# Appendix O

## Offset Area Management Strategy (OAMS)

# Offset Area Management Strategy

## Haughton Pipeline Stage 2

Townsville City Council

21 October 2022

→ **The Power of Commitment**

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# Acronyms and abbreviations

| Acronym | Description |
|---|---|
| au | assessment unit |
| DAWE | (Former Commonwealth) Department of Agriculture, Water and the Environment |
| DCCEEW | (Commonwealth) Department of Climate Change, Energy, the Environment and Water |
| DES | (Queensland) Department of Environment and Science |
| DoE | (Former Commonwealth) Department of Environment |
| DoEE | (Former Commonwealth) Department of the Environment and Energy |
| DoR | (Queensland) Department of Resources |
| DSEWPC | (Former Commonwealth) Department of Sustainability, Environment, Water, Populations and Communities |
| EPBC Act | (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999* |
| GHD | GHD Pty Ltd |
| Ha | Hectares |
| HPS2 | Haughton Pipeline Stage 2 |
| Km | Kilometres |
| KoRV | koala retrovirus |
| LRSA | Lake Ross Storage Area |
| m | metres |
| ML | Megalitres |
| MNES | Matters of National Environmental Significance |
| NC Act | (Queensland) *Nature Conservation Act 1992* |
| NRA | Natural Resource Assessments |
| OAMS | Offset Area Management Strategy |
| PD | Preliminary Documentation |
| PMAV | Property Map of Assessable Vegetation |
| PMST | Protected Matters Search Tool |
| RE | Regional Ecosystem |
| SQP | Suitably Qualified Person |
| TCC | Townsville City Council |
| TSSC | Threatened Species Scientific Committee |
| VDec | Voluntary Declaration |
| VM Act | (Queensland) *Vegetation Management Act 1999* |

# 1. Introduction

GHD Pty Ltd was engaged by Townsville City Council (TCC) to prepare an Offset Area Management Strategy (OAMS) for the Haughton Pipeline Stage 2 (HPS2) Project (the Project). The HPS2 Project involves a 28.5 km extension of the complete Stage 1 DN1800 water transfer pipeline from the Upper Haughton Irrigation Channel to a new 364 ML/day pump station located on the Burdekin River adjacent the SunWater Tom Fenwick pump station (Figure 1-1). The project is to provide water supply security for Townsville City.

The HPS2 was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 21 December 2021 and subsequently declared a "Controlled Action" requiring assessment by Preliminary Documentation (PD) pursuant to Section 18 and 18A (*listed threatened species and communities*).

As part of the Department of Climate Change, Energy, the Environment and Water (DCCEEW) PD requirements, a land-based offset is proposed to compensate for significant residual impacts arising from clearing habitat critical to the survival of the following Matters of National Environmental Significance (MNES):

– 96.34 ha of southern black-throated finch (*Poephila cincta cincta*) habitat – endangered under the EPBC Act and the Queensland *Nature Conservation Act 1992* (NC Act)
– 92.23 ha of bare-rumped sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*) habitat – vulnerable under the EPBC Act and the NC Act
– 122.58 ha of koala (*Phascolarctos cinereus*) habitat – endangered under the EPBC Act and vulnerable under the NC Act.

The OAMS has been developed to satisfy the requirements of the PD (Section 7.0), and prepared in accordance with the following to guide the implementation and management of offset activities:

– *Environmental Management Plan Guidelines* (DoE 2014)
– EPBC Act *Environmental Offset Policy* (Department of Sustainability Environment, Water, Population and Communities (DSEWPAC) 2012)
– *Guide to Determining Terrestrial Habitat Quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy* (Department of Environment and Science (DES) 2020)
– *BioCondition- A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual V2.2* (Eyre et al. 2015)
– *How to Use the Offsets Assessment Guide* (DSEWPaC 2012).

## 1.1 Purpose of this report

This OAMS has been prepared to guide the delivery and compliance of offset commitments specified in the PD requirements issued by DCCEEW for the Project. MNES that require delivery of an offset due to significant residual impacts, and are thus the focus of this plan, are the koala, southern black-throated finch and bare-rumped sheathtail bat.

This OAMS will also be submitted to the Queensland Department of Resources (DoR) in support of a voluntary declaration (Vdec) application to secure the offset parcel. In this regard, requirements identified by the Guide to Voluntary Declarations under the *Vegetation Management Act 1999* (effective 21 June 2019) (State of Queensland 2019) have been addressed within this OAMS.

## 1.2 Report structure

This OAMS contains the following sections:

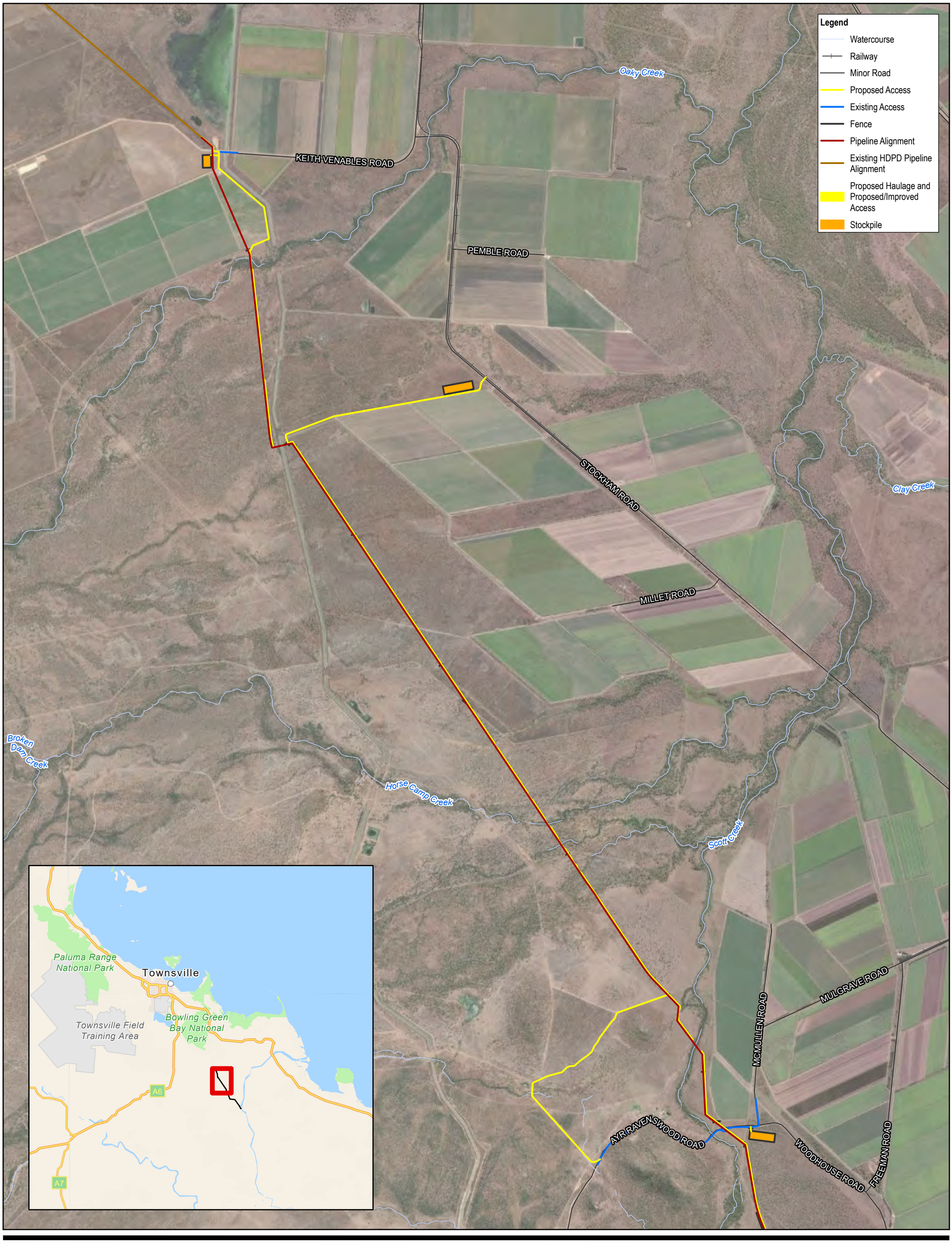
– Section 1 – Introduction to the Project and scope of the report
– Section 2 – Overview of offset area
– Section 3 – Suitability of the offset area including the presence and suitability of habitat for each species
– Section 4 – Methods used to assess habitat quality including desktop and field survey
– Section 5 – Approach proposed to inform inputs to the EPBC Act Offsets Assessment Guide
– Section 6 – Management actions to improve the quality of habitats within the offsets area
– Section 7 – Compliance with EPBC Act Environmental Offsets Policy and Environmental Management Plan Guidelines
– Section 8 – References
– Appendix A – Map of assessment units in the impact area
– Appendix B – Habitat quality scoring criteria for each species.

Table 1-1 identifies sections of the OAMS which satisfy Preliminary Documentation Section 7.0 (OAMS requirements).

***Table 1-1 Offset Area Management Strategy requirements***

| Item number | Information request | Section of this strategy |
|---|---|---|
| 7.2.1 | Specific details of the nature of the conservation gain to be achieved for relevant MNES, including the creation, restoration and revegetation of habitat in the proposed offset area/s. | Section 6 including Table 6-1 |
| 7.2.2 | Details of the environmental offset/s (in hectares) to compensate for the residual significant impacts of the proposed action on relevant MNES. | Section 2 and 3 |
| 7.2.3 | Details of the potential offset area/s (including a map) to compensate for the residual significant impacts of the proposed action on relevant MNES. | Section 2 and 3, Figure 2-1 |
| 7.2.4 | The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to the project site for each relevant MNES, including:<br>– total area of habitat (in hectares); and<br>– habitat quality (e.g. using the Queensland Government *Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* DES 2020).<br>Please note that a methodology that is suitable for each species (i.e., approved by the department or supported by literature) must be used to assess habitat quality, noting the same scoring mechanism must be used at both impact and offset sites. | Section 4<br>MNES report and attached technical reports |
| 7.2.5 | Details, with supporting evidence, of how the environmental offset/s meets the requirements of the department's EPBC Act *Environmental Offsets Policy* (2012) (Offsets Policy), available at: **www.environment**.gov.au/epbc/publications/epbc-act-environmental-offsets-policy. | Section 7 |
| 7.2.6 | The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to each potential offset area/s for each relevant MNES, including:<br>– time over which loss is averted (max. 20 years);<br>– time until ecological benefit;<br>– risk of loss (%) without offset;<br>– risk of loss (%) with offset; and<br>– confidence in result (%).<br>When calculating offsets, please refer to the department's published guidance: How to use the Offsets Assessment Guide, available at: **https://www**.awe.gov.au/sites/default/files/documents/offsets-how-use.pdf | Section 5 |

| Item number | Information request | Section of this strategy |
|---|---|---|
| 7.2.7 | Evidence that the relevant MNES, and/or their habitat, can be present in the potential offset area/s. | Section 2, Figure 2-4 - Figure 3-6 |
| 7.2.8 | Information about how the potential offset area/s provides connectivity with other relevant habitats and biodiversity corridors. | Section 2.2.2 |
| 7.2.9 | Details and execution timing of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide enduring protection for the potential offset area/s against development incompatible with conservation. | Section 6 |



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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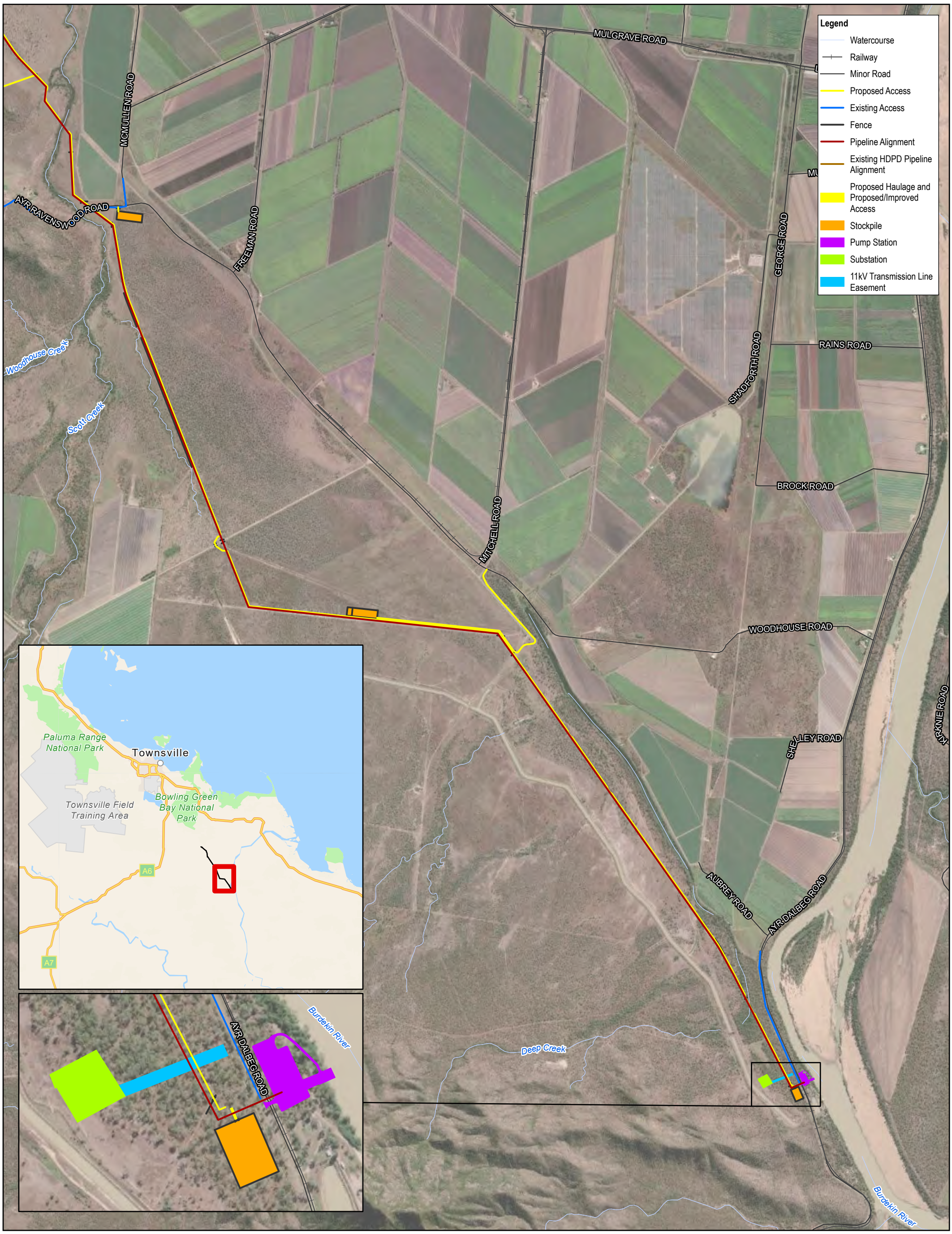
**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

Project No. **12537606**
Revision No. **1**
Date **7/20/2022**

## Haughton Pipeline Stage 2 project area

## FIGURE 1-1

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_001_ProjectArea_PAGE1_Rev1 Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2022); World Navigation Map: Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS
Print date: 20 Jul 2022 - 13:37
World Imagery: Maxar. Created by: shart2



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

**Haughton Pipeline Stage 2 project area**

Project No. **12537606**
Revision No. **1**
Date **7/20/2022**

**FIGURE 1-1**

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_001_ProjectArea_PAGE2_Rev1 Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2022); World Navigation Map: Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS
Print date: 20 Jul 2022 - 13:38
World Imagery: Maxar. Created by: shart2

## 1.3 Scope and limitations

This report has been prepared by GHD for Townsville City Council and may only be used and relied on by Townsville City Council for the purpose agreed between GHD and Townsville City Council as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Townsville City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of infrastructure, suitable access and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

GHD has prepared this report on the basis of information provided by third parties (i.e. Biodiversity Australia and Ecological Interpretations) who provided information to GHD, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

## 1.4 Suitably qualified personnel

Commonwealth offsets typically require baseline surveys to be conducted by a suitably qualified person (SQP) in accordance with the following Commonwealth survey guidelines:

– Survey guidelines for Australia's threatened birds (DEWHA 2009a)
– Survey guidelines for Australia's threatened bats (DEWHA 2009b)
– Survey Guidelines for Australia's threatened mammals (DSEWPaC 2011)

Further information on the guidelines used to inform the methodology is detailed in Section 4.

– Within the definitions of EPBC 2017/7941, a SQP for this project is defined as:

  *A person who has professional qualifications, training, skills and at least three years of relevant experience specific to locating, identifying and conserving the MNES. The SQP must be able to give authoritative independent assessment, advice and analysis specific to the MNES using the relevant protocols, standards, methods and/or literature. Where the person does not have the appropriate professional qualifications, they must have at least five years of relevant experience specific to the MNES.*

In order to comply with this requirement, all work has been undertaken under the direction of the following SQPs:

– Dr Greg Calvert (Biodiversity Australia) – BSc Hons (James Cook University) PhD (James Cook University). Greg designed the habitat scoring criteria for the southern black-throated finch and bare-rumped sheathtail bat and designed and led BioCondition surveys of the offset area. Greg has over 28 years' of ecological and consulting experience. Greg has applied his knowledge of threatened species, regional ecosystems, pest and weed management and revegetation techniques to a broad range of clients including traditional owner groups, linear infrastructure, mining and extractive industry companies, natural resource management groups, Defence and all tiers of government.

– Chris Kahler (Ecological Interpretations) – BSc (University of Queensland). Chris undertook the BioCondition surveys for the impact area. Chris has over 20 years' experience in ecological research and consulting. Chris has worked extensively within the savannah woodlands, wetlands, grasslands and vine thickets of central and north Queensland for a range of constituents. Chris has an interest in landscape scale ecology and the drivers of change (human, biotic and initiate) in our ecosystems and in how our management of landscapes impacts on their related species and other elements.
– Dr Simon Hodgkison (GHD) – BSc (Adelaide), MSc (James Cook University), PhD (Griffith University). Simon designed the habitat scoring for the koala and undertook habitat scoring surveys for the impact area. Simon has over 20 years' experience in ecological research and consulting. Simon has extensive experience delivering ecological assessments to support Commonwealth environmental approvals for infrastructure projects in the renewables, mining, gas, defence, road, rail, power and water development sectors. Simon has developed Commonwealth environmental offsets for a range of MNES including the koala, southern black-throated finch and bare-rumped sheathtail bat.

# 2. Overview of the proposed offset

## 2.1 Summary of matters being offset

The OAMS proposes land-based offsets for the following MNES species that will be subject to significant residual impacts due to the Project:

– Bare-rumped sheathtail bat – due to the clearance of 92.23 ha of habitat critical to the survival of the species
– Southern black-throated finch – due to the clearance of 96.34 ha of habitat critical to the survival of the sub-species associated with localised indiscriminate loss of trees within 1 km of water
– Koala – due to clearance of 122.58 ha of habitat critical to the survival of the species

Habitat loss for MNES representing a significant residual impact as a result of the Project is summarised in Table 2-1.

*Table 2-1 Summary of habitat loss representing a significant residual impact*

| Species | Loss of habitat |
|---|---|
| Bare-rumped sheathtail bat | Loss of 92.23 ha (in aggregate), comprising:<br>– Foraging and roosting habitat 36.44 ha<br>– Foraging only habitat 49.11 ha<br>– Roosting only habitat 6.68 ha |
| Black-throated finch (southern) | Loss of 96.34 ha (in aggregate), comprising:<br>– Nesting and foraging habitat 82.14 ha<br>– Foraging only habitat 14.19 ha |
| Koala | Loss of 122.58 ha |

### 2.1.1 Vegetation communities impacted

Recent BioCondition vegetation surveys undertaken by ecologists from Ecological Interpretations in March 2022 have mapped the distribution of regional ecosystems (REs) within the impact area. During BioCondition surveys, the following REs were identified, providing habitat for MNES that will be impacted by the Project. These BioCondition REs are summarised in Table 2-2.

*Table 2-2 BioCondition Field-verified REs within the impact area*

| RE | VM Act status | Vegetation | Area | Value for MNES |
|---|---|---|---|---|
| Remnant 11.3.7 | Least concern | *Corymbia* spp. Open woodland on alluvial plains | 17.87 ha | Koala, BTF, BRSTB |
| Remnant 11.3.35 | Least concern | *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains | 51.87 ha | Koala, BTF, BRSTB |
| Remnant 11.3.25b | Least concern | *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest | 2.56 ha | Koala, BTF |
| Remnant 11.3.4a | Of concern | *Corymbia tessellaris* woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict | 1.87 ha | Koala, BTF, BRSTB |
| Remnant 11.3.31 | Of concern | *Ophiuros exaltatus, Dichanthium* spp. Grassland on alluvial plains | 9.55 ha | Koala |
| Non-remnant 11.3.35 | Category X | *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains | 12.10 ha | Koala |
| Non-remnant 11.3.7 | Category X | *Corymbia* spp. Open woodland on alluvial plains | 6.18 ha | Koala |

| RE | VM Act status | Vegetation | Area | Value for MNES |
|---|---|---|---|---|
| Non-remnant 11.3.31 | Category X | *Ophiuros exaltatus, Dichanthium* spp. Grassland on alluvial plains | 45.62 ha | Koala |
| Non-remnant 11.12.1 | Category X | *Eucalyptus crebra* woodland on igneous rocks | 7.45 ha | Koala |

*VM Act – Queensland Vegetation Management Act 1999, BTF = southern black-throated finch, BRSTB = bare-rumped sheathtail bat*

## 2.1.2 Summary of MNES habitat areas impacted

This section presents a summary of the area of habitat likely to be required, based on the area and quality of habitat impacted. This is based on the Commonwealth Offsets Assessment Guide (DSWEPaC 2012b). It should be noted the habitat quality scores are estimates only, based on preliminary scores. These will be amended in the Offset Area Management Plan (OAMP) once final habitat scores have been calculated.

### 2.1.2.1 Bare-rumped sheathtail bat

The Project will impact on 92.23 ha of habitat for the bare-rumped sheathtail bat, with a habitat score of 5. A summary of impact area values used within the Offset Assessment Guide (DSWEPaC 2012b) is presented in Table 2-3.

***Table 2-3 Area of bare-rumped sheathtail bat habitat requiring offsetting based on Offsets Assessment Guide (DoEE 2012)***

| Attribute | Result | Rationale |
|---|---|---|
| Conservation status | Vulnerable | In accordance with the species listing status under the EPBC Act at the time of the project referral. |
| Area impacted | 92.23 ha | Significant residual impact as per the MNES report in the PD submission (GHD 2022) |
| Habitat quality score | 4.45 | Preliminary scores based on BioCondition assessments |
| Total quantum of impact to be offset | 36.89 ha | As per Offsets Assessment Guide (DSWEPaC 2012b) |

### 2.1.2.2 Southern black-throated finch

The Project will impact on 96.34 ha of habitat for the southern black-throated finch, with a habitat score of 5. A summary of impact area values used within the Offset Assessment Guide (DSWEPaC 2012b) is presented in Table 2-4.

***Table 2-4 Area of southern black-throated finch habitat requiring offsetting based on Offsets Assessment Guide (DoEE 2012)***

| Attribute | Result | Rationale |
|---|---|---|
| Conservation status | Endangered | In accordance with the species listing status under the EPBC Act at the time of the project referral. |
| Area impacted | 96.34 ha | Significant residual impact as per the MNES report in the PD submission (GHD 2022) |
| Habitat quality score | 5.63 | Preliminary scores based on BioCondition assessments |
| Total quantum of impact to be offset | 57.80 ha | As per Offsets Assessment Guide (DSWEPaC 2012b) |

### 2.1.2.3 Koala

The project will impact on 122.58 ha of habitat for the koala, with a habitat score of 5. A summary of impact area values used within the Offset Assessment Guide (DSWEPaC 2012b) is presented in Table 2-5.

