assess the proposed development and identify potential features that could attract bird species classified as potential hazards to aviation safety
- Determine bird species presence and abundance in the vicinity of the proposed development
    - Identify bird species that would pose an aviation safety hazard
    - Identify habitats and land uses around CWA and the proposed development area which would attract potentially hazardous bird species
- Recommended development options and mitigation measures during construction and operation of the development
    - Design and layout recommendations and mitigation measures
    - Construction phase impacts and mitigation measures
    - Ongoing monitoring, evaluation and adaptive management

Fynbos vegetation has low animal biomass but high levels of plant diversity and endemism (Sell et al., 2024). This type of vegetation naturally does not support many large bird species that could pose a bird strike risk to aircraft. Many of the larger bird species such as Egyptian Geese have increased in numbers in traditionally fynbos areas due to agricultural activities and the presence of artificial water reservoirs.

Typically, aerodromes establish grasslands on the manoeuvring area around the runways, taxiways, and outer airfield areas. Grass is suitable for this purpose as it binds the soil and can be easily maintained at a short height through regular mowing.

However, the short grass habitat, which is artificially maintained, attracts numerous hazardous bird species. At the proposed Cape Winelands Airport, it is exceptionally challenging to maintain a dense growth of grass due to the sandy soils and low rainfall during the hot dry summer months. Open grassland habitats are not native to the western Cape, and the unnaturally high numbers of bird species with a potential high-risk classification for bird strikes with aircraft, such as Egyptian Geese, Spur-winged Geese, Lapwings, Black-headed Herons, African Sacred Ibises and Hadada Ibises are a result of grassland habitats created through agriculture and urbanization.

Additionally, cutting the grass creates a disturbance event that attracts birds to feed on invertebrates. The windrows of cut grass left behind also provide ideal habitat for invertebrates and rodents.

Literature Review

Internationally there has been extensive research conducted focusing on finding solutions to resolve the conflict between aircraft and wildlife, particularly birds. Most of this research has focused on management programme efforts, such as habitat management, bird hazard control, and wildlife management on the airport itself (Barras & Seamans, 2002; Byron & Downs, 2002; Blackwell et al., 2009; DeVault et a., 2009; Blackwell et a., 2013; DeVault et al., 2014). There is now a growing call (Dolbeer, 2011; Martin et al., 2011) for research to be expanded beyond the perimeter of airports, to the surrounding areas where, depending on their land use, these areas may often attract birds too.

Dolbeer (2011) recognised that birds in the vicinity of airports are becoming more problematic for the aviation industry. Through the analyses of strike data collected over many years, it became apparent that >70% of bird strikes with civil aircraft occurred at just 152 m (<500 feet) above ground level. This puts the majority of strikes in the take-off and landing phases of flight.

To test the hypotheses that off-airport strikes may have even increased with increasing bird populations, Dolbeer (2011) undertook a trend analysis of the database for bird strikes, occurring only with commercial aircraft between at < and > 500 feet above ground level, for the period 1990 to 2009. He focused on the large and heavy Canada Geese as they are the species most frequently struck and for which the population in North America is estimated by the U.S. Fish and Wildlife Service each year. He determined that the risk to commercial aircraft at strikes at >500 feet above ground level is supported in his hypothesis: bird strikes are growing faster than the risk for strikes at <500 feet. His recommendations to counter these potential disasters are primarily to direct more attention at sites within 5 miles (~8.04 km) in the departure and arrival airspace; to integrate knowledge of movements of bird species determined to be hazardous and also to further research avian sensory perception, especially with respect to their reaction to moving objects.

Similarly, Martin et al. (2011) commented on the effectiveness of wildlife-strike mitigation techniques in that it is wholly dependent on the surrounding landscape and that of the ecology of species that are involved. The authors noted that airports are landscapes that intercept migratory paths of many animals, and they used an example of how waterfowl used a river as a migratory pathway within the buffer zones created for airports. It was also noted that the full collaboration with surrounding landowners, although difficult to achieve, is integral to achieving a reduction in strike rates. Incentives are to be recommended to convert current land-use considered hazardous to more acceptable land-

Research focusing on bird presence and bird strikes in South Africa remains limited and the only published material (Byron & Downs, 2002) available was that that had been conducted at Pietermaritzburg (previously known as Oribi) Airport, one of the smaller airports in South Africa and of land use beyond airports (Robinson et al., 2021).

Legislative overview

The International Civil Aviation Organisation (ICAO) formulates standards and recommendations for the aviation industry. Member states (of which South Africa is one) are then obliged, through their local civil aviation authority, to adopt and implement such measures. The ICAO recognises the importance of bird hazard control and wildlife management at airports and requires airports to have a management plan in place to address bird and wildlife presence at an aerodrome. According to the provisions (standards) contained in ICAO Annex 14 (ICAO, 2022) there is a need for ICAO member states to adopt measures, as necessary, for discouraging the presence of birds on, and also in the vicinity of an airport; especially if the birds constitute a hazard to safe aircraft operations.

In South Africa the Civil Aviation Regulations (CARS) Licensing and Operation of Aerodromes (CARS, 2011) states that the applicant shall, in the area within its authority where birds and wildlife presents, or are likely to present a hazard to aircraft operating to or from the aerodrome, establish an aerodrome environment management programme to minimise the effects of such hazard or potential hazard, taking due cognisance of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989), and the regulations made thereunder. It continues to further state that environmental issues within the boundaries of the aerodrome and in the immediate vicinity, up to a radius of 10 kilometres that might affect the aerodrome operations negatively, should be addressed.

Incompatible land use around airports:

Off-airport land use can contribute significantly to the bird/wildlife hazard at an airport. Land use planning in the vicinity of an airport is critical to ensure an effective bird and wildlife management programme. Successful airport wildlife management programmes don't function in isolation – the airport environment is a small part of the local ecosystem and any changes that take place near the airport could have far reaching implications. Birds can be attracted to areas near the airport and in turn go to the airport for food, resting or shelter. Some birds may also be struck outside the actual airport property over a land use that attracts them or as they fly between new roosting and/or feeding land use areas.

As per the standard requirement in ICAO Annex 14 an airport should implement a bird/wildlife strike prevention programme in order to reduce the risks presented by birds and wildlife at the airport and in its vicinity. The ICAO Doc 9137, Airport Services Manual, Part 3 — Wildlife Control and Reduction 5th edition 2020 - describes in its chapter the detail regarding the organization of such an airport bird/wildlife strike control programme and with reference to off-airport wildlife hazard management it states the following:

4.4 OFF-AERODROME MANAGEMENT

4.4.1 The concept of compatible land use planning is the environmental relationship between airports and their community neighbours. Its implementation requires careful study and coordinated planning. Land use around airports can influence restrictions on aircraft flights and affect aircraft safety.

