Rio Tinto Weipa Pty Ltd

# Terrestrial Management Plan – South of Embley Project - Amrun

16/10/2025

## DOCUMENT CONTROL

| Version | Purpose | Approval | Submission | Date |
|---|---|---|---|---|
| Final V1.0 | Submitted to DoE | | Submitted | 31 December 2014 |
| Final V1.1 | Response to DoE Comments | | Submitted | 31 May 2015 |
| Final V1.2 | Response to DoE 2nd Comments | | Submitted | 28 July 2015 |
| Final V1.3 | Response to DoE Migratory Bird Comments | | Submitted | 28 August 2015 |
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| Final V2.1 | Submission to DAWE for approval after incorporation of comments | | Submitted | 28 May 2020 |
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| Final V3.1 | 5 yearly review | | Submitted | 3 February 2025 |
| Final V3.1 | Respond to DCCEEW Comments | | Submitted | 16 October 2025 |
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[1] Plan approved by delegate 19 December 2025, however, approval was only provided to RTA Weipa PTY LTD 30 January 2026.

# TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES



## LIST OF APPENDICES

# 1 PURPOSE

This Terrestrial Management Plan documents the principles and practices under which RTA Weipa Pty Ltd (RTW) will undertake all land based activities associated with the construction and operation of the South of Embley (SoE) Project[2] (the Project) to manage, avoid and mitigate potential negative impacts on the following Matters of National Environmental Significance (MNES):

- Red Goshawk (*Erythrotriorchis radiatus*) – listed as Endangered (at time of approval listed as Vulnerable);
- Masked Owl (*Tyto novaehollandiae kimberli*) – listed as Vulnerable;
- Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*) – listed as Vulnerable;
- Listed migratory bird species as outlined in Appendix A;
- Listed Flora Species
    - Cooktown Orchid *(Dendrobium bigibbum*) – listed as Vulnerable;
    - Chocolate Tea Tree Orchid (*Dendrobium johannis [Cepobaculum johannis*]) – listed as Vulnerable; and,
    - Beach Nightshade (*Solanum dunalianum*) – listed as Vulnerable.

This Plan has been prepared to satisfy Conditions 25 to 30 of the South of Embley Project approval (EPBC 2010/5642) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

# 2 BACKGROUND

A detailed environmental impact assessment of MNES under the EPBC Act, including community consultation, was undertaken and is presented in the *South of Embley Project Environmental Impact Statement* (RTA 2013), referred to herein as the Commonwealth EIS.

## 2.1. REGULATORY REQUIREMENTS

The then Minister for Sustainability, Environment, Water, Population and Communities approved the SoE Project (EPBC 2010/5642) with conditions on 14 May 2013. The approval was varied on 3 December 2021 and requires a Terrestrial Management Plan be prepared and approved by the Minister prior to the commencement of the action. The plan was approved by the minister prior to the commencement of construction operations on 14 October 2015 and continues to be implemented. This plan addresses Condition 30 which requires submission of a revised Terrestrial Management Plan within 60 days of the first anniversary of commencement of operations with operations commencing on the 02 December 2018. The conditions relating to the Terrestrial Management Plan, and where they are addressed in this document, are outlined in **Table 1**.

[2] The Amrun Project is the first stage of the South of Embley (SoE) Bauxite Mine and Port Project. It was renamed in consultation with the local traditional owners. Naming remains SoE throughout to be consistent with permit conditions.

## Table 1: Terrestrial Management Plan EPBC Act Approval Conditions

| Condition | Addressed in this Management Plan |
|---|---|
| **25.** The approval holder must submit a Terrestrial Management Plan covering all of the land based activities associated with the **construction** and **operation** of the project for the **Minister's** approval to effectively define, avoid, adaptively manage and mitigate negative impacts to the following **matters of national environmental significance**:<br>**i.** Red Goshawk*(Erythrotriorchis radiatus*); Masked Owl (*Tyto novaehollandiae kimberli)*; and Bare-rumped Sheathtail Bat *(Saccolaimus saccolaimus nudicluniatus)*<br>**ii.** **listed migratory bird species**; and,<br>**iii.** **Listed flora species.** | This plan |
| **26.** The Terrestrial Management Plan must incorporate avoidance and mitigation measures for each impact associated with the project including, but not limited to: | **Section 5** describes potential impacts & **Section 6** describes avoidance and mitigation measures |
| **a.** measures for water related **impacts** including, but not limited to, erosion, construction and operation of the dam; stormwater runoff, flood events, hydrocarbon spills, sewage, crude or process water, runoff from ore stockpiles, and downstream **impacts** on watercourses, streams and marine environment (including estuaries); | Section 6.5 |
| **b.** measures for pests and weed management, dust management, and fire management; | Section 6, specifically Section 6.4, 6.3, 6.6 and 6.2, respectively. |
| **c.** implementing the vegetation buffers zones at condition 21; and, | Section 6.1 |
| **d.** measures identified in the Environmental Management Plan Outlines at Appendix 5-A (Threatened Flora Species); Appendix 6-C (Threatened fauna species); Appendix 8-A (Avian Migratory Species); and, Appendix 16-B (Water Monitoring and Management Conditions) in the **Final Environment Impact Statement.** | Section 5 and Section 6 |
| **27.** The Terrestrial Management Plan must also include adaptive management strategies to benefit the species listed at condition 25. The Terrestrial Management Plan must include and address effective management strategies to mitigate each potential **impact**, desired outcomes, benchmarks, readily measureable performance indicators and goals, timeframes for reporting and | Section 5 and Section 6 with a summary in **Table 9** |

| Condition | Addressed in this Management Plan |
|---|---|
| implementation, corrective actions and contingency measures, and, specify the persons/ roles with responsibility for implementing actions. The Terrestrial Management Plan must provide information detailing Traditional Owner employment opportunities, and mechanisms for reporting the number of local indigenous person/s actually employed in the implementation of this Plan (consistent with condition 42). | Section 8 |
| **28.** The Terrestrial Management Plan must be informed by the most current information available to avoid, manage or mitigate **impact** associated with the project (including, but not limited to *National Water Quality Management Strategy, Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000) or most current version/s of these guidelines. | Sections 6 |
| **29.** The Terrestrial Management Plan must be submitted to the **Minister** for approval at least 6 months prior to the **commencement of the action**. The **commencement of the action** must not occur until the Terrestrial Management Plan has been approved by the **Minister**. The approved Terrestrial Management Plan must be implemented**.** | The first version of the Terrestrial Management Plan was submitted to the Minister on 2 January 2015. Commencement of the Action occurred on 12 May 2016 with commencement of Construction, not Preliminary Works, as defined in EPBC 2010/5462. The Terrestrial Management Plan was approved by the Minister on 14 October 2015. |
| **30.** Within 60 days of the first anniversary of **operations** commencing, a revised Terrestrial Management Plan must be submitted to the **Minister** for approval. The Terrestrial Management Plan must be reviewed, revised and submitted to the **Minister** for approval every five (5) years (unless otherwise agreed by the **Minister** in writing) thereafter for the life of the project. The approved Terrestrial Management Plans, as revised, must be implemented. | This plan |

In addition, the Queensland Government also has issued conditions under the Environmental Authority (EPML00725113) (EA) relating to the management of certain terrestrial fauna listed under the Queensland *Nature Conservation Act 1992*. This Plan does not specifically address the Queensland EA; however, many of the requirements are similar.

## 2.2. PROJECT SUMMARY

The Project involves the construction and operation of a bauxite mine and associated processing and Port facilities for shipping of bauxite to either Gladstone or international markets. The Project (now referred to as Amrun) involves a staged increase in production up to 50 million dry product tonnes per annum (Mdptpa) of bauxite. The initial production capacity of the Project is approximately 22.8 Mdptpa , which has been constructed through the Amrun Project. Actual production rates and the timing and size of capacity expansions will depend on market conditions. The anticipated mine life is approximately 40 years (depending on production rates).

The Amrun operations are located near Boyd Point on the western side of Cape York Peninsula (**Figure 1**) and includes a range of infrastructure to support mining including processing plant, dam and tailing storage. Ferry and barge terminals are located at the existing Port of Weipa and along the northern and southern side of the Hey River and will transport the workforce and materials for day to day operations.

The main terrestrial components of the Project associated with terrestrial flora and fauna are illustrated in **Figure 1** and summarised below. Detailed information on the Project is presented in the Commonwealth EIS (RTA, 2013).

- **Bauxite mining** – involving the clearing, salvage of topsoil, stripping of overburden, extraction of up to 50Mdptpa of bauxite, replacement of topsoil and revegetation. Mined areas will be progressively rehabilitated;
- **Bauxite processing** – crude bauxite will be transported using a network of internal haul roads to one of two beneficiation plants (Boyd beneficiation plant, followed by a second plant near Norman Creek). A beneficiation plant separates the bauxite and waste materials through sizing, screening, washing and dewatering. Chemicals are not used in the process, only water. Fine waste materials are discharged to a tailings storage facilities;
- **Product bauxite stockpiles** – beneficiated product stockpiles built by a stacker for subsequent reclaiming are established adjacent to Boyd Port;
- **Ancillary infrastructure** – involving the construction and operation of a diesel-fuelled power station, workshops, warehouse, administration facilities, potable water treatment facilities, package sewage treatment plants, temporary waste storage prior to disposal off-site and diesel storage facilities;
- **Barge, ferry and tug facilities** – involving the construction and operation of a new ferry and roll on/roll off barge facility at Humbug Wharf, and a new barge and ferry terminal on the western bank of the Hey River;
- **On-site camp** – involving the construction and operation of a camp facility of approximately 900 beds
- **Water infrastructure** – involving the construction and operation of a water supply dam on a freshwater tributary of Norman Creek (referred to as Arraw Dam[3]), plus pipelines, water treatment plants (for potable water) and artesian bores;
- **Port and ship-loading facilities** – involving the construction and operation of the Boyd Port, ship-loading and tug mooring facilities between Boyd Point and Pera Head. The facility comprises of a jetty, bulk carrier vessel wharf and berthing structures, tug and line boat moorings, ship-loader plus initial and maintenance dredging of berth pockets and departure areas.

Preliminary Works for the Project commenced in October 2015, the Construction phase commencing on 12 May 2016 (Commencement of the Action) and the Operational phase of the Project commenced on 2 December 2018.

The Port of Weipa will continue to receive deliveries of fuel, cargo, and equipment for the Project at the Humbug, Evans Landing, and Lorim Point wharves from domestic (mostly the Port of Cairns)

[3] Arraw Dam was previously referred to as Dam C in the EIS documents. The Dam was named Arraw in 2017 which is the Wik-Waya term for Emu.

and international ports. Materials will then be transferred either to vehicles or smaller barges as required for transport to Amrun Mine.

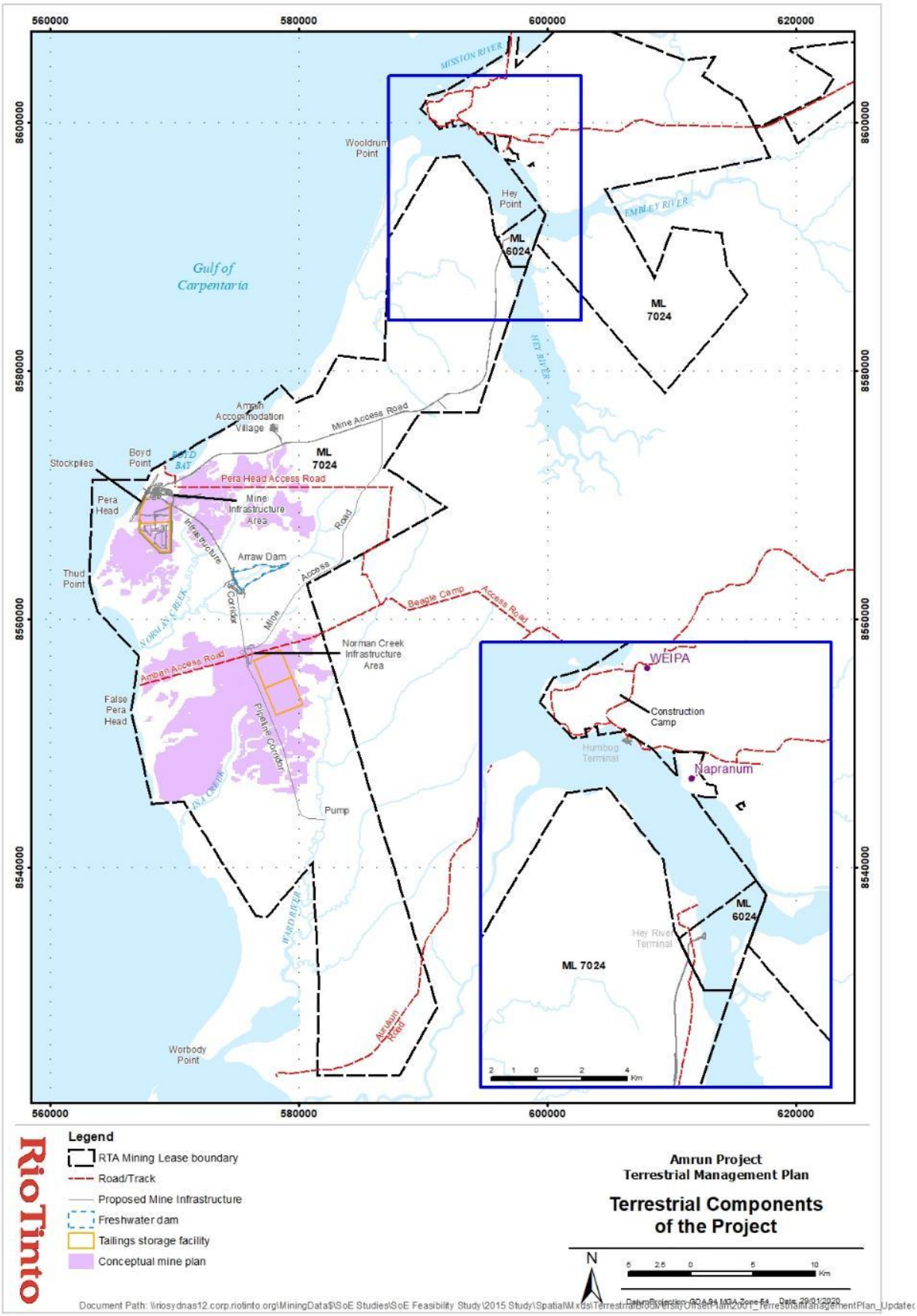


**Figure 1: Terrestrial Components of the Amrun Mine**

# 3 ENVIRONMENTAL RISK

Activities carried out for mining activities can pose considerable risk to MNES. This risk framework was developed specifically for the potential impacts to MNES from operational activities and based on the management practices outlined in the Leading Practice Sustainable Development for the mining industry risk assessment and risk management handbook (LPSDP 2016). The risk assessment approach was based on the following:

- Identification of potential impacts;
- Assessment of likelihood and consequence of the potential impacts;
- Assignment of a risk rating (inherent risk);
- Consideration of mitigation measures; and
- Reassessment of the risk rating, by re-evaluating the consequence and likelihood criteria, given the influence of the mitigation measure (residual risk).

A summary of the criteria used to determine consequence and likelihood of each potential impact is described in **Table 2** and **Table 3** respectively. Consequence levels are assessed based on impacts to ecosystem function, communities or species based on the impact. The risks were assessed as low, moderate, high and critical with the risk assessment matrix in **Table 4**. An initial risk assessment was completed based off already existing legislative controls (e.g. legislation) and is presented in **Section 6.7**. The assessment was then repeated, following consideration of all mitigation measures and safeguards (**Section 7.7**).

## Table 2: Consequence Descriptions

| Consequence levels | Negligible | Minor | Moderate | Major | High |
|---|---|---|---|---|---|
| Ecosystem function | Alteration or disturbance within natural variability. Ecosystem interactions may have changed but it is unlikely that there would be any detectable change outside natural variation or occurrence | Measurable change to the ecosystem components without a major change in function (no loss of species or introduction of new species that affects function), Recovery in less than 1 year | Measurable changes to ecosystem components without major change in function (no loss of species or introduction of new species that affects function), Recovery in 1-2 years | Measurable changes to ecosystem components with a major change in function Recovery in 3-10 years | Long term and possible irreversible damage to one or more ecosystems functions. Recovery if at all is greater than 10 years |
| Habitat communities / assemblages | Alteration or disturbance within natural variability. Less than 1% area is affected or removed | 1 – 5% of area affected in major way or removed. Re-establishment in a year | 5-30% of area affected in major way or removed. Re-establishment 1-2 years | 30-90% of area affected in major way or removed. Re-establishment 3-10 years | Greater than 90% of the area affected in a major way or removed. Reestablishment is at all is greater than 10 years. |
| Species | Population size or behaviour may change but unlikely to be any detectable change outside natural variation | Detectable change to population size and behaviour. No detectable impact on population breeding or dynamics and recover in less than a year | Detectable change to population size and behaviour. No detectable impact on population breeding or dynamics and recover in 1-2 years | Detectable change to population size and behaviour. No detectable impact on population breeding or dynamics and recover in 3-10 years | Local extinctions are imminent/immediate or population no longer viable. Recover if at all greater than 10 years. |

### Table 3: Likelihood Descriptors

| Likelihood | Description |
|---|---|
| A – Almost certain | Recurring event during life of the project – occurs multiple times a years (more than twice) |
| B – Likely | May occur frequently during the project – 1 to 2 times per year |
| C – Possible | May occur during life of project – 1 -10 years |
| D – Unlikely | Event that is unlikely to occur in the life time of project – 10 -100 year event |
| E - Rare | Event that is very unlikely to occur during the life time of a project - 100 year event |

### Table 4: Risk Assessment Matrix

| Likelihood | Consequence | | | | |
|---|---|---|---|---|---|
| | Negligible | Minor | Moderate | Major | High |
| A – Almost certain | Moderate | High | Critical | Critical | Critical |
| B – Likely | Moderate | High | High | Critical | Critical |
| C – Possible | Low | Moderate | High | Critical | Critical |
| D – Unlikely | Low | Low | Moderate | High | Critical |
| E - Rare | Low | Low | Moderate | High | High |

# 4 RELEVANT TERRESTRIAL SPECIES

Ongoing terrestrial flora and fauna surveys have been completed across the greater Amrun lease since 2006 to understand the distribution and abundance of potential MNES which could be impacted by mining activities. Details of these surveys can be found online in the EIS and pre-disturbance surveys annual reports alongside further Amrun environmental documentation (https://www.riotinto.com/en/operations/australia/weipa). Comprehensive flora and fauna surveys for EIS baseline data and operational pre-disturbance have included a variety of methods across the sites and seasons and this includes (but is not limited to):

- Incidental sightings
- Trapping (pitfall, box traps, cage traps, funnels)
- Camera traps
- Traverses
- Bird surveys
- Spotlighting
- Diurnal and nocturnal active searches
- Call playback

As outlined in Condition 25, two species of terrestrial birds, one bat, listed flora (three) and listed migratory birds were identified as those requiring effective management. Section 4.1 to 4.4 provides a summary of important information which has been identified and implemented since the previous TMP and EIS. Full profiles of the species, targeted surveys and general survey efforts are included in **Appendix B** and the Commonwealth EIS (RTA, 2013). Further detail on general pre-disturbance survey efforts are also included in **Appendix B.** Additional detail can be found on the Weipa website (https://www.riotinto.com/en/operations/australia/weipa). .

## 4.1. RED GOSHAWK

The Red Goshawk (*Erythrotriorchis radiatus*) is listed as Endangered (EPBC) with suitable habitat for the species found within the operational area. A dedicated research program commenced in 2018 in partnership with the University of Queensland (UQ), the Australian Wildlife Conservancy (AWC) and the Queensland State Environmental Administering Authority to gain a better understanding of the habitat, range and breeding success of the species. The broader aims of the Red Goshawk Research Project are to support and inform RTW's land management practices in order to provide rehabilitation that is functionally equivalent to the pre-disturbance habitat. The research will also aim to influence sustainable management of Red Goshawk habitats and provide original data and findings which support conservation efforts for the species across its distribution.

Intensive nest surveys searches have been carried out across all areas within the current and planned disturbance footprint for the Amrun operation, with four Red Goshawk nests found see Appendix Table B 9). As with all MNES, appropriate management processes are enacted following the identification of an active nest within the operational footprint.

