Species Management Program

Fitzroy to Gladstone Pipeline Project

Gladstone Area Water Board (GAWB)

December 2022

BASE/

BASE/

Document Control

Title	Fitzroy to Gladstone Pipeline - Environmental Constraints Protocol
Job Number	J0208
Client	Gladstone Area Water Board (GAWB) Pty Ltd

Document Issue

Issue	Date	Prepared By	Reviewed/Approved By
Rev A DRAFT – For client review	7/10/2022	Isaac Witten / Andrew Craig	Dr Craig Streatfeild
Rev O – Final	21/12/2022	Josh Tomarchio / Andrew Craig	Dr Craig Streatfeild

Table of Contents

Abbreviations

Abbreviation	Definition
Animals Regulation	*Nature Conservation (Animals) Regulation 2020*
BASE	Base Consulting Group
Bonn Convention	Convention on the Conservation of Migratory Species of Wild Animals signed at Bonn on 23 June 1979
CAMBA	Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment signed at Canberra on 20 October 1986
CEMP	Construction Environmental Management Plan
cm	Centimeter
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, Environment and Water
DES	Department of Environment and Science
DEWHA	Department of Environment, Water, Heritage and the Arts
EIS	Environmental Impact Statement
EO	Environmental Officer
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPBC Act approval	Approval under the EPBC Act dated 4 November 2011, varied on 26 October 2021 and 20 June 2022 (EPBC 2007/3501)
ESCP	Erosion and Sediment Control Plan
EVNT	Endangered, Vulnerable, Threatened, Least Concern
FGP	Fitzroy to Gladstone Pipeline
GAWB	Gladstone Area Water Board
GIS	Geographical Information Systems
GSDA	Gladstone State Development Area

Abbreviation	Definition
Ha	Hectares
JAMBA	Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment signed at Tokyo on 6 February 1974
km	Kilometre
m	Metre
ML	Megalitres
MP	Member of Parliament
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992*
MNES	Matters of National Environmental Significance
RE	Regional Ecosystem
ROKAMBA	Agreement Between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds signed at Canberra on 6 December 2006
ROW	Right of Way
SDA	State Development Area
SEIS	Supplementary Environmental Impact Statement
SGIC SDA	Stanwell-Gladstone Infrastructure Corridor State Development Area
SMP	Species Management Program
TEC	Threatened Ecological Community
The Project	Fitzroy to Gladstone Pipeline Project
Water Act	*Water Act 2000*
WoNS	Weeds of National Significance
WTP	Water Treatment Plant

Abbreviation	Definition
CE	Critically Endangered
E	Endangered
V	Vulnerable
NT	Near Threatened
SL	Special Least Concern

1.0 Introduction

Base Consulting Group (Base) was commissioned by Gladstone Area Water Board (GAWB) to prepare this Species Management Program (SMP) to manage potential impacts to animal breeding places as required under Queensland's *Nature Conservation (Animals) Regulation 2020* (Animals Regulation) from the construction and operation of the Fitzroy to Gladstone Pipeline (FGP) (the Project). The SMP has been developed in accordance with the requirements of the Animals Regulation and the associated Information Sheet – Species Management Program requirements for tampering with a protected animal breeding place and encompasses both high risk impacts (i.e. for species listed as Endangered, Vulnerable, Threatened, Least Concern (EVNT), Special Least Concern, Colonial Breeders and Least Concern species.

1.1 Background

The FGP traverses the Rockhampton Regional Council and Gladstone Regional Council Local Government Areas. The FGP, which is approximately 116 kilometres (km) long, will run from the Lower Fitzroy River at Laurel Bank, with the majority of its length within the Stanwell-Gladstone Infrastructure Corridor State Development Area (SGIC SDA), and then connect with the Gladstone Area Water Board's (GAWB) existing water infrastructure near Yarwun within the Gladstone State Development Area (GSDA). Refer to Figure 1 for the FGP locality and alignment.

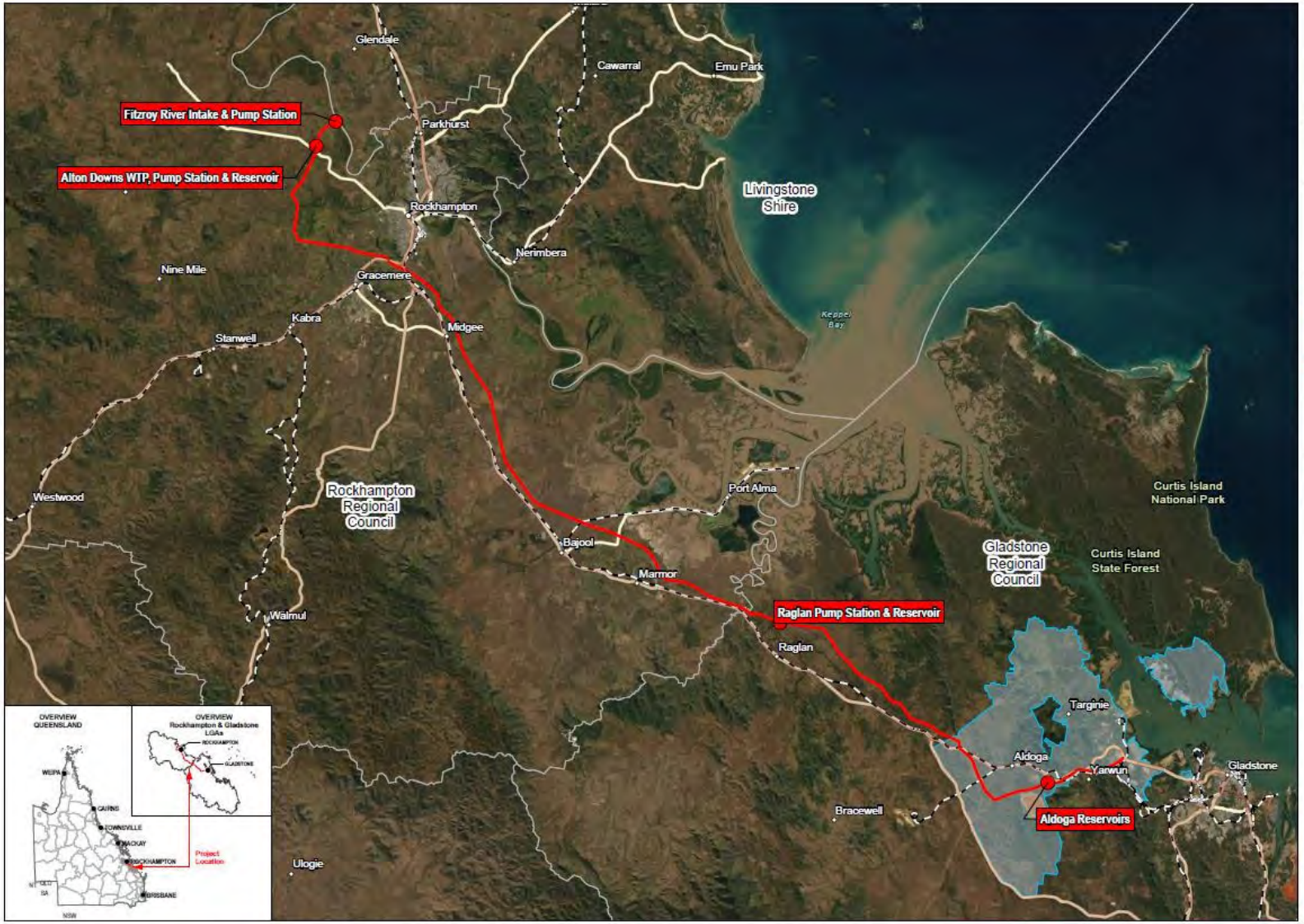
An Environmental Impact Statement (EIS) was completed for the Project in 2007 (ARUP, 2008), with a supplementary EIS (SEIS) completed in 2009 (ARUP, 2009). The Coordinator-General issued an evaluation of the Project's EIS on 2 February 2010. Commonwealth approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was received on 4 November 2011 and varied on 26 October 2021 and 20 June 2022 (EPBC 2007/3501) (EPBC Act approval).

1.2 Project Overview

The Project is an option to address the single source water supply risk from Awoonga Dam, enabling long-term water security for Gladstone's urban and industrial customers region. It will also support future water demand from the emerging hydrogen industry in the Gladstone region.

The Project comprises the following key elements:

- An intake and pump station on the southern bank of the Fitzroy River, approximately 17 km upstream of Rockhampton's Alexandra Bridge near Laurel Bank.
- A water treatment plant (WTP) at Alton Downs near the Fitzroy River.
- A pipeline with a length of approximately 116 km and 1 m in diameter, constructed within a Right of Way (ROW) corridor up to 30 metres (m) in width and buried for its full length with a minimum cover of 900 mm.
- Three pump stations, located at the Fitzroy River water intake, at the Alton Downs WTP, and near Raglan.
- A water storage tank of 10–15 Megalitres (ML) located at the Raglan booster pump station.
- Two reservoirs providing storage of approximately 100 ML capacity at Aldoga.



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Legend

- Infrastructure Locations
- Fitzroy to Gladstone Pipeline Alignment
- Roads
- Railways
- Gladstone State Development Area
- LGA Boundaries

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2. Cadastral data - Queensland series @ QSpatial, 2022
3. State Development Area precincts - Gladstone SDA @ QSpatial, 2015
4. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
(Datum GDA2020)

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FITZROY TO GLADSTONE PIPELINE PROJECT
Figure 1 Project Locality
000-G-MAP-2550 Version: 1 Date: 23/09/2022

1.3 Project Delivery

The Project is being advanced in three sections:

1. Northern Section – approximately 15.5 km of pipeline, Fitzroy River Intake Structure and Pump Station and Alton Downs WTP
2. SGIC SDA Section – approximately 81 km of pipeline and Raglan Pump Station and Reservoir
3. GSDA Section – approximately 18.5 km of pipeline, Aldoga Reservoirs and connection to the Gladstone raw water network.

Within each of the three sections identified, Northern, SGIC SDA and GSDA, the works will progress in stages. The typical works proposed in each stage are summarised below.

1.3.1 Pre-construction

The pre-construction activities include:

- Developing detailed design.
- Undertaking ecology surveys and cultural heritage surveys.
- Securing of approvals, permits, licences and land tenure agreements.
- Developing required management plans and monitoring programs.

1.3.2 Construction

The ROW is the total construction width within which vegetation will be cleared to enable construction processes to occur. The ROW width is approximately 30 m, but it will be reduced over short distances (e.g. in environmentally sensitive areas) and may vary depending on project or site-specific considerations. The ROW will allow room for the pipeline trench, vegetation and soil stockpiles, a roadway with appropriate width for passing and the pipeline preparation area. A typical ROW layout is shown in Figure 2.

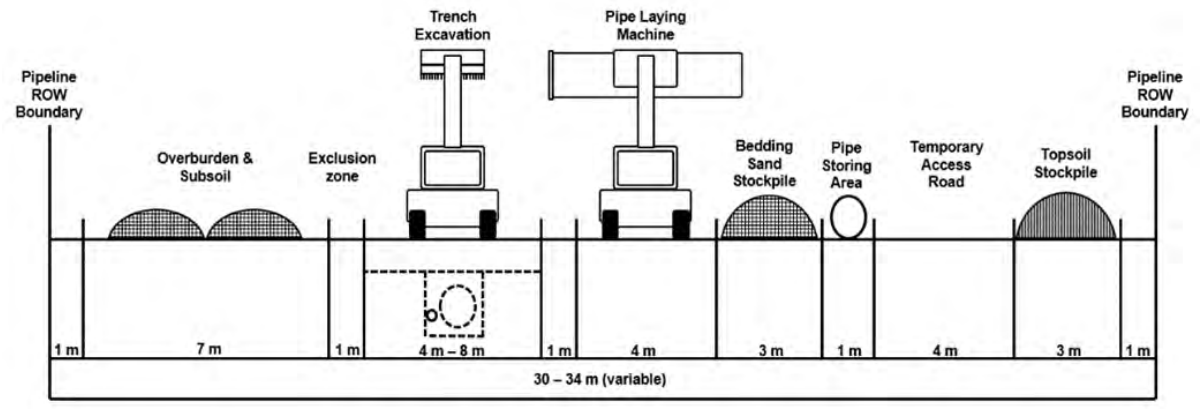


Figure 2 Typical ROW

1.3.2.1 Main Construction Stages

The main stages of construction are outlined as follows:

- Survey – prior to the commencement of construction, the ROW will be fully surveyed, and the pipeline centre line will be pegged.
- Clearing – clearing of the pipeline construction area involves removal of vegetation, rocks and obstructions from the pipeline ROW
- Grading – bulldozers and graders will level the ground in certain areas within the ROW to prepare a safe construction platform.
- Pipeline stringing – pipes will be delivered to site by truck from stockpile locations adjacent to the ROW and then laid next to the trench on skids (timber blocks like railway sleepers used to keep the pipe off the ground) or sandbags to protect the pipe from damage.
- Trenching – the pipeline trench will generally be 2 m deep but could be up to 5 m deep depending on pipeline design and location. The top of the excavation trench will generally be 12 m wide but could be up to 16 m wide in some locations depending on trench wall soil stability and pipeline design. Specialist heavy earth moving machinery will be used to excavate the pipeline trench. Topsoil and trench spoil will be stockpiled separately as shown in Figure 2.
- Pipe laying and backfilling – appropriate bedding material is required to prepare the trench for pipe laying. Following placement of the bedding the remainder of the trench will be backfilled using trench spoil and finally topsoil.
- Clean up and rehabilitation – all areas affected by construction including ROW, work areas, access tracks, and temporary site office areas will be cleaned up and rehabilitated to pre-construction conditions as far as practicable. The stockpiled vegetation will be utilised in the rehabilitation process, where possible (e.g. use of mulch and placement of logs etc. in the ROW (pending end land use).
- Pipeline cleaning and testing – this process occurs at the end of construction to remove debris from the inside of the pipe and test for leaks.

1.4 Applicant

GAWB is a Queensland Government statutory Water Authority with the purpose of ensuring the long- and short-term water needs of current and future customers are met in ways that are environmentally, socially and commercially sustainable.

On 1 October 2000, GAWB commenced operations as a Category 1 commercialised Water Authority under the *Water Act 2000* (Water Act). From 1 July 2008, GAWB became a registered service provider under the *Water Supply (Safety and Reliability) Act 2008*. GAWB is responsible to Mr Glenn Butcher, Member of Parliament (MP), Minister for Regional Development and Manufacturing and Minister for Water.

Gladstone was officially drought declared between 1 May 2019 and October 2022 due to three consecutive failed wet seasons in 2018-19, 2019-20 and 2020-21. The Gladstone region has a long history of drought. Water security and reliability is a key consideration for the region.

GAWB has been appointed as the Delivery Management Proponent for pre-construction activities for the Project.

1.4.1 Applicant details

Applicant: Gladstone Area Water Board (GAWB)

Registered Legal Entity: Gladstone Area Water Board Pty Ltd

Registered Business Address: 151 Goondoon Street, Gladstone, QLD, 4680

Contact: Simon Wakefield (Approvals Project Manager – Fitzroy to Gladstone Pipeline)

Telephone: 0401 712 962

Email: swakefield@gawb.qld.gov.au

Website: Home - Gladstone Area Water Board (gawb.qld.gov.au)

ACN:ABN: 88 409 667 181

1.5 Purpose

In addition to the EIS, a number of additional State approvals are also required to construct and operate the Project, including approval to tamper with an animal breeding place as required under section 335 of the Animals Regulation. Approval to tamper with an animal breeding place is granted via an approved SMP and this document presents the management and enhancement measures which are proposed to be implemented within the Project's ROW corridor to minimise impacts to animal breeding places.

This SMP has been limited to those species for which a breeding place has been identified or is reasonably likely to be encountered during the proposed Project works. Potential breeding places were determined during ecological investigations to support the Project's EIS (ARUP, 2008; ARUP, 2009) and more recent surveys undertaken in 2022 to support State approval and permitting requirements (GHDa, 2022; refer to Appendix A).

This SMP addresses both high risk of impacts and low risk of impacts to animal breeding places and includes potential impacts to EVNT, Special Least Concern, Colonial Breeders and Least Concern species where the tampering may have broader impacts to the species. This SMP applies to all activities that that require vegetation and /or habitat clearing that has the potential to impact on an animal breeding place. This SMP has been prepared by suitably qualified persons with experience (refer to Appendix B) with fieldwork, surveys and ecological reporting undertaken by GHD (refer to Appendix A).

1.6 Responsibilities

This SMP, once approved, will be implemented as part of construction and operational phase contracts for the FGP including where vegetation clearing, or other activities may result in the disturbance of fauna habitat, vegetation and soil.

All employees, contractors or other agents will be required to operate in accordance with this SMP as part of the activity. The Project's Environmental Officer (EO) or equivalent, is required to apply this SMP to the activity areas and implement where necessary, the corrective actions outlined in Section 7.3 for the term of this approved SMP.

2.0 Legislation and Guidelines

2.1 Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) provides for the protection and management of native wildlife and habitat that supports native species with particular regard to:

- The clearing of plants protected under the NC Act
- A clearing permit or an exemption under the NC Act
- Activities that may cause disturbance (that is tamper, damage, destroy, mark, move or dig up) to animal breeding places
- The taking of fauna.

For any proposed activity that will impact on breeding places of protected animals that are classified as extinct in the wild, EVNT, special least concern, colonial breeder or least concern, an SMP for that species will be required. Animal breeding places include obvious structures such as bird nests and tree hollows, as well as more cryptic places such as amphibian or reptile habitat where breeding takes place.

2.2 Nature Conservation (Animals) Regulation 2020

The Animals Regulation lists the flora and fauna species considered extinct in the wild, endangered, vulnerable, near threatened, least concern, international and prohibited. It states the declared management intent and the principles to be observed in any taking of or destruction for each group.

Under the Animials Regulation, special least concern species are:

- Echidna (*Tachyglossus aculeatus*)
- Platypus (*Ornithorhynchus anatinua*)
- A least concern bird to which any of the following apply:
    - The agreement called ‘Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment’ and signed at Tokyo on 6 February 1974 (JAMBA);
    - The agreement called ‘Agreement Between the Government of Australia and the Government of the People’s Republic of China for the Protection of Migratory Birds and their Environment’ and signed at Canberra on 20 October 1986 (CAMBA);
    - The agreement called ‘Agreement Between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds’ and signed at Canberra on 6 December 2006 (ROKAMBA); and
    - The convention called ‘Convention on the Conservation of Migratory Species of Wild Animals’ and signed at Bonn on 23 June 1979 (Bonn Convention).