4.4.2 A 13-km circle centred on the aerodrome reference point is recognised where land use should be assessed with regard to wildlife hazard management. However, the circle may be extended or reduced based on a wildlife evaluation of the aerodrome vicinity. States should consider all aviation safety concerns related to land development in the vicinity of the aerodrome to minimize the attraction of wildlife. Aerodrome operators are encouraged to communicate their safety concerns with the local authority in order to raise awareness). Prior planning is necessary to ensure that incompatible land use is not allowed to become established. Such developments should be subjected to a risk assessment process *as described in Chapter 3* and changes sought, or the proposal opposed, if a significant increase in the wildlife strike risk is likely to result.

4.4.3 In order to successfully deal with land use issues, a comprehensive WHMP including coordination among the aviation regulatory authority, aerodrome operator, aircraft operators and the surrounding communities should be implemented.

4.4.4 A monitoring process of sites where hazardous wildlife is to be found should be instigated, at least seasonally. The survey of the land use around aerodromes should be reviewed at a period determined by the safety risk assessment. In general, it is desirable to carry out a new comprehensive land use survey assessment every five years.

4.4.5 Modern technology like satellite detection facilitates the registration and monitoring of different land use types.

4.4.6 The aerodrome operator should engage with local farmers in the vicinity of the aerodrome to encourage them to choose agriculture practices that are the least attractive to hazardous species. These practices may include types of crop, livestock and grain and feed storage.

4.4.7 The appropriate authority should encourage prohibiting or restricting the establishment of new or existing organic waste sites near aerodromes. If a waste management site in the vicinity of an aerodrome cannot be closed, it may be necessary to provide control measures at the site to reduce its attractiveness to hazardous wildlife.

Avifaunal Risk Assessment

This avifaunal study evaluated bird diversity and abundance within the ICAO-prescribed 13 km radius surrounding the proposed Cape Winelands Airport. The primary goal was to provide informed recommendations for on- and off-airport land use planning.

The most abundant bird species were assigned hazard levels based on their potential of posing an aviation safety hazard. Different habitat types were identified within the study area which would support the most abundant hazardous bird species and evaluated in terms of suitability based on the diversity and number of hazardous species it would support. The proposed airport expansion was evaluated in terms of potential bird habitat types which would be created because of the landscaping features and planned infrastructure. These bird habitats were then rated based on attractiveness to hazardous bird species known to occur in the area and which could be drawn to these areas.

Study area

The study area was defined as the ICAO prescribed 13km radius around the proposed Cape Winelands Airport (ICAO, 2022).

As part of the risk assessment methodology primary, secondary and special bird hazard zones were defined around the proposed Cape Winelands Airport (Figure *1*).

The Risk Assessment Methodology

Research on aviation wildlife hazards emphasizes the importance of identifying and managing potentially dangerous land uses near airports. Evidence shows that while most bird strikes happen on or near airports, the birds involved in these incidents usually come from areas outside the airport. Bird strikes occur typically occur as birds move between different on- and off-airport areas. The risk assessment methodology process followed here is designed and adapted based on Sowden et al. (2007) to help identify and address wildlife hazards associated with off-airport land uses. The initial steps in the process involve defining primary, secondary, and special Bird Hazard Zones (BHZs).

PRIMARY BHZs (PBHZs) enclose the airspace in which aircraft are typically at or below altitudes of 1500 feet AGL (above ground level). These are the altitudes at which hazardous birds are most likely to be found at, and at which most collisions with birds are likely to occur.

The PBHZ for airports servicing commercial transport aircraft are typically defined as follows:

- A buffer area of 2km on either side of the runway that extends for 9km along the centreline of the runway widening to a width of 4km at its furthest point away from the airport – see Figure 1.

SECONDARY BHZs (SBHZs) are a buffer area of 4km (see Figure 1) around the PBHZ that account for:

- variables in pilot behaviour and technique;

- variations in departure and arrival paths that are influenced by environmental conditions, ATC (air traffic control) requirements, etc.; and
- unpredictability of bird behaviour, and variations in bird movements around specific land uses.

SPECIAL BHZs – Special BHZs are specific bird attractants within the remainder of the 13km radius that can potentially have a significant effect on bird presence or movement through the Primary or Secondary BHZs. No Special BHZs were identified as in the study area as several bird attractive areas were already identified within close proximity of the airport falling within the PBHZ and SBHZ.

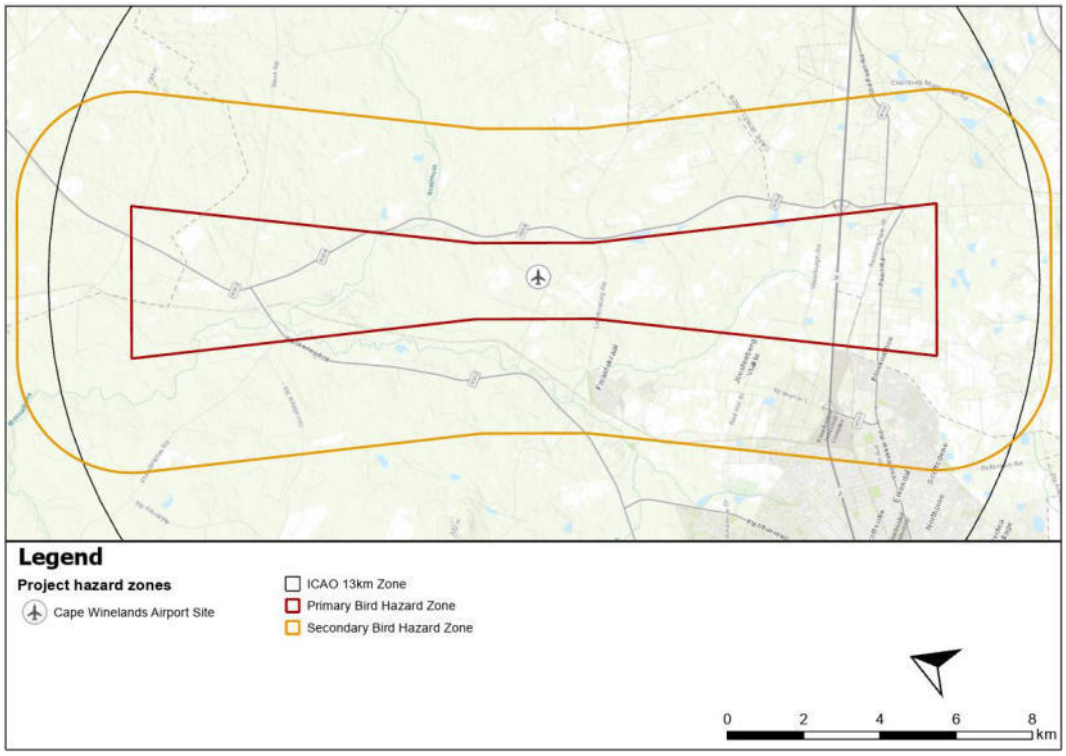

Figure 1: Bird Hazard zones around the proposed expansion of the Cape Winelands Airport.