*Table 2-5 Area of koala habitat requiring offsetting based on Offsets Assessment Guide (DoEE 2012)*

| Attribute | Result | Rationale |
|---|---|---|
| Conservation status | Endangered | In accordance with the species listing status under the EPBC Act at the time of the project referral. |
| Area impacted | 122.58 ha | Significant residual impact as per the MNES report in the PD submission (GHD 2022) |
| Habitat quality score | 1.93 | Preliminary scores based on BioCondition assessments |
| Total quantum of impact to be offset | 24.52 ha | As per Offsets Assessment Guide (DSWEPaC 2012b) |

# 2.2 Offset area

## 2.2.1 Overview of the offset strategy

A land-based offset has been proposed on seven contiguous land parcels located 2.7 km south-east of Lake Ross (Ross River Dam) in southern Townsville. The proposed offset area is shown in Figure 2-1. Preliminary ecological surveys have been undertaken in areas shown in red in Figure 2-1 and are detailed in Section 3.1.2. The proposed offset area provides suitable habitat for all three MNES and occurs in an area where all three species have been historically recorded. The suitability of the habitat for each MNES is detailed in Section 3.2 to 3.5. The offset area supports a combination of remnant woodland vegetation, regrowth and non-remnant areas that have been historically cleared and subject to cattle grazing. The area including remnant woodland areas has been extensively degraded by weeds including woody weeds and invasive grassy weeds that are known to negatively impact the quality of habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala. Additional land areas (shown in blue in Figure 2-1) are being investigated and suitable areas will be added to the final offset area. A large area of suitable land is available that will attain low-moderate scores (i.e. 4 – 5). The quality of habitat for MNES can be improved by the offset. The following management actions are proposed to improve the quality and connectivity of the habitats for the three MNES:

– Active planting of tubestock in non-remnant areas, particularly around waterbodies
– Natural or assisted regeneration of native woodland in regrowth areas
– Establishing native food grasses for the southern black-throated finch within 400 m of waterbodies
– Maintenance of existing waterbodies and provision of additional drinking sites
– Active weed management in areas of high weed density and surrounding waterbodies
– Implementing appropriate fire regimes and maintaining fire breaks
– Removing cattle to reduce degradation of understorey vegetation

While the starting habitat quality values have not been quantified, preliminary observations suggest they will be comparable to the current habitat condition scores for the impact area (i.e. low to moderate values). Through the management measures detailed above (and discussed in more detail in Section 6), there is potential to increase the condition of habitats across the proposed offset area by up to 2 to 3 points. Given the large area of land, and the opportunity for improvement, the offset is likely to meet the requirements of the Commonwealth offset calculator.

## 2.2.2 Land tenure

Details of the property descriptions, ownership and areas for each of the MNES offset values are summarised in Table 2-6. Ecological field investigations have been undertaken in a 300 ha part of the proposed offset area (shown in red in Figure 2-1). Additional land areas (shown in blue in Figure 2-1) are being investigated. The final proposed offset area will be determined once the outcomes of the ecological investigations are known and an optimal strategy to meet the offset requirements has been confirmed. Ecological field surveys of the additional land areas have been undertaken in August 2022, the final offset area will be presented in the OAMP following completion of all data analysis.

Lot on plan 103 EP1450, presently owned by the State of Queensland, is in the process of being acquired by TCC. An offer from the Department of Resources has been accepted for transfer of ownership by TCC which is anticipated to be finalised by November 2022.

*Table 2-6 Summary of lots currently being investigated for the proposed offset area**

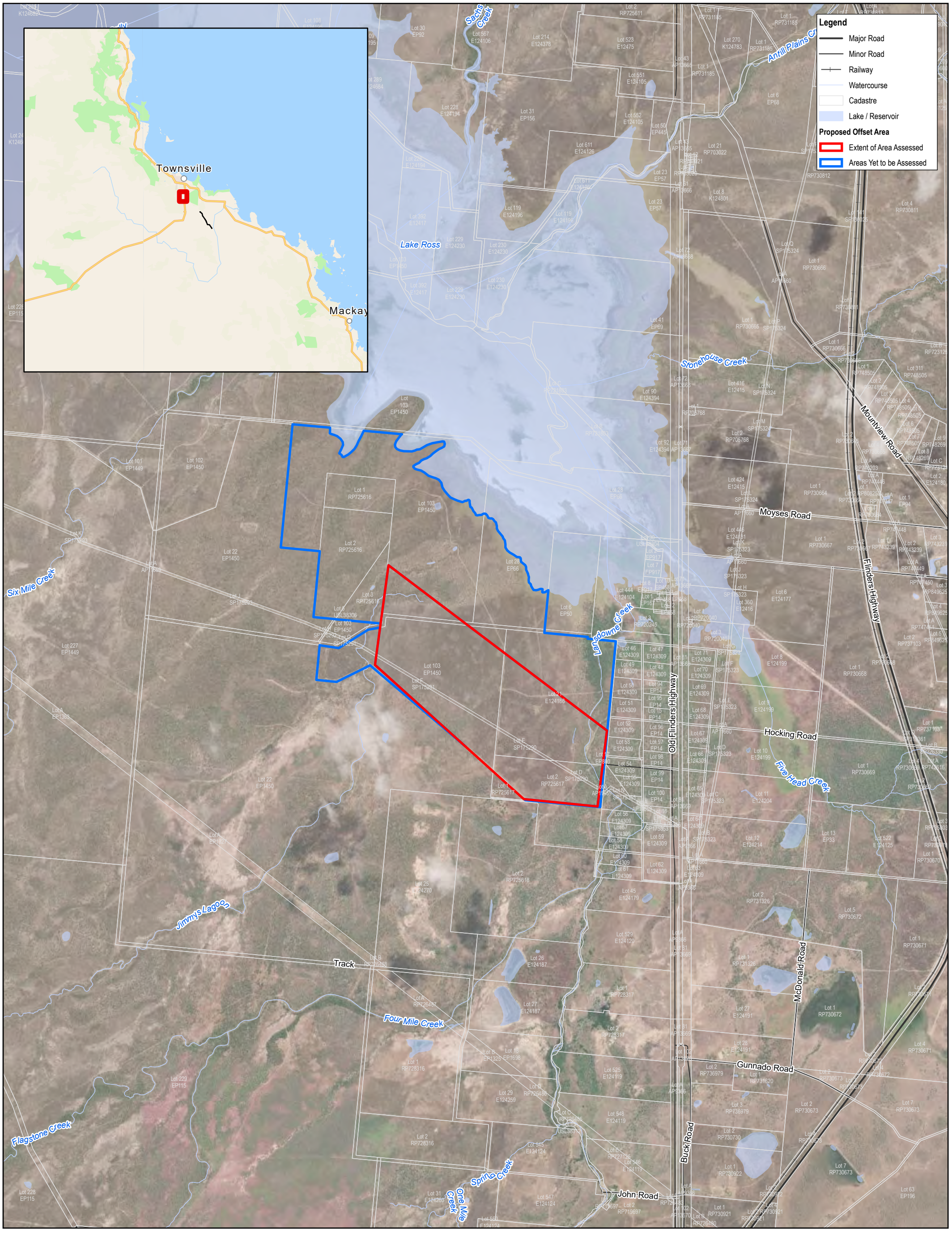
| Lot and Plan | Ownership | Tenure |
|---|---|---|
| Lot 21 E124186 | TCC | Deed of Grant |
| Lot 2 RP725617 | TCC | Deed of Grant |
| Lot 103 EP1450 | State of Queensland | Unallocated State Land |
| Lot 28 EP66 | TCC | Deed of Grant |
| Lot 1 RP725616 | TCC | Deed of Grant |
| Lot 2 RP725616 | TCC | Freehold |
| Lot 3 RP725616 | TCC | Deed of Grant |

*Additional properties may be investigated, as required

### 2.2.3 Landscape context

The proposed offset area is located south of Ross River Dam in the Lake Ross Storage Area (LRSA), the primary reservoir for Townsville. The dam has a catchment area of approximately 75 $km^2$ and a maximum capacity of 233,187 ML.

The proposed offset area comprises a mix of open eucalypt woodlands and forests, shrublands or low woodlands of *Melaleuca viridiflora* (broad-leaf tea-tree) and/or *Petalostigma* spp. (quinine bush) and/or *Ziziphus mauritiana* (chinee apple), riparian forests and open grasslands dominated by exotic grass species (NRA 2018). The area has been historically subject to cattle grazing and cattle are still present in low densities. Given the primary role of providing safe water quality for the Townsville population, public access to the area is restricted.






Paper Size ISO A3

0 1 2 Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

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## Map of the proposed offset area

# FIGURE 2-1

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_002_ProposedOffsetArea_Rev0 Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2022); World Navigation Map: Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS
Print date: 24 Jul 2022 - 21:26
World Imagery: Maxar. Created by: shart2

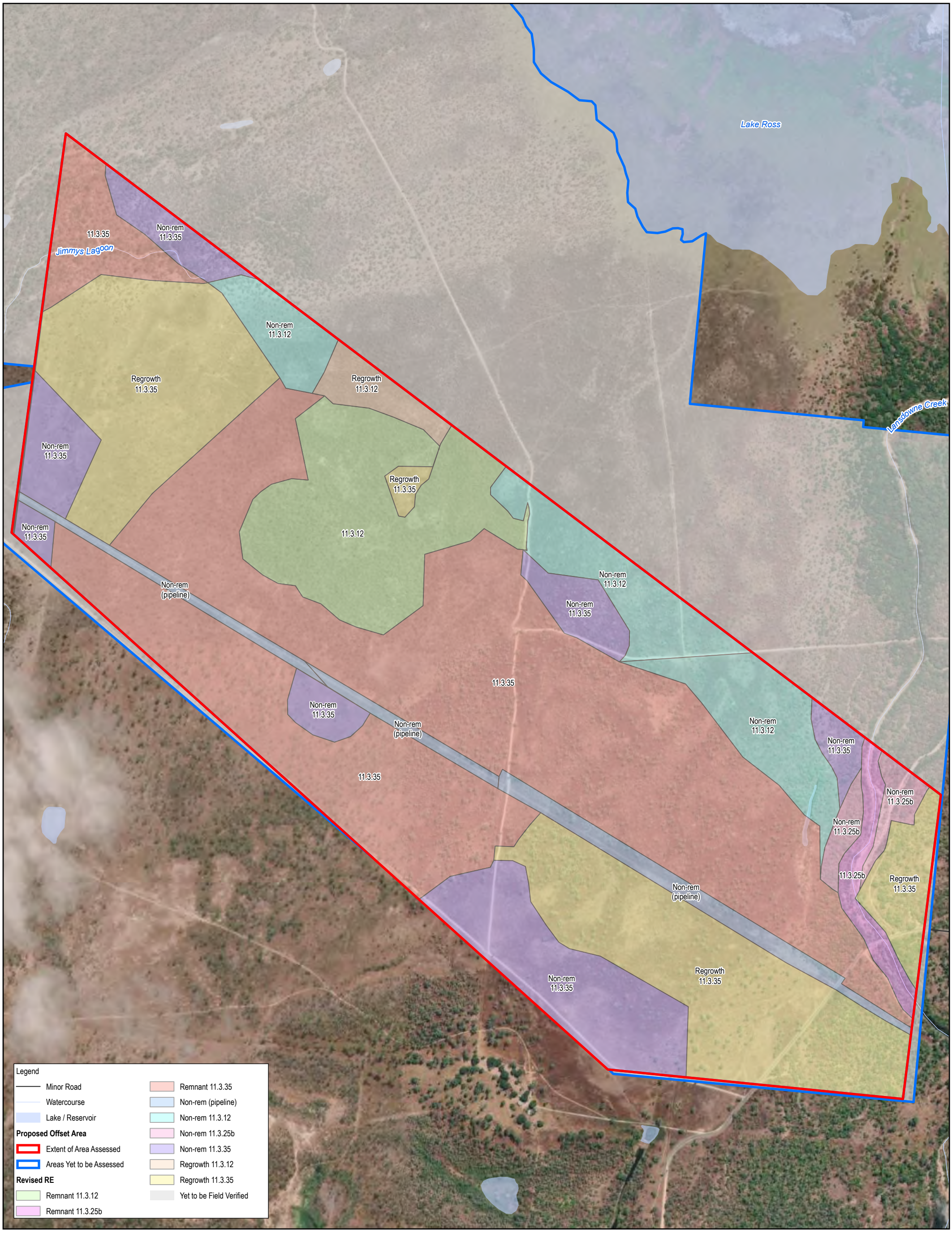
### 2.2.4 Vegetation communities

Recent vegetation surveys undertaken by ecologists from Biodiversity Australia (detailed in Section 3) have mapped the distribution of REs within part of the offset area (shown in red in Figure 2-1). Field verified REs that have been confirmed present within the offset area are detailed in Table 2-7 and mapped in Figure 2-2. Additional surveys being undertaken in August 2022 will confirm and map the distribution of REs in the remaining balance areas (shown in blue in Figure 2-1). While the field-verified REs are only a sub-set of those present within the impact area, they are ecologically comparable and provide suitable habitat values for the three MNES for which impacts are being offset. The vegetation communities represent a mix of remnant and regrowth REs and non-remnant areas that previously have supported suitable woodland REs according to DoR version 12.1 pre-clear mapping. Areas of remnant RE represent existing habitat values for the MNES, whilst areas of non-remnant and regrowth REs have future potential habitat values that will be actively managed to enhance the habitat values of the proposed offset. The final area of REs secured will be presented in the OAMP. Given the offset area provides a mix of existing habitat and future potential habitat (i.e. areas of former habitat that have been historically cleared for agriculture), the offset area offers substantial opportunities to increase habitat connectivity through the strategic replanting of regrowth and non-remnant areas.

***Table 2-7 Regional Ecosystems confirmed present within the offset site to date***

| Regional Ecosystem | VM Act Status | Description | Status | Area | Habitat for MNES |
|---|---|---|---|---|---|
| 11.3.12 | Least Concern | *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains | Remnant | 32.96 ha | Current value for BTF |
| | | | Regrowth | 4.4 ha | Future value for BTF |
| | | | Non-remnant | 30.84 ha | |
| 11.3.25b | Least Concern | *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest | Remnant | 4.94 ha | Current value for BTF, BRSTB, koala |
| | | | Non-remnant | 4.57 ha | Future value for BTF, BRSTB, koala |
| 11.3.35 | Least Concern | *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains | Remnant | 146.11 ha | Current value for BTF, BRSTB, koala |
| | | | Regrowth | 79.74 ha | Future value for BTF, BRSTB, koala |
| | | | Non-remnant | 41.92 ha | |

BTF = southern black-throated finch, BRSTB = bare-rumped sheathtail bat






Paper Size ISO A3

0 250 500 Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

## Regional Ecosystem within the proposed offset area

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# FIGURE 2-2

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_003_RegionalEcosystem_Rev0
Print date: 24 Jul 2022 - 21:28c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

### 2.2.5 Water resource availability

Water resource availability for drinking sites is a key ecological requirement for all three MNES, particularly for the southern black-throated finch. The proposed offset area has high local availability of suitable wet season drinking sites. Lake Ross is located immediately north of the offset area. Five mapped watercourses intersect the proposed offset area including four 1st order watercourses and one 5th order watercourse (Lansdowne Creek). The area is low-lying and subject to seasonal inundation, with four wetlands mapped within the offset area in the Queensland inland waters watercourse mapping. These would be seasonally available during the breeding season, providing additional drinking sites for the southern black-throated finch. Two permanent stock dams are located at the north and north-east of the offset area and additional stock dams are located 480 m to the south, 10 m to the east and 590 m to the east outside the offset area. The distribution of water resources is mapped in Figure 2-3.

### 2.2.6 Existing land use and disturbances at the offset area

The majority of the LRSA including the proposed offset area has been historically used for cattle grazing on freehold land. TCC has been acquiring land parcels over time and continues to agist cattle on acquired properties at varying densities. Although grazing ceased on the parcels that are the focus of the proposed offset in 2002 (pers. comm. Bradley Drinkwater (Ross River Dam Ranger)), grazing still occurs from time to time within and surrounding the proposed offset area when boundary fences are down (flooding etc). Sustained cattle grazing has caused a reduction in the abundance of native perennial and annual grasses and relatively high abundance of exotic plant species in the LRSA (NRA 2018).

The LRSA, including the proposed offset area, is subject to extensive weed infestation, with invasive shrubby weeds, particularly chinee apple and *Cryptostegia grandiflora* (rubber vine) occurring in high local densities. Exotic herbs including *Stylosanthes scabra* (stylo), *Chamaecrista rotundifolia* (Wynn cassia) and *Sida* spp. and exotic introduced pasture grasses such as *Urochloa mosambicensis* (Sabi grass) dominate the ground layer (Biodiversity Australia 2022b). These invasive weed species are known to adversely impact habitat values for the southern black-throated finch (Rechetelo 2016) and bare-rumped sheathtail bat (Duncan et al. 1999; Woinarski and Milne 2002 cited in Schulz and Thomson 2007).

Within the proposed offset area, fire has been infrequent (at most, one fire since 2000) (NRA 2018). In other areas of the proposed offset area, fire has been more frequent, predominantly occurring during periods of relatively low rainfall and warm or hot weather (NRA 2018). NRA (2018) suggested that historical fire regimes have been unfavourable to southern black-throated finch and has likely contributed to proliferation of certain weedy grasses and forbs. Similarly, inappropriate fire regimes are known to exacerbate the abundance of shrubby weeds that are known to adversely impact the bare-rumped sheathtail bat.

Introduced animals including feral pigs (*Sus scrofa*) and wild dogs (*Canis familiaris*) are considered common within the LSRA and proposed offset area. Feral pigs are known to degrade ground-level habitats and water sources, and thus have the potential to impact on potential southern black-throated finch habitat at the offset area. Rabbits (*Oryctolagus cuniculus*) are considered uncommon within the LSRA (NRA 2018; pers comm. Bradley Drinkwater (Ross River Dam Ranger)), and therefore are not considered likely to have an adverse impact on habitats at the offset area. Each year TCC conduct an aerial shooting program where they control approximately 30 wild dogs and 220 wild pigs per year (pers. comm. Bradley Drinkwater (Ross River Dam Ranger)). More information on the habitat values of the proposed offset area and the specific threats faced by each MNES are detailed in Section 4.

### 2.2.7 Potential to contribute to landscape connectivity

As shown in Figure 2-4, the proposed offset area identified in red is located between two State significant biodiversity corridors, mapped in Queensland's Biodiversity Planning Assessment mapping; one that covers Lake Ross, and another larger biodiversity corridor that runs east-west at the southern half of the offset area – linking Hervey's Range in the west to Toonpan in the east. A regionally significant biodiversity corridor also runs north-south through the proposed offset area, along Lansdowne Creek. By revegetating parts of the offset area that are currently support non-remnant and regrowth vegetation, the offset has the potential to increase local and regional habitat connectivity at multiple scales.




Paper Size ISO A3

0 250 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

**Townsville City Council**
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**Offset Area Management Strategy**

**Water sources located within the proposed offset area**

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# FIGURE 2-3

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_004_WaterSources_Rev0
Print date: 27 Jul 2022 - 11:46c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2




Paper Size ISO A3

0 1.5 3

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

# Connectivity of the proposed offset area to State and regional biodiversity corridors

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**FIGURE 2-4**

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_016_BiodiversityCorridors_Rev0
Print date: 27 Jul 2022 - 18:48

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout (2022); World Imagery: Earthstar Geographics. Created by: shart2

# 3. Suitability of the offset area

## 3.1 Overview

The suitability of the offset area has been assessed through a combination of desktop and field investigations.

### 3.1.1 Desktop assessments

A desktop review of the following sources was undertaken searching a 10 km radius of the approximate centre of the offset area:

- Commonwealth Protected Matters Search Tool (PMST)
- DES Wildlife Online database
- DES Species Profile Search
- Atlas of Living Australia database search
- Birdata database search
- DES Biomaps mapping layers
- Biodiversity Planning Assessment mapping layers
- DES essential habitat mapping layer

### 3.1.2 Field surveys

Information on the distribution and suitability of habitat within the proposed offset area has been gathered in three ecological field surveys commissioned for the Project:

- **Biodiversity Australia (2022a) Rapid habitat assessment – Black-throated finch**. This survey undertaken over two days in March 2022 involved a rapid assessment of habitat values for the southern black-throated finch at three initial offset areas, two within the current proposed offset area at Lake Ross and an additional offset area located further to the west in Hervey's Range.
- **Biodiversity Australia (2022b) Offset area investigation**. This survey undertaken between April and May 2022 comprised a detailed investigation of the ecological values of the proposed offset area shown in red in Figure 2-1, including:
  - Field-verification and mapping of REs to form the basis of offset assessment units
  - BioCondition surveys to assess the condition of assessment units in accordance with the methodology detailed in the *BioCondition- A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual V2.2* (Eyre et al. 2015)
  - Habitat scoring for the southern black-throated finch and bare-rumped sheathtail bat using scoring criteria devised for the Project in accordance with guidance provided in the Queensland *Guide to Determining Terrestrial Habitat Quality* (DES 2020), the *Modified QLD Habitat Quality spreadsheet* (provided by DCCEEW directly for this purpose), and the EPBC Act Offsets Assessment Guide (DSEWPaC 2012b).
  - Targeted surveys for the southern black-throated finch and bare-rumped sheathtail bat including visual searches for birds within suitable nesting habitat and full spectrum analysis of microbat echolocations recorded by passive deployment of Anabat detectors along suitable flyways (i.e. watercourses) for a combined period of 26 nights.

    Information on the methods used to assess habitat quality are detailed in Section 4.
- **Biodiversity Australia (2022c) Haughton area investigation.** This survey being undertaken in July and August 2022 comprised a detailed investigation of additional land areas within the offset area shown in blue in Figure 2-1, including:
  - Field-verification and mapping of REs to form the basis of offset assessment units

- BioCondition surveys to assess the condition of assessment units in accordance with the methodology detailed in the *BioCondition- A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual V2.2* (Eyre et al. 2015)
- Habitat scoring for the koala, southern black-throated finch and, bare-rumped sheathtail bat using scoring criteria devised for the Project in accordance with guidance provided in the Queensland *Guide to Determining Terrestrial Habitat Quality* (DES 2020), the *Modified QLD Habitat Quality spreadsheet* (provided by DCCEEW directly for this purpose), and the EPBC Act Offsets Assessment Guide (DSEWPaC 2012b).
- Targeted surveys for koalas using systematic SAT searches in suitable habitat and nocturnal spotlighting.

Additional targeted surveys for the southern black-throated finch were previously undertaken within the LRSA:

– **NRA Environmental Consultants (2018) Management Plan for Black-throated Finch (*Poephila cincta cincta*) Habitat at Lake Ross Storage Area, Townsville**. This survey undertaken over 3.5 days in July and August 2017 assessed the value and distribution of habitats and water resources for the southern black-throated finch with the intent to provide advice on the practical land management of the LRSA to protect values for the southern black-throated finch. Information from this survey has been used to inform the assessment of habitat values.

# 3.2 Suitability for the bare-rumped sheathtail bat

## 3.2.1 Ecology of the bare-rumped sheathtail bat

Information on the ecology of the bare-rumped sheathtail bat is relatively limited, partly restricted by the difficulties of trapping the species or detecting it via conventional echolocation surveys (DAWE 2021). While the species was only known from two recent historical locations at the time the listing advice was prepared, recent advances in acoustic detection via full-spectrum echolocation analysis have increased detection of the species. The species may be more widespread and common than previously thought (Schulz and Thomson 2007).

**Commonwealth habitat definition:** The Commonwealth listing advice identifies habitat as including mostly in lowland areas, typically in a range of woodland, forest and open environments (Schulz and Thomson 2007; Reardon et al. 2010; Dennis 2012). In north Queensland, the species occurs in lowland open woodland areas dominated by *Eucalyptus platyphylla* (poplar gum) (Compton and Johnson 1983).

**Foraging habitat**: The bare-rumped sheathtail bat has been suggested to forage over habitat edges such as the edges of rainforest and forest clearings (Churchill 1998). It has been suggested that the species forages on aerial insects over the canopy or along the edges of woodland and forest communities and around open clearings.

