Biota Environmental Sciences

Winu Project Night Parrot Impact Assessment

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Night Parrot calls have been detected on passive acoustic recordings collected in and around a formerly-proposed water borefield ('Texas'). As a result, Biota Environmental Sciences (Biota) was commissioned to undertake monitoring, habitat mapping and an assessment of potential impacts to Night Parrots and Night Parrot habitat from proposed project activities. The development envelope was modified by RTW to exclude all Night Parrot habitat.

The objective of this document was to assess the risk that these potential impact pathways might pose to Night Parrots or their habitat, to inform the environmental impact assessment of the project. To undertake the assessment, all credible project impact pathways with the potential to impact Night Parrots or their habitat were identified. Potential impact pathways identified comprised:

- Habitat loss through clearing;
- Collisions with fixed infrastructure;
- Vehicle and aircraft strike;
- Increased fire risk, resulting in roosting/nesting habitat loss;
- Increased feral predator densities resulting in increased predation risk;
- Industrial noise;
- Light pollution;
- Introduction and/or spread of weeds; and
- Human disturbance.

This assessment found that the project does present an inherent risk of direct and indirect impacts to Night Parrots and Night Parrot habitat in the Winu locality. In the absence of mitigation measures, the most significant risks would likely be habitat loss through clearing or increased potential for fires, increased risk of predation by feral fauna, the risk of collision with vehicles and fixed infrastructure, and the risk of disturbance and stress from industrial noise.

RTW removed all Night Parrot habitat from the project Development Envelope, in addition to committing to general mitigation measures to help minimise the risk of significant environmental impacts (RTW 2023). These mitigation measures significantly reduce the likelihood of significant impacts to Night Parrots in the Winu locality, though there is a still some risk of localised impacts from the project, particularly through fire, collision with infrastructure, and industrial noise pollution. However, localised impacts are expected to be low to moderate, while the small population of Night Parrots likely to use the Winu locality (one individual known, and precautionarily still likely fewer than five individuals), their apparent intermittent presence in the area, and the relatively limited extent of suitable habitat compared to Lake Waukarlycarly to the south, means that the project presents a low risk of significant impacts on Night Parrots at the population level.

2.0 Introduction

2.1 Project Background

Rio Tinto Winu Pty Limited (RTW) plans to develop a new copper-gold mine, referred to as the Winu Project (hereafter 'the project'), approximately 320 km east of Port Hedland in the Pilbara region of Western Australia, within both the Nyangumarta and Martu Peoples' Native Title Determination Areas. (Figure 2.1). Key terminology for the project is outlined below in Table 2.1 and the main project Development Envelope is mapped in Figure 2.2.

Table 2.1: Winu Project terminology.

Term	Description
Project	Includes the development of a new below-water table copper-gold deposit and associated infrastructure and activities required to access, process and transport ore.
Development Envelope (DE)	Refers to the current Development Envelope, including the combined areas of the mine and infrastructure area, access road and regional borefield at Rimfire. All activities will occur within this area.
Mine and Infrastructure Area (MIA)	Refers to the area containing the mineralised deposit and related infrastructure. This is the Winu mine site.
Road Access Corridor (RAC)	Refers to the access road from the Great Northern Highway junction to the Winu Project Area.
Rimfire Borefield (Rimfire)	Refers to the regional borefield located at Rimfire, which is approximately 31 km from the MIA.
(Former) Texas Borefield (Texas)	Refers to the regional borefield located at Texas, approximately 22 km from the MIA. This area has been removed from the current DE.
Winu locality	In the context of this report, refers to the main Development Envelope (MIA and Rimfire) and surrounding areas (including the former Texas borefield) up to 15 km from the Development Envelope that have been surveyed for Night Parrot habitat.

Considerable biological survey work has already been completed to support the environmental impact assessment (EIA) of the proposal (Biota 2020a, 2020b, 2021a, 2021b, 2022a, 2022b, 2022c, 2023a, 2023b). During this work, a Night Parrot (*Pezoporus occidentalis*) was detected in 2024 within the proposed Texas borefield, which has now been excluded from the Development Envelope. Targeted work has since been undertaken to better understand and contextualise the occurrence of Night Parrots in proximity to the Winu Project (Biota 2025a) and is currently ongoing.

2.2 Study Scope and Objectives

The main objective of this study was to undertake a desktop-based assessment of the potential impacts of the project on Night Parrots in the Winu locality based on our current understanding of the species' occurrence, and to identify actions that could be employed to reduce any potential risks. Specifically, this includes:

- Review and summarise current knowledge relating to Night Parrot biology, ecology and occurrence within the Winu locality;
- Identify potential impact pathways through which project activities may directly or indirectly affect Night Parrots or Night Parrot habitat;

- Assess the risk of actual impacts on Night Parrots or Night Parrot habitat through each of these impact pathways;
- Where possible, quantify the potential impacts on Night Parrots or Night Parrot habitat, per EPA/DBCA Guidance; and
- Summarise the outcomes of the impact assessment.

The spatial scope of the study includes potential direct and indirect impacts within the Development Envelope, and indirect impacts in the Winu locality.

2.3 Significant Impact Guidelines

As a federally-listed threatened species, the Night Parrot constitutes a Matter of National Environmental Significance (DotE 2013). Significant impact criteria state that an action is likely to have a significant impact on a critically endangered species if there is a reasonable possibility that it will:

- lead to a long-term decrease in the size of a population;
- reduce the area of occupancy of the species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of a population;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- introduce disease that may cause the species to decline; or
- interfere with the recovery of the species.

Throughout this report, use of the term "significant impact" is based on these criteria.

2.4 Limitations

Many aspects of Night Parrot biology remain poorly known, despite significant increases to our knowledge of the species over the past 10 years. This is particularly relevant as emerging evidence suggests differences in some aspects of behaviour and habitat preferences between populations in the western deserts and the better-studied western Queensland population (Ngururrpa Rangers et al. 2024; Dr N. Leseberg, pers. comm. 2024). In addition, there are few, if any, areas permanently occupied by Night Parrots in close proximity to human activities, and little empirical data or observational evidence is available on the impacts of anthropogenic disturbance on the species. This reduces our ability to accurately assess potential impacts from some of the impact pathways identified in this report. Given this context, we have adopted a conservative approach to assessing impacts to help to account for this uncertainty.

2.5 Acknowledgements

Biota would like to thank Dr Nick Leseberg (Adaptive NRM) for his review of the final draft of this report (Leseberg 2025), and have endeavoured to incorporate feedback from this review into this final version of the report.