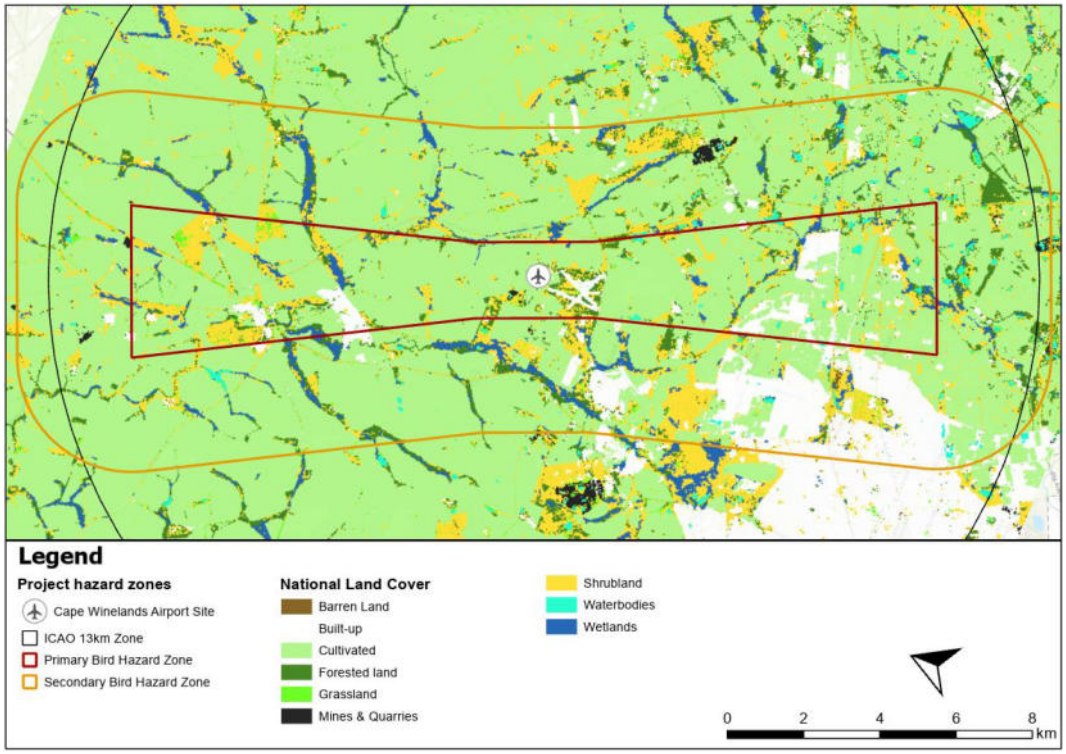

Figure 2: Land cover classifications of the study area indicating the vast expanse of cultivated lands that surround the proposed airport expansion. Note that the current Fisantekraal airfield is classified as primarily shrubland and forested land (characterised by alien invasive tree stands).

Spatial avifauna habitat and diversity assessment (Satellite imagery; South African National land cover data; SABAP2 bird diversity and abundance)

The following presents the assessment of bird diversity and land uses (habitat types) in the study area and how the information was used to better understand and classify the potential risks to aviation safety.

Avifaunal habitats:

Both the PBHZ and SBHZ contain extensive areas of habitat likely to attract potentially hazardous bird species to the study area. Different habitat types were identified within the study area (Figure *2*) which would support the abundant hazardous bird species and assessed in terms of its hazard, based on the diversity and abundance of hazardous species it would support.

In order to identify relevant bird habitats this study made use of the following data sources:

- Data on vegetation types in the study area was obtained from the Vegetation Map of South Africa, (Mucina & Rutherford, 2006).
- Wetland and freshwater ecosystem spatial data (SANBI, 2011) was used to identify existing wetlands and waterbodies.
- Southern African Land Cover data (2020) (SANBI, 2020) was used to further refine bird habitats and identify areas where potentially hazardous bird species would congregate.

- A field visit to the study area was conducted between 14-16 September 2022 to form a first-hand impression of the bird micro-habitats within the study area.

The study area falls within the Fynbos Biome (Mucina & Rutherford, 2006). As is evident from Figure *2* the study area has been subjected to significant anthropogenic habitat transformation. Despite the amount of habitat alteration (primarily agriculture and cultivation) that characterises the study area, the area still supports a high diversity of bird species largely dependent on the transformed habitats present. The potentially hazardous bird species identified (see Table 2 and 3) below are likely to prefer two broad habitat types identified in the study area. These habitat types are:

Agricultural Land Uses - Crop Cultivation and Livestock Management:

Extensive areas of commercial agriculture surround the proposed airport. The irrigated or dryland agricultural fields are a haven for various hazardous bird species. Egyptian Goose (Level 1), African Sacred Ibis (Level 1), Spur-winged Goose (Level 1) and Western Cattle Egrets (Level 3) are all known to frequent agricultural fields as foraging areas. Egyptian Goose and especially African Sacred Ibis could occur in large numbers at the Wastewater Treatment Works (WWTW) and livestock feedlots to the west and north-west of the site. Both these species are likely to commute between the existing WWTW and agricultural activities in the broader area. Hadada Ibis (Level 2) and Helmeted Guineafowl (Level 2) will also occur regularly in the agricultural areas.

Cultivated areas with shorter vegetation typically comprise of mowed lawns, turf cultivation, golf courses, sports fields, and public parks. Among the bird species associated with these habitats are Hadada Ibises (Level 1), lapwings (Level 4), Guineafowl (Level 2), Western Cattle Egret (Level 3), Black-headed Heron (Level 2), and smaller passerines like the Common Starling (Level 4). Notably, Hadada Ibises thrive in neatly manicured short grass habitats within urban environments (*Hockey et al., 2005*). Due to their preference for such areas, they have become problematic at various airports across South Africa (*Froneman, 2000*). Additionally, areas of turf grass cultivation and a poultry abattoir south of the proposed airport could attract a significant number of hazardous bird species.

