

Table 14 describes the habitats that occur within the Project Area (PLA). The remnant areas of intact vegetation provide a range of habitats that may support a diversity of fauna species. The pine plantations, whilst considered lower value than the remnant areas also offer habitat for fauna and flora species.

Table 14 Project Area (PLA) Habitats



Plate 1 Pine Plantations

The pine plantations are highly modified environments and are considered low value habitat compared to the remnant vegetation remaining within the Project Area (PLA). Although the pine plantations are actively managed by the commercial forestry operations (eg. slashing and herbicide treatment between rows), they provide habitat for a range of flora and fauna species. Microbats were recorded at all pine forest sites regardless of production stage, as they feed on insects within the plantation. None of the microbat species recorded utilising the pine for foraging are listed species under the NC Act or EPBC Act. Rows of mature pine would also offer good “fly-ways” for microbat species. Whilst they are suitable for microbat foraging they are not considered suitable for roosting given the absence of hollows and other structure. Least concern species such as Eastern bearded dragons (*Pogona barbata*) and small insectivorous birds (eg. red-backed fairy wrens) were observed within the pine plantations.



Plate 2 Pine Plantations

The pine plantations are highly modified environments and are considered low value habitat compared to the remnant vegetation remaining within the Project Area (PLA). Some of the mature pine forests contain thick weedy undergrowth although this is managed by existing operations. Some mature pine forests have sparse undergrowth where the weeds and regrowth have been cleared and treated (refer Plate 3).



Plate 3 Pine Plantations

The pine plantations are highly modified environments and are considered low value habitat compared to the remnant vegetation remaining within the Project Area (PLA). Most mature pine forests have sparse undergrowth where the weeds and regrowth have been cleared and treated. Weeds are often less in these areas due to shading out (other than lantana which is treated)



Plate 4 Pine Plantations

Semi-mature pine that has undergone routine management of weeds and woody species.



Plate 5 Melaleuca forest

Melaleuca forest habitat values include:

- Melaleuca trees and shrubs provide food for nectar eaters and supports prey (invertebrates and small vertebrates) for small mammals, birds and reptiles
- Provide shelter and protected areas for breeding for a variety of fauna, including live vegetation and fallen woody debris
- Potential habitat for wallum froglet (*Crinia tinnula*) and other acid frog species
- *Tenuibranchiurus glypticus* (Swamp crayfish) (NC Act – E) was recorded in a small pool in this location.
- Will not be cleared for construction of the wind turbines.
- Roadside drains in pine plantations adjacent to these low-lying areas may potentially provide habitat for acid frog species such as *Crinia tinnula*.



Plate 6 *Eucalyptus racemosa*, *Eucalyptus latisinensis* and woodland

Woodland habitat values include:

- Woodland trees and shrubs provide food for nectar eaters and supports prey (invertebrates and small vertebrates) for small mammals, birds and reptiles
- Provide shelter and protected areas for breeding for a variety of fauna, including live vegetation and fallen woody debris
- Woodlands with HBTs are of critical importance for hollow-dependent animals (e.g. parrots, microbats)
- Will not be cleared for construction of the wind turbines.



Plate 7 *Permanent waterways (Poona Creek)*

Some creeks remain within the pine plantation with narrow riparian areas. They provide habitat for.

- Aquatic flora and fauna species
- Amphibians
- Water source for fauna including microbats
- Wind farm infrastructure avoids these creeks
- Will not be cleared for construction of the wind turbines
- Possible trimming of vegetation may be required to upgrade some existing waterway crossings, although this would be assessed on a case by case basis during detailed engineering design.



Plate 8 *Narrow degraded ephemeral waterways*

Some creeks and drainage lines are degraded with:

- little to no riparian vegetation
- erosion and sedimentation of waterway
- weeds
- disturbance by wild horses
- These cleared low-lying areas adjacent to remnant pockets of wallum habitat may potentially provide suitable habitat for acid frog species such as *Crinia tinnula*.



Plate 9 Remnant eucalypt woodland in NSF portion of Project Area (PLA)

Woodland habitat values on Lot 1419FTY1697 (NSF) include:

- Woodland trees and shrubs provide food for nectar eaters and supports prey (invertebrates and small vertebrates) for small mammals, birds and reptiles
- Provide shelter and protected areas for breeding for a variety of fauna, including live vegetation and fallen woody debris
- Although selectively logged, the eucalypt woodlands still contain HBTs which are important for hollow-dependent animals (e.g. parrots, microbats, gliders)
- Grey-headed flying-foxes were observed feeding on the flowering eucalypts within the NSF (June 2019)
- This area provides potential habitat for Pineapple Zamia.



Plate 10 Ephemeral waterways in NSF portion of Project Area (PLA)

Some ephemeral waterways are present:

- Some pools may persist longer in the landscape and provide important water sources for fauna and breeding habitat for amphibians (eg. tusked frog)
- Lantana was common on the waterways on Lot 1419FTY1697 (NSF)
- Disturbance by pigs was observed in some areas

4.2.1.1 Flora and Vegetation

Field surveys identified *Macrozamia pauli-guilielmi* (Pineapple Zamia) which is endangered under the EPBC Act and NC Act. Plants were identified growing in remnant RE patches, while some were also recorded in the pine plantations. All plants were found within 10m of road edges. Refer to Figure 2 for locations of Pineapple Zamia currently identified. No other threatened flora was recorded during vegetation surveys.

The vegetation in the area immediately surrounding Raintree Bridge along Tinana Creek is currently mapped as RE 12.3.16 (endangered under the VM Act) and is described as *complex notophyll to microphyll vine forest on alluvial plains*.

Surveys undertaken in January 2020 confirmed that the area near Raintree Bridge on Tinana Creek is RE 12.3.16 (described as *Complex notophyll to microphyll vine forest on alluvial plains*). The RE is analogous to the EPBC Act listed Lowland Rainforest of Subtropical Australia. The vegetation assessed at the existing Raintree Bridge crossing does not meet the species richness condition threshold for the listed community with only 11 native woody species from Appendix A of the listing advice recorded during the survey rather than the minimum 40 species required for remnant vegetation patches (Fox & Co, 2020).

An unidentified orchid was recorded in a remnant patch of *Melaleuca quinquenervia* woodland within the Project Area (PLA) during initial vegetation and flora surveys. It was not in flower and identification could not be verified at the time. The orchid was flowering during a brief subsequent site inspection in January 2020 and was identified as *Geodorum densiflorum* (shepherd's crook orchid). It is a Least Concern native species.

As previously discussed, wind farm infrastructure largely avoids the clearing of remnant vegetation. Nonetheless, vegetation surveys confirmed the DES RE mapping. The pine plantations are actively managed and undergo regular slashing between rows and herbicide treatment. As the management area of pine plantation is expansive, some pine plantation areas have more regrowth and weeds than others. Clearing plantation pine for Project infrastructure will also result in clearing some native regrowth species growing amongst the pine. All areas will be ground-truthed prior to clearing to ensure EVNT flora species that are tolerant to disturbance (eg. *Acacia attenuata*) are not within the area of impact. Species such as *A. attenuata* have been found in disturbed areas such as roadsides subject to vegetation control (outside of the Project Area (PLA)). As such, it is possible this species may occur in low-lying areas within the Project Area (PLA), yet outside of remnant areas. The Plantation Licensee undertakes plantation maintenance of woody weeds every 3 – 4 years using machines and/or prescribed burning and eventually (year 27) clear fells the compartment. Nonetheless, as they are known to occur in disturbed roadside areas, it is possible *A. attenuata* may be present in the low-lying non-remnant plantation areas.

Refer to Figure 2 for vegetation survey locations, Pineapple Zamia and orchid locations and Appendix B for quaternary vegetation assessment results. Refer to Appendix D for likelihood of occurrence of EVNT flora species.

4.2.1.1.1 Weeds

Thirty weed species were recorded across the Project Area (PLA) during surveys. Two (2) are declared plants (lantana (*Lantana camara*) and groundsel bush (*Baccharis halimifolia*)) under Qld's *Biosecurity Act 2014*. Refer to Appendix B for a list of weeds recorded.

4.2.1.2 Terrestrial Fauna (non-flying)

The field surveys recorded 92 fauna species, including 66 bird species (refer Section 4.2.1.4), 7 mammal, 6 amphibian, 6 reptiles, 4 fish and 3 freshwater crustaceans.

Crinia tinnula (Wallum froglet) which are listed as vulnerable under the NC Act, were heard calling within the Project Area (PLA) from a roadside drain beside the main access road into the Hyne Timber Mill (Maryborough – Tuan Forest Road), proximate to BUS survey location #5. The location *Crinia tinnula* were identified was outside of mapped EH and within a non-remnant area. It is possible *Crinia tinnula* and other tolerant acid frog species such as *Litoria freycineti* are present outside of the mapped EH for these species, such as roadside drains within the low-lying plantation areas (eg. Pre-clear wallum habitat).

Koala scats were recorded within the NSF portion of the Project Area (PLA) (USC, 2019) (Appendix I). Habitat utilization determined from systematic surveys is considered low at approximately between 0-6%. From the age of scats found (ranged from 2-5), this suggests variability in the time frames that koalas were present. Numerous scats approximately one (1) month old were found near Mt Eaton Creek (USC, 2019).

Koalas, greater gliders and GHFF were not observed in the Project Area (PLA). Koalas and greater gliders are listed as vulnerable under the NC Act and EPBC Act. GHFF are listed as vulnerable under the EPBC Act.

No other threatened terrestrial fauna species (nonavian) were observed.

The species list is provided in Appendix B.

4.2.1.3 Aquatic Fauna

One (1) threatened aquatic species was recorded (*Tenuibranchiurus glypticus*, Swamp crayfish) which is listed as endangered under Queensland's NC Act. It is not listed under the EPBC Act. Refer to Figure 5 for the location of *T. glypticus*.

Least concern aquatic species were recorded and are provided in Appendix B. No other threatened aquatic species were recorded.

4.2.1.4 Birds

Bird surveys recorded 66 bird species across the Project Area (PLA). Refer to Appendix B for the bird species list. The following five (5) species of conservation significance were recorded:

1. White-throated needletail (*Hirundapus caudacutus*) – V, MT, LM (EPBC Act)
2. Fork-tailed swift (*Apus pacificus*) – MT (EPBC Act)
3. Spectacled monarch (*Monarcha trivirgatus* (syn. *Symposiarchus trivirgatus*)) – LM, MT (EPBC Act)
4. Rainbow bee-eater (*Merops ornatus*) – LM (EPBC Act)
5. Cicadabird (*Coracina tenuirostris*) – LM (EPBC Act)

No migratory shorebirds were observed within the Project Area (PLA) or flying over the Project Area (PLA) on any of the bird surveys.

Seven (7) Least Concern (NC Act) raptor species (whistling kite (*Haliastur sphenurus*), spotted harrier (*Circus assimilis*), black-shouldered kite (*Elanus axillaris*), brown falcon (*Falco berigora*), Australian hobby (*Falco longipennis*), peregrine falcon (*Falco peregrinus macropus*) and wedge-tailed eagle (*Aquila audax*)) were recorded within the Project Area (PLA). None of the raptors are listed species under the EPBC Act or NC Act.

One (1) large water bird (white-necked heron (*Ardea pacifica*)) was observed flying over the site. White-necked herons are not listed under the EPBC Act or NC Act.

4.2.1.4.1 Species Diversity and Abundance

The most common birds observed were Torresian crows (*Corvus orru*) and noisy friarbirds (*Philemon corniculatus*), being recorded on all surveys across the Project Area (PLA). All 64 birds

recorded are shown on Figure 6 with their minimum and maximum flight height observed during surveys. Some birds recorded at heights less than the RSA height have the potential to fly at or above the RSA height and are also included in the collision risk assessment. Whilst it is important to consider conservation significant species in collision risk assessment because the consequences of mortality may be more severe, it is also important to considered common (least concern) species to provide a better understanding of species at risk which is important for mitigation and continual adaptive management. Least Concern species observed and/or likely to occur (based on previous Wildnet records) are included in the collision risk assessment provided in Section 5.2.2 and Appendix G.

White-throated needletails (*Hirundapus caudacutus*) (WTN) were observed in the highest numbers. This species was recorded on 9 of the 16 survey days (22 of the 139 fixed-point BUS surveys). Seven (7) of the 22 BUS assessments they were reported in numbers greater than 10 (on 4 days of the 16 survey days) as outlined in Table 15. The first initial BUS undertaken in December 2016 identified the greatest number of individuals, with a flock of 327 reported at 50m – 100m above ground level. One other survey (18 December 2018) reported flocks greater than 100 individuals with 165 being recorded between 30m – 200m above ground level.

Table 15 White-throated Needletails Exceeding 10 Individuals

Site	Date	Number of individuals	Height (m above ground level)
1	8 December 2016	327	50-100 m
3	8 December 2016	56	20 – 150 m
19	15 March 2017	17	60 m
7	18 December 2018	165	30 – 200 m
8	18 December 2018	16	30 m
9	18 December 2018	83	50 m
7	20 February 2019	12	50 m

¹ – at a National level, an important population is 0.1% of the total population (total population estimated at least 10,000 individuals), which equates to 10 WTN (*Draft referral guideline for 14 birds listed migratory under the EPBC Act* (DoE, 2015)).