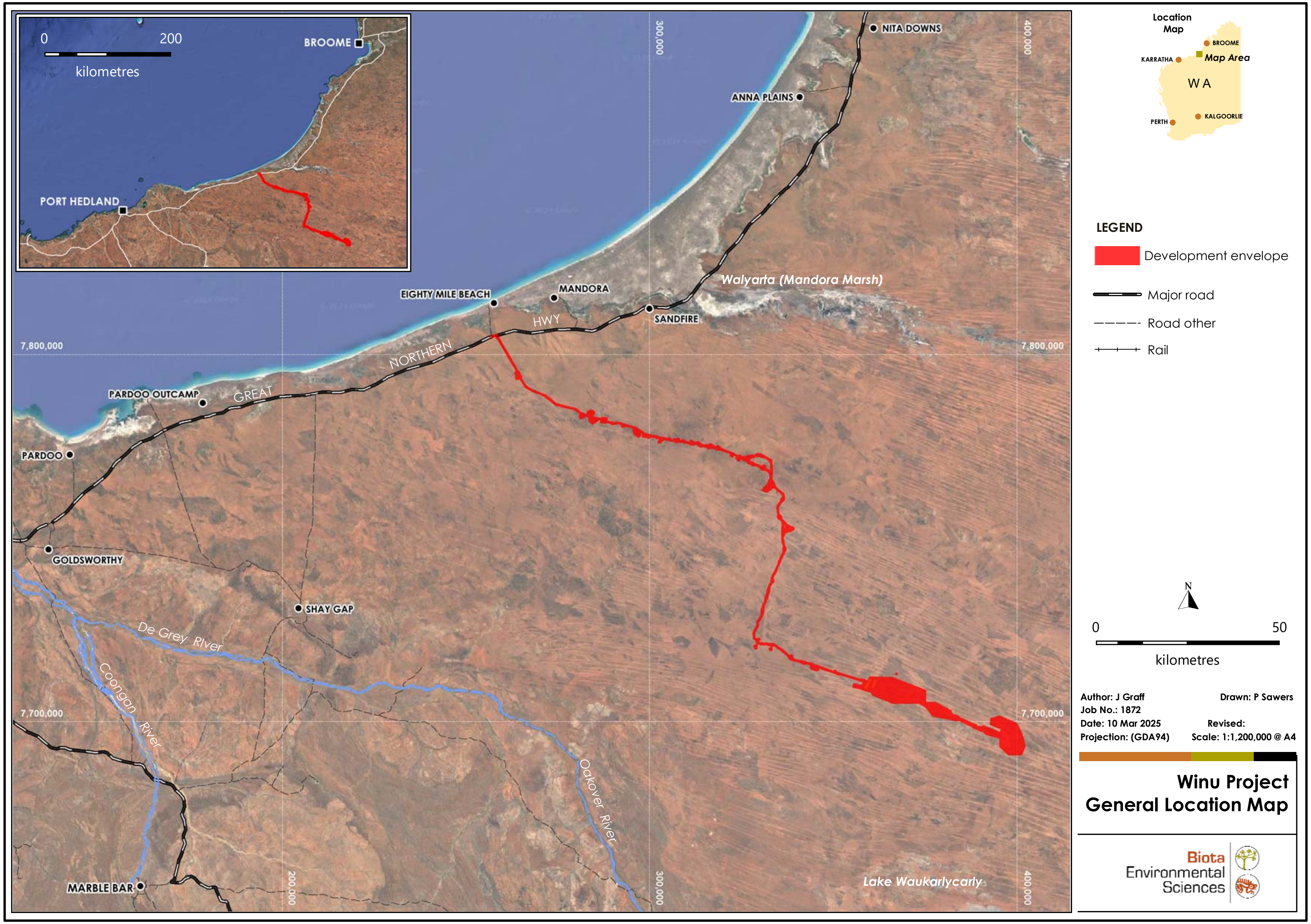

Figure 2.1: **Location of the Winu Project and Lake Waukarlycarly.**

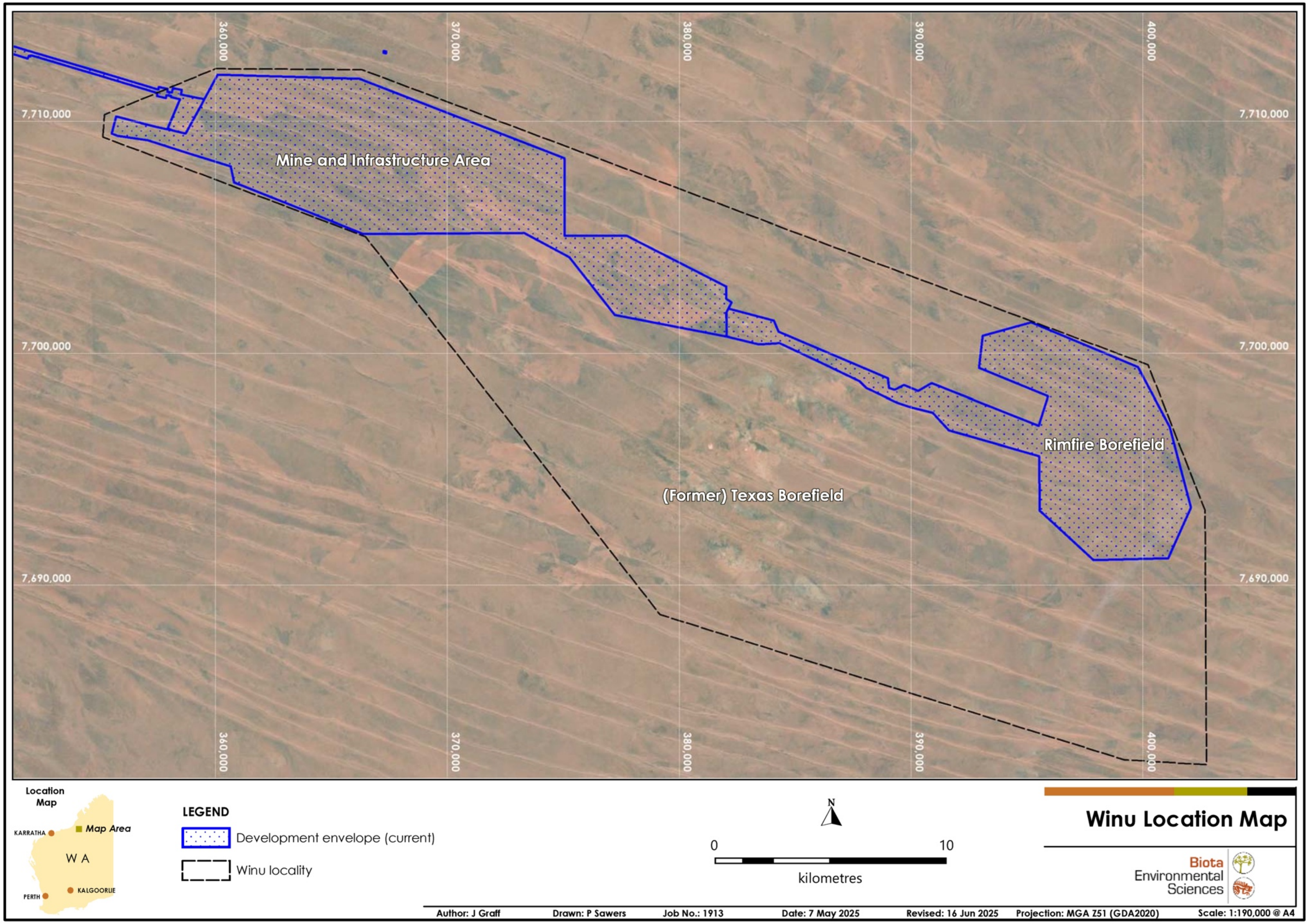

Figure 2.2: **Detail of the Winu Project Development Envelope (DE) and locality.**