Waterbodies and wetlands:

All areas of natural wetlands, watercourses and rivers as well as artificial dams and wastewater treatment works are included in this category. Depression and seepage wetlands that only hold shallow water for very short periods of time following heavy rains were not included in this habitat category. Hazardous bird species of most concern which will be attracted to the water habitats are Egyptian Goose (Level 1), African Sacred Ibis (Level 1) and Spur-winged Goose (Level 1). Other species identified through the SABAP2 data and bird strike hazard classification include Great White Pelican (Level 1) and White-breasted Cormorant (Level 1) Great White Pelican and White-

breasted are known to commute between large waterbodies, notably pelicans will soar for extended periods which can pose a protracted hazard when they do so. Surrounding the site, the Fisantekraal Wastewater Treatment Works to the northwest will act as a drawcard to waterbirds, as will the large farm dam to the southeast of the proposed airport, alongside the R304.

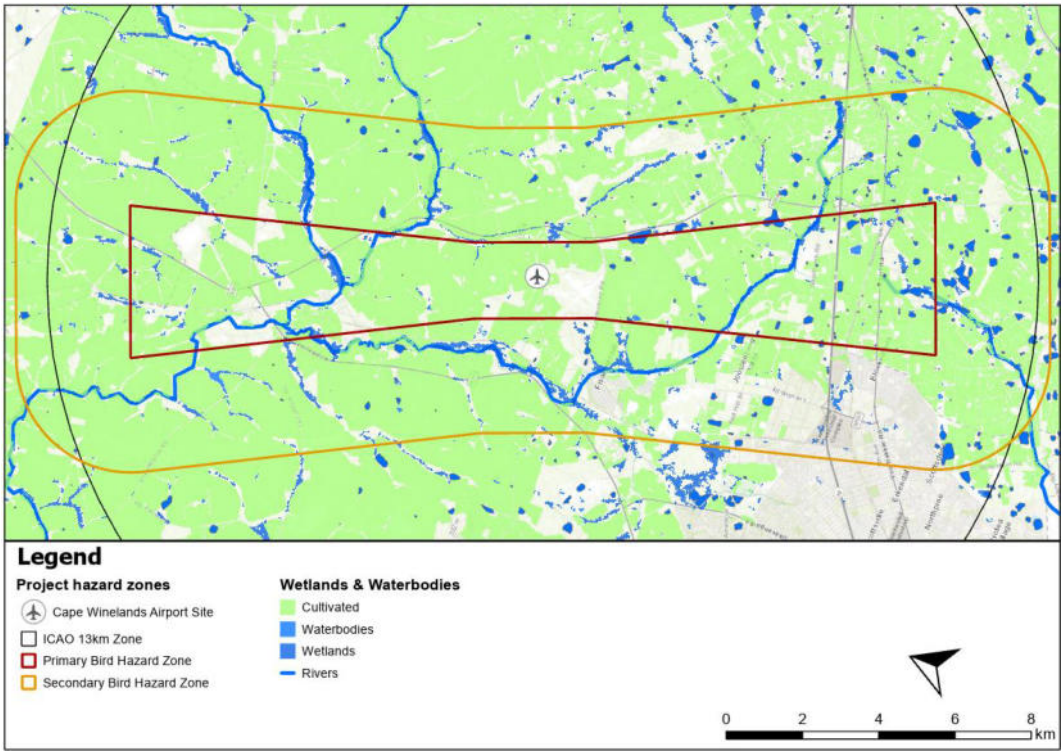

Figure 3: High Risk Avifaunal habitat classifications.

In addition to the high-risk avifaunal habitat classifications specific areas of interest likely to attract significant numbers of high-risk species have been identified in close proximity to the proposed airport expansion. These are depicted in Figure 4 below. Most notable is the large farm dam to the southeast that supports a high diversity of potentially hazardous waterbirds including regular presence of Great White Pelicans. It is thus likely that regular flight movement of high-risk species will take place within the PBHZ intersecting with the approach and departure paths of aircraft.

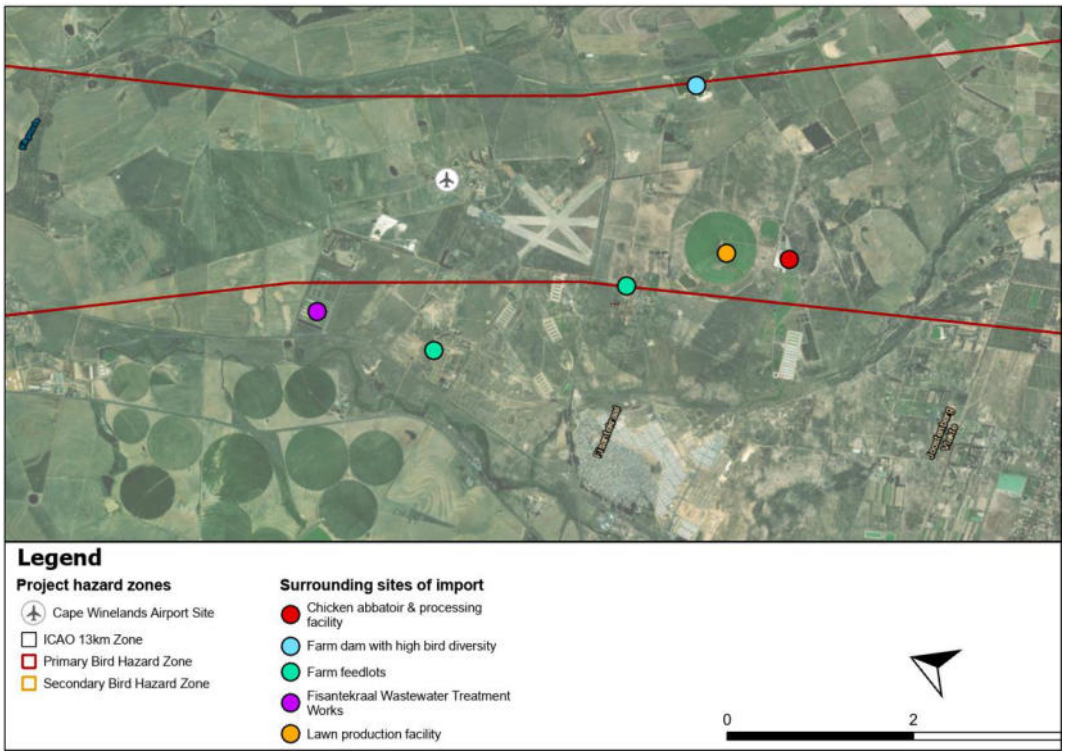

Figure 4: High risk activities in proximity to the proposed airport expansion activity.