Colonial breeding species are a group of animals of the same kind co-existing in close association for breeding purposes.

Under Section 335 of the Animals Regulation, ‘a person must not, without a reasonable excuse, remove, or tamper with, an animal breeding place that is being used by a protected animal to incubate or rear the animal’s offspring, unless ‘an approved species management program for animals of the same species’ is in place.

Under Section 335 (2), an animal breeding place is being used by a protected animal to incubate or rear the animal’s offspring if:

- The animal is preparing, or has prepared, the place for incubating or rearing the animal’s offspring; or

- The animal is breeding, or is about to breed, and is physically occupying the place; or
- The animal and the animal's offspring are physically occupying the place, even if the occupation is only periodical; or
- The animal has used the place to incubate or rear the animal's offspring and is of a species generally known to return to the same place to incubate or rear offspring in each breeding season for the animal.

This SMP has been prepared under the provisions of the NC Act and associated Animals Regulation to manage the construction and operational phases of the Project and to minimise the risk of tampering with animal breeding places and where necessary, to do so in a sensitive manner.

2.3 Information sheet - Species Management Program: Requirements for tampering with a protected animal breeding place in Queensland

As outlined in the information sheet *Species Management Program: Requirements for tampering with a protected animal breeding place in Queensland, Version 1.00* dated August 2020*,* koalas are not included in SMP documentation as koalas do not use a habitual breeding place. Hence, the clearing of vegetation that has the potential to be utilised by koalas is viewed as clearing of koala habitat rather than clearing of a koala breeding place. As such, koalas are not included in this SMP. However, reference is made to the surveys undertaken for the koala in 2022 (GHDa, 2022) as these have relevance to determining potential breeding places for species that utilise tree hollows and woodlands for breeding.

3.0 Terms

3.1 Terms of approval

This SMP applies to the construction and operational phases of Project and covers EVNT, special least concern (including migratory) and colonial breeding animals listed in Section 4.2. This SMP is intended to be valid and in effect for five years after approval is granted by Department of Environment and Science (DES). Further, additional approval will be sought from DES after this period if construction of the Project is delayed such that the mine life extends beyond eight years.

3.2 Approved parties

GAWB and any of its subsidiary entities, employees, contractors or agents are authorised to operate under this approved SMP.

4.0 Applicable species and impacts to breeding places

4.1 Survey effort

As part of the Project's State and Commonwealth approvals process, detailed ecological assessments were undertaken in 2008, 2009 (ARUP) and 2022 (GHD) in order to:

- Determine the presence/absence of listed flora and fauna species within the Project are
- Assess the vegetation characteristics and the presence of ecological communities with the Project area
- Describe the likely adverse impacts on fauna species including breeding places within the Project area
- Describe measures that would be implemented to avoid and mitigate impacts on those species and breeding places.

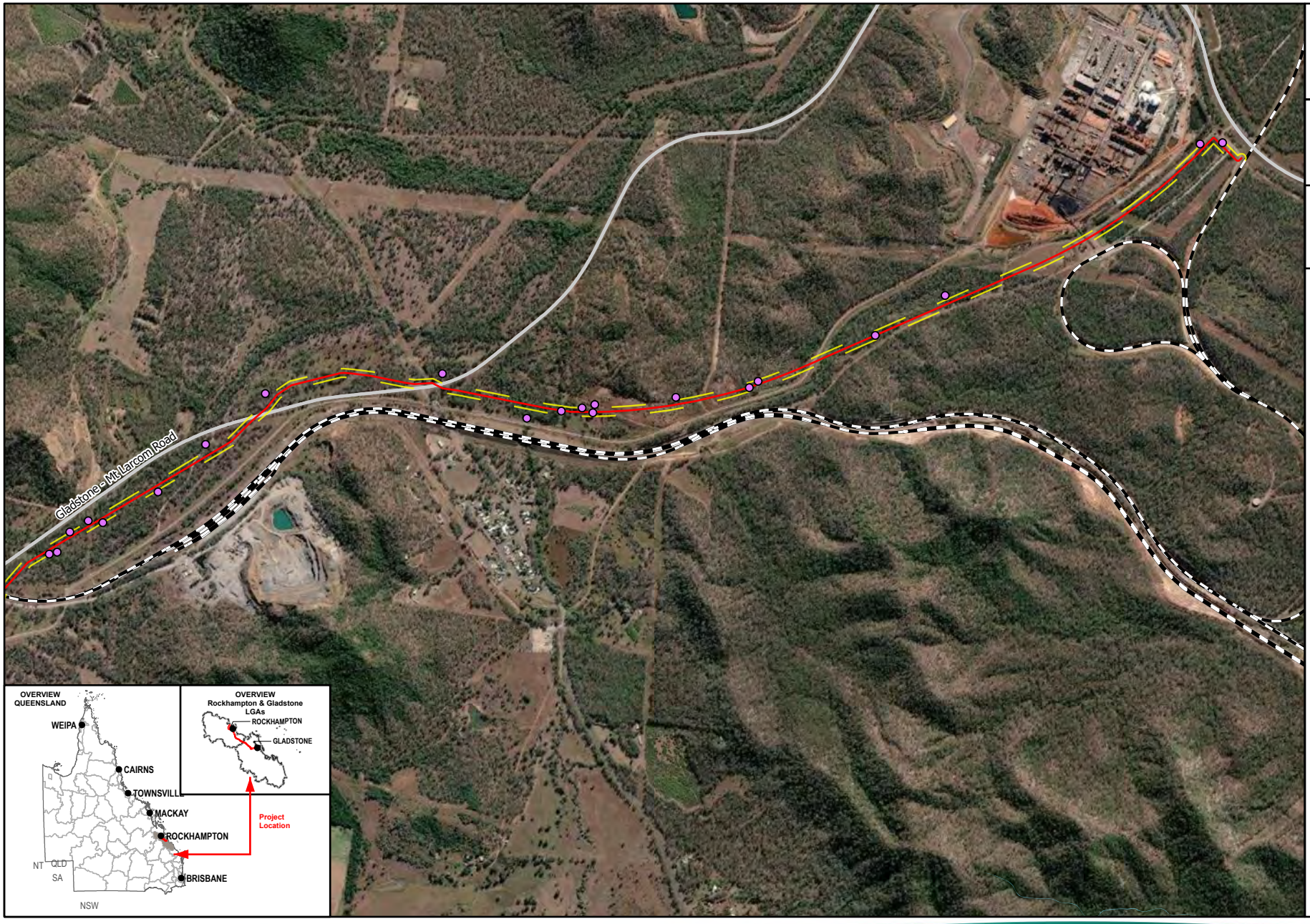
This section outlines the ecological assessments undertaken to determine the likelihood of occurrence of breeding places to occur or potentially occur, within the Project area and to assess the potential impacts on those breeding places.

As breeding places can vary over time and space, the 2022 ecological surveys undertaken by GHD has primarily been used to determine the presence or likely presence of breeding places. However, the earlier surveys undertaken by Arup have also been used where relevant. The 2022 terrestrial ecological assessment incorporated two (2) surveys events undertaken from 21 – 25 February (wet season) and 2 – 9 May (post wet season) in 2022 (GHDa, 2022; Appendix A).

4.1.1 Flora survey effort

A variety of flora and fauna survey methods were used to detect potential breeding places and species occurrences. A total of 207 vegetation and flora survey sites were assessed during the two ecological field surveys (refer to Figure 3 for locations). Vegetation surveys were undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 5.1* (Neldner, et al., 2020).

Field verification of on-ground vegetation communities during the ecological field surveys were undertaken using a combination of Quaternary level assessments and informal observations (as described in Neldner, et al., 2020). Data and observations were collected on the structural and floristic composition of vegetation communities as well as soils, geology and landform to determine the Regional Ecosystem (RE) type. Where a mapped RE did not accurately reflect on-site observations, it was assigned an RE from the Regional Ecosystem Description Database (REDD) (Queensland Herbarium, 2019) that most closely matched the Land Zone and vegetation attributes observed. Discrepancies in RE boundaries were also noted. Height and cover measurements at survey sites were also assessed against relevant RE benchmark data where initial observations suggested that mapped regrowth vegetation may have achieved remnant status.



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Legend

Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline

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PROJECTION UTM Zone 56
(Datum GDA2020)

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Figure 3-a
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022

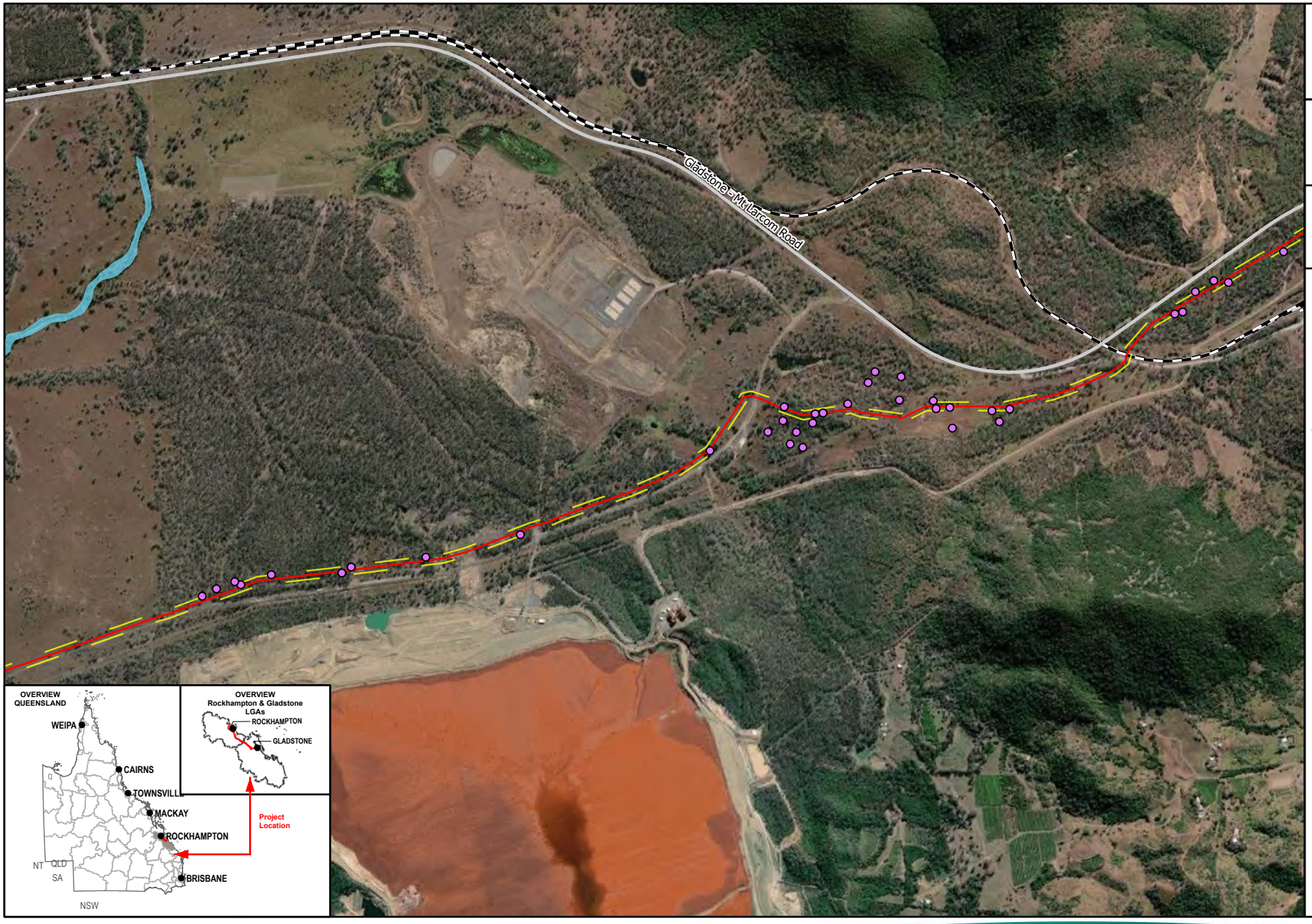

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Figure 3-b
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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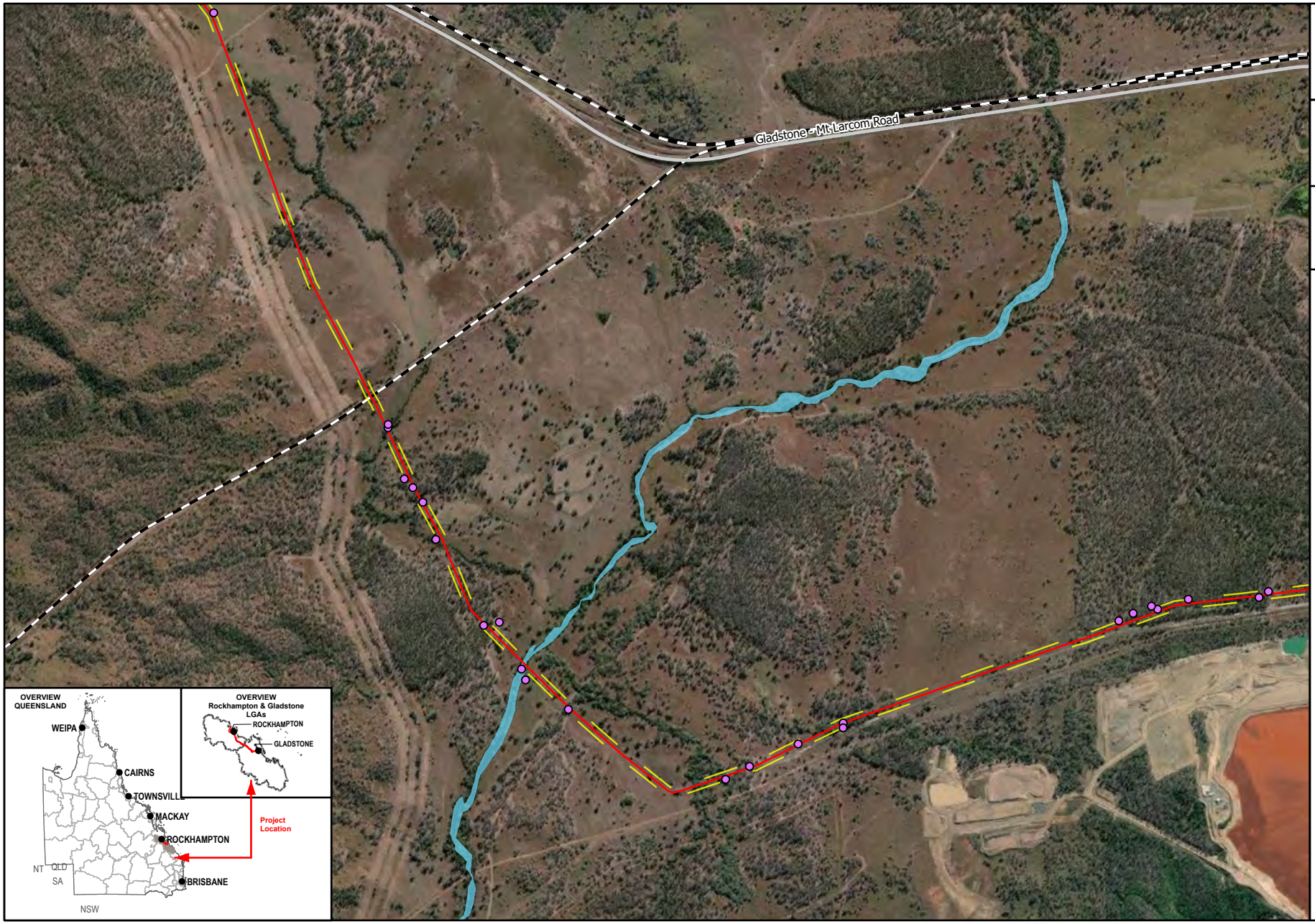

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Figure 3-c
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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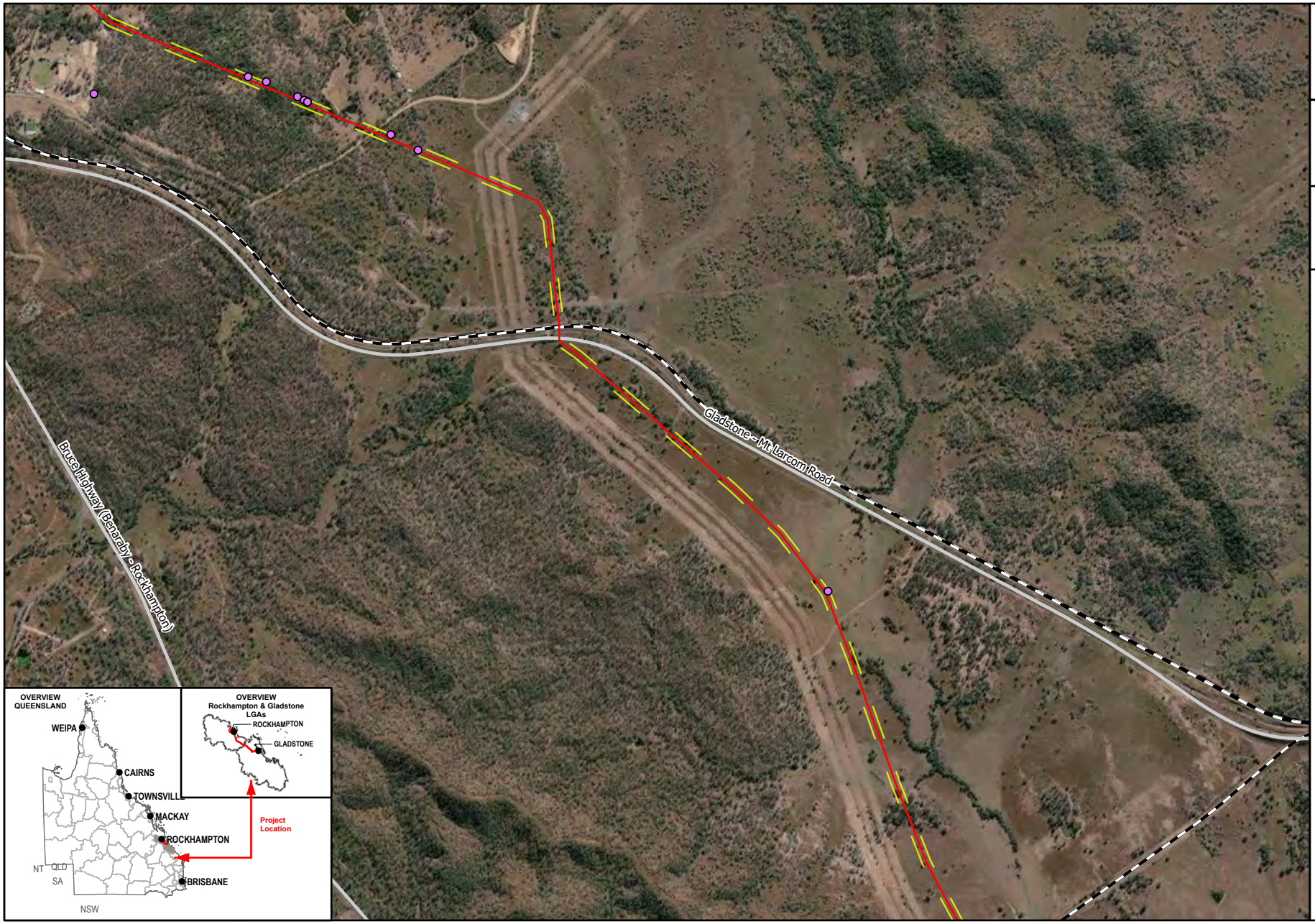