3.0 Night Parrot

3.1 Distribution

The Night Parrot occurs in semi-arid and arid areas of inland Australia, with historical records indicating that it was widespread and relatively common in these areas up until the late 19th century (Murphy et al. 2017b, Leseberg et al. 2021a). The species appears to have undergone significant declines in abundance and extent of occurrence during the 19th and 20th centuries, and is now known from the Murchison, eastern Pilbara and north-eastern desert regions in Western Australia, as well as a small area in western Queensland (Leseberg et al. 2021a, Lindsay et al. 2024).

3.2 Habitat

Night Parrots require two distinct habitat types, one for roosting and nesting, and one for foraging (DBCA 2024). Roosting and nesting habitat typically comprises patches of long-unburnt spinifex (*Triodia* spp.), particularly ring-forming species such as *T. longiceps*, in open areas with very few (if any) trees and shrubs (Jackett et al. 2017, Murphy et al. 2017a, DBCA 2024, Ngururrpa Rangers et al. 2024). The total extent of spinifex within a patch does not appear to be an important determinant of Night Parrot occupancy, but structural complexity of the spinifex, including a mix of hummock sizes with at least some large, long-unburnt hummocks, does appear to be important (DBCA 2024). In addition, although the extent of a particular patch of spinifex does not appear to be important, widespread suitable roosting habitat on a landscape scale does appear to be required for Night Parrots to persist in an area (DBCA 2024).

Foraging habitat is generally characterised by floristically diverse run-on areas that provide a broad array of grasses and forbs, ranging from small depressions and gilgai formations to large floodplains (Murphy et al. 2017a, DBCA 2024). Night Parrots are known to travel up to 10 km from their roosting sites to visit foraging areas (Murphy et al. 2017a), so foraging habitat is likely to be more important if it is located within 10 km of patches of suitable roosting habitat (DBCA 2024). The proximity of suitable foraging areas to suitable roosting habitat is likely to be important in determining whether a landscape can support Night Parrots (Leseberg 2024).

3.3 Night Parrots in the Winu Locality

3.3.1 Night Parrot Records

Night Parrot calls have been detected on automated recording units (ARUs) at eight locations within the Winu locality as of December 2024 (Figure 3.1). Possible detections have also been obtained from two additional locations, but these detections involve "hollow whistle" type calls very difficult to distinguish from a particular type of Pallid Cuckoo vocalisation, and therefore these are currently only considered possible detections (Figure 3.1). Confirmed Night Parrot calls detected within the Winu locality were almost exclusively of the "two-note trill" call type, which has previously been recorded from the Great Sandy Desert region (Leseberg et al. 2019), while the remainder involved similar "one-note trill" calls. Given the similarity in call structure, frequency, and position within calling sequences of "two-note trills", all "one-note trill" and "two-note trill" calls detected thus far are likely to be attributable to the same individual bird (Biota 2025a). The ARU data indicate that the bird was not always present in the Winu locality, with many months between some recordings.

In order to provide regional context to the results obtained in the Winu locality, ARUs were also deployed at Lake Waukarlycarly, a salt lake system approximately 45 km to the south of Winu. This area was identified as the nearest area of extensive Night Parrot habitat to the Winu locality and thus the likely source population for the Night Parrot at Winu (Biota 2025a). To date, several ARUs have recorded a number of differing Night Parrot calls in addition to the characteristic "two-note trill" of the bird in the Winu locality, suggestive of multiple individuals utilising the system (Biota 2025a) and lending credence to the idea that the bird identified in the Winu locality was a seasonal visitor from this system.

3.3.2 Night Parrot Habitat

A total of 2,475.1 ha of Night Parrot habitat was identified and mapped in proximity to the Winu Project (Biota 2025a). Roosting/nesting habitat accounted for most of that total at 2,167.8 ha, with foraging habitat comprising the rest at 307.3 ha (Figure 3.1).

In response to the Night Parrot records obtained from the Texas borefield and surrounds, RTW has removed the proposed Texas borefield area and all Night Parrot habitat from the Development Envelope. As such, there is no Night Parrot habitat mapped within the current Winu Development Envelope (Figure 3.1).

[redacted]

Figure 3.1: Night Parrot habitat and detections in the Winu locality.

4.0 Potential Impact Pathways

Generalised pathways through which human activities have the potential to impact Night Parrots and Night Parrot habitat are summarised below in Table 4.1, and discussed below in Sections 4.1 (direct impacts) and 4.2 (indirect impacts). These risks are discussed in a project-specific context in the following section (Section 5.0).

Table 4.1: Summary of generalised potential impact pathways and inherent risk.

Impact Pathways	Inherent Risk Rating
Direct Impacts	
Habitat loss	**Very High** Night Parrots have very specific habitat requirements and suitable habitat is typically patchy and limited within the landscape. Habitat loss has also been identified as a significant threatening process for Night Parrots.
Collision with infrastructure	**High** Night Parrots are likely to have lower visual acuity than other parrot species and thus are likely to be susceptible to collision with man-made structures, especially inconspicuous stationary structures such as fences. Collision with barbed wire fences is the known cause of several Night Parrot fatalities.
Vehicle strike	**High (at night)** Night Parrots frequently fly at low levels when making local movements, so are likely to fly at heights where collision with vehicles is likely, and a Night Parrot specimen found in 1990 is likely to have been killed by a vehicle. Risk of collision primarily at night, relatively low during the day.
Aircraft strike	**Moderate** Lack of direct evidence due to a lack of exposure, but is a plausible risk if aircraft are operating at low altitude (such as during take off and landing) at night over Night Parrot habitat. Low risk during daytime operations, but some risk if helicopters operate at very low altitude over, or land in, roosting habitat.
Indirect Impacts	
Increased fire frequency	**Very High** Long-unburnt *Triodia* is a critical component of Night Parrot roosting and breeding habitat and can take decades to regenerate to suitable size and structure following fire. Hence, changed fire regimes and habitat loss through fire are frequently cited as a key threatening process for Night Parrots. Human activities have the potential to increase fire risk through introduction of additional flammable material and ignition sources into the area.
Increased feral predator activity	**Very High** Feral predators, primarily cats and foxes, are frequently cited as a key threatening process for Night Parrots. Increased human activity has the potential to increase feral predator densities in the area through increased access, increased availability of food, water and shelter, and thus increase predation risk.
Industrial noise	**High** No demonstrated impacts on Night Parrot, but industrial noise has been demonstrated to have a range of impacts on other bird species and research suggests that Night Parrots have particularly acute hearing.
Light pollution	**Moderate** No demonstrated impacts on Night Parrot, but light pollution has been demonstrated to have a range of impacts on other bird species and so has the potential to impact Night Parrots, which may be more sensitive to light pollution due to their nocturnal habits.