Sightings and suitable habitat for this species are captured in

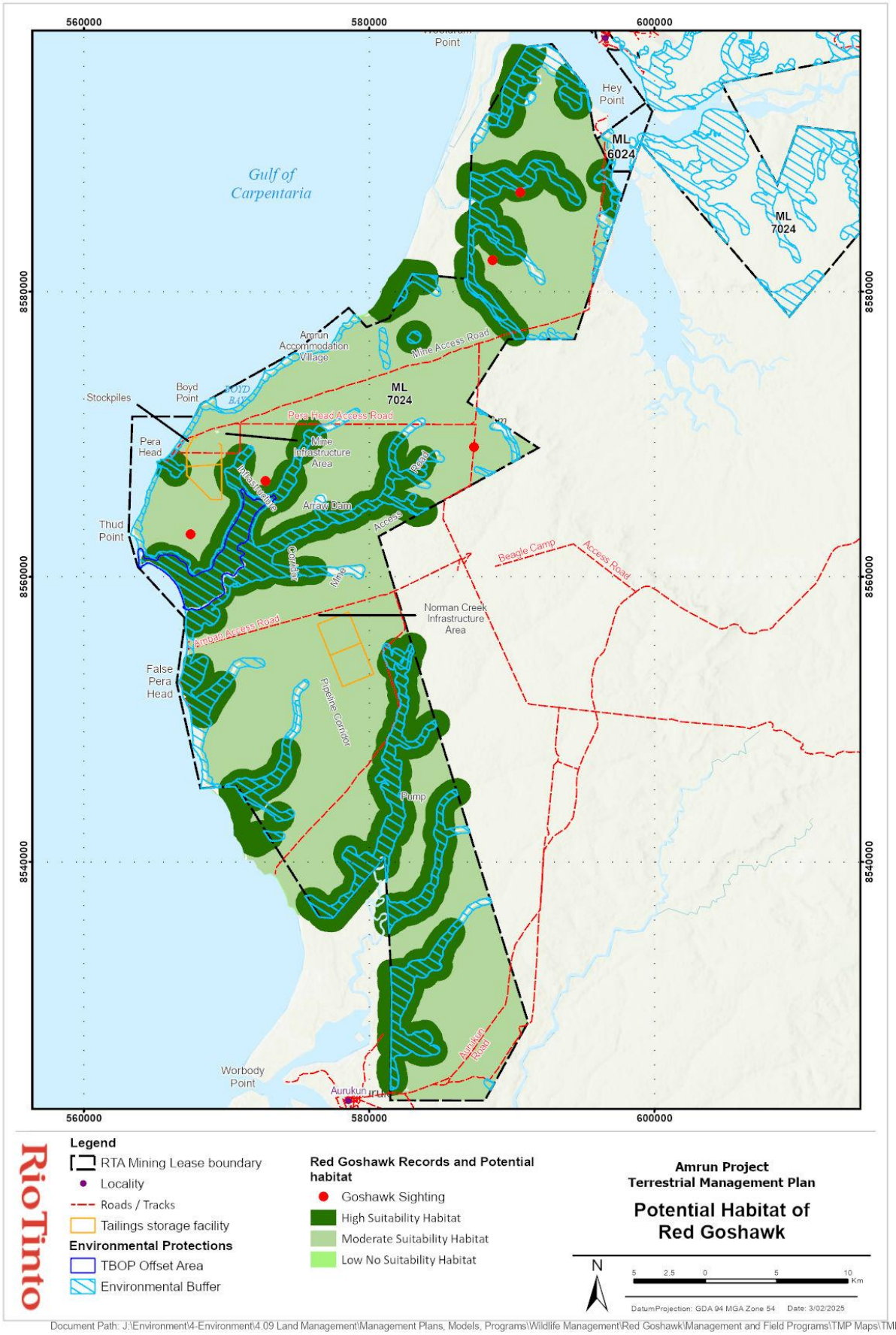

**Figure 2**.

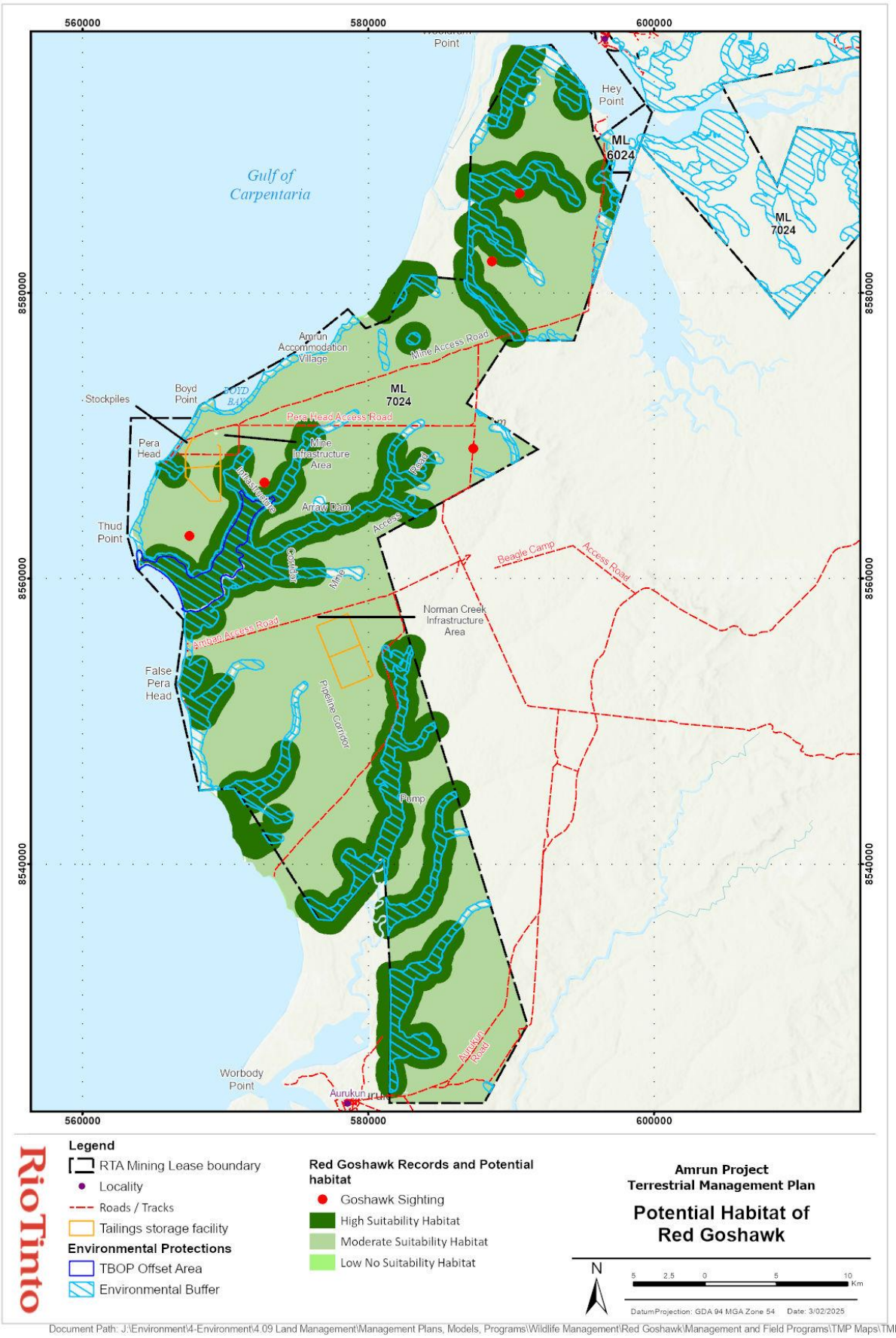


**Figure 2: Potential Habitat of the Red Goshawk**

## 4.2. MASKED OWL

The Masked Owl (*Tyto novaehollandiae kimberli*) is listed at Vulnerable (EPBC). The total confirmed historic record of this species comprises of two specimens from the Watson River and Archer Creek in the vicinity of Aurukun, collected in 1914 and 1915 respectively (Specimens 20491 and 20489, Adelaide Museum).

Significant effort was put into detecting this subspecies of Masked Owl throughout the initial and construction phases of the project, including night call playback, spotlight and hollow surveys, with no evidence of occupation by the species found (Appendix Table B 9). Survey effort was focused around areas of potential habitat for Masked Owl, including areas of disturbance, the Infrastructure Corridor and Arraw Dam.

Potential habitat is displayed in **Figure 3** and all falls within the current Weipa operations environmental buffers, excluded from all mining activity. Should this species be subsequently detected within the operational area, as with all MNES, appropriate management processes will be enacted.

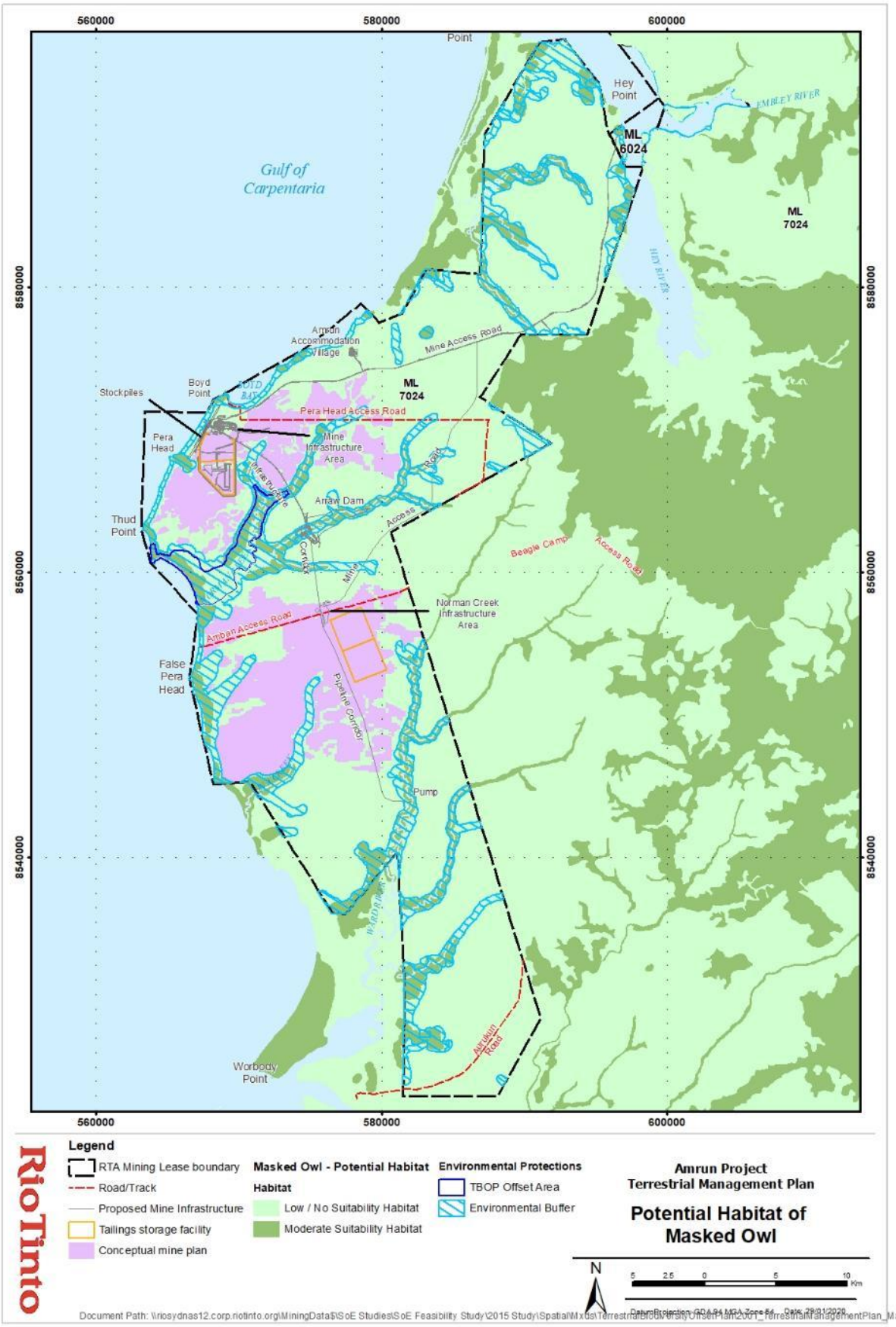


**Figure 3: Potential Habitat of the Masked Owl**

## 4.3. BARE-RUMPED SHEATHTAIL BAT

The Bare-rumped Sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*) has not been detected on site. Surveys conducted for the Bare-rumped Sheathtail Bat in the Project area are summarised in **Appendix C**. These included general bat surveys between 2007 and 2009 and targeted surveys for the species in 2012. The Bare-rumped Sheathtail Bat was not recorded in the Project area during either the general surveys or targeted survey. The 2012 surveys included deployment of broad spectrum acoustic monitors. At that time an adequate reference call library for the Bare-rumped Sheathtail Bat was not available and an analysis of the acoustic monitoring results was unable to be included in the Commonwealth EIS (RTA 2013). Subsequent statistical analysis by Armstrong and Konishi (2013) using reference calls from a known roost near Cairns found there was no unambiguous evidence of the occurrence of the Bare-rumped Sheath-tailed Bat in the Project area. It was concluded that, while there were limitations in the acoustic analysis, there was no indication of presence of the Bare-rumped Sheath-tailed Bat from recordings of bat echolocation. This report can be found on the Amrun Project website https://www.riotinto.com/search/documents#main-search_e=0&main-search_sxatags=weipa .

The results of the targeted broad spectrum acoustic survey were provided to the Commonwealth Department of Environment on 28 November 2013, satisfying the requirement of Condition 31 (a) of the EPBC approval.

Given the lack of data on this species on Cape York and the absence of records or data on habitat utilisation in Western Cape York Peninsula it is not possible to predict potential habitat within the Project area accordingly no potential habitat map is provided.

As per Condition 31(b) of the EBPC approval a sponsorship agreement was reached with the Australasian Bat Society in May 2013. RTA and ABS finalised the agreement on 12 December 2018 with payment now completed.

Should the Bare-rumped Sheathtail Bat be identified in the Project area, adaptive management measures to avoid and mitigate impacts from the mine will be incorporated in this management plan within 6 months of identification of the species in accordance with Condition 31(d) of the EPBC 2010/5642 Approval.

## 4.4. PROTECTED FLORA

Three species of protected flora have the potential to occur within the Amrun Project Area. This includes the Cooktown Orchid (*Dendrobium biggibum*), Chocolate Tea-Tree Orchid (*Dendrobium johannis*) and Beach Nightshade (*Solanum dunalianum*). Potential habitat of these species is displayed in **Figure 4** below. As outlined in Section 4.4.1 and 4.4.2 previous tentative identifications of these species have been confirmed as a separate non-threatened species and previous recorded locations are not shown on the map.

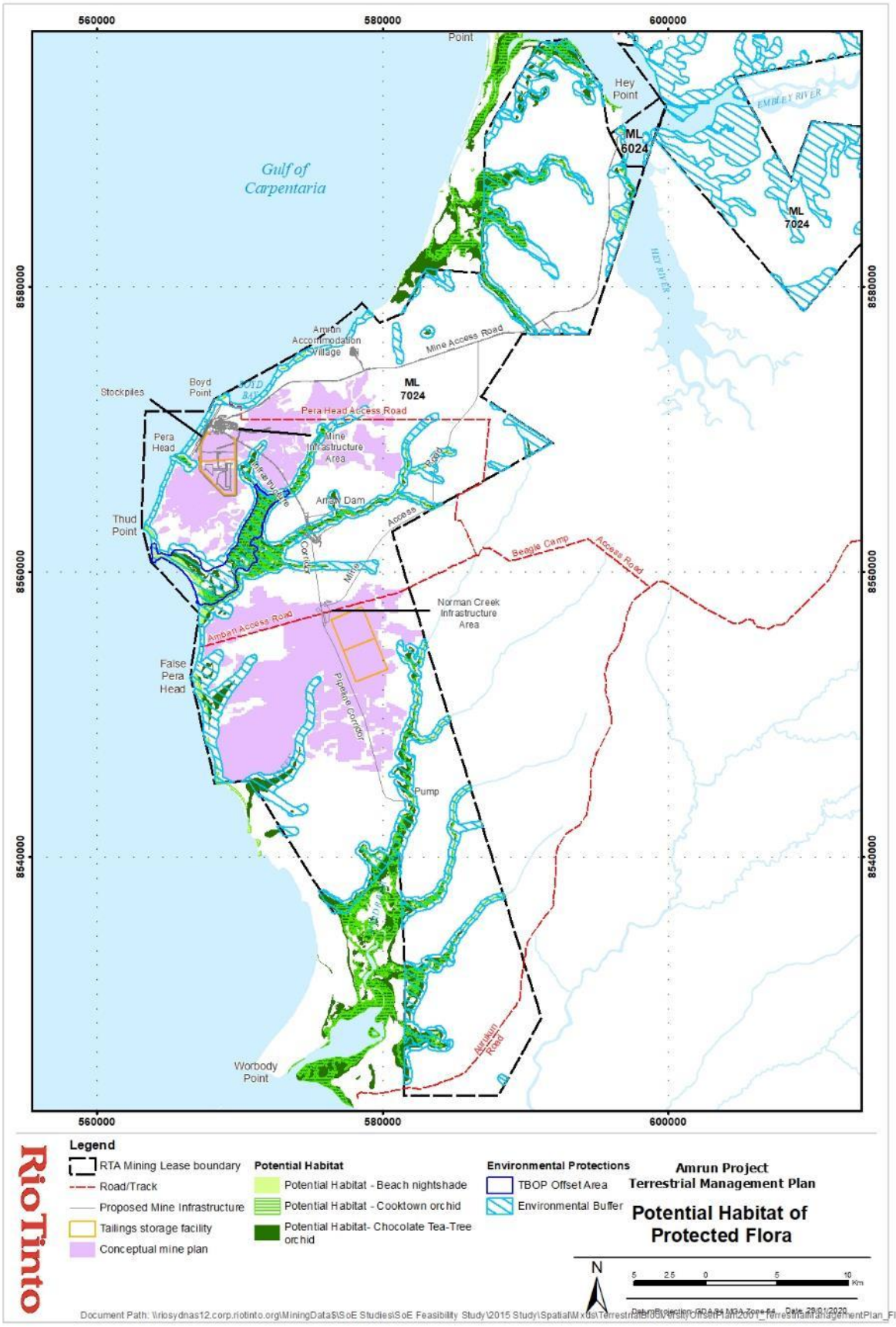


**Figure 4: Potential Habitat of Protected Flora**

### 4.4.1. Cooktown Orchid

The Cooktown Orchid (*Dendrobium biggibum*) which is listed as Vulnerable is an epiphytic orchid which grows on a variety of tree and rock hosts. It inhabits denser vegetation types with moderate light intensity including coastal and inland vine forest, moist gullies in open forest and woodland with protection from fire, and riparian vegetation. It has been recorded in several locations within the Cape York Peninsula. Extensive surveys were completed during the EIS stage which identified numerous specimens of this species within the Arraw Dam footprint.

Prior to 2016, Arraw Dam surveys reported the host Cooktown Orchid (*Dendrobium biggibum*) were tentatively identified by David Fell in 2013 as part of the South of Embley EIS (RTA 2013). Several efforts have been undertaken to identify the presence of Cooktown Orchids at various times of year (at least 8 trips between 24 February 2017 and 11 August 2017, with additional trips in 2015 and 2016). From these field trips no Cooktown Orchids were observed or confirmed since the tentative identifications by David Fell in 2013. In addition, orchids salvaged from Arraw Dam at previously recorded Cooktown Orchid locations flowered and are clearly *Dendrobium trilamellatum* due to their distinctive floral morphology.

As with the Chocolate Tea Tree Orchid, it is concluded there were no Cooktown Orchids within the Arraw Dam impoundment area at the time of clearing and therefore there is no strict requirement to translocate and/or propagate 3.5 plants as required under Condition C10, (b). However, given that the orchid propagation and translocation program is already well underway and that the Cooktown Orchid is a vulnerable iconic species of the Weipa region, RTW will continue the program as an additional conservation action. The program is increasing the Cooktown Orchid population by propagating specimens from the Weipa area and translocating them to suitable habitats within the offset area.

All potential Cooktown Orchid habitat is located within buffer systems established for environmental management (buffer systems are further discussed in Section 6.1.1) as displayed on **Figure 4** . As previous identifications have been confirmed as a different species no previous sightings are displayed on any of the maps. A detailed profile of this species is included in Appendix B.

### 4.4.2. Chocolate Tea-Tree Orchid

The Chocolate Tea Tree Orchid (*Dendrobium johannis*) which is listed as Vulnerable is an epiphytic orchid which grows on host trees and grows in open humid habitats such as swamps and closed in forests. Extensive surveys were completed during the EIS stage which identified numerous specimens of this species within the Arraw Dam footprint.

In 2015 the taxonomy of the Tea-Tree Orchids was revised with the Queensland Herbarium recognising the Large Tea-Tree Orchid (*Dendrobium trilamellatum*) as a distinct taxon within Queensland (M. Mathieson pers. Comm. June 2015). *Dendrobium trilamellatum* is not considered threatened under the EPBC Act.

A specific survey during the peak flowering period of *Dendrobium trilamellatum* was conducted on 17 August 2016 by Dr Michael Mathieson, Curator of Orchidaceae, Queensland Herbarium. The survey confirmed that no specimens of the Chocolate Tea Tree Orchid were identified. Furthermore, it appears all orchids identified previously as Chocolate Tea Tree Orchid at the time of the South of Embley EIS (RTA 2013) are now correctly identified as Large Tea-Tree Orchid.

The Chocolate Tea Tree Orchid (*Dendrobium johannis;* as currently identified by the Queensland Herbarium) does not occur within the Amrun mining lease area (Ecotone, 2016). All potential habitat

is located within buffer systems established for environmental management (buffer systems are further discussed in Section 6.1.1) as displayed on **Figure 4** . As previous identifications have been confirmed as a different species no previous sightings are displayed on any of the maps. A detailed profile of this species is included in Appendix B.

### 4.4.3. Beach Nightshade

Beach night shade (*Solanum dunalianum*) which is listed as Vulnerable is a perennial shrub growing to approximately 4m with good detectability. The Beach Nightshade is known from a few records near Weipa and on the Torres Strait islands, although more recent surveys for known populations in the Weipa area failed to relocate the species despite targeted searching (Landsberg and Clarkson 2004). The Queensland Herbarium holds 20 specimens of the species, mainly from New Guinea, with three of the four Australian specimens from the Weipa area and the fourth from Torres Strait. Its potential habitat is within vine forest (RE 3.2.2 and RE3.5.2).

Extensive focused surveys were completed during the EIS and did not record the species. **Figure 4** displays the potential habitat which sits outside any mining activities and within protected environmental buffer zones (buffer systems are further discussed in Section 6.1.1). A detailed profile of this species is included in Appendix B.

## 4.5. LISTED MIGRATORY BIRDS

A specific list of migratory birds were identified and provided as Annexure 1 of the EPBC approval. These were grouped based on traits and include:

- International Migratory Shorebirds
- Waterbirds
- Seabirds
- Raptors
- Woodland Birds
- Barn Swallow;
- Aerial species.

Detailed profiles of these species are included in **Appendix B**.

The Commonwealth EIS (RTA 2013) determined that there will be only negligible impacts on migratory avian species as a result of the Project and therefore no specific mitigation targeted at migratory avian species is warranted. However, the generic avoidance, mitigation and management measures detailed in Section 6, aimed at mitigating the potential impacts on other terrestrial species, will also reduce impacts on migratory avian species.

# 5 POTENTIAL IMPACTS AND RISK

Detailed information on potential impacts is presented in the Commonwealth EIS (RTA, 2013). The Commonwealth EIS (RTA 2013) determined that there will be only negligible impacts on migratory avian species as a result of the Project and therefore no specific mitigation targeted at migratory

avian species is warranted. However, the generic avoidance, mitigation and management measures detailed in Section 6, aimed at mitigating the potential impacts on other terrestrial species, will also reduce impacts on migratory avian species.

Management measures for flora and fauna species not covered by Condition 25 of the EPBC Act approval are presented in Appendix 5A and 6C respectively of the Commonwealth EIS (RTA 2013).

The following potential impacts and risk assessment was applies to terrestrial listed MNES based on previous observations of operational activities, similar projects and appropriate literature.

## 5.1. HABITAT LOSS AND FRAGMENTATION

Development for mining will require land clearing which may result in the direct loss of potential habitat or habitat fragmentation prior to rehabilitation. To mitigate the potential impact to any MNES, RTW will continue to maintain connectivity of key threatened ecosystems through its extensive environmental protection buffer system. This includes stream orders 1-5, sensitive vegetation or breeding places of any threatened species.

## 5.2. FIRE

Australia's Biodiversity Conservation Strategy 2010-2030 (Commonwealth of Australia, 2013) identifies changing fire regimes as one of the six main threats to Australia's biodiversity. Although fire is an integral part of the natural environment in Northern Australia, the scale and pattern of fires has changed following European settlement with the result that fires have become more frequent, are more extensive and burn with a greater intensity. Fire sensitive plants and animals have correspondingly declined under these changed conditions to the extent that some species and some entire ecological communities are now threatened by the fire regime (Fitzimmons et. al. 2010).

On Cape York frequent hot fires have slowly extended their impact further into mesic communities with corresponding changes in understorey vegetation. The Approved Conservation Advice for *Dendrobium bigibbum* (DoE 2008) cites changed fire regimes as a key threat to the Cooktown orchid.

Another impact from frequent hot fires is the widespread decline of small marsupials as a result of impacts on food supplies and reduction in cover to protect from predators (Fitzimmons et. al. 2010).

Since 2017 the Land and Sea Management Program (LSMP) have implemented a low intensity savannah burning program to reduce the intensity across the Amrun site. Since commencement of the annual controlled savannah burning program there has been a significant reduction in late season fires across the project area. Detailed planning and execution is carried out to mitigate the impact of off lease wildfires having a direct impact on the sensitive areas within the project area.

## 5.3. WEEDS

The key threatening processes under the EPBC Act (DoE, 2009) include ecosystem degradation, habitat loss and species decline due to invasion of northern Australia by introduced Gamba Grass (*Andropogon gayanus*), Para Grass (*Urochloa mutica*), Olive Hymenachne (*Hymenachne amplexicaulis*), Mission Grass (*Pennisetum polystachion*) and Annual Mission Grass (*Pennisetum pedicellatum*).

Gamba Grass, and to a lesser extent Para Grass and Mission Grass, are problem weeds in the Weipa region north of the Embley River. These introduced grasses are high biomass pasture grasses that out-compete native grasses and increase fuel loads which promote intense, late, dry season fires. Gamba Grass has fuel loads up to seven times higher than native grasses, produces fires that are eight times more intense than those produced by native grasses with a mean rate of spread of fires five times that of native grass plots (Rossiter-Rachor et al., 2008 and Rossiter et al., 2003; cited in DoE, 2009). These factors modify ecosystem processes and have a detrimental effect on trees and other native flora and fauna allowing exotic grass monocultures to dominate (DoE, 2009).

Weed management has been implemented on site since 2016 with ongoing surveys and controls, resulting in a decrease of weed abundance across the Amrun lease compared to the baseline survey (2016, 2019 and 2022 detailed surveys). This indicates the current weed controls (detailed in **Section 6.3**) are being implemented effectively.

## 5.4. FERAL ANIMALS

Feral animals are a potential threat to terrestrial MNES in particular feral pigs and feral cats with both species listed as key threatening processes under the EPBC Act (DoE, 2005; DoE, 2015).

### 5.4.1. Feral Pigs

Feral pigs can impact both flora and fauna within the site. The EPBC key impact listing cites 'predation, habitat loss, competition and disease transmission' as the key threats (DoE, 2005; DoE, 2013). Feral pig management has been implemented on site since 2016 with a combination of baiting, ground and aerial shooting with results available on the Amrun Project website.

Since its inception in 2016, the program has adaptively changed over time to optimise the approach to eradicating feral pigs. This is meeting the intended objective of decreasing marine turtle nest predation along the Amrun foreshore.

The initial scope of the program was to focus on boars resident along the coastal swamps and beaches. New data from CSIRO demonstrated feral pigs will move much greater distances to forage, especially on protein-rich food sources including turtle eggs. The program has ultimately been expanded to include most Amrun on-lease areas of ML7024 between the Embley and Ward rivers. The only areas excluded from the program are those in which infrastructure is present. This expanded culling area still focuses on the high-biodiversity coastal swamps of the Ward River, Norman Creek, Winda Winda Creek and Triluck Creek whilst not excluding moving groups of feral pigs outside of these areas. Feral pig control within and outside the offset area has potential to reduce detrimental impacts associated with this feral animal.