**Roosting habitat:** In Australia, all confirmed roosting records are from deep tree hollows in *E. platyphylla*, *Eucalyptus miniata* (Darwin woollybutt), *Eucalyptus tetrodonta* (Darwin stringybark) and *Melaleuca leucadendra* (weeping paperbark) (Churchill 1998; Compton and Johnson 1983; McKean et al. 1981; Murphy 2002). In Queensland, the bare-rumped sheathtail bat has been recorded roosting in large *E. platyphylla* in colonies of 3 – 4 bats (Churchill 2008). The long deep hollows in the poplar gum provide suitable roosting habitat and maternity sites for the bare-rumped sheathtail bat (Churchill 1998; Compton and Johnson 1983). All known roosts have been in large hollows 18 – 29 cm in diameter. Roosts are typically high in the tree with recorded roosts ranging between 7 and 8 m in height (Schulz and Thomson 2007). Potential roosting trees are considered to include all suitable roost tree species with deep hollows > 10 cm diameter that are >8 m in height (Greg Ford, pers. comm.).

**Behaviour:** The bare-rumped sheathtail bat is a high-flying species, foraging for flying insects above canopy height (Churchill 1998). The species is known to fly at altitudes up to and above 400 m and capable of moving long distances (Clague pers. comm. 2015, cited in Threatened Species Scientific Community (TSSC) 2016).

**Key threats:** Key threats to the bare-rumped sheathtail bat include habitat loss, degradation of habitat by weeds particularly *Mimosa pigra* (giant sensitive tree), inappropriate fire regimes, timber collections and targeted tree removal, as well as disease and competition for tree hollows by termites, bees, feral birds such as the common myna (*Acridotheres tristis*) and native birds such as the rainbow lorikeet (*Trichoglossus haematodus*) and sulphur-crested cockatoo (*Cacatua galerita*) (Schulz and Thomson 2007).

**Status as important population:** Important populations of the bare-rumped sheathtail bat have not been formally defined in the Commonwealth listing advice (DAWE 2021). The National Recovery Plan (Schulz and Thomson 2007) identified all populations as important populations. However, this designation was made at a time when the species was listed as critically endangered. Despite this, given the paucity of records, any confirmed populations should be considered important.

**Habitat critical to the survival of the species:** Habitat critical to the survival of the species has not been formally defined in the Commonwealth listing advice or National Recovery Plan for the species. In the absence of a formal definition, habitat critical to the survival of the species has been defined for the purposes of this assessment using the definition outlined in the Significant impact guidelines 1.1 (DoE 2013), which state that habitat critical to the survival of a particular species refers to areas that are necessary:

– For activities such as foraging, breeding, roosting, or dispersal
– For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
– To maintain genetic diversity and long-term evolutionary development, or/
– For the reintroduction of populations or recovery of the species or ecological community.

In this context, all foraging and roosting habitat is considered habitat critical to the survival of the species.

### 3.2.2 Bare-rumped sheathtail bat presence within the offset area

The bare-rumped sheathtail bat was positively detected from a full spectrum echolocation call, captured immediately north of the offset area during targeted baseline surveys for the offset (Biodiversity Australia 2022b). The call was positively identified by bat call analysis expert Greg Ford from Balance Environmental! Numerous historical records are also known from the Townsville region, as shown in Figure 3-1. Most are relatively recent records that have been confirmed since recent advances in acoustic detection via full spectrum analysis have increased the capacity to detect the species.

### 3.2.3 Suitability of habitat for the bare-rumped sheathtail bat within the offset area

Suitable habitat for the bare-rumped sheathtail bat was broadly distributed across the proposed offset area. The following RE communities that are known to represent habitat for the bare-rumped sheathtail bat were present:

– RE11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains
– RE 11.3.25b *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest.

Approximately 151.05 ha of remnant RE 11.3.35 and 11.3.25b currently provides habitat for the bare-rumped sheathtail bat. An additional 126.23 ha of regrowth and non-remnant RE 11.3.35 and 11.3.25b represent future potential habitat for the bare-rumped sheathtail bat. The distribution of current and future potential habitat for the bare-rumped sheathtail bat is mapped in Figure 3-2. With the habitat identified to date, and the potential for additional habitat in surrounding lots that are yet to be acquired, there is sufficient land area to provide a land-based offset for the bare-rumped sheathtail bat. The existing condition of habitats has been assessed and is detailed in Section 4.




Paper Size ISO A3

0 2.5 5

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

**Bare-rumped sheathtail bat records near the proposed offset area**

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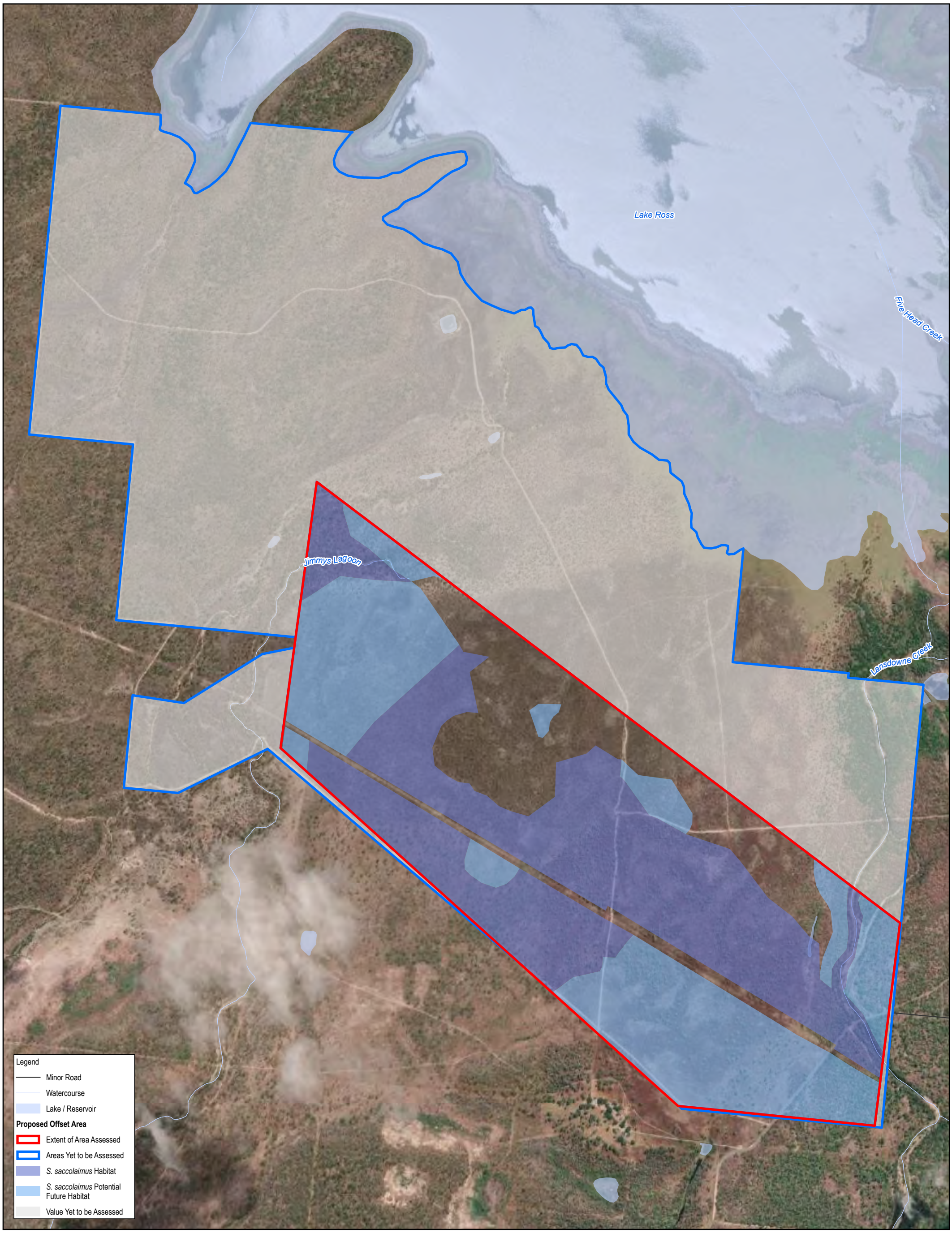
**FIGURE 3-1**

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_005_BRSTRecords_Rev0
Print date: 27 Jul 2022 - 13:15c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Earthstar Geographics. Created by: shart2






Paper Size ISO A3

0 250 500

Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

**Habitat for the bare-rumped sheathtail bat within the offset area**

Project No. **12537606**
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Date **7/24/2022**

**FIGURE 3-2**

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_006_BRSTHab_Rev0
Print date: 27 Jul 2022 - 13:17c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

## 3.3 Suitability for the southern black-throated finch

### 3.3.1 Ecology of the southern black-throated finch

The species occurs in grassy open woodlands dominated by *Eucalyptus, Corymbia* and *Melaleuca*, in close proximity to water and where seeding grasses occur (Black-throated finch Recovery Team 2007). In the wet season, southern black-throated finches require a mosaic of different habitats for foraging. Within suitable habitats, the southern black-throated finch requires access to three key resources:

– Water sources
– Grass seeds, and
– Trees providing suitable nesting habitat (DEWHA 2009a)

**Foraging habitat:** The species diet includes a variety of grass species, such as *U. mosambicensis, Digitaria ciliaris* (crabgrass)*, Melinis repens* (red Natal grass) and *Chloris inflata* (purple-top chloris), and typically varies seasonally (Mitchell 1996). At Ross River Dam, the southern black-throated finch has been recorded foraging in cleared, open areas and in tall open eucalypt woodlands dominated by *Corymbia erythrophloia* (red bloodwood) or *E. platyphylla* (Mitchell 1996). It is also known that the species forages on seeds of *U. mosambicensis* during the non-breeding period, and during the breeding period, the species mainly feeds on seeds of *D. Ciliaris* (Mitchell 1996). The species is also known to feed on insects (i.e. termites) and their larvae, especially during the wet season (Black-throated finch Recovery Team 2007). The Townsville population of the southern black-throated finch experiences a critical resource bottleneck at the start of the wet season (November and December) due to a local shortage of seeding species (NRA 2007). Early-flowering perennial grass species that produce seed in November and December represent a critical resource for the species locally (NRA 2007). Key perennial food grass species that are thought to dominate the southern black-throated finch diet include *U. mosambicensis, Enteropogon acicularis* (curly windmill grass)*, Panicum decompositum* (native millet)*, Panicum effusum* (hairy panic)*, Dichanthium sericeum* (bluegrass)*, Alloteropsis semialata* (cockatoo grass)*, Eragrostis sororia* (woodland lovegrass) and *Themeda triandra* (kangaroo grass) (Mitchell 1996; NRA 2007).

**Nesting habitat:** In Townsville, the southern black-throated finch typically breeds during the wet season between February and May, mainly in non-remnant vegetation. In Townsville, nesting habitat is typically located within 400 m of permanent water sources (NRA 2006). Nesting sites also need to be near foraging habitat as observations suggest that during the breeding season the subspecies travels smaller distances than it does during the dry season and rarely ventures more than 1 km from nesting sites during the breeding season (Mitchell 1996; NRA 2006; NRA 2007), cited in (DEWHA 2009a)). While suitable nesting sites are likely to be relatively common in the landscape, the distribution and availability of water and foraging habitat is much more limited and will, in turn, limit the number of nesting sites available to the black-throated finch (southern) (DEWHA 2009a). Nests are composed of grass and are constructed in hollow branches, or in the fork of trees or shrubs.

**Key threats**: Key threats to the southern black-throated finch include the loss and fragmentation of habitat, degradation of habitat by domestic livestock and rabbits, and invasion of weeds including exotic grasses, and predation by introduced predators.

**Status as important population:** At sites around Townsville and Charters Towers, the southern black-throated finch is still considered locally common (DEWHA 2009b). However, given that a reliable estimate of population size is currently not available, and the sub-species is under threat throughout its' range, recovery efforts should aim to conserve all existing populations of the southern black-throated finch (DAWE 2021). Accordingly, all populations, including the Townsville population, are considered important in the national context.

**Habitat critical to the survival of the sub-species:** Habitat critical to the survival of the sub-species has not been formally defined in *the National recovery plan for the black-throated finch southern* sub-species *Poephila cincta cincta* (Black-throated finch Recovery Team 2007) or the *Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta)* (DEWHA 2009). Habitat critical to the survival of the species is likely to include nesting habitat. In the Townsville region, the southern black-throated finch typically nests within 400 m of a water source and is rarely seen more than 1 km from permanent water during the breeding season (NRA 2006). Nesting sites also need to be near foraging habitat as observations suggest that during the breeding season the subspecies travels smaller distances than it does during the dry season (Mitchell 1996; NRA

2006; NRA 2007). The presence of suitable trees for breeding, and requisite foraging resources, close to seasonal water sources is critical for the southern black-throated finch.

### 3.3.2 Presence of southern black-throated finch within the offset area

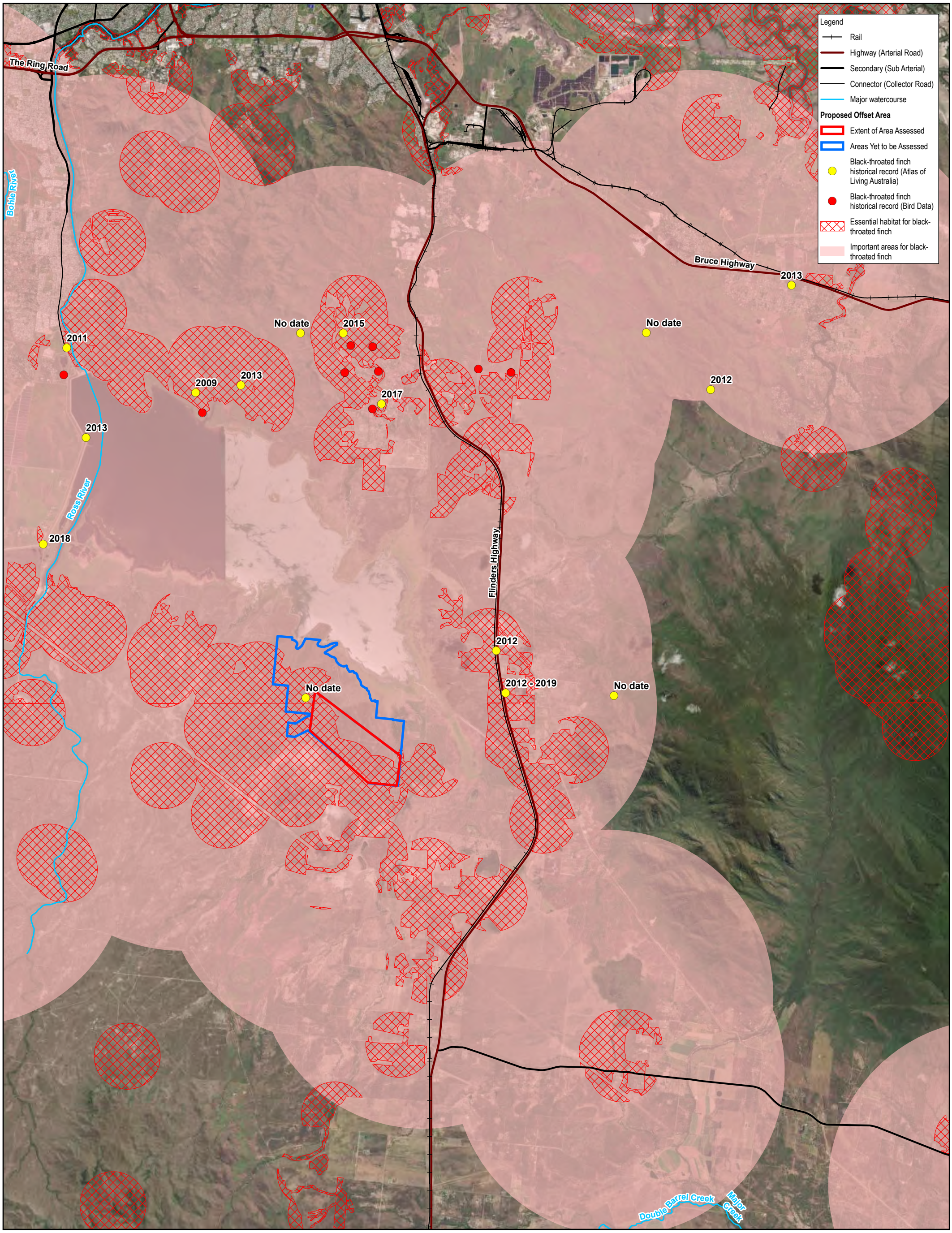
The offset area occurs within the centre of a mapped important area for the southern black-throated finch, recognised in the Commonwealth's Greater Townsville important areas mapping (DEWHA 2009). While no individual black-throated finches were recorded within the offset area in targeted surveys (Biodiversity Australia 2022a,b), Ross River Dam area is considered a hotspot for the species, with the Atlas of Living Australia and Birdata identifying high densities of historical records of the species within the local area as shown in Figure 3-3. There are a total of 201 historical records of the southern black-throated finch within a 20 km radius of the proposed offset area. Based on this information, the species is known to occur within the proposed offset area.

### 3.3.3 Suitability of habitat for the southern black-throated finch

Suitable habitat for the southern black-throated finch is broadly distributed across the proposed offset area. The following RE communities that are known to represent habitat for the southern black-throated finch were present within the offset area:

– RE11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains
– RE 11.3.25b *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest
– RE 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains

Approximately 181.01 ha of remnant RE 11.3.35, 11.3.25b and 11.3.30 currently provides habitat for the southern black-throated finch. An additional 161.47 ha of regrowth and non-remnant RE 11.3.35 and 11.3.25b represent future potential habitat for the southern black-throated finch. The distribution of current and future potential habitat for the southern black-throated finch is mapped in Figure 3-4. With the habitat identified to date, and the potential for additional habitat in surrounding lots that are yet to be acquired, there is sufficient land area to provide a land-based offset for the southern black-throated finch. The existing condition of habitats has been assessed and is detailed in Section 4.






Paper Size ISO A3

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Kilometers

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

# Historical records of the southern black-throated finch near the proposed offset area

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

**FIGURE 3-3**

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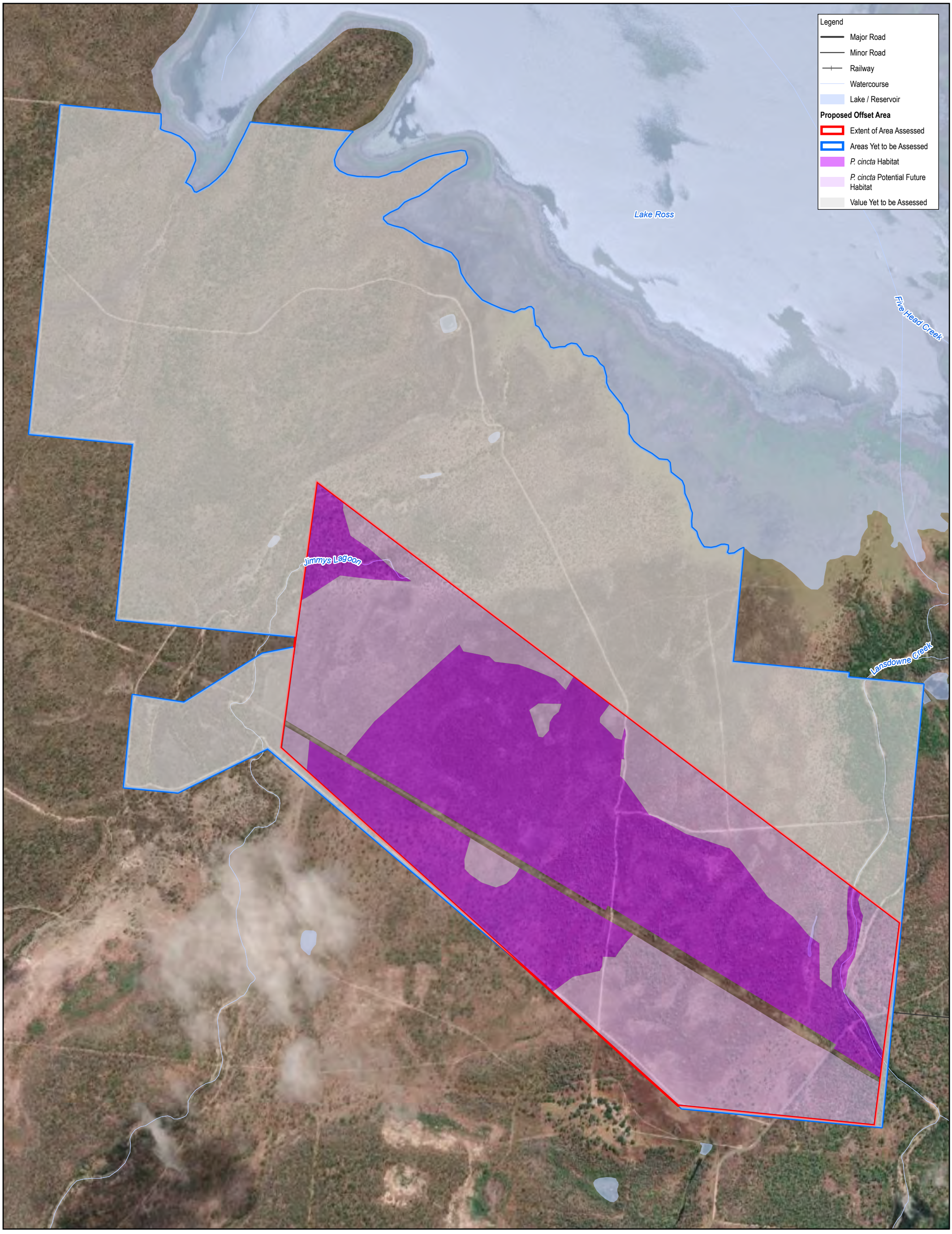
Print date: 27 Jul 2022 - 13:18c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Earthstar Geographics. Created by: shart2






Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Plan**

## Habitat for the southern black-throated finch within the proposed offset area

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

# FIGURE 3-4

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Print date: 27 Jul 2022 - 13:20c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

# 3.4 Suitability for the koala

## 3.4.1 Ecology of the koala

The koala occurs in coastal and inland habitats from the Herberton area in Queensland, westward into hotter and dryer semi-arid climates through central Queensland, and south into coastal and inland New South Wales and the Australian Capital Territory. The species' distribution is not continuous across this range (DAWE 2022a).

**Foraging habitat:** The koala has a specialist diet, feeding on the leaves of select species of *Eucalyptus, Lophostemon, Corymbia, Angophora* and occasionally *Melaleuca* and *Leptospermum* (Martin and Handasyde 1999; Moore and Foley 2000). Consequently, koalas are reliant on access to stands of forest and woodland that support those key food-tree species. Shelter (non-food) tree species are also used to rest and assist in thermoregulation (Crowther et al. 2013; Briscoe et al. 2015).

Koala habitat is generally defined as coastal and inland areas characterised by *Eucalyptus* forests and woodlands (DAWE 2022a). Koala habitat includes places that contain resources necessary for foraging, survival, growth, reproduction and movement. This includes forests or woodlands, road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce, and access to vegetated corridors or paddock trees to facilitate movement between patches (DAWE 2022a).

The way in which koalas move through the landscape also influences their use of habitat. In general, koalas are relatively sedentary, typically changing trees only a few times each day (DAWE 2021). Koala movement increases in spring when young dispersing males move distances of up to 10 km in urban south-east Queensland (Dique et al. 2003) and 16 km in rural south-east Queensland (White 1999). For the rest of the year koalas move relatively little within home ranges that vary between 8 ha and 135 ha (Ellis et al. 2002; Goldingay and Dobner 2014). Home range size generally increases with distance from the coast, as inland koalas need to move more widely to derive sufficient sources of food and water (Davies et al. 2013).

Key factors that influence the quality of habitat for koalas are the presence and density of preferred food tree species, food trees' nutritional foliar chemistry, and shelter trees and vegetation structure. Koalas move between trees and patches, and the safety or hostility of these areas also contributes to the quality of koala habitat (DAWE 2022b). Broadly, these are determined by a number of factors including climate variables, disturbance (i.e. fire, vegetation clearance), and landforms of the natural and built environment. At a landscape scale, the total amount of available habitat and its' quality are the primary factors that influence koala presence (DAWE 2022b). In the assessment of habitat quantity and quality, the National Recovery Plan for the koala (DAWE 2022b) highlights the importance of considering landscape patch size, form and spatial configuration within the context of the wider landscape, which can vary among landscapes and varies regionally (DAWE 2022b). In fragmented landscapes, the use of isolated paddock trees is commonly recorded, along with the use of roadside vegetation. In more arid areas, riparian habitats and surface water bodies are essential for the survival of koalas, particularly in the western margins of the species' distribution. Additionally, riparian vegetation facilitates local movement and provides important dispersal pathways for long-distance movement (DAWE 2022b).