Impact Pathways	Inherent Risk Rating
Weeds	**Moderate** Weed establishment has the potential to outcompete favoured Night Parrot foraging plants and increase fuel loads and hence fire frequency and intensity.
Human disturbance	**High** High levels of human disturbance may damage habitat and cause chronic stress, increased risk of predation, increased risk of breeding failure, and possibly complete abandonment of nests or inhabited areas.

4.1 Direct Impacts

4.1.1 Habitat Loss

Habitat loss is frequently identified as a significant threatening process for Night Parrots, primarily in the context of habitat loss through fire or degradation by introduced herbivores (e.g. Murphy et al. 2018, Leseberg et al. 2023, Ngururrpa Rangers et al. 2024). However, clearing of habitat for infrastructure would also have a similar impact. Night Parrots have specific habitat requirements (see Section 3.2), including areas of dense long-unburnt spinifex (*Triodia* spp.) in open, largely treeless areas for roosting, within landscapes with some natural fire resistance, and often in proximity to higher productivity run-on areas with suitable grasses, forbs or chenopods for foraging. Such habitats are limited in extent, and loss of suitable habitat, particularly roosting and nesting habitat, is likely to have a significant impact on Night Parrot populations.

4.1.2 Collision with Infrastructure

Analysis of skull morphology suggests that Night Parrots have lower visual acuity than other parrot species (Iwaniuk et al. 2020). Lower visual acuity is unlikely to present problems to Night Parrots in their natural environment, as they prefer open habitats with few trees (Murphy et al. 2017a, DBCA 2024). However, it does mean that the species is likely to be at increased risk of collision with artificial structures, particularly stationary structures that are relatively inconspicuous (Iwaniuk et al. 2020) such as wire fences and power lines. Night Parrot fatalities caused by collisions with fences, particularly those with barbed wire, have also been recorded on several occasions (e.g. McDougall et al. 2009, WAM 2024).

Night Parrots are typically observed flying within 10 m of the ground (N. Jackett and N. Leseberg, unpublished data, cited in Jackett and Leseberg 2021), though these observations are primarily of birds making short flights within areas of suitable habitat. Long distance foraging flights are likely to occur at greater heights: a VHF-tracked individual was observed to fly over a researcher at a height of more than 40 m (S. Murphy, unpublished data), and another individual was observed with a thermal scope flying to an estimated height in excess of 30 m before being lost from view (N. Leseberg, unpublished data, both cited in Jackett and Leseberg 2021). Thus, while Night Parrots appear more likely to collide with infrastructure closer to the ground, there is also the potential for collision at higher altitudes during longer distance flights.

Given the demonstrated susceptibility of the species to collision with fences, and the visual acuity of the species likely rendering it susceptible to collisions with inconspicuous infrastructure, fixed infrastructure built in proximity to Night Parrot habitat is likely to represent a high risk of collision for the species.

4.1.3 Vehicle Strike

As discussed above, Night Parrots often fly at low altitudes and appear to have a lower visual acuity than other parrot species, and are therefore potentially susceptible to vehicle strike. A Night Parrot specimen found in 1990 next to a highway in Queensland was almost certainly killed by a vehicle (Boles et al. 1994). Hence, operating vehicles at night in proximity to Night Parrot habitat is likely to present a high risk of collision with vehicles for Night Parrots. The likelihood of collision during the day is likely to be low, though there is some potential for a bird to be struck if disturbed from a roost site next to a vehicle track or by a vehicle driving through roosting habitat.

4.1.4 Aircraft Strike

Aircraft strike is not a known threat to Night Parrots and is not currently considered to be a significant threat to the species as a whole given the relative lack of airports and aircraft operations in proximity to known Night Parrot populations. However, aircraft operations at night in proximity to Night Parrot habitat would introduce a risk of mortality through aircraft strikes as birds move around within suitable habitat or between suitable habitat patches. The likelihood of strikes during the day is low as Night Parrots roost during the day and do not flush readily, but strikes could occur if helicopters operated at very low altitude over suitable roosting habitat or land within such habitat.

4.2 Indirect Impacts

4.2.1 Increased Fire Risk

Night Parrots require dense hummocks of old growth spinifex for roosting and nesting (Jackett et al. 2017, Murphy et al. 2017a, DBCA 2024, Ngururrpa Rangers et al. 2024). Mature spinifex used for roosting has been estimated to have a minimum age of 14 years (Ngururrpa Rangers et al. 2024), while *Triodia* used for long-term stable roosts in Western Australia and Queensland is estimated to be over 50 years old (Leseberg et al. 2023). Thus, the loss of roosting/nesting habitat through fires is a significant threat to Night Parrots (e.g. Murphy et al. 2018, Leseberg et al. 2023, Ngururrpa Rangers et al. 2024).

Human activities such as mining and other industrial operations can increase the risk of fire by introducing additional flammable materials and ignition sources into an area. Flammable materials can include flammable liquids and gases (e.g. fuels), flammable structures and equipment (e.g. pallets), and wastes (e.g. plastics, cardboard). Ignition sources can include hot surfaces on vehicles and other mobile equipment, sparks from cutting and grinding, or electrical discharge. Increased risk of fires increases the likely fire frequency and in turn, increases the risk of loss of mature spinifex roosting and nesting habitat required by Night Parrots.

4.2.2 Feral Predators

Feral predators, particularly cats and foxes, have been identified widely as a significant potential threat to Night Parrots (e.g. Leseberg et al. 2023, Ngururrpa Rangers et al. 2024). Human habitation and increased human activity in an area has the potential to increase the density of feral predators in the vicinity providing additional shelters or denning sites (e.g. under buildings), directly increasing food resources (scavenging food waste or deliberate feeding), indirectly increasing food resources by facilitating increased densities of rodents and other prey species, or increasing the availability of water sources. Additionally, clearing of roads and tracks through the landscape can facilitate easier access for feral predators.