Results for the adapted program up till and including 2024 has recorded an ongoing sustained reduction in predation of turtle nests and significant increase in pigs culled.

### 5.4.2. Feral Cats and Dogs

While feral dogs and cats are considered of a lower threat to the MNES, they prey on native fauna and threaten fauna biodiversity. Control of feral dogs and cats will be a priority near residential areas and mining camps which may increase in population due to scavenging opportunities.

Feral cats are solitary hunters and a significant threat to small native animals. They prey on mammals, birds, reptiles, amphibians and invertebrates depending on resource availability. Live prey is almost the sole source of food for cats. Mammals tend to be the dominant prey item when available.

Wild dogs prey on a variety of animals including mammals, birds and reptiles of all sizes from insects to larger animals. However, they prefer to eat small and medium-sized mammals when available, including native mice, bandicoots and wallabies. Wild dogs have been implicated in the decline of several species, both historically and in the recent past.

Feral cat and dog monitoring and control has been implemented since 2016 and has included incidental sightings, spotlighting and trapping (2016 & -2024). As part of adaptive management the feral cat and dog program has been expanded to provide positive environmental outcomes in line with the Terrestrial Biodiversity Offset Program (TBOP). The feral animal control outlined in the previous TMP required the following:

- Regular visual monitoring at the Mine Infrastructure Area, Camp and Hey River Terminal. Quarterly spotlight has been replaced as part of adaptive management with regular feral animal control utilising thermal equipment. The increased effort included 54 nights during 2023 spread throughout the year to coincide with peak animal activity.
- Attempted trapping or baiting of the animals sighted during spotlighting is undertaken for animals that are located in areas where use of firearms is not available. The animals are naturally cautious and accordingly trapping is completed in a progressive manner to habituate the animals with the traps. Trapping is ongoing until one of the following is met:
    - The animal is captured or known to be deceased;
    - There are no sighting of the target species for 15 days (trapping event is considered three consecutive nights); or
    - Potential impact to animal welfare (e.g. lactating mother, severe weather).

Since implementation of the program the following findings have been noted:

- More animals are sighted and recorded through incidental sightings by the LSMP team then at targeted spotlighting. Repeated visuals of an animal during daylight provides the best chance of trapping animals;
- The ground based shooters are having the highest engagement with feral cats and dogs. The thermal equipment utilised provides the highest chance of sighting and removal of feral animals;
- Cat trapping is ineffective, no animal has returned to investigate the trap or bait;
- Crows are impacting the dog trapping having learnt to obtain the food without setting off the trap;
- Sightings of feral cats are higher on camera traps set for other works then during spot lighting; and,
- No animals have been sighted at HRT since completion of construction.

Using adaptive management the following additional management methods were trialled in 2019 and have proven to be effective management measure:

- Trapping or ground based shooting is implemented for repeated incidental sightings outside of spotlighting events;
- Introduction of feral cats and nuisance feral dogs around infrastructure as targets for the ground based shooting program. This provides the following benefits:
    - Increased spotlighting and thermal monitoring events to maximise chance of identifying feral animals.
    - Ability to quickly eliminate feral cats in which no progress was made in previous years (0 captures). Nineteen cats were eliminated in 2023.
- Use of ground based shooting where possible to eliminate animals sighted during spotlighting surveys.

## 5.5. DUST

Dust produced from mining or construction activities may impact photosynthesis of individual plants resulting in reduced disease tolerance or death. It is unlikely dust will impact MNES flora with elevated levels with potential habitat areas within buffer zones outside the mining footprint.

## 5.6. WATER

Changes to the water management regime have the potential to impact potential habitat of a number of MNES due to the following matters:

- Erosion;
- Dam operation;
- Stormwater run off;
- Hydrocarbon spills;
- Sewage;
- Crude or process water;
- Runoff from ore stock piles; and,
- Downstream impacts on waters courses, streams and the marine environment.

Accordingly the operations was developed to be nil spill to the environment. Impacts associated with the marine environment are outlined in the Operational Marine and Shipping Management Plan which was approved 2 September 2024.

## 5.7. RISK ASSESSMENT OF POTENTIAL IMPACTS (UNMITIGATED)

The potential impacts from the Amrun Project were assessed using the risk assessment process described in Section 4. Impacts have been assessed prior to consideration of any additional management measures as identified in Section 6 and the outcomes of the risk assessment are

presented in **Table 5** below. A further assessment of residual risk following mitigation measures is included in Section 6.

**Table 5: Potential Impact Risk Assessment (Unmitigated)**

| Impact | Species | Consequence | Likelihood | Risk |
|---|---|---|---|---|
| Habitat Loss and Fragmentation | All | Moderate | Possible | High |
| Fire | All | Moderate | Possible | High |
| Weeds | All | Moderate | Possible | High |
| Feral animals – pigs | Listed Fauna | Moderate | Possible | High |
| Feral animal – cats and dogs | Listed fauna | Moderate | Possible | High |
| Dust | Listed Flora | Minor | Possible | Moderate |
| Water | Lister Flora | Minor | Possible | Moderate |

The Commonwealth EIS (RTA 2013) determined that there will be only negligible impacts on migratory avian species as a result of the Project and therefore no specific mitigation targeted at migratory avian species is warranted. However, the generic avoidance, mitigation and management measures detailed in Section 6, aimed at mitigating the potential impacts on other terrestrial species, will also reduce impacts on migratory avian species.

Management measures for flora and fauna species not covered by Condition 25 of the EPBC Act approval are presented in Appendix 5A and 6C respectively of the Commonwealth EIS (RTA 2013).

# 6 AVOIDANCE, MITIGATION AND MANAGEMENT MEASURES

The following key avoidance, mitigation and management measures will be implemented to mitigate the potential impacts.

The following sections describe the key avoidance, mitigation and management measures to be implemented to control the potential impacts on terrestrial species included in this plan.

Avoidance, mitigation and management measures incorporate the following:

- Measures for water related impacts including, but not limited to, erosion and sediment control operation of Arraw Dam; stormwater runoff, flood events, hydrocarbon spills, sewage, crude or process water, runoff from ore stockpiles, and downstream impacts on watercourses, wetlands and marine environment (including estuaries);
- Measures for pests and weed management, dust management, and fire management;
- Implementation of vegetation buffers zones; and,
- Measures identified in the Environmental Management Plan Outlined in Appendix 5-A (Threatened Flora Species); Appendix 6-C (Threatened fauna species); and, Appendix 8-A (Avian Migratory Species) in the Commonwealth EIS (RTA, 2013) as well as the water monitoring requirements in Schedule H of the Queensland Environmental Authority (EPML 00725113).

## 6.1. HABITAT LOSS AND FRAGMENTATION

To minimise direct habitat loss or habitat fragmentation of known habitat or potential habitat of MNES the following avoidance and management measures will be implemented:

- Project planning for infrastructure has and will continue to minimise impact on terrestrial species by placing facilities in areas of Darwin Stringybark woodland where possible;
- Implementation of the SoE Amrun Environmental Buffer system (detailed in Section 6.1.1);
- Implementation of the SoE Amrun Pre Disturbance Program (detailed in Section 6.1.2);
- Minimise disturbance to areas required for operational development; and,
- Implement progressive rehabilitation in accordance with an approved rehabilitation strategy (detailed in Section 6.10).

### 6.1.1. SoE Amrun Environmental Buffer System

The implementation of the SoE Amrun Environmental Buffer System is a requirement under Condition 21 of EPBC 2010/5642. The SoE Amrun Environmental Buffer System will be established by applying a methodology for determining set-back distances from sensitive vegetation types. Mining will be precluded from the designated buffers.

In the mining area, sensitive vegetation is defined by the Regional Ecosystems listed in **Table 6** and broadly comprises the following categories:

- Riparian vegetation;
- Wetlands;

- Estuarine vegetation;
- Vine forests; and,
- Coastal vegetation on sand.

The sensitive vegetation will be buffered by adjoining vegetation, typically Darwin Stringybark woodland. The resultant buffer system creates a protected network of undisturbed habitat following the drainage lines and adjacent land. The environmental buffers are mapped and the maps are referred to when assessing applications for ground disturbance using the existing ground disturbance approval procedure.

**Table 6: Sensitive Vegetation which may be present in the Project Area**

| RE | Description | Equiv. Land Units* |
|---|---|---|
| 3.1.1a | Closed forest of Rhizophora stylosa +/- Bruguiera gymnorhiza. Occurs as outer mangroves | 3d |
| 3.1.3 | Ceriops tagal +/- Avicennia marina low closed forest. Extensive on intertidal areas | 6c |
| 3.1.5 | Sporobolus virginicus closed tussock grassland. Occurs on coastal plains | 12e |
| 3.1.6 | Sparse herbland or bare saltpans. Associated with salt plains and saline flats | 12e |
| 3.2.2a | Semi-deciduous vine thicket on coastal dunes and beach ridges | 3a |
| 3.2.5a | Acacia crassicarpa +/- Syzygium suborbiculare +/- Parinari nonda woodland. On beach ridges | 7a |
| 3.2.10c | Eucalyptus tetrodonta, Corymbia clarksoniana +/- E. brassiana woodland on stabilised dunes | 5a |
| 3.2.25 | Sparse herbland of mixed herbaceous species on foredunes and beach ridges | 12c |
| 3.3.9 | Lophostemon suaveolens open forest. Occurs on streamlines, swamps and alluvial terraces | 4a1 |
| 3.3.14a | Melaleuca saligna +/- M. viridiflora, Lophostemon suaveolens woodland on drainage swamps | 7b |
| 3.3.21 | Corymbia clarksoniana +/- Syzygium eucalyptoides woodland on lower slopes of sand ridges and in drainage depressions | - |
| 3.3.33 | Thryptomene oligandra and Melaleuca viridiflora woodland on sides of depressions | 7b |
| 3.3.42a | Melaleuca viridiflora low woodland in drainage areas | 5e |
| 3.3.49b | Melaleuca viridiflora +/- Petalostigma banksii low open woodland on floodplains | 5g |
| 3.3.50 | Melaleuca viridiflora +/- Petalostigma pubescens +/- M. stenostachya low open woodland on low plains | 5e |
| 3.3.60a | Themeda arguens, Dichanthium sericeum closed tussock grassland on marine plains | - |
| 3.3.61a | Panicum spp., Fimbristylis spp. tussock grassland on coastal alluvial plains | - |
| 3.3.63 | Closed sedgeland dominated by Eleocharis dulcis. Occurs on seasonally flooded marine plains | 12b |
| 3.3.64 | Baloskion tetraphyllum subsp. meiostachyum open sedgeland in drainage swamps in dunefields | - |

| RE | Description | Equiv. Land Units* |
|---|---|---|
| 3.3.65 | Ephemeral lakes and lagoons on alluvial plains and depressions | - |
| 3.5.4 | Semi-deciduous notophyll vine forest. Occurs as small patches on northern plateaus | 3c |
| 3.7.3 | Eucalyptus cullenii +/- E. tetrodonta woodland on erosional escarpments and plains | 5b |

The following methodology shall be followed when defining the environmental buffers:

- Pre-disturbance surveys as described in Section 6.1.2 continues to be undertaken to;
    - Verify the presence and boundaries of sensitive vegetation types indicated by the Queensland Government's Regional Ecosystem mapping.
    - Assess the location and stream order of any watercourses.
    - Determine the presence or absence of significant ecological features (such as springs, aquatic refugia and threatened flora and fauna in and around the sensitive vegetation types).
- Generally a buffer distance up to 200m will be adopted for vine forest, wetlands, estuaries, coastal vegetation on sand and riparian vegetation along watercourses of stream order three and above. Narrower buffer distances to a minimum of 100m may be adopted for riparian vegetation along watercourses of stream order one and two, or where significant ecological attributes are absent and physical characteristics are such that a narrower buffer would still provide edge effect protection and filtering of surface runoff flows from disturbed areas;
- When determining buffer distances from mining areas, vegetation type, important locations of threatened flora and fauna, stream order and hydrology will be considered. The minimum buffer distances to apply are outlined in Condition 21 of the EPBC 2010/5642 approval which sets out buffer zone distances from mining areas for certain environmental features and these are presented in Table 7. These buffer zone distances do not apply to infrastructure;
- Buffer distances will be finalised based on the findings of the surveys;
- The boundaries of the environmental buffers shall be recorded on the site Geographic Information System and used when assessing and approving ground disturbance permits; and,
- Establishment of the final buffer distance and authorisation for clearing non-buffered areas shall be managed through the existing ground disturbance approval procedure.

**Table 7: Minimum SoE Amrun Buffer Distances (Condition 21 of EPBC 2010/5642)**

| Environmental feature | Vegetation buffer zones |
|---|---|
| Stream order one or two | 100m to 200m** from edge of riparian vegetation |
| Stream order three or four | 100m to 200m** from edge of riparian vegetation |
| Stream order five and above | 200m from edge of riparian vegetation |
| Natural wetland | 200m from edge of wetland vegetation |
| Natural significant wetland | 200m from edge of wetland vegetation |
| Tidal areas and marine plants*** | 200m from boundary of feature |
| Vine forest, coastal vegetation on sand, estuaries | 200m from edge of relevant vegetation type |

*** Set based on site specific factors following field survey.*

**** Category B Environmentally Sensitive area as defined by the Environmental Protection Regulation 2008 (Qld).*

### 6.1.2. Pre-Disturbance Program

Condition 22 of the EPBC 2010/5642 approval sets out a Pre-Disturbance Program to be implemented prior to the clearing of any vegetation. Pre-disturbance surveys will be conducted to:

- Determine the presence of any active or potentially active Red Goshawk and/or Masked Owl nests prior to clearing any vegetation. Surveying will be undertaken:
    - Red Goshawk – in areas located within one (1) kilometre of permanent water supporting riparian gallery forest or Paperback wetland; seasonally inundated coastal wetlands and seasonal water courses supporting riparian gallery forest, or an estuary; and,
    - Masked Owl – in areas within 200 metres of permanent water supporting riparian gallery forest of paperbark wetland, seasonally inundated Paperbark wetlands, seasonal watercourses supporting riparian gallery forest or an estuary.
- Surveys involve walkthroughs of those areas to be cleared, prior to clearing;
- Any observations of nests that may be used by Red Goshawks and/or Masked Owls will be recorded and further assessment undertaken to determine whether the nest is being actively used;
- If an active nest is identified, avoidance, mitigation or management measures will be implemented and a 200m buffer will be established around the nest trees. The nest tree and buffer zone will not be cleared or disturbed until the end of the breeding season (being until fledglings no longer use the nest). Nesting periods are as follows.
    - Red Goshawk - courtship starts as early as April and young do not leave their natal territories until as late as the end of December. Breeding occurs generally in the spring with eggs laid between May and October;
    - Masked Owl - probably breeds between March and October but may breed when conditions are favourable, which can be any time of the year. It is thought that the female occupies the nest for up to 10 weeks before laying. The incubation period is generally 33–35 days, but could be as much as 42 days. The fledging period is 10–12 weeks.

- If a potential Red Goshawk and/or Masked Owl nest is located but is not actively being utilised, the tree may be felled immediately to encourage any future nesting pairs to establish a nest outside of the disturbance area.

During operations, survey findings shall be communicated to the RTW Land and Rehabilitation Team and associated management actions developed in consultation with the Operation and the RTW Land and Rehabilitation Team.

In addition to the Pre-Disturbance Program under Condition 22, pre-disturbance surveys for Eastern Osprey and White-bellied Sea-eagle will be undertaken within potential nesting riparian forest habitat within Arraw Dam and at infrastructure crossings of riparian forest. Any active nests identified will be buffered until the end of the breeding season for the species in question (see Tables 17 and 18).The protocol for surveys conducted under the Pre-Disturbance Program shall be prepared by an experienced environmental professional with knowledge of the identification of the Red Goshawk, Masked Owl, Eastern Osprey and White-bellied Sea-eagle and their nests.

### 6.1.3. Rehabilitation Strategy

A Rehabilitation Strategy is required to be developed under Conditions 33 to 40 of the EPBC 2010/5642 approval. The Rehabilitation Strategy is required to be submitted to the Minister for approval within three years of the commencement of operations and implemented after it is approved. The Rehabilitation Strategy will be reviewed every 5 years and submitted to the Minister for approval. The Rehabilitation Strategy will incorporate the following:

- Coverage of construction and operational areas of the SoE /Amrun area;
- Aim to ensure that rehabilitated areas are functionally similar to the pre-disturbance habitat to enable similar land use by the following species:
    - Red Goshawk (Erythrotriorchis radiatus);
    - Masked Owl (Tyto novaehollandiae kimberli);
    - Barn Swallow (Hirundo rustica); and,
    - If identified in the Project area, the Bare-rumped Sheathtail Bat (Saccolaimus saccolaimus nudicluniatus).
- Progressive rehabilitation over the life of the SoE Amrun area. Unless otherwise specified in the approved Rehabilitation Strategy:
    - Rehabilitation works will commence within two (2) years:
        - Following mining in the area/s where it has been completed; or,
        - Following decommissioning and removal of any infrastructure, in each area where that infrastructure will not be retained at the end of the SoE /Amrun area; and,
        - The land area to be progressively rehabilitated over the life of the mine will be no less than 28,880 hectares.

The Rehabilitation Strategy will:

- Include adaptive management strategies to benefit the species listed above;

- Include the measures outlined in the Commonwealth EIS;
- Address effective management strategies to identify desired outcomes, benchmarks, readily measurable performance indicators and goals, timeframes for reporting and implementation, corrective actions and contingency measures, and, specify the person/s roles with responsibility for implementing actions; and,
- Provide information detailing Traditional Owner employment opportunities, and mechanisms for reporting the number of local indigenous person/s actually employed in its implementation.

In addition:

- If the rehabilitation objectives identified described in the approved Rehabilitation Strategy for the above species do not meet any of the success criteria for any of these species after 10 years of rehabilitation commencing, or as otherwise agreed in the approved Rehabilitation Strategy, RTW will notify the Minister in writing within 20 business days of the area (hectares) over which the rehabilitation objectives and success criteria were not met;
- Within six (6) months of notifying the Minister as above, RTW will submit to the Minister for approval an Offset Strategy outlining the offset to be provided for the species outlined above. The related offset will be accordance with *the EPBC Act Environmental Offset Policy* (October 2012), or its most current version; and,
- Any approved Offset Strategy will be implemented.

Rehabilitation indicators will be measured and monitored to track the performance of rehabilitation against rehabilitation objectives. The Commonwealth EIS (RTA, 2013) included draft rehabilitation goals, objectives, indicators and completion criteria relevant to terrestrial fauna species addressed by this management plan for rehabilitation of mined areas (refer **Table 8**).

**Table 8: Draft Rehabilitation Objectives, Indicators and Completion Criteria for Listed Terrestrial Fauna Species**

| Rehabilitation Goal* | Rehabilitation Objective/s* | Indicators* | Completion Criteria* |
|---|---|---|---|
| Sustainable Land Use - Native, self-sustaining vegetation meeting criteria derived from reference sites and trials<br>A. Self-sustaining native dry woodland vegetation dominated by *Eucalypts, Corymbias, Erythrophleum* and other framework spp.<br>or<br>B. Self-sustaining native wetland community dominated by *Melaleuca and/or Lophostemon* species | Rehabilitated habitat suitable for a range of native fauna including threatened species | Vegetation structure provides suitable habitat for a wide range of fauna species | TBD:<br>e.g. Structural elements present that provide suitable shelter for small mammals and birds, including prey for Red Goshawk and Masked Owl |
| | | Native fauna species recolonising site | TBD:<br>e.g. Fauna habitat development and/or evidence of fauna utilisation.<br>Red Goshawk and Masked Owl prey species present |

*Draft rehabilitation goals, objectives, indicators and completion criteria only. These will be further developed through consultation, research, on-going monitoring, and site specific trials.

The Armun Rehabilitation Strategy is yet to be approved; once approved any necessary updates will be made to this plan in relation to rehabilitation goals, objectives, monitoring and completion criteria.

A rehabilitation monitoring program will be developed to regularly assess the success of rehabilitation. Performance against rehabilitation indicators will be used to inform an adaptive management approach.

## 6.2. FIRE

A Fire Management Program was updated in 2024 in cooperation with Traditional Owners and the relevant Western Cape Communities Coordinating Committee (WCCCC) sub-committee for the Amrun lease. It combines a mixture of aerial and ground based burning techniques and is implemented by the Land and Sea Management Programme.

The Amrun fire program has been underway since 2017 supporting construction of the Amrun mining infrastructure. This program has been adapted to suit ongoing operations and to support progressive rehabilitation which commenced in 2021. The annual plan aligns with the Fire Management Program and carried out in accordance with seasonal and ground based conditions. The site based plan is reviewed and amended at the end of each fire season to ensure a comprehensive program is implemented for the following season. Reviews are completed in consultation with traditional owners.

The success of the program is reviewed annually in consultation with the WCCCC with the program amended where necessary. The program aims to:

- Conserve fire-sensitive flora and vegetation communities and promote overall vegetation diversity by reducing fire intensity and frequency and promoting a regime of early to mid-dry season lower intensity burns at an appropriate frequency;

- Establish and maintain a network of fire breaks, where necessary, to facilitate effective control burns;
- Create a mosaic of burnt and unburnt vegetation with low average fuel loads;
- Provide opportunities for combating inappropriate fires; and,
- Control public access to the Project area for the purposes of minimising anthropogenic / unplanned / uncontrolled fire sources.

Activities related to the Fire Management Program include:

- Annual fire planning workshops and training;
- Pre-fire season inspections to assess fuel loads, fire risk and burn priorities;
- Annual fuel reduction burning activities which are managed to promote a random mosaic of burnt and unburnt country;
- Monitor the success of the burn program using a comparative analysis of fire scar patterns during and post fire season to determine mosaic scale, percentage of burnt/unburnt and future fire season planning; and,
- Post fire inspections and monitoring.

## 6.3. WEED MANAGEMENT PROGRAM

Certain weeds currently present in the Weipa region would pose a significant threat to vegetation within the proposed mine and infrastructure areas were they to become established. Weeds such as Gamba Grass (*Andropogon gayanus*), Guinea Grass (*Panicum maximum*), Grader Grass (*Themeda quadriva /vis*), Rubber Vine (*Cryptostegia granditlora*), Leucaena (*Leucaena leucocephala*), Stinky Passionfruit (*Passiflora foetida*), Thatch Grass (*Hyparrehnia rufa*) and Hyptis (*Hyptis suaveolens*) can exclude native ground cover vegetation, significantly reduce ground cover floristic and structural diversity and affect recruitment of upper strata. Rubber Vine and Stinky Passionfruit can kill off midstorey and canopy trees with Rubber Vine most active in riparian and floodplain situations. Neem (*Azadirachta indica*) is an invasive plant that is also present in the Weipa area.

Vegetation types most at risk from weed invasion include riparian, wetland, estuarine and coastal communities. Weed invasion typically follows disturbance and it is anticipated that, any potential weeds would most likely occur in operational plant and mine areas, rehabilitation areas and along the edges of access roads. Based on observations of undisturbed habitat immediately adjacent to mining blocks at the existing East Weipa and Andoom mining areas, it is not anticipated that weed invasion of undisturbed vegetation would occur as a result of the initial mine construction and operation provided that appropriate weed control measures are implemented.

A Weed Management Program for the site was developed and implement by the Land and Sea Management Programme and is also adapted from the existing RTW Weed Management Program.

The main focus of the weed management program will be early detection and early control of any invasive weeds. The existing RTW Weed Management Plan has been extended to the Project area and will use a risk based approach for weed management. Priority weed species will be defined

and containment, prevention and eradication zones in the existing RTW Weed Management Plan will be extended to Project. Under the current plan the top priority weed species are Gamba Grass, Leucaena, Para Grass and Neem. Any occurrence of these species in a prevention or eradication zone would trigger a weed report with GPS coordinates and treatment at the earliest possible opportunity (recognising that herbicide treatment windows are weather dependent).