**Key threats:** Known threats to the koala and koala habitat include loss and fragmentation of climatically suitable habitat due to land clearing, increased intensity and frequency of drought, increased intensity and frequency of heatwaves, increased intensity and frequency of uncontrolled bushfires, declining nutritional value of foliage, mortality due to dog attacks and vehicle collisions and increased incidence of disease including koala retrovirus (KoRV) and Chlamydia (*Chlamydia percorum*).

**Status as important population:** The concept of 'important populations' has been applied to the koala in general terms in the current Conservation listing advice (DAWE 2022a). This considers important populations as those that are valued for cultural, social, and economic reasons as well as for the species conservation. For the species conservation, it will be imperative to maintain populations that:

- Have the potential to act as source populations to adjacent areas of suitable, or potentially suitable, habitat
- Exist in areas of climatically suitable refugia during periods of environmental stress including droughts, heatwaves, and long-term climate change
- Are genetically diverse
- Are disease free and/or exhibit low rates of infection with important pathogens

– Contain genes which may confer adaptation to current and future environmental stressors
– Are geographical or environmental outliers within the species' range.

Populations that are also valued for social, cultural or economic reasons, and may or may not overlap with populations listed above:

– Cultural and spiritual importance to Indigenous people
– The social value and enjoyment of having koalas close to residential areas
– The economic value brought to local business and tourism
– The iconic species value at the national and international political and community level.

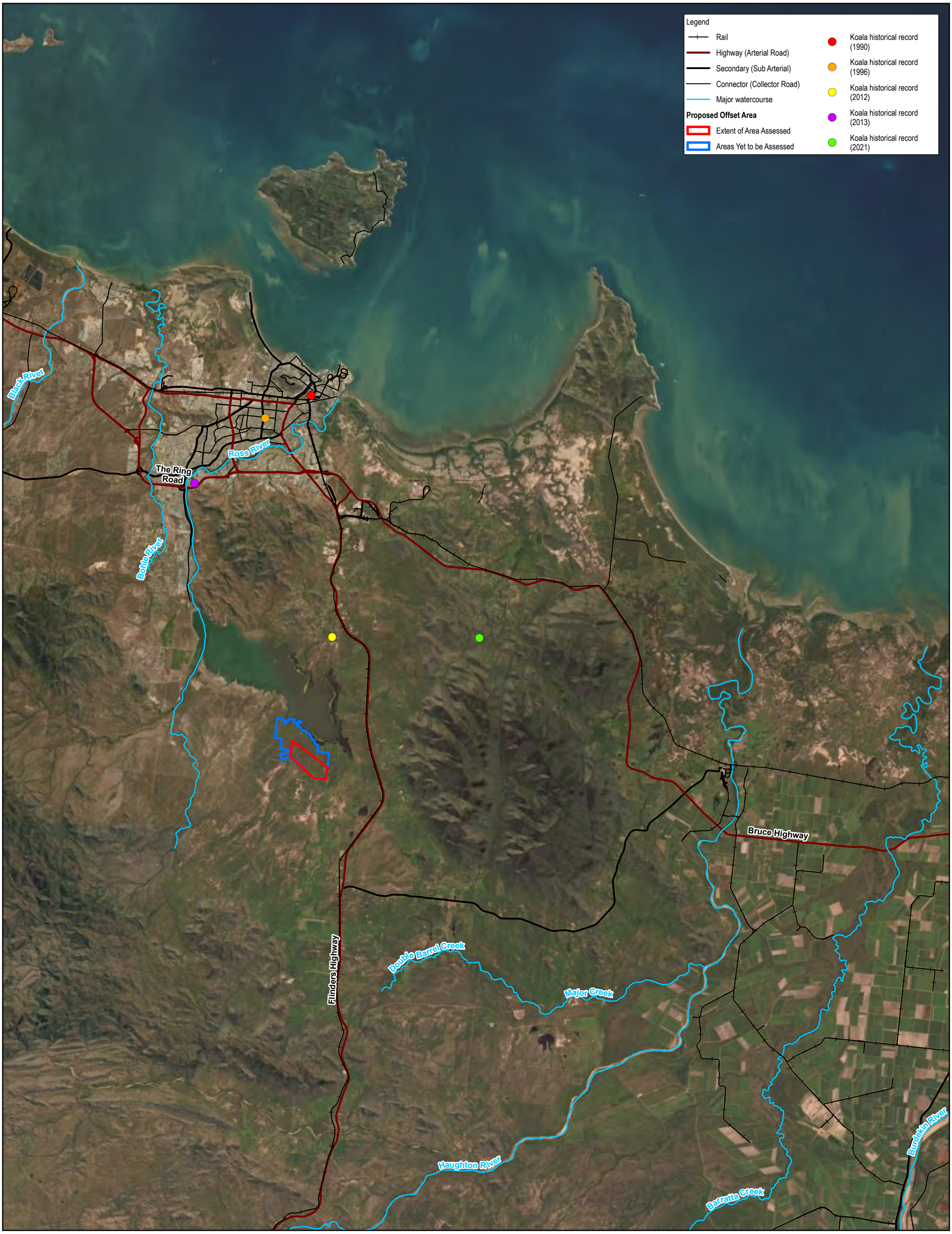
The low density of historical records within the Project area and geographical location would suggest the local population is not likely to be classified as an important population. However, at the national level, the Queensland subpopulation occurring north of the Clarence Valley in New South Wales is considered a genetically important population (DAWE 2022a).

**Habitat critical to the survival of the species:** The definition of habitat critical to the survival of the koala is formally defined in the conservation advice for *Phascolarctos cinereus* (DAWE 2022a) as '*the areas that the species relies on to avoid or halt decline and promote the recovery of the species*.' The conservation advice further defines habitat critical to the survival of the koala in general terms, outlining the definition that is relevant to all species protected under the EPBC Act as:

– Habitat that is used during periods of stress (examples: flood, drought or fire);
– Habitat that is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);
– Habitat that is used by important populations;
– Habitat that is necessary to maintain genetic diversity and long-term evolutionary development;
– Habitat that is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements;
– Habitat that is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation;
– Habitat that may in any other way be critical to the survival of a listed threatened species or a listed threatened ecological community.

### 3.4.2 Presence of koalas within the offset area

Koalas are known to occur in low local densities within the Townsville coastal floodplain and surrounding coastal regions of north Queensland. Due to their low density of occurrence, targeted koala surveys undertaken in the proposed impact area using methods recommended in the former Commonwealth referral guidelines for the vulnerable koala (DoE 2014) could not detect the species. For the same reason, it is possible that targeted surveys to be undertaken in the offset area may not detect the species. However, in both instances, the presence of suitable habitat and proximity to historical koala records indicates koalas are likely to occur in low densities. In the case of the impact area, one koala was recorded 2 km west of the impact area in 1987. For the offset area, more recent records of koalas are known, with koalas recorded 6 km north of the offset area in 2012 and 14 km north-east of the offset area in 2022 (Figure 3-5). The closest record, from Oak Valley is connected to habitats within the offset area via riparian corridor along Sachs Creek and Antill Creek. This record is well within the dispersal range of the koala (i.e. 10 – 16 km). While the offset area does not represent an area of high koala densities, it is consistent with the principles of the Commonwealth Environmental Offset Policy in that it offers a 'like for like' compensation for the habitat lost within the impact area. The provision of a comparable offset in a similar area of low koala density, within the same coastal floodplain is therefore considered a suitable offset. While alternative offset areas with higher koala densities occur west of the Great Dividing Range in areas like Collinsville, these areas would not compensate for the loss of koala habitat within the coastal floodplain and for that reason are not considered as suitable. Targeted koala surveys of the offset area have been commissioned and are scheduled for August 2022. However, given koalas occur in low densities, the offset strategy will rely on an achieving an increase in koala habitat values rather than an increase in the species stocking rate or local koala densities.






Paper Size ISO A3

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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

**Koala records near the proposed offset area**

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

**FIGURE 3-5**

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Print date: 27 Jul 2022 - 13:22c

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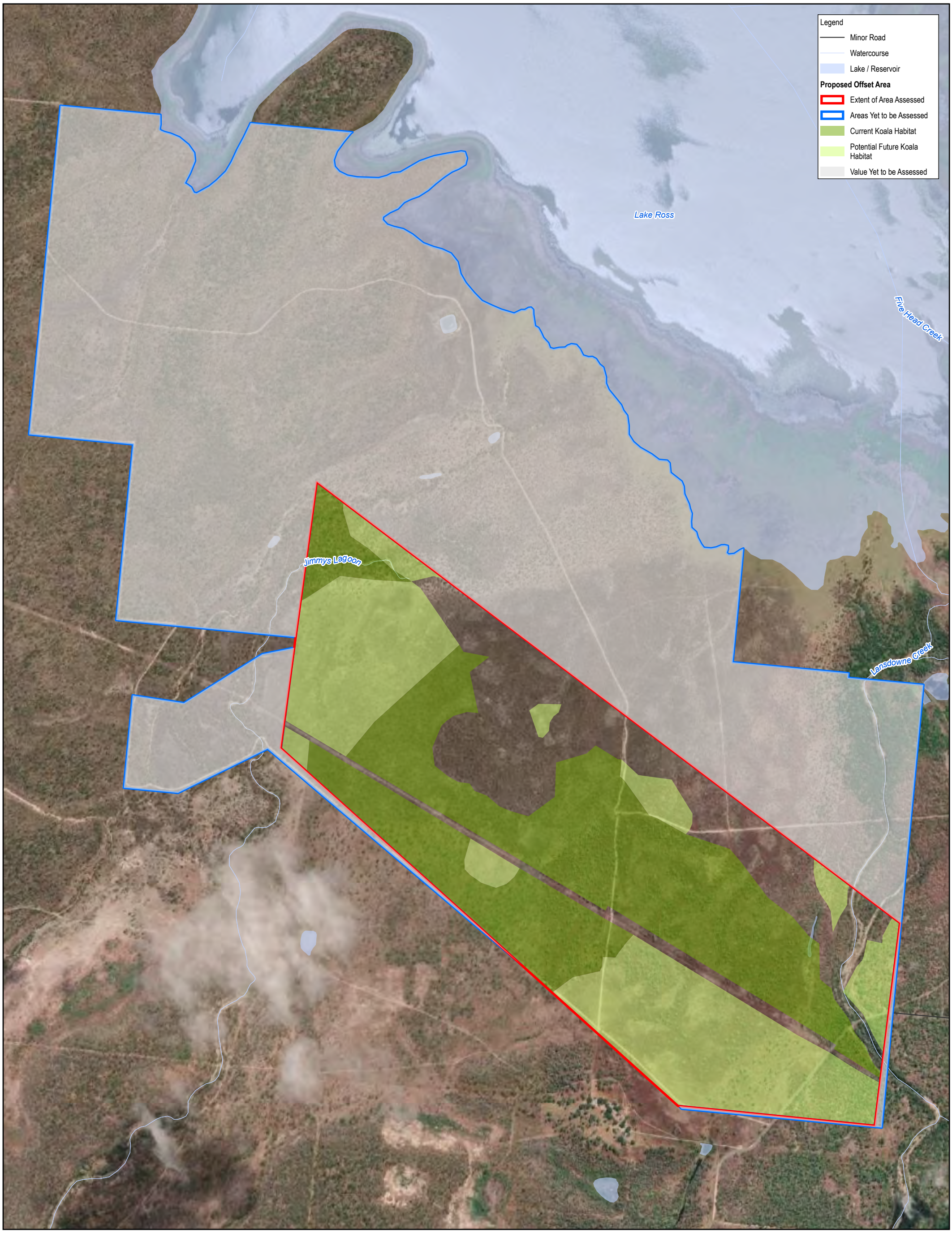




Paper Size ISO A3

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Meters

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Plan**

**Habitat for the koala within the proposed offset area**

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

**FIGURE 3-6**

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Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

### 3.4.3 Suitability of habitat for the koala within the offset area

Suitable habitat for the koala is broadly distributed across the proposed offset area. The following RE communities that are known to represent habitat for the koala have been recorded in the offset area:

– RE11.3.35 *Eucalyptus platyphylla, Corymbia clarksoniana* woodland on alluvial plains
– RE 11.3.25b *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest
– RE 11.3.30 *Eucalyptus crebra, Corymbia dallachiana* woodland on alluvial plains

Approximately 151.05 ha of remnant RE 11.3.35, 11.3.25b and 11.3.30 within the offset area currently provides habitat for the koala. An additional 126.23 ha of regrowth and non-remnant RE 11.3.35 and 11.3.25b represent future potential habitat for the koala. The distribution of current and future potential habitat for the koala is mapped in Figure 3-6. With the habitat identified to date, and the potential for additional habitat in surrounding lots that are yet to be acquired, there is sufficient land area to provide a land-based offset for the koala. The existing condition of habitats has been assessed and is detailed in Section 4.

## 3.5 Summary of existing habitat availability for MNES

The proposed offset area provides substantial existing habitat that can be enhanced and future potential habitat that can be created through revegetation and rehabilitation. Additional land areas are being investigated to confirm the final area of current and future habitat that can be enhanced for the species. The land areas available are summarised in Table 3-1.

*Table 3-1 Summary of the area of current and future habitat for each MNES within the proposed offset area investigated to date*

| Species | Existing habitat | Future potential habitat |
|---|---|---|
| Koala | 151.05 ha | 126.23 ha |
| Southern black-throated finch | 181.01 ha | 161.47 ha |
| Bare-rumped sheathtail bat | 151.05 ha | 126.23 ha |

## 3.6 Offset condition suitability and potential for enhancement

Preliminary habitat condition assessments have been undertaken at areas shown in red in Figure 2-1. These have confirmed the presence of suitable habitat for each of the MNES as summarised in Table 3-1. From preliminary investigations, the condition of habitat at the impact and offset areas is likely to be consistent. Both impact and offset areas have been subject to existing impacts including:

– Historical loss and fragmentation of habitat
– Exposure to decades of cattle grazing
– Exposure to inappropriate fire regimes
– Extensive coverage of invasive woody weeds (i.e. chinee apple, rubber vine) and grassy weeds (i.e. Guinea grass, grader grass)
– Localised degradation of habitat by pigs
– Extensive coverage of exotic pasture grasses.

Based on the extent and condition of habitat within the offset area, there are substantial opportunities for habitat improvement through replanting of non-remnant areas with canopy, sub-canopy and shrub-layer species to reinstate the pre-clear RE communities, natural rehabilitation of regrowth areas, re-establishing native food grass species for the southern black-throated finch within the ground layer, extensive weed control including removal of chinee apple, rubber vine, lantana and other woody weeds and removal of invasive grassy weeds. These improvements have the potential to make a real contribution to MNES by increasing the availability of resources for foraging, shelter and breeding and increasing mobility through increased habitat connectivity. Due to the preliminary nature of the assessment, habitat condition scores have not been provided. However, the results of the surveys to date indicate the offset area has the potential to meet the requirements of a successful offset area.

# 4. Methods used to assess habitat quality

## 4.1 Overview of the approach

As detailed in Section 1, the proponent intends to provide a direct land-based offset within the offset area by securing and managing the areas of existing habitat (i.e. remnant areas) and areas of future potential suitable habitat (i.e. regrowth and non-remnant).

The following methodology has been used to identify and assess the value of habitats within the impact area and proposed offset area:

– Potential offset sites were identified from pre-clear RE mapping, selecting REs that represent suitable habitat types for each species using mapping criteria consistent with that used to assess habitat values in the impact area.
– Targeted field surveys of the impact area were undertaken by Ecological Interpretations in March 2022 and targeted field surveys of the offset area were undertaken Biodiversity Australia in March/April 2022 to complete the following:
    - Field-verify RE mapping to provide a basis for mapping habitat values for each MNES
    - Assess the habitat quality of sites within the impact and proposed offset areas. Habitat quality was scored in accordance with the Queensland *Guide to Determining Terrestrial Habitat Quality* (DES 2020), the *Modified QLD Habitat Quality spreadsheet* (provided by DCCEEW directly for this purpose), and the EPBC Act Offsets Assessment Guide (DSEWPaC 2012b).
– Identify site-specific offset management strategies and monitoring requirements, with specific ecological outcomes and performance indicators.
– A risk assessment was undertaken against the risk matrix template supplied by DCCEEW.
– As the intention is to increase the size of the offset area, additional surveys are scheduled for August 2022 to identify and assess the habitat value of additional land areas immediately north and south of the proposed offset area to maximise the total area available for offsetting.

## 4.2 Habitat quality scoring methods

The EPBC Act *Offsets Assessment Guide* (DSEWPaC 2012) was used to determine the percentage of the offset liability that would be met by the proposed offset area, considering the following elements to assess habitat quality:

– Site condition
– Site context
– Species stocking rate

The *Modified QLD Habitat Quality spreadsheet* (provided by DCCEEW) was used to input data obtained during field surveys and desktop analysis for impact areas and offset areas.

Habitat scores were weighted with the ratios of site condition 30%, site context 30%, and species stocking rate 40%, consistent with recommendations provided by DCCEEW.

Site condition and site context scores were calculated using the *Guide to Determining Terrestrial Habitat Quality* (DES 2020), including scores for fauna species habitat (refer to Section 4.4.2 and 4.4.3) as per the Modified QLD Habitat Quality spreadsheet. Species stocking rate was informed by the results of three targeted surveys of the offset area (NRA 2021; Biodiversity Australia 2022a,b) and published information on the ecology of each species (DEWHA 2009; Schulz and Thomson 2007).

## 4.3 Overview of assessment units

Site condition within the impact area and proposed offset area was assessed within a series of assessment units (AU) as recommended in the Queensland environmental offsets framework, with nine assessment units identified in the impact area and eight assessment units identified within the offset area, as summarised in Table 4-1. Within each assessment unit, a number of replicate condition plots was established in accordance with the number specified in Table 1.2 of the *Guide to Determining Terrestrial Habitat Quality* (DES 2020). Assessment at multiple condition plots is necessary to measure vegetation condition at representative locations across the spatial extent of each assessment unit.

Site condition was assessed at 36 plots; comprising 24 within the impact area and 18 within the offset area. As the size of the offset area is being expanded, additional condition plots will be required to meet the requisite number of replicates for some assessment units. The locations of condition plots within the offset area is mapped in Figure 4-1.

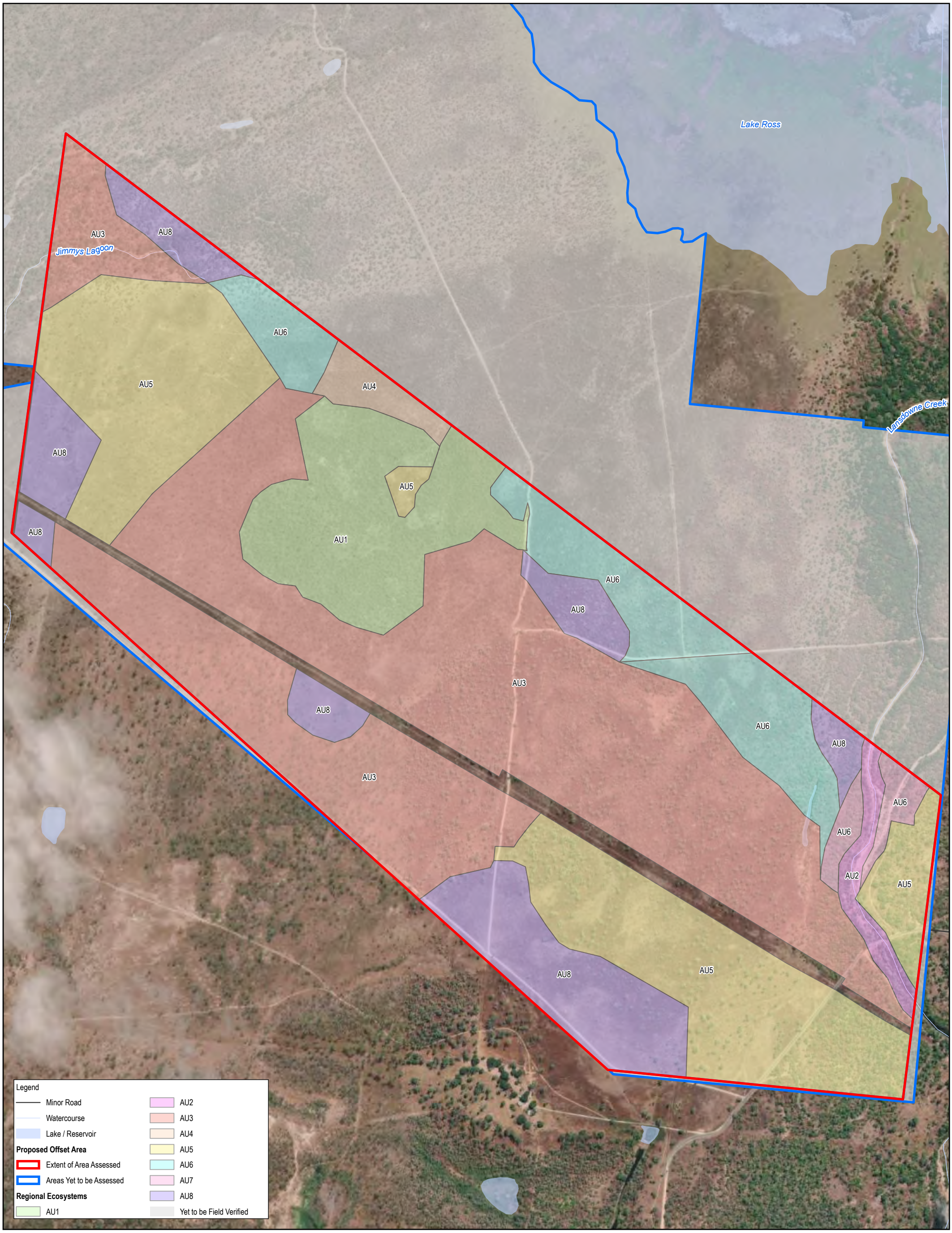
Condition plots were assigned individual site codes, representing sequential numbering of sites within the impact area assessment units (i.e. IAU-1 - 26) and offset area assessment units (i.e. OAU-1 - 21), with the I = Impact, O = Offset and AU = Assessment Unit. Sites and assessment units are detailed in Table 4-1. It should be noted that the list of assessment units for the offset area is a provisional list of those surveyed at the time of OAMS preparation. As additional areas are added to the offset area, additional BioCondition plots and potentially additional assessment units will be added to comply with the area-based replicate requirements in the *Guide to determining terrestrial habitat quality* (DES 2020).