Avifaunal diversity:

The risk assessment also involved an analysis of the bird populations around the proposed airport expansion site. The methods used for data gathering included an analysis of bird species data that had already been collected by citizen scientists through the Southern African Bird Atlas Project 2 (SABAP2), actual BirdLasser® observation locations and through data gathered during an on-site visit 14-16 September 2022. SABAP2 is based at the University of Cape Town and is funded by the FitzPatrick Institute of African Ornithology and the South African National Biodiversity Institute. The project is actively supported by BirdLife South Africa and BirdLasser®. SABAP2 commenced in July 2007 and is a follow-up project to SABAP1 which ran from 1987 through to 1991. For SABAP2 the sampling unit has been reduced from larger Quarter-Degree Grid Cells to pentad grid cells (or pentads). A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. This finer scale was selected to obtain more detailed information on the occurrence of species. The area around the proposed airport expansion considered for the study area in relation to SABAP2 consists of two pentad grid cells (Table 1). Since 2007 and continuing through until August 2024, a total of 226 full protocol cards (i.e. 226 bird surveys lasting a minimum of two hours to a maximum of five days each) have been completed for this area. For a list of the pentads and the respective number of full protocol surveys conducted see Table 1.

Table 1: SABAP 2 pentads and number of full protocol cards submitted for the study area (SABAP2, 2024).

Pentad	Cards
3345_1840	124
3345_1845	102

To date, a total of 200 bird species have been recorded within the study area and its immediate surroundings (SABAP2, 2024). The most abundant bird species likely to pose a bird strike hazard were assessed. Hazard levels based on the likely risk that a particular species could pose to aircraft were assigned based on their reporting rate, weight and flocking behaviour. Table 2 lists the hazard levels and criteria used to rate species.

Table 2: Bird Hazard Ranking System (after Transport Canada, 2004). A bird hazard classification system used to determine the risk level of bird species occurring in the area.

Level of Risk	Characteristics	Illustrative Species
Level 1 (Highest)	**Very large (>1.8 kg)**	**Great White Pelican (6-14kg)** **Spur-wing Goose (3.5 – 5.1 kg)** **Egyptian Goose (2.1 kg)**
Level 2	**Large (1-1.8 kg)**	**Hadada Ibis (1.25 kg)** **Sacred Ibis (1.5 kg)**
Level 3	**Medium (300 – 1000 g)**	**Western Cattle Egret (0.4 kg)**
Level 4	**Small**	**Grey-headed Gull (0.28 kg)**

Based on the above criteria a subset of species was identified (frequently recorded and/ or having a hazard / risk level of between 1 and 4) see Table 1. Most notably 8 species with a high Level 1 hazard ranking were identified to occur frequently (based on SABAP2 average reporting rate) in the area all associated with the habitat classes identified above.

Table 1: Bird species posing a potential hazard to aircraft known to occur in the study area.

Species	Scientific Name	Average Reporting Rate (%)	Weight (kg)	Habitat	Flocking behaviour	Bird Hazard Ranking
Great White Pelican	*Pelecanus onocrotalus*	21.0%	6 – 14	Waterbodies	Yes	Level 1
Secretarybird	*Sagittarius serpentarius*	1.5%	2.8 – 5	Farmland, Grasslands	No	Level 1
Egyptian Goose	*Alopochen aegyptiacus*	96.2%	1.5 – 3.5	Waterbodies, cultivated fields	Yes	Level 1
Spur-winged Goose	*Plectropterus gambensis*	76.9%	2.5 – 7	Waterbodies, cultivated fields	Yes	Level 1

Blue Crane	*Anthropoides paradiseus*	55.2%	4 – 5.5	Grassland, cultivated fields, wetlands	Yes	Level 1
White Stork	*Ciconia ciconia*	15.0%	2.4 – 4	Grasslands, cultivated fields, wetlands	Yes	Level 1
African Fish Eagle	*Icthyophaga vocifer*	35.8%	2 – 3.8	Waterbodies	No	Level 1
White-breasted Cormorant	*Phalacrocorax carbo*	35.0%	1.8 – 3.2	Waterbodies	Yes	Level 1
Hadada Ibis	*Bostrychia hagedash*	94.0%	1 – 1.5	Grasslands, fields, wetlands	Yes	Level 2
African Sacred Ibis	*Threskiornis aethopicus*	90.3%	1.5	Wide range – wetlands, cultivated fields, rubbish dumps etc.	Yes	Level 2
Helmeted Guineafowl	*Numida meleagris*	91.7%	1.1 – 1.8	Grassland, cultivated fields	Yes	Level 2
Black-headed Heron	*Ardea melanocephala*	60.5%	1.2 – 1.9	Grassland, fields, vleis	No	Level 2
Common Buzzard	*Buteo buteo*	25.3%	0.54 – 0.92	Open cropland and woodland	No	Level 3
Western Cattle Egret	*Bubulcus ibis*	90.3%	0.28 - 0.45	Grassland, pastures and open savanna	Yes	Level 3
Spotted Thick-knee	*Burhinus capensis*	43.3%	0.38 – 0.6	Open grassland, lawns, airfields	No	Level 3
Yellow-billed Kite	*Milvus migrans*	39.5%	0.57 – 0.76	Wide range incl. built-up areas	No	Level 3
Grey-headed Gull	*Chroicocephalus cirrocephalus*	5.2%	0.22 - 0.34	Waterbodies, rubbish dumps	Yes	Level 4
Common Starling	*Sturnus vulgaris*	95.5%	0.65 – 0.95	Urban and suburban areas	Yes	Level 4
Blacksmith Lapwing	*Vanellus armatus*	91.7%	0.13 - 0.2	Associated with water & open short grassland & lawns	No	Level 4

In order to assess the spatial distribution of high-risk bird species in the study area BirdLasser® observation locations were plotted. Figures 4 – 7 indicate that species of risk level 1, 2 and 3 occur in high densities within both the primary and secondary bird hazard zones. The fact that high-risk bird strike species are common around the airport further supports the notion that more favourable habitat for these species cannot be created on the airfield itself. See Annexure 1 for a more detailed explanation and reasoning for the on airport vegetation establishment.