Fork-tailed swifts (FTS) were recorded on 4 of the 16 survey days (15 of the 139 fixed-point BUS assessments). One (1) survey (29 November 2018) recorded up to 51 individuals at one site (they were recorded at most sites surveyed during that survey). Bushfires in the Wide Bay area on the 29 November 2018 (the small township of Tinnanbar was cut off by bushfires) correlated with the highest number of FTS recorded. This is consistent with their known flight behaviour. WTN were also recorded during the same survey.

A pair of spectacled monarchs (*Symposiarchus trivirgatus*) (EPBC Act – LM, MT) were observed in the understory along Tinana Creek within the vine forest in January 2020. Spectacled monarchs are a vertebrate species that commonly occur in vine forest.

Rainbow bee-eaters were recorded on seven of the 16 survey days (10 of the 139 fixed-point BUS assessments). Two (2) cicadabirds were observed at one location in 2016. Refer Figure 17, Appendix A for locations of conservation significant bird species.

4.2.1.4.2 Flight Heights

The risk assessment for collision based impacts has considered the likelihood of occurrence, typical flight behaviour, distribution and biology. Risk categories are:

- **Low Risk:** low flight behavior with the species typically foraging just above the tree canopy and below it.
- **Medium Risk:** has the potential to occasionally fly at RSA height and suitable habitat is present in the Project Area (PLA) or immediately adjacent to it
- **High Risk:** known to regularly fly at or above RSA height, aerial insectivore foragers and suitable habitat present on or adjacent to the site

Approximately 71% (47 of the 66) of all bird species recorded during the surveys are considered low risk of collision due to their low-flight behaviour. Most birds were recorded at less than 30m above ground level as shown on Figure 6. Some of these birds possess flight behaviour that may potentially put them within the RSA and are therefore included in the collision risk assessment.

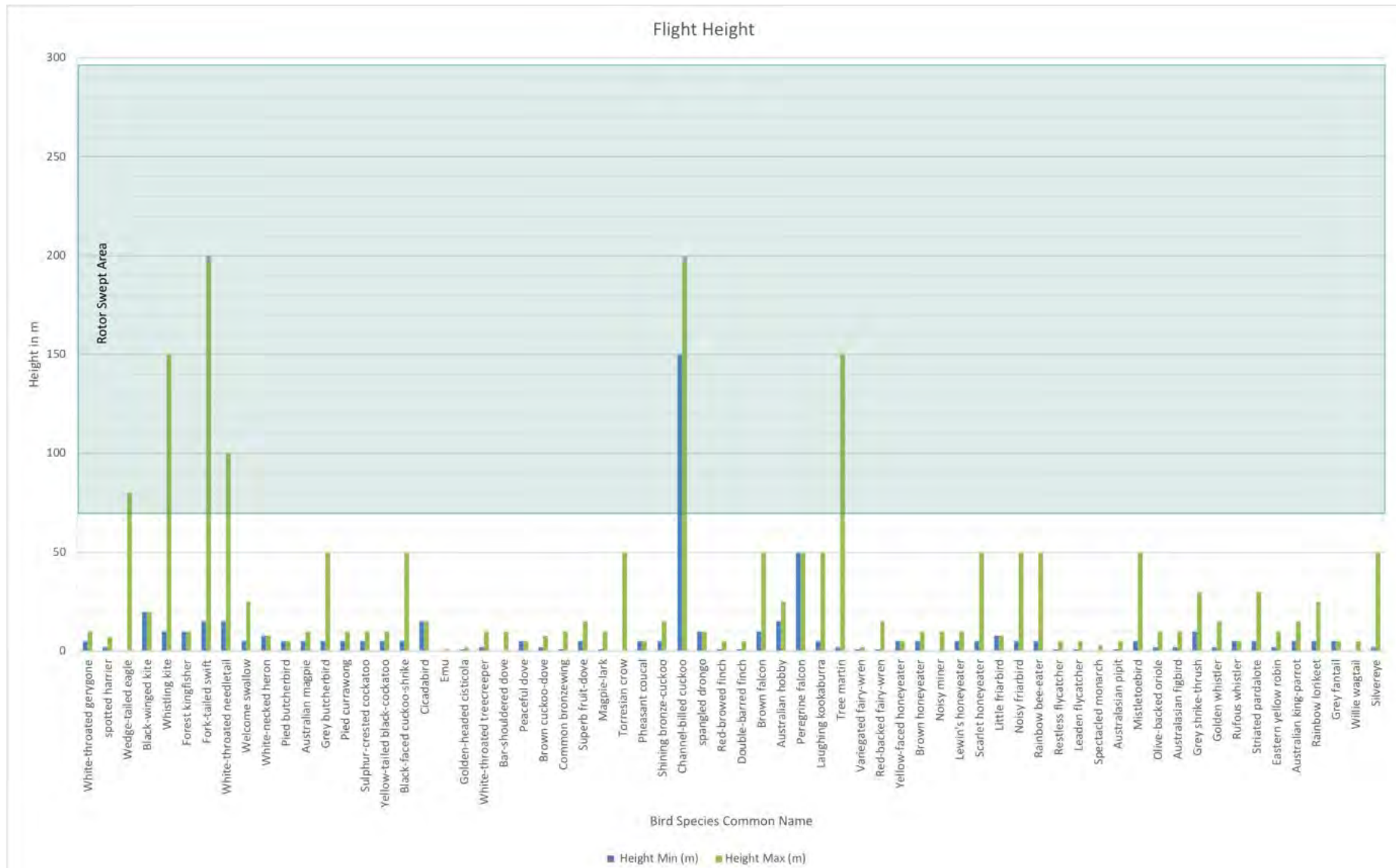


Figure 6 – Bird Flight Ranges on Project Area (PLA)

The following 19 birds recorded on the Project Area (PLA) are known to exhibit moderate to high risk flight behaviour.

1. White-throated needletail (*Hirundapus caudacutus*) – V, MT, LM (EPBC Act)
2. Fork-tailed swift (*Apus pacificus*) – MT (EPBC Act)
3. Whistling kite (*Haliastur sphenurus*) – Least Concern (LC) (NC Act)
4. Channel-billed cuckoo (*Scythrops novaehollandiae*) – LC (NC Act)
5. Tree martin (*Petrochelidon nigricans*) – LC (NC Act)
6. Spotted harrier (*Circus assimilis*) – LC (NC Act)
7. Black-shouldered kite (*Elanus axillaris*) – LC (NC Act)
8. Wedge-tailed eagle (*Aquila audax*) – LC (NC Act)
9. Welcome swallow (*Hirundo neoxena*) – LC (NC Act)
10. White-necked heron (*Ardea pacifica*) – LC (NC Act)
11. Brown falcon (*Falco berigora*) – LC (NC Act)
12. Australian hobby (*Falco longipennis*) – LC (NC Act)
13. Peregrine falcon (*Falco peregrinus macropus*) – LC (NC Act)
14. Rainbow bee-eater (*Merops ornatus*) – LM (EPBC Act)
15. Cicadabird (*Coracina tenuirostris*) – LM (EPBC Act)
16. Torresian crow (*Corvus orru*) – LC (NC Act)
17. Australian magpie (*Gymnorhina tibicen*) – LC (NC Act)
18. Sulphur-crested cockatoo (*Cacatua galerita*) – LC (NC Act)
19. Yellow-tailed black-cockatoo (*Calyptorhynchus funereus*) – LC (NC Act)

All of the raptors are included although only whistling kite and wedge-tailed eagle were observed flying within the RSA height. The tree martins, welcome swallows and rainbow bee-eaters were all observed below RSA height, however they have also been included as at moderate risk of impact due to being aerial insectivores and therefore influenced by atmospheric conditions and insect height. The white-necked heron was also observed below RSA height although are considered to have a moderate risk flight behaviour. Torresian crows and Australian magpies whilst observed within the Project Area (PLA) below 30m have been included due to their potential to fly with the RSA.

Other least concern species not recorded during surveys although have the potential to occur (based on previous Wildnet records in the Project Area (PLA)), with a moderate to high risk of collision include wedge tailed eagle (*Aquila audax*), Australian pelican (*Pelecanus conspicillatus*), Australian white ibis (*Threskiornis molucca*) and straw-necked ibis (*Threskiornis spinicollis*). These are also included in the risk assessment for collision based impacts in Section 5.2.2 and Appendix G.

Figure 17, Appendix A shows birds of conservation significance identified during BUS.

4.2.1.5 Bats

GHFF were observed feeding in the flowering eucalypts within the NSF portion of the Project Area (PLA) during nocturnal surveys in June 2019. No other flying-fox species were recorded within the Project Area (PLA).

Up to 14 microbat species were recorded during the bat surveys. Eleven call-types were positively identified to ten unique species plus the *Nyctophilus* genus (refer Appendix C). Up to three *Nyctophilus* species potentially occur in the Project Area (PLA) (*N. bifax*, *N. geoffroyi* and *N. gouldi*), however their calls cannot be reliably differentiated. All three (3) *Nyctophilus* species are least concern under the NC Act and the EPBC Act. Three other call-types were identifiable only to mixed-species groups because they had variable or intermediate pulse-characteristics. Two of those groups contained species that were otherwise reliably identified (*Chalinolobus gouldii*/*Ozimops ridei* and *C. nigrogriseus*/*Scotorepens greyii*). The third group – *Vespadelus troughtoni*/*Chalinolobus morio* – potentially represented two additional species that was not otherwise recorded. Where these “unresolved calls” were encountered, all members of the relevant group were listed as “probable” (refer Appendix C) unless positively identifiable calls of one or both species were also observed.

Microbat species positively identified on the Project Area (PLA) are listed below. All species are least concern under the NC Act and not listed under the EPBC Act.

1. Eastern horseshoe bat (*Rhinolophus megaphyllus*)
2. Gould’s wattled bat (*Chalinolobus gouldii*)
3. Hoary wattled bat (*Chalinolobus nigrogriseus*)
4. *Nyctophilus* sp.
5. Little broad-nosed bat (*Scotorepens greyii*)
6. Little bent-wing bat (*Miniopterus australis*)
7. Australian bent-wing bat (*Miniopterus orianae*)
8. White-striped freetail bat (*Austronomus australis*)
9. Ride’s free-tailed bat (*Ozimops ridei*)
10. Northern free-tailed bat (*Ozimops lumsdenae*)
11. Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*)

Almost 95% (576) of the calls were positively identified, with 83% (504 calls) attributable to just three species: *C. nigrogriseus*; *O. ridei*, and *Saccolaimus flaviventris*. These three (3) species are least concern under the NC Act and EPBC Act.

No threatened microbat species were recorded. Section 5.2.2 provides a risk assessment of potential consequence of collision for all bat species identified. Refer to Appendix C for the microbat report.

4.2.1.6 Pest Species

Five (5) pest species were identified within the Project Area (PLA) (*Gambusia holbrooki* (Gambusia), *Felis catus* (cat), *Rhinella marina* (cane toad), *Equus caballus* (horse (brumby)) and *Sus scrofa* (pig)). The most prevalent and noticeable were feral horses (brumbies) throughout the Project Area (PLA). Disturbance caused by horses was observed in most waterways across the Project Area (PLA).

4.3 Matters of State Environmental Significance

MSES within the Project Area (PLA) include:

- MSES wetlands, waterways and vegetation intersecting a watercourse
- Regulated vegetation (essential habitat)
- Regulated vegetation (endangered or of concern RE under the VM Act)
- Protected wildlife habitat

The Significant Residual Impact Guidelines (State of Queensland, 2014) are used to determine whether a Project will or is likely to have a Significant Residual Impact (SRI) on a MSES. Assessment frameworks for the activities to which this guideline applies have an 'avoid, mitigate, offset' obligation that requires in the first instance, avoiding impacts on prescribed environmental matters and if avoidance cannot be achieved, demonstrating that impacts have been carefully managed and minimised (mitigated). If after avoidance and mitigation, there is still an impact on prescribed environmental matters, an offset may be required where the impact is, or is likely, to be significant. If there is still an impact on the MSES after all reasonable avoidance and on-site mitigation measures for the prescribed activity have been or will be undertaken, the Significant Residual Impact Guideline (State of Queensland, 2014) is used to determine the 'significance' of the impact.

Project infrastructure has been specifically sited to avoid impacts to MSES as outlined in the sections below. Where there is a likelihood of an MSES occurring outside of an area of regulated mapping (eg. *crinia tinnula* in low-lying non-remnant areas), management measures are proposed to identify these areas during detailed design so they can be avoided, mitigated and assessed using the SRI guidelines, if required. Given that existing access tracks within the Project Area (PLA) are proposed to be utilised and the non-remnant pine proposed to be cleared represents less than 1% of the plantation area, and most of this is in elevated areas, the likelihood of impacts is considered low. Nonetheless, the indirect and direct impacts have been considered on these NC Act listed species that have the potential to occur outside of the non-remnant areas.