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Figure 3-d
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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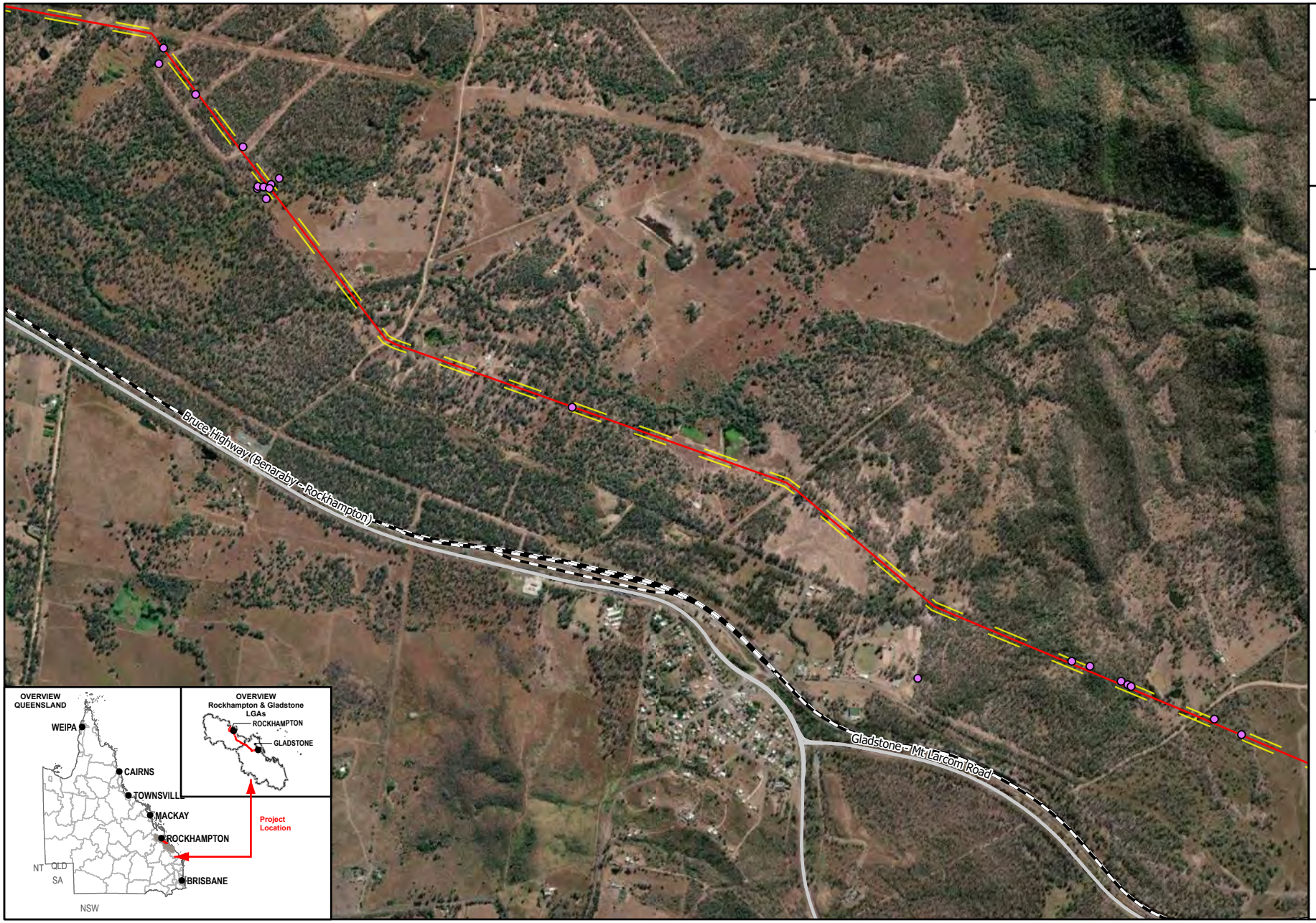

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Figure 3-e
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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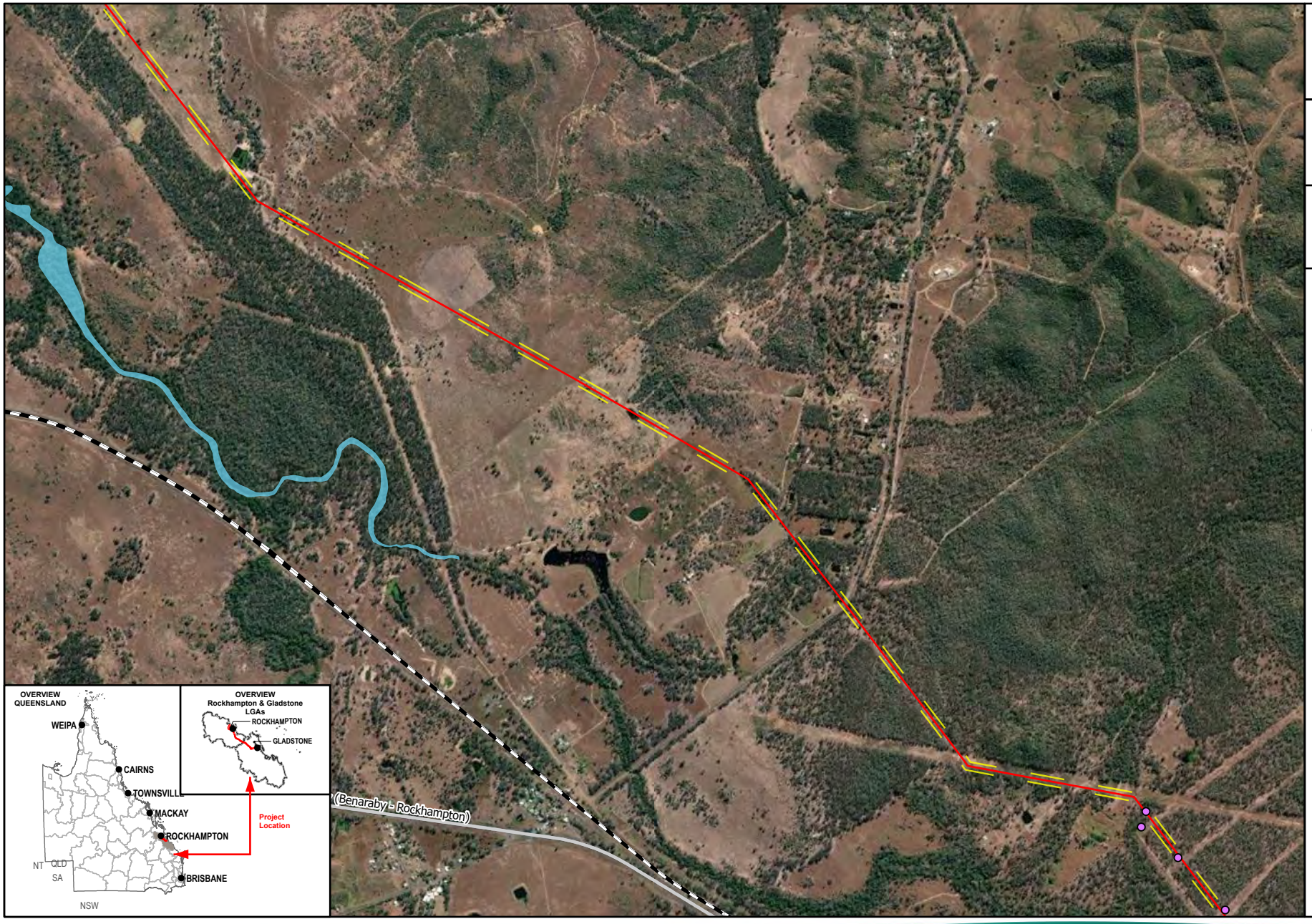

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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline

Gladstone Area Water Board
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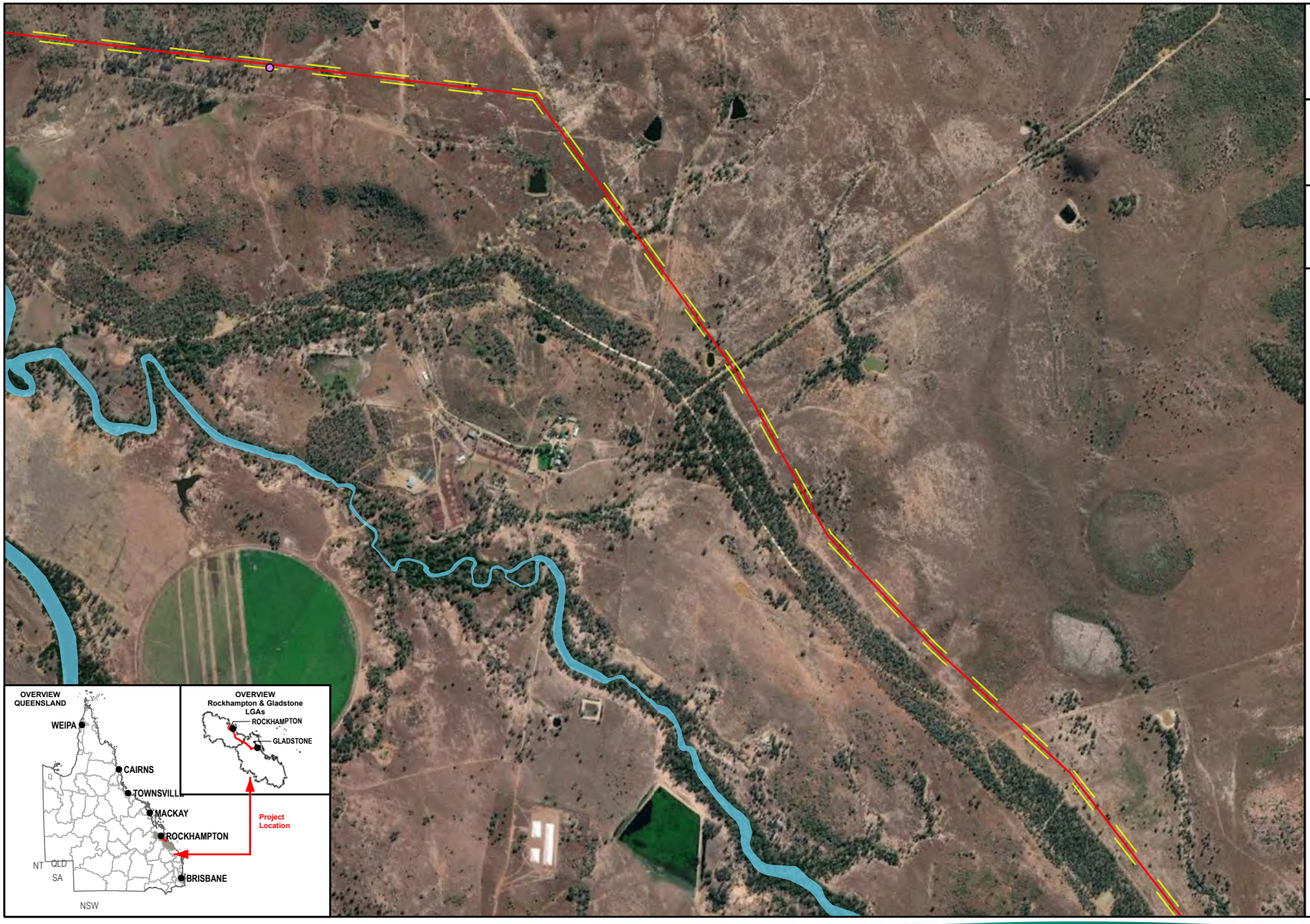
Ph: 07 4976 3000 www.gawb.qld.gov.au

PROJECTION UTM Zone 56
(Datum GDA2020)