The Weed Management Program includes the following components:

- Washdown facilities are provided at numerous locations throughout Weipa and across the Operations including Humbug barge terminal. All vehicles will be thoroughly washed before transfer to the Hey River barge/ferry terminal and mine access road;
- Runoff from wash-down facilities will be contained and treated before being released;
- Annual weed surveys will be conducted post wet season, targeting:
    - All operational areas (mining and infrastructure) and immediately adjacent ecosystems; and,
    - Site access roads.
- Periodic weed surveys will be conducted at least every three years, targeting:
    - Habitats where key weed species are most likely to become established; and,
    - Areas within the mining lease where recreational visitation (especially to riparian and wetland areas) is possible.
- Detailed mapping of the above areas will form the basis of the weed management program and guide annual weed control activities;
- Training courses will be conducted regularly for relevant mine personnel, highlighting significant weed species and basic identification features for weeds likely to be encountered on the site, to ensure staff have been provided with enough information to accurately identify weed species;
- Protocols will be established for easy reporting of weed occurrence by any personnel working on site and be of a format that encourages reporting;
- Results of weed surveys and any weed reporting will be uploaded to the site GIS in a timely manner so that weed mapping is maintained as a live database; and,
- Any weed infestation by target species will have controlled access until appropriate treatment and suppression is complete and there is no risk of propagules being translocated.

## 6.4. FERAL AMINALS

### 6.4.1. Feral Pig Control program

Development and implementation of a Feral Pig Management Offset Strategy (which includes a feral pig control program) is a requirement under Conditions 43 to 48 of the EPBC 2010/5642 approval. The Strategy was approved by the Minister prior to the commencement of the initial action in 2016. The Strategy is focussed on reducing the predation of marine turtle nests within the Project

area by feral pigs; however, the feral pig control program will also provide benefit to terrestrial flora and fauna by reducing feral pig damage in riparian and wetland areas which provide habitat for the majority of species covered in the Plan.

Since its inception in 2016, the program has adaptively changed over time to optimise the approach to eradicating feral pigs. This is meeting the intended objective of decreasing marine turtle nest predation along the Amrun foreshore.

The initial scope of the program was to focus on boars resident along the coastal swamps and beaches. New data from CSIRO demonstrated feral pigs will move much greater distances to forage, especially on protein-rich food sources including turtle eggs. The program has ultimately been expanded to include most Amrun on-lease areas of ML7024 between the Embley and Ward rivers. The only areas excluded from the program are those in which infrastructure is present. This expanded culling area still focuses on the high-biodiversity coastal swamps of the Ward River, Norman Creek and Winda Winda Creek and Triluck Creek whilst not excluding moving groups of feral pigs outside of these areas. Feral pig control within and outside the offset area has potential to reduce detrimental impacts associated with this feral animal. .

The proposed program is detailed in the approved Feral Pig Management Strategy with results presented in the annual Feral Animal Report published on the project website. The annual programs continue to demonstrate high levels of success. The program includes:

- Feral pig eradication through a combination of aerial shooting, ground based shooting and baiting techniques through peak turtle nesting periods; and,
- The program is implemented in consultation with Traditional Owners seeking their ongoing input and consent;

Further details of management is provided in the Approved Feral Pig Management Strategy with results presented in the Annual Amrun Feral Animal Report (provided on the Project website).

### 6.4.2. Feral Cats and Dogs

An increase in scavenging opportunities in and around the village and mine infrastructure area may occur leading to an increase in numbers of feral cats and dogs in these areas. Based on adaptive management based on previous year's results the feral cat and dog control program to be implemented in and around the camp and mine infrastructure area is as follows:

- LSMP to record incidental observations for feral cats and dogs around the camp and mine infrastructure area ongoing throughout the year. Records provided by operational personnel will also be investigated;
- incidental observations by the LSMP Team;
- If feral cats and dogs are repeatedly sighted around an area that an eradication program for that animal will be implemented. This may include trapping, baiting or shooting. The program will continue in the area until the animal is caught or no sighting of the animal is recorded for a period of 15 days;
- Feral cats will be targeted across site during feral pig ground based shooting events;

- Feral dogs will be targeted around infrastructure areas only during ground based shooting activities as agreed with traditional owners ground based shooting activities as agreed with traditional owners 4; and,
- Records will be kept of all reported sightings, trappings and disposals.

Shooting, trapping and/or baiting program are completed in accordance with the following:

- Preparation of requirements to be implemented regarding animal welfare, health and safety requirements and public awareness of relevant control practices;
- Suitably experienced individuals will be used to oversee the program;
- Traps will be located and checked in accordance with relevant safety and animal welfare requirements;
- Cat and/or dog traps will only be deployed when there is capacity to euthanize any trapped animals in accordance with animal welfare and health and safety requirements; and,
- Any trapped dogs/cats will be disposed of appropriately.

## 6.5. WATER

Impacts on water that may potentially impact on the species covered in this Plan will be predominantly managed through the conditions relating to water in Schedule H of the Queensland Environmental Authority. The Environmental Authority is informed by the most current versions of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality**(external link)**. The Environmental Authority conditions related to water are in turn based on the Queensland Coordinator General's conditions of approval for the Project area (cited in Appendix 16-B Water Monitoring and Management Conditions of Commonwealth EIS (RTA 2013)).

The following measures will be implemented to minimise impacts on the species covered in this plan in relation to erosion, stormwater runoff, flood events, hydrocarbon spills, sewage, crude or process water, runoff from ore stockpiles, and downstream impacts on watercourses, wetlands and marine environment (including estuaries):

- Stormwater runoff will be managed by constructing and maintaining appropriately sized stormwater management structures;
- A Stormwater, Erosion &Sediment Control Plan for site includes the following;
    - Measures to prevent or minimise the contamination of stormwater;
    - Measures for diverting uncontaminated stormwater runoff around areas disturbed by mining activities or where contaminants or wastes are stored or handled;

[4] Dingoes are the totem of some local traditional owners. An agreement was made on visually distinguishing a wild dog (half breed) from a purebred dingo and traditional owners were comfortable with the program continuing. No dingoes are engaged, unless they become a safety hazard.

- Measures to collect, treat, reuse or release contaminated stormwater runoff, incident rainfall and leachate;
- Including roofing where practicable or minimising the size of areas where contaminants or wastes are stored or handled;
- The identification of alternate materials or processes (if practicable) to clean up spills;
- Measures to ensure erosion and sediment control structures are placed to minimise the erosion of disturbed areas and prevent contamination of waters;
- Identify procedures for ensuring that erosion and sediment control structures are maintained and that adequate storage is available in sediment dams in accordance with design criteria;
- Requirements for the training of staff that will be responsible for the maintenance and operation of erosion and sediment control structures;
- Measures to restrict clearing to areas essential for mining and associated facilities;
- Requirements for vegetation clearing and topsoil stripping to occur following the wet season where possible;
- Requirements for backfilled pits to be revegetated as soon as practicable;
- Measures for stormwater to be directed via a sediment pond if active of backfilled pits are not internally draining;
- Requirements for disturbed areas around construction sites to be rehabilitated promptly if not in an area subject to future mining or infrastructure;
- Requirements for sediment traps to be included as part of drainage designs at points where haul roads cross watercourses; and,
- Requirements to follow the relevant aspects of the engineering Guidelines for Soil Erosion and Sediment Control.

- A Water Management Plan was developed in accordance with the Environmental Authority;
- Surface water monitoring will be conducted in accordance with the Environmental Authority conditions for the Amrun mine site as follows:
  - Monitoring of contaminant releases to waters and receiving waters at specified points. The key parameters to be monitored include pH, EC, turbidity, suspended solids, and aluminium;
  - Investigation trigger levels for fresh and estuarine waters have been set based on ANZECC (2000) default values and site-specific contaminant limits for receiving waters will be set based on the statistical baseline; and,
  - A Receiving Environment Monitoring Program, including surface water monitoring parameters and designated sampling locations, was developed and implemented prior to the commencement of significant construction work (commencement of the action) for the Project area and is undertaken each wet season between the Months of December to April.

- Water will be recycled from the tailings storage facilities and the mine industrial area drainage slots and used preferentially as process water;
- Treated effluent from the Boyd and the proposed Norman Creek sewage treatment plants (STPs) will be recycled;
- Treated effluent from the village STP will be used for irrigation of landscaping around the village or for dust suppression. Treated sewage effluent released to land will be monitored to ensure it meets the contaminant release limits described in the Queensland EA;
- Areas disturbed by mining activities and infrastructure will be rehabilitated to a stable landform with a self-sustaining vegetation cover as outlined in the Rehabilitation Strategy. Rehabilitation works will commence within 2 years following completion of mining and will assist in the management of erosion;
- The water quality of natural surface drainage systems will be maintained by preserving riparian vegetation corridors by implementing the SoE/Amrun Environmental Buffer System (refer Section 6.1.1);
- The discharge from sediment control structures (and internally draining mine pits, if any) will pass through the SoE/Amrun environmental buffers around and adjoining surface drainage lines and wetland features before entering watercourses. Slow flow velocities through these vegetated buffers (due to the very flat topography of the bauxite plateau) and the retention effect provided by ground layer vegetation and leaf litter will provide additional protection against elevated sediment load risks that may otherwise impact aquatic ecosystems;
- Arraw Dam has been designed as a low to significant incremental flood hazard category according to the Australian National Committee on Large Dams (ANCOLD, 2000) and, as such, the spillway will be designed to pass a 1:1,000 ARI storm event as a minimum. A 1:1,000 ARI storm event is considered a rare event (Aust IE, 2001). The dam spillway will be designed to pass the peak flow from a 1:2,000 ARI flood event; and
- Arraw Dam will be fitted with a low level outlet pipe which will permit the controlled release of environmental flows when required. Sufficient water will be reserved for environmental flows to enable continued releases in the driest months (August to October) of a volume equivalent to 25% of monthly dam inflows, if required. The pipe will be sized to enable peak discharge of up to 1,000L/s, if required. When dam inflows cease, environmental flow releases will cease. Once the dam is full following the onset of the wet season, the spillway will typically overflow on a regular basis. If environmental flow releases are required during the wet season, they will commence after the dam is full.

## 6.6. DUST

The following dust abatement measures will be implemented to minimise airborne dust and the potential effects of settled dust on individual plants.

- The implementation of environmental buffers;
- Restricting the area to be cleared to the minimum practical;
- Restricting vehicle speeds where roads intersect sensitive areas when dust problems occur; and,

- Haul road watering.

In addition to the above measures, adaptive management will be used to control specific dust issues as they arise. For example, where particularly dusty conditions exist where roads intersect areas of high sensitivity, road closures may be considered when roads are not currently being treated by water trucks.

## 6.7. SUMMARY OF POTENTIAL IMPACTS MANAGEMENT AND MONITORING METHODS

**Table 9** provides the action management plans for the terrestrial impacts identified for MNES including:

- Residual risk assessment;
- The current benchmark or baseline status;
- Desired outcomes and goals following mitigation;
- Performance indicators;
- Timeframes for implementation; and,
- Corrective actions and contingency measures; and, roles and responsibilities for implementation.

## Table 9: Action Plan for Operational Management Activities

| *Potential Impact* | Species potentially impacted | Avoidance, mitigation and management measures | Benchmark/ baseline Monitoring | Residual Risk (consequence / likelihood – risk) | Desired Outcomes / Goal / Targets | Performance Indicators | Timeframes for implementation | Corrective actions and contingency | Responsibility |
|---|---|---|---|---|---|---|---|---|---|
| *Habitat loss and fragmentation* | **Goshawk,**<br>**Masked Owl**<br>**Bare-rumped Sheathtail bat**<br>**Listed Flora**<br>**Listed Migratory Birds** | SoE/Amrun Environmental Buffer System as outlined in Section 6.1.1 | Buffer requirements outlined in the Qld *Regional Vegetation Management Code for Western Bioregions.*<br>Buffer requirements outlined in Condition 21 of the EPBC Approval.<br>Habitat suitability mapping. | Negligible / Unlikely - Low Risk | Zero breaches of environmental buffer system setback requirements<br>Direct disturbance of high suitability habitat is limited to the areas identified Figure 5.<br>Maintain a network of high suitability habitat for MNES<br>No direct disturbance of avian or mammal MNES species | Number of breaches of environmental buffer system setback requirements.<br>Area of direct disturbance to high suitability habitat areas. | Buffers to be established prior to clearing for mining activities<br>Disturbance permit approval required prior to clearing activities. | Breaches to be investigated and appropriate mitigation measures implemented. | Determine Buffer – Superintendent Land & Rehabilitation<br>Disturbance Permits - Mine Planning and Operational Superintendents<br>Investigations – Manager Health Safety & Environment |
| | | Siting of Infrastructure implemented as identified in construction documents | Infrastructure design. | Negligible / Unlikely - Low Risk | Zero instances where infrastructure is not constructed as per design. | Number of instances where Infrastructure is not constructed as per design. | Design prior to construction.<br>Clearing and siting of infrastructure during construction.<br>Survey of infrastructure post construction. | Survey prior to construction.<br>As built drawings.<br>Training and awareness for personnel to stay within infrastructure corridors. | Design and location of Infrastructure –Manager, SoE/Amrun Engineering Operations |
| | | Pre-disturbance Program as outlined in Section 6.1.2 | Known nesting habitat of the avian species<br>Known recorded locations of flora species | Negligible / Unlikely - Low Risk | Flora and Fauna - Surveys completed prior to disturbance<br>Fauna- Active nests found in disturbance areas are avoided until the end of the breeding season.<br>Flora – Relocation of flora species where possible | No clearing of active nests in areas located within 1km of permanent water supporting riparian gallery forest or Paperbark wetland; seasonally inundated coastal wetlands and seasonal water courses supporting riparian gallery forest or an estuary. | Surveys prior to any clearing activities.<br>Immediately establish a 200m buffer around any active nest trees found during surveys.<br>200m buffer around any active nests trees found to be left and buffer and nest tree not to be cleared until the end of the breeding season.<br>Flora to be translocated if possible | Breaches to be investigated and appropriate mitigation measures to be implemented. | Conducting pre-disturbance surveys – Superintendent Land & Rehabilitation<br>Maintaining buffer around nesting trees during the breeding season – Construction and Operational Superintendents<br>Orchid relocation – LSMP<br>Investigations – Manager Health Safety & Environment |
| | | Rehabilitation Strategy as outlined in Section 6.1.3 | Information from monitoring of existing mining operations concerning the re-colonisation of prey fauna in rehabilitation will be outlined in the Rehabilitation Strategy. | Negligible / Unlikely - Low Risk | Over time the number of prey fauna re-colonising in rehabilitated areas increases. | After 10 years of rehabilitation commencing the number of prey fauna re-colonising in rehabilitated areas over time. | The Rehabilitation Strategy is to be submitted to the Minister for approval within 3 years of commencement of operations (December 2021) in the Amrun mine area in accordance with EPBC approval Condition 36.<br>The Rehabilitation Strategy is to be implemented as required under the EPBC approval Condition 36 once it has been approved by the Minister. | To be outlined in the Rehabilitation Strategy. | Development and implementation of Rehabilitation Strategy – Superintendent Land & Rehabilitation |
| *Altered Fire Regime* | **Goshawk,**<br>**Masked Owl;**<br>**Bare-rumped Sheathtail bat**<br>**Listed Flora**<br>**Listed Migratory Birds** | Implement management measure as per Section 6.2 | Use satellite imagery and the North Australian Fire Information (NAFI) website (www.firenorth.org.au) for comparative analyses of the fire scar patterns during and post fire season to determine mosaic scale, percentage of burnt/unburnt and future fire season planning | Minor / Unlikely – Low Risk | Create a mosaic of burnt and unburnt vegetation with low average fuel loads.<br>Lower frequency of high-intensity late dry season fires threatening high suitability habitat. | Reduction in the number of high-intensity late dry season fires threatening high suitability habitat. | At the end of the fire season, develop a comprehensive burn program for the following season, ensuring ample time for logistical planning and preparedness.<br>Implement burning activities during cooler months (May – September) | Investigate the root cause of very hot, late dry season fires entering the lease and adopt adaptive management measures to mitigate causal factors. | Development and Implementation of Fire Management Program – LSMP |

| *Potential Impact* | Species potentially impacted | Avoidance, mitigation and management measures | Benchmark/ baseline Monitoring | Residual Risk (consequence / likelihood – risk) | Desired Outcomes / Goal / Targets | Performance Indicators | Timeframes for implementation | Corrective actions and contingency | Responsibility |
|---|---|---|---|---|---|---|---|---|---|
| *Introduction of weeds* | **Goshawk,**<br>**Masked Owl**<br>**Listed Flora**<br>**Listed Migratory Birds** | Implement management measures as per Section 6.3 | Change in abundance and number of weed species with Amrun site<br>Current number of Class 2 and 3 weed species and their extent within the Project area. | Minor / Unlikely – Low Risk | Protect high quality habitat from adverse impacts from weeds through early detection, control and monitoring<br>All priority weeds* treated at the earliest possible opportunity<br>Weed abundance and distribution <=2017 observations<br>No new occurrences of Class 2 and 3 weed species.<br>Annual review results of effectiveness of monitoring | Number of new occurrences of Class 2 and 3 weed species.<br>Number of weeds that have been introduced to high suitability habitat. | Weed management planning is reviewed on ongoing basis (minimum annually) based on results of previous season.<br>Treatment will be implemented on an as needs basis after identification. | Training and awareness.<br>Demarcation of any weed occurrences.<br>Control access into area until treatment and suppression is complete<br>Increase frequency of weed inspections and treat affected areas on as needs basis. | Implementation of Weed Management Program – LSMP<br>Reporting of Weed Outbreaks<br>- All Personnel |
| *Feral animals – feral pigs* | **Goshawk,**<br>**Masked Owl**<br>**Listed Flora**<br>**Listed Migratory Birds** | Implement management measures as outlined in the Feral Pig Offset Strategy to protect degradation of habitat | Reduction of feral pig predation on turtle nests compared to baseline surveys. | Minor/ Unlikely – Low Risk | Protect high quality habitat from adverse impacts by pigs through a culling program.<br>Feral pig damage in riparian and wetland areas near turtle nesting beaches is reduced.<br>Feral pig predation on turtle nests below 30%. | Percent of predation on turtle nests by feral pigs[5]. | The FPOS is implemented annually with works targeting peak nesting season. | Refer Feral Pig Management Offset Strategy | Implementation of Feral Pig Management Offset Strategy – LSMP |
| *Feral Cat and Dog Management Program* | **Goshawk,**<br>**Masked Owl**<br>**Listed Migratory Birds** | Implemented as outlined in Section 6.4.2 | Number of feral cat and dog and their extent within the Project area compared to previous years | Minor/ Unlikely – Low Risk | Protect high quality habitat from impacts of feral cats and dogs<br>Impacts on prey species as a result of feral dog and cat predation do not increase.<br>Reduction in feral cat and dog number in and around the camp and mine infrastructure area. | Number of new sightings of feral cats or dogs compared to previous years | Ongoing monitoring throughout the year with annual reporting completed in August<br>Control program to implemented after repeated | If increase is recorded infrastructure review current systems and their implementation<br>Increase frequency of feral cat and dog controls and review effectiveness of current control program<br>Training and awareness. For staff on site | Implementation of feral cat and dog monitoring program - LSMP |
| *Water Management Measures* | **Goshawk**<br>**Listed Migratory Birds** | **Implemented as outlined in Section 5.6.** | Requirements under the Qld EA, including water quality triggers<br>ANZECC (2000) Guidelines | Negligible / Unlikely - Low Risk | Monitoring is consistent with ANZECC (2000) Guidelines and indicates compliance with Qld EA requirements. | Compliance with water quality requirements including water quality triggers as outlined in the Qld EA. | For duration of program as outlined in the receiving environment management program (REMP) | Breaches to be investigated and appropriate mitigation measures to be implemented. | Water Quality Monitoring – Environmental Superintendent<br>Investigations – Manager Health Safety & Environment |
| | | **Implemented as outlined in Section 5.6.** | Release of environmental flows from Arraw Dam. | Negligible / Unlikely - Low Risk | Sufficient storage to allow release of up to 25% of dam inflow if required from August to October. | Volume of the release of environmental flows from Arraw Dam from August to October. | During operations. | If monitoring of inflows and outflows shows relevant release ratio is not achieved when required, then investigate operating procedures and instrument function and take corrective action. | Monitoring of the release of environmental flows from Arraw Dam – Environmental Superintendent |
| *Dust Management Measures* | **Listed Flora** | **Implemented as outlined in Section 5.5.** | Requirements under the Qld EA | Negligible / Unlikely - Low Risk | Air quality requirements under the Qld EA are met.<br>No continual dust build up observed on leaves in high value vegetation | Air quality requirements under the Qld EA<br>Quality habitat reviews every 5 years in offset area | From the commencement of the action. Targeting dry season monitoring when dust impacts are most prevalent | Breaches to be investigated and appropriate mitigation measures to be implemented. | Implementation of Dust controls –Operations Personnel.<br>Air Quality Monitoring – Environmental Superintendent |

[5] The reduction in turtle nest predation is currently identified as the best way to track effectiveness of our feral pig control activities.

# 7 MONITORING AND REPORTING

All reports and related analysis of survey data required by this plan will be published annually on the RTA website (see link below) in accordance with Conditions 57 and 59 of the EPBC Act approval.

https://www.riotinto.com/en/operations/australia/weipaThe survey data will also be provided on request in accordance with Condition 56.

If the Bare-rumped Sheathtail Bat is identified within the Project area, RTW will notify the Commonwealth Administering Authority in writing within five days of a confirmed or suspected observation in accordance with Condition 32.

# 8 TRADITIONAL OWNER EMPLOYMENT OPPORTUNITIES

RTW has committed to working collaboratively with Traditional Owners, through the relevant Western Cape Communities Co-existence Agreement (WCCCA) Sub-Committees and the WCCCA Coordinating Committee to further increase representation of local Aboriginal people, and in particular, the Wik & Wik Waya Traditional Owners across the workforce. For this reason, focussed work, in collaboration with Traditional Owners and the Members of the WCCCA Employment, Training, Environment and Heritage Sub-Committee will be undertaken, to understand the current challenges, the outcomes achieved to date and the development of strategies specific to the needs of this community.

In addition, RTA Weipa as a signatory to the Western Cape Regional Partnership Agreement (RPA) is actively working with the RPA working group on employment and training to identify opportunities where industry, Governments and local Aboriginal people can strategically partner to develop relevant skills and employment pathways during the Project.

Traditional Owner employment opportunities associated with terrestrial management will be available in the following Land and Sea Management Programmes, which are part of the Communities, Heritage and Environmental Management Plan (SoE Communities, Heritage and Environment Working Group, 2014):

- Feral pig control program;
- Feral cat and dog control program;
- Weed management program;
- Rehabilitation program;
- Water management program;
- Fire management program; and
- Seed collection associated with rehabilitation.

In addition, through the existing Indigenous Land Use Agreement, opportunities for employment of Traditional Owners are identified through an employment and training plan. This plan identifies work opportunities and roles within these work opportunities that may be filled by Traditional

Owners. Traditional Owners that may be capable of filling these roles are then identified with RTW supporting identified candidates to become appropriately skilled to fill the identified roles. RTW supports the employment of Traditional Owners if they are appropriately skilled and qualified in all areas of the business.

As a part of the reporting obligations under the Indigenous Land Use Agreement, quarterly review reports are provided to the WCCCA on RTW's Indigenous employment and training obligations. This report shall include the number of Indigenous employment opportunities taken up under Land and Sea Management Programmes.

# 9 MANAGEMENT PLAN REVIEW

The Terrestrial Management Plan shall be reviewed, revised and submitted to the Minister for approval within 60 days of the first five year anniversary of commencement of operations (this document) and every five years thereafter for the life of the project.

# 10 REFERENCES

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# 11 GLOSSARY

**ANZECC** - Australian and New Zealand Environment Conservation Council.

**Amrun** - the area located on ML7024 and ML 6024 south of the Embley River – previously referred referred to as South of Embley

**clearing of vegetation/ clear vegetation** – the clearing or inundation by water of vegetation, for pest and weed control, or construction of any infrastructure.

**commencement of the action** - any works that are required to be undertaken for construction (except exploration, site investigation and preliminary works).

**completion criteria** - the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The completion criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly disturbed by the mining activities. Completion criteria may include information regarding:

- stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage;
- control of geochemical and contaminant transport processes;
- quality of runoff waters and potential impact on receiving environment;
- vegetation establishment, survival and succession;
- vegetation productivity, sustained growth and structure development;
- fauna colonisation and habitat development;
- ecosystem processes such as soil development and nutrient cycling, and there-colonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- resilience of vegetation to disease, insect attack, drought and fire;
- vegetation water use and effects on ground water levels and catchment yields.