An increase in feral predator density around human habitation is likely to extend into the surrounding habitat, as feral predators such as cats and foxes can occupy relatively large home ranges and readily move long distances (Edwards et al. 2001, Moseby et al. 2009, Roshier and Carter 2021). Increases in the density of feral predators in Night Parrot habitat in the locality would then likely increase the predation risk to Night Parrots, which is already one of the major threats to the species.

4.2.3 Industrial Noise

Little is known about potential effects of noise on Night Parrots, but exposure to anthropogenic noise has been demonstrated to have a variety of impacts on animals (Sordello et al. 2020). Noise impacts reported for other bird species include:

- temporary or permanent damage to hearing at continuous noise levels over 93 dB or impulsive noise from 125 dB (Dooling et al. 2000);
- increase in stress and disturbance levels (Blickley et al. 2012a, Strasser and Heath 2013, Wang et al. 2022);
- displacement from noise-polluted areas (Blickley et al. 2012b, Carral-Murrieta et al. 2020);
- changed calling and singing volumes and frequencies (Brumm 2004, de Magalhães Tolentino et al. 2018);
- changes in pairing and breeding success due to masking and disturbance effects from noise (Habib et al. 2007, Strasser and Heath 2013);
- increasing predation risk by masking the sound of approaching predators or alarm calls of conspecifics (Tilgar et al. 2022); and
- decreased or increased survival rates for some species (Pharr et al. 2023).

CT scans of the skull of the holotype Night Parrot specimen suggest that the species is likely to have particularly acute hearing (Shute et al. 2023), which is not surprising for a nocturnal species. The specimen showed large exoccipital bones, which may function to amplify sound being transmitted to the inner ear, and asymmetries in morphology between the left and right ears, which are likely to aid in pinpointing sound, particularly in the horizontal plane (Shute et al. 2023). Thus, it is suggested that Night Parrots may be particularly susceptible to impacts from noise disturbance (Shute et al. 2023).

4.2.4 Light Pollution

No direct evidence is available regarding the potential effects of artificial light pollution on Night Parrots, but there is an increasing body of evidence indicating that artificial light pollution can have noticeable effects on both diurnal and nocturnal animals. Artificial lighting has been shown to:

- increase the risk of birds colliding with artificial structures at night, particularly in poor visibility conditions (Guilford et al. 2018, Lao et al. 2020);
- changes to timing of behaviour within a day, such as diurnal species becoming facultatively nocturnal in areas with extensive artificial lighting, changes to roosting times and duration, and changes to timing of singing (Miller 2006, Gaston et al. 2013, Raap et al. 2017);

- changes to seasonal timing of behaviours that are based on photoperiod, such as moulting and breeding behaviour, and physiological changes associated with breeding (Dominoni et al. 2013, Ouyang et al. 2017);
- increased risk of predation (Santos et al. 2010, Fleming and Bateman 2018); and
- decreased or increased survival rates for some bird species (Pharr et al. 2023).

There is also some evidence that exposure to artificial noise and light pollution in combination may have a greater impact than predicted by additive effects (Dominoni et al. 2020). Of these, the most plausible risks to Night Parrots are likely to be increased risks of collisions with artificial structures where lightspill interferes with their vision, and increased risk of predation as predators take advantage of greater nocturnal visibility.

4.2.5 Weeds

Human activities have the potential to introduce weeds that, once established, can spread over a wide area and be difficult to eradicate. Introduced weeds may outcompete native plants that Night Parrots forage on and thus reduce available foraging resources for the species or increase fuel loads and consequently fire risk. Buffel grass (*Cenchrus ciliaris*) is likely to be a particular concern in this respect, as it is widely established across much of Australia including arid zones and can be highly invasive (Marshall et al. 2012). The presence of buffel grass has been shown to increase fuel loads (Miller et al. 2010) which in turn can increase fire intensity (Miller et al. 2010, Schlesinger et al. 2013). Increases in fire frequency and intensity increase the risk of loss of Night Parrot roosting and breeding habitat, which in turn would likely have a significant impact on Night Parrot.

4.2.6 Human Disturbance

Human disturbance is not listed as a key threatening process for Night Parrots in most threat assessments (e.g. Leseberg et al. 2021b), likely due to the remoteness of the locations of known Night Parrots populations. However, increased human activity in proximity to Night Parrots and Night Parrot habitat does have the potential to result in impacts. High levels of human disturbance have been shown to have effects on other bird species, including:

- reduced fitness through chronic stress, reduced time available for foraging and breeding activities, displacement from optimal foraging habitat, and increased energetic costs of behavioural responses such as increased vigilance and fleeing (Burger 1988, Burger and Gochfeld 1998, Frid and Dill 2002, Ruiz et al. 2002, Price 2008);
- reduced breeding success through reduced adult fitness, reduced fledging success, nest abandonment, or egg/chick death from excess time away from nests (e.g. Anderson and Keith 1980, Carney and Sydeman 1999, Strasser and Heath 2013);
- increased exposure to predation when birds are flushed from secure roosting sites; and
- abandonment of areas due to excess disturbance (e.g. Burger 1986, Fernández-Juricic 2000).

High levels of human activity could also damage Night Parrot habitat by trampling or driving over vegetation. Low levels of visitation for research, monitoring or management purposes undertaken responsibly are less likely to cause significant impacts to populations if managed appropriately, and do not appear to have significantly impacted the Night Parrot population at Pullen Pullen in Queensland.

5.0 Impact Assessment

To assess the potential impact of the project on Night Parrots, we have considered the potential impact pathways described in Sections 4.1 and 4.2 in the context of the project's proposed activities and location in relation to known Night Parrot habitat in the Winu locality, and current knowledge of Night Parrot occurrence in the Winu locality. To assess potential impacts at the population level, we have estimated the number of Night Parrots and extent of significant Night Parrot habitat that may be impacted in the context of the species' population as a whole and the extent of known habitat.

For the purposes of this risk assessment, we have assessed potential impacts of the project taking into consideration mitigation measures outlined in RTW's initial state referral supporting document (RTW 2023) and subsequent modification of the Development Envelope to explicitly exclude all mapped Night Parrot habitat.

5.1 Exposure to Impact

5.1.1 Night Parrot Habitat

While there is no Night Parrot habitat within the DE, a total of 2,475.1 ha has been identified and mapped in the Winu locality, including 2,167.8 ha of roosting/nesting habitat and 307.3 ha of foraging habitat (Biota 2025a)(Figure 5.1). There is little information available on the extent of suitable Night Parrot habitat across Australia. The area of occupancy (AOO) of the species across its range has been estimated at 50,000 ha, but the reliability of this estimate is low (Leseberg et al. 2021b) and this may be outdated now following subsequent discoveries of new populations (e.g. Ngururrpa Rangers et al. 2024, Biota 2025a). Based on the 2021 AOO estimate, the extent of habitat in the Winu locality represents almost 5% of the estimated area of occupancy of the species. However, this is likely to be an overestimate following the discovery of additional populations since the 2021 AOO was calculated.