4.3.1 MSES Wetlands and Waterways

Locations of MSES wetlands and waterways, including Regulated Vegetation (intersecting a watercourse) and High Ecological Value Waters within the Project Area (PLA) are provided on Figures 12, 13 and 14 in Appendix A.

Mitigation measures to avoid impacts to MSES wetlands and waterways include:

- Wind turbines are not located in areas mapped as wetlands of High Ecological Significance (HES), High Ecological Value (HEV), Vegetation Management Wetlands or Regulated Vegetation (intersecting a watercourse).
- Utilise existing track network within the Project Area (PLA). Track upgrades undertaken in accordance with approved project specific Environmental Management Plans (EMPs) and/or Species Management Plans (SMPs).
- Transmission Line will span mapped areas of MSES waterways and wetlands (including waterways not mapped as MSES). Access to Transmission Line towers in the Project Area (PLA) will be via existing forestry tracks.

4.3.2 Regulated Vegetation (Essential Habitat)

Locations of MSES Vegetation (Essential Habitat) are provided on Figure 8.

Mitigation measures to avoid impacts to MSES Essential Habitat include:

- Wind turbines are not located in areas mapped as Essential Habitat.
- Utilise existing track network within the Project Area (PLA). Track upgrades undertaken in accordance with approved project specific SMPs.
- Transmission Line will span mapped areas of Essential Habitat. Access to Transmission Line towers in the Project Area (PLA) will be via existing forestry tracks.
- Undertake protected plant surveys in areas mapped on the protected plant flora survey trigger map, including within areas of existing pine plantation.

4.3.3 Regulated Vegetation under the VM Act

Locations of regulated vegetation under the VM Act within the Project Area (PLA) is provided on Figure 9.

Mitigation measures to avoid impacts to MSES regulated vegetation (remnant vegetation) include:

- Wind turbines are not located in areas mapped as remnant vegetation.
- Utilise existing track network within the Project Area (PLA).
- Transmission Line will span mapped areas of regulated vegetation. Access to Transmission Line towers in the Project Area (PLA) will be via existing forestry tracks.

4.3.4 Protected Wildlife Habitat

Locations of threatened wildlife under the NC Act recorded within the Project Area (PLA) are provided on Figure 16. These include *Macrozamia pauli-guilielmi* (Pineapple Zamia), wallum froglet (*Crinia tinnula*) and swamp crayfish (*Tenuibranchiurus glypticus*). Other NC Act listed species have previously been recorded within the Project Area (PLA) and are included in the Likelihood of Occurrence tables in Appendix D, with their likelihood of impact.

Mitigation measures to avoid impacts to MSES Protected Wildlife include:

- Wind turbines are not located in areas mapped as remnant vegetation which is the likely refugia habitat suitable for NC Act listed species known or likely to occur within the Project Area (PLA).
- Utilise existing track network within the Project Area (PLA) to avoid clearing further habitat.
- Avoid waterways and riparian areas which may contain suitable habitat for NC Act protected species such as turtles, amphibians, fish and crustaceans.
- Habitat outside of remnant areas may provide suitable habitat for some frog species such as wallum froglet (*Crinia tinnula*) and wallum rocketfrog (*Litoria freycineti*) and flora species such as *Acacia attenuata*. Should preclearance surveys identify these species, then the areas would also be classified as Protected Wildlife Habitat (MSES) and a Significant Residual Impact Assessment (SRIA) may be required if avoidance measures cannot be undertaken. Any potential track upgrades, turbine locations and other ancillary infrastructure in low lying areas, including areas within pine plantations must be undertaken in accordance with an approved SMP for acid frogs.
- The distribution lines will span mapped areas of remnant vegetation or will be underground.

4.4 Matters of National Environmental Significance

A Significant Impact Assessment (SIA) on MNES protected under the EPBC Act, has been prepared to assess impacts on MNES (*Fox & Co Environmental (March 2020). Significant Impact Assessment Matters of National Environmental Significance, Report No. 01032020*).

5 POTENTIAL IMPACTS

The wind turbines, meteorological masts (met masts) and operation / constructions compounds are all situated in the exotic pine plantation and avoid remnant vegetation. Access tracks within the Project Area (PLA) also follow existing Forestry tracks and avoid remnant vegetation.

The construction and ongoing operation of the Project within the Project Area (PLA) has a low potential to impact on the nature conservation values of the area. The Project Area (PLA) is located within existing operational exotic pine plantations that retain small areas of fragmented remnant vegetation. The Project (i.e. project infrastructure) within the Project Area (PLA) avoids environmentally sensitive areas (ESA) and MSES such as remnant vegetation, essential habitat and watercourses / wetlands. There remains potential for habitat for protected species outside of the remnant areas, such as disturbance tolerant flora species such as *Acacia attenuata*. Indirect and direct impacts to these species and non-remnant habitat has been considered. Whilst the Project Area (PLA) is expansive, the disturbance footprint for the Project is quite small.

5.1 Construction Phase

The construction phase of the Forest Wind project will involve construction of the wind turbines and associated infrastructure such as construction and operations compounds, substation and distribution lines.

5.1.1 Fauna

Potential impacts associated with construction of the Project that may affect fauna and fauna habitat values of the Project Area (PLA) are detailed below.

- Direct loss of fauna habitat and resources as a result of vegetation clearing
- Loss of connectivity (included, however is considered a 'general' construction impact, rather than a Project impact)
- Direct mortality impacts to terrestrial fauna
- Avoidance behaviour from disturbances associated with activities (e.g. impacts associated with light, dust, noise and vibration)
- Introduction of exotic weed and pest species to retained habitats

The Project infrastructure has been specifically located within exotic pine plantations and therefore the risk of potential direct and indirect impacts on least concern species, MSES and MNES fauna and fauna habitats is considered low and construction activities are not considered to pose a significant threat to local populations.

5.1.2 Habitat Loss

Vegetation and HBTs provide foraging habitat and roosting / nesting habitat for fauna. Hollow-bearing trees and most of the flowering vegetation (excluding regrowth and weeds within the exotic pine plantations) are present within the remnant vegetation patches within the Project Area (PLA). Infrastructure will be sited away from remnant vegetation within the Project Area (PLA) to avoid clearing hollow-bearing trees, foraging and roosting / nesting habitat. The Transmission Line towers in the Project Area (PLA) will be located approximately 450m – 650m apart to span areas of remnant vegetation where necessary. Plantation pine and native vegetation regrowth within the pine forests will require clearing for the turbine tower footings and other project construction compounds. These areas, whilst actively managed by slashing and weed management, also provide foraging and micro-habitats for fauna species, such as foraging microbat species. Less than 1% of the total pine plantation area is proposed to be cleared for the Project.

5.1.3 Loss of Connectivity

Landscape fragmentation and loss of connectivity is not considered significant as the Project Area (PLA) consists largely of exotic pine plantations. Turbines and associated infrastructure are largely located outside of remnant vegetation and existing high value habitat.

The riparian habitats throughout the exotic pine plantations provide the best opportunities for habitat connectivity through the plantation landscape. Clearing within riparian habitats will be avoided, other than minor trimming of vegetation for potential bridge / culvert upgrades on existing tracks/bridges. As such, there will be no loss of connectivity for least concern, MSES and MNES species.

5.1.4 Waterways and Water Quality

Least concern, MSES and MNES species may potentially occur in some waterways within the project area. Construction has the potential to impact on waterways in the local area. The activities with the highest risk of causing impacts to aquatic ecosystems / water quality include:

- Removal of topsoils from turbine locations and laydown areas and stockpiling of overburden on site resulting in sediment movement through overland flow
- Changes to water quality and quantity
- Storage of chemicals on site (e.g. hydrocarbons, detergents, degreasers, etc) during construction and operations and the movement of these to creeks.

5.2 Operation Phase

5.2.1 Avoidance Behaviour

There is potential for least concern, MSES and MNES birds to alter their migration pathways or local flight paths to avoid wind farms which may cause displacement, also known as 'barrier effect'. It has the potential to increase energy expenditure which has potential impacts on breeding productivity and survival (visiting migratory birds to the Great Sandy Strait are here for the non-breeding season). The effect depends on several factors including type of bird (flight height and avoidance of turbines), location, layout, operational status of the wind farm, time of day, visibility, wind force and direction, topography. There are currently few (if any) examples of birds being excluded from key areas due to barrier effects, mainly because onshore wind farms are reasonably isolated from each other and suitable availability of unaffected habitat in the area or region (Gove, 2013).

The bird and bat species present occur across a wide variety of landscapes including modified and fragmented landscapes as occurs within the Project Area (PLA). Whilst avoidance behaviour is difficult to predict, any avoidance behaviour displayed by the species present is unlikely to affect local and regional populations.

Although displacement is not expected due to the location of the Project, the Bird and Bat Management Plan has begun implementing a Before After Control Impact (BACI) monitoring program to monitor changes in flight behaviour of least concern and conservation significant bird and bat species.

5.2.2 Collision Events

5.2.2.1 Birds

As per avoidance behavior, collision events with birds are dependent on type of bird (flight height and avoidance of turbines), location, layout, operational status of the wind farm, time of day, visibility, wind strength and direction and topography. Some birds show avoidance when passing through a wind farm and others have typically low flight elevations, which reduces the likelihood of collision (Gove, 2013).

Most birds in the Project Area (PLA) are small passerines and although there have been few studies on the displacement of small passerines, they are generally not considered to be particularly sensitive

or vulnerable at a population level to wind farms due to being typically short-lived with high productivity rates (Gove, 2013).

A risk assessment of potential consequence of collision has been undertaken for:

- All threatened and/or migratory birds identified in the likelihood of occurrence assessment (Refer Table 6 in Section 4.1.1. and Appendix D) – Conservation Significant Bird Risk Assessment (Table 16);
- Migratory shorebirds – Migratory Shorebird Risk Assessment (Table 17); and
- Least concern birds considered at moderate to high risk of collision – Least Concern Bird Risk Assessment (Table 18).

The likelihood of occurrence assessment identified four (4) threatened birds, twelve (12) migratory birds and one (1) conservation significant bat species as either known to occur or having a moderate to high likelihood of occurrence within the Project Area (PLA) (Table 6, Section 4.1.1). A further 18 least concern bird species and up to 15 least concern bat species (as there are potentially three *Nyctophilus* species occurring in the Project Area (PLA) have also been identified as either known to occur or having a moderate to high likelihood of occurrence with a potential risk of collision. The risk assessment for collision based impacts has considered the likelihood of occurrence, typical flight behaviour, distribution and biology (such as feeding behavior). Risk categories are:

- Low Risk: low flight behavior with the species typically foraging just above the tree canopy and below it.
- Medium Risk: has the potential to fly at RSA height and suitable habitat is present in the Project Area (PLA) or immediately adjacent to it.
- High Risk: known to regularly fly at or above RSA height, aerial insectivore foragers and suitable habitat present on or adjacent to the Project Area (PLA).

5.2.2.1.1 Conservation Significant Birds

Table 16 Conservation Significant Bird Risk Assessment

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Threatened Birds			
White-throated Needletail <i>Hirundapus caudacutus</i> <i>EPBC Act - V, MT, LM</i> <i>NC Act – SLC</i>	Known	Summer migrant (October – April). Occurs in high open spaces above wide range of habitats, such as oceans, ranges and headlands (Morcombe, 2003). The White-throated Needletail is widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Qld and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains (DoE, 2019). There are no published estimates of the extent of occurrence of the White-throated Needletail in Australia, although the species occurs at numerous and widespread sites in eastern Australia (DoE, 2019). In Australia, the White-throated Needletail is almost exclusively aerial, from heights of	High

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		<p>less than 1 m up to more than 1000 m above the ground (DoE, 2019).</p> <p>They often forage in areas of updraughts, such as ridges, cliffs or sand-dunes, or in the smoke of bushfires, or in whirlwinds. They often forage along the edges of low pressure systems, which both lift their food sources and assist with their flight, and it is said that they follow these systems across Australia (DoE, 2019).</p> <p>Surveys demonstrated the occurrence and abundance of this species across the Project Area (PLA) is highly variable. The 2 survey occasions when they were recorded in flocks greater than 100 were on days associated with local bushfires or stormfronts.</p>	
<p>Powerful owl</p> <p><i>Ninox strenua</i></p> <p>EPBC Act – not listed</p> <p>NC Act - V</p>	<p>Moderate</p>	<p>Found in open forests and woodlands, as well as along sheltered gullies in wet forests with dense understoreys, especially along watercourses.</p> <p>Known to roost in sheltered groves of midstorey trees, or sometime pine plantations (Curtis <i>et al.</i> 2012)</p> <p>Mainly on the eastern side of the Great Dividing Range (Morcombe, 2003).</p> <p>If present, they are likely to be utilising remnant patches of native vegetation to roost (midstorey) and occasionally foraging in the logged or regenerating areas. They prey mainly on arboreal mammals (not likely in pine plantations), however are also known to prey on flying-foxes and other species such as birds.</p> <p>They are not likely to fly significantly above canopy height and the potential impact to this species is considered to be low.</p>	<p>Low</p>
<p>Ground Parrot</p> <p><i>Pezoporus</i> <i>Wallicus wallicus</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act - V</p>	<p>Moderate</p>	<p>The Ground Parrot (eastern) is terrestrial. It occurs mostly in coastal heathland or sedgeland with very dense cover and a high density of the parrot's preferred food plants. In south-east Queensland, it occurs mostly in closed, subtropical graminoid heathlands (consisting of grass-trees, with a high diversity of sedges, rushes and low shrubs), either moist or dry. Within heathlands, dry habitats are used from mid-autumn to late spring, and wet habitats at other times. It is sometimes found in open Banksia woodlands with a heath understorey, in closed fernland around shallow creeks on plains, or in sedges at swamp margins (DoE, 2019)</p>	<p>Low</p>