**construction** - any works that are required to be undertaken for the project including the beneficiation plant (including tailings storage facility); Boyd Port facility, and Hey and Embley River facilitates; dam construction; clearing of vegetation; and infrastructure facilities (including power station, roads, and fuels storage). Excludes preliminary works.

**dam** - a land-based structure or a void that is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. However; a dam does *not* mean a fabricated or manufactured tank or container designed to a recognised standard, *nor* does a dam mean a land-based structure where that structure is designed to an Australian Standard. In case there is any doubt, a levee (dyke or bund) is a dam, but (for example) a bund designed for spill containment to AS1940 is *not* a dam.

**EIS** - the Environmental Impact Statement for the South of Embley Project.

**environmental authority** - an environmental authority granted in relation to a mining activity under the Queensland *Environmental Protection Act 1994*.

**extraction areas** - any areas of ML6024 and ML7024 disturbed by mining activities associated with the extraction of bauxite or that facilitate the extraction of baux1te including but not limited to pits, haul roads, access tracks, pipelines and conveyors.

**hazard category** - a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995).

**impacts/impacted** – as defined in section 527E of the EPBC Act.

**infrastructure** – operations or activities that are ancillary to mining such as haul and access roads, conveyors, bridges, tailings storage facilities, loading ramps, pumps, pipelines and water management infrastructure, energy generation and transmission, exploration, Boyd Port, beneficiation plant, stockpiles, and the barge and ferry terminals.

**land use** – a term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

**listed flora species** – listed vulnerable threatened species under the EPBC Act, specifically Cooktown Orchid (*Dendrobium bigibbum*); Chocolate Tea Tree Orchid (*Dendrobium johannis* (*Cepobaculum johannis*)); and Beach nightshade (*Solanum dunalianum*).

**listed migratory bird species** – listed migratory species under the EPBC Act, specifically as identified in **Appendix A**.

**matter of national environmental significance** – those matters protected under the EPBC Act: World Heritage properties, National Heritage places, wetlands of international importance (Ramsar wetlands), listed threatened species and communities, listed migratory species, Commonwealth marine areas, Great Barrier Reef Marine Park, the environment where nuclear actions are involved (including uranium mines).

**measures** - any measures to prevent or minimise environmental impacts of the activity such as bunds, silt fences, diversion drains, capping, and containment systems.

**mining / mining area/s** - operations or activities connected with the extraction of bauxite ore (excluding infrastructure) or the location where operations or activities connected with the extraction of bauxite ore occur.

**mining activities** - an activity as described in section 147 of the Environmental Protection Act 1994.

**Minister** – the Minister administering the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and includes a delegate of the Minister.

**operation/s** – commencement of activities associated with bauxite mining and production, including shipping activities from the Boyd Port and facilitates in the Hey and Embley Rivers. This does not include activities associated with construction or preliminary works.

**preliminary works** – includes activities associated with the upgrade of Beagle Camp and Pera Head Access Roads; establishment of exploration drill and seismic lines; vegetation clearing and construction of the mine access road (between Hey River terminal and Boyd mine infrastructure area); terrestrial vegetation clearing associated with temporary barge landing area near Pera Head; construction and operation of barge landing area located on Hey River; preparation of laydown areas at Humbug and Hornibrook terminals (existing disturbed areas); construction (including vegetation clearing of up to 30 hectares) and operation of a temporary accommodation camp (up to 200 persons) in the project area; installation and operation of ancillary infrastructure (including diesel fuelled power generation, laydown areas, package sewage treatment plants, waste storage and disposal facilities, fuel storage, offices and cribs, and access roads); construction and operation of an artesian bore including associated storage and treatment facilities and pipelines; and, installation of communications infrastructure.

**progressive rehabilitation** – rehabilitation undertaken progressively or a staged approach to rehabilitation as mining operations are ongoing.

**publish/ed** – documentation available on the approval holder's website for the duration of the action (including decommissioning).

**receiving environment** - all groundwater, surface water, land, and sediments that are not disturbed areas authorised by this environmental authority.

**receiving waters** - all groundwater and surface water that are not disturbed areas authorised by this environmental authority.

**reference site** - a location relating to an environmental value, such as water quality, a coral reef, fishing ground, or other feature as defined in the Queensland Water Quality Guidelines (QWQG) that will not be affected by a disturbance caused by the proposed activity. Where a proposed activity has been identified to place one or more environmental values under some level of risk, reference site(s) serve to indicate the state of the natural condition outside of the influence of the proposed activity. Reference sites are typically matched or correspond to one or more Concern Sites. Reference sites are sometimes referred to as Control Sites when they do not strictly comply with the true definition of Reference Sites in the QWQG and ANZECC & ARMCANZ (2000).

**rehabilitation** - the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the completion criteria set out in the current version of the Queensland Environmental Authority and, where relevant, includes remediation of contaminated land.

**South of Embley (SoE)** - the area on ML7024 and ML 6024 south of the Embley River – now referred to as Amrun

**spillway** - a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from a dam, normally under flood conditions or in anticipation of flood conditions.

**stable -** in relation to land, means land form dimensions are and will remain within tolerable limits now and in the foreseeable future. Issues to be properly considered in regard to whether or not the landform is stable include geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

**stream order** - denotes a stream classification system where a watercourse is given a classification according to the number of additional tributaries associated with the watercourse.

**survey data** - information obtained from monitoring and survey activities associated with plan/s and/or strategies specified by these conditions and where relevant must include, at minimum, the name of species (common and scientific), time and day of survey, GPS location, number of individuals located, age class (if known), habitat type, and EPBC Act listing status.

**waters** - includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

**wetlands** - areas of permanent or periodic/intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed 6 metres. To be classified as a wetland, the area must have one or more of the following attributes:

- at least periodically, the land supports plants or animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle, or
- the substratum is predominantly undrained soils that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers, or
- the substratum is not soil and is saturated with water, or covered by water at some time.

# Appendices

## Appendix A: Migratory Bird Species

| Migratory Avian Group | Species |
|---|---|
| International Migratory Shorebirds | *Actitis hypoleucos* Common Sandpiper |
| | *Calidris acuminata* Sharp-tailed Sandpiper |
| | *Calidris canutus Red Knot* |
| | *Calidris ferruginea* Curlew Sandpiper |
| | *Calidris ruficollis* Red-necked Stint |
| | *Calidris tenuirostris* Great Knot |
| | *Charadrius leschenaultia* Great Sand Plover |
| | *Charadrius mongolus* Lesser Sand Plover |
| | *Charadrius veredus* Oriental Plover |
| | *Gallinago hardwickii* Lathan's Snipe, Japanese Snipe |
| | *Heteroscelus brevipes* Grey-tailed Tattler |
| | *Limnodromus semipalmatus* Asian Dowitcher |
| | *Limosa lapponica* Bar-tailed Godwit |
| | *Limosa limosa* Black-tailed Godwit |
| | *Numenius madagascariensis* Eastern Curlew |
| | *Numenius minutus* Little Curlew, Little Whimbrel |
| | *Numenius phaeopus* Whimbrel |
| | *Pluvialis fulva* Pacific Golden Plover |
| | *Pluvialis squatarola* Grey Plover |
| | *Tringa nebularia* Common Greenshank |
| | *Tringa stagnatilis* Marsh Sandpiper |
| | *Xenus cinereus* Terek Sandpiper |
| Waterbirds | *Acrocephalus stentoreus* Clamorous Reed-Warbler |
| | *Ardea Alba* Great Egret, White Egret |
| | *Egretta Sacra* Eastern Reef Egret |
| | *Grus Antigone* Sarus Crane |
| | *Plegadis falcinellus* Glossy Ibis |
| Seabirds | *Fregata minor* Great Frigatebird |
| | *Fregata ariel* Lesser Frigatebird |
| | *Sterna albifrons* Little Tern |
| Raptors | *Haliaeetus leucogaster* White-bellied Sea-eagle |
| | *Pandion cristatus* Eastern Osprey |
| Woodland Birds | *Cuculus saturates* Oriental Cuckoo |
| | *Merops ornatus* Rainbow Bee-eater |
| | *Mylagra cyanoleuca* Satin Flycatcher |
| | *Rhipidura rufifrons* Rufous Fantail |
| | *Monarcha melanopsis* Black-faced Monarch |
| Barn Swallow | *Hirundo rustica* Barn Swallow |
| Aerial Species | *Apus pacificus* Fork-tailed swift |
| | *Hirundapus caudacutus* White-throated Needletail |

# Appendix B: Previous baseline studies, habitat mapping and species profiles for terrestrial flora and fauna

## Previous Studies

### *Flora*

Flora surveys have been undertaken on an ongoing basis since July 2006 and throughout the construction and operational periods of the project.

Flora surveys were undertaken in July 2006, May 2007, December 2007, May 2008, December 2008, May 2009 and June 2012. The distribution of survey events provided survey effort over the two key seasons for detecting vegetation and floristic variability within the SoE Amrun area, namely the dry season and late wet season.

The flora surveys focussed initially (July 2006) on Darwin Stringybark woodland communities on the bauxite plateau which occur within the proposed mining areas. Following this initial survey, non-Darwin Stringybark communities became the focus of survey effort to describe vegetation types and overall floristics, and to determine the presence of threatened flora. The June 2012 survey addressed Darwin Stringybark woodland and riparian vegetation types occurring along the roads to be used for construction access and focussed on detection of threatened species.

The non-Darwin Stringybark communities within the SoE/Amrun Project area include riparian forest, vine forest, seasonally inundated areas and beach and estuary communities. These are most likely to support the threatened flora species that could potentially occur in the SoE/Amrun Project area.

The location of flora survey sites and traverses undertaken within the SoE/Amrun Project area is indicated in the figure below.

**Table B 1** details the survey effort employed during all surveys in the Project area.

**Table B 1: Flora Survey Effort**

| Survey Effort | Survey/Level | Vegetation Community and Floristics | Targeted Threatened Flora Searches* |
|---|---|---|---|
| No. of survey days | | 43 | 14 |
| No. of EIS survey sites | Secondary | 134 | n/a* |
| | Tertiary | 6 | n/a* |
| | Quaternary | 883 | n/a* |

* Targeted threatened flora searches comprised traverses and broad searches for target species.

A follow-up survey to determine the population, distribution and ecological requirements of the threatened orchid species impacted by the construction of Arraw Dam was carried out in July 2013.

The initial survey described what was chocolate tea tree orchid (*Dendrobium johannis*) was found to be abundant along stream margins and adjoining alluvial terraces within the seasonally inundated riparian communities. A total of 749 orchids were recorded within 381 host trees. The orchid prefers three tree species, namely swamp penda (*Xanthostemon crenulatus*), swamp box (*Lophostemon suaveolens*) and paperbark (*Melaleuca viridiflora*).

Occurrences of potential Cooktown orchids (*Dendrobium biggibum*) were rare and occurred on the same tree species as the chocolate tea tree orchid. Orchid distribution occurred throughout the

creek system although low densities are attributed to the width of the alluvial terrace and the influence of fire on riparian vegetation.

Prior to 2016, Arraw Dam surveys reported the presence of the Chocolate Tea-Tree Orchid (*Dendrobium johannis*), with identifications confirmed by the Queensland Herbarium (Ecotone, 2016). *Dendrobium johannis* is listed as Vulnerable under the NC Act.

In 2015 the taxonomy of the Tea-Tree Orchids was revised with the Queensland Herbarium recognising Large Tea-Tree Orchid (*Dendrobium trilamellatum*) as a distinct taxon within Queensland (M. Mathieson *pers. comm*. June 2015). *Dendrobium trilamellatum* is listed as Least Concern under the Queensland NC Act and is also not considered threatened under the EPBC Act.

Given this revised taxonomy and consequent change in status of *Dendrobium trilamellatum* within Queensland, and the potential for the Norman Creek orchid population to be comprised of this species, a detailed field assessment was arranged in August 2016 during the peak flowering period to confirm the taxonomy of this orchid population. This assessment was conducted by Dr Michael Mathieson, Curator of Orchidaceae, Queensland Herbarium on 17th August 2016 within the Arraw Dam infrastructure footprint and an adjoining arm of Norman Creek.

During the assessment, at least 100 specimens of the subject orchids (*Dendrobium* sp. aff. *johannis*) were identified in flower along the northern bank of Norman Creek within the footprint of Arraw Dam. Dr Mathieson collected several plants from this area and inspected many more, and when later compared with reference specimens held within the Queensland Herbarium, all were determined to be the Large Tea Tree Orchid (*Dendrobium trilamellatum*).

No specimens of the Chocolate Tea Tree Orchid (*Dendrobium johannis*) were identified. Furthermore, it appears all orchids identified as *Dendrobium johannis* at the time of the South of Embley EIS are now correctly identified as *Dendrobium trilamellatum. Dendrobium johannis* (as currently identified by the Queensland Herbarium) does not occur within the Amrun mining lease area (Ecotone, 2016).

### Survey of Listed Species in Arraw Dam Footprint

Individuals of threatened orchid species occurring within the Arraw Dam footprint area were recorded by intensive field traverses, undertaken progressively between June 2013 and June 2016 (Ecotone, 2016).

Systematic searches were undertaken throughout the entire riparian zone of the Arraw Dam footprint area. Individual orchid-bearing trees were marked with flagging tape, and the GPS location, tree species, tree size (height and trunk diameter at breast height), and the number and species of orchids were recorded. A total of 30 Cooktown Orchids (*Dendrobium bigibbum*) were recorded from 19 trees within the Arraw Dam footprint, while a further 946 Large Tea-tree Orchids (*Dendrobium trilamellatum*) were recorded from an additional 531 trees. The locations of trees bearing threatened orchids within the Arraw Dam footprint are shown in Figure D1 below.

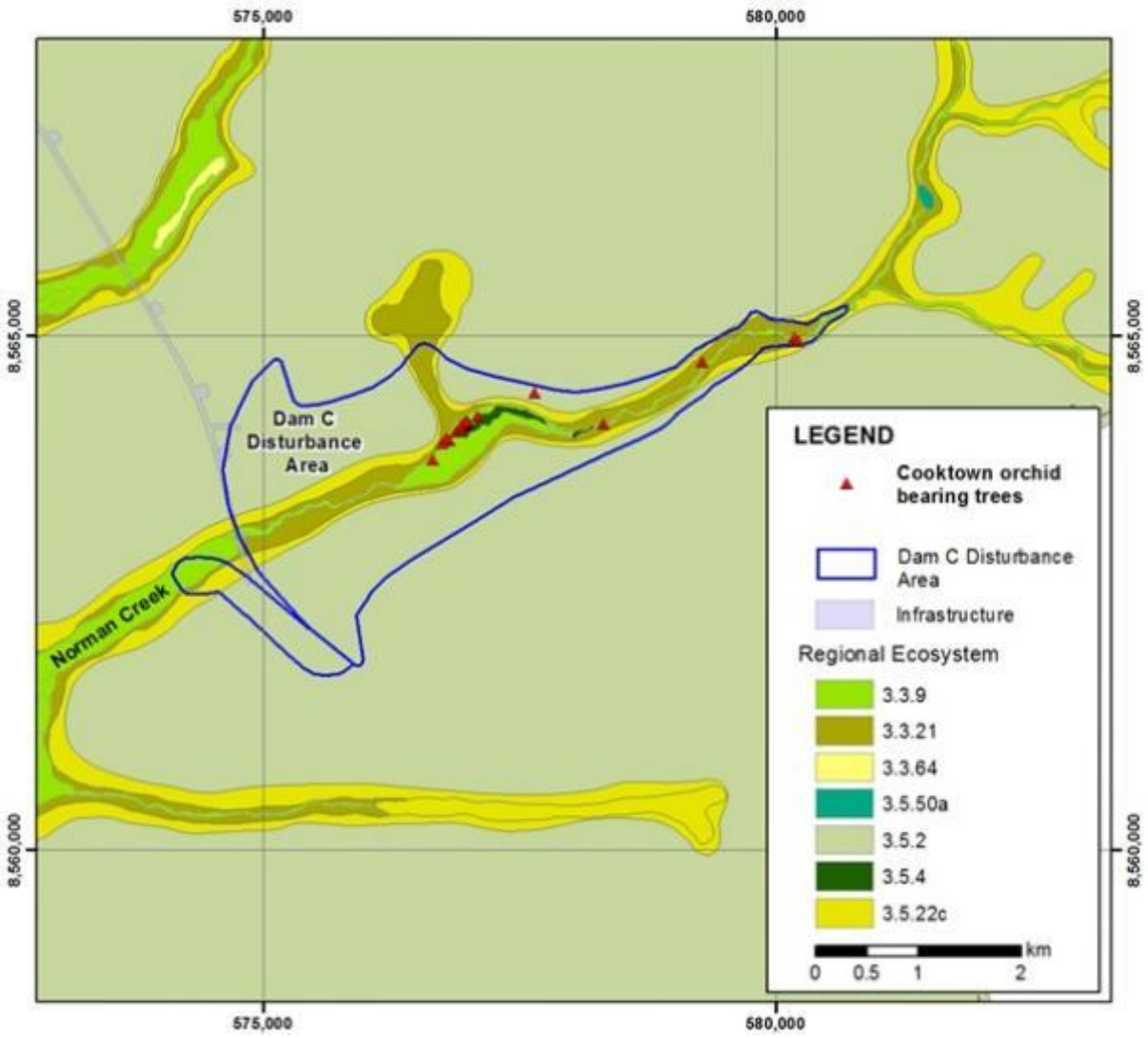


**Figure D1: Location of trees thought to be bearing threatened orchids within the footprint of Arraw Dam (2013-2016 survey data)**

Searches for additional rare or threatened plants listed under the NC Act were also undertaken during these detailed ground searches for orchids. No other rare or threatened plant species were recorded.

Since establishing this orchid propagation program, all the orchids found in the Arraw Dam footprint have now been positively identified as the Large Tea-Tree Orchid (*Dendrobium trilamellatum*) and it is now clear that no Cooktown Orchids existed in the Arraw Dam clearing area (Ecotone, 2017b).

Condition C10(b) of the Environmental Authority requires RTW to carry out the translocation and/or propagation of 3.5 plants of Cooktown Orchid for each plant found within the footprint of disturbance and establish these within the offset area. Since it is now clear that no Cooktown Orchids existed in the Arraw Dam footprint of disturbance, Condition C10(b) no longer requires the establishment of additional Cooktown Orchids in the offset area. However, since the orchids were propagated in 2016 in anticipation of translocating them to the offset area, translocation of the orchids will continue.

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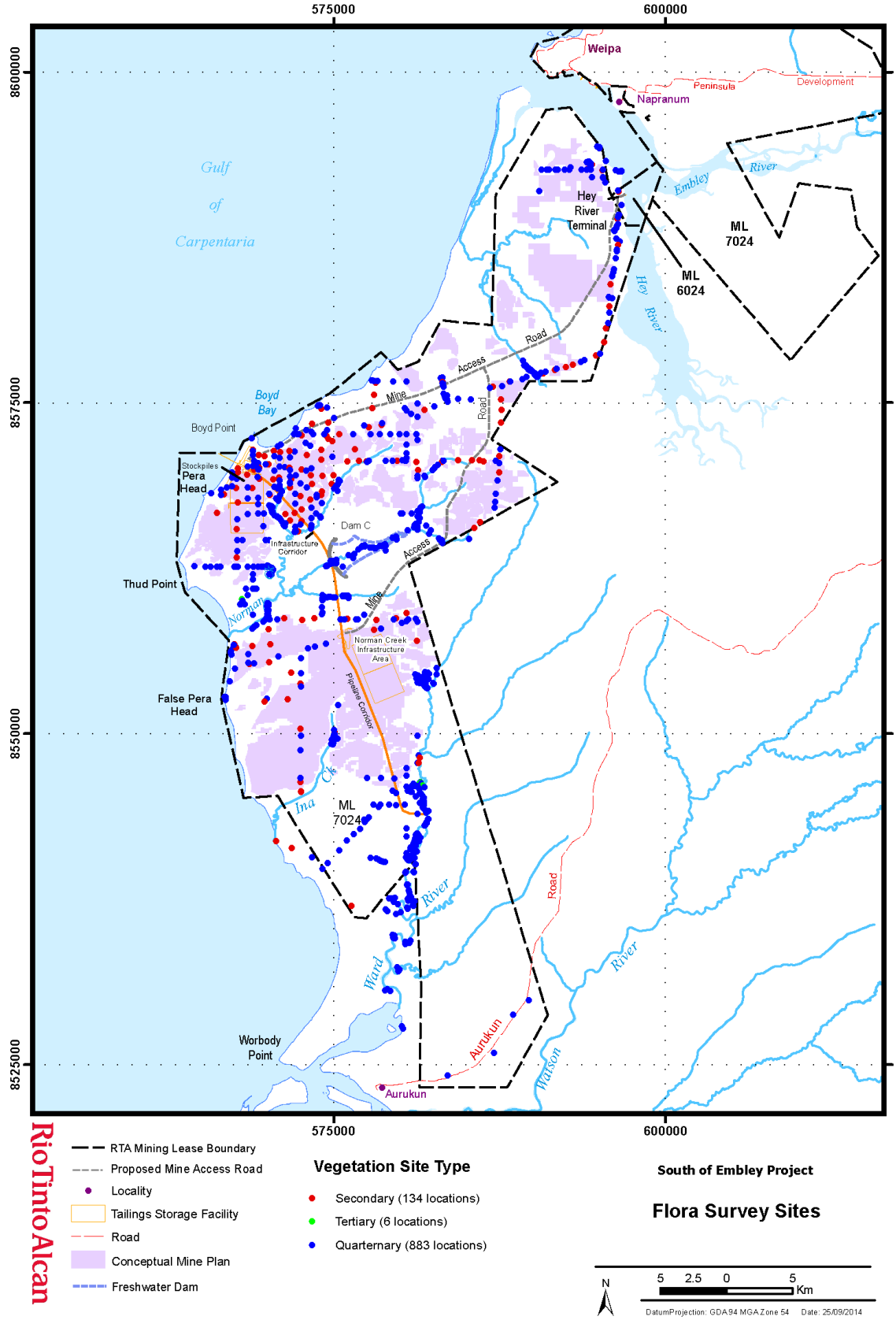
## Flora Survey Sites for baseline studies



***Terrestrial Fauna***

Field surveys for terrestrial fauna (including migratory birds) were conducted in July 2006, May 2007, December 2007, May 2008, December 2008, May 2009, June 2012 and October 2012. Ongoing preclear surveys targeting threatened species have been occurring since 2015 throughout the construction and operational phases of the project.