Compiled by:YS16239

Figure 3-f
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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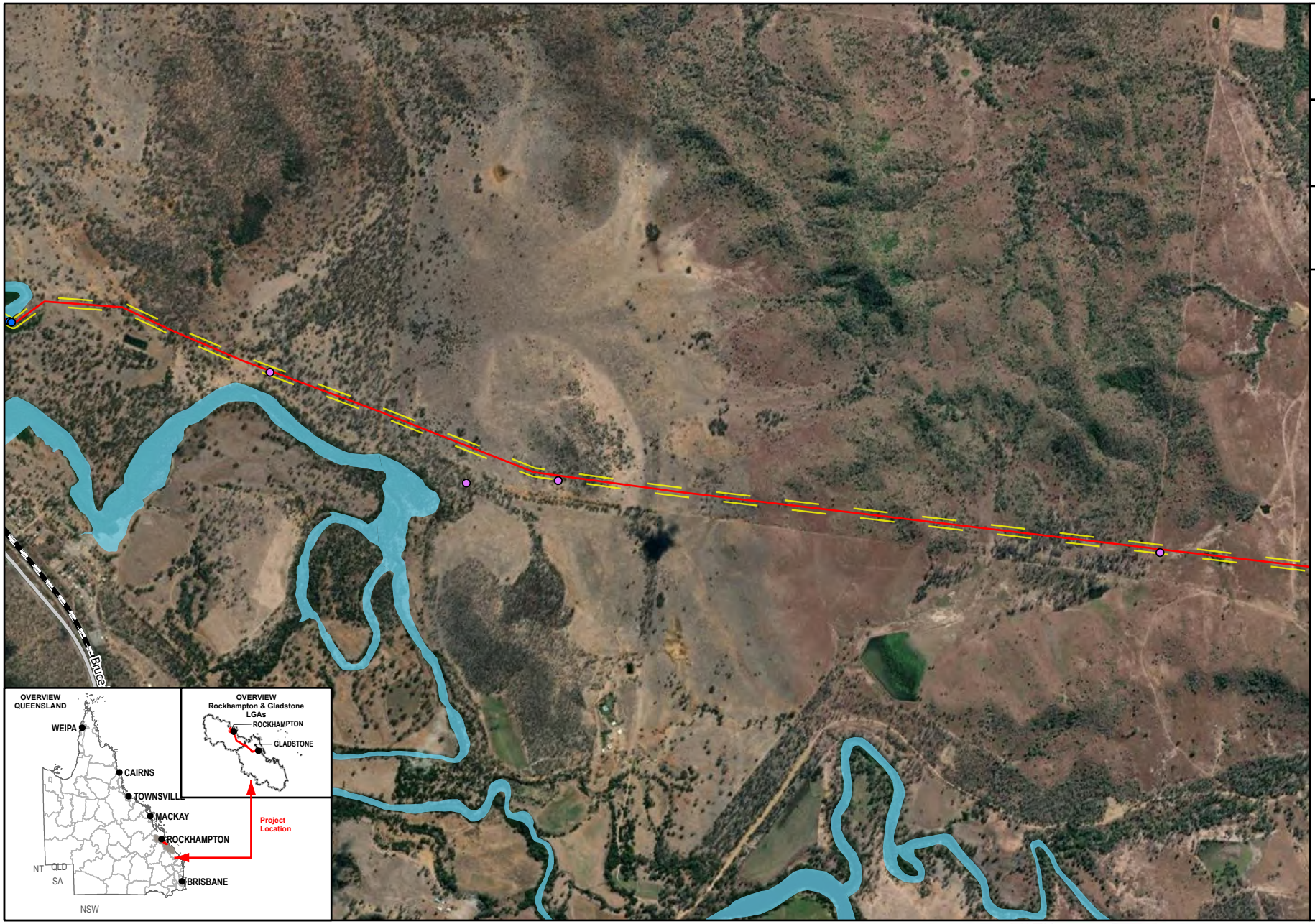
Figure 3-g
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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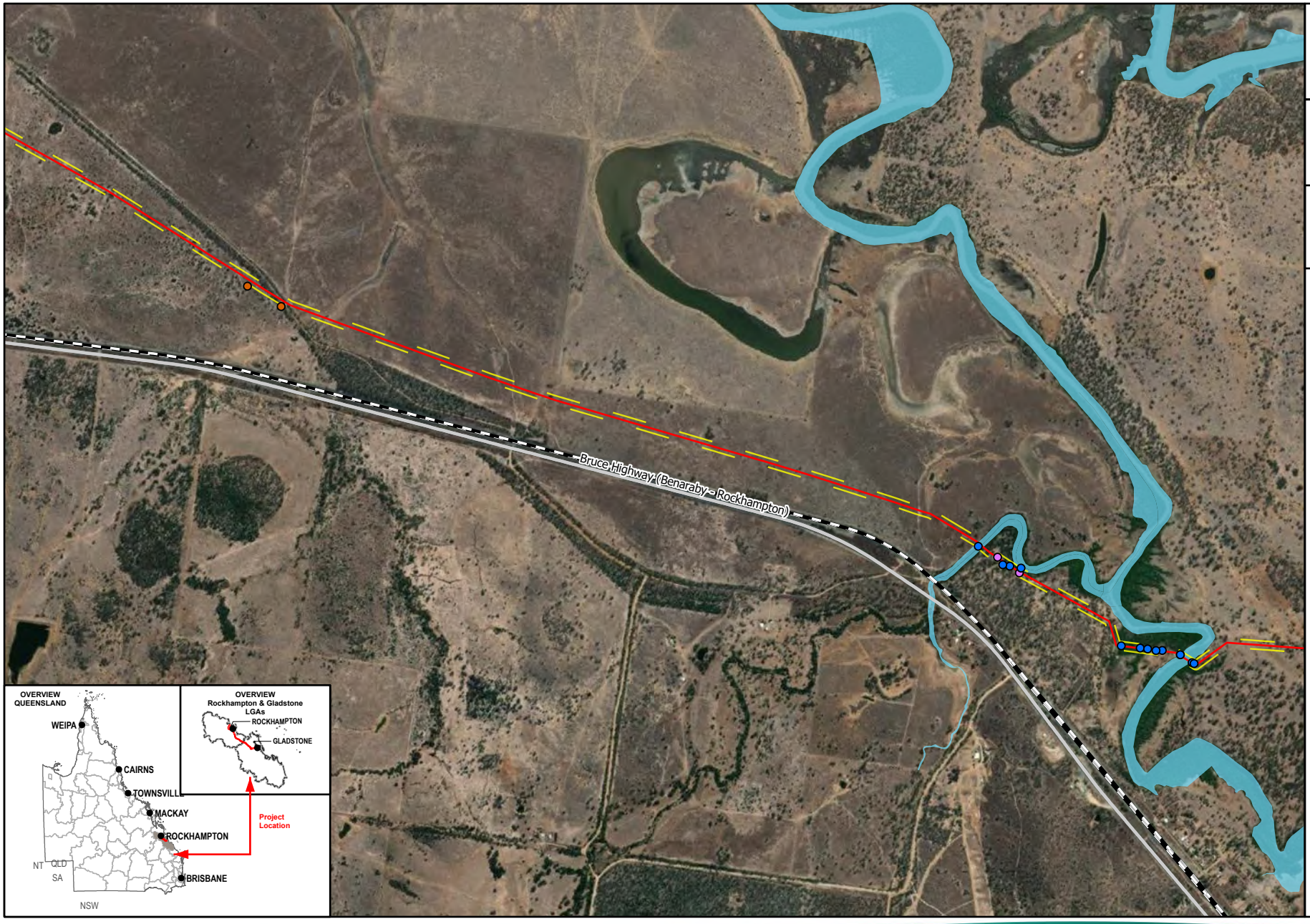
Figure 3-h
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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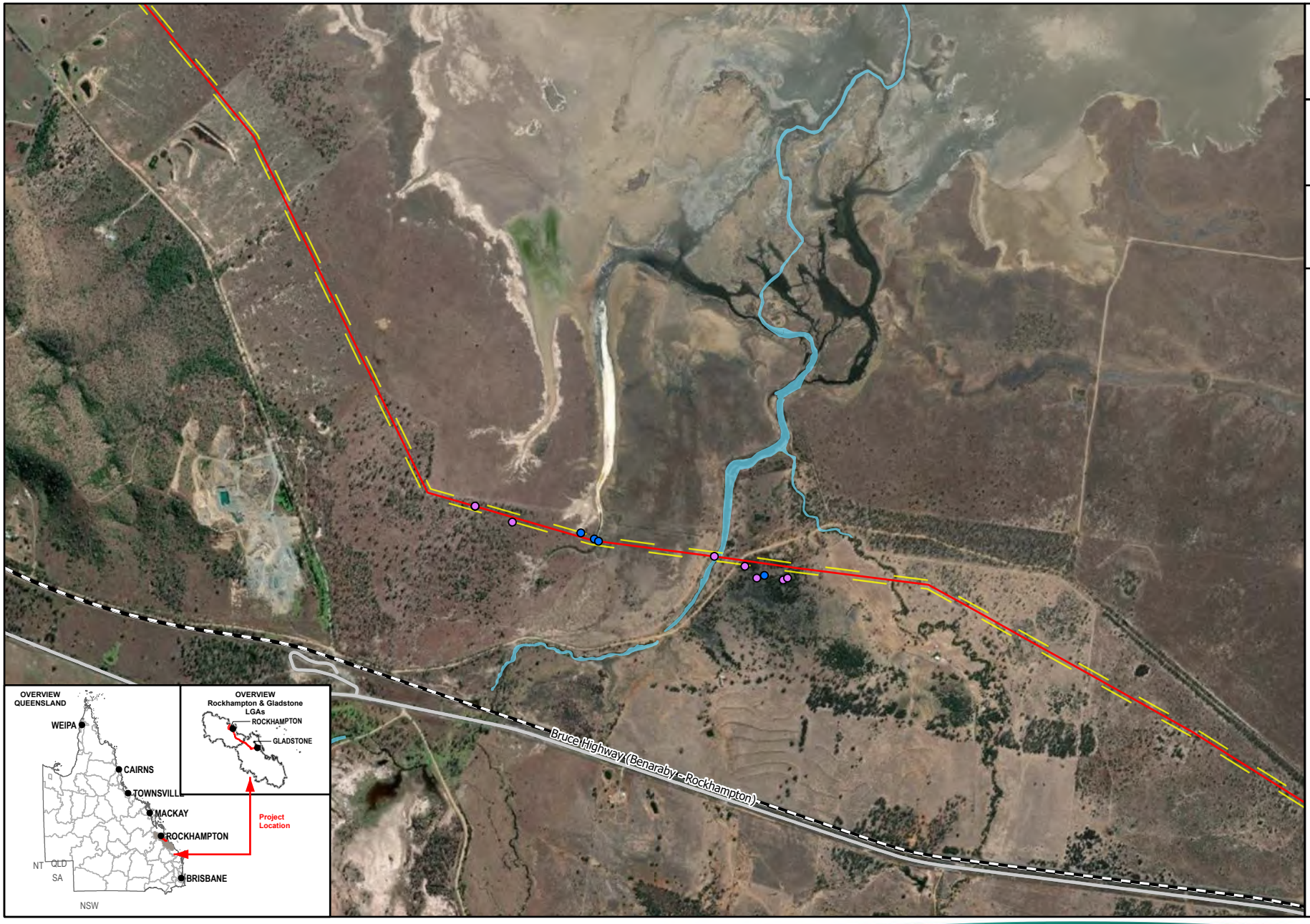
Figure 3-i
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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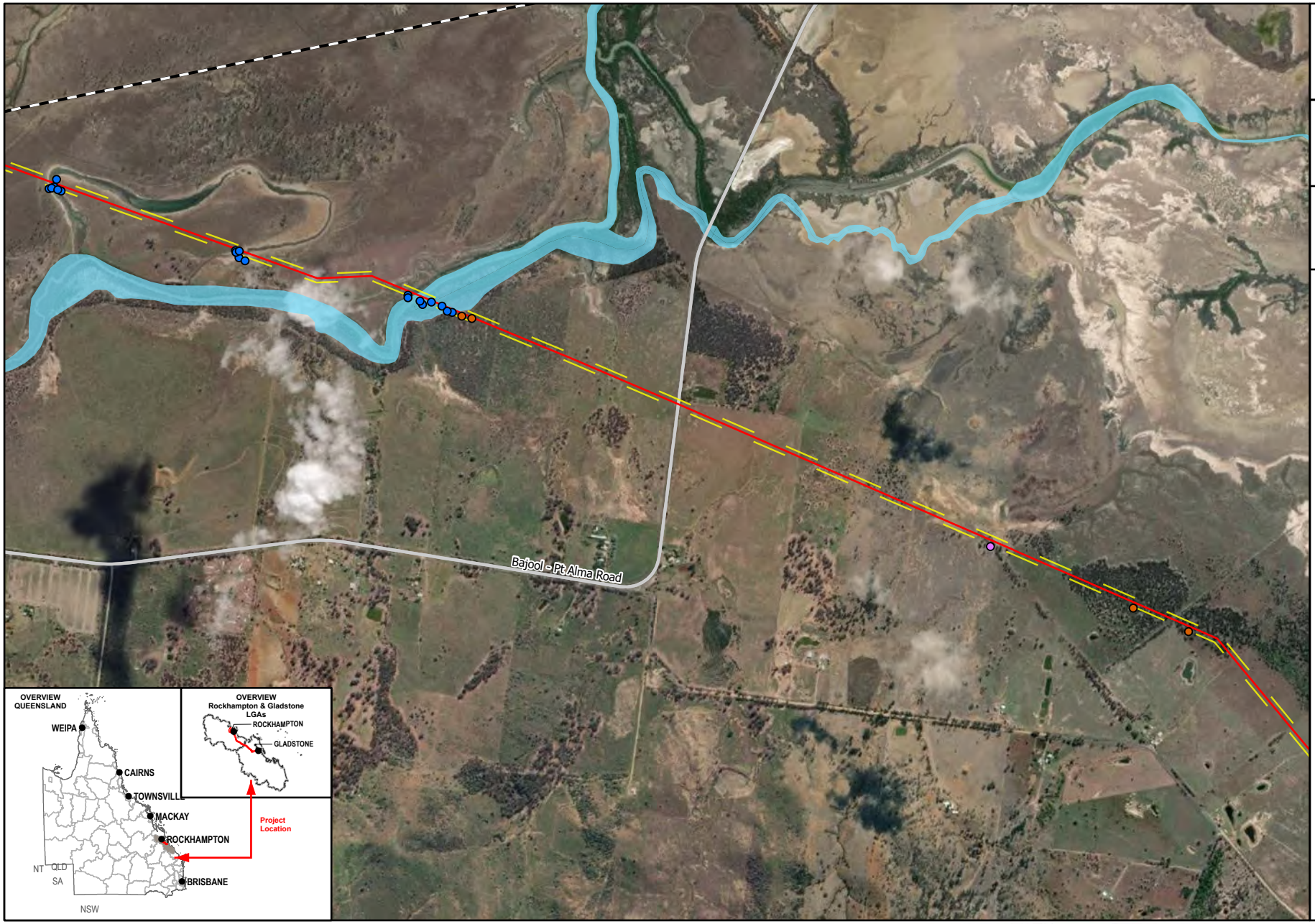
Figure 3-j
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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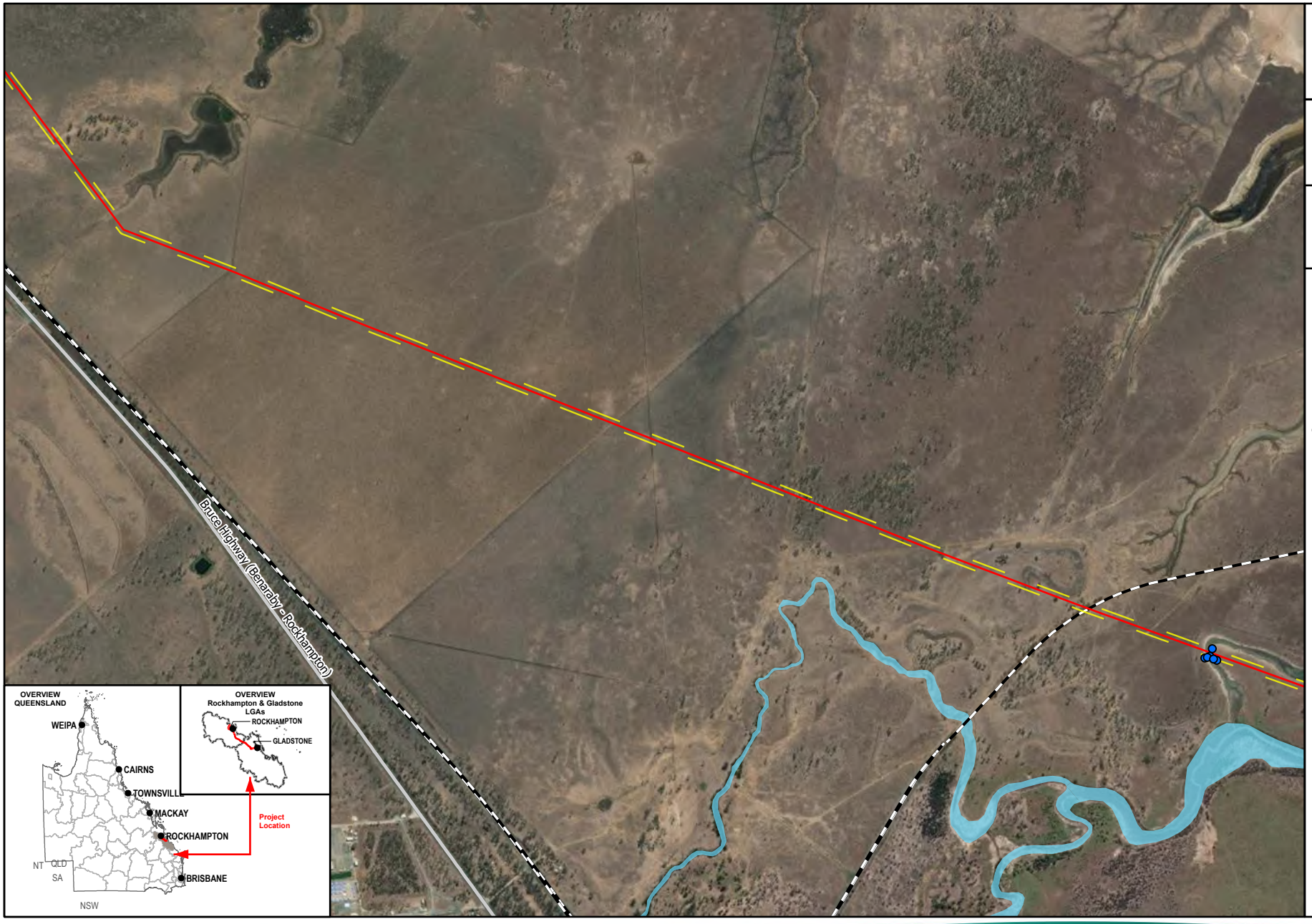
Figure 3-k
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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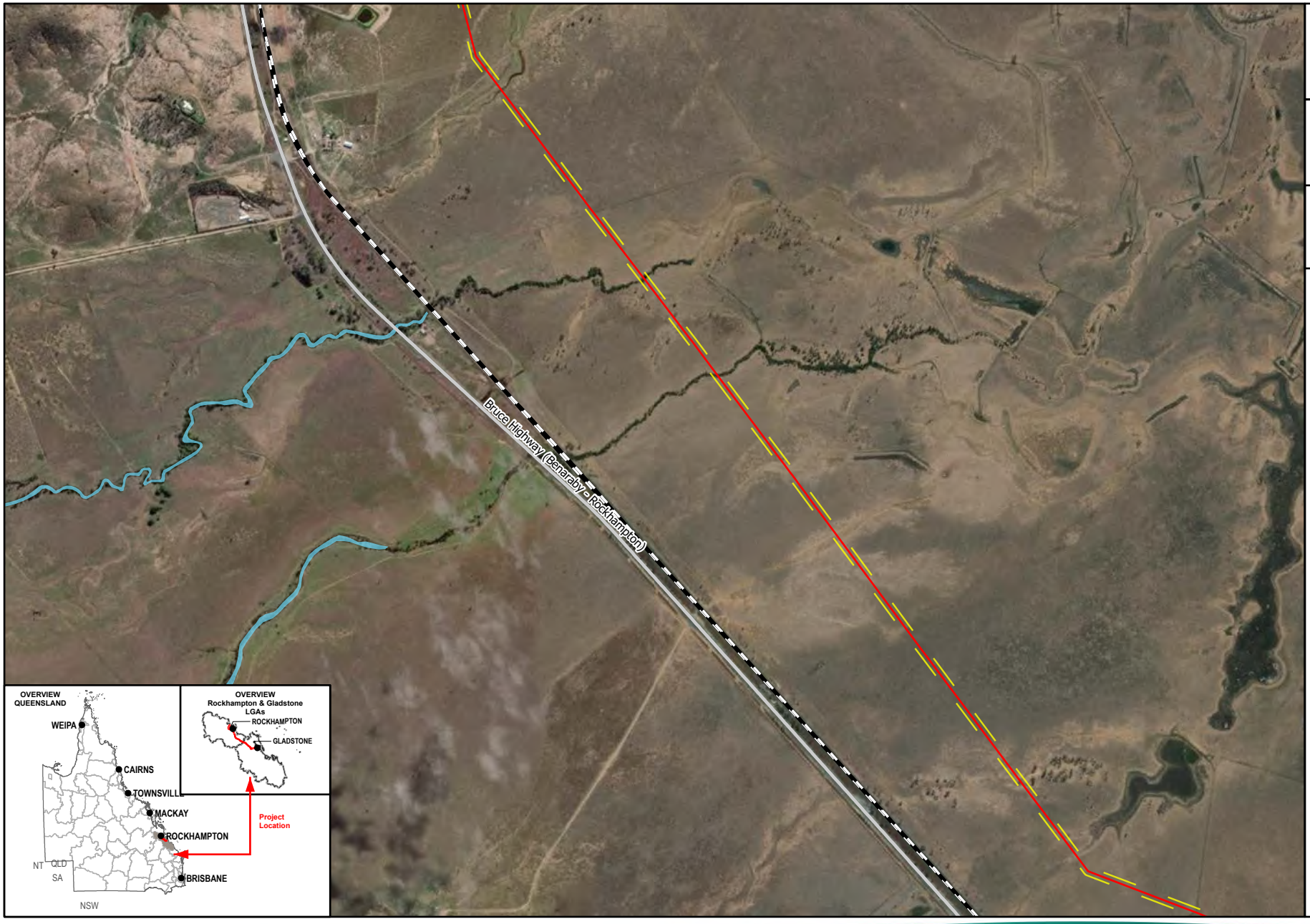
Figure 3-I
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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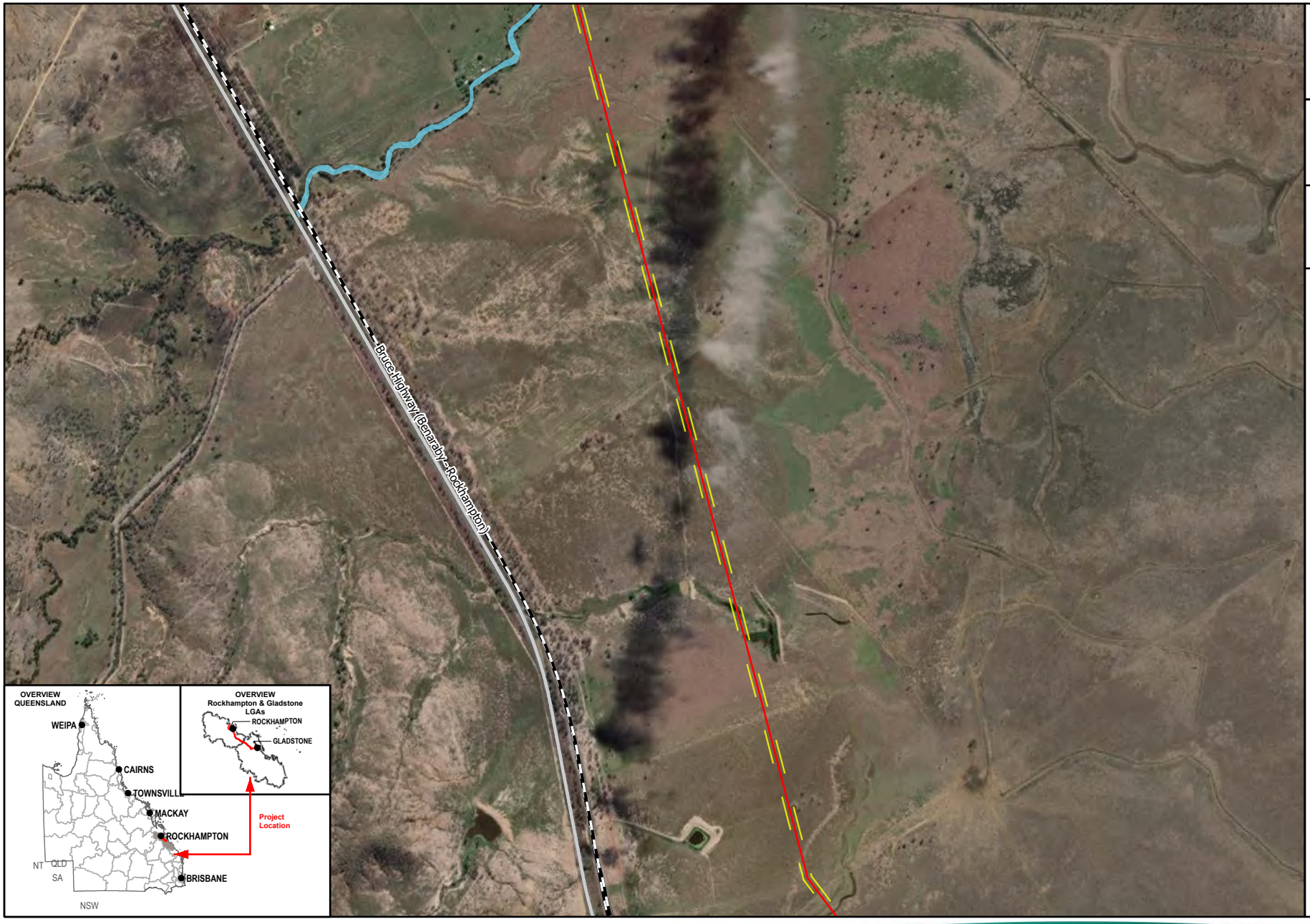
Figure 3-m
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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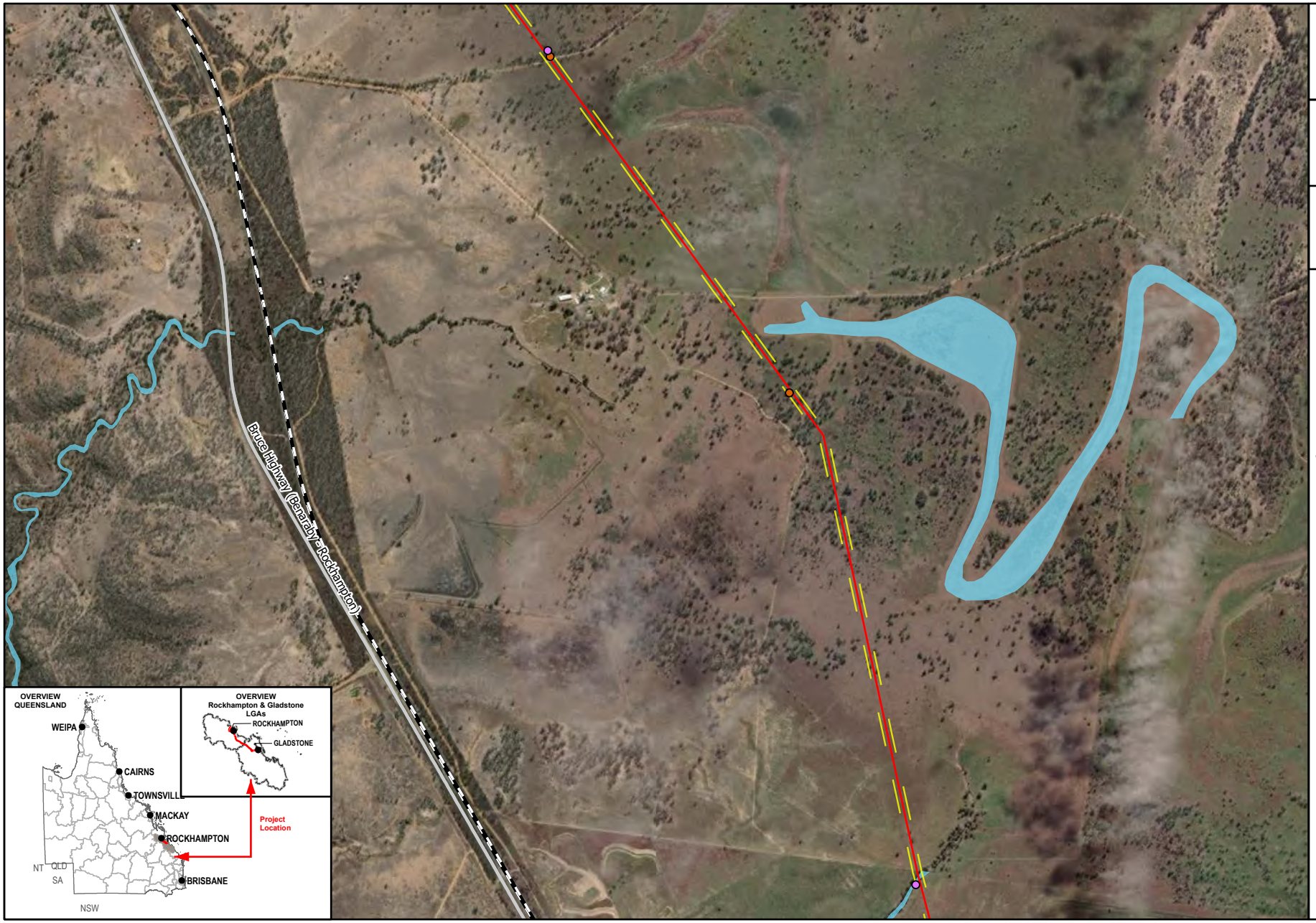
Figure 3-n
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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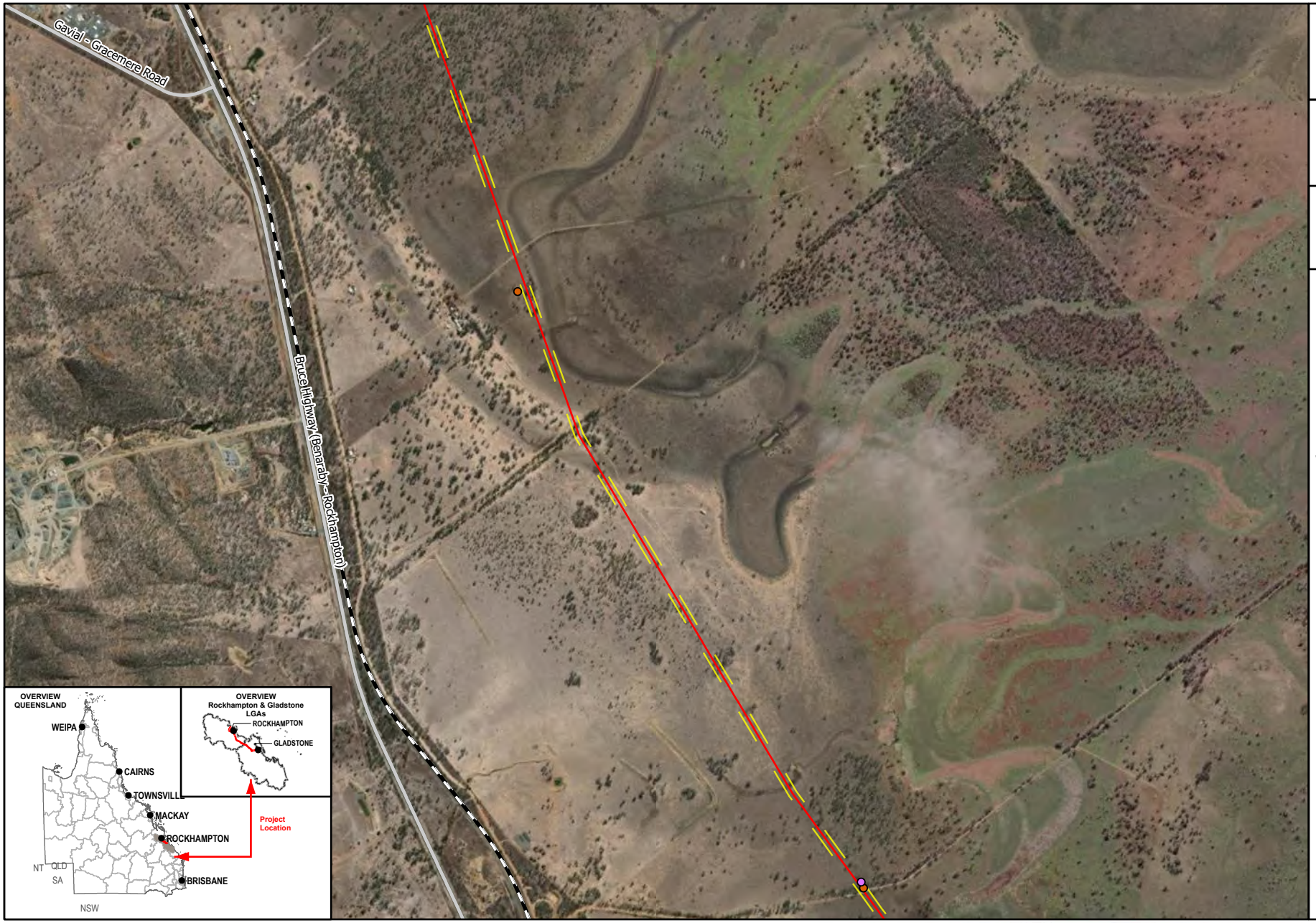
Figure 3-o
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways

Data Sources:
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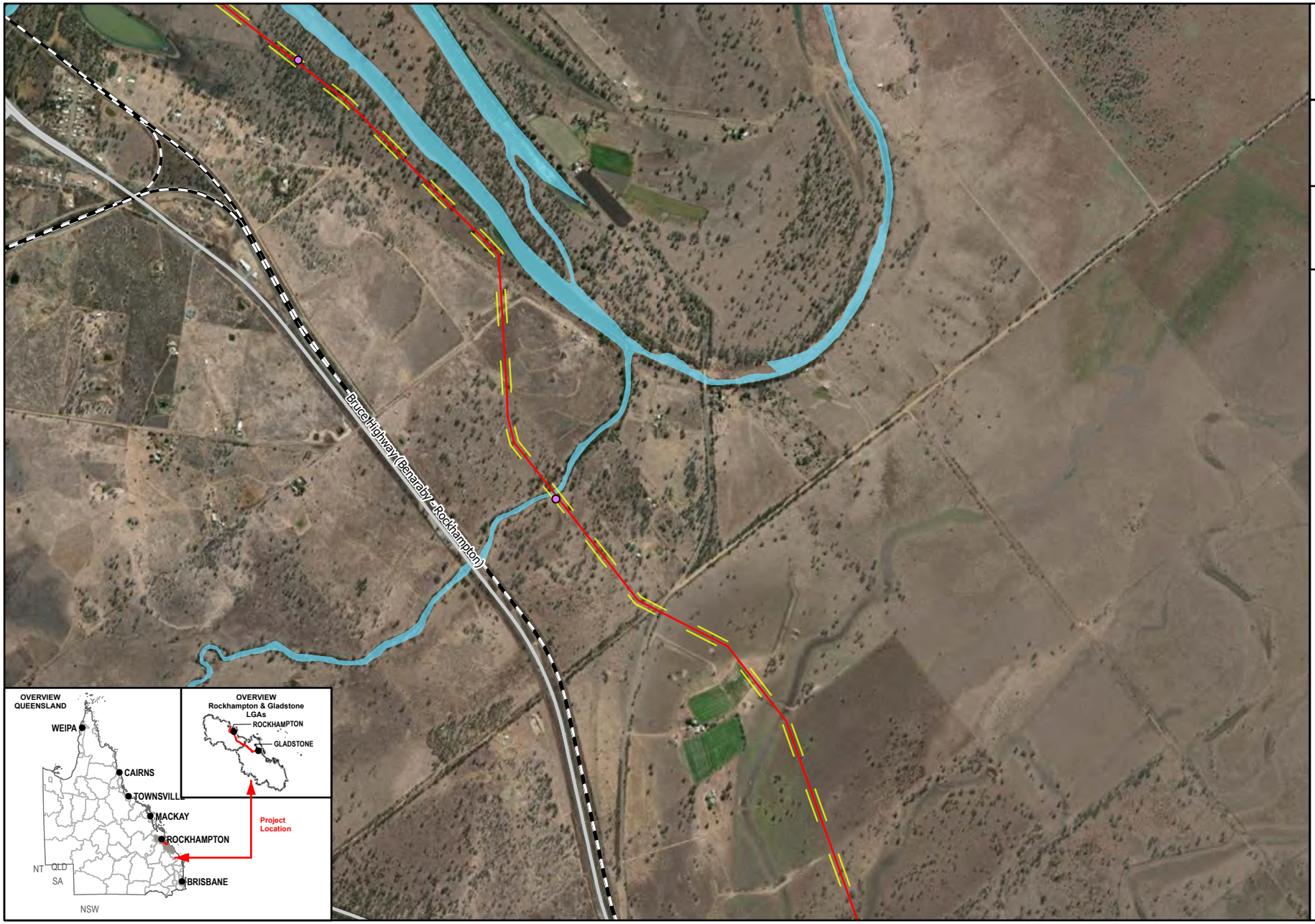
Figure 3-p
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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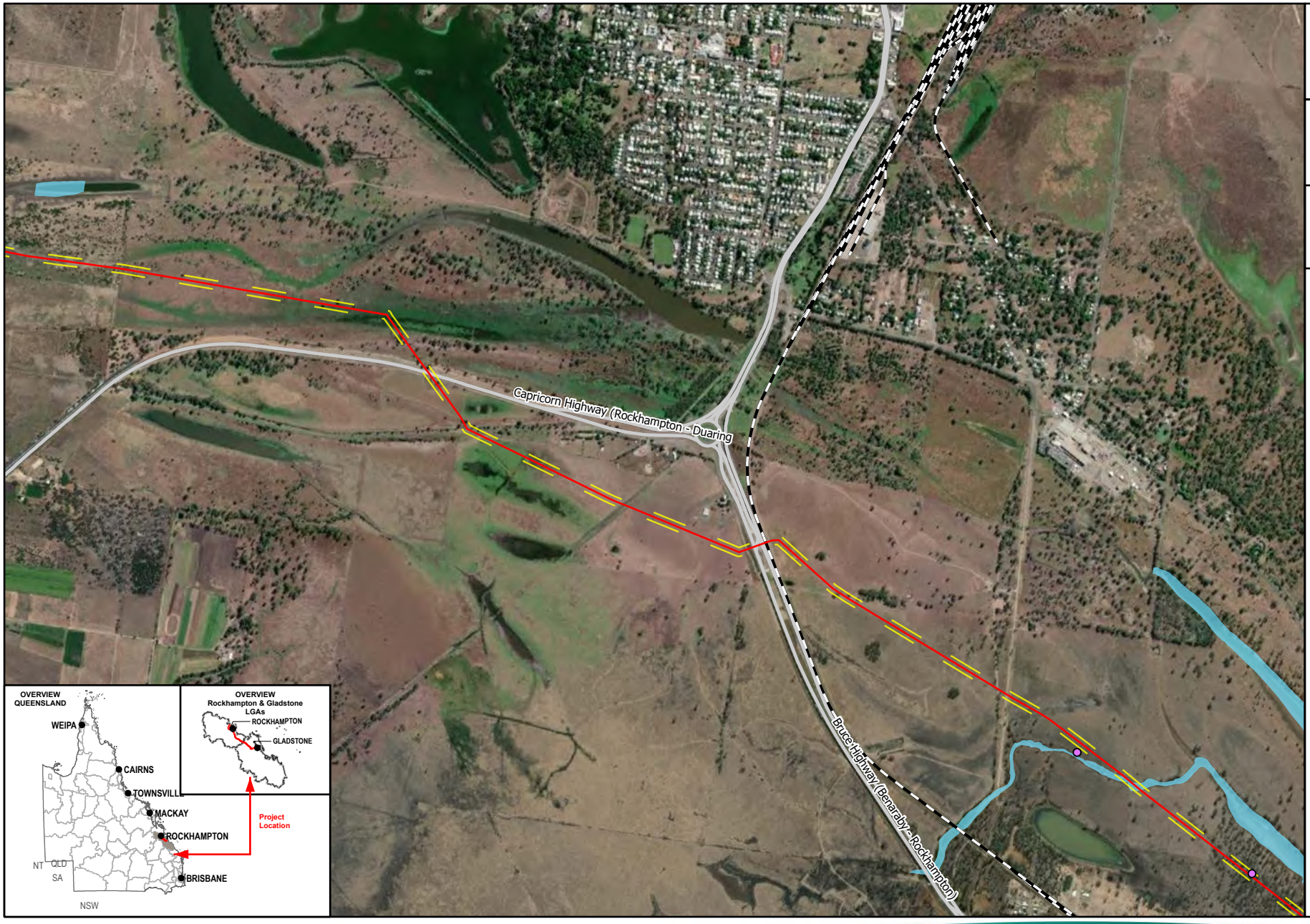
Figure 3-q
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Legend

Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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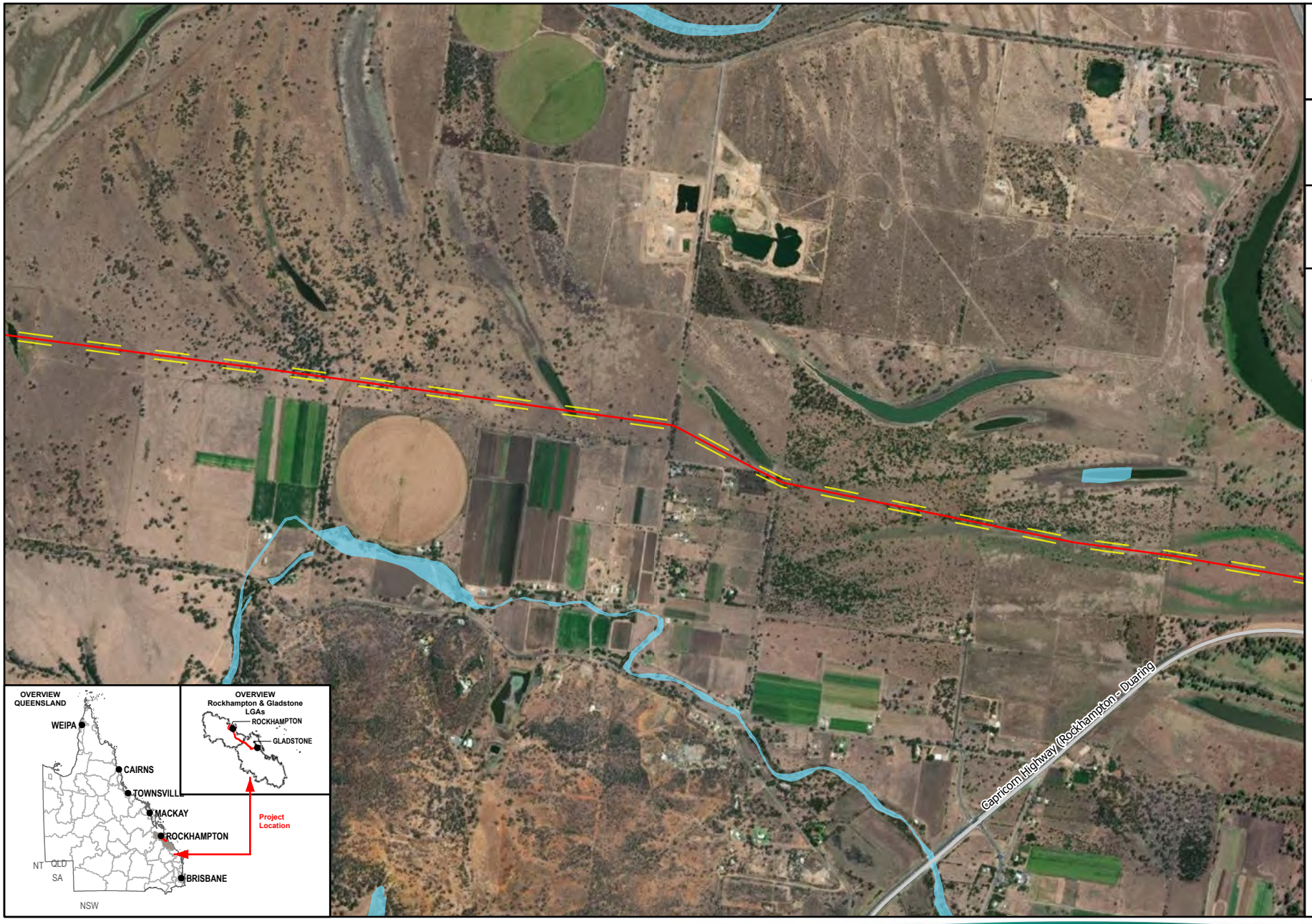
Figure 3-r
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Legend

- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Waterbody

Data Sources:
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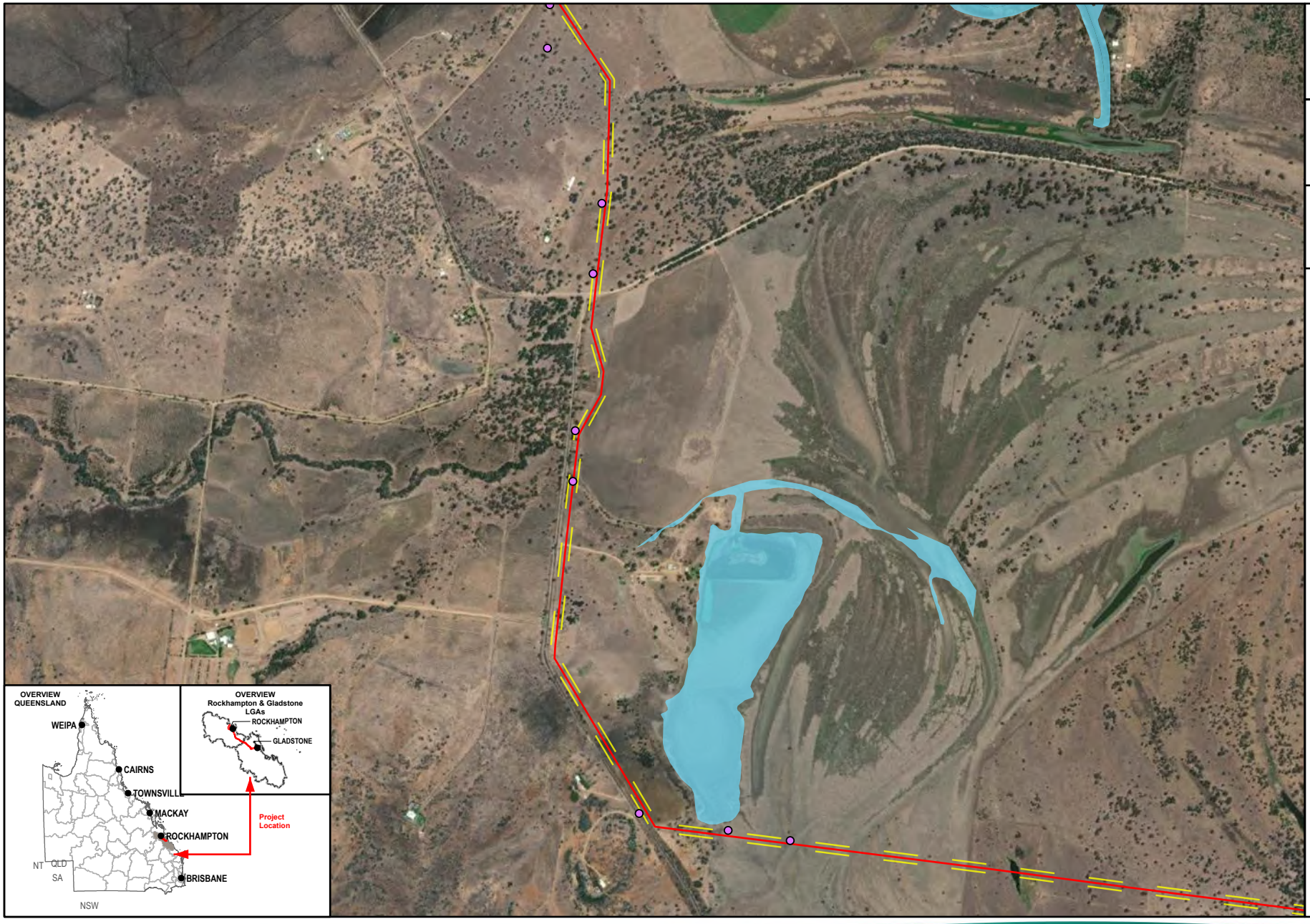
Figure 3-s
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Waterbody

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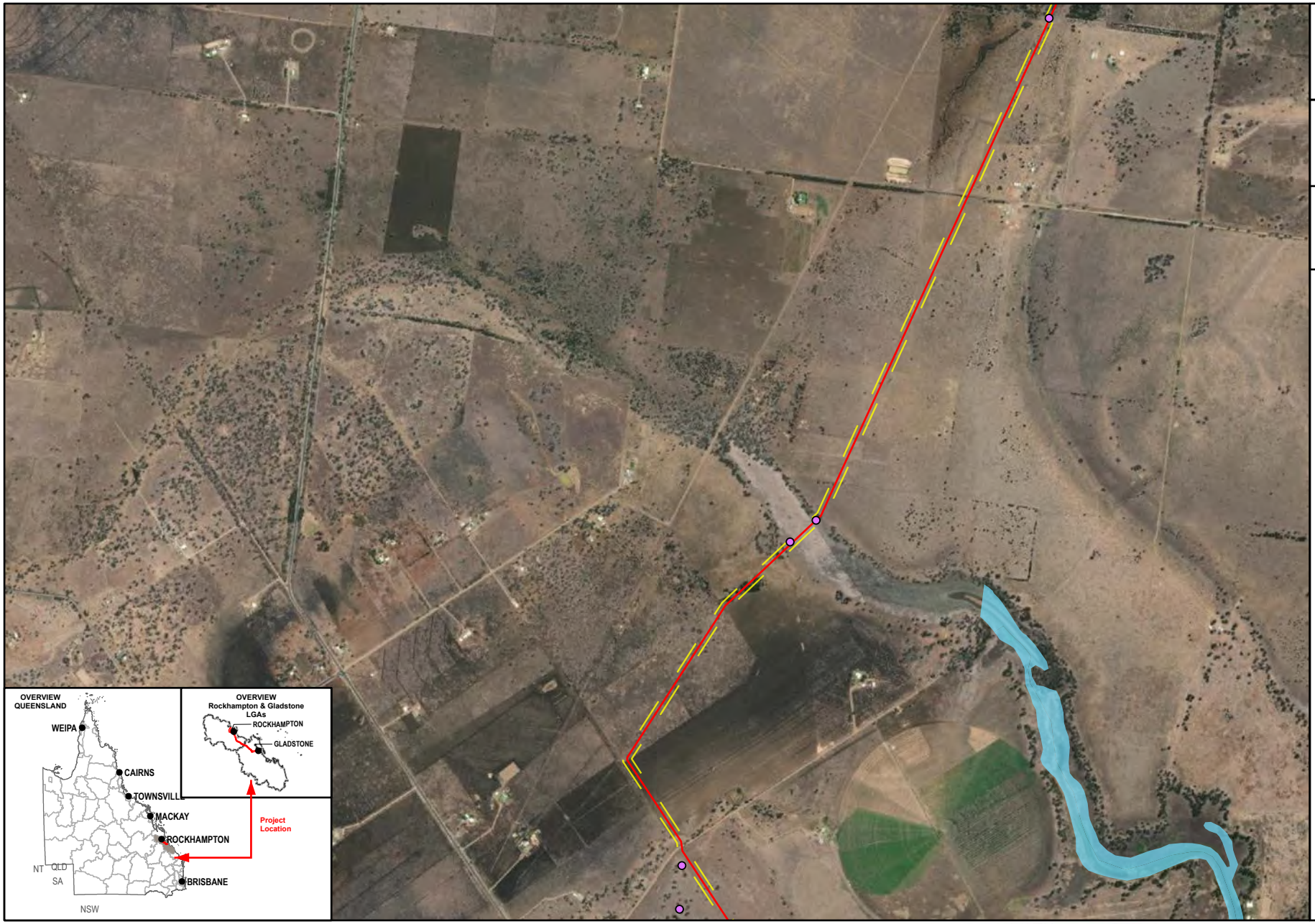
Figure 3-t
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

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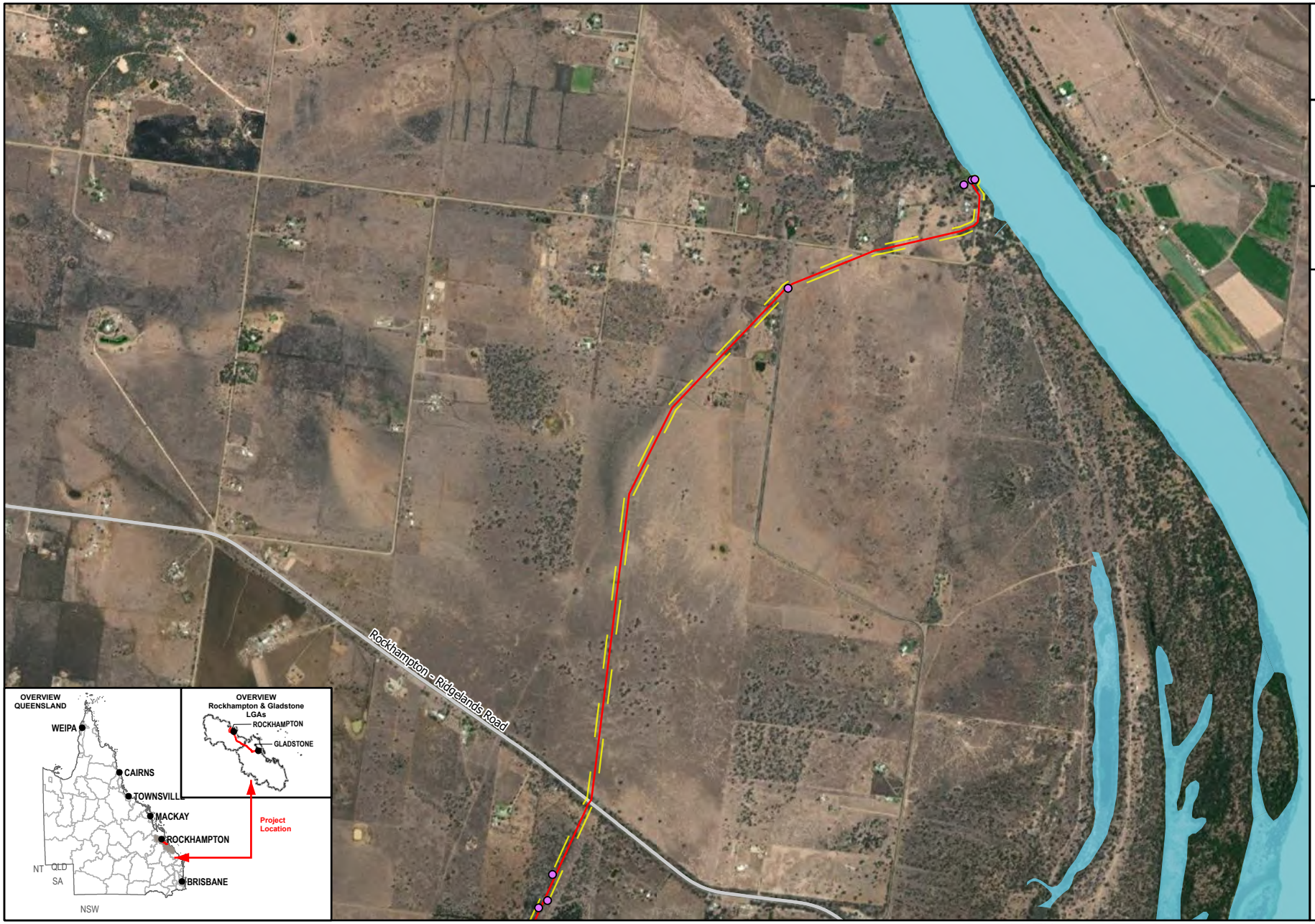
Figure 3-u
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Waterbody

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Figure 3-v
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022

4.1.2 Fauna survey effort

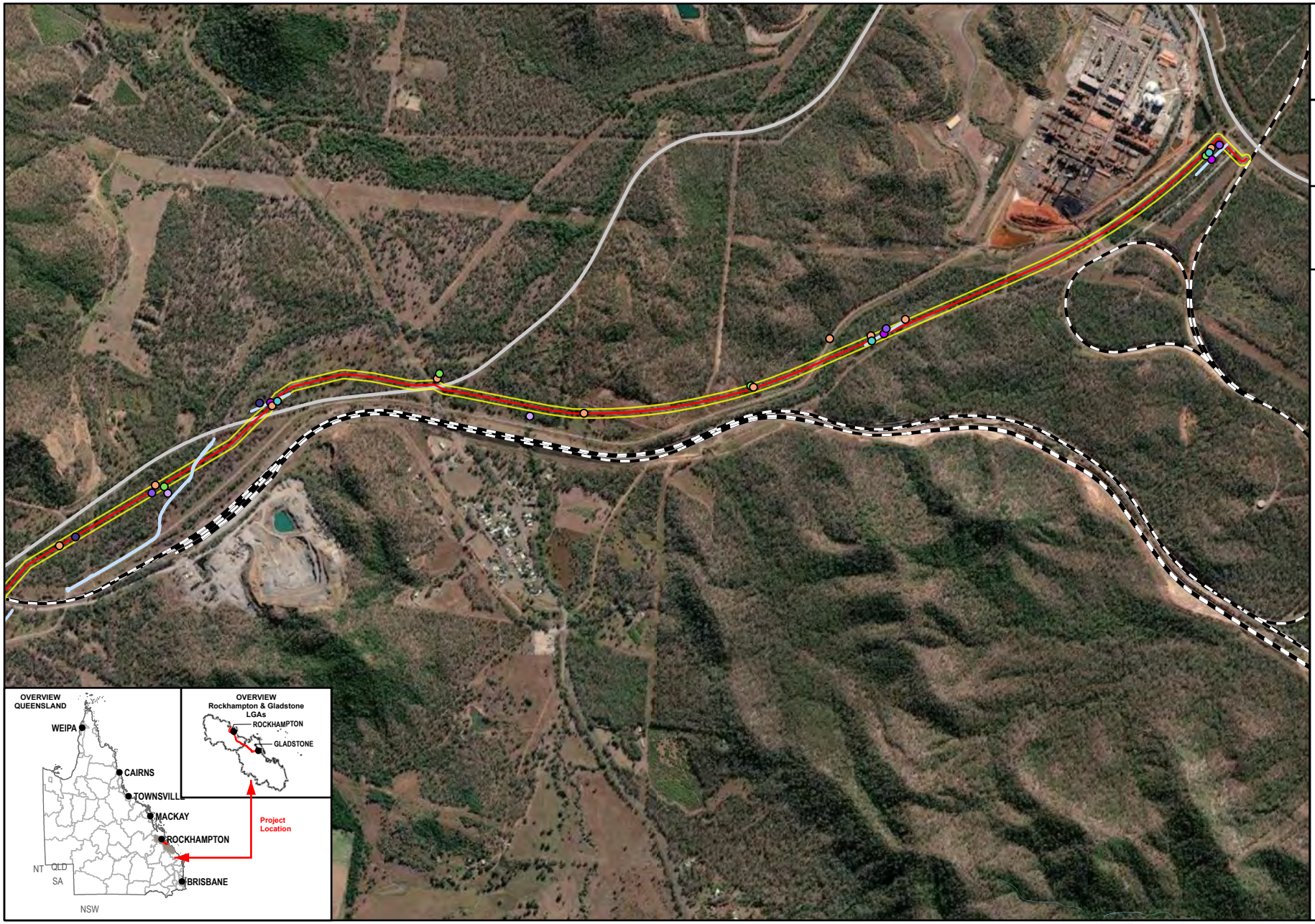
A total of 145 fauna survey sites were assessed during the ecological field surveys (GHDa, 2022) as shown on Figure 4. Fauna assessments included targeted species searches and habitat assessments to determine suitability of habitat types for fauna species of conservation significance. Although the fauna surveys targeted live species, evidence of their presence provides an indication of the likely presence of breeding places.

Habitat assessments involved characterisation of vegetation communities into broad habitat types noting vegetation composition, foraging nesting and refuge resources and key habitat features. The habitat assessments were completed in accordance with the relevant Commonwealth/State guidelines and are outline in Table 1, with further details on targeted conservation significant species provided in Appendix A.