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.	
Australian painted snipe <i>Rostratula australis</i> (Syn. <i>Rostratula benghalensis</i>) EPBC Act – E, LM, MW NC Act - V	Moderate	Variety of habitats but generally requires presence of water. Inhabits shallow terrestrial freshwater wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (Department of the Environment, 2014f). Usually remains among the cover of wetland vegetation while foraging. It feeds at night, probing the soft mud with its long bill as it walks, pecking at seeds and taking small invertebrates (Birdlife Australia). Low risk of collision due to specific habitat preferences low numbers moving through Project Area (PLA).	Low
Migratory and / or Listed Marine Birds			
Fork-tailed Swift <i>Apus pacificus</i> EPBC – LM, MM NC Act - SLC	Known	Summer migrant (October – April). Occurs in low to very high airspace over variety of habitats including rainforest and semi-arid areas. Known to be most active in front of summer storm fronts (Morcombe, 2003). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher (DoE, 2019). They forage along the edge of low pressure systems and for that reason are considered a precursor to unsettled weather. The low pressure system helps to lift prey, such as insects, from the ground and assists in flight (DoE, 2019) They are widespread but scattered in coastal areas from 20° S, south to Brisbane and in much of the south south-eastern region. They are more widespread west of the Great Dividing Range and are commonly found west of the line joining Chinchilla and Hughenden (DoE, 2019). Surveys demonstrated the occurrence and abundance of this species across the Project Area (PLA) is highly variable. FTS were recorded in their highest numbers (up to 51 individuals) on 29 November 2018 which was associated with severe local bushfires (same days as the WTN).	High
Rainbow bee-eater	Known	Summer migrant (September – April) although in northern Australia they remain and breed. In recent years, they have been	Moderate

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<i>Merops ornatus</i> EPBC Act – LM NC Act - LC		<p>observed throughout the year on the Sunshine Coast (pers obs, Paul Fox). Occurs in open woodlands, semi-arid scrub, grasslands, clearing in heavier forests, farmlands and coastal areas. Avoids heavy forests due to hindrance to feeding (i.e. catching insects) (Morcombe, 2003).</p> <p>All birds observed during BUS surveys were foraging less than 30m above ground level. Infrequent collision based on low-flight behaviour across the pine plantation.</p> <p>Although observed within Project Area (PLA) below RSA, they are aerial insectivores and therefore considered to potentially fly within RSA.</p>	
Cicadabird <i>Coracina tenuirostris</i> EPBC Act – LM NC Act - LC	Known	<p>Occurs in the foliage canopy of diverse forests and woodlands as well as mangroves and paperbark swamps. A migratory visitor to south eastern Australia (Morcombe, 2003).</p> <p>Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.</p>	Low
Magpie Goose <i>Anseranas semipalmata</i> EPBC Act – LM NC Act - LC	Moderate	<p>The species may fly at RSA height during movement inland between the coast and inland wetland habitats. None observed during surveys. Infrequent collision based on low numbers moving through the Project Area (PLA).</p>	Low
Great Egret <i>Ardea modesta</i> EPBC Act – LM, MW NC Act - LC	Moderate	<p>Widespread in Australia. Recorded in a wide range of wetland habitats including flooded pastures, dams, estuarine mudflats, mangroves and reefs and usually frequents shallow water. (Department of the Environment, 2015b; Morcombe, 2003).</p> <p>No records from the Project Area (PLA) or suitable habitat within the Project Area (PLA).</p> <p>The species may fly at RSA height during movement inland between the coast and inland wetland habitats. None observed during surveys. Infrequent collision based on low numbers moving through the Project Area (PLA).</p>	Low
Cattle egret <i>Ardea ibis</i> (Syn. <i>Bubulcus ibis</i>)	Moderate	<p>Occurs in moist pastures with tall grass, shallow open wetlands and margins and also mudflats (Morcombe, 2003).</p> <p>The species may fly at RSA height during movement inland between the coast and</p>	Low

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<i>EPBC Act – LM, MW</i> <i>NC Act - LC</i>		inland wetland habitats. None observed during surveys. Infrequent collision based on low numbers moving through the Project Area (PLA).	
Oriental cuckoo <i>Cuculus optatus</i> <i>EPBC Act – MT</i> <i>NC Act - SLC</i>	Moderate	Vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears quite often along edges of forests, or ecotones between forest types. This cuckoo feeds arboreally, foraging for invertebrates on loose bark on the trunks and branches of trees, and among the foliage, including in mistletoes. It will forage from the ground, but requires shrubs or trees from which it sallies and returns to consume prey items. Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.	Low
White-bellied sea-eagle <i>Haliaeetus leucogaster</i> <i>EPBC Act – LM</i> <i>NC Act - LC</i>	Moderate	Occurs in predominantly coastal areas although also occurs far inland on large pools of rivers. Mostly over islands, reefs, headlands, beaches and estuaries. Known to occur on seasonally inundated swamps, lagoons and floodplains (Morcombe, 2003). It is considered to be a common species throughout much of its range, and has an estimated global population of more than 10 000 individuals (including breeding and non-breeding adults, and immature birds). (DoE, 2019). The White-bellied Sea-Eagle generally forages over large expanses of open water; this is particularly true of birds that occur in coastal environments close to the sea-shore, where they forage over in-shore waters. However, the White-bellied Sea-Eagle will also forage over open terrestrial habitats (such as grasslands) (DoE, 2019). Breeding adult birds are generally sedentary, although they forage over large areas and are capable of undertaking long-distance movements. Home ranges occupied by the White-bellied Sea-Eagle can be up to 100 km ² (DoE, 2019). Although not observed during surveys, given they are known along the Great Sandy Strait and Fraser Island and have a large home range, they may possibly fly over the site at RSA height. This is considered unlikely and infrequent due to their behavioural preference of foraging along the coastline.	Low

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		Infrequent collision due to low numbers moving through Project Area (PLA) and preferred foraging habitat along the coastline.	
Black-faced monarch <i>Monarcha melanopsis</i> EPBC Act – LM, MT NC Act - SLC	Moderate	Found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating into the south-east during summer (Morcombe, 2003). No previous records although suitable habitat maybe in the adjacent National Parks (Poona NP and Great Sandy NP). Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.	Low
Spectacled Monarch <i>Monarcha trivirgatus (syn. Symposiarchus trivirgatus)</i> EPBC Act – LM, MT NC Act - SLC	Occurs	Resident of NE Qld and migrates to SE Qld. Found mainly in rainforests but also can be found in mangroves, swamps and watercourse thickets. (Morcombe, 2003). Identified during surveys (Fox & Co, 2020) within vine forest along Tinana Creek near Raintree Bridge. Two individuals observed in understorey. Potential suitable habitat in the adjacent National Parks (Poona NP and Great Sandy NP). Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.	Low
Satin Flycatcher <i>Myiagra cyanoleuca</i> EPBC Act – MT NC Act - SLC	Moderate	Satin Flycatchers are eucalypt forest and woodland inhabitants. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland. The diversity of occupied habitats expands during migration, with the species recorded in most wooded habitats (Draft Referral Guideline for 14 Birds listed as Migratory Species under the EPBC Act, 2015). No previous records although suitable habitat maybe in the adjacent National Parks (Poona NP and Great Sandy NP). Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.	Low
Rufous Fantail <i>Rhipidura rufifrons</i>	Moderate	Found in rainforest, dense wet eucalypt and monsoon forest, swamps, riverside vegetation. Found in open country on migration.(Morcombe, 2003)	Low

Species Threatened Birds	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
EPBC Act – LM, MT NC Act - SLC		Infrequent collision based on low numbers moving through the Project Area (PLA) and low flight behaviour.	

5.2.2.1.2 Migratory Shorebirds

Migratory shorebirds were assessed for their susceptibility to collision based impacts considering their arrival and departure from the Great Sandy Strait over the Summer months. The risk of impact is low or unlikely and is provided in Table 17 below.

The Great Sandy Strait is considered an internationally important site for seven (7) migratory species (Bamford M, *et al.* 2008). Table 17 provides an assessment of those seven (7) species, although all migratory species either known or predicted to occur were also assessed and are provided in the likelihood of occurrence table in the Appendix D.

There have been several studies on the climbing and flight speeds of coastal shorebirds when departing on long-distance migratory flights (Piersma *et al.* 1990 and 1997). Based on the studies, it is understood shorebirds depart in an elongated, shallow “V” formation, termed an “echelon” in flocks of between 5 and 250 birds, with occasional observations of larger flocks. They ascend rapidly and steeply, often resulting in being lost from sight while still ascending. Estimates of climb rate vary, however larger / heavier species of shorebirds are slower to ascend (Piersma *et al.* 1990, 1997). Observations of flight altitude using weather radar show that during migration, shorebirds fly at between 0.5 and 6 km (Piersma *et al.* 1990). However it is likely to be higher, as studies using radar from oceanic islands when the birds are in a long-flight, level pattern have reporting heights ranging from 2.6km to 6 km above sea-level.

Given the absence of migratory shorebird records within and/or flying over the Project Area (PLA) during known summer migratory periods over three summer seasons, the known steep and rapid ascension on departure and distance of a minimum of 4km from the Great Sandy Strait, it is considered:

- migratory shorebirds present in the Great Sandy Strait during the Summer months possibly arrive or depart in a north-south direction along the coast, avoiding the Project Area (PLA).
- should migratory shorebirds pass through the Project Area (PLA), due to the rapid and steep rate of departure and distance of at least 4km from the Great Sandy Strait, it is unlikely shorebirds would be flying at heights low enough to be impacted by the RSA of the turbines.
- Shorebirds have specific habitat preferences and are unlikely to fly into the site.

Table 17 Migratory Shorebird Risk Assessment

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Terek sandpiper (<i>Xenus cinereus</i>)	Unlikely in the Project Area (PLA). Known to occur in the Great Sandy Strait as a Summer migrant.	Forages mostly in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (<i>Halosarcia spp.</i>). Birds are seldom near the edge of water, however, birds may wade into the water (Department of the Environment, 2016e).	Low

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		<p>There appear to be two waves of migration down the eastern coast: one in August or September and one in November (DoE, 2019).</p> <p>Widespread in coastal Queensland, from south-east of the Gulf of Carpentaria, north to Torres Strait and along the eastern coast to south-east Australia.</p> <p>Migratory shorebird of the EAA. The Great Sandy Strait is an important non-breeding site in Australia (Bamford <i>et al.</i>, 2008).</p> <p>Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat immediately west of Project Area (PLA) so short flights unlikely to occur.</p>	
<p>Grey-tailed tattler (<i>Tringa brevipes</i>)</p>	<p>Unlikely in the Project Area (PLA).</p> <p>Known to occur in the Great Sandy Strait as a Summer migrant.</p>	<p>Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found in most coastal regions. In Qld it is found along the entire coast, with small numbers located in the Gulf of Carpentaria.</p> <p>The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves (DoE, 2019).</p> <p>Migratory shorebird of the EAA. The Great Sandy Strait is an important non-breeding site in Australia (Bamford <i>et al.</i>, 2008).</p> <p>Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat immediately west of Project Area (PLA) so short flights unlikely to occur.</p>	<p>Low</p>
<p>Common greenshank (<i>Tringa nebularia</i>)</p>	<p>Unlikely in the Project Area (PLA).</p> <p>Known to occur in the Great Sandy Strait as a Summer migrant.</p>	<p>It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms (Department of the Environment, 2015s).</p> <p>Migratory shorebird of the EAA. The Great Sandy Strait is an important non-breeding site in Australia (Bamford <i>et al.</i>, 2008).</p>	<p>Low</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		<p>Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat immediately west of Project Area (PLA) so short flights unlikely to occur.</p>	
<p>Bar-tailed godwit (<i>Limosa lapponica baueri</i> and <i>Limosa lapponica menzbieri</i>)</p>	<p>Unlikely in the Project Area (PLA).</p> <p>Known to occur in the Great Sandy Strait as a summer migrant.</p>	<p>Inhabits mainly in coastal areas such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays, around beds of seagrass, saltmarsh, coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips (DoE, 2019; Morcombe, 2003).</p> <p>Breeds in eastern Russia and Alaska (Migratory Shorebirds of the EEA Flyway).</p> <p>Migratory shorebird of the EAA. Seven important non-breeding sites in Australia; one being the Great Sandy Strait.</p> <p>Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat immediately west of Project Area (PLA) so short flights unlikely to occur.</p>	<p>Low</p>
<p>Lesser sand plover (<i>Charadrius mongolus</i>)</p>	<p>Unlikely in the Project Area (PLA).</p> <p>Known to occur in the Great Sandy Strait as a summer migrant.</p>	<p>Within Australia, the lesser sand plover is widespread in coastal regions and has been recorded in all states. It mainly occurs in northern and eastern Australia, in south-eastern parts of the Gulf of Carpentaria, western Cape York Peninsula, islands in Torres Strait, and along the entire east coast (DoE Conservation Advice, 2016). It is most numerous in Queensland and New South Wales. Inhabits mud and sandflats in sheltered bays, estuaries, harbours, and occasionally rocky outcrops, sandy beaches and coral reefs. Roosting occurs near foraging areas (DoE, 2019).</p> <p>Migratory shorebird of the EAA. Seven important non-breeding sites in Australia; one being the Great Sandy Strait.</p> <p>Numbers begin to increase at various sites in northern Australia between February and April (mostly March to April), suggesting that birds move along the eastern and northern coasts before they leave on their northern migration in April (DoE, 2019)</p> <p>Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat</p>	<p>Low</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		immediately west of Project Area (PLA) so short flights unlikely to occur.	
Whimbrel (<i>Numenius phaeopus</i>)	Unlikely in the Project Area (PLA). Known to occur in the Great Sandy Strait as a summer migrant.	Often found in mudflats of estuaries, particularly those with mangroves. Occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms (DoE, 2019). When they arrive, they move south along the east coast. Influxes (which are mostly temporary) occur at sites along the east coast during migration in August (north of 20° S), and in September-October (south of 20° S) (DoE, 2019). When they depart Australia, Whimbrels begin migrating from February onwards (Higgins & Davies 1996). Influxes occur at most sites in Qld from early March to early April. The birds leave the north and north-east coasts by late April (DoE, 2019). Migratory shorebird of the EAA. Non-breeding period in Australia (Bamford et al, 2008). Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat immediately west of Project Area (PLA) so short flights unlikely to occur.	Low
Far eastern curlew (<i>Numenius madagascariensis</i>)	Unlikely in the Project Area (PLA). Known to occur in the Great Sandy Strait as a summer migrant.	Associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats (Morcombe, 2003). Migratory shorebird of the EAA. Non-breeding period in Australia (Bamford et al, 2008). Low risk of collision due to specific habitat preferences that restrict species distribution to intertidal areas. No habitat immediately west of Project Area (PLA) so short flights unlikely to occur.	Low