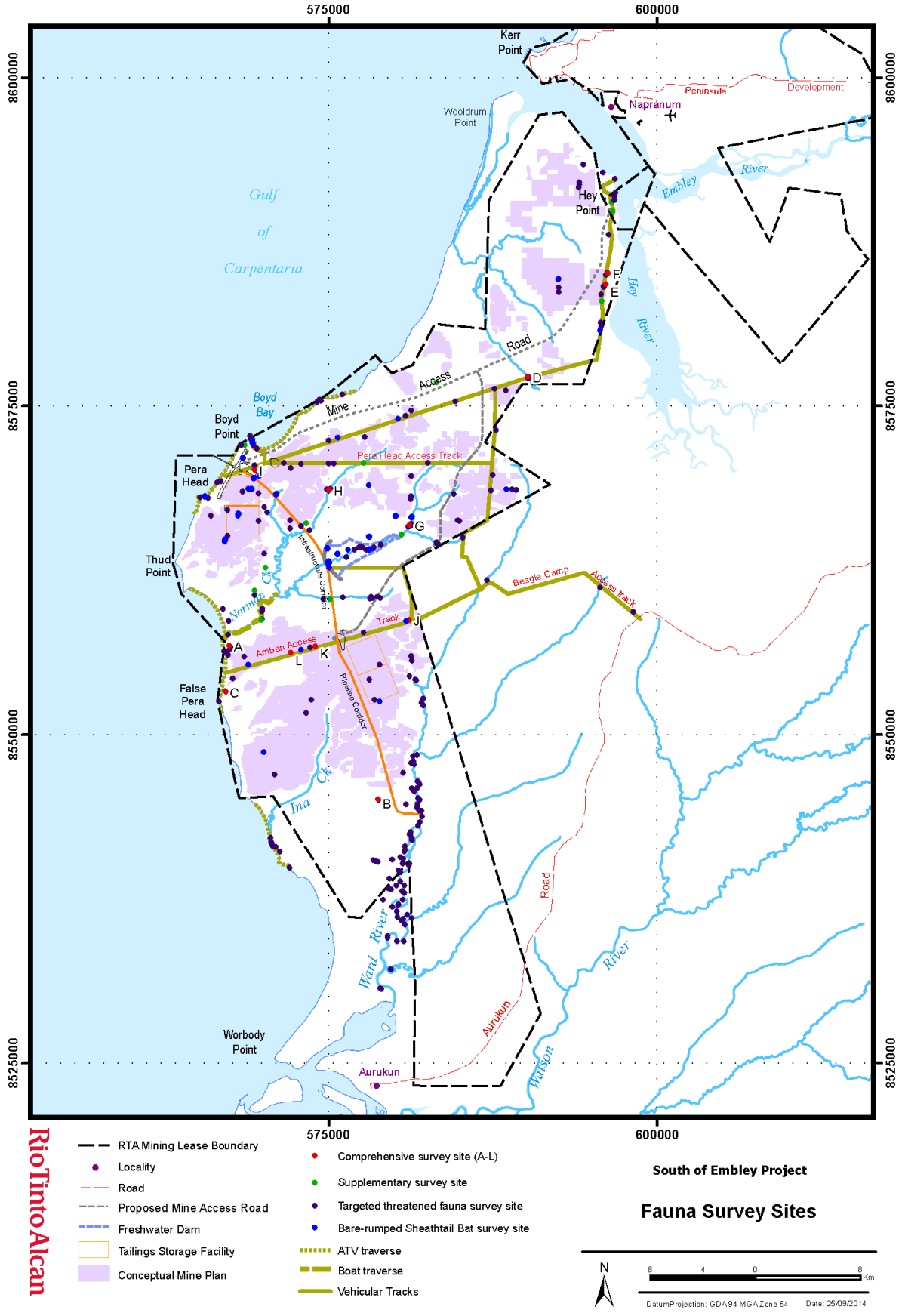
Fauna surveys focussed initially on Darwin Stringybark dominated communities on the bauxite plateau which occur within mining areas. Following this initial survey, non-Darwin Stringybark dominated communities became the focus of survey effort to adequately describe their fauna community and concentrate the search effort within habitat that is favoured by the targeted threatened fauna in order to determine presence of the species. This approach is consistent with the approach recommended by the DSEWPaC Survey Guidelines for Australia's Threatened Birds (DEWHA 2010) and Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011) for large areas with a variety of distinct habitat types. This included comprehensive surveys, supplementary surveys and targeted surveys. Comprehensive surveys were conducted determine the fauna community within the SoE/Amrun Project area. Survey sites were representative of the main habitats present within the SoE/Amrun Project area. The supplementary surveys comprised locations selected for a particular survey activity based on apparent habitat features, for example, favourable sites for harp traps, sites with high bird activity, sites with potential for supporting arboreal mammals; or, where comprehensive surveys were not completed due to fire or access issues. The targeted surveys focused on riparian forest, vine forest, wetlands, and beach and estuary communities which are most likely to support the threatened fauna species that are likely or possibly occur in the Project area, although some survey effort was still employed within areas of Darwin Stringybark woodland potentially subject to mining.

The June 2012 and October surveys included survey efforts not employed during previous surveys comprising mist netting and broad spectrum acoustic monitoring for the Bare-rumped Sheathtail Bat, sampled from riparian habitats and Darwin Stringybark woodland within proposed mining areas.

A summary of the different survey activities related to the species covered in this Terrestrial Management Plan are listed in **Table B 2** to **Table B 5,** with ongoing survey effort in **Table B 7**. The location of terrestrial fauna survey sites and traverses undertaken within the SoE/Amrun Project area is indicated in the figure below.

The pre-disturbance surveys referenced in **Table B.7** demonstrates the significant amount of time and effort put into locating MNES in areas of future disturbance. This survey methodology is designed specifically to locate any threatened species or breeding locations, including those of the Red Goshawk, Masked Owl or other raptor species.

## Terrestrial Fauna Survey Sites for baseline surveys



## Table B 2: Survey Effort for the Red Goshawk

| Survey activity | No. days /no. sessions | Duration of each survey activity (average hours) | Total survey effort for activity (hours) |
|---|---|---|---|
| ***Targeted threatened fauna surveys – December 2007/2008, May 2008/2009, June 2012, October 2012 - total survey period of 60days*** ** | | | |
| Foot traverses | 43 sessions | 4.3 hours | 185 |
| Coastal observations | 6 days | average 4 hours/day | 24 |
| ATV beach traverses | 2 sessions | 4 to 5.5 hours | 9.5 |
| Boat traverse of Norman Creek | 1 session | 6.5 hours | 6.5 |
| Vehicle traverses | 41 days | average 2.8 hours/day | 116 |
| Call playback | 7 sessions | 0.3 hours (20 minutes) | 2.1 |
| | | *Total for Targeted threatened fauna surveys* | 300 |
| ***Comprehensive surveys – May 2007, May 2008 - total survey period of 16 days*** ** | | | |
| Bird searches | 24 sessions | 1 hour | 24 |
| Vehicle traverses | 16 days | average 3 hours in daylight/day | 48 |
| | | *Total for Comprehensive surveys* | *72* |
| ***Supplementary surveys (July 2006, May 2007, May 2008) - total survey period of 12 days*** ** | | | |
| Bird searches | 10 sessions | 1 hour | 13 |
| Vehicle traverses | 12 days | average 3 hours in daylight/day | 36 |
| Foot traverses | 3 sessions | Average 6 hours/day | 18 |
| | | *Total for Supplementary surveys* | *67* |
| | | Grand Total | 482 |

** Only the components of the total survey period that are applicable to the Red Goshawk are presented in this section of the table.

## Table B 3: Survey Effort for the Masked Owl

| Survey activity | No. nights | Duration of each survey activity (hours) | No. of sites | Total survey effort for activity (hours) |
|---|---|---|---|---|
| ***Comprehensive surveys – May 2007, May 2008 - total survey period of 16 days*** ** | | | | |
| Call Playback | 6 | 0.3 | 13 | 3.9 |
| Spotlight session | 12 | 2 x 0.75 | 12 | 18 |
| Vehicle traverses | 13 | 2 (average) | | 26 |
| | | | *Total for Comprehensive surveys* | *47.9* |
| ***Targeted threatened fauna surveys – December 2007/2008, May 2008/2009, June 2012, October 2012)- total survey period of 60 days**** | | | | |
| Call Playback | 12 | 0.3 | 32 | 10 |
| Spotlight session# | 12 | 0.75 | 24 | 18 |
| Vehicle traverses | 12 | 2 (average) | | 32 |
| | | | *Total for Targeted threatened fauna surveys* | *60* |
| ***Supplementary surveys – July 2006 and May 2007 - total survey period of 12 days*** ** | | | | |
| Call Playback | 2 | 0.3 | 6 | 1.8 |
| Spotlight session | 4 | 0.75 | 8 | 6 |
| Vehicle traverses | 4 | 2 | | 8 |
| | | | *Total for Supplementary surveys* | *15.8* |
| ***Targeted Owl Playback Surveys 2015 – 2017*** | | | | |
| Call Playback # | 18 | 0.3 | 50 | 25 |
| | | | Grand Total | 148.7 |

** Only the components of the overall surveys that are applicable to the Masked Owl are presented in this section of the table.

# For the October 2012, 2015, 2916, 2017 surveys, spotlighting is included as part of the call playback component.

## Table B 4: Survey Effort for the Bare Rumped Sheathtail Bat

| Survey activity | Duration of survey activity | No. of sites | Total survey effort for activity(hours/trap nights) |
|---|---|---|---|
| ***Comprehensive surveys - May 2007, May 2008 - total survey period of 16 days*** ** | | | |
| AnaBat survey | overnight | 12 | 12 survey nights |
| Harp traps | overnight | 12 | 12 trap nights |
| *Total for Comprehensive surveys* | | | *12 survey nights*<br>*12 trap nights* |
| ***Supplementary surveys - July 2006, May2007, May 2008 - total survey period of 12 days*** ** | | | |
| Harp traps | overnight | 4 | 4 trap nights |
| *Total for Supplementary surveys* | | | *4 trap nights* |
| ***Targeted threatened fauna surveys - December 2007/2008, May 2008/2009, June 2012, October 2012 - total survey period of 60 days*** ** | | | |
| *December 2007/2008, May 2008/2009 Surveys - total survey period of 27 days*** | | | |
| AnaBat survey | overnight | 16 | 16 survey nights |
| Harp traps | overnight | 10 | 10 trap nights |
| *June 2012 October 2012 Surveys - total survey period of 20 nights* | | | |
| Harp traps | overnight | 11 | 43 trap nights |
| Mist nets | 3.5 - 5 hours per net | 45 | 47 trap nights |
| Broad spectrum acoustic survey | Overnight | 54 (June)<br>56 (October) | 110 survey nights |
| *Total for Targeted threatened fauna surveys* | | | *16 Anabat survey nights*<br>*100 trap nights (Harp trap and mist net)*<br>*110 broad spectrum nights* |
| **Grand Total** | | | 28 survey nights (AnaBat survey)<br>116 trap nights (Harp trap and mist net) |

** Only the components of the overall supplementary surveys that are applicable to the Bare-rumped Sheathtail Bat are presented in this section of the table.

Note: The applied mist net technique included multiple linked mist nets deployed at each site thus producing substantial net area compared to the standard single or double mist net method.

## Table B 5: Survey Effort for Migratory Birds

| Survey activity | Total survey effort (hours) | International migratory shorebirds | Waterbirds | Seabirds | Raptors | Woodland birds | Barn Swallow | Aerial species |
|---|---|---|---|---|---|---|---|---|
| *Targeted (migratory avian) Fauna Surveys - December 2007/2008, May 2008/2009, October 2012 - total survey period of 30 days* | | | | | | | | |
| Foot traverses* | 174 | X | X | X | X | X | X | X |
| Coastal observations | 30 | X | | X | X | X | X | X |
| ATV beach traverses | 9.5 | X | | X | X | X | X | X |
| Boat traverse of Norman Creek | 6.5 | X | X | X | X | X | X | X |
| Vehicle traverses | 69 | | | X | X | X | X | X |
| *Comprehensive Surveys - May 2007, May 2008 - total survey period of 18 days* | | | | | | | | |
| Bird searches | 18 | | X | | X | X | X | X |
| Vehicle traverses | 54 | | | X | X | X | X | X |
| *Supplementary Surveys - July 2006, May 2007, May 2008 - total survey period of 12 days* | | | | | | | | |
| Bird searches | 13 | | X | | X | X | X | X |
| Vehicle traverses | 36 | | | X | X | X | X | X |
| Foot traverses | 18 | X | X | X | X | X | X | X |

* Note that foot traverses were conducted across a range of habitat types and that the total survey effort was not relevant to all migratory bird groups.

## Table B 6: Operation Pre-disturbance Survey Efforts

| Amrun Survey Effort to Date | | | |
|---|---|---|---|
| | | | |
| **Survey Activity** | **Frequency** | **Duration of survey activity** | **Total survey effort for activity** |
| **2015-0766 Drilling Preclear SOE Program (Amrun)** | | | |
| Traverse - flora/fauna | 362 km | 15 km / day /10 hrs | 24 Days |
| Bird Survey | 125 | 15 minutes | 1875 minutes |
| Cam Sites | 109 | 4 nights | 436 nights |
| Bat recording Station | 50 | 1 night | 50 nights |
| pitfall, funnel, drift fence | 57 | 4 nights | 228 nights |
| **2016-0783 Amrun Infrastructure Preclear** | | | |
| Traverse - flora/fauna | 198 ha | 150 ha / day/ 10 hrs | 1.3 days |
| Bird Survey | 8 | 15 minutes | 120 minutes |
| Cam Sites | 8 | 4 nights | 32 nights |
| **2017-0808 Amrun Infrastructure Preclear** | | | |
| Traverse - flora/fauna | 3000 ha | 150 ha / day/ 10 hrs | 20 days |
| Bird Survey | 120 | 15 minutes | 1800 minutes |
| Cam Sites | 120 | 4 nights | 480 nights |
| **2019-0861 Amrun Drilling Preclear** | | | |
| Traverse - flora/fauna | 1252 ha | 100 ha / day/10hrs | 12.5 days |
| Bird Survey | 52 | 15 minutes | 780 minutes |
| Cam Sites | 391 | 4 nights | 1564 nights |
| cage trap (BFTR) | 86 | 4 nights | 344 nights |
| elliot trap (BFTR) | 16 | 4 nights | 64 nights |
| **2019-0861 Amrun Mine Preclear** | | | |
| Traverse - flora/fauna | 750 ha | 100 ha / day/10hrs | 7.5 days |
| Bird Survey | 21 | 15 minutes | 315 minutes |
| Cam Sites | 106 | 4 nights | 424 nights |

| | | | |
|---|---|---|---|
| **2020-0929-Amrun Mine Preclear** | | | |
| Traverse - Flora/fauna | 1253.2 ha | 100ha/day/10hrs | 12.5 days |
| Bird Surveys | 39 | 15 minutes | 312 minutes |
| Cameras | 127 | min. 8 nights | 1035 nights |
| **2020-0940-Amrun Drilling Preclear** | | | |
| Traverse - Flora/fauna | 2703 ha | 100ha/day/10hrs | 27 days |
| Bird Surveys | 42 | 15 minutes | 336 minutes |
| Cameras | 215 | min. 8 nights | 1839 nights |
| **2020-0949-Boyd Bay East Drilling Project** | | | |
| Traverse - Flora/fauna | 1917 ha | 100ha/day/10hrs | 19 days |
| Bird Surveys | 23 | 15 minutes | 184 minutes |
| Cameras | 234 | 8 nights | 1934 nights |
| **2020-0955-Arraw Dam Clearing extension** | | | |
| Traverse - Flora/fauna | 271.2 ha | 100ha/day/10hrs | 2.7 days |
| Bird Surveys | 6 | 15 minutes | 48 minutes |
| Cameras | 31 | min. 8 nights | 248 nights |

| | | | |
|---|---|---|---|
| **2021-0974-Amrun Mine Preclear** | | | |
| Traverse - Flora/fauna | 2237.7 ha | 100ha/day/10hrs | 22.4 days |
| Bird Surveys | 36 | 15 minutes | 312 minutes |
| Cameras | 148 | min. 8 nights | 1522 nights |
| **2021-0989 SoE Drilling Preclear** | | | |
| Traverse - Flora/fauna | 4858 ha | 100ha/day/10hrs | 48.6 days |
| Bird Surveys | 174 | 15 minutes | 1392 minutes |
| Cameras | 830 | min. 8 nights | 6887 nights |
| **2022-1031 Southern Ops Mine Preclear** | | | |
| Traverse - Flora/fauna | 2487.55 ha | 100ha/day/10hrs | 24.9 days |
| Bird Surveys | 48 | 15 minutes | 384 minutes |
| Cameras | 232 | min. 8 nights | 1975 nights |
| **2022-1035 SoE Drilling Preclear** | | | |
| Traverse - Flora/fauna | 9033.5 ha | 100ha/day/10hrs | 90.3 days |
| Bird Surveys | 71 | 15 minutes | 568 minutes |
| Cameras | 913 | min. 8 nights | 9204 nights |
| **2023-1075-Southern Ops Mine Preclear** | | | |
| Traverse - Flora/fauna | 3813 ha | 100ha/day/10hrs | 38 days |
| Bird Surveys | 55 | 15 minutes | 440 minutes |
| Cameras | 282 | min. 8 nights | 3602 nights |
| **2023-1080-SoE Drilling Preclear** | | | |
| Traverse - Flora/fauna | 5530 ha | 100ha/day/10hrs | 55.3 days |
| Bird Surveys | 49 | 15 minutes | 392 minutes |
| Cameras | 355 | min. 8 nights | 3555 nights |
| **2024-1130 SoE Drilling Preclear** | | | |
| Traverse - Flora/fauna | 13921 ha | 100ha/day/10hrs | 139.2 days |
| Bird Surveys | 320 | 15 minutes | 4800 minutes |
| Cameras | 1152 | min. 8 nights | 9216 nights |
| **2024-1148 Amrun Test Pits Preclear** | | | |
| Traverse - Flora/fauna | 59.2 ha* | 100ha/day/10hrs | 0. days |
| Bird Surveys | 2 | 15 minutes | 30 minutes |
| Cameras | 41 | min. 8 nights | 328 nights |
| **2024-1122 Southern Ops Mine Preclear** | | | |
| Traverse - Flora/fauna | 2633 ha | 100ha/day/10hrs | 26.3 days |
| Bird Surveys | 42 | 15 minutes | 630 minutes |
| Cameras | 222 | min. 8 nights | 1776 nights |

## Species Profiles

**Table B 7** to **Table B 9** provides a summary of species profiles for terrestrial flora, fauna and migratory bird species covered in the Terrestrial Management Plan.

## Table B 7: Profile Summaries Terrestrial Flora

| ***Species*** **Common Name (if exists)** | **Growth Form** | **Potential Habitat within SoE/Amrun area** | **Known/ estimated population in SoE/Amrun area** | **Likelihood of Occurrence within SoE/Amrun Area** |
|---|---|---|---|---|
| *Dendrobium bigibbum* Cooktown Orchid | An epiphyte that grows on trees and rocks in situations with moderate light intensity. | Within the SoE/Amrun area the Cooktown Orchid grows as an epiphyte on trees (as rocks are absent) and is commonly encountered in closed forest communities comprising coastal vine forest (RE 3.2.2), riparian rainforest (RE 3.3.5, 3.3.9), vine forest on bauxite (RE 3.5.4), and mangroves (REs 3.1.1a, 3.1.1c, 3.1.3). All areas of these habitat types within the SoE/Amrun area provide potential habitat. | Cannot be accurately estimated based on the targeted survey approach employed during field surveys, however, it is widespread and locally common within the SoE/Amrun area. | **Mining Area**<br>**Unlikely:** No suitable habitat exists in Darwin Stringybark woodland.<br>**Infrastructure footprint**<br>**Known to Occur**: Identified in the vicinity of Norman Creek and Winda Winda Creek, however this was outside the footprint of infrastructure.<br>**Balance of Project Area not disturbed**<br>**Known to Occur:** Located in coastal and non-coastal vine forest, and mangrove edges at several locations within the SoE/Amrun area that would not be affected by mining or infrastructure. |
| *Dendrobium johannis* Chocolate Tea Tree Orchid | An epiphyte that grows in open humid habitats | Within the Project area the Chocolate Tea Tree Orchid grows as an epiphyte on trees (as rocks are absent) and is commonly encountered in freshwater swamps (RE 3.2.3, 3.3.14a, 3.3.21 and 3.3.50a); *Melaleuca* fringing vegetation on seasonal marine swamps and salt flats (RE 3.1.6, 3.3.63, and 3.3.65); riparian gallery forest (RE 3.3.5, 3.3.9, and 3.3.14a); and the landward margin of mangroves (RE 3.1.1a, 3.1.1c, and 3.1.3). | Cannot be accurately estimated based on the targeted survey approach employed during field surveys, however, it is widespread and locally common within the Project area. | **Mining Area**<br>**Unlikely:** No suitable habitat exists in Darwin Stringybark woodland.<br>**Infrastructure footprint**<br>**Unlikely Occur**: Extensive surveys within the area have not identified any specimens within the Amrun mining lease area (Ecotone, 2016)<br>**Balance of Project Area not disturbed**<br>**Unlikely :** Located in riparian gallery forest and *Melaleuca* dominated swamps particularly along major drainage lines and associated tributaries throughout the Project area, in areas not to be disturbed. |
| *Solanum dunalianum* Beach Nightshade | An herbaceous shrub growing to 2–4m | Potential habitats within the Project area comprise all areas of coastal vine forest (RE 3.2.2) and all areas of vine forest on the bauxite plateau (RE 3.5.2). | If present, population is likely to be small. | **Mining Area**<br>**Unlikely:** No suitable habitat exists in Darwin Stringybark woodland.<br>**Infrastructure footprint**<br>**Unlikely:** Within the SoE/Amrun area the species is expected to be restricted to coastal vine forest and vine forest on bauxite.<br>**Balance of Project Area not disturbed**<br>**Likely**: Not detected during field surveys but suitable coastal vine forest and vine forest on bauxite habitat occurs in the SoE/Amrun area in areas not to be |

| *Species* Common Name (if exists) | Growth Form | Potential Habitat within SoE/Amrun area | Known/ estimated population in SoE/Amrun area | Likelihood of Occurrence within SoE/Amrun Area |
|---|---|---|---|---|
| | | | | disturbed. |

**Table B 8: Profile Summaries Terrestrial Fauna**

| *Species* Common Name | Key Resources | Potential Habitat within SoE/Amrun area | | | Known/ estimated Population in Project area | Likelihood of Occurrence within Project Area |
|---|---|---|---|---|---|---|
| | | High Suitability Habitat | Moderate Suitability Habitat | Low/no Suitability Habitat | | |
| *Erythrotriorchis radiatus* Red Goshawk | Mosaic of open forest/woodland/ riparian/wetland habitats close to permanent water. Trees >20m high for nesting within 1km of a permanent watercourse or wetland. Abundance of moderate sized bird prey. | Habitat mosaics associated with the main drainage systems of the SoE/Amrun area (Ward River, Norman Creek, Winda Winda Creek) including *Corymbia* dominated woodlands on upper (seasonal) drainage lines and colluvial areas (RE 3.3.21), riparian gallery forest, *Melaleuca* wetlands, seasonal freshwater wetlands on marine plains, mangrove communities, and adjacent very tall Darwin Stringybark woodland. | More extensive tracts of Darwin Stringybark dominated woodland and open forest and associated woodlands located between 1km and 8km (maximum foraging distance) away from drainage line habitat mosaics (high suitability habitat). | None present, all parts of the SoE/Amrun area are within foraging distance of high suitability habitat. | Survey data indicates that there are currently four (4) breeding pairs within the Project Area. | **Mining Area** **Confirmed:** Four (4) breeding pairs of Red Goshawk have been confirmed within the open forests of the mining area.. **Infrastructure footprint** **Possible:** no nests were located within the proposed dam site. However, the Arraw Dam site contains potential foraging and nesting habitat. **Balance of Project area not disturbed** **Confirmed:** Tracking data and survey data demonstrates that the Red Goshawk breeding pairs are utilising the open forest, woodland, riparian, and wetland habitats that occur throughout the SoE/Amrun area. |

| ***Species***<br>**Common Name** | **Key Resources** | **Potential Habitat within SoE/Amrun area** | | | **Known/ estimated Population in Project area** | **Likelihood of Occurrence within Project Area** |
|---|---|---|---|---|---|---|
| | | **High Suitability Habitat** | **Moderate Suitability Habitat** | **Low/no Suitability Habitat** | | |
| *Tyto novaehollandiae kimberli*<br>Masked Owl (northern) | Medium to large tree hollows for nesting.<br>Availability of small-medium sized ground mammal prey. | No high suitability habitat identified within the SoE/Amrun area due to the paucity of small mammal populations within the SoE/Amrun area. | Riparian, wetland and mangrove habitats and immediately adjoining Darwin Stringybark woodland associated with the Ward River and Norman Creek.<br>Other areas of riparian gallery forest, *Melaleuca* wetland, mangrove forest and vine forest and immediately adjoining Darwin Stringybark woodland throughout the SoE/Amrun area.<br>The actual suitability of these habitat locations would depend on the small mammal population present in each location. Field surveys show that small mammals are generally present in these areas in low densities. | The majority of the SoE/Amrun area comprises low/no suitability habitat due to the lack of small mammals. | Most likely not present but may possibly occur at very low densities. | **Mining Area**<br>**Unlikely:** suitable habitat areas (riparian, wetland and vine forest habitats) and peripheral habitat (Darwin Stringybark open forest habitat adjacent to the moderate suitability habitat areas), are not located within the mining area.<br>**Infrastructure footprint**<br>**Possible:** sections of tall closed forest on major drainages along Norman Creek and the Ward River provide potentially suitable habitat. The Arraw Dam footprint contains some suitable habitat; however, this area is not regarded as especially significant for foraging or breeding. The prevalence of the species may be significantly limited by the apparent paucity of small mammal populations within the SoE/Amrun area.<br>**Balance of Project Area not disturbed**<br>**Possible:** the majority of key habitat resources for the species within the SoE/Amrun area are located in areas not to be disturbed; however, the prevalence of the species may be significantly limited by the apparent paucity of small mammal populations. |

| ***Species***<br>**Common Name** | **Key Resources** | **Potential Habitat within SoE/Amrun area** | | | **Known/ estimated Population in Project area** | **Likelihood of Occurrence within Project Area** |
|---|---|---|---|---|---|---|
| | | **High Suitability Habitat** | **Moderate Suitability Habitat** | **Low/no Suitability Habitat** | | |
| *Saccolaimus saccolaimus nudicluniatus*<br>Bare-rumped Sheathtail Bat | Poorly known but includes availability of tree hollows for roosting and availability of flying insect prey. | Given the lack of data on this species on Cape York and the absence of records or data on habitat utilisation in western Cape York Peninsula it is not possible to predict potential habitat within the SoE/Amrun area. | | | No known population. Population estimates not possible without basic ecological information for western Cape York Peninsula. | **Unlikely**:<br>High trapping effort using appropriate equipment (mist nets hoisted into canopy) has returned capture of 70 individuals belonging to two other *Saccolaimus* species, but not the Bare-rumped Sheathtail Bat. Deployment of 110 full night targeted broad spectrum acoustic survey did not find the species. |