***Table 4-1 Summary of replicate BioCondition plots in each assessment unit***

| Assessment unit | Vegetation type | Area | Number of sites required | BioCondition plots | Value for MNES |
|---|---|---|---|---|---|
| **Impact area** | | | | | |
| IAU-1 | Remnant 11.3.7 | 17.87 ha | 2 | BC1, BC19 | Koala, BTF, BRSTB |
| IAU-2 | Remnant 11.3.35 | 51.87 ha | 3 | BC4, BC7, BC8, BC9, BC12, BC14, BC15, BC16 | Koala, BTF, BRSTB |
| IAU-6 | Remnant 11.3.25b | 2.56 ha | 2 | BC11, BC18 | Koala, BTF |
| IAU-8 | Remnant 11.3.4a | 1.87 ha | 2 | BC13, BC20 | Koala, BTF, BRSTB |
| IAU-5 | Non-remnant 11.3.35 | 12.10 ha | 2 | BC17, BC21 | Koala |
| IAU-7 | Non-remnant 11.3.7 | 6.18 ha | 2 | BC2, BC22 | Koala |
| IAU-15 | Non-remnant 11.3.30 | 45.62 ha | 2 | BC23, BC24 | Koala |
| IAU-16 | Non-remnant 11.3.31 | 9.55 ha | 2 | BC5, BC6 | Koala |
| IAU-18 | Non-remnant 11.12.1 | 7.45 ha | 2 | BC25, BC26 | Koala |
| **Offset area** | | | | | |
| OAU-1 | Remnant 11.3.12 | 32.96 ha | 2 | BC5, BC9 | BTF |
| OAU-2 | Remnant 11.3.25b | 4.94 ha | 2 | BC3, BC20 | Koala, BTF |
| OAU-3 | Remnant 11.3.35 | 146.11 ha | 3 | BC1, BC2, BC16, BC18 | Koala, BTF, BRSTB |
| OAU-4 | Regrowth RE 11.3.12 | 4.4 ha | 2 | BC10, BC21 | BTF |
| OAU-5 | Regrowth RE 11.3.35 | 79.74 ha | 3 | BC6, BC14, BC19 | Koala, BTF, BRSTB |
| OAU-6 | Non-remnant RE 11.3.12 | 30.84 ha | 2 | BC8, BC11, BC17 | BTF |

| Assessment unit | Vegetation type | Area | Number of sites required | BioCondition plots | Value for MNES |
|---|---|---|---|---|---|
| OAU-7 | Non-remnant RE 11.3.25b | 4.57 ha | 2 | BC12, BC13 | Koala, BTF |
| OAU-8 | Non-remnant RE 11.3.35 | 41.92 ha | 2 | BC7, BC15 | Koala, BTF, BRSTB |

*BTF = southern black-throated finch, BRSTB = bare-rumped sheathtail bat*






Paper Size ISO A3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

**Map of assessment units**

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

**FIGURE 4-1**

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Print date: 27 Jul 2022 - 13:32c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

## 4.4 Site condition assessment

Site condition was calculated for each assessment unit using the following criteria detailed in the EPBC Act *Offsets Assessment Guide* (DSEWPaC 2012):

– BioCondition data consistent with the *Guide to Determining Terrestrial Habitat Quality* (DES 2020)
– Quality and availability of food and foraging habitat using species-specific criteria detailed in Section 4.1.4.2
– Quality and availability of shelter using species-specific criteria detailed in Section 4.1.4.3

Habitat quality criteria for the bare-rumped sheathtail bat and southern black-throated finch were derived by suitably qualified ecologists from Biodiversity Australia. Habitat quality criteria for the koala were derived by suitably qualified ecologists from GHD. For each condition parameter, scores out of 25 were assigned (in accordance with the *Guide to Determining Terrestrial Habitat Quality* (DES 2020). These were then converted to a score out of 10 to align with the EPBC Act *Offsets Assessment Guide* (DSEWPaC 2012) scoring framework as detailed in the *Modified QLD Habitat Quality spreadsheet*.

### 4.4.1 BioCondition plot methodology

Each BioCondition plot measured 100 m by 50 m and was established along the direction of the contour (i.e. along the slope rather than upslope or downslope). The location of the centre of each plot was marked with a GPS and representative photographs of the plot were taken in each aspect (i.e. north, east, south, west). Each plot was then divided into sub-plots, as illustrated by the plot layout diagram provided as Figure 4-2, and the following attributes were recorded:

– 100 m transect:
  - Tree canopy cover.
  - Shrub canopy cover.
– 100 m by 50 m plot:
  - Total number of large eucalypt and non-eucalypt trees.
  - Height of ecologically dominant layer and other canopy/sub-canopy/emergent layers.
  - Tree species richness.
  - Proportion of the dominant canopy species with evidence of recruitment.
– 50 m by 10 m plot:
  - Species richness of shrubs, grass, forbs and other native species.
  - Weed cover.
– Five 1 m by 1 m quadrats:
  - Percent cover of native perennial grass.
  - Percent cover of organic litter.

The data was entered into the DES scoring sheet and compared to representative benchmark data for each RE containing habitat for the MNES. The Queensland Herbarium (2021a) has published benchmark data for individual REs, which is based on the above BioCondition assessment method using field-based reference sites that are best-on-offer for that RE. Benchmark data is used as a comparison against the data collected on site to derive the habitat quality score for each assessment unit. These scores were then incorporated into the overall condition score for each assessment unit by combining with species foraging and shelter habitat values (refer Section 4.4).

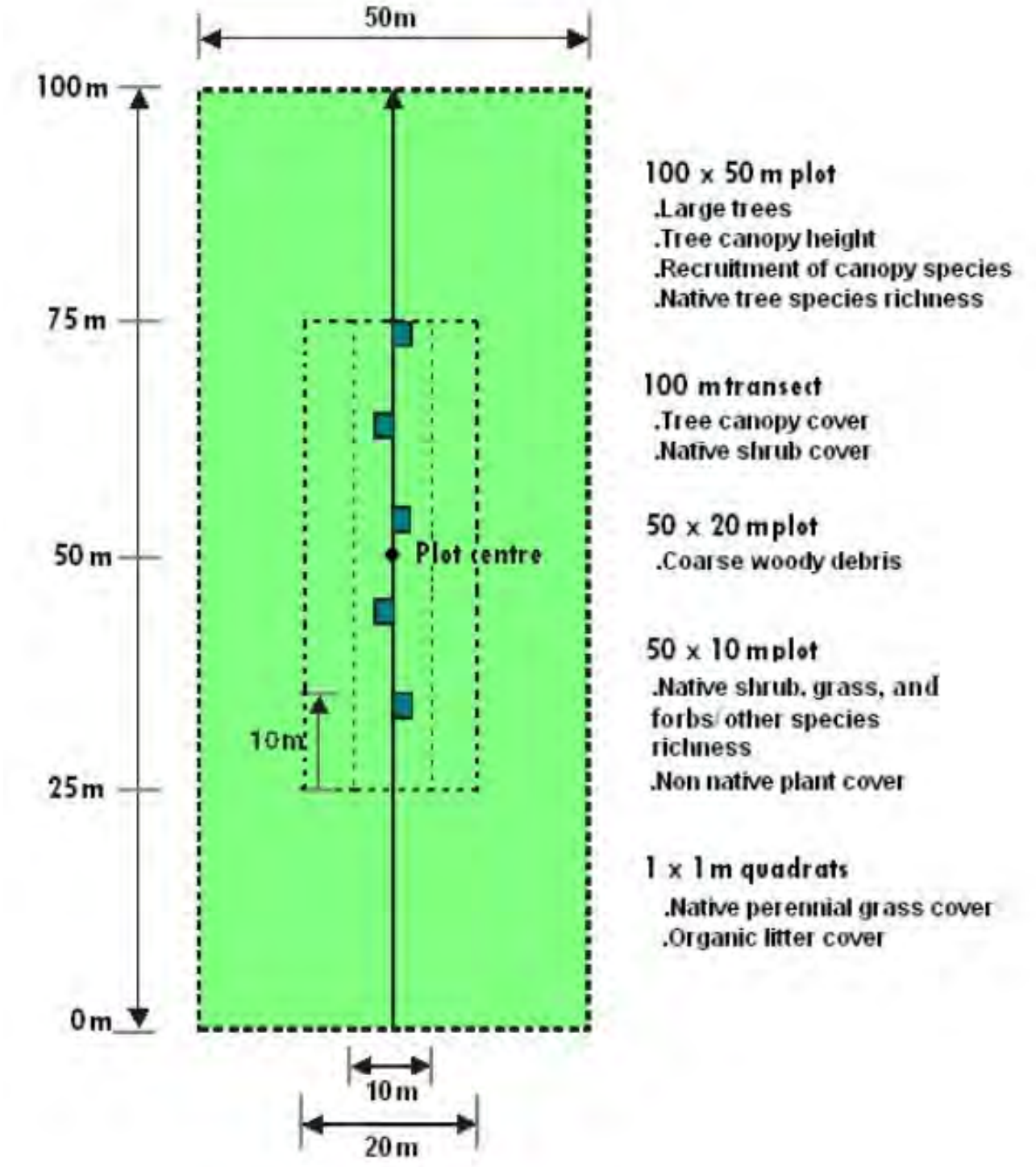
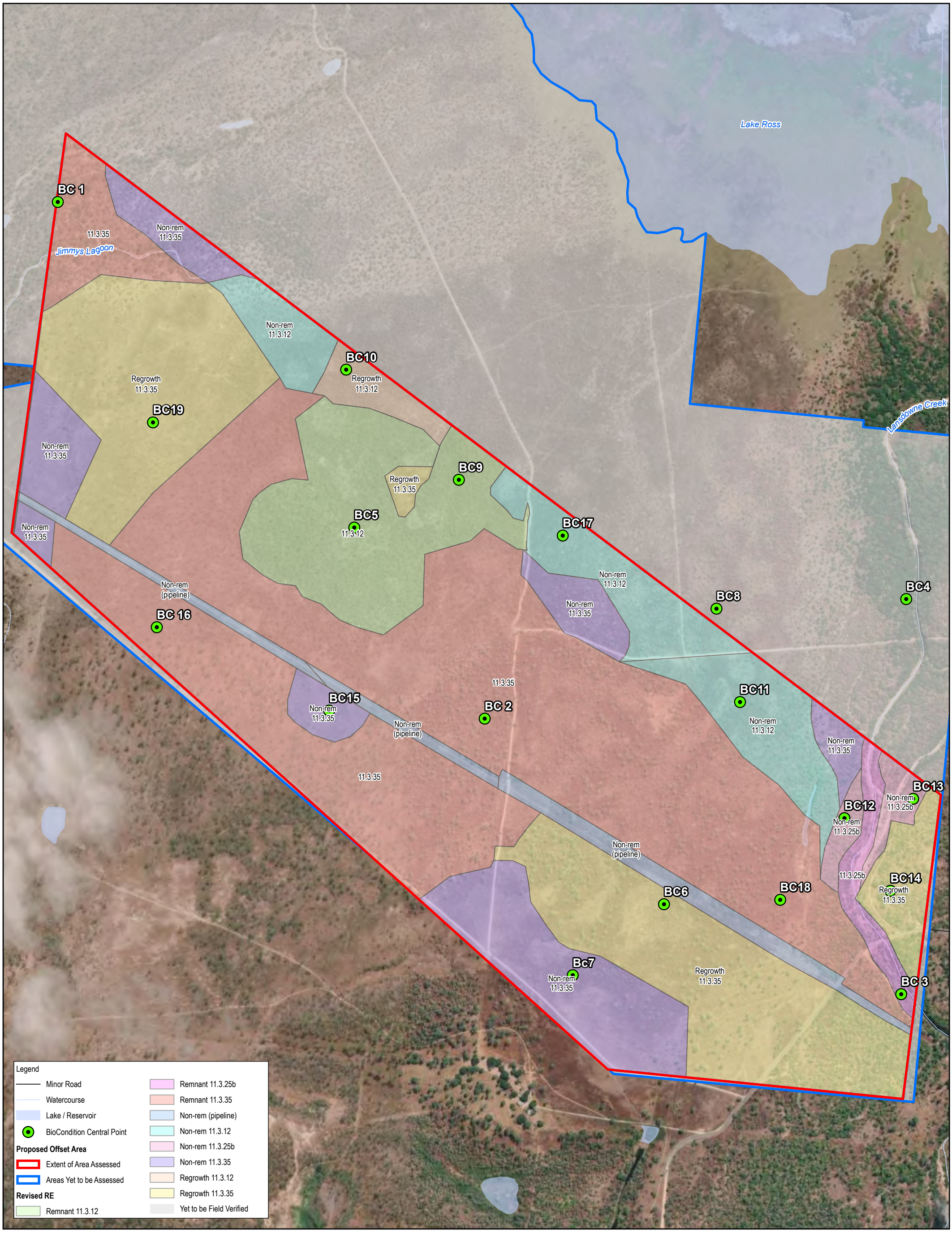



*Figure 4-2 Layout of the BioCondition plot*






Paper Size ISO A3

0 250 500 Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

# Location of BioCondition scoring plots within the proposed offset area

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

# FIGURE 4-3

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx 12537606_Offset_014_BioConditionPoints_Rev0
Print date: 27 Jul 2022 - 13:33c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

### 4.4.2 Quality and availability of food and foraging habitat

The quality and availability of food and foraging habitat was determined for each species using criteria detailed below. Food quality/availability scores were calculated for each assessment unit based on the average of all plot scores, with all criteria scored out of 25. Criteria for the bare-rumped sheathtail bat and southern black-throated finch were derived by ecologists from Biodiversity Australia, while criteria for the koala were derived by ecologists from GHD. Justification for all criteria is detailed below. Scoring parameters for all species are summarized in Appendix B.

#### 4.4.2.1 Bare-rumped sheathtail bat

Foraging habitat quality for the bare-rumped sheathtail bat was scored based on the following criteria:

– **Presence and maturity of remnant woodland:** This relatively simple criteria reflects the unspecialised foraging habitat requirements of the species. The bare-rumped sheathtail bat is known to forage in a wide range of habitats. For this reason, foraging habitat is not particularly limiting. The Commonwealth listing advice states the species occurs mostly in eucalypt forests and woodlands, generally in near-coastal areas. In Queensland, it is known to be associated with coastal lowland rainforests, and more open forests dominated by *Eucalyptus* or *Corymbia* species interspersed with coastal lowland rainforest (TSSC 2016).

#### 4.4.2.2 Southern black-throated finch

Foraging habitat quality for the southern black-throated finch was scored based on the average of the following criteria, each scored out of 25, with scoring parameters for each criteria shown in Appendix B:

– **Abundance of food grass:** The abundance of preferred food grasses was calculated in 1 m x 1 m BioCondition quadrats, where preferred food grasses were the 41 grass species that have been recorded in the literature as a known food source for the species (e.g. Mula Laguna et al. 2019, Williams et al. 2020). This metric was consistent with performance indicators used by NRA (2011) – “Early flowering perennial grasses, such as cockatoo grass, occur in >25% of 20 randomly-spaced 0.5 m by 0.5 m plots in areas used by southern black throated finches during the early wet season and wet season (November to February). This functional group of grasses is to be dominated by native species”.
– **Species richness of food grasses:** The number of food grass species was calculated in 1 m x 1 m BioCondition quadrats. This indicator is consistent with performance indicators by NRA (2011) “At least six different grass species occur in 20 randomly spaced 0.5 m by 0.5 m plots in areas used by southern black throated finches. At least four should be native”.
– **Mosaic of bare patches and grass:** The ratio of bare ground to native grasses was calculated within the BioCondition plots. Southern black-throated finch habitat must encompass patches with bare ground or low vegetation density to allow southern black-throated finches access to the seed bank (Rechetelo 2015). NRA (2011) provided the grazing recommendation aim for over 50% ground cover at the end of the dry season. They prefer areas with low vegetation density have a positive relationship with bare ground and a negative association with high total ground cover (Rechetelo 2015). If bare ground is too high, then there may be too few grasses to provide sufficient food resources. In preferred habitat areas (areas with observed use), a bare ground cover of 40.59% ± 19.28% with a maximum of 85% bare ground area was measured (Rechetelo 2015).

#### 4.4.2.3 Koala

The quality of food and foraging habitat for the koala was scored based on the average of the following criteria:

– **The abundance of non-juvenile locally important food trees**: The number of *locally important* koala food trees in each 50 m x 100 m BioCondition plot that meet the size criteria to qualify as non-juvenile koala food trees was calculated. This was based on the definition of *locally important* food trees as specified for the Brigalow belt in Youngentob et al. (2021) and the non-juvenile koala food tree definition outlined in the Queensland *Environmental Offsets Policy* (DES 2022) (i.e. any koala habitat tree that is more than 4 m high or has a trunk with circumference of more than 31.5 cm at 1.3 m above the ground). This criteria provides a measure of the biomass of food resources available to local koalas.

– **Relative diversity of locally important koala food trees**: This was calculated by dividing the number of *locally important* koala food tree species present in each 50 m x 100 m BioCondition plot by the total number of locally important food tree species listed in the technical description for that RE community (Pollock 2018). Koalas are known to forage on a variety of food tree species. While koalas can persist in areas with only a single food tree species where that species meets its' nutritional requirements, the provision of a diversity of food tree species increases the adaptability of foraging resources available to koalas. In north Queensland, koalas have been shown to occur in higher densities in riparian habitats where there is higher food tree species richness (Munks et al. 1996).
– **Ease of movement**: This was scored based on the relative connectivity of habitat and the anticipated physical barriers (i.e. fences, dense vegetation) and behavioural barriers (i.e. large gaps) to koala movement. This observes that while koalas are capable of moving large distances across open ground when dispersing, during foraging activities, they tend to forage preferentially through habitats that have higher levels of connectivity and pose lower risks of mortality from dog attack and other forms of misadventure (Rus et al. 2020).

## 4.4.3 Quality and availability of shelter

The quality and availability of shelter was determined for each species using criteria detailed below. Shelter quality/availability scores were calculated for each assessment unit based on the average of all plot scores, with criteria scored out of 25 (as recommended in the *Guide to Determining Terrestrial Habitat Quality* DES 2020) and then converted to scores out of 10 to align with the EPBC Act QLD *Modified QLD Habitat Quality spreadsheet*.

### 4.4.3.1 Bare-rumped sheathtail bat

The quality and availability of shelter for the bare-rumped sheathtail bat was scored based on the average of the following criteria:

– **The abundance of preferred trees:** The number of individuals of the three preferred tree species (i.e. *E. platyphylla, Corymbia tessellaris* and *M. leucadendra*) within each 50 m x 100 m BioCondition plot. The bare-rumped sheathtail bat is an obligate hollow-roosting species (Milne et al. 2009). At the time of publication of the national recovery plan for the bare-rumped sheathtail bat (Schulz and Thomson 2007), it had only been recorded from poplar gum (*E. platyphylla*), Darwin woollybutt (*E. miniata*) and Darwin stringybark (*E. tetrodonta*), however, it has since also been located in *M. leucadendra* (Greg Ford pers. comm.) and *C. tessellaris* (Reside et al. 2016). Due to difficulties in determining their presence in tree hollows, it is likely that the species utilises hollows in a broader range of tree species, particularly eucalypts. As the bats only occur at low densities in the region (Schulz and Thomson 2007), only a small minority of available tree hollows would be likely to be utilised.
– **The abundance of suitable deep hollows in roost tree species**: The number of suitable hollows (i.e. >10 cm diameter and > 8 m high in *E. platyphylla, C. tessellaris* or *M. leucadendra* (G. Ford pers comm.) was counted in each 50 m x 100 m BioCondition plot. The bare-rumped sheathtail bat has specific hollow-requirements, only known to roost in large, deep hollows in *E. platyphylla, E. miniata, E. tetradonta and M. leucadendron* (TSSC 2016).

### 4.4.3.2 Southern black-throated finch

The quality and availability of shelter for the southern black-throated finch was scored, based on the average of the following criteria:

– **The abundance of suitable nesting sites and known nesting tree species**: The canopy cover of typical nest tree species (i.e. *E. platyphylla* and *Melaleuca viridiflora*) was calculated for each 50 m x 100 m BioCondition plot. The woodland species *E. platyphy*lla and *M. viridiflora* are the preferred nest trees with nests occasionally recorded in *C. tessellaris* and *C. dallachyana* (Rechetelo 2015). The nests are often built in a hollow branch of a tree, or in a fork of a tree, shrub or sapling. A single tree may contain several active nests (e.g. two to five nests have been observed in one tree). Nests are used for breeding and roosting, with individuals returning each night to roost (Buosi 2011). Flocks are also negatively associated with high tree abundance (Rechetelo 2015). The mean number of large tress was 1.3/ha, medium trees 63/ha and small trees 181/ha (Rechetelo 2015). They occur in grassy open woodland (Buosi 2011), defined by Specht (1970)

as having a crown cover <20% of trees 10-30m height. BioCondition benchmarks for 11.3.35 notes a 30% tree canopy cover.

– **Distance to water**: The distance to the nearest suitable breeding season drinking site was measured for each BioCondition plot. Proximity to drinking sites is a critical requirement. During the breeding season, southern black-throated finches rarely venture far from the nest and therefore need to be able to access food and drinking resources in close proximity. Southern black throated finches nest an average of 167 m from water but generally require a water source to be within 200 m of breeding and foraging areas, and no more than 400 m (Buosi 2011).

#### 4.4.3.3 Koala

The quality and availability of shelter for the koala was scored, based on the average of the following criteria:

– **The abundance of non-juvenile *ancillary habitat* trees**: The number of *ancillary habitat* trees in each 50 m x 100 m BioCondition plot that meet the size criteria to qualify as non-juvenile koala habitat trees was calculated. This was based on the *ancillary habitat* trees identified for the Brigalow belt in Youngentob et al. (2021) and the non-juvenile koala food tree definition outlined in the Queensland *Environmental Offsets Policy* (DES 2022) (i.e. any koala habitat tree that is more than 4 m high or has a trunk with circumference of more than 31.5 cm at 1.3 m above the ground). This criterion provides a measure of the biomass of shelter resources available to local koalas.

– **Relative diversity of *ancillary habitat* trees**: This was calculated by dividing the number of *ancillary habitat* tree species present in each 50 m x 100 m BioCondition plot by the total number of locally *ancillary habitat* tree species listed in the technical description for that RE community (Pollock 2018). Ancillary habitat elements such as shelter vegetation may not contribute substantially to a koala's diet but is important for movement and thermoregulation. Shelter tree species that do not provide nutritional value can play an important role when they co-occur with *locally important* koala trees. Although these species do not constitute habitat in the absence of *locally important* koala trees, they are thought to make an important and potentially necessary contribution to koala habitat in many regions (Youngentob et al. 2021).

– **The relative abundance of shrub cover**: This was calculated directly from the shrub canopy cover scores calculated from the BioCondition plot data detailed in Section 4.4.1. This provides an additional measure of shelter abundance for the koala.

## 4.5 Site context

For each assessment unit, site context scores were assigned based on the average of all plot scores for:

– Size of patch
– Connectedness
– Context
– Role of the site location to the overall population in the state
– Threats to the species
– Species mobility capacity.

### 4.5.1 GIS derived site context attributes

The first four GIS attributes of size of patch, connectedness, context and ecological corridors were calculated as part of the desktop analysis using the *Guide to Determining Terrestrial Habitat Quality* (DES 2020). This involved geospatial analysis to calculate the following indicators for each condition plot:

– Patch size, which involves measurement of the area of vegetation in which the assessment unit is contained and all other directly connecting areas of mapped remnant vegetation (total score of 10)
– Connectedness, which involves measurement of the length of remnant vegetation along the boundary of the site (total score of 5)
– Context, which involves measuring the percentage of remnant vegetation within a 1 km buffer around the site (total score of 5).

The information on each attribute was then used to determine the site context score in accordance with the framework provided by the *Guide to Determining Terrestrial Habitat Quality* (DES 2020), as shown in Table 4-2. These scores are then incorporated into the overall condition score for each assessment unit.

*Table 4-2 Site context scoring framework*

| | | | | | | |
|---|---|---|---|---|---|---|
| **1 Size of Patch*** | **Score** | 0 | 2 | 5 | 7 | 10 |
| | **Description** | <5ha | 5-25ha | 26-100ha | 101-200ha | >200ha |
| **2 Connectedness*** | **Score** | 0 | 2 | 4 | | 5 |
| | **Description** | 0-10% | >10%-<50% | 50-75% | | >75% or >500ha |
| **3 Context*** | **Score** | 0 | 2 | 4 | | 5 |
| | **Description** | <10% remnant | >10%-30% remnant | >30-75% remnant | | >75% remnant |
| **4 Distance to permanent watering point †** | **Score** | 0 | 2 | 5 | 10 | 20 |
| | **Description** | 0-500m | >500m-1km | >1-3km | >3-5km | >5km |
| **5 Ecological corridors** | **Score** | 0 | 4 | | 5 | |
| | **Description** | Not within | Sharing a common boundary | | Within (whole or part) | |

* *Measured for fragmented bioregions only*

† *Measured for intact bioregions only*

## 4.5.2 Role of the site location to the overall population in the state

As detailed in the *How to Use the Offsets Assessment Guide* (DAWE 2018), this value was obtained from the species stocking rate (detailed in Section 4.6), adjusted to a score of 10.

## 4.5.3 Threats to the species

At each assessment unit, threats to each species were assessed based on an average of all plot scores using criteria detailed below. For all species, the absence of threats were calculated as a score out of 25 using the risk matrix detailed in Table 4-3, taken from the *Guide to Determining Terrestrial Habitat Quality* (DES 2020), with the absence of threat score assigned based on the lowest score assigned for any threat. The score was then adjusted to a score out of 10 to align with the EPBC Act *Modified QLD Habitat Quality spreadsheet*.