5.2.2.1.3 Least Concern Bird Species

Least concern bird species either recorded during site surveys or considered likely to occur were assessed on their susceptibility of collision. Table 18 provides least concern species identified as at risk of collision. Whilst their risk of collision is considered moderate to high, given their often wide distribution across Australia and stable populations (least concern), impacts to their populations are considered low.

Table 18 Least Concern Bird Species Risk Assessment

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Passerine Species			

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Welcome swallow <i>Hirundo neoxena</i> EPBC Act – LM NC Act - LC	Occurs	<p>Welcome Swallows are widespread in Australia and occupy a wide variety of habitats.</p> <p>They were observed within the Project Area (PLA) flying below the RSA, although they are likely to fly within the RSA as they are known to feed with swifts, woodswallows and martins (Simpson & Day, 2004).</p> <p>They are aerial insectivores and are considered at risk of collision with wind turbines</p>	High
Torresian crow <i>Corvus orru</i>	Occurs	<p>The Torresian crow has an extensive distribution across Australia. Occurs in open forest, woodland, farms, grassland and urban areas.</p> <p>The Torresian crow, similarly to many corvids, is an opportunistic species and has adapted to a broad range of habitats. The population size in Australia is increasing, possibly due to urban and agricultural expansion.</p> <p>One of the reasons the Torresian crow is able to take advantage of increased urbanisation is its diet; a significant proportion of the diet of the species consists of carrion. Torresian crows are large and aggressive birds, with females displaying the more aggressive behaviour and dominating most other species. They have been observed to attack larger birds of prey, particularly wedge-tailed eagles and most owl species in defense of their nest or territory (ALA, 2020).</p> <p>Although not observed flying within the RSA within the Project Area (PLA), they are considered at risk of collision due to their aggressive flight behavior and penchant for carrion</p>	High
Australian magpie <i>Gymnorhina tibicen</i>	Occurs	<p>Australian magpies are common throughout Australia and are found wherever there is a combination of trees and adjacent open areas. They live in groups of up to 24 birds in territories that are defending all year around by group members.</p> <p>Collision mortalities have been recorded at Ararat windfarm (BL& A, 2018). They were recorded below the RSA height during BUS surveys however have the potential to fly at RSA height.</p>	High

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Tree martin <i>Petrochelidon nigricans</i> EPBC – LM (as <i>Hirundo nigricans</i>) NC Act - LC	Occurs	Tree martins occur throughout Australia and occur in the airspace above almost every terrestrial habitat in Australia, ranging from grassy plains to forests, wetlands and built-up areas (Birdlife, 2020). Tree Martins are aerial insectivores and fly erratically in pursuit of flying insects. They often feed above the canopy and occasionally below the canopy. Their flight is agile and erratic. They are considered at risk of collision due to their flight behavior.	High
Non-passerine Species			
Channel-billed cuckoo <i>Scythrops novaehollandiae</i> EPBC Act – LM NC Act - LC	Occurs	The Channel-billed Cuckoo migrates to northern and eastern Australia from New Guinea and Indonesia between August and October each year. The birds leave Australia in February or March (Australian Museum, 2020). Channel-billed Cuckoo is found in tall open forests, usually where host species occur. They feed on native figs and native fruits, though some seeds, insects and baby birds are also taken. Observed flying over the Project Area (PLA) within the RSA and therefore are at risk of collision.	High
Sulphur-crested cockatoo <i>Cacatua galerita</i> EPBC – not listed NC Act - LC	Occurs	Occupies a variety of habitat types and flocks feed on the ground (Simpson & Day, 2004). The sulphur-crested cockatoo range extends throughout northern and eastern Australia and Tasmania. A population has established in Western Australia around Perth. Eggs are laid in a suitable hollow and both birds incubate and care for the chicks. Chicks remain with parents all year round and family groups stay together indefinitely (Australian Museum, 2020). Observed in the Project Area (PLA) although not within the RSA height. Considered low risk of collision due to observed flight behavior and feeding behaviour.	Moderate
Yellow-tailed black-cockatoo	Occurs	Yellow-tailed black-cockatoo inhabits a variety of habitat types, however favours	Moderate

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<p><i>Calyptorhynchus funereus</i></p> <p>EPBC Act – not listed NC Act - LC</p>		<p>eucalypt woodland and pine plantations. Occurs in small to large flocks (Australian Museum, 2020).</p> <p>Yellow-tailed black-cockatoo is found in south-eastern Australia, from Eyre Peninsula, South Australia to south and central eastern Queensland.</p> <p>They feed on wood-boring larvae and seeds of native and introduced trees and ground plants. They are known to tear open pine cones to extract the seeds. Both sexes construct the nest, which is a large tree hollow, lined with wood chips. The female incubates the eggs, while the male supplies her with food. Usually only one chick survives, and this will stay in the care of both parents for approximately 6 months.</p> <p>Observed within Project Area (PLA). Due to their common occurrence in pine plantation forests in south-east Queensland they are considered at risk of collision, although low due to observed and general flight height.</p>	
Raptors			
<p>Whistling kite</p> <p><i>Haliastur sphenurus</i></p>	Occurs	<p>Whistling kites are found throughout Australia. They are known to occur in open pastures, grasslands and lightly wooded areas and are typically found near water.</p> <p>They feed on small mammals, birds, fish, reptiles, crustaceans and insects. They will also feed on carrion. They often take prey from the ground although are also known to feed on insects from the air.</p> <p>Whistling kites were observed on the Project Area (PLA) within the RSA height and are at risk of collision.</p>	High
<p>Spotted harrier</p> <p><i>Circus assimilis</i></p>	Occurs	Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast. They occur in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands (NSW Office of Environment and Heritage, 2020).	Low - Moderate

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		<p>They prey on terrestrial mammals, birds, reptiles, insects and occasionally carrion (Morcombe, 2011).</p> <p>Although is known to soar high it is more commonly seen hunting low over vegetation. This species was recorded within the Project Area (PLA) however observed below the RSA height.</p> <p>Based on its flight behavior it is considered at low – moderate risk of collision.</p>	
Black-shouldered kite <i>Elanus axillaris</i>	Occurs	<p>Black-shouldered kites are common throughout Australia. They usually inhabit grasslands and open habitats.</p> <p>They feed mainly on rodents, particularly the introduced house mouse. They prefer to hunt during the day, particularly early morning and late afternoon, often hovering with their wings held upright in a V-shape, before dropping down and grabbing prey with their talons (Birdlife Australia, 2020).</p> <p>Although is known to soar high it is more commonly seen hunting low over vegetation. This species was recorded within the Project Area (PLA) however observed below the RSA height.</p> <p>Based on its flight behavior it is considered at low – moderate risk of collision.</p>	Low - Moderate
Brown falcon <i>Falco berigora</i>	Occurs	<p>Brown falcons are common throughout Australia. They are often observed hovering or flying back and forth over open habitats, especially grasslands and low shrublands, where they search for prey. They are opportunistic raptors, catching and eating mammals and birds, snakes and insects (Birdlife Australia, 2020).</p> <p>Observed within the Project Area (PLA) however below the RSA height during surveys. They are likely to occur within the RSA height and are therefore susceptible to collision.</p>	High
Australian hobby <i>Falco longipennis</i>	Occurs	<p>They are common throughout Australia. Often seen dashing past, either low to the ground or just above the treetops, the Australian Hobby is often seen hunting in vegetated urban areas, as well as in almost any lightly timbered country. Their flight varies from swift and direct with flickering wing-beats to gliding and soaring, and they regularly catch their food—small birds and insects—in the air. They sometimes eat it</p>	High

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		<p>on the wing too, or land on a high perch (Birdlife Australia, 2020).</p> <p>Observed within the Project Area (PLA) however below the RSA height during surveys. They are likely to occur within the RSA height and are therefore susceptible to collision.</p>	
Peregrine falcon <i>Falco peregrinus macropus</i>	Occurs	<p>Peregrine falcons occur throughout Australia. Peregrine Falcons mate for life and pairs defend a home range of about 20-30 km². Peregrine Falcons are the fastest animal in the world, with stoops recorded at speeds faster than 300 km/hr. Hunting is mainly done during the day, including around dawn and dusk. Feeding primarily on small-medium sized birds, but occasionally taking insects, such as moths, cicadas and locusts (Birdlife Australia, 2020).</p> <p>Observed within the Project Area (PLA) however below the RSA height during surveys. They are likely to occur within the RSA height and are therefore susceptible to collision.</p>	High
Wedge tailed eagle <i>Aquila audax</i>	Likely to occur	<p>Wedge-tailed Eagle (WTE) is Australia's largest bird of prey and is found throughout Australia. They known to soar up to altitudes of 2000m.</p> <p>Wedge-tailed eagles eat live prey and carrion. Wedge-tailed eagles occupy an area of about 30 to 35km². They spend most of their time either perched in trees or in the air, circling throughout their territory with a pattern of arcs and dives to signal ownership. Eagles usually nest and perch in high trees or other structures.</p> <p>Wedge-tailed eagles have been known to collide with wind farms in Tasmania (Hull <i>et al.</i> 2013) and the Ararat wind farm in Victoria (BL & A, 2018). Carcass monitoring on the Ararat windfarm reported most wedge-tailed eagles impacted by collision were young birds that would have recently fledged and left their nests. Continued monitoring on and around the Ararat wind farm has reported WTE flying in and around the wind farm without collisions suggesting the collisions were from young WTE entering the wind farm area from outside in the search of new territory (BL & A, 2018). It is assumed WTE are at risk of collision mainly due to their soaring habits and uplifting on air currents.</p>	High

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Waterbird Species			
Australian pelican <i>Pelecanus conspicillatus</i>	Likely to occur	<p>Australian pelicans live very close to water in coastal inlets, shorelines, lakes, swamps and rivers of the interior. They will reside in almost any area that supports a large abundance of fish, however their major habitat is the marine intertidal zone including sandy shoreline, sandbars and spits (Poole, 2011).</p> <p>They are strong, slow fliers that often glide on thermals to conserve energy. During flight they pull their head inward towards their body and rest it on their shoulders. These birds will travel very long distances in order to find food, and have been known to remain airborne for 24 hours (Poole, 2011). Australian pelicans are highly social, diurnal birds that fly together in groups which can be very large at times (Poole, 2011).</p> <p>Australian pelicans are of least concern because they have a very large range, their population trend is fluctuating, and their population size is very large (between 100,000 and 1,000,000 individuals) (Poole, 2011).</p> <p>Pelicans were not observed during BUS surveys however due to the available food resources in the Great Sandy Strait, their ability to soar on thermals and travel large distances, they are considered likely to pass over the Project Area (PLA) and therefore are at risk of collision.</p>	High
Australian white ibis <i>Threskiornis Molucca</i> straw-necked ibis <i>Threskiornis spinicollis</i>	Likely to occur	<p>Both ibis species are found throughout Australia and have previously been recorded on the Project Area (PLA) (Wildnet). However they were not recorded during BUS assessments. They mainly feed on aquatic invertebrates, insects, molluscs, fish and snakes in their natural habitat. Australian white ibis also frequently scavenge in land-fill sites and human recreation areas (ALA, 2020).</p> <p>They are a least concern waterbirds and are known to soar at heights within and above the RSA and therefore are considered at risk of collision.</p>	High
White-necked heron <i>Ardea pacifica</i>	Occurs	<p>White-necked Heron is widespread throughout most of Australia except desert areas of Western Australia and South Australia.</p>	Moderate