## Table B 9: Profile Summaries Migratory Birds

| Group (refer Appendix A for species) | Preferred Habitat | Potential habitat within SoE/Amrun area | Population in SoE/Amrun area | Likelihood of Occurrence within SoE/Amrun area |
|---|---|---|---|---|
| International migratory shorebirds | International migratory shorebirds utilise a variety of habitat types for foraging including tidal mudflats and sandflats, inland lakes or waterways and estuaries. Roost habitats can include beaches, rocky headlands, mangroves and clay pans. A number of internationally significant sites occur across Queensland. The nearest significant site is the south east Gulf of Carpentaria, approximately 500km south of the SoE/Amrun mine site. | International migratory shorebird habitat within the SoE/Amrun area includes coastal intertidal zones and estuarine waterways found along the Gulf shoreline, the lower and upper estuary of Norman Creek, Hey Point estuary, and the coastal wetlands associated with Norman Creek and the Ward River. | The SoE/Amrun area is situated within the East Asian-Australasian Flyway. Migrating individuals could be present within the mining area during August to May with overwintering individuals potentially present at other times of the year. | **Mining Area**<br>**Unlikely**: Mining areas do not overlap with the favoured wetland habitats of these species.<br>**Infrastructure footprint**<br>**Likely**: Isolated individuals may forage in the Port area. The wetland and riparian habitats in the Arraw Dam area are unlikely to be utilised by the species. The mangroves in the vicinity of the proposed Hey River terminal have been identified as of low suitability for shorebird roosting.<br>**Balance of the SoE/Amrun Area not disturbed**<br>**Known to Occur**: Five species confirmed as present with a further three species likely and 14 species possible. |
| Waterbirds | Preferred habitats for waterbird species include, but are not limited to, river shallows, estuaries, tidal mudflats, freshwater wetlands and large dams. | Available habitat within the SoE/Amrun area includes all natural and artificial wetlands, waterways and intertidal flats. Habitat for the Clamorous Reed-warbler includes those wetlands that support reed beds. | Only modest numbers of waterbirds were observed within the SoE/Amrun area. | **Mining Area**<br>**Unlikely**: Mining areas do not overlap with the favoured wetland habitats of these species.<br>**Infrastructure footprint**<br>**Possible**: The riparian and colluvial habitat corridor within the Arraw Dam footprint may be utilised by the Great Egret or Glossy Ibis during the wet season but these habitats do not represent key habitat for these species.<br>**Balance of the Amrun Area not disturbed**<br>**Known to Occur**: Four species confirmed within the Amrun area with an additional species likely to occur. |

| Group (refer Appendix A for species) | Preferred Habitat | Potential habitat within SoE/Amrun area | Population in SoE/Amrun area | Likelihood of Occurrence within SoE/Amrun area |
|---|---|---|---|---|
| Seabirds | Seabirds utilise coastal waters and open ocean for feeding. Seabird species are known to breed in colonies on beaches and offshore islands. | Seabird habitat within the SoE/Amrun area includes the coastal waters and estuary inlets to the west of the site. Scattered dunal areas found within the Project area may accommodate breeding colonies for the Little Tern (*Sterna albifrons*). | Substantial seabird populations occur within the SoE/Amrun area, particularly associated with the Gulf coastline. | **Mining Area**<br>**Unlikely**: Mining areas do not overlap with the favoured coastal habitats of these species.<br>**Infrastructure footprint**<br>**Known to Occur**: All three species forage along the coastline where the Port facility is situated.<br>**Balance of the Project Area not disturbed**<br>**Known to Occur**: Three species confirmed within the SoE/Amrun area in coastal habitats. No frigatebird roosts located or anticipated within the SoE/Amrun area. There would be limited disturbance to the important foraging habitat of the Lesser Frigatebird in over-water areas off the SoE/Amrun area. |
| Raptors | The Eastern Osprey (*Pandion cristatus*) and White-bellied Sea-eagle (*Haliaeetus leucogaster*) are wide ranging bird species which occupy marine and terrestrial habitats. Preferred habitat for the Eastern Osprey includes coasts, estuaries, bays and inlets. The White-bellied Sea-eagle utilises the same habitats as the Eastern Osprey as well as large rivers and inland lakes. Both bird species nest in tall trees within 1km of water. | Habitat for both raptor species within the Project area includes tall trees lining the coastline and estuaries. Fringing riparian woodland would also provide nesting opportunities for the White-bellied Sea-eagle. Habitat within the SoE/Amrun area includes mangrove and estuarine communities, wetlands and riparian woodland, coastal foreshore, beach and tidal flats. | Both species are well established within the coastal areas of the SoE/Amrun mine area and surrounding region with residential breeding pairs. | **Mining Area**<br>**Unlikely**: Mining areas do not overlap with the favoured coastal habitats of these species.<br>**Infrastructure footprint**<br>**Known to Occur**: Both species forage along the coastline where the Port and stockpile facilities are located<br>**Balance of the Project Area not disturbed**<br>**Known to Occur**: Both species confirmed throughout the SoE/Amrun area. |

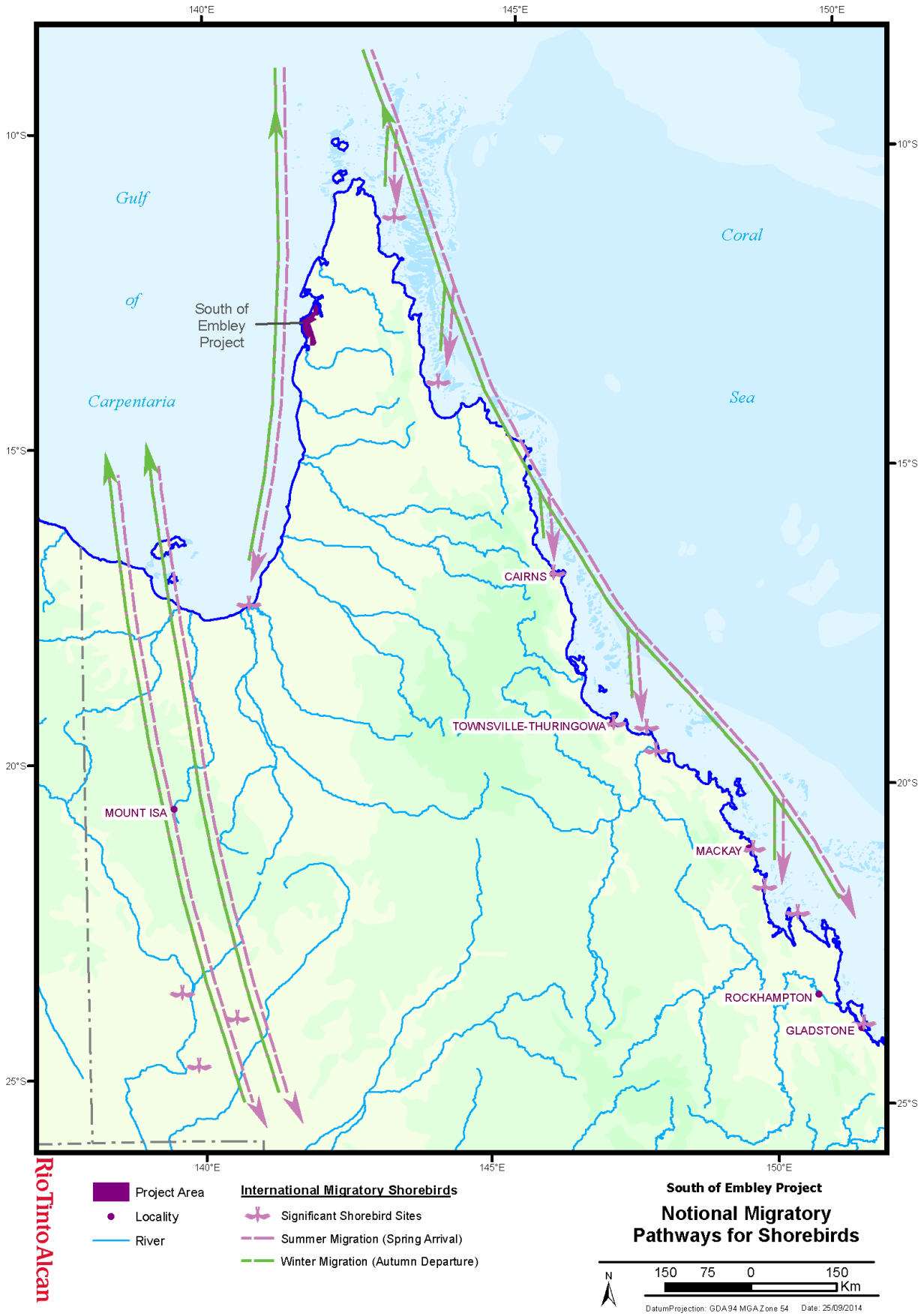
| Group (refer Appendix A for species) | Preferred Habitat | Potential habitat within SoE/Amrun area | Population in SoE/Amrun area | Likelihood of Occurrence within SoE/Amrun area |
|---|---|---|---|---|
| Woodland Species:<br>Rainbow Bee-eater / Oriental Cuckoo | Both the Rainbow Bee-eater (*Merops ornatus*) and Oriental Cuckoo (*Cuculus saturatus*) are known to occur within a variety of habitats including open woodlands, riparian zones, cliffs, mangroves and rainforest. The Rainbow Bee-eater may nest in creek banks in riparian forest habitat. | All habitats within the SoE/Amrun area are considered potential habitat for both species. | The Rainbow Bee-eater is well established in the Project area with resident individuals. The Oriental Cuckoo is likely to be present at low densities during summer migration between September and May. | **Mining Area**<br>**Known to Occur**: Darwin Stringybark woodland habitat that occurs within the mining area is utilised by the species.<br>**Infrastructure footprint**<br>**Known to Occur**: The Rainbow Bee-eater confirmed in these areas and the Oriental Cuckoo also likely to occur.<br>**Balance of the Project Area not disturbed**<br>**Known to Occur**: The Rainbow Bee-eater is common in a variety of habitats, but mainly in association with beach, estuary, vine forest and riparian habitats. The Oriental Cuckoo is likely to be present in small numbers in similar wide arrays of habitats. |
| Woodland Species:<br>Satin Flycatcher / Rufous Fantail / Black-faced Monarch | The Satin Flycatcher (*Myiagra cyanoleuca*), Rufous Fantail (*Rhipidura rufifrons*) and Black-faced Monarch (*Monarcha melanopsis*) are known to utilise rainforest, *Eucalypt* woodlands and riparian zones and mangroves. | Potential habitat within the SoE/Amrun area for these species includes the riparian and alluvial woodlands, vine forest and paperbark woodlands and wetland swamps. Additionally these species may utilise the coastal vine forest, mangrove and estuary communities found across the SoE/Amrun area. | The Rufous Fantail is common within the SoE/Amrun area in favoured habitats during winter migration period.<br>The Satin Flycatcher also likely to be present during winter migration period.<br>The Black-faced Monarch is possibly present during non-summer months. | **Mining Area**<br>**Unlikely**: Mining areas do not overlap with the favoured dense forest habitats of these species.<br>**Infrastructure footprint**<br>**Likely**: The Rufous Fantail and Satin Flycatcher are likely to utilise the dense riparian habitats within the Arraw Dam area. The Black-faced Monarch possibly uses this area.<br>**Balance of the Project Area not disturbed**<br>**Known to Occur**: The Rufous Fantail was found to be common in the SoE/Amrun area in favoured dense habitats comprising mangroves, riparian gallery forest, vine forest and *Melaleuca* wetland.<br>The Satin Flycatcher and Black-faced Monarch likely to occupy similar habitats to the Rufous Fantail but especially riparian gallery forest and *Melaleuca* wetlands. |

| Group (refer Appendix A for species) | Preferred Habitat | Potential habitat within SoE/Amrun area | Population in SoE/Amrun area | Likelihood of Occurrence within SoE/Amrun area |
|---|---|---|---|---|
| | | | | |
| Barn Swallow | The Barn Swallow (*Hirundo rustica*) is often recorded in open county, near water, towns and cities. Habitats in which this species is known to occur include freshwater wetlands and paperbark woodland. | Within the SoE/Amrun area potential habitat for the Barn Swallow includes Darwin Stringybark woodland, riparian gallery forest and alluvial woodland, paperbark woodland, foreshore, vine thicket, mangrove and estuarine communities. | Likely to occur during summer migration. | **Mining Area**<br>**Possible**: The species may forage above Darwin Stringybark woodland in proposed mining areas.<br>**Infrastructure footprint**<br>**Likely**: The species is likely to forage in infrastructure areas.<br>**Balance of the SoE/Amrun Area not disturbed**<br>**Likely**: Habitats likely to be occupied by this species include naturally open areas such as beach, estuary and coastal swamps throughout the SoE/Amrun area. |
| Aerial species | Aerial species spend day and night on the wing and are known to occupy airspace across most habitat types. | It is considered that both aerial species would occupy airspace above the entire SoE/Amrun area. | Both species likely to be present during summer migration period October-March. | **Mining Area**<br>**Likely**: Airspace above all habitats likely to be utilised.<br>**Infrastructure footprint**<br>**Likely**: Airspace above all habitats likely to be utilised.<br>**Balance of the Project Area not disturbed**<br>**Known to Occur**: Both species confirmed within coastal and riparian habitats but likely to utilise airspace above all habitats. |

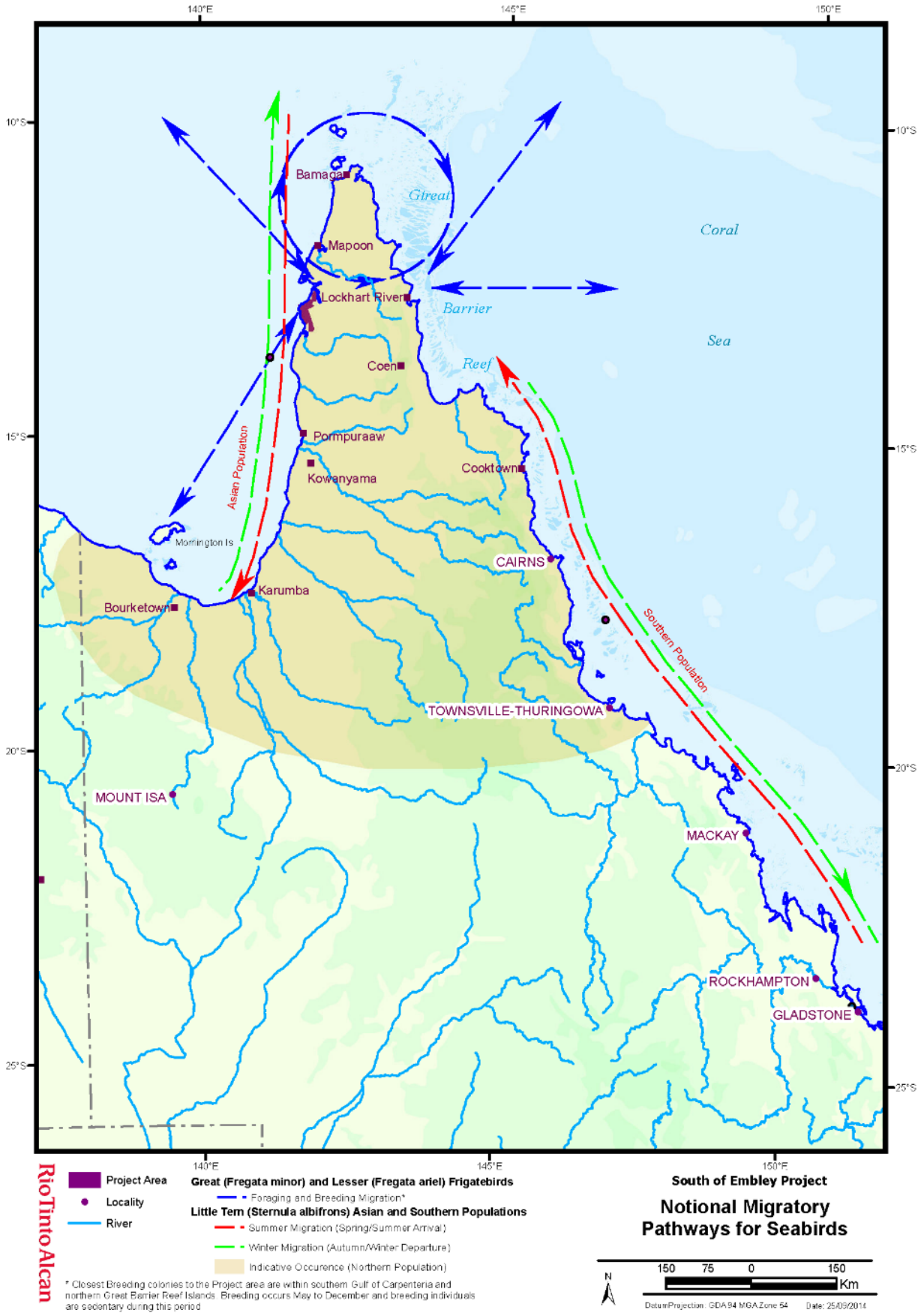
**Potential Habitat**

Potential habitat for the relevant terrestrial flora and fauna species within the SoE/Amrun area is illustrated in the Terrestrial Management Plan. Potential habitat for the Bare-rumped Sheathtail Bat is not mapped as its habitat is not yet known and it was not found during targeted surveys (see Appendix C).. Notional migratory pathways for migratory bird species are presented in the figures below.

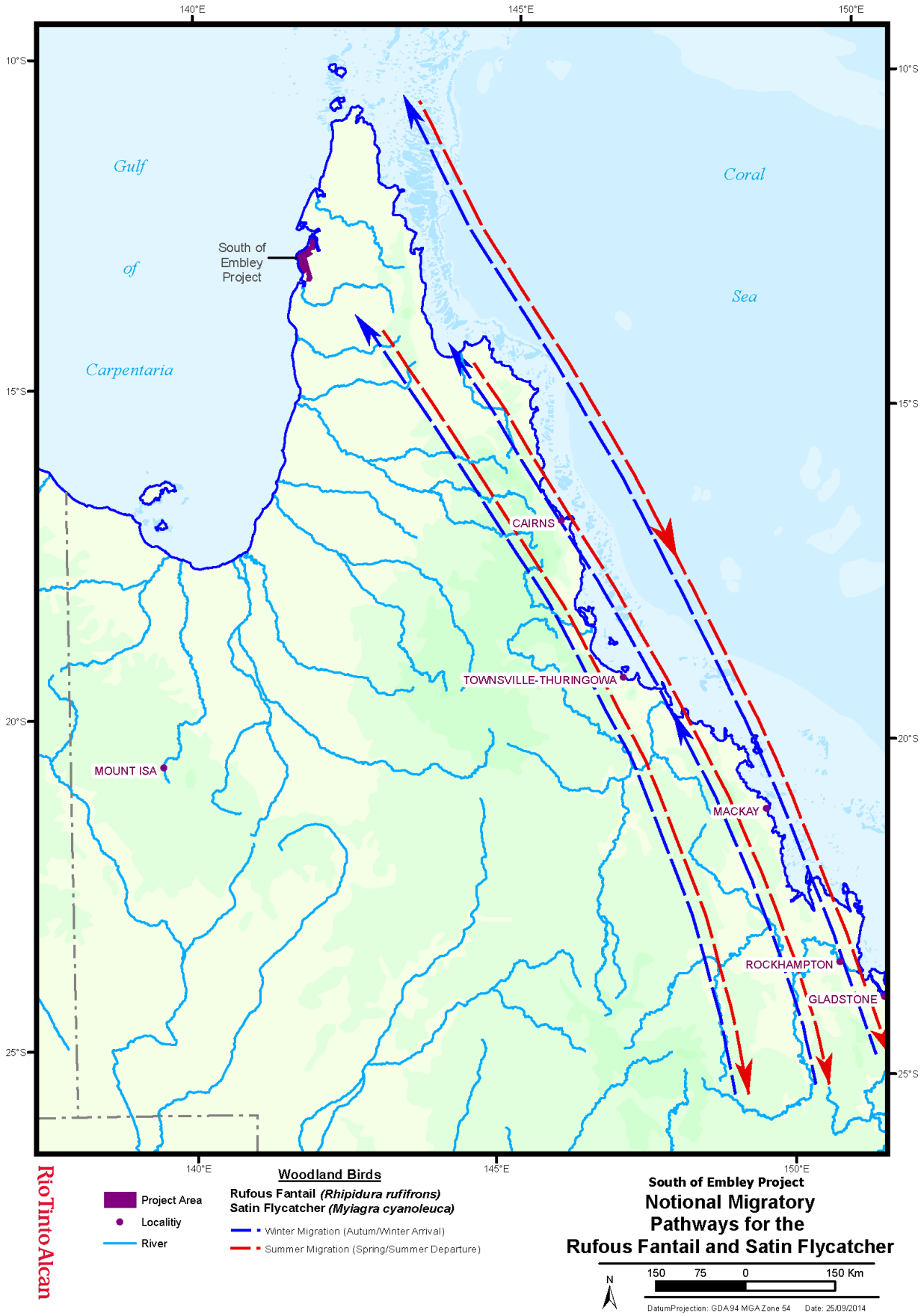
## Notional Migratory Pathways for Shorebirds