*Table 4-3 Threat matrix used to score absence of threats*

| **Threat matrix** | | | **Severity** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Very high** | **High** | **Medium** | **Low** | **Very low** |
| | | | 1 | 2 | 3 | 4 | 5 |
| **Scope** | **Very high** | 1 | 1 | 2 | 3 | 4 | 5 |
| | **High** | 2 | 2 | 4 | 6 | 8 | 10 |
| | **Medium** | 3 | 3 | 6 | 9 | 12 | 15 |
| | **Low** | 4 | 4 | 8 | 12 | 16 | 20 |
| | **Very low** | 5 | 5 | 10 | 15 | 20 | 25 |

### 4.5.3.1 Bare-rumped sheathtail bat

The following key threats faced by the bare-rumped sheathtail bat were scored out of 25, using the threat matrix above, scored for the following threats that are identified in the National Recovery Plan for the species (Schulz and Thomson 2007) and relevant to the Project area:

– **Abundance of exotic invasive weedy shrubs**: For each BioCondition plot, the proportional cover of invasive weedy shrubs including leucaena (*Leucaena leucocephala*), chinee apple and rubber vine was used to assign scores using the threat matrix based on the severity and scope of weed coverage. Numerous introduced plant

species may have the potential to negatively impact on their preferred roosts in hollow trees. Without mitigation measures, the spread and invasion of these species could pose a significant threat to the long-term persistence of the bare-rumped sheathtail bat.

#### 4.5.3.2 Southern black-throated finch

Threats faced by the southern black-throated finch were scored out of 25, using the threat matrix above, scored for the following threats that are identified in the Significant impact guidelines for the endangered black-throated finch (southern) *Poephila cincta cincta* (DEWHA 2009a):

- **Reduction in the availability of drinking water**: Southern black-throated finches need to drink water on at least a daily basis and drink more frequently during the drier times of the year (Buosi 2011).
- **Inappropriate grazing regimes**: Southern black-throated finch often occur in areas grazed by cattle. However, inappropriate heavy grazing may result in the alteration of fuel loads, vegetation structure and the availability of food during the wet season (DEWHA 2009b). Additional impacts include soil compaction and degradation, trampling of fallen grass seed, and alteration of the composition and abundance of different grass species (Buosi 2011).
- **Inappropriate fire regimes:** Fire influences grass and herb diversity and the abundance of grass seed, and can alter the extent of *Stylosanthes* in a pasture (Williams et al. 2020). Altered fire regimes (e.g. landscape wide fire damage) reduced ground cover, impact seed production, damage nesting habitat and promote introduced invasive weeds (Buoisi 2011).
- **Introduction of exotic weeds**: Although new weeds may colonise the site over time, the bigger issue is the increase spread of weeds on site, including vegetation thickening by woody weeds (e.g. chinee apple) that modifies the habitat away from the desired open grassy woodland community, replacement of desirable forage grasses with pasture improvement species (especially stylos, which is negatively associated with the Black Throated Finch (Rechetelo 2015)), and changes in fire regimes due to introduced grasses that alter fuel loads and subsequent fire regimes.

#### 4.5.3.3 Koala

Threats faced by the koala were scored out of 25, using the threat matrix above, scored for the following threats that are identified in the Conservation listing advice for the koala (DAWE 2022a):

- **Risk of uncontrolled wildfire:** Koalas experienced extreme population losses throughout their range as a result of the devastating Black Summer fires. Climate change has increased the level of threat faced by koalas from uncontrolled wildfires. While there has been a universal increase in the wildfire threat profile, inappropriate fire regimes can exacerbate the local threats by elevating fuel loads and increasing fire frequencies.
- **Risk of drought:** Changes in the climate are exposing koala populations to increased risk of decline from drought. This is particularly relevant for populations at the western edges of the species' range in habitats that are already more marginal in terms of their suitability.
- **Injury and mortality due to dog attacks:** Koalas are highly susceptible to injury and mortality from dog attacks. While this is particularly prevalent in peri-urban and residential areas, it is an ongoing threat to the species in all areas where wild or domestic dogs occur.
- **Collision with vehicles:** Injury and mortality of koalas represents a substantial threat to local koala populations in peri-urban and residential areas. This can exert negative pressures on local populations by increasing mortality and imposing barrier effects that restrict access to regional resources.

### 4.5.4 Species mobility capacity

The species mobility capability was scored for the bare-rumped sheathtail bat and southern black-throated finch using criteria detailed below.

#### 4.5.4.1 Bare-rumped sheathtail bat

For each site, a species mobility capability score was assigned for the bare-rumped sheathtail bat. This was a score out of 25, based on an average of the following scores:

– **Habitat connectivity:** For each BioCondition plot a score of connectivity was assigned based on the following criteria: 5 (totally isolated), 10 partially isolated, 15 (periodically isolated), 20 major connectivity, 25 (totally connected).

This bat species is generally considered to be a high-flying species, feeding on insects above the canopy to a height of 80 m, though sometimes swooping down to within 2m of the ground in pursuit of prey (Churchill 2008). Their presence on Magnetic Island (4.37km from coast) implies that they are capable of flying over expanses of open water, and this ability to fly between land masses is supported by their extra-limital distribution which ranges from India in the west to Bougainville Island (PNG) in the East (Churchill 1998). Evidence therefore supports the theory that open treeless areas are not a barrier to movement, and it is reasonable then to expect that a high-flying species capable of flying hundreds of kilometers over open ocean would not regard roads and tracks as a barrier to movement. As such for the purpose of this assessment the species was assigned very high mobility scores due to it highly mobile nature.

#### 4.5.4.2 Southern black-throated finch

For each site, a species mobility capability score was assigned for the southern black-throated finch. This was a score out of 25, based on an average of the following scores:

– **Presence of shrubs**: For each BioCondition plot, the density of shrubs was calculated and used as an index of mobility. Southern black-throated finches prefer a general absence of shrubs but the scattered presence of a medium strata (Rechetelo 2015). Flocks are negatively associated with shrub abundance, shrub cover, large tree abundance and high total ground cover (Rechetelo 2015). Rechetelo (2015) noted a mean shrub density of 395 shrubs/ha but with a range of 0-2788. Biocondition benchmarks for 11.3.35 notes a 5% shrub canopy cover. Sparse shrub cover is optimal (NRA 2011), defined by Specht (1970) as 10-30%.
– **Presence of suitable open grassy woodland**: For each BioCondition plot, the relative presence and connectivity of suitable canopy vegetation was scored. Connectivity in the canopy vegetation is a critical element influencing the movement capabilities of the southern black-throated finch.

#### 4.5.4.3 Koala

For each site, a species mobility capability score was assigned for the koala. This was a score out of 25, based on an average of the following scores:

– **Habitat connectivity:** For each BioCondition plot a score of connectivity was assigned based on the following criteria: 5 (totally isolated), 10 partially isolated, 15 (periodically isolated), 20 major connectivity, 25 (totally connected)

## 4.6 Species stocking rate assessment

For each assessment unit in the impact area and offset area, a single value of species stocking rate will be calculated using the criteria detailed in Table 4-4, based on the scoring system in the EPBC Act *How to Use the Offsets Assessment Guide.*

*Table 4-4 Species stocking rate scoring criteria*

| Criteria | Score | | | |
|---|---|---|---|---|
| **Presence detected on or adjacent to the site** | 0 | 5 | | 10 |
| | No | Yes – adjacent | | Yes – on site |
| **Species usage of the site** | 0 | 5 | 10 | 15 |
| | Not habitat | Dispersal | Foraging | Breeding |
| **Approximate density per ha** | 0 | 10 | 20 | 30 |
| | | | | |
| **Role/importance of species population on site** | 0 | 5 | 10 | 15 |
| | 0 | 5 – 15 | 20 – 35 | 40 – 45 |

Scores for species stocking rate will be based on information on the likely presence and abundance of each species, based on the results of targeted assessments undertaken within the impact area and offsets area, with survey effort summarised for each species below in Table 4-5. For species with low density (i.e. koala) nominal low density scores will be used to calculate species stocking rate. As directed in the *Modified QLD Habitat Quality spreadsheet*, where information on changes in density is not available due to low density, these will be kept relatively constant and improvements in habitat quality will rely on increases in site condition scores (i.e. BioCondition, foraging habitat value, shelter habitat value, mobility habitat value and reduction in threat scores.

***Table 4-5 Summary of targeted survey methods to assess local utilisation by the southern black-throated finch and bare-rumped sheathtail bat***

| Survey | Targeted survey methods | | |
|---|---|---|---|
| | **Southern black-throated finch** | **Bare-rumped sheathtail bat** | **Koala** |
| **Impact area** | | | |
| NRA<br>April / May 2021 | 32 quaternary RE confirmation sites<br>32 habitat assessments<br>Visual bird surveys | 32 quaternary RE confirmation sites<br>3 Anabat detector nights<br>32 habitat assessments | 32 quaternary RE confirmation sites<br>32 habitat assessments<br>Visual koala searches |
| GHD<br>October 2021 | 8 quaternary RE confirmation sites<br>35 habitat assessments<br>14 waterbody watches<br>Vigilant bird surveys over 6 x 10 hr days | 8 quaternary RE confirmation sites<br>35 habitat assessments<br>Inventory of all potential roost trees | 8 quaternary RE confirmation sites<br>35 habitat assessments<br>30 SAT searches for koala pellets<br>Visual koala searches |
| GHD<br>March / April 2022 | 14 area searches around waterbodies for nests and birds<br>14 waterbody watches<br>Vigilant bird surveys over 4 x 10 hr days | 6 dusk roost watches<br>5 Anabat detector nights | 25 SAT searches for koala pellets |
| Ecological Interpretations<br>March 2022 | Field-verification of RE mapping within the impact area<br>18 BioCondition assessments | Field-verification of RE mapping within the impact area<br>18 BioCondition assessments | Field-verification of RE mapping within the impact area<br>18 BioCondition assessments |
| **Offset area** | | | |
| Biodiversity Australia<br>March 2022 | 80 rapid vegetation assessment sites<br>32 rapid habitat assessments for black-throated finch | 80 rapid vegetation assessment sites | 80 rapid vegetation assessment sites |
| Biodiversity Australia<br>April 2022 | Field verification of RE mapping in red area shown in Figure 2-1<br>19 BioCondition plots.<br>19 habitat scoring plots using methods in Section 4.4.2, 4.4.3, 4.5.3 and 4.5.4.<br>Targeted surveys for southern black-throated finches and nest sites. | Field verification of RE mapping in red area shown in Figure 2-1.<br>19 BioCondition plots.<br>19 habitat scoring plots using methods in Section 4.4.2, 4.4.3, 4.5.3 and 4.5.4.<br>26 nights passive deployment of Anabat detectors on flyways. | Field verification of RE mapping in red area shown in Figure 2-1.<br>19 BioCondition plots. |
| Proposed survey<br>Biodiversity Australia<br>August 2022 | Field verification of RE mapping in blue area shown in Figure 2-1.<br>BioCondition plots on balance area. | Field verification of RE mapping in blue area shown in Figure 2-1.<br>BioCondition plots on balance area. | Field verification of RE mapping in blue area shown in Figure 2-1.<br>BioCondition plots on balance area. |

| Survey | Targeted survey methods | | |
|---|---|---|---|
| | Southern black-throated finch | Bare-rumped sheathtail bat | Koala |
| | Habitat scoring plots using methods in Section 4.4.2, 4.4.3, 4.5.3 and 4.5.4 | Habitat scoring plots using methods in Section 4.4.2, 4.4.3, 4.5.3 and 4.5.4 | Habitat scoring plots using methods in Section 4.4.2, 4.4.3, 4.5.3 and 4.5.4<br>SAT searches for koala faecal pellets |

#### 4.6.1.1 Role / importance of the species population on site

For each assessment unit, the role / importance of the site for the species will be assessed using the criteria detailed in Table 4-6 based on the supplementary table to the Species Stocking Rate in the EPBC Act Offsets Guide.

*Table 4-6 Role/importance of the species population on site*

| Criteria | Score | |
|---|---|---|
| Key source population for breeding | 0 | 10 |
| | No | Yes/Possibly |
| Key source population for dispersal | 0 | 5 |
| | No | Yes/Possibly |
| Necessary for maintaining genetic diversity | 0 | 15 |
| | No | Yes/Possibly |
| Near the limit of the species range | 0 | 15 |
| | No | Yes |

# 5. Approach proposed to inform inputs to the EPBC Act Offsets Assessment Guide

## 5.1 Overview

This section presents an overview of the approach that will be used to inform inputs to the EPBC Act Offsets Assessment Guide (DSEWPaC 2012b):

– Time over which loss is averted (max. 20 years)
– Time until ecological benefit
– Risk of loss (%) without offset
– Risk of loss (%) with offset
– Confidence in result (%)

## 5.2 Time over which loss is averted

The proposed offset area will be owned and managed by TCC. As such, the offset can be managed for the life of the Project. Construction of the Project is proposed to last three years. To maximise the benefits of the offset, the time over which loss is averted will be set at 20 years, exceeding the impacts of the Project.

## 5.3 Time until ecological benefit

Time until ecological benefit will be relatively short for the southern black-throated finch. Improvement of habitat quality for these species are predominantly linked to the rehabilitation of the ground layer and increase in native food grass abundance and diversity. These values can be improved within a 5-year timeframe.

Enhancement of values for the koala and bare-rumped sheathtail bat are more closely linked to the rehabilitation of regrowth and non-remnant woodland areas with the aims of increasing food availability and habitat connectivity for both species. Koalas are known to forage in relatively immature regrowth (Youngentob 2021) and the bare-rumped sheathtail bat is capable of foraging widely. The benefits of the offset are therefore likely to be achieved within a 20-year timeframe.

## 5.4 Risk of loss without the offset

Risk of loss has been informed by the *Guidance for informing 'risk of loss' estimates when evaluating biodiversity offsets proposals under the EPBC Act* (Maseyk et al. 2017) and knowledge on existing threats detailed in Section 2. The land within the proposed offset area represents a mix of remnant, regrowth and non-remnant vegetation on freehold and state land. Given there is no credible evidence that the offset area will be subject to development in the foreseeable future, the default risk of loss value of 0.05 percent for the Townsville Local Government Area recommended in Maseyk et al. (2017) has been used.

## 5.5 Risk of loss with the offset

The potential for total loss of habitat at the site will be negligible with the land legally secured as an offset. The land as an offset will be managed and monitored specifically for the conservation of the southern black-throated finch and less likely to suffer from deterioration in habitat quality and decline of the population.

## 5.6 Confidence in the result

A high degree (100 percent) of confidence has been attributed to the risk of loss with and without the offset. This has been based on the adoption of relatively conservative estimates recommended in Maseyk et al. (2017). A lower degree of confidence (i.e. 70 percent) has been assigned to the future risk of loss. Given there are external

factors that can threaten the success of the habitat and its management as an offset area, the confidence in level associated with the risk of loss has been reduced to reflect the reduced certainty.

# 6. Management actions

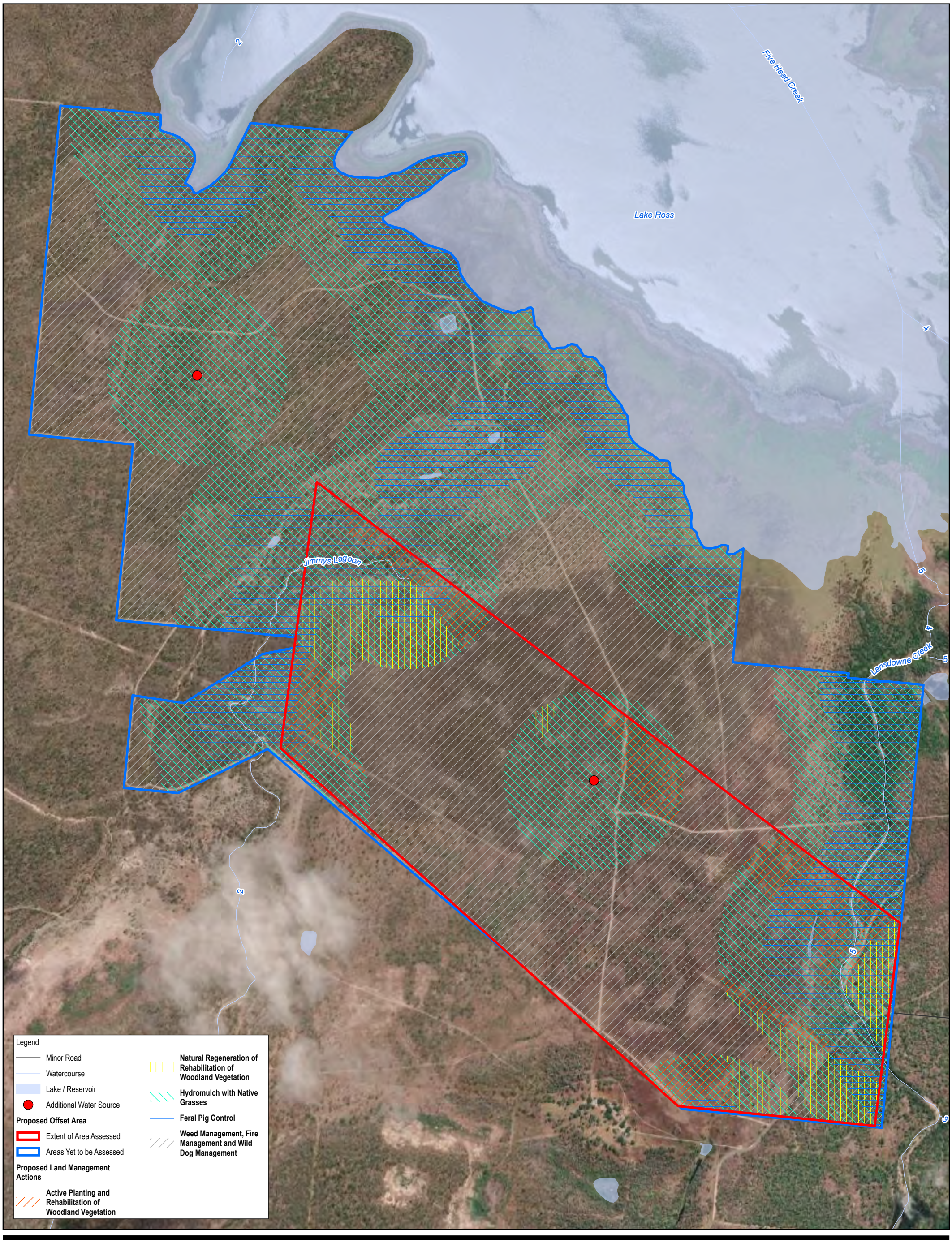
## 6.1 Overview of management actions

This section outlines management measures that will be implemented to increase the ecological value of habitats for the southern black-throated finch, bare-rumped sheathtail bat and koala on the proposed offset area. The results of preliminary ecological surveys and habitat quality assessments have confirmed there are opportunities to improve the value of habitats within the offset area. While the proposed offset area supports areas of habitat for each of the three MNES species, the extent and quality of habitats has been substantially degraded by existing historical threats and can be improved through active management. Proposed management actions and their potential to improve values for MNES area summarised in Table 6-1. More information on management actions including the requirement to legally secure the offset area are outlined in Table 6-2.

*Table 6-1 Overview of existing threats and opportunities for habitat enhancement in the offset area*

| Proposed management action | Existing threat this will address | Proposed distribution of management action | Benefit for MNES |
|---|---|---|---|
| **Rehabilitation of woodland REs**<br>Strategic planting and rehabilitation of tubestock is proposed for areas of non-remnant and regrowth woodland, together with seeding the ground layer with native food grass species for the southern black-throated finch | Loss and fragmentation of woodland habitat<br>Large parts of the offset area have been historically cleared for agriculture particularly at the northern extent, reducing resource availability and habitat connectivity | Replanting and rehabilitation is proposed for non-remnant and regrowth areas | MNES benefitted: koala, southern black-throated finch and bare-rumped sheathtail bat.<br>This will increase the abundance and availability of key resources for all three MNES (i.e. koala food trees, foraging habitat and future roost trees for bare-rumped sheathtail bat, nesting sites and foraging habitat for southern black-throated finch.<br>This will increase connectivity, thereby facilitating movement of all species, increasing the ability to access to resources and flee wildfire and other threats. |
| **Weed management**<br>Active removal of woody weeds (i.e. chinee apple, rubber vine, prickly Acacia) and invasive grasses (i.e. Guinea grass, grader grass, giant ratstail grass) | **Degradation by** weeds<br>Woody and invasive grassy weeds are ubiquitous across much of the offset area, substantially reducing food resource availability for the southern black-throated finch and supressing the recruitment of canopy trees used by all three MNES species. | Weed management will be undertaken across the offset area with weed management in areas of high ecological value (i.e. within 1 km of waterbodies) and areas of existing high weed densities. | MNES benefitted: Koala, southern black-throated finch, bare-rumped sheathtail bat.<br>Weed management (in conjunction with reinstatement of the ground layer) will increase food resource availability for the southern black-throated finch<br>Reduce suppression of native plants, allowing germination of canopy and sub-canopy species that provide key resources for all species (i.e. koala food trees, bare-rumped sheathtail bat roost trees and southern black-throated finch nest trees)<br>Increase movement of koala that is currently deterred by high vegetation densities |
| **Water source management**<br>Existing stock dams will be maintained to provide continued access.<br>Additional water sources (i.e. stock troughs) will be provided at locations across the offset area to increase availability of | Waterbodies (drinking sites) are currently abundant within the offset area. However, removal of cattle could lead to the deterioration of stock dams that provide permanent drinking sites. Degradation of habitats | All existing stock dams will be maintained.<br>Additional drinking sites (i.e. stock troughs) will be provided across the offset area.<br>Areas within 400 m of waterbodies will be subject to habitat enhancement measures to increase the | MNES benefitted: Southern black-throated finch and koala.<br>Continued access to suitable waterbodies across the offset area is essential to maintain access to drinking sites for the southern black-throated finch and koala and preserve the viability of nesting habitat for the southern black-throated finch. |

| Proposed management action | Existing threat this will address | Proposed distribution of management action | Benefit for MNES |
|---|---|---|---|
| drinking sites and expand the range of foraging and nesting habitat<br>and seasonal waterbodies managed to enhance the ecological value of surrounding canopy and ground level vegetation | around drinking sites reduces the quality of local foraging habitat. | ecological value of habitats surrounding drinking sites | |
| **Fire management**<br>Develop and implement appropriate fire management practices (i.e. cool mosaic burns in the appropriate season) to reduce the risk of uncontrolled wildfires and promote growth of native grasses | The offset area has been subject to inappropriate fire regimes with hot dry burns responsible for localised concentrations of exotic forbs and grasses (e.g. Stylo) that are known to be negatively associated with abundance of southern black-throated finch.<br>Koala and the bare-rumped sheathtail bat are particularly susceptible to impact from uncontrolled wildfire – with fire a recognised threat to roosting sites for the bare-rumped sheathtail bat | Fire management will be undertaken across the offset area.<br>Fire management will apply a patchy mosaic burn that is applied to manage existing habitat conditions.<br>Areas already overgrown with exotic forbs indicative of inappropriate fire regimes will be subject to early management. | MNES benefitted: Koala, southern black-throated finch, bare-rumped sheathtail bat.<br>Appropriate fire management will promote increased abundance and quality of food grasses for the southern black-throated finch by reducing the abundance of exotic forbs that outcompete native grasses.<br>Appropriate fire management will also reduce the extent and severity of impact from uncontrolled fire events that can significantly impact the koala and bare-rumped sheathtail bat. |
| **Management of pest fauna**<br>Develop and implement a pest fauna management plan to control influence of feral pigs, feral cats and wild dogs. | Mortality by dog attacks represents a local threat to koalas across their range<br>Degradation of habitat by feral pigs is a significant threat to the southern black-throated finch with pigs known to target critical food resources such as cockatoo grass, a key early wet season food resource. | Wild dog management will be undertaken across the offset area.<br>Management of feral pigs will be targeted at areas with highest pig densities – close to waterbodies. | MNES benefitted: Koala, southern black-throated finch.<br>Wild dog management will reduce the risks of koala injury and mortality due to dog attacks.<br>Controlling feral pigs and the rehabilitation of habitat degraded by pigs will increase food resource availability for the southern black-throated finch. |
| **Removal of cattle**<br>Cattle will be removed from newly acquired lots and perimeter fencing secured to prevent cattle entering from adjoining properties.<br>Reinstatement of the native ground layer will require a holistic management combining management of weeds, fire and existing pasture grasses. | The offset area has been subject to varying levels of cattle grazing. This has reduced the extent and quality of foraging habitat for the southern black-throated finch | Cattle will be removed from the offset area. Areas with high localised grazing impacts will be rehabilitated by re-establishing native food grasses | MNES benefitted: Southern black-throated finch.<br>Removal of cattle and reinstatement of native grassy ground layer will increase food availability for the southern black-throated finch |