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		<p>Although White-necked Herons are sometimes seen in tidal areas, most are found in shallow fresh waters, including farm dams, flooded pastures, claypans, and even roadside ditches.</p> <p>They were observed on the Project Area (PLA) feeding in a roadside drain. They are capable of soaring within the RSA height and therefore susceptible to collision.</p>	

5.2.2.2 Consequence of Collision (Birds)

The above assessment identified the following for conservation significant and least concern species:

- White-throated Needletail (*Hirundapus caudacutus*) – High risk of collision
- Fork-tailed Swift (*Apus pacificus*) - High risk of collision

- Rainbow bee-eater (*Merops ornatus*) - Moderate risk of collision

- Powerful owl (*Ninox strenua*) – Low risk of collision
- Ground Parrot (*Pezoporus Wallicus wallicus*) – Low risk of collision
- Australian painted snipe (*Rostratula australis*) (*Syn. Rostratula benghalensis*) – Low risk of collision
- Great Egret (*Ardea modesta*) – Low risk of collision
- White-bellied sea-eagle (*Haliaeetus leucogaster*) – Low risk of collision
- Black-faced monarch (*Monarcha melanopsis*) - Low risk of collision
- Spectacled Monarch (*Monarcha trivirgatus* (*syn. Symposiarchus trivirgatus*)) – Low risk of collision
- Satin Flycatcher (*Myiagra cyanoleuca*) - Low risk of collision
- Cicadabird (*Coracina tenuirostris*) - Low risk of collision
- Rufous Fantail (*Rhipidura rufifrons*) - Low risk of collision
- Oriental cuckoo (*Cuculus optatus*) – Low risk of collision
- Magpie Goose (*Anseranas semipalmata*) – Low risk of collision
- Cattle egret (*Ardea ibis* (*Syn. Bubulcus ibis*)) – Low risk of collision
- Migratory Shorebirds - Low risk of collision

Impacts to populations of Least Concern species with a moderate to high risk of collision are considered low given their stable populations and widespread distribution.

The potential consequences associated with collision based impacts to the populations of White-throated Needletail (*Hirundapus caudacutus*) and Fork-tailed Swift (*Apus pacificus*) are discussed below because they are conservation significant species with a high risk of collision.

White-throated Needletail (*Hirundapus caudacutus*)

This species is a non-breeding Summer migrant (October – April) to Australia. It occurs in high open spaces above a wide range of habitats, such as oceans, ranges and headlands (Morcombe, 2003). During the Summer months, the White-throated Needletail is widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains (DoEE, 2019).

Large tracts of native vegetation, particularly forest, may be a key habitat requirement for the species (DoEE, 2015). In Australia, the White-throated Needle-tail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground (DoEE, 2019).

They often forage in areas of updraughts, such as ridges, cliffs or sand-dunes, or in the smoke of bushfires, or in whirlwinds. They often forage along the edges of low pressure systems, which both lift their food sources and assist with their flight, and it is said that they follow these systems across Australia (DoEE, 2019).

There are no published estimates of the extent of occurrence of the White-throated Needle-tail in Australia, although the species occurs at numerous and widespread sites in eastern Australia (DoEE, 2019)

Surveys demonstrated the occurrence and abundance of this species across the Project Area (PLA) is highly variable. The two survey occasions when they were recorded in flocks greater than 100 were on days associated with local bushfires or stormfronts. The *draft referral guideline for 14 birds listed migratory under the EPBC Act* (DoEE, 2015) lists ecologically significant proportions of each species population, which is 100 individuals (international proportion) or 10 individuals (national proportion) for the WTN. A significant impact involves the loss of this many birds from the population in a year. Two (2) of the 139 BUS assessments recorded numbers greater than 100 and five (5) of the 139 surveys recorded numbers greater than 10 (3 of those 5 were less than 20 individuals).

Potential collision with wind turbines is considered of low risk to the population. This is also consistent with the DoE Conservation advice regarding the assessment of threats to the WTN (Table 1, item 2.1 of the Approved Conservation Advice, 4 July 2019).

Fork-tailed Swift (*Apus pacificus*)

This species is a non-breeding Summer migrant (October – April) to Australia. It occurs in low to very high airspace over a variety of habitats including rainforest and semi-arid areas. It is known to be most active in front of summer storm fronts (Morcombe, 2003).

The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher (DoEE, 2019). They forage along the edge of low pressure systems and for that reason are considered a precursor to unsettled weather. The low pressure system helps to lift prey, such as insects, from the ground and assists in flight (DoEE, 2019)

They are widespread but scattered in coastal areas from 20° S, south to Brisbane and in much of the south south-eastern region. They are more widespread west of the Great Dividing Range, and are commonly found west of the line joining Chinchilla and Hughenden (DoEE, 2019).

Surveys demonstrated the occurrence and abundance of this species across the Project Area (PLA) is highly variable. FTS were recorded in their highest numbers (up to 51 individuals) on 29 November 2018 which was associated with severe local bushfires. This number is less than the ecologically significant proportion for FTS (1000 and 100 for International and National proportions, respectively) individuals as described in the *draft referral guideline for 14 birds listed migratory under the EPBC Act* (DoEE, 2015).

Potential collision with wind turbines is considered of low risk to the population as numbers observed during surveys are less than the ecological significant proportion of 100 individuals.

5.2.2.3 Bats

Of the two major groups of bats (microbats and megabats) all reported fatalities of bats from wind turbines in Australia and overseas, have been microbats (Australian Bat Society Inc., 2017). Although there are no reported fatalities of megabats (eg. flying-foxes), this may be attributed to most

Australian wind farms have not been in areas of flying-fox roosts or potential foraging areas. As such, they may be at risk of collision or barotrauma.

Operation of the wind farm has the potential to result in susceptibility of collision with wind turbines. A risk assessment of potential consequence of collision has been undertaken for all bat species identified within the Project Area (PLA) or within dispersal distances (ie flying-foxes) from the Project Area (PLA) (**Error! Reference source not found.**).

Table 19 Bat Risk Assessment

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Megabats			
Grey-headed flying-fox <i>Pteropus poliocephalus</i> EPBC – V NC Act – Least Concern	High	<p>A canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, <i>Melaleuca</i> swamps and <i>Banksia</i> woodlands (DoE, 2019). Roost sites are typically located near water, such as lakes, rivers or the coast.</p> <p>The Grey-headed Flying-fox is highly mobile and the national population is fluid, moving up and down the east coast in search of food (DoE, 2019). Grey-headed Flying-fox presence will be dependent on food resources. The time and location of flowering and fruiting of diet plants varies among seasons and years. In particular, drought years can have a strong influence on eucalypt flowering times. Sites noted as important in one year or period may not be visited again in the following year (DoE, 2019).</p> <p>The relatively small amount of native vegetation within the pine plantation is not considered core foraging habitat compared to the surrounding native state forests, National Parks and agricultural areas, outside of the Project Area (PLA).</p> <p>Local populations dispersing at night are also likely to be below the RSA height.</p> <p>Infrequent collision due to local dispersal flight height, absence of roosts within the Project Area (PLA) and the widespread distribution of preferred foraging habitat outside of the project area. However due to their nomadic lifestyle and likely poor maneuverability they are considered at risk of collision.</p>	Moderate