Lake Waukarlykarly, a salt lake system approximately 45 km south of the project DE, was identified as the most extensive area of potential habitat near to the Winu project and has been a focus of ongoing monitoring (Biota 2025a). Here, a total of 24,152.9 ha of potential Night Parrot habitat was mapped from aerial imagery (Biologic 2022). The extent of habitat in the Winu locality thus represents approximately 9.3% of the total combined extent of habitat across the Winu locality and Lake Waukarlycarly.

5.1.2 Night Parrot Individuals

Night Parrot detections from the Winu locality thus far are thought to involve a single individual, based on the consistent call type and call characteristics of all calls recorded there, and the pattern of detections among sites (Biota 2025a). This individual appears to be present intermittently in the Winu locality, likely moving between Lake Waukarlycarly and the Winu locality based on local conditions (Biota 2025a). It is possible that other individuals are present in the Winu locality at times and have not yet been detected, perhaps because they may visit the area more intermittently than the detected individual. However, even a precautionary estimate of the number of Night Parrots using the Winu locality would still be fewer than five individuals.

The most recent published population estimate for the species is 40-500 mature individuals, with a best estimate of 200 mature individuals (Leseberg et al. 2021b). The recent discovery of a significant Night Parrot population in the Ngururrpa Indigenous Protected Area (Ngururrpa Rangers et al. 2024) indicates that the lower point of the 2021 population estimate may be revised upwards. Based on the best population estimate of 200 mature individuals, the known number of individuals in the Winu locality would constitute 0.5 % of the total Night Parrot population, while a precautionary estimate would be less than 2.5 % of the total population.

5.1.3 Night Parrot Movements

No Night Parrot habitat remains within the current Development Envelope and there is limited Night Parrot habitat directly adjacent to the Development Envelope (see Figure 3.1). This significantly reduces the likelihood of Night Parrot moving through the Development Envelope, which in turn reduces the exposure to impact pathways, particularly direct impact pathways.

5.2 Impact Pathways

5.2.1 Habitat loss

RTW responded rapidly to the occurrence of Night Parrot in the vicinity of the project by modifying the project Development Envelope to avoid all identified Night Parrot habitat. Thus, there is no Night Parrot habitat within the current Development Envelope and no direct habitat loss is expected to occur as a result of project activities. Thus far, all positive Night Parrot records (approximately 3,000 records) have come from mapped Night Parrot habitat, despite significant survey effort outside of mapped habitat. As such, no localised or population-level impacts to Night Parrots are expected through direct clearing of habitat.

5.2.2 Collision with Infrastructure

The majority of the fixed infrastructure associated with the project is proposed for areas several kilometres north and west of known Night Parrot habitat and records (Figure 5.1), with the nearest fixed infrastructure being at the airport, just over three kilometres from the closest Night Parrot habitat. The airport does not bisect Night Parrot habitat (Figure 5.1). A small section of the Rimfire borefield pipeline located in close proximity to Night Parrot habitat will be buried, with construction activities occurring during daylight hours only. Apart from the unsealed access track, there will be no residual surface infrastructure. Operations at the Rimfire borefield, most of which is located more than three kilometres to the east, will be operated remotely. Traffic along the Rimfire borefield track would be limited to scheduled and ad hoc maintenance, and would occur during daylight hours only, except in the event of an emergency.

Night Parrot habitat within the Winu locality has been mapped in detail, but there may be areas of unmapped Night Parrot habitat outside of the locality. Consequently, there is some potential for Night Parrots to move through the proposed infrastructure footprint, although no detections have been made in any areas outside of mapped Night Parrot habitat to date.

As the number of Night Parrots in the Winu locality is low (one known, with a likely maximum of less than five individuals), the vast majority of significant habitat is located south of the DE, and the bird or birds are only occasionally present, the likelihood of Night Parrot movement through the DE and thus the risk of collision are also likely to be relatively low. Nonetheless, the species is susceptible to collisions, particularly with fencing and similar structures (see Section 4.1.2). In addition, the known population in the Winu locality and Lake Waukarlycarly is small (< 10 individuals), so any loss of individuals has the potential to impact the local population. However, the number of Night Parrots using the Winu locality is still a small proportion of the overall population estimate, so any fatalities through collisions with infrastructure are unlikely to have a significant impact at the species level.

5.2.3 Vehicle Strike

The Development Envelope has been adjusted to avoid all Night Parrot habitat, but as discussed in the previous section, some still occurs in close proximity. The confirmed presence of Night Parrots in this mapped Night Parrot habitat (Biota 2025a) means it is likely that they would move through such sections from time to time, including the Rimfire borefield access track (Figure 5.1). While there is still a risk that Night Parrots could be struck by vehicles, the low number of individuals in the Winu locality, and the exclusion of Night Parrot habitat from the Development Envelope means that this risk is considerably reduced. Furthermore, RTW has proposed to implement speed limits aimed at minimising risk of fauna injury or death from vehicle strike, and restrict vehicle traffic to defined roads and tracks (RTW 2023). As discussed previously, all operations east of the airport (which includes occasional vehicles on the Rimfire access track) will be during daylight hours only, except in emergency situations, which further reduces the risk of vehicle strike. Thus, the likelihood of an event is expected to be very low on a local level, and there is unlikely to be a significant impact to the species as a whole.

5.2.4 Aircraft Strike

Aircraft strike from fixed-wing aircraft operating from the Winu airstrip is unlikely to be a significant risk to Night Parrots, as approach and departure paths largely avoid overflying Night Parrot habitat and flights are likely to operate almost exclusively during daylight hours, outside of potential emergency events. As a result, fixed-wing aircraft strike is unlikely to have a significant impact on Night Parrots at a local or population level.

Helicopters at Winu have some potential to operate over Night Parrot habitat, but they are restricted to daylight hours when Night Parrots are roosting. During construction and operations, helicopter use is expected to be minimal and restricted to the DE where there is no Night Parrot habitat. During monitoring, mitigations previously agreed with DBCA as part of access and Section 40 approvals will remain in place, including the requirement to avoid impacting potential roosting habitat. As a result, the overall risk at a local level is likely to be low, particularly given the low numbers of parrots and their intermittent presence in the area. Furthermore, there is unlikely to be a significant impact to the species at the population level.

[redacted]

Figure 5.1: Location of proposed infrastructure in relation to Night Parrot habitat and detections in the Winu locality.