Paper Size ISO A3

0 250 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

# Preliminary indicative map of proposed land management actions within the offset area

Project No. **12537606**
Revision No. **0**
Date **7/24/2022**

# FIGURE 6-1

\\ghdnet\ghd\AU\Townsville\Projects\42\12537606\GIS\Maps\APRX\12537606\12537606_Ecology.aprx
12537606_Offset_015_ProposedLandManagement_Rev0
Print date: 27 Jul 2022 - 13:34c

Data source: DoR: Roads, Railway, Watercourses (2021); GHD: Site Layout, Regional Ecosystems v12 with Field-verified Edits (2022); World Imagery: Maxar.
Created by: shart2

*Table 6-2 Proposed management and mitigation measures for MNES*

| Justification | Proposed action |
|---|---|
| **Management Action 1 – Legally securing offset area** | |
| It is proposed to use a voluntary declaration (Vdec) to secure the offset area. A Vdec is an option under the VM Act that provides a simplified, streamlined process for landholders to voluntarily protect areas of native vegetation not otherwise protected by the VM Act. A Vdec can be used to protect areas of high nature conservation values (or areas vulnerable to land degradation), and to secure areas of land to satisfy statutory offset requirements. | The proponent will follow the process outlined in the Guide to Voluntary Declarations under the VM Act (effective 21 June 2019) to obtain the Vdec, which is summarised below.<br>A Request for a voluntary declaration application is submitted to DoR, including written consent from all registered owners, a description of the purpose of the Vdec and how the area meets the criteria of high nature conservation value, and a copy of the offset area management plan.<br>The DoR will assess the Vdec request to ensure it meets all criteria required and to ensure the management plan contains the appropriate elements to ensure the declared area is managed to achieve the desired outcomes.<br>Once the DoR is satisfied that the Vdec request meets the criteria for a declaration, a Vdec offer will be sent that includes a draft:<br>– Declaration notice.<br>– Declared area code (if proposed).<br>– Property Map of Assessable Vegetation (PMAV) showing the area as Category A vegetation, giving it a high level of protection similar to endangered regional ecosystems within a Category B area.<br>– Declared area management plan, including map of the declared area.<br>After the DoR and the proponent agree to the offer, DoR will make the declaration and provide a finalised Vdec package. The declaration takes effect from the date the chief executive signs the declaration notice. The offset area management plan has effect under the Vdec process from the same date. The Vdec will be applied over the offset areas in perpetuity.<br>There are no statutory timeframes for the Vdec application and approval process. |
| **Management Action 2 – Revegetation and regeneration management** | |
| Large parts of the proposed offset area have been historically cleared and now support non-remnant or regrowth REs. Loss and fragmentation of habitat is a key threat to all three MNES. Remnant woodland provides key resources for each of the three MNES being offset. The proposed offset provides an opportunity to increase the value of habitats for all three species through active rehabilitation of woodland REs within non-remnant and regrowth areas. Reinstating the natural RE community has the potential to increase habitat connectivity and increase the availability of key resources including:<br>– Food and shelter trees for the koala<br>– Nesting trees and foraging grasses for the southern black-throated finch<br>– Future roosting trees for the bare-rumped sheathtail bat<br>– Foraging habitat for the bare-rumped sheathtail bat | Within 6 months of Project approval by DCCEEW, revegetation will commence within nominated areas.<br>Areas of non-remnant and regrowth will be rehabilitated following the commencement of the Project to increase the coverage and connectivity of woodland habitat across the offset area. To maximise future nesting habitat value for the southern black-throated finch, tree planting will focus particularly on areas within a 1 km radius of waterbodies.<br>Non-remnant areas will be subject to active planting of tubestock. The composition of species' plantings will be informed by the dominant canopy, sub-canopy and shrub species in each RE likely to have occurred prior to cleared as assessed from pre-clear RE mapping and on-ground investigations of the land zone and remaining vegetation.<br>Within mapped regrowth areas, natural regeneration is preferred to the reconstruction of the vegetation community (i.e. soil improvements, dense planting etc). Management of these areas will focus on controlling weeds and restricting access from vehicles or stock |

| Justification | Proposed action |
|---|---|
| Rehabilitation and revegetation is a key action that will improve habitat values within the offset area, while also expanding habitat values in areas that have been subject to weed infestations. Rehabilitation aims to reinstate existing degraded areas and areas exposed as a result of management action 3 (weed management). | animals, or other existing significant disturbances, in order to promote further growth and new seedlings. Where natural regeneration is unsuccessful minor infill planting will be implemented to facilitate recovery. Non-remnant and regrowth areas within 400 m of water sources will also be subject to ground level rehabilitation, re-establishing a mix of native food grass species for the southern black-throated finch.<br>The rehabilitation program will be undertaken by a suitably qualified bush regeneration contractor and will include measures to ensure the maintenance and survival of new trees in the offset area.<br>Baseline surveys (refer to Table 4-5) will be undertaken to identify rehabilitation and regeneration areas and will record the following data:<br>– Locations, extent and characteristics of disturbed or cleared areas to be revegetated within the offset areas.<br>– Locations, extent and characteristics of regrowth or disturbed areas to be managed for natural regeneration of nesting and roosting trees.<br>– Existing threats and disturbances, including weed infestations, rubbish, land degradation, land use and access.<br>– Opportunistic observations of habitat and nesting conditions<br>A planting program will be designed for areas where disturbances occur within the offset sites (e.g. non-remnant and regrowth). The species selected will be site-specific and dependent on localised habitat features and landforms and consistent with the mapped regional ecosystem or pre-clear regional ecosystem over the area.<br>Site establishment and planting will be scheduled within the first year of the offset commencing, with a monitoring and maintenance schedule implemented to provide adequate watering, weed control and replacement of stock, as necessary. |
| **Management Action 3 – Weed management** | |
| The vegetation communities within the offset area were observed to be in an altered condition due to weed infestation. Many parts of the site contain a mid-dense to dense shrub layer of chinee apple *(Ziziphus maurtiana)* (listed under the *Biosecurity Act 2014*).<br>Under normal conditions these communities would have a grassy woodland to open woodland structure suitable for a range of granivorous birds. These species commonly forage on grass seeds in open areas; however, the closure of the understorey has reduced this habitat from both a structural perspective and through competition with the native grass food source. Southern black-throated finch tend to avoid sites with high shrub cover and abundance, particular chinee apple *(Ziziphus maurtiana)*, lantana *(Lantana camara)* and Townsville wattle (*Acacia leptostachya*) (Rechetelo 2015). Chinee apple also limits the application of fire as a management tool leading to vegetation thickening, which also alters the vegetation community structure. The closure of the understorey also suppresses the recruitment of native canopy species.<br>Stylo (an introduced pasture legume) was also common within the ground layer strata, whereby potentially suppressing southern black-throated finch foraging | Weed management measures will be implemented within 6 months of Project approval by DCCEEW and an ongoing weed control program will commence. Methods for weed control will be site-specific and appropriate to each species, with regard to best practice and relevant guidelines, such as:<br>– Townsville City Biosecurity Plan 2020 – 2024<br>– Biosecurity Queensland fact sheets.<br>Treatment options will be undertaken using an integrated approach. Methods may involve a combination of physical, chemical and/or biological methods, depending on the species and extent of infestations. Fire management as discussed below should also form part of the overall integrated approach. Some species may require subsequent treatments due to viability of seed banks for longer periods.<br>Prior to any use of mechanical clearing, proposed treatment sites should be examined, and desirable trees and regrowth clearly marked with pink flagging tape to help reduce native vegetation. |

| Justification | Proposed action |
|---|---|
| grasses. Fire management has been recommended to maintain the balance between Stylo and palatable grass species in improved pastures (Partridge et al. 1996). Fire management is further discussed below.<br>The field investigations identified the following weed species that are likely to lead to the degradation of southern black-throated finch habitat:<br>**Woody weeds**<br>– Chinee apple (Ziziphus maurtiana)<br>– Lantana (Lantana camara)<br>– Townsville wattle (Acacia leptostachya)<br>– Rubber vine (Cryptostegia grandiflora)<br>– Prickly Acacia (Vachellia nilotica; syn. Acacia nilotica)<br>– Siam Weed (Chromolaena odorata).<br>**Exotic forbs**<br>– Snakeweed (stachytarpheta jamaicensis)<br>– Stylo<br>– Round-leaf Cassia<br>– Horehound (Mesosphaerum (syn. Hyptis) suaveolens)<br>– Sidas (mostly Sida acuta)<br>– Broad-leaf Tea-tree<br>– Quinine (Petalostigma pubescens).<br>**Exotic grasses**<br>– Rat's Tail Grass *(Sporobolus* sp. American Rat's Tail Grass. *S. jacquemontii)*<br>– Guinea Grass *(Megathyrsus maximus)*<br>– Thatch Grass *(Hyparrhenia rufa)*<br>– Grader Grass *(Themeda quadrivalis)*.<br>Invasion of habitat by exotic weed species, including exotic grasses is listed in the National Recovery Plan as a major threat and the Habitat Management Guidelines (NRA 2011) recommend the control of lantana and chinee apple.<br>To improve habitat value of the removal and control of chinee apple and other invasive weeds is required to return the vegetation community to an open woodland structure with a sparse shrub stratum as recommended by NRA (2011). | Appropriate minor use permits from the Commonwealth Australian Pesticides and Veterinary Medicines Authority may apply. |

| Justification | Proposed action |
|---|---|
| **Management Action 4 – Water source management** | |
| The provision of drinking sites will enhance the value of habitats for the southern black-throated finch and help reduce the impact of drought on the koala. Habitat critical to the survival of the species has not been formally defined in the National Recovery Plan for the species (Black-throated finch Recovery Team 2007) or the *Referral guidelines for the Black-throated finch (southern)* (DEWHA 2009). Habitat critical to the survival of the species is likely to include nesting habitat. In the Townsville region the southern black-throated finch typically nests within 400 m of a water source and is rarely seen more than 1 km from permanent water during the breeding season (NRA 2006). Nesting sites also need to be near foraging habitat as observations suggest that during the breeding season the subspecies travels smaller distances than it does during the dry season (Mitchell 1996; NRA 2006; NRA 2007). The presence of suitable trees close to seasonal water sources is critical for the southern black-throated finch.<br>Performance indicators for water supply detailed in the habitat management guidelines (NRA 2011) include:<br>– Southern black-throated finches using water sources.<br>– Water sources are located within 200 m of and not more than 400 m from foraging habitat and near woody vegetation.<br>Compromised water sources due to drought and intense grazing regimes is listed in the Significant Impact Guidelines as a major threat.<br>A permanent water source which contains water during an average wet season is located on the lower reaches of Lansdowne Creek, located greater than 700 m to the north-east of the offset area eastern extent. A section of Landsdowne Creek is located within the offset site (21 on E124186 and 2 on RP725617) and flows parallel to its eastern boundary. Within this reach Lansdowne Creek is considered semi-permanent. There are a number of farm dams located to the south of the offset area's southern extent which are considered permanent, the closest being within 200 m.<br>Although one permanent dam is located within 400 m from the proposed offset area's south-eastern extent (Figure 2-3), due to the size of the proposed offset area, the lack of permanent water sources may restrict SBTF utilisation of the area. NRA (2011) suggests that water sources can be used to manipulate the distribution of Southern black-throated finch within the landscape, in which species have been known to drink from artificial water sources (e.g. cattle troughs) if suitable perches are available. The installation of artificial permanent water points are proposed to ensure the distribution of SBTF is not restricted within the offset area. | Within 12 months of Project approval, permanent water sources will be installed at locations identified in Figure 2-3 in a manner that excludes livestock, macropods and limits predation by feral cats (water troughs mounted on extended legs above ground level). Feral cats have been observed ambushing birds, including finches, at cattle troughs (NRA 2011).<br>The permanent water source will consist of a windmill and water trough mounted on extended legs, with suitable perches. The provision of artificial permanent water sources will ensure that a water source is accessible within 1 km from any location within the offset area. |
| **Management Action 5 – Fire management** | |
| NRA (2018) suggested that historical fire regimes on LRSA are likely to be unfavourable for southern black-throated finch. The historical fire regime has | As part of the OAMP, a Bushfire Management Plan will be developed. This will be implemented within 12 months of project approval. A review of historical fire management |

| Justification | Proposed action |
|---|---|
| probably contributed to the proliferation of certain weedy grasses and forbs that are unfavourable for southern black-throated finch (NRA 2018). The National Recovery Plan has identified the alteration of habitat by changes in fire regime as a major threat to southern black-throated finch. Inappropriate fire regimes that lead to infrequent hot dry fires threaten roost resource availability for the bare-rumped sheathtail bat and increase the risk of uncontrolled wildfires that are a threat to the koala, bare-rumped sheathtail bat and southern black-throated finch.<br><br>Fire has been infrequent in the south of the LRSA (0 to 1 fire since 2000). In other areas of the LRSA fire has been more frequent, whereby predominantly occurring during periods of relatively low rainfall and warm or hot weather (NRA 2018). Fires that occur at times of low soil moisture disadvantage native grasses and favour forbs (NRA 2018). Additionally, hot fires coinciding with these conditions can result in temporary broad-scale loss of plant biomass, thereby creating conditions favourable for weed ingress and homogenising grass flowering/seeding timeframes (NRA 2018). When repeated over the medium to long term, these conditions will likely disadvantage southern black-throated finch (NRA 2018).<br><br>*Stylosanthes* (an introduced pasture legume) which was commonly observed within the ground layer of the offset area, can out compete potential SBTF foraging grasses. Fire has been recommended to maintain the balance between *Stylosanthes* and palatable grass species in improved pastures (Partridge et al. 1996).<br><br>Consideration should also be given to where grader grass and thatch grass is present. Both species can expand rapidly in response to ground disturbance caused by fire (NRA 2018).<br><br>Management should aim to prevent extensive and uncontrolled fires which poses threats to all three MNES. This is especially an issue in areas that have high fuel loads, such as lands not grazed by cattle (NRA 2011).<br><br>Recommendations for managing southern black-throated finch habitats with fire are listed in the Habitat Management Guidelines (NRA 2011) and include:<br>– Maintain landscapes that have variety in burning regimes, e.g. variety in the timing and intensity of fires and the areas burnt each year. This can be achieved by adopting a fire regime that involves burning fire breaks earlier in the season then following up with early dry season (May to July) patch burns (cool burns) in discrete areas (i.e. don't burn entire landscapes at once). Areas should be left unburnt for 5 or more years apart from fire breaks which may require more frequent treatment.<br>– Southern black-throated finch will most likely benefit from landscapes that have a mosaic of fire histories (spatially and temporally).<br>– Protect dry season southern black-throated finch habitat, especially grasslands near to water, from late dry season fires. This is particularly important during dry years. Also protect grasslands near water sources | efforts and fire history will be undertaken for the proposed offset areas and surrounds. Fire management actions will be planned and implemented on a property-wide scale, rather than for just the offset area, but with the aim of protecting the habitat values and resources for all three MNES for which the offset is provided.<br><br>The Queensland Herbarium (2021b) provide fire management guidelines for each of the Queensland Regional Ecosystems that occur within the offset area and are described in Table 6-3.<br><br>Although the Queensland Herbarium (2021b) guidelines are developed for the general maintenance of a regional ecosystem and needs to be considered, they are not tailored to promote and maintain suitable foraging grasses for individual species. Fire management should therefore aim to meet the Habitat Management Guidelines (NRA 2011) performance indicators for managing fire for southern black-throated finch habitat as this will benefit both the southern black-throated finch.<br><br>A fire management strategy including a program of actions will be developed. Fire risks to the local koala, southern black-throated finch and bare-rumped sheathtail bat populations will be managed through the implementation of the following key components:<br>– Identification and maintenance of fire breaks using existing fence-lines and track networks, widening fire breaks up to a width of 10 m if necessary.<br>– Scheduled, periodic fuel management via hazard reduction burning. These will be developed and implemented in consultation with DES and Queensland Rural Fire Service with prescribed burns undertaken by suitably qualified and experienced practitioners.<br><br>Management of vegetation will be generally consistent with guidelines for the local regional ecosystem, with prescribed post wet (May – June) burns at low intensity at intervals of between 2 and 7 years, with the aim to burn at no greater than 20% percent of stands in any one year. This will reduce the potential for uncontrolled high intensity fires that have the capacity to burn out habitat across the entire offset area.<br><br>Fire management actions will be reviewed every five years, at a minimum, in consultation with local Fire Management Authorities and including the DES and Qld Rural Fire Service. |

| Justification | Proposed action |
|---|---|
| during the southern black-throated finch breeding season when there is no alternative water or habitat nearby.<br>– Burn when there is good soil moisture. Spell grasslands after fire to reduce woody vegetation thickening and assist in the recovery of native perennial grasses.<br>– Wet season fires (January to March) should be avoided due to impacts on Cockatoo grass.<br>– A fire regime recommended by the Queensland Herbarium (2021b) for REs 11.3.7, 11.3.12, 11.3.30, 11.3.35 and 11.3.35a is suitable for most southern black-throated finch habitats on LRSA. Igniting fires under appropriate weather conditions is essential for achieving these outcomes.<br>These fire management measures are considered appropriate for all three species. | |
| **Management Action 6 – Control of feral animals** | |
| Feral animals including the feral pig and wild dog are common in the proposed offset area and have the potential to impose negative pressures on both the southern black-throated finch and koala.<br>Feral pigs can reduce the availability of seedling grasses, such as cockatoo grass *(Alloteropis semialata),* essential for southern black-throated finch and act as vector for the spreading and establishment of weed species. Feral pigs are known to remove cockatoo grass by digging up the plants to feed on the tubers (NRA 2011), thereby reducing the abundance of resources for southern black-throated finch.<br>Dogs represent a key mortality threat to koalas particularly in urban and agricultural grazing areas where domestic or wild dogs occur in elevated densities,<br>Each year TCC conduct an aerial shooting program where they control approximately 30 wild dogs and 220 wild pigs per year (Pers comm. Bradley Drinkwater (Ross River Dam Ranger)).<br>Feral cats also pose a threat to southern black-throated finch when drinking, where they have been observed attacking birds including finches at cattle troughs (NRA 2011). Predators, such as feral cats, may occur in higher numbers in areas closer to water sources. | Baseline pest monitoring will be undertaken to identify evidence of feral or unwanted pests and development of a property wide feral animal management program specifying techniques (trapping, baiting, shooting) to be utilised will be completed within 12 months of commencement of the action.<br>Annual pest monitoring by a suitably qualified pest management contractor, with evidence of pest animals GPS recorded. Where there is evidence of pest animals, targeted trapping and baiting programs will be implemented by an independent suitably qualified pest management contractor. Where annual monitoring does not identify any feral or pest species monitoring will be reduced to 2 yearly.<br>Where practical and appropriate, participate cooperatively in pest management planning and implementation with local land managers (government departments, local governments and utility providers) to ensure effective pest management in the locality of the offset area.<br>As discussed in Management Action 4 (water source management), permanent water sources will be provided within the offset area. The permanent water source will consist of a bore and windmill and water trough mounted on extended legs, with suitable perches. The trough mounted on extended legs will prevent predation by cats and will prevent other feral animals from utilising the water source. |
| **Management Action 7 – Removal of cattle** | |
| The offset area has been subject to varying levels of cattle grazing. This has degraded understorey vegetation, with reduced extent and quality of foraging habitat for the southern black-throated finch within the offset area particularly notable. Removal of cattle and reinstatement of native grassy ground layer will increase food availability for the southern black-throated finch. | Cattle will be removed from the offset area and perimeter fencing will be secured to prevent cattle entering the offset area from adjoining properties.<br>Areas with high localised grazing impacts will be rehabilitated to re-establish native food grasses for the southern black-throated finch, and reinstatement of the native ground layer will require a holistic management combining management of weeds, fire and existing pasture grasses. |

Fire management guidelines for each of the REs that occur within the offset area and are described in Table 6-3.

*Table 6-3 DES fire management guidelines for each of the Queensland Regional Ecosystems in the offset area*

| Regional Ecosystem | Short description | DES Fire Management Guidelines |
|---|---|---|
| 11.3.12 | *Melaleuca viridiflora, M. argentea +/- M. dealbata* woodland on alluvial plains | SEASON: Mid-dry season.<br>INTENSITY: Low to moderate.<br>INTERVAL: Occasional fires, typically ev–ry 5 - 10 years.<br>STRATEGY: Use occasional burning to promote herbs and shrubs and reduce excessive fuel build up that can cause high intensity fires.<br>ISSUES: The coastal north Queensland populations of *Grevillea pteridifolia* are fire-killed obligate seeders with fire promoted germination. Many herbs are promoted by fire, such as ground orchids. Conversely, terrestrial orchids can be killed by fires that are intense enough to scorch them in the canopy and therefore they provide a useful indicator of past fire intensities. Ensure maintenance of a diverse ground and shrub layer. Where *Grevillea pteridifolia* or other fire-killed shrubs are present, wait until subsequent post-fire seedlings have matured before burning again. |
| 11.3.35 | *Eucalyptus platyphylla*, *Corymbia clarksoniana* woodland on alluvial plains | SEASON: Early dry season when there is good soil moisture, with some later fires in the early storm season or after good spring rains.<br>INTENSITY: Primarily low to moderate, with occasional high intensity fires.<br>INTERVAL: Typically 2 - 7 years, with some areas longer unburnt.<br>STRATEGY: A predominance of early dry season fires is recommended, although there is value in occasional late dry season fires, or storm burns, over small areas. Burning should begin very soon after the wet season, to secure boundaries and adjacent fire-sensitive vegetation. Subsequent repeat ignitions can be used within the same section of land weeks or months after the boundaries have been secured by early burning, to produce a mixture of burnt areas with multiple ignition dates. Use topographical features to ignite areas as soon as they dry out. This will create a mosaic of areas that were burnt at different dates and unburnt sections within the same area of woodland. Burn away from riparian communities, which can be critical habitat for some species. Approximately 25% of the grassy woodlands within a landscape should receive patchy fires in most years.<br>ISSUES: These woodlands have a diverse native grass and herb layer that is maintained and promoted by regular fire. Burning that starts immediately after the wet season, with follow up small fires ignited progressively over multiple dates can increase the availability of grass and herb seed, which is a critical food source for many birds and small mammals. Recently burnt grass clumps tend to produce more seed than unburnt clumps and the earlier burnt grass usually seeds earlier than later burnt grass. Maintaining a fire mosaic will help ensure protection of habitat and mitigate against wildfires. Low to moderate intensity burns with good soil moisture minimise the risk of losing hollow trees. An occasional late season burn will promote grasses and legumes. Ensure a diverse grass layer; maintain hollow-bearing trees and vegetation structure. |

## 6.2 Summary of management measures for each MNES

Table 6-4 presents a summary of the management measures proposed to enhance the ecological values of local habitats for the koala, southern black-throated finch and bare-rumped sheathtail bat.