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<p>Little red flying-fox (LRFF)</p> <p><i>Pteropus scapulatus</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act – Least Concern</p>	<p>Moderate</p>	<p>Little red flying foxes are nomadic, predominately blossom feeders. They congregate in large camps, often beside water, commonly sharing camps with other flying fox species.</p> <p>They are found in a broad range of habitats, across the north and east of Australia. All dominant tree species are included in their diet and their nomadic lifestyle enables them to utilize an unpredictable food supply.</p> <p>As with other flying fox species, their presence in an area can be highly variable one year to the next, depending on the flowering of food tree species, as some eucalyptus can produce large amounts of blossoms one year and little the next (Churchill 2008)</p> <p>They are not very maneuverable and are often found caught in barbed wire fences (ALA, 2020).</p> <p>Infrequent collision due to distance from nearest camps, however due to their nomadic lifestyle and poor maneuverability they are considered at risk of collision.</p>	<p>Moderate</p>
<p>Black flying fox (BFF)</p> <p><i>Pteropus alecto</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act – Least Concern</p>		<p>Black flying foxes are found in a wide range of habitats in tropical and subtropical woodlands, feeding predominately on the fruit and blossoms of eucalypts, <i>Melaleuca</i> and Turpintines. They camp in mangroves, rainforests, <i>Melaleuca</i>, bamboo and monsoon forest, often using the same camp for many years. (Churchill 2008)</p> <p>They are migratory, roosting in large numbers high in the tree canopy during the day, leaving to feed at dusk. They generally disperse to smaller camps over the winter and recongregate in spring, summer (Australian Museum, 2020).</p> <p>Infrequent collision due to distance from nearest camps, however due to their nomadic lifestyle and poor maneuverability they are considered at risk of collision.</p>	<p>Moderate</p>
Microbats			
<p>Eastern horseshoe bat</p> <p><i>Rhinolophus megaphyllus</i></p>	<p>Known to occur</p>	<p>Eastern horseshoe bats are cave dwellers, found in a wide variety of caves, abandoned mines and can also be found in tree hollows, roosting mostly in complete darkness. They are found in tropical and temperate rainforest along the east coast of Australia. They are much more active in mature forests than in regrowth, avoiding large cleared areas. (Churchill 2008).</p>	<p>Low</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<p><i>EPBC Act – Not Listed</i></p> <p><i>NC Act – Least Concern</i></p>		<p>They hunt flying and non-flying insects and spiders, with moths being their dominant food. They have a slow, but highly maneuverable flight pattern, and can fly close to the ground to catch their prey, which is often taken to a temporary roost to be eaten. They use echolocation and are well adapted to hunting for insects in dense foliage (Churchill 2008 & Australian Museum).</p> <p>Eastern horseshoe bats were recorded within the Project Area (PLA). Due to their flight behavior and maneuverability they are considered at low risk of collision.</p>	
<p>Gould's wattled bat</p> <p><i>Chalinolobus gouldii</i></p> <p><i>EPBC Act – Not Listed</i></p> <p><i>NC Act – Least Concern</i></p>	<p>Known to occur</p>	<p>The Gould's wattled bat's distribution is widespread and they found in almost all habitats throughout Australia. They insectivorous, feeding on bugs and moths predominately, as well as a wide variety of other insects.</p> <p>They fly just below or within the lower level of the tree canopy and are agile flyers.</p> <p>They roost most commonly in tree hollows and hollow limbs of mature trees, particularly river red gums and cypress pines. They move daily between a number of roost sites and are highly adaptable. (Churchill, 2008)</p> <p>Mortalities have been recorded at other Australian wind farms (BL & A, 2018 and Boothroyd, I <i>et al.</i> 2012).</p> <p>Gould's wattled bat were recorded within the Project Area (PLA). Given previous mortalities at other wind farms and presence on the Project Area (PLA), they are considered at risk of collision.</p>	<p>High</p>
<p>Hoary wattled bat</p> <p><i>Chalinolobus nigrogriseus</i></p> <p><i>EPBC Act – Not Listed</i></p> <p><i>NC Act – Least Concern</i></p>		<p>The Hoary wattled bat is found in the north/north east of Australia, in a range of habitat types including monsoon forests, dry sclerophyll forest, littoral rainforest, river red gum riparian woodland, vine thickets, coastal scrub, sand dunes, grasslands and floodplains. They roost in primarily in hollows in eucalyptus trees.</p> <p>They are agile flyers and can change course quickly in response to prey movements. They are insectivores, with a preference for beetles, ants and moths but will also eat a range of other prey species.</p> <p>Little flight height information is available for this species, however given it is an aerial</p>	<p>High</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
		insectivore it is considered at high risk of collision.	
<p><i>Nyctophilus sp.</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act – Least Concern</p>	<p>Known to occur</p> <p>(all may potentially occur however could not speciate beyond genus level)</p>	<p>Three <i>Nyctophilus</i> species are potentially present in the windfarm area.</p> <p><i>Nyctophilus bifax</i>, Eastern long-eared bat</p> <p><i>Nyctophilus geoffroyi</i>, Lesser long-eared bat</p> <p><i>Nyctophilus gouldi</i>, Gould's long-eared bat</p> <p><i>Nyctophilus bifax</i>, are found along the eastern coast of Qld to northern NSW, favouring wetter habitats, including rainforest and monsoon forests, but are also found in open woodlands, tall open forest and dry sclerophyll forests. They primarily eat moths, along with other insects including ants and click-beetles. They have been observed perch hunting, making short flights to catch prey (Churchill, 2008)</p> <p><i>Nyctophilus geoffroyi</i> are widespread across Australia and are found in a broad range of habitats, from deserts to rainforests, agricultural land, urban areas, tropical to alpine woodlands and grasslands. They are highly maneuverable flyers feeding on moths, crickets and grasshoppers, primarily, but their diet also includes a range of other insects. They roost in crevices and tree hollows, often alone or in small groups (Churchill, 2008)</p> <p><i>Nyctophilus gouldi</i> are found in a range of habitats across Eastern Australia and the SW of WA. They are found in wet and dry sclerophyll forests, Melaleuca, red river gum waterways, woodlands and Acacia shrubland. They usually roost along creek lines, in tree hollows, fissures and under peeling bark. They generally fly in 2-5 m above the ground under the canopy of forest trees, to catch their prey, which consists mainly of moths and beetles, but as with other <i>Nyctophilus sp.</i>, a range of insects are included in their diet. (Churchill, 2008).</p> <p>Recorded during bat surveys on Project Area (PLA). Given low flight behavior they are considered low risk of collision.</p>	<p>Low</p>
<p>Little broad-nosed bat</p>	<p>Known to occur</p>	<p>Little broad-nosed bats are abundant in the north of Australia and are commonly caught near water. Their range of habitats include Monsoon forest, <i>Melaleuca</i> forest, tall and open forest, open woodland, mulga</p>	<p>Low</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<p><i>Scotorepens greyii</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act – Least Concern</p>		<p>shrubland, mixed shrubland, escarpments, grasslands, river red gum-lined waterways and <i>Pandanus</i>. They are continuous flight foragers, with moderately fast, agile flight. Their diet consists mostly of beetles, bugs and ants. They search for insects close to tree-tops, but not usually above them.</p> <p>They roost in tree hollows, fence posts as well as disused buildings, in small groups usually less than 20 bats. (Churchill 2008).</p> <p>Recorded within the Project Area (PLA) during bat surveys. Given flight behavior below the canopy, they are considered low risk of impact.</p>	
<p>Little bent-wing bat</p> <p><i>Miniopterus australis</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act – Least Concern</p>	<p>Known to occur</p>	<p>Little bent-wing bats are found along the east coast of Australia, in well timbered areas including rain forest, wet and dry sclerophyll forests, vine thickets, <i>Melaleuca</i> swamps and coastal forests. They are cave dwellers, congregating in maternity colonies in summer and dispersing in winter. Their diet consists primarily of beetles, moths, spiders and flies. They are maneuverable flyers between the shrub and canopy layers of forests.</p> <p>Recorded within the Project Area (PLA) during bat surveys. Given flight behavior below the canopy, they are considered low risk of impact.</p>	<p>Low</p>
<p>Australian bent-wing bat</p> <p><i>Miniopterus orianae</i></p> <p>EPBC Act – Not Listed</p> <p>NC Act – Least Concern</p>	<p>Known to occur</p>	<p>They are found east primarily east of the Great Dividing Range, along the East Coast of Australia. Their habitat includes rainforests, wet and dry sclerophyll forest, monsoon forests, open grasslands, open woodlands and <i>Melaleuca</i> forests.</p> <p>In forested areas this species flies high, above the canopy, to many times the canopy height. Their diet consists mostly of moths, along with other insects including flies, cockroaches and beetles. They can forage up to 65kms from their roost sites, which are predominately caves, but can be found in man-made structures, such as road culverts (Churchill 2008).</p> <p>Given their flight behavior many times the canopy height and feeding on aerial insects, they are considered high risk of collision.</p>	<p>High</p>
<p>White-striped freetail bat</p>	<p>Known to occur</p>	<p>White-striped freetail bats are broadly distributed across Southern Australia and found in a wide range of habitats from deserts, grasslands, forests, urban areas, woodlands,</p>	<p>High</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
<p><i>Austronomu s australis</i></p> <p><i>EPBC Act – Not Listed</i></p> <p><i>NC Act – Least Concern</i></p>		<p>shrublands and open agricultural landscapes. They are a tree-dwelling species with roost colonies of up to 300 individuals. In summer they migrate south to cooler areas.</p> <p>Their diet includes moths, beetles and grasshoppers as well as ground dwelling insects such as ants and non-flying beetles.</p> <p>They are a fast flying species, but are not designed for maneuverability (Churchill 2008), which may increase their risk of colliding with turbines.</p> <p>Mortalities have been recorded at other Australian wind farms (BL & A, 2018 and Boothroyd, I et al 2012).</p> <p>Recorded within the Project Area (PLA) during bat surveys. Given their low maneuverability and previous collisions at other Australian wind farms, they are considered high risk of collision.</p>	
<p>Ride's free-tailed bat</p> <p><i>Ozimops ridei</i></p> <p><i>EPBC Act – Not Listed</i></p> <p><i>NC Act – Least Concern</i></p>	<p>Known to occur</p>	<p>Found along the East coast of Australia in a wide range of habitats, including rainforest, <i>Melaleuca</i> forests, monsoon forests, woodlands and open forests. The bats fly predominately through trees to forage for bugs, flies and beetles. They roost mainly in tree hollows but can be found in building, cracks in fence posts and under bark (Churchill 2008).</p> <p>Recorded in Project Area (PLA) during bat surveys. Flight behaviour is predominantly below canopy, however not always, as such they are considered at moderate risk of collision.</p>	<p>Moderate</p>
<p>Northern free-tailed bat</p> <p><i>Ozimops lumsdenae</i></p> <p><i>EPBC Act – Not Listed</i></p> <p><i>NC Act – Least Concern</i></p>	<p>Known to occur</p>	<p>Widely distributed across northern Australia from Western Australia to Qld, extending south to the north-east corner of NSW. They are found in habitats ranging from rainforests to open forests and woodlands, and are often recorded along watercourses.</p> <p>They are found roosting mainly in tree hollows although relatively large colonies have also been found under house roofs in urban areas (NSW Govt. 2018)</p> <p>Recorded in Project Area (PLA) during bat surveys. Little known on flight behavior however is assumed similar to <i>O. ridei</i> and therefore considered moderate risk of collision.</p>	<p>Moderate</p>

Species	Likelihood of Occurrence	Distribution and Flight Behaviours	Susceptibility of Collision
Yellow-bellied sheathtail bat <i>Saccolaimus flaviventris</i> EPBC Act – Not Listed NC Act – Least Concern	Known to occur	Yellow bellied sheathtail bats have a wide distribution across most of north eastern Australia. They are found in a broad range of habitats, from desert to grasslands, wet and dry sclerophyll forests, open woodlands, Acacia scrubland and mallee. They migrate to southern Australia during the summer, generally January – March. They roost in large tree hollows in colonies of up to 30 individuals. They fly fast and straight, usually above the canopy, unless flying out in the open, where they will fly lower. Their diet consists mainly of beetles, however they will also eat a range of other insects including grasshoppers, crickets, leafhoppers, wasps, shield bugs and flying ants (Churchill, 2008). Recorded in Project Area (PLA) during bat surveys. Given their flight behavior above the canopy and diet including aerial insects, they are considered high risk of collision.	High

Nine of the 13 Least Concern (NC Act) microbat species recorded within the Project Area (PLA) are considered to have a moderate to high risk of collision due to their flight behaviour. Impacts to populations of Least Concern bat species with a moderate to high risk of collision are considered low given their stable populations and widespread distribution. Nonetheless, the bird and bat monitoring plan includes all bat species (including Least Concern) to ensure potential impacts are monitored and mitigated if required.

The potential consequences associated with collision based impacts to the population of GHFF (*Pteropus poliocephalus*) is discussed below as they are a conservation significant species.

5.2.2.4 Consequence of Collision (Bats)

Grey-headed flying-fox (*Pteropus poliocephalus*)

GHFF is canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands (DoE, 2019). Roost sites are typically located near water, such as lakes, rivers or the coast.

The Grey-headed Flying-fox is highly mobile and the national population is fluid, moving up and down the east coast in search of food (DoE, 2019). Grey-headed Flying-fox presence will be dependent on food resources. The time and location of flowering and fruiting of diet plants varies among seasons and years. In particular, drought years can have a strong influence on eucalypt flowering times. Sites noted as important in one year or period may not be visited again in the following year (DoE, 2019).

There are seven (7) known GHFF camps within 50km of the wind turbine project area. Two (2) are Nationally Important Flying-fox Colonies (Gympie and Woocoo) which are a minimum 30km and 40km from the nearest turbine, respectively. The Gympie colony is 66km from the furthest turbine,

while Woocoo is 65km from the furthest turbine. Vast areas of foraging habitat are present between the camps and project area.

The two closest camps are Anderleigh Road (9km and 49km (closest and furthest turbine)) and Maaroom (4km and 42km). These camps are known to fluctuate over time, however surveys undertaken since 2012 for the National Flying-fox Monitoring Program indicate they generally average between 2,500 – 9,999 (category 3) individuals.

The relatively small amount of native vegetation within the pine plantation is not considered core foraging habitat compared to the surrounding native state forests and National Parks, outside of the Project Area (PLA). Local populations dispersing at night are also likely to be below the RSA height.

Infrequent collision due to local dispersal flight height, absence of roosts within the Project Area (PLA), camp size (category 3) and the widespread distribution of preferred foraging habitat outside of the project area is therefore considered to pose a low risk to the National population.

5.2.2.5 GHFF Foraging Resources

GHFF require foraging resources and roosting sites (DoEE, 2019). No roosts are known within the Project Area (PLA) however the mosaic of remnant vegetation amongst the exotic pine plantations may occasionally provide foraging resources such as when the vegetation is in flower. GHFF usually forage up to 15km of the day roost site, although they are capable of nightly foraging flights of up to 50km from their camp as resource availability changes (DoEE, 2019). Irregular GHFF migration may also occur between camps subject to food availability.

Within these 15km and 50km foraging zones from each camp, most of the available GHFF foraging habitat (96 – 100%) is outside of the Project Area (PLA) (ie. 0-4% within the Project Area (PLA)). Refer to Figure 6, Appendix A for the foraging areas of each GHFF camp and Table 20 for the areas and proportions of available foraging habitat. This demonstrates the low likelihood of foraging behaviour within the Project Area (PLA) as opposed to the available foraging habitat and associated behaviour outside the Project Area (PLA).

Calculations are considered conservative as they exclude non-remnant vegetation outside the Project Area (PLA) which could also include orchards, street trees and regrowth vegetation (which is comparably absent from the Project Area (PLA) in comparison) which would provide additional foraging habitat outside of the Project Area (PLA).

Table 20 GHFF Foraging Habitat Outside / Inside of Project Area (PLA)

GHFF Camp	Foraging radius from camp	Mapped remnant vegetation outside Project Area (PLA) within foraging radius (ha)	Mapped remnant vegetation inside Project Area (PLA) within foraging radius (ha)	Total remnant within foraging radius	% of Foraging Habitat	
					Outside Project Area (PLA)	Inside Project Area (PLA)
Glenwood	15km	35,514	142	35,657	99.60%	0.4%
	50km	394,078	8,887	402,965	97.79%	2.21%
Maaroom	15km	29,454	737	30,191	97.56%	2.44%
	50km	334,648	8,887	343,535	97.41%	2.59%
Goomborium	15km	29,488	1,281	30,769	95.84%	4.16%
	50km	349,507	8,853	358,360	97.53%	2.47%
Maryborough Albion Rd	15km	33,531	53	33,585	99.84%	0.16%
	50km	398,666	7,850	406,516	98.07%	1.93%
Gympie	15km	29,917	0	29,917	100.00%	0.0%

	50km	408,925	6,643	415,568	98.40%	1.6%
Woocoo	15km	46,740	0	46,740	100.00%	0.0%
	50km	420,312	3,404	423,717	99.20%	0.8%
Maryborough Tinana Cr	15km	29,563	197	29,760	99.34%	0.66%
	50km	400,221	8,822	409,043	97.84%	2.16%

The above table excludes non-remnant areas (which could also be foraging areas such as orchards outside of the Project Area (PLA)) and waterways (including oceans, estuaries and canals).

5.2.3 Terrestrial and Aquatic Flora and Fauna (non-flying)

Wind Farm infrastructure within the Project Area (PLA) avoids remnant vegetation by strategically placing turbines, compounds (operation and construction) within the pine plantations, therefore avoiding impacts to remnant vegetation and terrestrial and aquatic habitat within these remnant areas. Access is via existing forestry tracks.

Indirect impacts such as sediment runoff will be managed through applying to strict erosion and sediment control practices.

Crinia tinnula (wallum froglet) were identified in the northern portion of the Project Area (PLA) (in a roadside drain) and other low-lying remnant and non-remnant areas contain suitable habitat for this species and other threatened frog species such as *Litoria freycineti* (wallum rocketfrog). These areas are avoided within the Project Area (PLA) and therefore impacts to amphibians in these areas are considered unlikely. Impacts outside of the remnant areas is also considered unlikely due to utilizing existing access tracks.