5.2.5 Increased Fire Frequency

Natural fires caused by lightning strike have directly impacted the DE multiple times since the commencement of survey work, with three fires affecting the MIA and two affecting the Rimfire borefield (Biota 2025b) in the last seven years. Landscape scale and localised features of Night Parrot habitat provide a measure of resistance to fire, in particular, a mosaic of open sandy areas and claypans between spinifex patches (Biota 2025a), but there remains a risk of project-attributable fire impacting Night Parrot habitat. Mitigation measures proposed by RTW include maintaining fire breaks, provision of fire suppression equipment and training, and implementation of hot works and fire response procedures (RTW 2023). The overall likelihood of a project-attributable fire occurring is low, but it could result in the loss of a significant proportion of Night Parrot roosting/breeding habitat within the Winu locality for an extended period (>15 years), and thus impact the local population. However, the overall extent of habitat within the Winu locality is relatively small and a degree of protection from fire is provided by landscape features even in the event of a project-attributable fire, so there are unlikely to be significant impacts to the species at the population level.

5.2.6 Increased Feral Predator Activity

An increase in feral predator densities would have significant potential to impact Night Parrots in the Winu locality. Without adequate mitigation measures, there is a high likelihood that the project would result in increased feral predator densities in the vicinity of the project which would likely increase predation risk to Night Parrots. RTW has already proposed mitigation measures including minimising the availability of additional surface water, minimising access to food waste, and undertaking feral animal monitoring and control in high-risk areas (RTW 2023). If effective ongoing feral animal control is undertaken within suitable Night Parrot habitat and surrounding areas, then the risk of increased predation pressure on Night Parrots is relatively low. As such, the impact to the local population is likely to be low, and there are unlikely to be significant impacts to the species at the population level.

5.2.7 Industrial Noise

Potential effects of noise on significant fauna species, including Night Parrot, have been discussed in detail in a separate noise impact assessment (Biota 2025c). The maximum predicted noise levels from mining operations (e.g. pit mining, processing, and power generation) at the project are modelled to be 35 dB(A) or less (the level of a quiet whisper) at all known Night Parrot habitat in the Winu locality under a worst-case scenario (Lloyd George 2025a). Evidence in the literature suggests that impacts to terrestrial wildlife begin at approximately 40 dB(A) (Shannon et al. 2016). However, research has suggested that Night Parrots may have particularly sensitive hearing (Shute et al. 2023), thus it is possible that Night Parrots are more susceptible to industrial noise and may be affected at lower noise levels than most species.

Higher noise levels in Night Parrot habitat are also predicted from aircraft arriving and departing from the airport. Noise levels of up to 72 dB(A) (loud conversation) are predicted in the closest Night Parrot habitat from the operation of jet aircraft, though predictions over the majority of Night Parrot habitat are 50 dB(A) or lower (quieter than a normal conversation) (Lloyd George 2025b). Intermittent noise has been shown to increase stress and disturbance more than constant noise in some circumstances (Blickley et al. 2012b), so aircraft noise may result in stress and disturbance to Night Parrots. The airfield noise will involve daytime only operations with exceptions for emergencies such as RFDS medical evacuations. The noise impacts will occur infrequently (approximately 12 flights per week during construction, and seven flights per week during operation) and last a very short duration (10 – 15 seconds).

The potential responses of Night Parrots to daytime noise are unknown, but given that they are present intermittently and in low numbers, and aircraft noise in most Night Parrot habitat is predicted to be below 50 dB(A) (i.e. quieter than normal conversation), it is anticipated that any impacts from aircraft noise is likely to be low. However, given the species may have particularly sensitive hearing, there is some potential for increased impacts. Nonetheless, as the number of Night Parrots in the Winu locality is low, it is unlikely that any local impacts would flow on into significant population level impacts.

5.2.8 Light Pollution

There is very little artificial lighting in the region outside of existing project exploration and development activities, so the lighting associated with the fully operational project is likely to represent a significant increase in artificial lighting in the local area. RTW has proposed that lighting will be designed and managed in accordance with national guidelines (DCCEEW 2023), and permanent lighting installations will be minimised as much as practicable and be shielded and directional to minimise light spill (RTW 2023).

Lack of modelling of likely light spill and of knowledge on the effects of artificial light on Night Parrot mean it is difficult to accurately assess likely impacts on Night Parrots from lighting for the project. Adherence to best practice guidelines is expected to reduce potential impacts, though is unlikely to eliminate light spill entirely. However, the majority of Night Parrot habitat (including all habitat with detections) is over 12 km from the main infrastructure area, so impacts from lighting here are likely to be minor. Lighting at the airport is more likely to affect Night Parrots as this area is closer to Night Parrot habitat, but as airport operations are proposed for daylight only (excepting emergency situations), lighting may be more limited and/or able to be largely switched off during the night. Thus, impacts to Night Parrots may be minimised. As Night Parrots are present intermittent and in low numbers, it is unlikely that any local impacts would result in significant population level impacts.

5.2.9 Weeds

Weeds are largely absent across the Development Envelope, with some populations along road access corridor along the Nyangumarta Highway close to the Great Northern Highway within the Wallal Downs pastoral station (Western Botanical 2023). Buffel grass (*Cenchrus ciliaris*) and tomato (*Solanum lycopersicum*) have been identified around the Winu Camp but were manually removed following detection (Western Botanical 2023). No weeds were recorded in the Texas borefield area (Western Botanical 2023), where the majority of significant Night Parrot habitat occurs.

The presence of buffel grass and tomato around the Winu camp demonstrate the potential for weeds to establish in the vicinity of project activities, so the risk of weed invasion of these areas is high. The removal of Night Parrot habitat from the Development Envelope reduces the risk of weed invasion in these areas by reducing human activity in these areas. However, there is still a risk of invasion during visitation for monitoring and management, or through expansion of weed populations that establish elsewhere around the project. Establishment of weeds in and around Night Parrot habitat has the potential to impact Night Parrot food resources by competing with important food plants, and could increase fuel loads and hence increase fire risk.

RTW has committed to implementing a weed management plan, including hygiene and inspection processes for personnel, materials, and plant and equipment entering the project, and a monitoring program focussing on detection and eradication of weeds (RTW 2023). If the proposed controls are implemented effectively, then the risk of weed establishment in proximity to Night Parrot habitat is likely to be relatively low, and thus the impact on the local Night Parrot population is likely to be low.

5.2.10 Human Disturbance

The removal of all significant Night Parrot habitat from the Development Envelope reduces the likelihood of disturbance to Night Parrots from general human activity related to the project. Occasional visitation of Night Parrot habitat will likely continue for monitoring and management purposes, so there is a low likelihood of disturbance impacts. Monitoring, research and management activities do not appear to have had a significant impact on Night Parrot population at Pullen Pullen in Queensland and consequently the risk at Winu is expected to be similarly low.