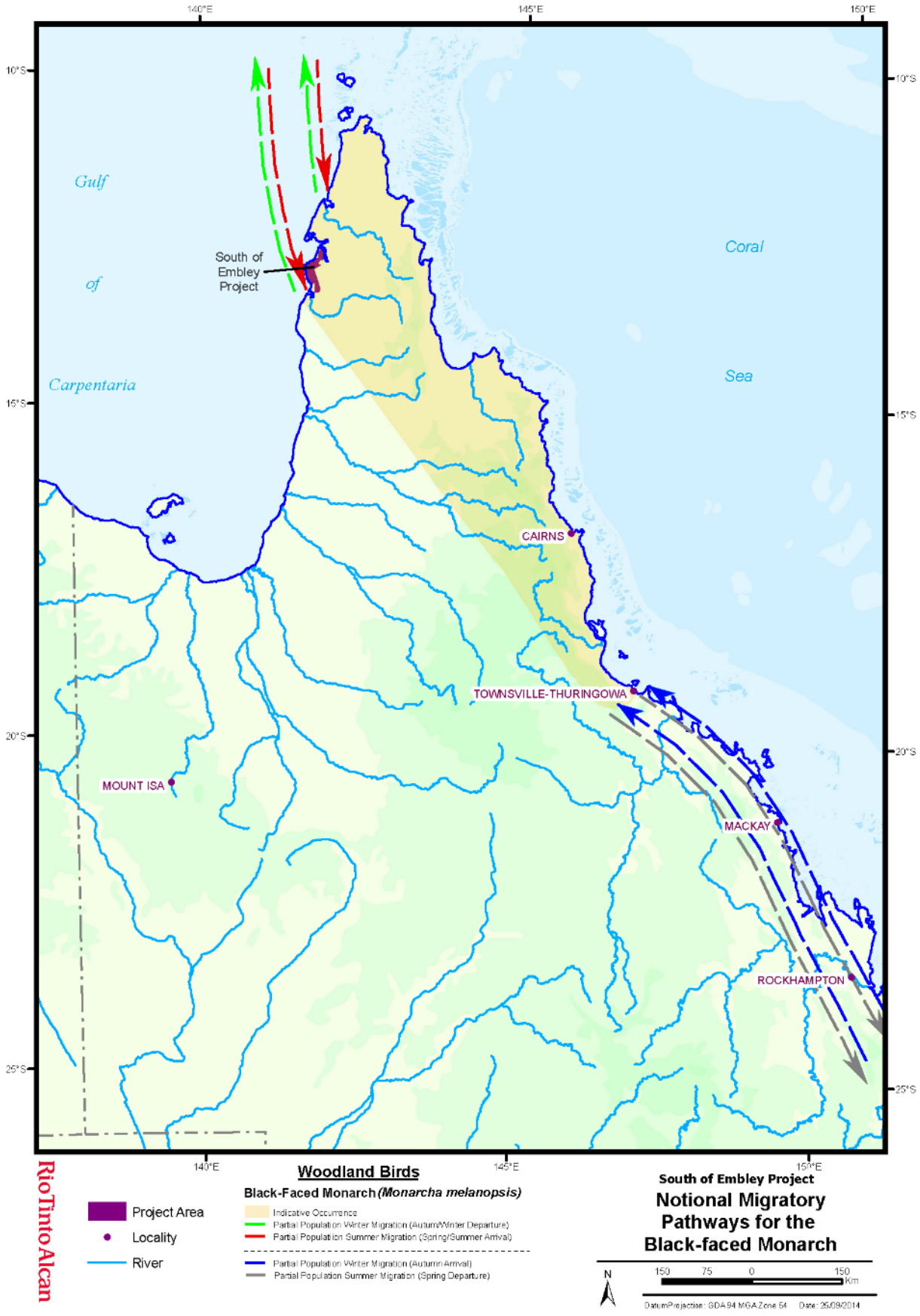
## Notional Migratory Pathways for Seabirds



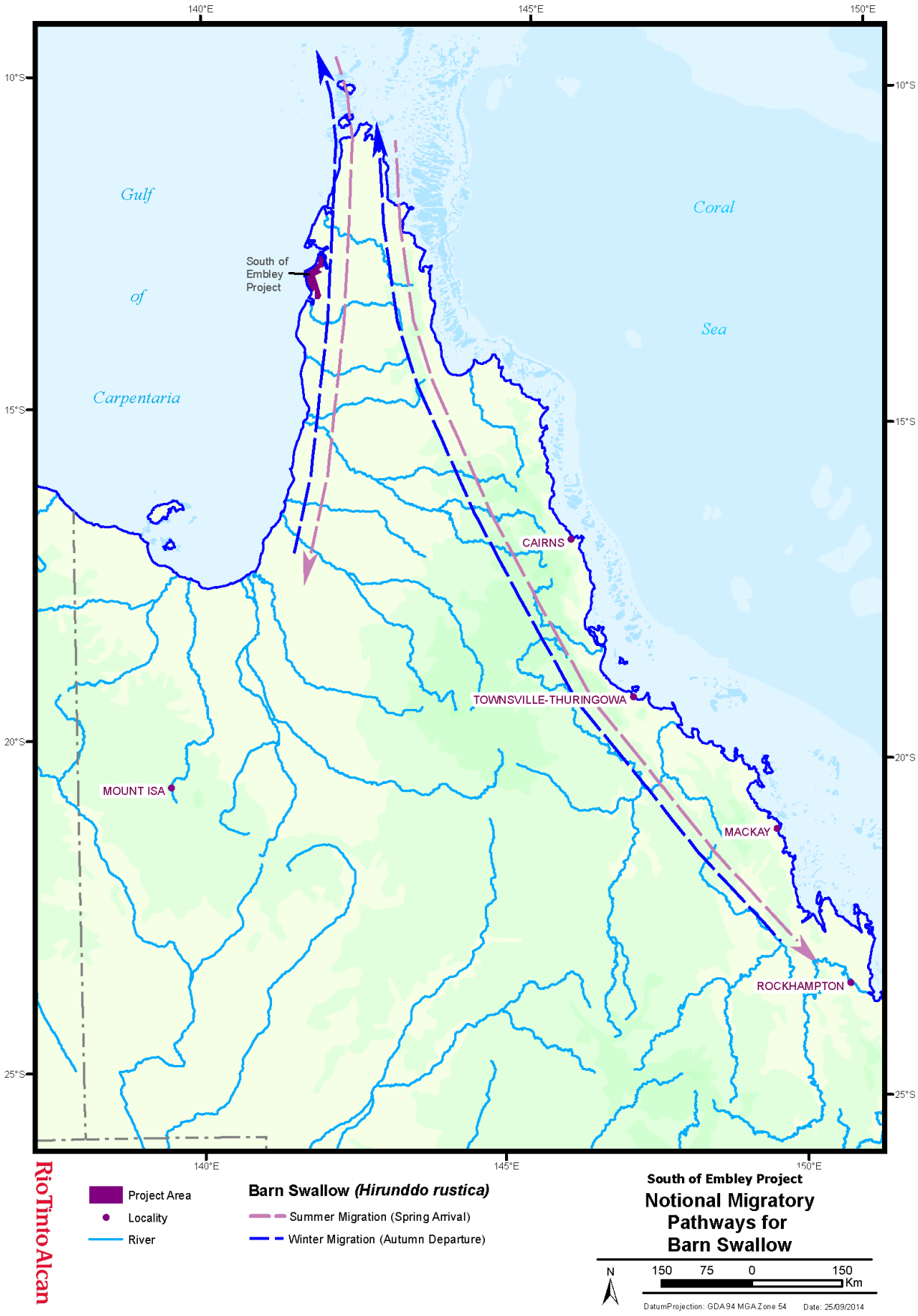
## Notional Migratory Pathways for the Rufous Fantail and Satin Flycatcher



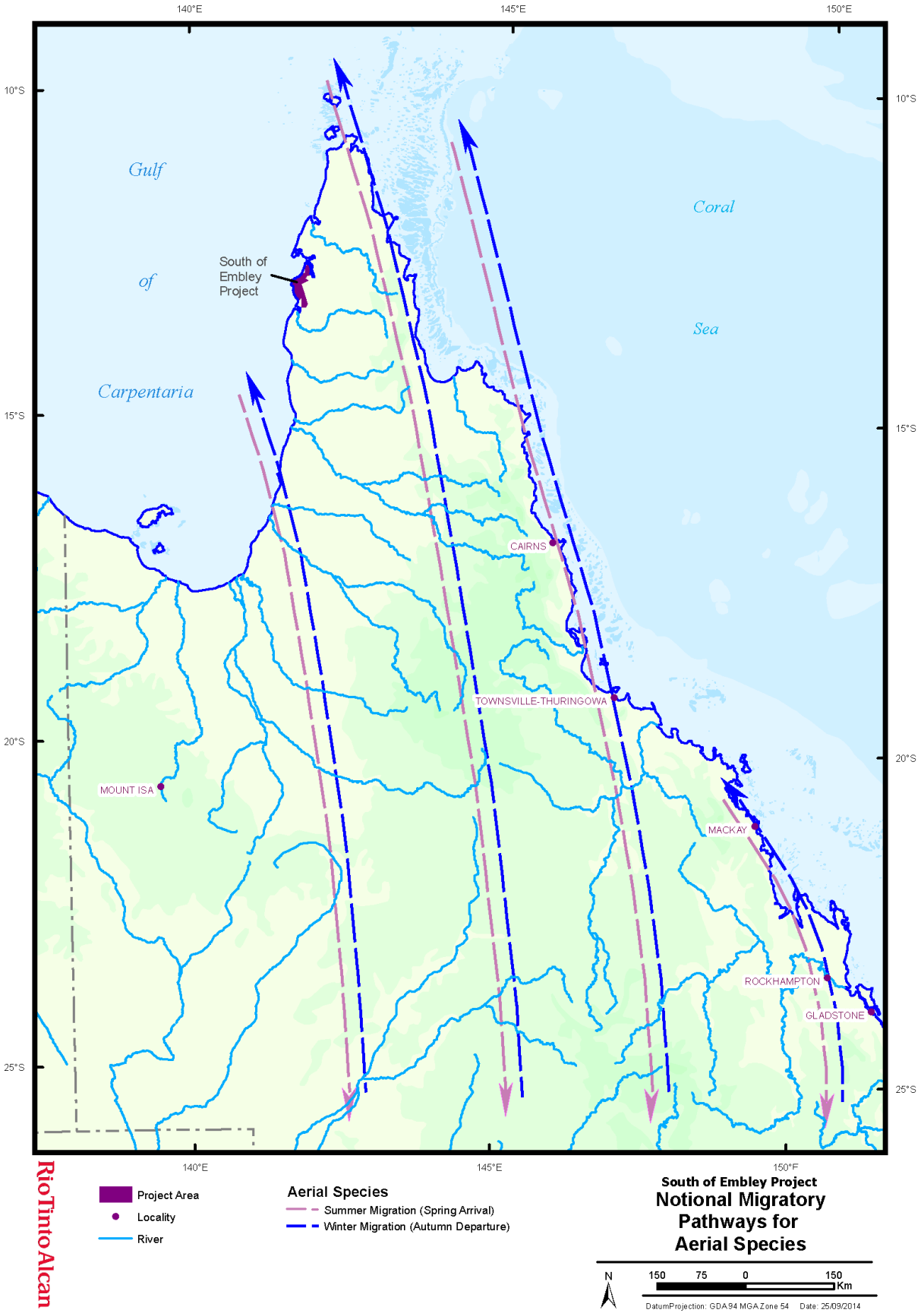
**Notional Migratory Pathways for the Black-faced Monarch**



## Notional Migratory Pathways for the Barn Swallow



## Notional Migratory Pathways for Aerial Species



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DSEWPaC (2011). Survey Guidelines for Australia's Threatened Mammals. Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999.* Department of Sustainability, Environment, Water, Population and Communities, Australian Government, Canberra.

# Appendix C: Bare-rumped sheathtail bat surveys

## Previous Surveys

### 2007 – 2009 Surveys

The general bat survey effort undertaken for the SoE Project between 2007 and 2009 at comprehensive survey sites and threatened fauna survey sites did not target the Bare-rumped Sheathtail Bat specifically (RTA, 2013). Nevertheless, the surveys undertaken did provide an opportunity to indicate the occurrence of the species. Bat survey effort was based on the use of AnaBat detectors and ground-deployed harp traps.

Although the species could not be definitively identified using AnaBat call analysis at the time of these surveys, the AnaBat system represented the best available call recognition technique at that time. In addition the collection of AnaBat call sequences provided the potential for recordings to be re-analysed if reliable reference calls for the species become available in the future, allowing the retrospective and unambiguous identification of the species. The presence of calls attributed to one or more of the three candidate *Saccolaimus* species at each survey site (Bare-rumped Sheathtail Bat *Saccolaimus saccolaimus nudicluniatus*, Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*, Papuan Sheathtail Bat, *Saccolaimus mixtus*) provided an indication of the potential presence of the Bare-rumped Sheathtail Bat; and, conversely, the absence of *Saccolaimus* calls at a site suggested the absence of *Saccolaimus* species during the survey event (bearing in mind the limitations of the sampling effort and such factors as detector range).

### 2012 Surveys

Surveys for Bare-rumped Sheathtail Bats conducted in June and October 2012 (Armstrong & Konishi, 2013) formed a targeted survey program for this species prior to the commencement of construction of the SoE Amrun Project. These surveys aimed to determine whether the species is present within the SoE Project area and included recognised bat specialists Dr. Kyle Armstrong and Mr. Glenn Hoye on the survey team.

The June 2012 survey focused on the proposed Boyd TSF and the Arraw Dam area where initial disturbance for construction of Project infrastructure occured. Habitats surveyed included Darwin Stringybark woodland in the Boyd TSF area and riparian gallery forest, *Melaleuca* wetland and Darwin Stringybark woodland within the Arraw Dam area. Surveys provided the opportunity to produce new knowledge on the actual presence and habitat utilisation of the species that may be extrapolated to the wider Project area and used for development of impact mitigation programs should the species be found to be present. The October 2012 survey resampled a sub-set of sites in the initial disturbance area and also extended survey effort into the future mining footprint (Darwin Stringybark). The survey was conducted over 10 nights; however, the survey was conducted by two survey teams each night enabling the survey effort in the mining areas to be completed without reducing the proposed repeat survey effort in the initial disturbance area. Upon completion of the October survey, 20 equivalent survey nights were completed in the initial disturbance area (10 equivalent nights over each survey period) and 10 equivalent survey nights in the future mining footprint.

The June 2012 survey programme included two main survey methods aimed at trapping of individuals. Both harp traps and mist nets were deployed within the canopy of vegetation to target the high flying species and the survey completed a total of 39 harp trap nights at eleven sites, and twelve mist net nights at ten sites. Based on the experience gained during the June 2012 survey

event, mist nets were determined to provide the most effective trapping method for high flying species, compared to harp traps, given the much larger net area and ability to set nets high in the canopy. Consequently mist nets were utilised solely during the October 2012 survey and a total of 35 mist nets were deployed over 20 sites. The 2012 survey effort is summarised in **Table C 1.**

**Table C 1: 2012 Survey Effort for Bare-rumped Sheathtail Bat:**

| Survey activity | Duration of survey activity | No. of sites | Total survey effort for activity(hours/trap nights) |
|---|---|---|---|
| *June 2012 October 2012 Surveys - total survey period of 20 nights* | | | |
| Harp traps | overnight | 11 | 43 trap nights |
| Mist nets | 3.5 - 5 hours per net | 45 | 47 trap nights |

Triple bank harp traps were attached to ropes draped over branches within the woodland canopy and hoisted into gaps within the canopy that could potentially be used by high flying species as flyways when foraging through the canopy. Traps were typically deployed between 15-25m above ground level with the height depending on the height of the canopy and availability of gaps at each site. Usually a single triple bank harp trap was deployed in this way although two triple bank harp traps were secured together and used as a single unit at one site. Harp traps were deployed at each site for between two and ten consecutive nights with an average deployment of 3.4 nights.

Mist nets were erected using 7m telescopic poles (four sites in June 2012; 15 sites in October 2012) and rope and pulley assemblies attached to canopy trees (six sites in June 2012; 20 sites in October 2012). The rope and pulley assemblies enabled a vertical stack of three mist nets to be successively attached and hoisted into the canopy allowing the entire space between the canopy up to 25m and about 3m above the ground to be netted. The pole mounted mist nets were not deployed as high, being limited by the length and rigidity of the poles to a maximum 7m height.

Significant effort in locating potential roosts in the trunks of trees or dead stags was planned but not implemented because of safety and practical limitations related to the height of potentially suitable hollows which were typically higher than could be practically reached with 10m pole mounted cameras.

In June 2012, 54 broad spectrum acoustic recorders were deployed in the Amrun Project area and a further 56 were deployed in October 2012.

**2012 Survey Results**

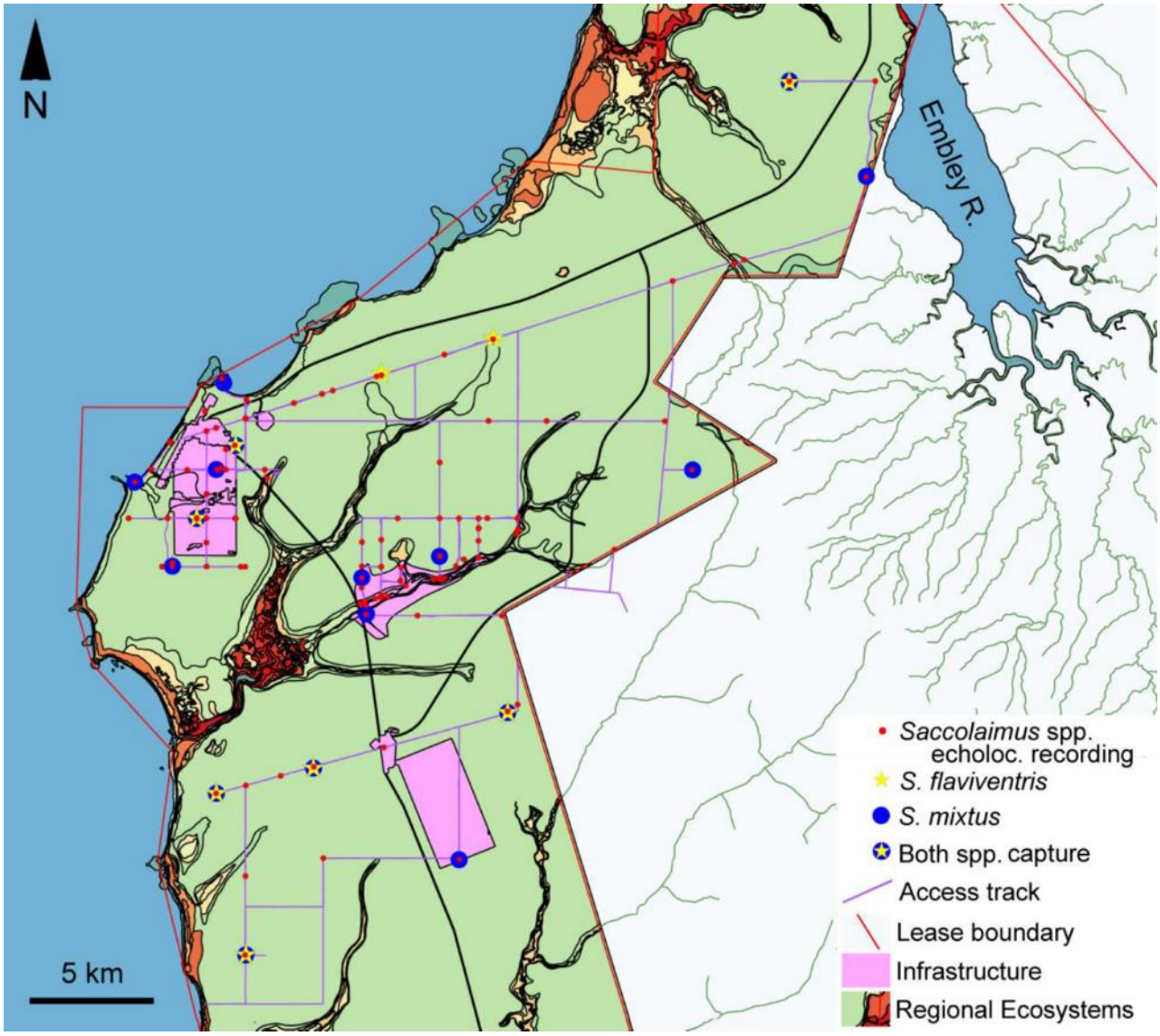
The Bare-rumped Sheathtail Bat was not recorded during the 2012 targeted surveys.

Bat species captured during the June and October 2012 surveys included 92 individuals of the high flying species (refer **Figure C 1**), Northern Freetail Bat (*Chaerophon jobensis*), Little red flying-fox (*Pteropus scapulatus*) Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) and Papuan Sheathtail Bat *(Saccolaimus mixtus*). This has proven the effectiveness of mist nets set high in the canopy to capture species with a similar high flying habit to the Bare-rumped Sheathtail Bat.

In the June 2012 survey a total of 16 individuals of the Papuan Sheathtail Bat were captured from three sites, all of which comprised rope mounted mist nets hoisted 25m into the canopy of Darwin Stringybark. During the October 2012 survey, where much greater effort was given to rope mounted

mist nets in canopy, a total of 38 Papuan Sheathtail Bats and 16 Yellow-bellied Sheathtail Bats were captured from 15 of 20 sites. Only one individual of the Papuan Sheathtail Bat was captured in a pole mounted 7m high mist net. These results demonstrates the effectiveness of this trapping technique through the unprecedented number of captures of *Saccolaimus*, and provides some basis for concluding the rarity or absence of the Bare-rumped Sheathtail Bat from the area during the surveys. Of interest was the recapture of one Papuan Sheathtail Bat after two nights from a site at least 10km away (identified from the biopsy wing punch, but not individually marked). This demonstrates that these high flying species range widely at night while foraging.

**Figure C 1: Locations Bat Species Recorded in the SoE Project Area during 2012 Targeted Surveys**




The capture of 54 Papuan Sheathtail Bats is of interest as this species is of similar size and has a similar fast, high-flying foraging behaviour to the Bare-rumped Sheathtail Bat. It is not known at this stage whether the Papuan Sheathtail Bat and Bare-rumped Sheathtail Bat species co-inhabit areas of habitat. The current known distribution of the two species is mutually exclusive with the Papuan Sheathtail Bat apparently distributed over the northernmost tip of Cape York and down the

west coast to just south of Aurukun. This area includes all of the bauxite areas between Aurukun and Vrilya Point (near Cape York), including the Project area. The distributions of the Bare-rumped Sheathtail Bat and the Yellow-bellied Sheathtail Bat do overlap, but no information is available on how they might partition themselves by foraging habitat or diet.

**Results of Further Call Analysis**

Reference echolocation calls were recorded from bats captured during the 2012 survey (especially species of *Saccolaimus*) and from Bare-rumped Sheath-tailed Bats near a Cairns roost site so that anonymous calls recorded on unattended detectors could be identified following comparison with recordings made from bats with a verifiable species identification.

The total deployment of 110 full nights of recording with broad spectrum detectors was one of the largest acoustic surveys conducted in a single targeted survey programme in Australia, and has associated with it the largest reference echolocation call dataset from *Saccolaimus* that has been compiled to date (Armstrong & Konishi, 2013). The effort compares well with that recommended in the Commonwealth Government's "Survey guidelines for Australia's threatened bats" (DEWHA, 2010), and provides what Armstrong and Konishi (2013) believe is the first comprehensive demonstration of an appropriate level of effort consistent with the guidelines for this species, at least in a large project area. The survey also provided the first quantitative analysis of the acoustic differences in signature echolocation calls amongst the three species of *Saccolaimus* in Australia.

There was no unambiguous evidence of the occurrence of the Bare-rumped Sheath-tailed Bat in the SoE Project area. No captures were made, and while there were limitations in the acoustic analysis, there was no indication of presence of the Bare-rumped Sheath-tailed Bat from recordings of bat echolocation.

**References**

Armstrong, K., & Konishi, Y. (2013). Targeted survey for the bare-rumped sheath-tailed bat in the South of Embley Project area, near Weipa. RTA Weipa Pty Ltd.

DEWHA. (2010). Survey guidelines for Australia’s threatened bats. Department of the Environment, Water, Heritage and the Arts.

RTA. (2013). South of Embley Project Environmental Impact Statement. RTA Weipa Pty Ltd.

# Appendix D: Department of Environment Approval Letter

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC 2010/5642

Mr Sean Fagan
Senior Adviser Environment
Aluminium Pacific Operations
sean.fagan@riotinto.com
Weipa, Queensland, 4874

**Approval of Rehabilitation Management Plan and revised Terrestrial Management Plan for South of Embley Bauxite Mine and Port Development, Cape York Queensland (EPBC Act referral 2010/5642)**

Dear Mr Fagan

Thank you for your emails dated 12 December 2022 and 11 July 2025 to the Department of Climate Change, Energy, the Environment and Water (the department), seeking approval of the Rehabilitation Strategy and the Revised Terrestrial Management Plan respectively, in accordance with condition 33 and 30 of the above project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Officers of the department have advised me on the Rehabilitation Strategy and the Revised Terrestrial Management Plan and the requirements of the conditions of the approval for this project. On this basis, and as a delegate of the Minister for the Environment and Water (the Minister), I have decided to approve the *RTA Weipa Pty Ltd Rehabilitation Strategy*, *version 1.2* dated 01 Oct 2025 and the revised *RTA Weipa Pty Ltd Terrestrial Management Plan – South of Embley Project - Amrun Version 3.1* dated 02 February 2025.

Now that these plans have been approved, they must be implemented. The approved plans must also be published in accordance with your conditions of approval.

As you are aware, the department has an active monitoring program which includes monitoring inspections, desk top document reviews and audits. Please ensure that you maintain accurate records of all activities associated with, or relevant to, the conditions of approval so that they can be made available to the department on request. Should you require any further information please contact Carlos Del Monaco Briceno by email to PostApproval@dcceew.gov.au.

Yours sincerely

Rachel Short
Branch Head
Environment Assessments (Vic and Tas) and Post Approvals Branch
Environment Regulation Division

19 December 2025