No threatened fish or turtles were recorded although they may be present in the permanent creeks through the Project Area (PLA). Waterways and riparian areas are not impacted by the project and therefore impacts to threatened fish, reptiles (including turtles) and amphibians is considered unlikely.

6 MANAGEMENT MEASURES

Mitigation measures proposed are in accordance with industry standards and the mitigation recommendations provided in *Wind Farm Industry EPBC Act Policy Statement 2.3 (DoE, 2009)*.

Avoidance is the guiding principle to minimising impacts on all flora and fauna, particularly MNES and MSES within the Project Area (PLA). Avoidance measures utilised in the Project include:

- The Project is set back a minimum of 4km from the Great Sandy Strait which is a known significant non-breeding area for EPBC listed migratory shorebirds.
- The Project Area (PLA) is located within an existing exotic pine plantation and predominantly avoids remnant vegetation and waterways.
- Only marginal clearing of remnant vegetation may occur for upgrades to existing waterway crossings.
- Electrical cabling will mostly be underground along existing access tracks which will further reduce the likelihood of collision and/ or electrocution of birds and bats.
- Other infrastructure such as construction compounds avoid remnant vegetation and waterways and therefore avoid damage to remnant areas of natural habitat.
- Existing forestry tracks will be used to provide access within the Project Area (PLA) and therefore avoids disturbance to remnant vegetation and habitat within remnant areas.
- Pineapple zamia will also be avoided during the micro-siting process of the wind turbines.
- Translocation of Pineapple Zamia under an Approved Translocation Management Plan may be required if micro-siting is not feasible in some locations, although this is considered unlikely.
- Pre-clearance surveys undertaken prior to any track widening or clearing along roadsides or within pine plantation areas to determine if native species resilient to disturbance are present and if further avoidance measures are required.

Additional mitigation measures to reduce collision based impacts during operation are associated with adaptive management and reducing the risk of attracting birds and bats into the rotor swept area (RSA) of the wind farm. This includes:

- An adaptive management bird and bat monitoring program has been prepared and already commenced implementation. Should the monitoring program's results demonstrate that further mitigation is required, further assessment will be undertaken to determine appropriate mitigation or management measures. Additional measures may include deploying a radar detection and deterrent technology system.
- Spatially and temporarily replicated carcass monitoring undertaken by suitably qualified ecologists or trained detector dogs or other approved method. This will be used to identify particular turbines that may be causing excessive number of deaths of any species. Monthly surveys to be undertaken at a stratified random representative selection of turbines. Surveys will also be timed to occur at times of flowering of eucalypt and melaleuca where possible. Should mortality be shown to exceed an acceptable mortality rate, comprehensive evaluation of risk factors will be undertaken and mitigation plans adopted until the risk of impact has been abated. Mitigation plans may include changes in operational regimes of the turbine causing impact, for example, different systems, limiting rotational speed or suspension of operation of high risk turbines in high impact periods which may be identified through detection systems (eg. departure and return flight times in evening for bats, identified with a radar).
- Trial acoustic and/or sonar to deter bats/birds. Slow rotor speeds or temporary shutdown of subject turbines during Summer period of known migratory aerial insectivores when birds may be on site.
- A Project specific Bird and Bat Management Plan has been prepared which outlines the objectives and monitoring program.

Additional measures to reduce impacts to flora and fauna include:

- Utilise existing tracks wherever possible
- Pre-clearance/pre-construction surveys to determine if site -specific micro-siting of turbines is required to further minimise impacts
- Clearly and accurately designate no-go areas prior to detailed design of Transmission Line to ensure sensitive areas are spanned (eg. pineapple zamias, confirmed EH, waterways)
- Span waterways as much as reasonably practical.
- Micro-siting of wind turbines.
- Avoid HBTs where possible. Remnant areas within Project Area (PLA) where most HBTs occur are avoided and therefore loss of hollows is expected to be minimal. Nonetheless, pre-clearance surveys to determine density and number of hollows lost during construction, if any. Replace any loss of hollows at a previously agreed replacement ratio.
- ESCP developed by a CPESC
- Clearly and accurately designate no-go areas prior to any vegetation clearing
- Storage of fuels, chemicals, wastes and other potentially contaminating substances in appropriately bunded areas and away from waterways.

6.1 Offset Strategy

Koalas and koala habitat are known to occur in the NSF. No confirmed infrastructure is proposed in this area at this stage and therefore does not trigger any offset requirements.

6.2 Additional Permits

The following permits may be required for the Project:

- A Protected Plant Clearing Permit (Section 15 of *Nature Conservation (Administration) Regulation (2006)*) may be required following additional pre-clearance surveys, including protected plant surveys within the flora survey trigger areas.
- A Riverine Protection Permit (*Water Act (2000)*) may be required to upgrade existing waterway crossings.
- A Licence to Take or Interfere with Water (*Water Act (2000)*) may be required to upgrade existing waterway crossings.
- A Species Management Program (Low and High Risk) (NC Act)) may be required for tampering with a protected animal breeding place
- A Permit to Clear Native Vegetation in a State Forest (Section 39 *Forestry Act 1959*) may be required to clear vegetation in a State Forest

7 CONCLUSION

This report presents the results of the flora and fauna (including bird and bat utilisation surveys), and accompanies the baseline Ecological Investigation prepared by Premise (2017). The surveys, including the bird utilisation survey has been designed to comply with State code 23: Wind farm development (the code) (Queensland Government, 2017). The potential impacts to flora and fauna, with specific consideration given to birds and bats have been assessed and specific mitigation measures to reduce the severity of potential impacts identified.

Desktop assessments and detailed field surveys have been undertaken across the Project Area (PLA), including reference sites away from proposed turbine locations, since 2016. Initial surveys have been undertaken over the NSF portion of the Project Area (PLA). Key findings of the assessments include:

7.1 Birds

- 139 fixed-point bird utilisation surveys have been undertaken across the Project Area (PLA) (including reference sites) between December 2016 and April 2019.
- 66 bird species were recorded on the Project Area (PLA)
- Five (5) of the 66 bird species were of conservation significance:
 1. White-throated needletail (*Hirundapus caudacutus*) – V, MT, LM (EPBC Act)
 2. Fork-tailed swift (*Apus pacificus*) – MT (EPBC Act)
 3. Spectacled Monarch (*Monarcha trivirgatus* syn. *Symposiarchus trivirgatus*) – LM, MT (EPBC Act)
 4. Rainbow bee-eater (*Merops ornatus*) – LM (EPBC Act)
 5. Cicadabird (*Coracina tenuirostris*) – LM (EPBC Act)
- No migratory shorebirds were observed flying over the site during known migratory activity periods suggesting the movement pathways are north – south along the Queensland coastline.
- 71% of the birds are considered to have low risk flight behaviours, occurring below the RSA on all recorded occasions. 92% of all bird species were recorded below the RSA, however some of these species are still capable of flying at or above the RSA
- 19 birds recorded on the Project Area (PLA) are known to exhibit moderate to high risk flight behaviour and include:
 - White-throated needletail (*Hirundapus caudacutus*) – V, MT, LM (EPBC Act)
 - Fork-tailed swift (*Apus pacificus*) – MT (EPBC Act)
 - Whistling kite (*Haliastur sphenurus*) – Least Concern (LC) (NC Act)
 - Channel-billed cuckoo (*Scythrops novaehollandiae*) – LC (NC Act)
 - Tree martin (*Petrochelidon nigricans*) – LC (NC Act)
 - Spotted harrier (*Circus assimilis*) – LC (NC Act)
 - Black-shouldered kite (*Elanus axillaris*) – LC (NC Act)
 - Welcome swallow (*Hirundo neoxena*) – LC (NC Act)
 - White-necked heron (*Ardea pacifica*) – LC (NC Act)
 - Brown falcon (*Falco berigora*) – LC (NC Act)
 - Australian hobby (*Falco longipennis*) – LC (NC Act)
 - Peregrine falcon (*Falco peregrinus macropus*) – LC (NC Act)
 - Wedge-tailed eagle (*Aquila audax*) – LC (NC Act)
 - Rainbow bee-eater (*Merops ornatus*) – LM (EPBC Act)
 - Cicadabird (*Coracina tenuirostris*) – LM (EPBC Act)
 - Torresian crow (*Corvus orru*) – LC (NC Act)
 - Australian magpie (*Gymnorhina tibicen*) – LC (NC Act)
 - Sulphur-crested cockatoo (*Cacatua galerita*) – LC (NC Act)
 - Yellow-tailed black-cockatoo (*Calyptorhynchus funereus*) – LC (NC Act)
- Six (6) of these bird species were identified during surveys flying at or above RSA which included:

- White-throated needletail (*Hirundapus caudacutus*) – V, MT, LM (EPBC Act)
- Fork-tailed swift (*Apus pacificus*) – MT (EPBC Act)
- Whistling kite (*Haliastur sphenurus*) – least concern
- Wedge-tailed eagle (*Aquila audax*) – least concern
- Channel-billed cuckoo (*Scythrops novaehollandiae*) – least concern
- Tree martin (*Petrochelidon nigricans*) – least concern
- The potential impact of the five (5) bird species of conservation significance was assessed.
- It was determined that although the risk of collision of some bird species (WTN and FTS) may occur, the likelihood of impacting the International and/or National population of these species is considered low. This is due to the widespread distribution of the species and the highly variable occurrence and abundance of this species across the Project Area (PLA).
- Impact on populations of Least Concern (NC Act) bird species considered at risk of collision is considered low, however adaptive management strategies will be applied to all species known or likely to occur within the Project Area (PLA).

7.2 Bats

- Up to 14 species of microbat were recorded during the bat surveys.
- None of the microbat species recorded are threatened species under the NC Act or EPBC Act
- There are three (3) species of flying-foxes known to occur in the region.
 - Grey-headed flying-fox (GHFF) (*Pteropus poliocephalus*) – (EPBC Act – Vulnerable, NC Act – Least Concern)
 - Little red flying-fox (LRFF) (*Pteropus scapulatus*) – (EPBC Act – Not Listed, NC Act – Least Concern)
 - Black flying-fox (BFF) (*Pteropus alecto*) – (EPBC Act – Not Listed, NC Act – Least Concern)
- There are seven (7) grey-headed flying-fox camps within 50km of the Project Area (PLA), which have been active over the past five (5) years. These camps are often mixed with the black-flying fox and little-red flying fox. Two (2) of the seven (7) camps are Nationally Important Grey-headed Flying-fox Colonies which are 30km and 40km from the nearest turbine. Given the distance to the site, relatively small amount of remnant vegetation (foraging habitat) on site (0-4% within foraging ranges) and significant widespread foraging areas between these camps and the site (96-100% outside Project Area (PLA)), significant impacts to these populations are considered unlikely.
- As above, given the large areas of intact native vegetation outside of the Project Area (PLA) and relatively small amount of native foraging vegetation within the Project Area (PLA), and local flight behaviour, the risk of collision-based impacts on least concern flying-fox colonies and grey-headed flying-fox colonies within 50km of the turbine area is considered low.
- No daytime flying-fox roosts are known within the Project Area (PLA).
- Impact on populations of Least Concern (NC Act) bat species considered at risk of collision is considered low, however adaptive management strategies will be applied to all species known or likely to occur within the Project Area (PLA).

7.3 Terrestrial and Aquatic Flora and Fauna

- *Macrozamia pauli-guilielmi* (Pineapple Zamia) listed as endangered under the EPBC Act and NC Act was identified in the Project Area (PLA) and within the NSF portion of the Project Area (PLA). The *Macrozamia*s found within the Project Area (PLA) have helped inform the layout and will be avoided. The *Macrozamia*s within the Project Area (PLA) were found in remnant vegetation and also mature pine plantations. All plants were found within 10m of road edges. Access is proposed to utilise existing access tracks and therefore impacts to *Macrozamia*s is proposed to be avoided.
- Some areas within the Project Area (PLA) have been mapped within a high-risk area on the DES Protected Plants Flora Survey Trigger Map. Should clearing be required within these areas, a pre-construction survey will be required to meet the requirements of the Flora Survey Guidelines.

- Koalas are known to occur in the NSF portion of the Project Area (PLA). No confirmed infrastructure is proposed for this area.
- No greater gliders were identified in the areas surveyed within the Project Area (PLA) or NSF.
- *Crinia tinnula* (Wallum froglet) listed as vulnerable under the NC Act was identified in a roadside drain next to the Maryborough – Tuan Forest Road (access road into Hyne Timber Mill) within the Project Area (PLA). Other similar areas (ie. roadside drains in low-lying areas) within the Project Area (PLA) may potentially also provide suitable habitat for this species. Although they are not expected to be impacted by the Project (due to utilising existing tracks, should access tracks require widening in low-lying areas, pre-clearing surveys are recommended with works undertaken in accordance with an approved Species Management Plan for acid frogs).
- No other threatened frog species were identified within the Project Area (PLA), although they may occur in remnant areas such as along Tinana Creek which is not impacted by the Project.
- No threatened fish or turtles were recorded although they may be present in the permanent creeks through the Project Area. Waterways and riparian areas are not impacted by the project and therefore impacts to threatened fish, reptiles (including turtles) and amphibians is considered unlikely.

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