5.3 Impact Assessment Summary

In order to summarise the residual risk of each potential impact pathway on Night Parrot, an assessment of likelihood and consequence was conducted using the framework below. Likelihood and consequence categories are presented in Table 5.1 and the residual risk matrix in Table 5.2. A summary of the residual risk for each of the identified potential impact pathways is included below in Table 5.3.

Table 5.1 Likelihood and Consequence categories

Likelihood	Definition
Remote	Hasn't occurred in similar projects or settings elsewhere; No credible chance of occurring in next 10 years
Unlikely	Has occurred at least once in similar projects or settings; Might occur within the next 10 years
Occasional	Uncommon in similar projects or settings; ~25% chance to occur in the next 5 years
Probable	Has occurred in similar projects or settings; ~50% chance to occur within 2-5 years
Frequent	Has occurred often in similar projects or settings; >50% chance to occur this year

Consequences	
Negligible	No loss of individuals or significant modification to local core habitat
Marginal	Short-term displacement of individuals and/or localised modification of core habitat (<5%)
Serious	Permanent displacement of individuals and/or localised loss of core habitat
Critical	Individual mortality and/or loss or modification of up to 25% core habitat
Catastrophic	Loss of multiple individuals threatening population viability and/or loss of >50% of core habitat

Table 5.2 Residual risk matrix

		Consequence				
		Negligible	**Marginal**	**Serious**	**Critical**	**Catastrophic**
Likelihood	**Remote**	Very low	Very low	Low	Low	Moderate
	Unlikely	Very low	Low	Low	Moderate	High
	Occasional	Low	Low	Moderate	High	High
	Probable	Low	Moderate	High	High	Very High
	Frequent	Low	Moderate	High	Very High	Very High

Table 5.3: Impact assessment summary

Impact Pathway	Likelihood		Consequence	Residual Risk
Direct Impacts				
Habitat loss	Remote	No direct habitat loss is expected as the project Development Envelope (DE) has been revised to exclude all Night Parrot habitat.	Negligible	**Very low**
Collision with infrastructure	Unlikely	There is a moderate risk of collision with infrastructure, particularly around the airport as this is the closest significant infrastructure to Night Parrot habitat. Given the low numbers of Night Parrots in the area, any additional mortality is likely to impact the local population, but is unlikely to have a significant impact on the species as a whole.	Critical	**Moderate**
Vehicle strike	Unlikely	The lack of the Night Parrot habitat within the DE and proposed mitigation measures, including activities being restricted to daylight hours, suggests that the likelihood of a vehicle strike is very low. Given the low numbers of Night Parrots in the area, any additional mortality is unlikely to have a significant impact on the species as a whole.	Critical	**Moderate**
Aircraft strike	Unlikely	The likelihood of aircraft strike from fixed wing aircraft operating out of Winu airport is very low. The risk of helicopter strike during operations over Night Parrot habitat is also low, but there is some potential for strikes if landing in Night Parrot roosting habitat. The likelihood of this remains relatively low, and given the low numbers of Night Parrots in the area, any additional mortality is unlikely to have a significant impact on the species as a whole.	Critical	**Moderate**
Indirect Impacts				
Increased fire frequency	Unlikely	The likelihood of fire is reduced by proposed mitigation measures, but not eliminated, and has the potential to impact Night Parrot habitat in the Winu locality. The relatively limited extent of habitat in the Winu locality compared to habitat at Lake Waukarlycarly reduces the likelihood of significant impact at the population scale.	Critical	**Moderate**
Increased feral predator activity	Unlikely	An increase in feral predators has potential to have significant local impacts but providing effective ongoing feral animal control as proposed by RTW, these are likely to be ameliorated and the actual impact is expected to be low. In turn, no significant impacts would be expected at the population level.	Critical	**Moderate**

Impact Pathway	Likelihood		Consequence	Residual Risk
Industrial noise	Occasional	Noise levels in Night Parrot habitat from ongoing mining operations are expected to be approximately 35 dB (a quiet whisper). Noise from aircraft operations may reach 72 dB (roughly the level of a loud conversation) at the nearest Night Parrot habitat, but these will be short-duration, intermittent events. Over most Night Parrot habitat, these noise levels will be lower, predicted to be 50 dB or lower (quieter than normal conversation). However, Night Parrots appear to have relatively acute hearing and may be more susceptible to noise impacts than many other species. Consequently noise, particularly aircraft noise, may result in stress and localised disturbance to Night Parrots. However, given their intermittent presence and low numbers, potential local impacts are not expected to translate into a population-level impact.	Serious	**Moderate**
Light pollution	Frequent	Lighting for the project is likely to significantly increase the artificial lighting in the locality. Adherence to best practice guidelines for artificial lighting, and the distance from the main infrastructure area (approximately 12 km) suggests impacts are likely to be minor. Given the intermittency and low numbers of Night Parrots in the area, localised disturbance may be possible, but should not extend to population level impact.	Marginal	**Moderate**
Weeds	Occasional	Night Parrot habitat in the Winu locality is currently weed-free, so the potential consequences of weed invasion into that habitat are significant. However, If the proposed controls are implemented effectively, then the risk of weed establishment in proximity to Night Parrot habitat is likely to be low.	Marginal	**Low**
Human disturbance	Occasional	Exclusion of all Night Parrot habitat from the Development Envelope reduces the likely levels of human disturbance to Night Parrots, and low-level visitation for monitoring, research and management purposes is not expected to cause significant disturbance.	Marginal	**Low**

6.0 Conclusions

The Winu Project presents a risk of direct and indirect impacts to Night Parrots and their habitat in the Winu locality. In the absence of mitigation measures, the most significant inherent risks would likely be habitat loss through clearing and/or increased potential for fires, increased risk of predation driven by increases in feral predator densities, the risk of collision with vehicles and infrastructure, and the risk of stress and disturbance from industrial noise.

However, RTW has modified the project Development Envelope to exclude all Night Parrot habitat, which will prevent direct clearing of Night Parrot habitat for the project, and reduce the risk of impacts through other impact pathways. In addition, RTW has already proposed general mitigation measures to help minimise the risk of significant environmental impacts (RTW 2023), which are likely to reduce the risk of other direct and indirect impacts to Night Parrots and their habitat. These mitigation measures reduce the likelihood of significant impacts to Night Parrots in the Winu locality.

There is a still a risk of localised impacts from the project, particularly through fire, collision with infrastructure, and noise impacts. However, given the proposed mitigation measures, we consider that the overall likelihood of impacts to the local Night Parrot population is low to moderate. The small population of Night Parrots likely to use the Winu locality (one individual known, and precautionarily still likely fewer than five individuals), their apparent intermittent presence in the area, and the relatively limited extent of suitable habitat compared to Lake Waukarlycarly to the south, means that the project presents a low risk of significant impacts on Night Parrots at the population level.

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