*Table 6-4 Summary of management measures proposed for each MNES*

| Koala | Southern black-throated finch | Bare-rumped sheathtail bat |
|---|---|---|
| Planting of woodland vegetation in non-remnant areas to increase the availability and connectivity of food and shelter trees for the koala. | Planting of woodland vegetation in non-remnant areas – targeting areas around waterbodies to increase foraging/nesting resource availability | Planting of woodland vegetation in non-remnant areas to increase the availability and connectivity of foraging habitat and future roosting opportunities. |
| Natural regeneration of woodland vegetation in regrowth areas to increase food/shelter resource availability | Natural regeneration woodland vegetation in regrowth areas to increase foraging/nesting resource availability | Natural regeneration of woodland vegetation in regrowth areas to increase foraging and future roosting resource availability |
| Removal and ongoing control of shrubby weeds including chinee apple, lantana, rubber vine and prickly acacia | Removal and ongoing control of shrubby weeds including chinee apple, lantana, rubber vine and prickly acacia | Removal and ongoing control of shrubby weeds including chinee apple, lantana, rubber vine and prickly acacia |
| | Removal and control of invasive grassy weeds and subsequent planting with native grasses | |
| Implementation of pest management including dog baiting and shooting to reduce impact of wild dog attacks on koala | Implementation of pest management including feral pig trapping and shooting and feral cat controls to reduce impact of foraging habitat degradation by pigs and predation by feral cats | |
| Implementation of appropriate fire management protocols to promote natural regeneration of habitat and reduce risk of uncontrolled fire | Implementation of appropriate fire management protocols to promote natural regeneration of habitat and reduce risk of uncontrolled fire | Implementation of appropriate fire management protocols to promote natural regeneration of habitat and reduce risk of uncontrolled fire |
| Maintenance of existing stock dams and waterbodies to maintain drinking opportunities. | Maintenance of existing stock dams and waterbodies to maintain drinking opportunities. Construct additional water sources to increase drinking/foraging and nesting resource availability. | |
| | Removal of cattle to prevent degradation of understorey vegetation | |

## 6.3 Indicative timeframes

Timing and indicative dates for delivery of the offset are provided in Table 6-5.

*Table 6-5 Indicative timeframes for offset delivery*

| Action | Timing | Indicative date |
|---|---|---|
| Submit OAMP to DCCEEW | Prior to commencement | Q4 2022 |
| Offset proposal (this report) approved by DCCEEW | Prior to commencement | Q1 2023 |
| Apply for legal securing (VDec) | Prior to commencement | Q1 2023 |
| Commence offset | Within 6 months of Project approval by DCCEEW | Q3 2023 |
| Develop and implement monitoring | Within one year of baseline surveys | Q2 in year 1 (2024), year 3 (2025) and year 5 (2027)<br>Then every 5 years until relevant ecological outcome demonstrated or end of approval (whichever is sooner) |
| Compliance reporting | Annually | Annually from time of commencement |

# 7. Compliance with EPBC Act Policies

## 7.1 EPBC Act Environmental Offsets Policy

The proposed offsets have been developed in accordance with the overarching principles and aims of the EPBC Act and EPBC Act Environmental Offsets Policy (DSEWPaC 2012a), as outlined in Table 7-1.

*Table 7-1 EPBC Act Environmental Offsets Policy Principles*

| Policy Principle | Compliance |
|---|---|
| 1. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matters. | The proposed offset area will be legally secured and contain suitable habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala that will be maintained through removal or management of major threats (i.e. weeds), including at a property-scale for some aspects, improved the quality and extent of foraging and sheltering habitat for both species and regular monitoring and reporting of the existing populations and habitat characteristics, which will provide data for the ongoing successful management of the populations to maintain their viability. The proposed offset areas will increase connectivity to the adjacent surrounding habitats. |
| 2. Suitable offsets must be built around direct offsets but may include other compensatory measures. | The proposed offset area achieves approximately 100% of the direct offset requirements for the southern black-throated finch, bare-rumped sheathtail and koala. |
| 3. Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter. | The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide (DSEWPaC 2012b) and therefore is considered consistent with the statutory protection that applies to the southern black-throated finch, bare-rumped sheathtail bat and koala. |
| 4. Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter. | The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide (DSEWPaC 2012b) and therefore is considered to be of a size and scale proportionate to the residual impacts on the southern black-throated finch, bare-rumped sheathtail bat and koala. |
| 5. Suitable offsets must effectively account for and manage the risks of the offset not succeeding. | The offset area contains suitable habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala, is currently owned by the proponent, and will be legally secured prior to the impacts occurring through the VDec process and hence protected from clearing or other major disturbances and undergo management of the southern black-throated finch, bare-rumped sheathtail bat and koala population and existing threats such as weed infestation and bushfire.<br>Risks of the offset not succeeding will be managed through the management actions to be implemented, monitoring and timeframes, and performance indicators and ecological outcomes to be achieved. Management measures will include revegetation, weed management, water source management, feral animal management, fire management, removal of cattle, , and maintenance as appropriate.<br>The risk assessment for existing and future threats is provided in Section 1. The residual risk ratings for impacts to the offset area were reduced sufficiently through proposed management, monitoring and corrective action, to result in low to medium risk of the offset not succeeding. |
| 6. Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs. | The offset area is not otherwise protected or managed as habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala. The offset area is located on freehold tenured land owned/in the process of being acquired by the proponent, but will be further protected through the Voluntary Declaration process to become a Category A area regulated under the VM Act. This will be additional protection to the existing status of Least Concern remnant vegetation (Category B).<br>The proposed management of the offset areas will be additional to requirements and enforcement under law or planning regulations, such as the *Biosecurity Act 2014*.<br>The Queensland Environmental Offsets Policy recognises that requirements for offsets for MNES under the EPBC Act do not need to be duplicated where the same impact and prescribed matter have been subject to assessment under the EPBC Act as a controlled action.<br>The proposed rehabilitation areas which is part of the wider LRSA, will improve connectivity and quality of habitats within the refuge. |

| Policy Principle | Compliance |
|---|---|
| 7. Suitable offsets must be efficient, timely, transparent, scientifically robust and reasonable. | The proposed delivery of the offset has been based on established and standard scientific survey and management methods and will be commenced within six months of Project approval by DCCEEW. Assessments and monitoring and management programs proposed are based on documented management strategies and land management techniques that have been adapted to the locations and site characteristics, with input from species experts and other suitably qualified persons, and reference to priority management actions and species profile information, recovery plans and threat abatement plans. |
| 8. Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced. | The offset proposal includes responsible parties, management actions, timeframes, monitoring programs, review processes, reporting, and remedial action triggers and measures. Compliance reporting and non-compliance notification to DCCEEW is included. |

## 7.2 EPBC Act Environmental Management Plan Guidelines

The proposed offsets have been developed in accordance with the overarching principles and aims of the EPBC Act Environmental Management Plan Guidelines (Commonwealth of Australia 2014), as outlined in Table 7-2.

*Table 7-2 Offset compliance with EMP guidelines*

| Relevant EMP Guideline section | Compliance |
|---|---|
| 2.1 Key principles | This offset proposal meets the key principles of an EMP, as relevant,<br>including:<br>– Being balanced, objective and concise.<br>– Stating the purpose of the use of the document and any assumptions made.<br>– Identifying gaps in information requiring further detail (such as information to be updated following monitoring events).<br>– Using adaptive management strategies.<br>– Being clearly presented and written.<br>– Identifying roles and responsibilities for the commitments made. |
| 2.2 Including commitments in management plans | Commitments in the offset proposal are specific and measurable with clear timeframes. The offset management and monitoring program will be submitted to DoR as part of approval of the VDec legally securing process. |
| 3. Content of the EMP | The offset proposal is structured appropriately for its purpose as a<br>guide to the delivery of the offsets. This includes:<br>– Project description, purpose, roles and responsibilities, report structure and limitations sections.<br>– Reporting of monitoring surveys and other management requirements.<br>– Management measures that describe the activities and control programs to be designed and undertaken at the offset sites, including timeframes and measurable performance indicators and completions criteria.<br>– Site maps are included.<br>– Monitoring programs are described, including triggers for remedial actions and reporting processes.<br>– Audit and review processes. |
| 4. Evaluating risk | A risk assessment has been prepared with regard to the EMP Guidelines risk assessment method. This is presented in Section 8. |

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# Appendix A

## Map of assessment units in the impact area




Paper Size ISO A3

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Meters

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

# Map of assessment units in the impact area

Project No. **12537606**
Revision No. **0**
Date **7/28/2022**

**APPENDIX A**

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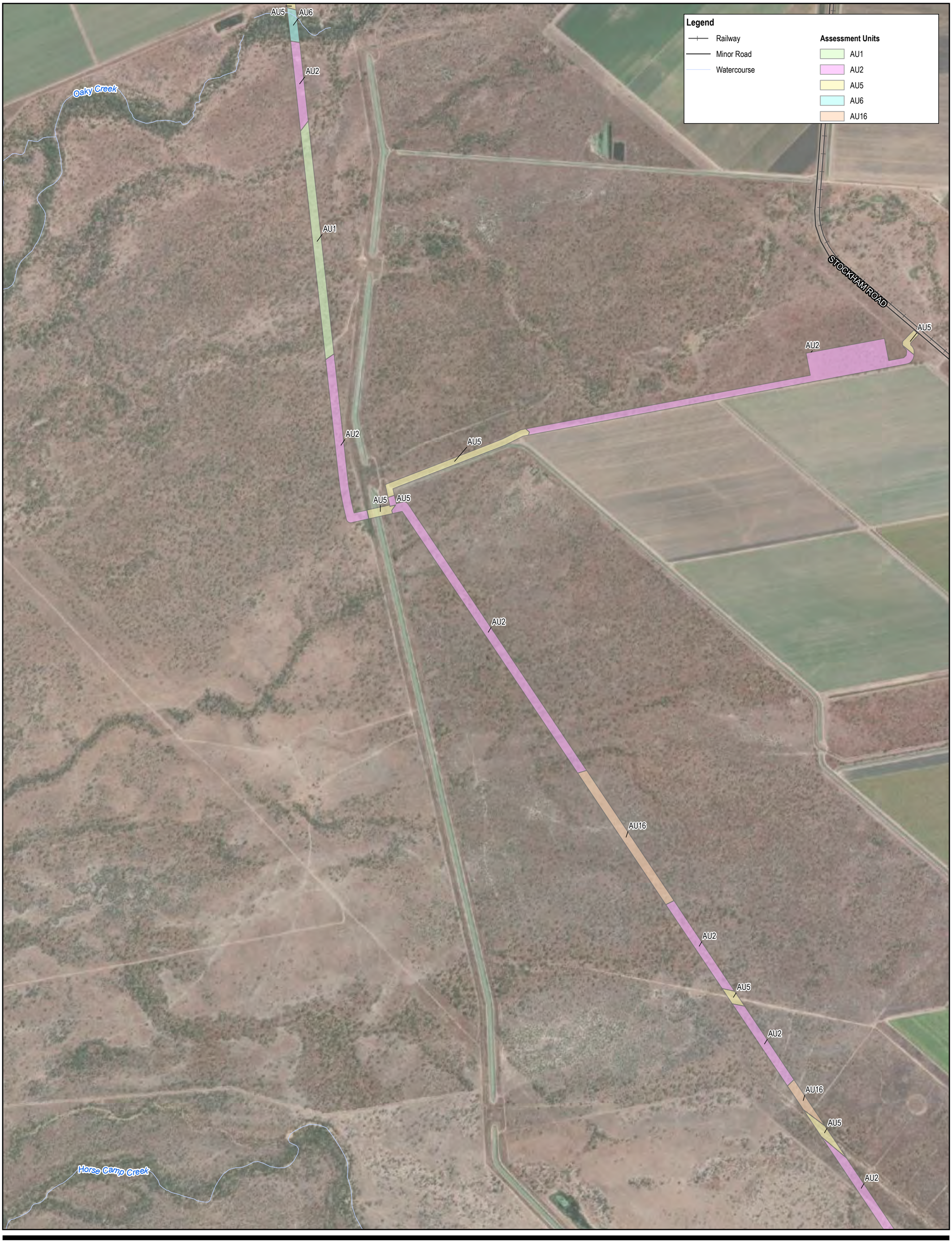




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**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

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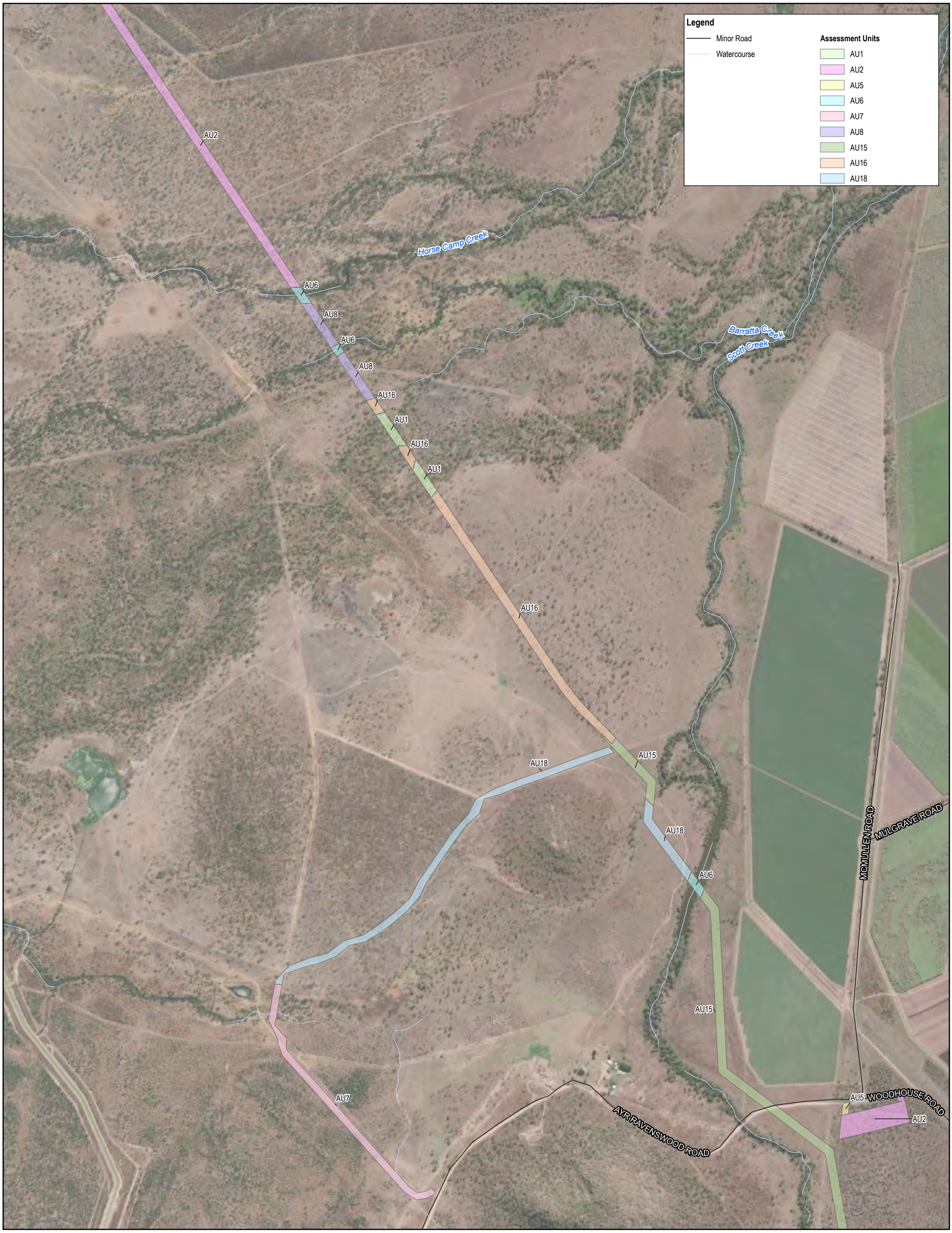




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**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

## Map of assessment units in the impact area

Project No. **12537606**
Revision No. **0**
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Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

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Map Projection: Transverse Mercator
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**Townsville City Council**
**Haughton Pipeline Stage 2 - Offset Area Management Strategy**

## Map of assessment units in the impact area

Project No. **12537606**
Revision No. **0**
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# APPENDIX A

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

# Map of assessment units in the impact area

Project No. **12537606**
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Date **7/28/2022**

# APPENDIX A

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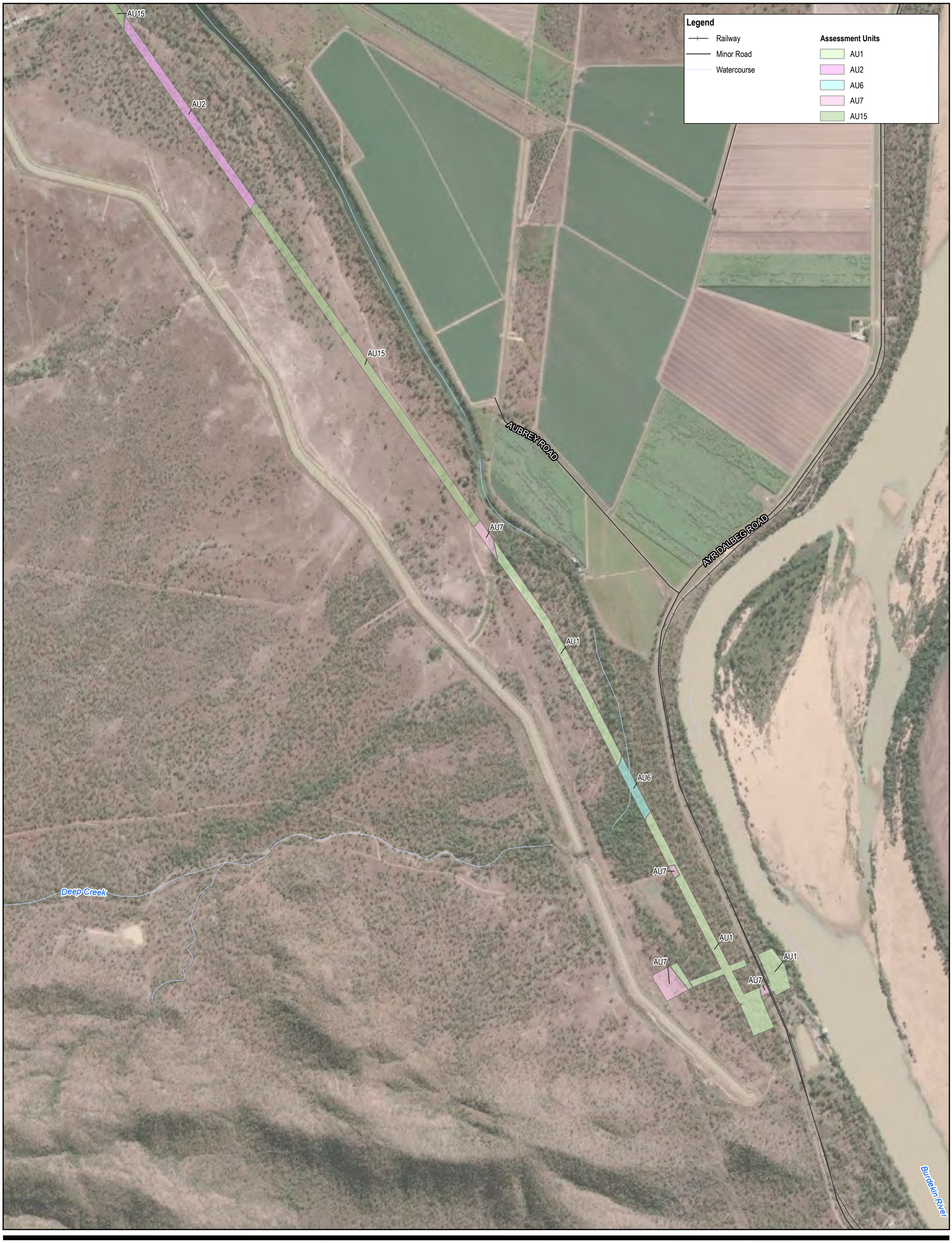




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**Townsville City Council**
**Haughton Pipeline Stage 2 -**
**Offset Area Management Strategy**

# Map of assessment units in the impact area

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# Appendix B

## Summary of habitat scoring criteria for each species

*Table 8-1 Habitat quality scoring criteria for each MNES species*

| Attribute | Scoring system | | | | |
|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 |
| **Bare-rumped sheathtail bat** | | | | | |
| Quality and availability of food and habitat for foraging | | | | | |
| Presence of remnant vegetation within known range | Absent | No remnant on or adjacent to site | Adjacent to site only | Remnant vegetation in which suitable old growth trees are a component | Undisturbed old growth remnant dominated by suitable trees |
| Quality and availability of habitat for shelter and breeding | | | | | |
| Presence of preferred tree species (*E.platyphylla* or *M.leucadendra*) | Absent | Low (1 – 2 per plot) | Moderate (3 – 4 per plot) | High (5 – 8 per plot) | Very high (>8 per plot) |
| Presence of deep hollows in preferred species | Absent | Low (1) | Moderate (2) | High (3 – 4) | Very high (5+) |
| Quality and availability of habitat for mobility | | | | | |
| Connectivity between suitable habitats | Absent | Low | Moderate | High | Very high |
| Absence of threats* | | | | | |
| Introduction of exotic weeds | Absent | Low | Moderate | High | Very high |
| **Southern black-throated finch** | | | | | |
| Quality and availability of food and foraging habitat | | | | | |
| Abundance of preferable grass species | None present | Preferred grass present but cover <10% of plots | Preferred grass cover 10 - 25% of plots | Preferred grass cover 25 – 75% of plots | Preferred grass cover > 75% of plots |
| Species richness of food grasses | Absent | 1 -2 spp present | 3 – 4 spp present | 5+ spp present with annuals only | 5+ spp present with annuals and perennials |
| Mosaic of bare patches and grass | No bare ground / 100% weed cover | < 5% or >85% bare ground | 5 – 15 % or 70 – 85% bare ground | 15 – 20% or 60 – 70% bare ground | 20 – 60% bare ground |
| Quality and availability of habitat for shelter and breeding | | | | | |
| Availability of nesting site with known tree species | Absent | *E.platyphylla* cover 0 – 5%, *M.viridiflora* canopy < 3 m | *E.platyphylla* cover 5 – 15% or > 50%, *M.viridiflora* canopy 3 - 5 m | *E.platyphylla* cover 15 – 20% or 30 - 50%, *M.viridiflora* canopy 5 - 6 m | Numerous 20 – 30% with hollows, and/or mature *M.viridiflora* canopy (>6 m) present |
| Distance to water | Over 1.5 km | 1 – 1.5 km | 400 m – 1 km of a breeding season water source | 200 m – 400 m of a breeding season water source | Within 200 m of a breeding season water source |
| Quality and availability of habitat for mobility | | | | | |
| Presence of shrubs (including invasive species) | Very high (over 70% abundance) | Mid-dense – High (50 – 70%) | Mid-dense – Low (30 – 50%) | Sparse (10 – 30%) | Very sparse (< 10%) |

| Attribute | Scoring system | | | | |
|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 |
| Presence of suitable open grassy woodland | Absent | Present but both understorey and tree canopy degraded | Suitable grassland species present but tree species absent or degraded / regrowth | Open woodland with vegetation thickening and/or low grass species diversity | High quality open woodland with low shrub density |
| Absence of threats* | | | | | |
| Reduction in the availability of water | Absent | Low | Moderate | High | Very high |
| Inappropriate grazing regimes | Absent | Low | Moderate | High | Very high |
| Inappropriate fire regimes | Absent | Low | Moderate | High | Very high |
| Introduction of exotic weeds | Absent | Low | Moderate | High | Very high |
| **Koala** | | | | | |
| Quality and availability of food and habitat for foraging | | | | | |
| Species richness of locally important food trees | Absent | 1 | 2 | 3 | 4+ |
| Abundance of non-juvenile locally important food trees | Absent | 1 - 5 | 6 -10 | 10 – 20 | >20 |
| Quality and availability of habitat for shelter and breeding | | | | | |
| Species richness of ancillary habitat trees | Absent | 1 | 2 | 3 | 4+ |
| Abundance of non-juvenile ancillary habitat trees | Absent | 1 - 5 | 6 -10 | – 20 | >20 |
| Quality and availability of habitat for mobility | | | | | |
| Connectivity between suitable habitats | Absent | Low | Moderate | High | Very high |
| Absence of threats* | | | | | |
| Risk of dog attack | Absent | Low | Moderate | High | Very high |
| Risk of vehicle strike | Absent | Low | Moderate | High | Very high |
| Risk of uncontrolled wildfire | Absent | Low | Moderate | High | Very high |
| Risk of drought | Absent | Low | Moderate | High | Very high |

**Scored using the threat risk matrix presented in the Guide to Determining Terrestrial Habitat Quality (DES 2020)*

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