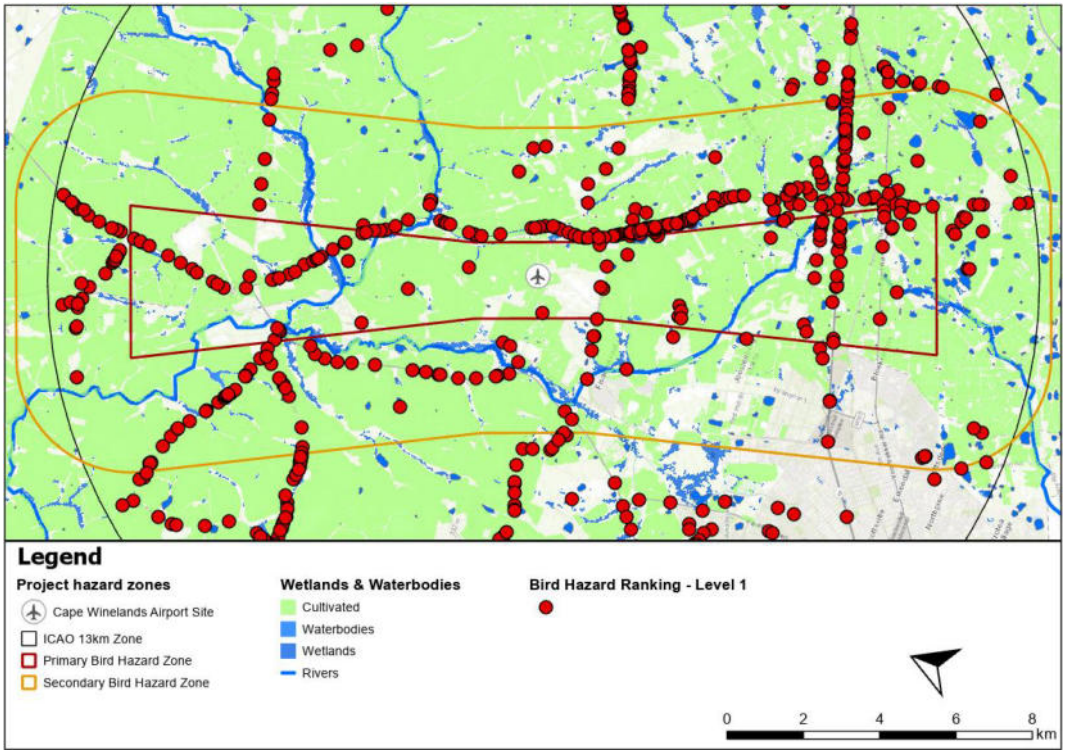

Figure 5: Bird Hazard Ranking - Level 1 species distribution.

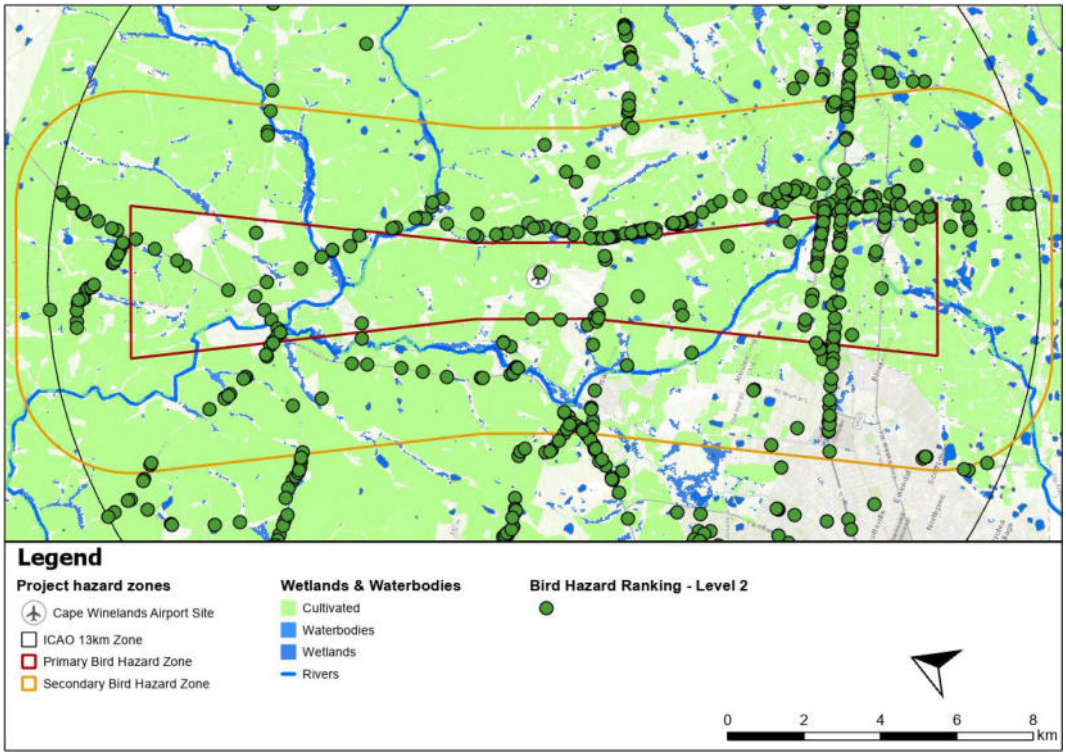

Figure 6: Bird Hazard Ranking - Level 2 species distribution.

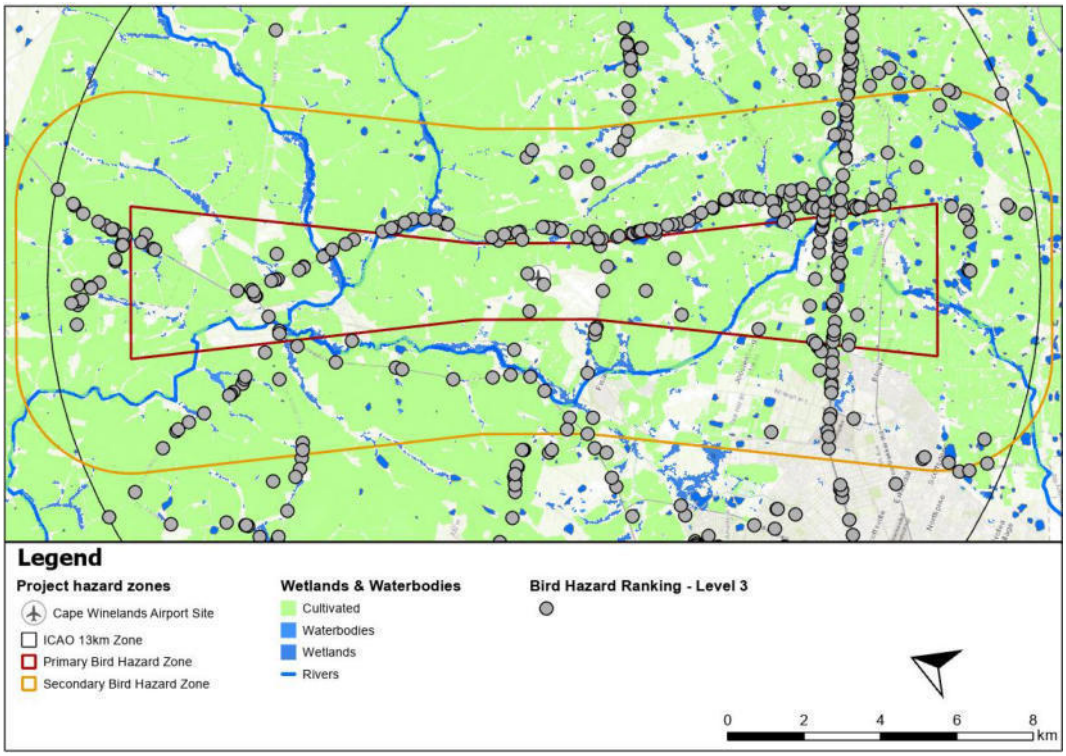

Figure 7: Bird Hazard Ranking - Level 3 species distribution.

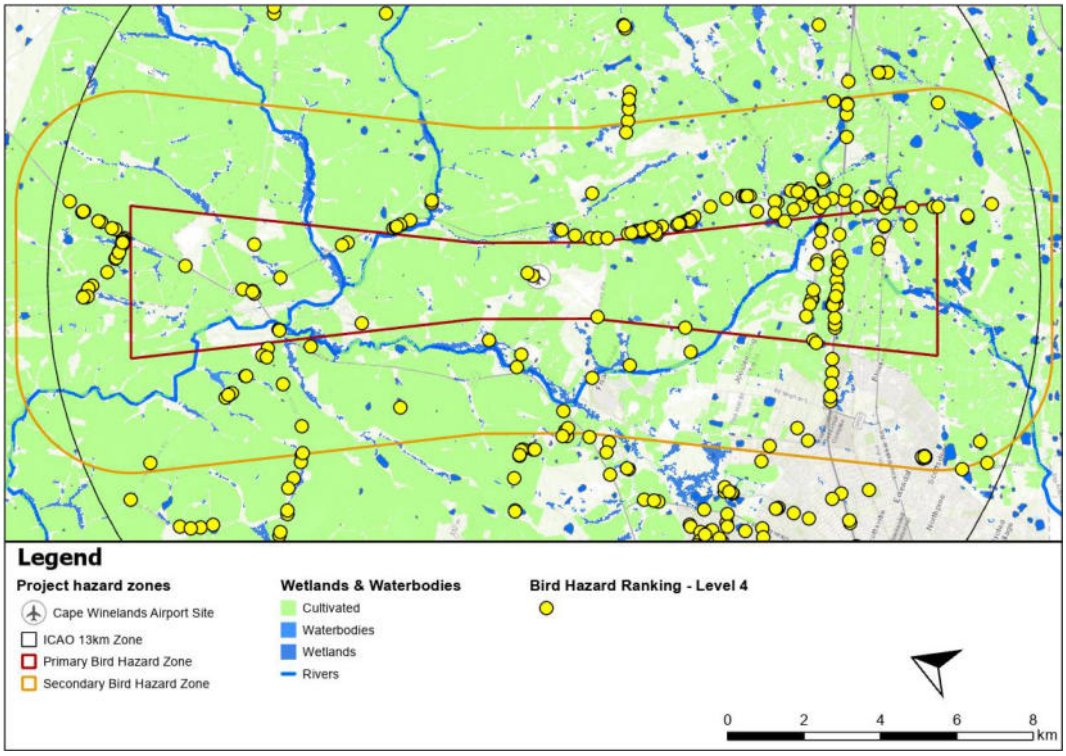

Figure 8: Bird Hazard Ranking - Level 4 species distribution.

Other habitat types such as dense woodland, stands of alien trees, open bare ground e.g. in quarries, residential areas, informal settlements and urban / industrial zones were not included as separate habitat categories as it is unlikely that the subset of most hazardous species will be abundant in these habitats.

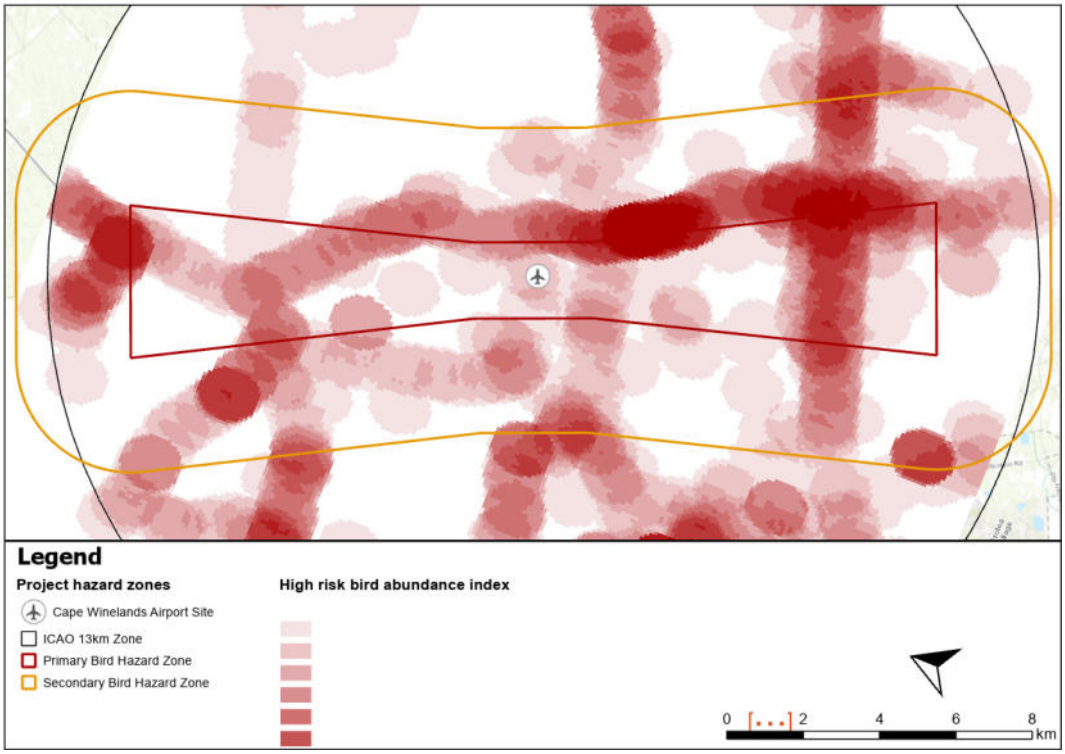

Figure 9: Aggregated high risk bird abundance in the study area around the proposed Cape Winelands Airport.

Conclusion

The presence and abundance of high-risk bird species are primarily associated with agricultural land use and water bodies within the primary bird hazard zone surrounding the proposed airfield. The movement of birds between these habitats warrants attention. Specific attention should be given to managing the wastewater treatment works (WWTW), its expansion, and the surrounding livestock feedlots and lawn cultivation areas. Additionally, the large open water body to the southeast of the airfield requires careful oversight.

Effective management will necessitate engagement with landowners in the vicinity to mitigate the attractiveness of agricultural and farming activities to birds. Notably, given that most high-risk bird species are drawn to grasslands, establishing grassed areas directly on the airfield and adjacent to manoeuvring zones is not advisable. For further details, please refer to Appendix 1, which contains the Bird and Wildlife Hazard Management Landscape and Open Space Planning Guideline document compiled for the proposed Cape Winelands Airport.

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Annexure 1:

Cape Winelands Airport

Bird and Wildlife Hazard Management

Landscape and Open Space Planning Guidelines

Albert Froneman

February 2024

Background & motivation

Bird and wildlife management on an aerodrome is a critical part of the airport safety management system and an integrated approach is required to adequately address this risk. The purpose of this document is to provide guidance for the pro-active management of bird and wildlife hazards through landscape and open space planning.

The Cape Winelands Airport is located within the Fynbos Biome. The primary vegetation type classification of the aerodrome site is the critically endangered Swartland Granite Renosterveld. Almost 80% of this vegetation type has been transformed as a result of agriculture and urban sprawl.

Fynbos vegetation typically has low animal biomass but very high levels of plan diversity and endemism. In its natural state fynbos vegetation does not support many large bird species that would pose a bird strike risk to aircraft. Most of the larger bird species that at present occur in large numbers (e.g. Egyptian Geese) within the fynbos biome have established and proliferated in the area as a result of agriculture (e.g. grassland type habitats) and the associated establishment of farm dams and other artificial water reservoirs.

As a general rule aerodromes typically establish grasslands on the airfield around the runways, taxiways and outer airfield. Grass is well suited for this purpose as it binds the soil and can easily be maintained, through regular mowing, at a short height.

The short grass habitat that is created and artificially maintained is a significant attractant for hazardous bird species. In the case of the Cape Winelands Airport the sandy soils and low rainfall during the hot dry summer months will make if exceptionally challenging to successfully maintain a dense growth of grass that will bind the soil. Vast open grassland habitats are not native to the western cape. Many or most of the bird species, with a potential high-risk classification for bird strikes with aircraft, that occur in the area (e.g. Egyptian Geese, Spur-winged Geese, Lapwings, Black-headed Herons and Hadada Ibises) are present in unnaturally high numbers as a result of grassland habitats created through agriculture and urbanisation. In addition, every time the grass is cut to maintain it at a short height it creates a significant disturbance event that attracts birds to the area to feed on invertebrates etc. The windrows of cut grass left behind following the grass cutting event also provide ideal micro habitats where invertebrates can proliferate and even rodents can hide under the dense grass mats.

A unique opportunity thus exists where natural fynbos vegetation could be established in stead of the typical grass and in so doing minimise (or to a large degree eliminate) the bird strike risk. Establishing natural renosterveld and fynbos could also contribute towards the conservation of a critically endangered vegetation type. If short growing renosterveld and fynbos species are selected and cultivated for this purpose maintenance costs (i.e. grass cutting) can be eliminated or at least greatly reduced.

The below table provides an overview of the different aerodrome landscapes and open spaces and provides guidance from a bird and wildlife management perspective.

Airport development area	Vegetation description	Motivation	Implementation & establishment	Management	Other considerations
Airside					
Airside – RWY strip (50m) & TWY strip (23m)	Short growing indigenous fynbos / renosterveld vegetation - 20cm maximum height	Offset initial cost through reduced maintenance over time.	Would need specialist guidance on soil preparation, species composition, cultivation of seedlings(?) and establishment planting of plugs etc? Uncertain about how long establishment would take / weed control etc.	As little as possible if the right vegetation has been established – may require annual or bi-annual 'trim' in case some elements grow a bit too tall. Will the fynbos need to burn every few years? i.e. burning regime requirement if any?	Establish a track for use by patrol vehicles on the edge of the short grass section around the runway that delineates the boundary between the runway strip and the rest of the airfield. Initial dust suppression during and post initial establishment.
Outer airfield – remainder of airfield vegetated area	Shorter growing fynbos vegetation - vegetation species composition can include some slightly taller growing species - not more than 40-50cm maximum.	Offset initial cost through reduced maintenance over time.	Would need specialist guidance on soil preparation, species composition, cultivation of seedlings(?) and establishment planting of plugs etc? Uncertain about how long establishment would take / weed control etc.	Annual or by annual trimming. Burning requirement -frequency.	Establish a 2m underground mole barrier fence around the outer perimeter.

Airport development area	Vegetation description	Motivation	Implementation & establishment	Management	Other considerations
Airport precinct – landside and tenant areas					
Airport landside precinct gardens and tenant garden areas	Follow the same theme of natural fynbos gardens throughout. No lawns! Do not establish any ponds or water features.	Drastic saving in terms of irrigation costs as most indigenous fynbos species is quite drought resistant.	Options should be more readily available through existing garden and landscaping service providers.	General garden maintenance – no grass cutting or mowing	
Stormwater retention ponds	Anything else than grass to cover the base of the stormwater retention ponds. Shorter wetland type fynbos and restios perhaps. Vegetation should not hinder quick drainage of the area. Any water that stands for long will become an attractant for birds	Retention of storm water should not create suitable habitat for birds. The areas should drain fairly rapidly and no residual wetland habitat should remain.			
Other open areas on land owned by CWA	Eliminate any agricultural or cultivation activities	Agricultural and cultivation activities will attract numerous large			

	on land owned or managed by CWA	hazardous birds to the area.			
Waste management				All waste skips should be covered at all time and waste storage facilities should all be under roofed and closed off.	

Airport development area	Vegetation description	Motivation	Implementation & establishment	Management	Other considerations
Off-airport habitats and considerations					
Existing water bodies on site and in immediate surrounds	Specific waterbodies or dams in the landscape are known to attract large numbers of waterbirds. Increase edge depth, remove shallow edges, establish dense typha or phragmites stands along the edge of the water. Remove all islands and eliminate dry tress that would provide roosting and perching space for the birds.	Minimise the attractiveness of existing water bodies to birds and have them move to alternate areas away from risk zones.	Challenges of changing existing dams and water bodies on private land?	Maintain vegetation along edges and monitor that shallow areas or islands don't form again over time.	Permits to do this?
Wastewater treatment works (WWTW)	Maintain status quo – short vegetation around evaporation ponds.	Few waterbirds were present during site visit.		Regular monitoring required.	Future expansion should maintain similar design.