Table 1 Fauna survey methods used within the Project area

Assessment	Survey methods
Habitat assessments	Targeted surveys were conducted at each habitat assessment site. Targeted surveys assessed the suitability of habitat for conservation significant species - with active searches (described above) conducted in areas of high habitat quality. As part of the targeted surveys, conservation significant species reported within the desktop assessment were considered at each habitat assessment site to assist with determining potential habitat mapping. The assessment involved documenting the presence / abundance of habitat features (e.g. hollow-bearing trees, certain vegetation communities, etc.) which are often utilised by multiple conservation significant species.
Bird surveys	Surveys for birds were undertaken through a series of standardised 2 hectares (ha) area searches using the Birds Australia census method. All birds seen and heard calling were recorded. Opportunistic bird surveys were also undertaken throughout the study area, recording birds seen or heard that had not been recorded during standardised 2 ha searches.
Active searches	Active searches were undertaken to detect reptile and amphibian species by actively searching beneath rocks, logs, bark, leaf litter and other suitable microhabitats.
Anabat detectors	Anabat detectors were deployed at six different locations and were left overnight for nine nights to record call from Microchiroptera bat species. The data from the Anabat detectors were analysed by Greg Ford (Balance Environmental) to confirm species present. Greg is a terrestrial ecologist with more than 25 years' experience in ecological

Assessment	Survey methods
	research and is an active member of the Australasian Bat Society
Remote cameras	Remote cameras were baited with a mixture of rolled oats, peanut butter, honey and sardines and set at six locations and were left overnight for a total of nine nights. The remote cameras were used to detect fauna, with particular focus on threatened species.
Large tree density assessment	Suitable greater glider habitat assessments were undertaken in accordance with the Guide to greater glider habitat in Queensland (Eyra, et al., 2022). Large tree counts were undertaken to assess the density of large trees within an area. This involved measuring the diameter at breast height (DBH) of trees within a 1 ha plot. Large tree benchmarks were determined based on the Brigalow Belt bioregion, as being greater than 46.5 ± 7.5 centimeters (cm) DBH, with a density of more than 20 large trees.
Hollow-bearing tree counts	Hollow-bearing tree count transects (200 m x 50 m) were undertaken within suitable glider habitat to assist in the mapping of predicted habitat for the species. Hollow size and number of total hollows within the transect were recorded.
Nocturnal searches and spotlighting	Nocturnal active searches and spotlighting surveys involved active searches with head torches Surveys were conducted in the most suitable woodland environments for nocturnal species, where access and terrain permitted. Spotlighting was undertaken over four nights, with 2 to 3 hours spent spotlighting each night.
Opportunistic searches	All incidental records of fauna observed during the ecological field surveys were recorded. Bones, feather, skulls, sloughed skins, faecal pellets, tracks, burrows, scratches, and other wildlife traces were also recorded.



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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Hollow-bearing Tree Counts
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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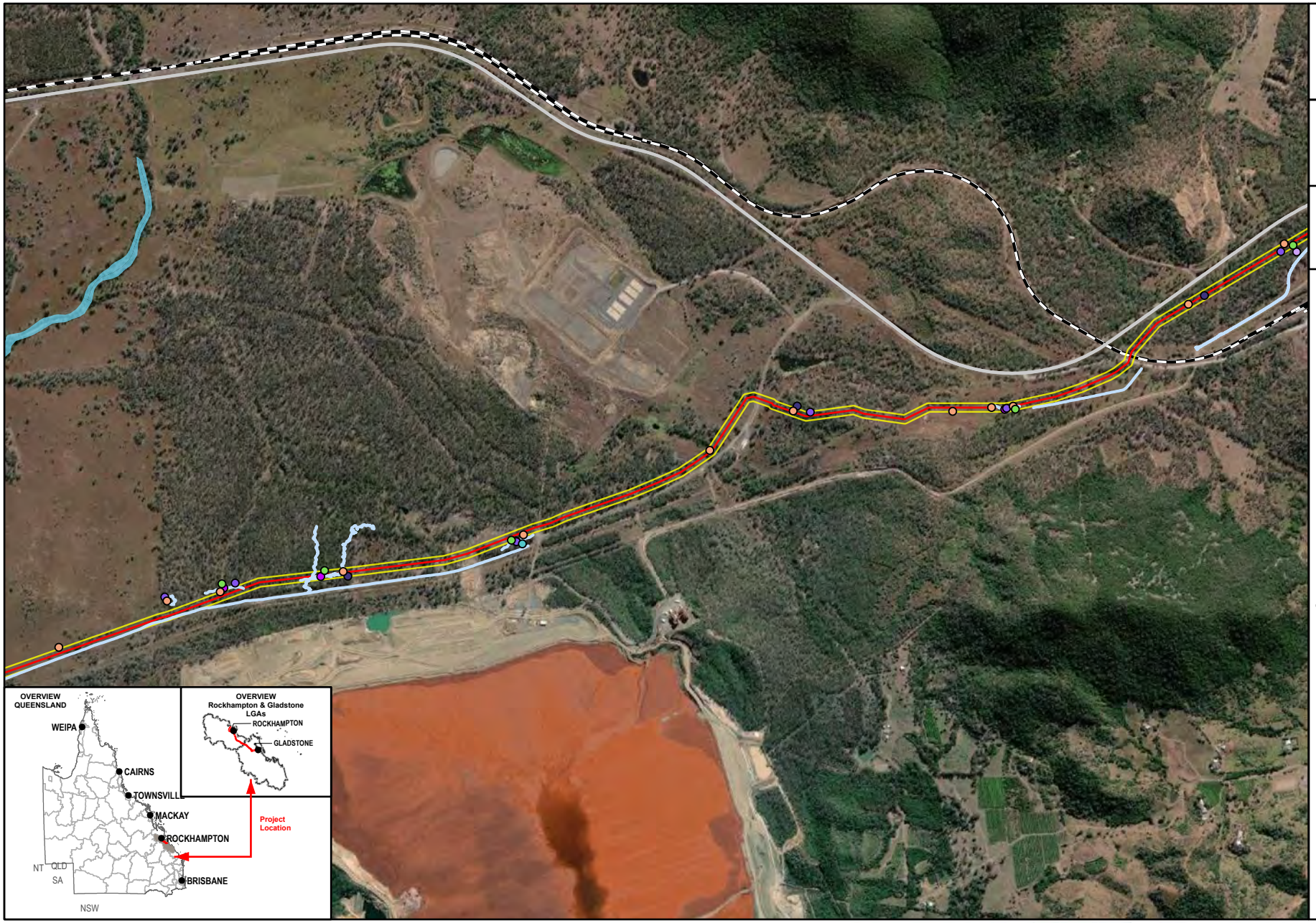
Figure 4-a
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Hollow-bearing Tree Counts
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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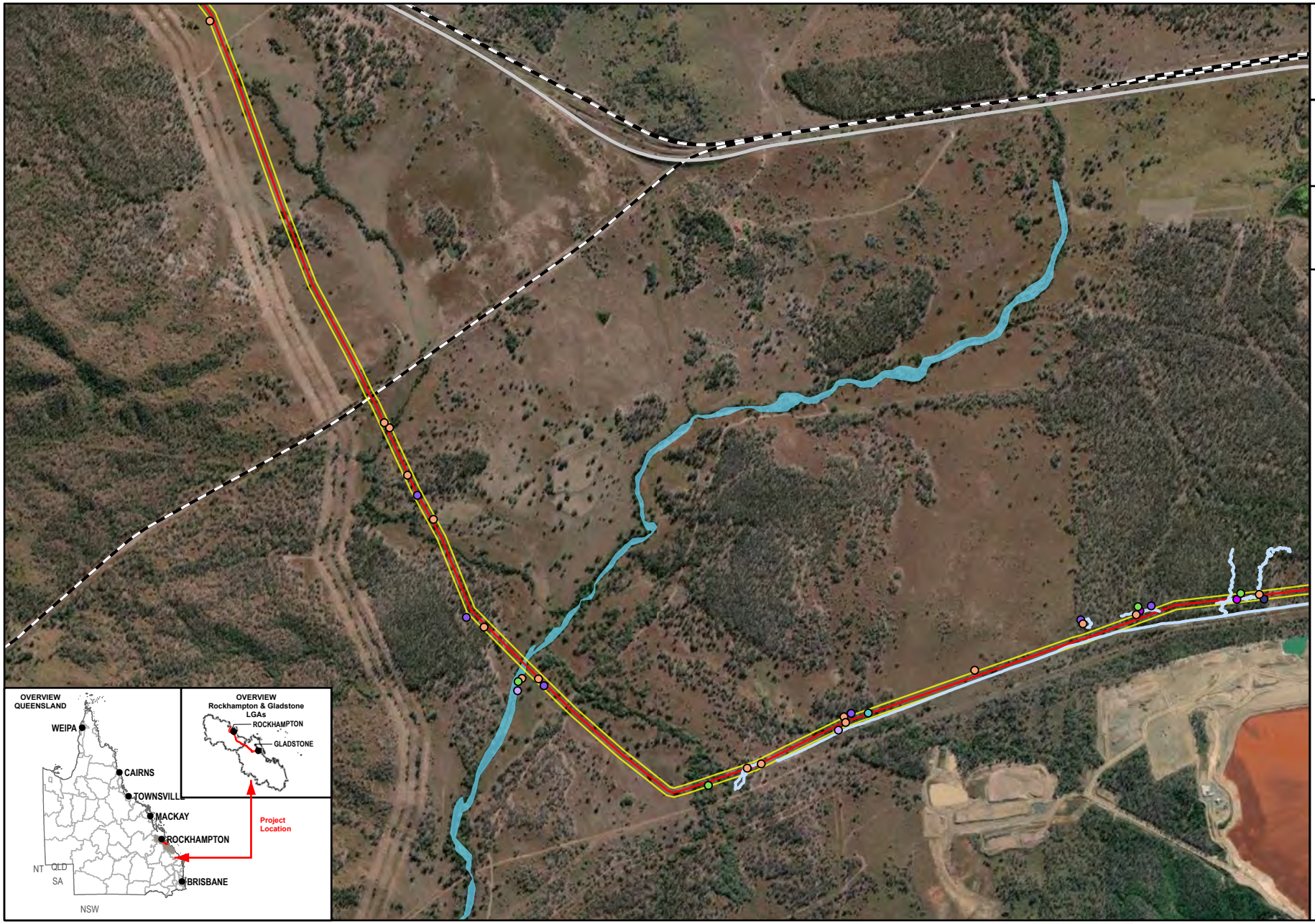
Figure 4-b
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Hollow-bearing Tree Counts
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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Figure 4-c
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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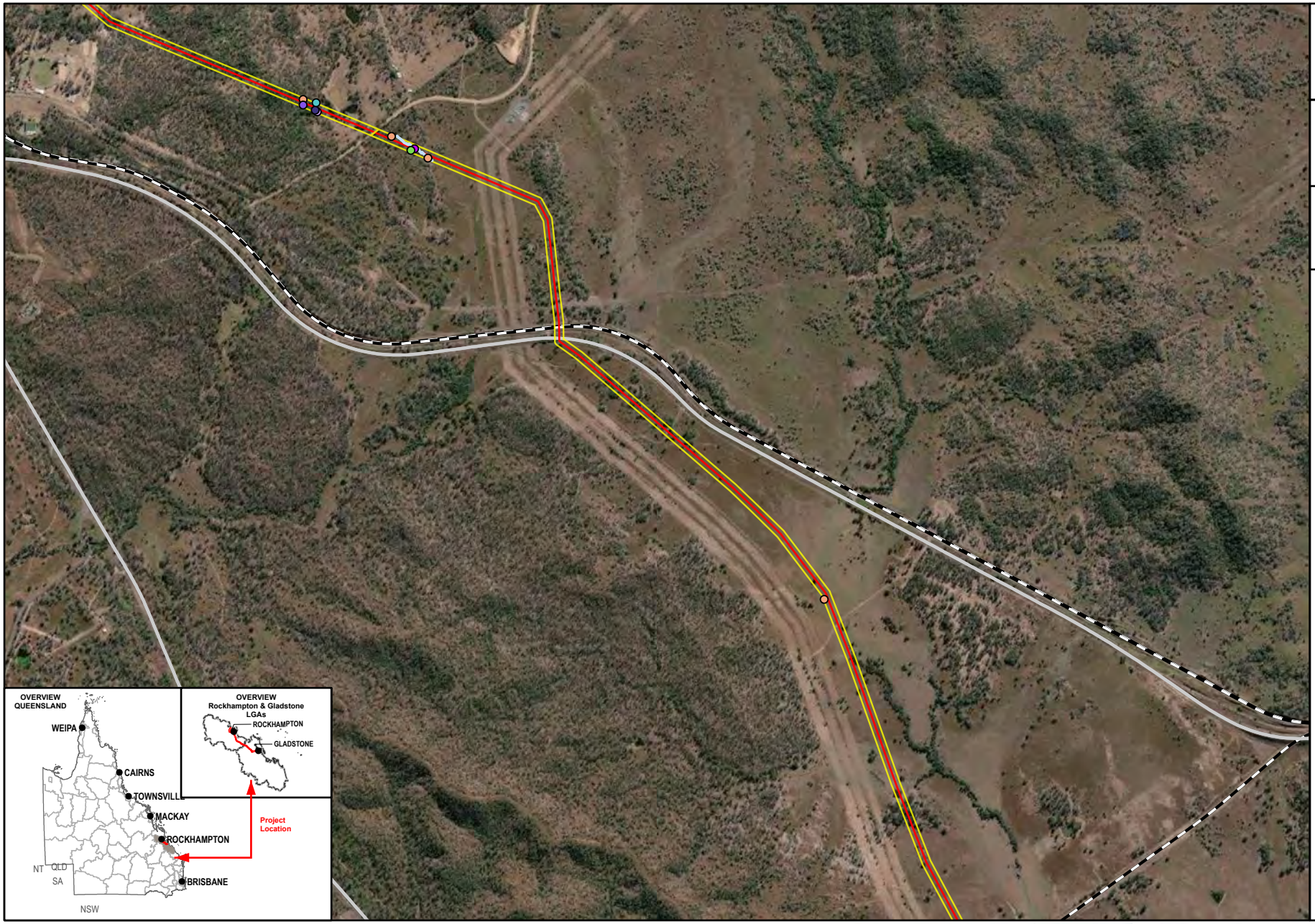

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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Hollow-bearing Tree Counts
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways

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Figure 4-d
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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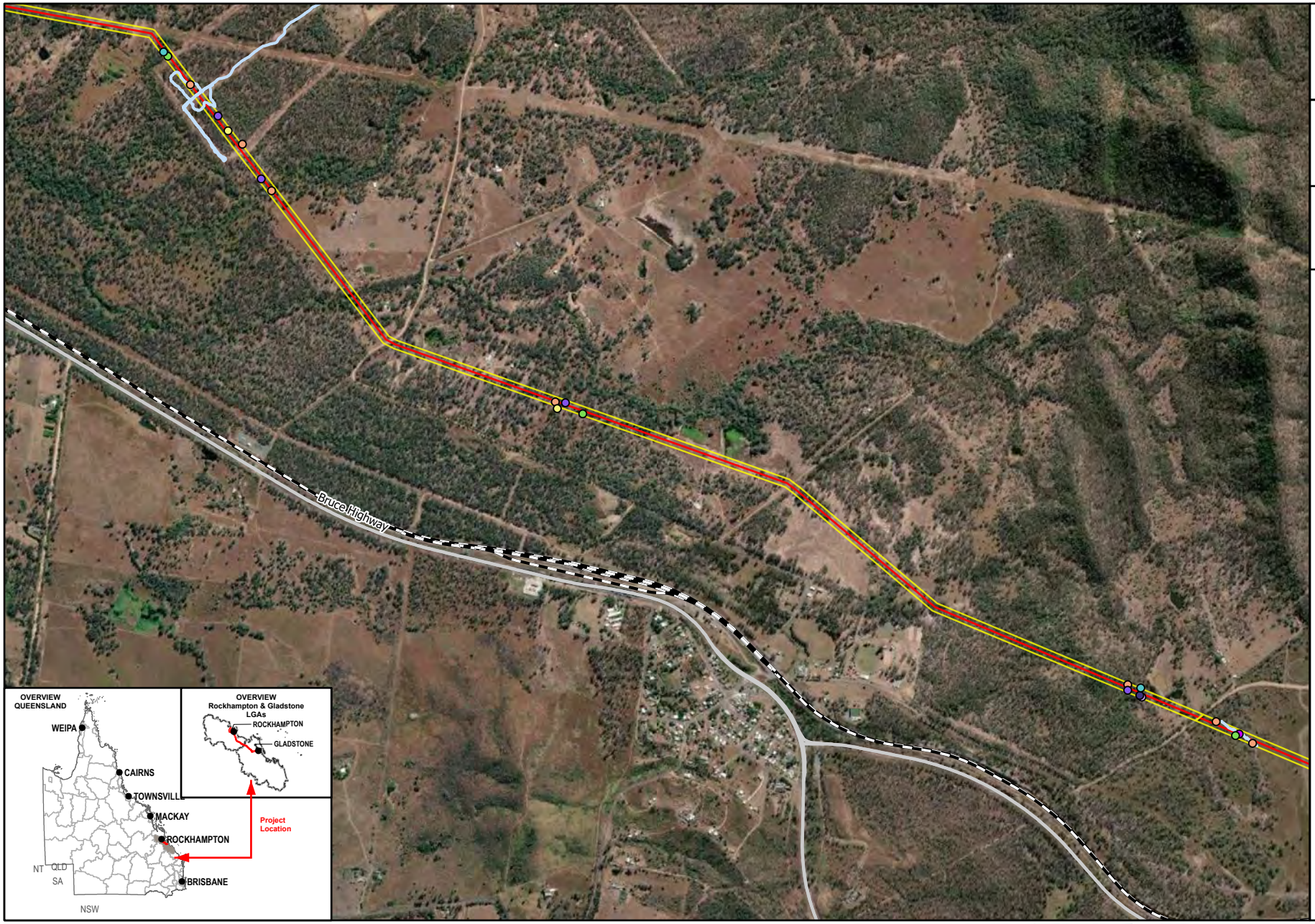

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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Large Tree Density Assessment
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Hollow-bearing Tree Counts
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways

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Figure 4-e
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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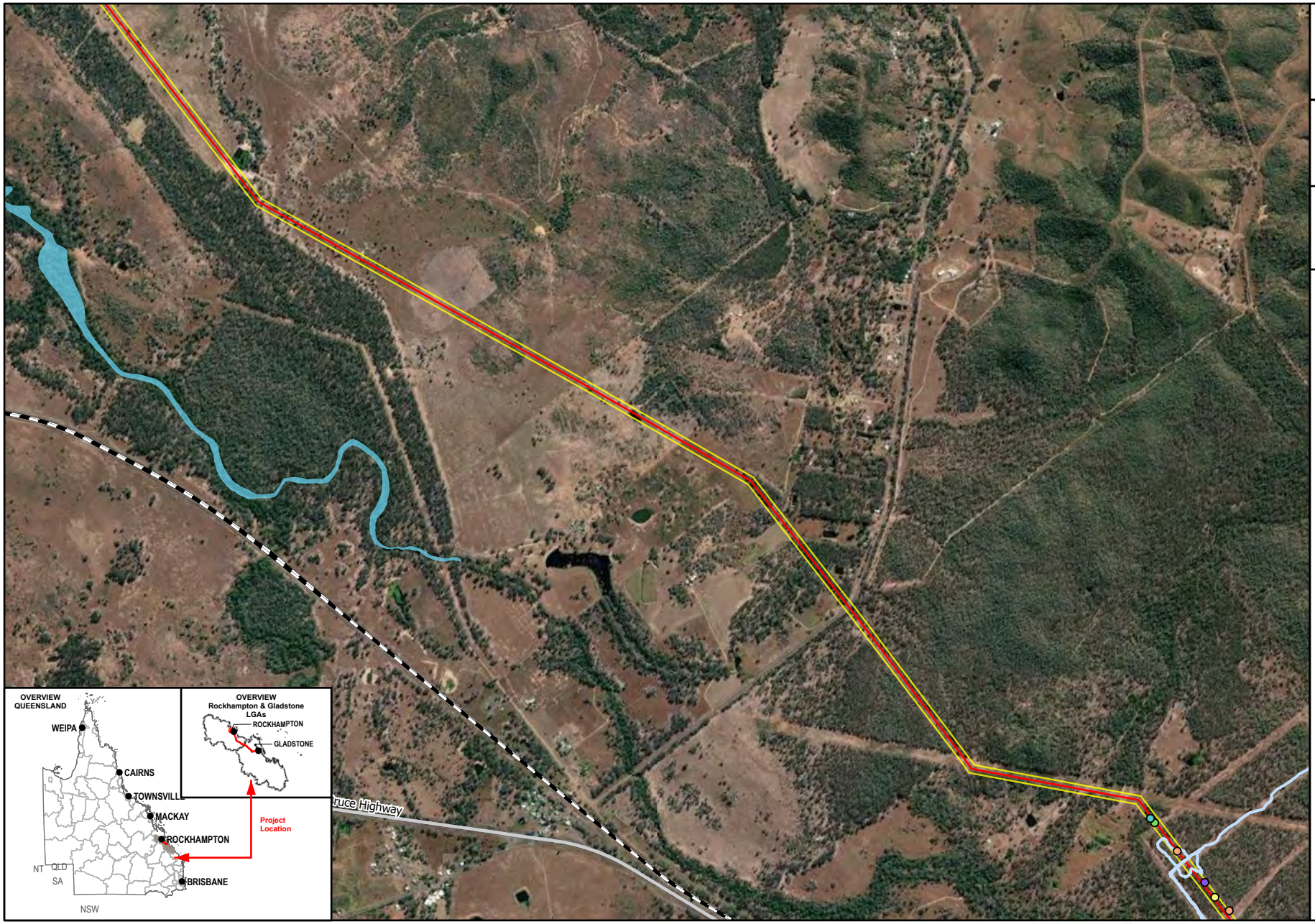

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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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Figure 4-f
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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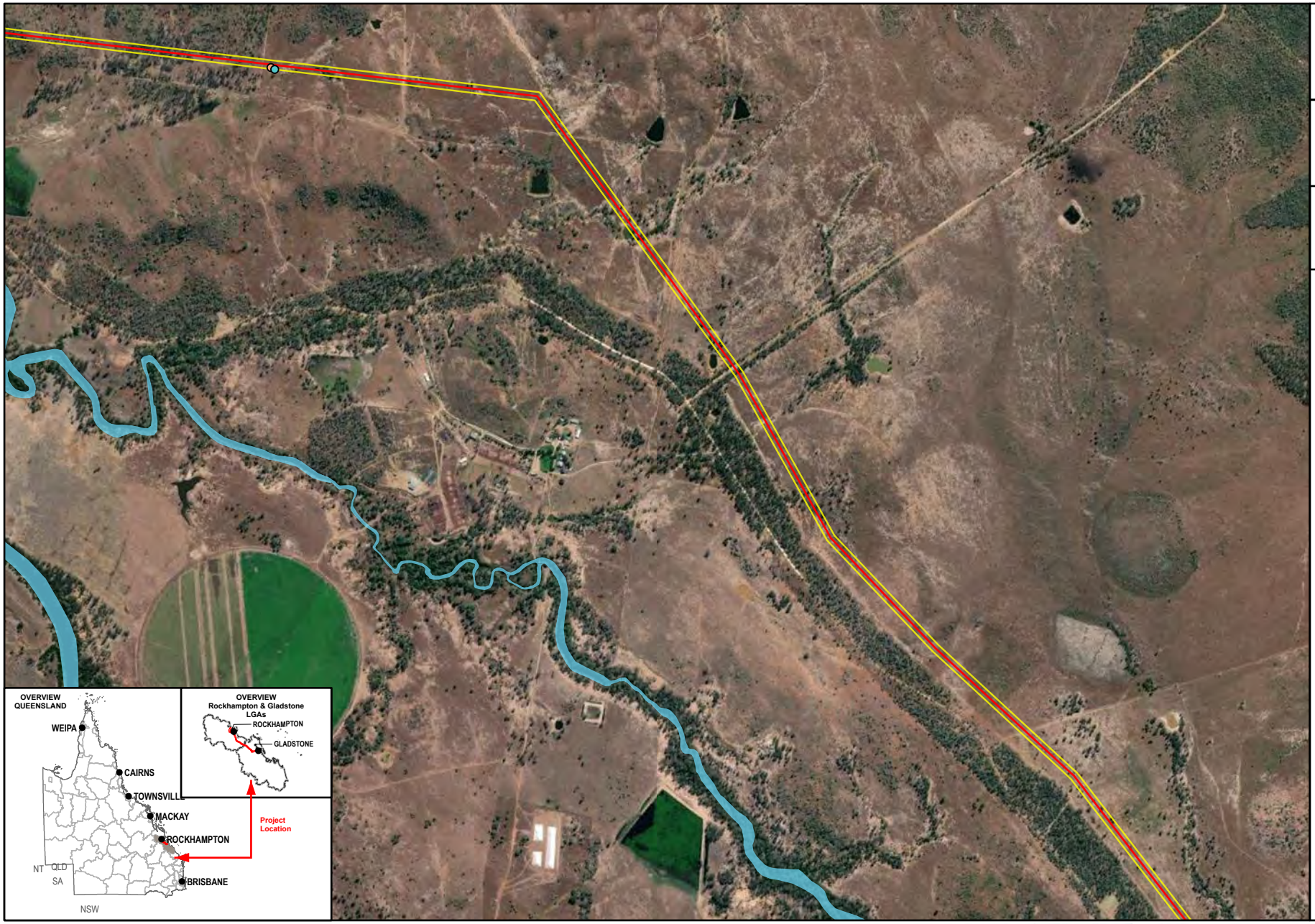

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Terrestrial Fauna Assessment Site

- Active Searches
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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Figure 4-g
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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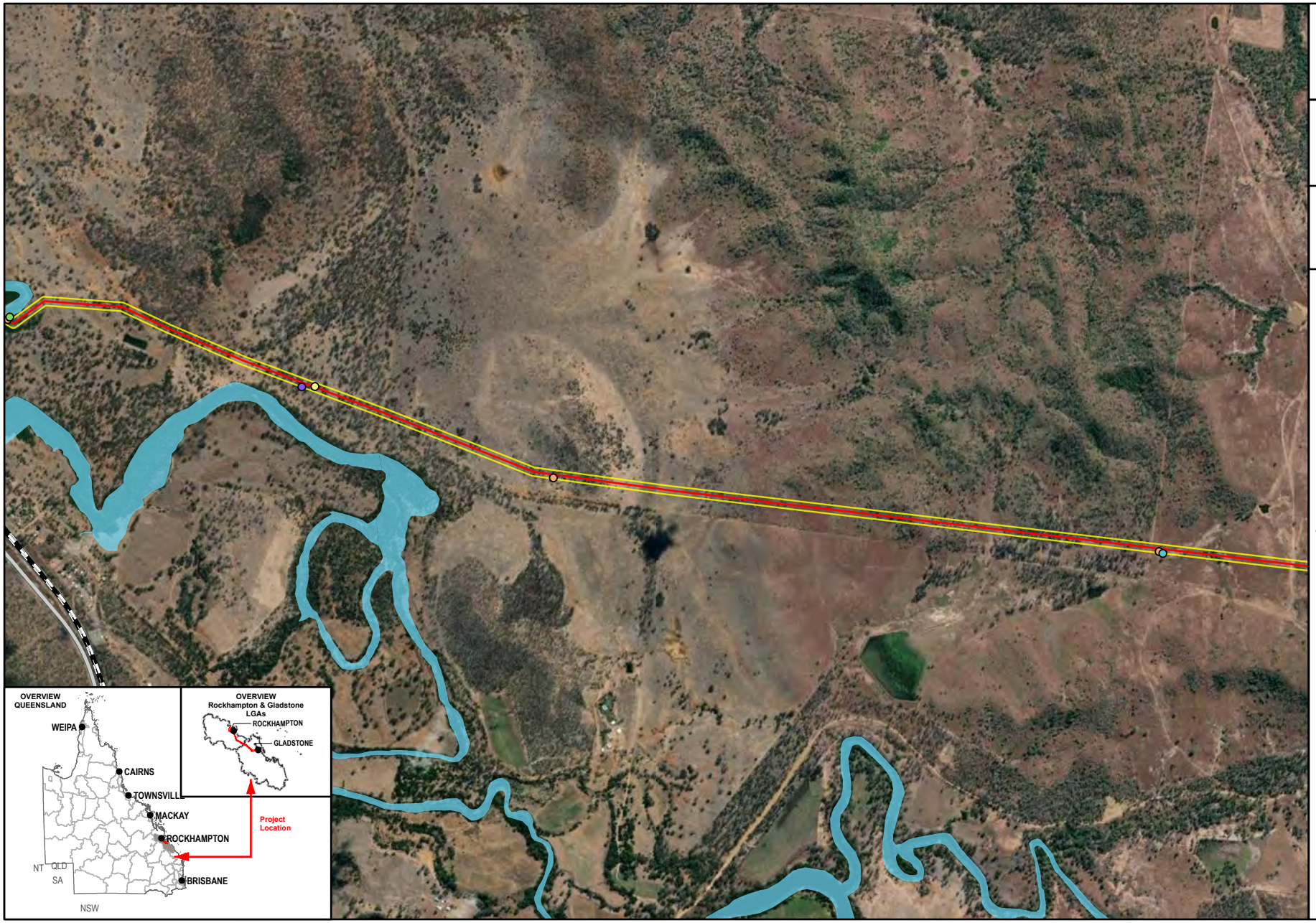

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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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Figure 4-h
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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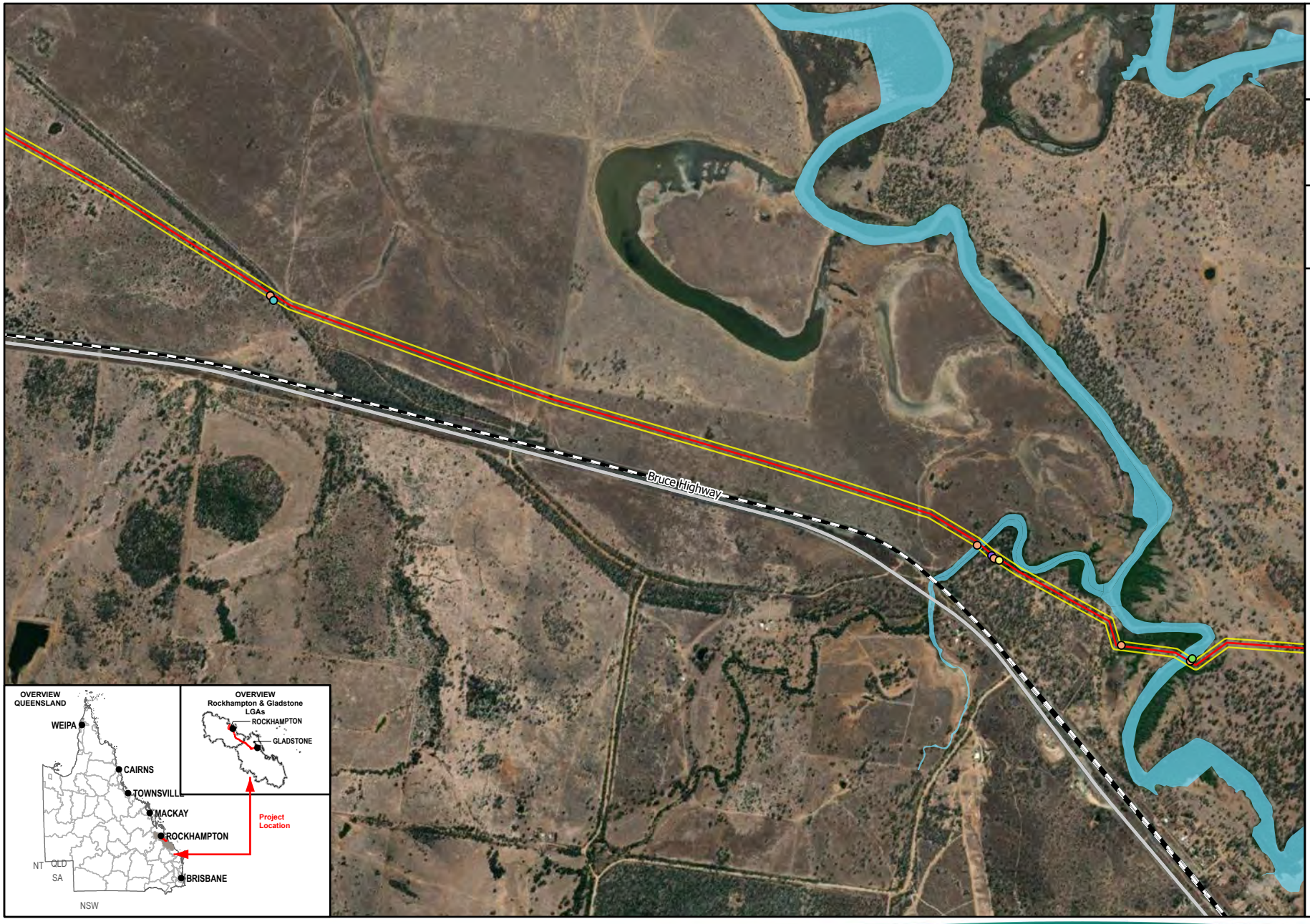

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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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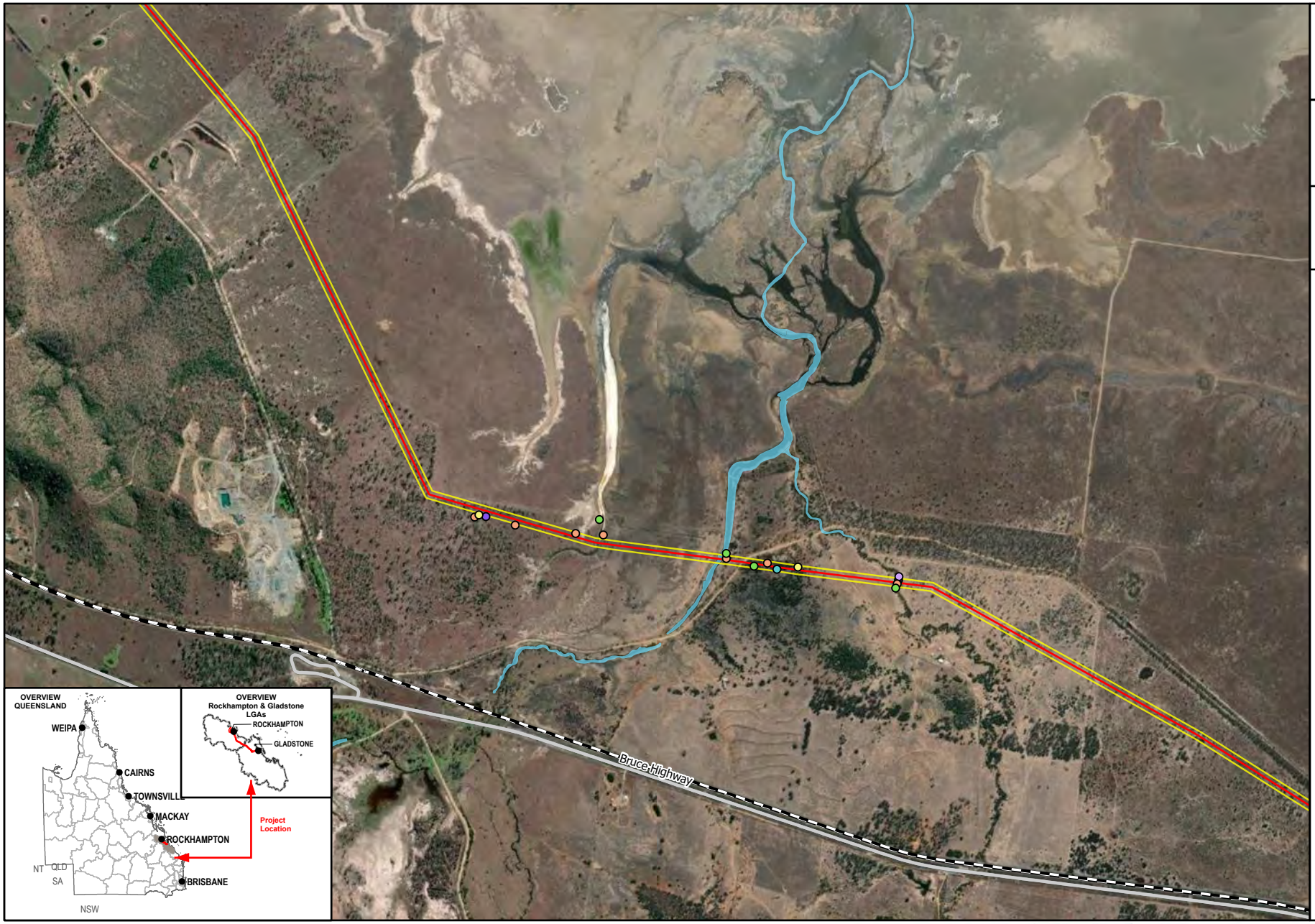
Figure 4-i
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Large Tree Density Assessment
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
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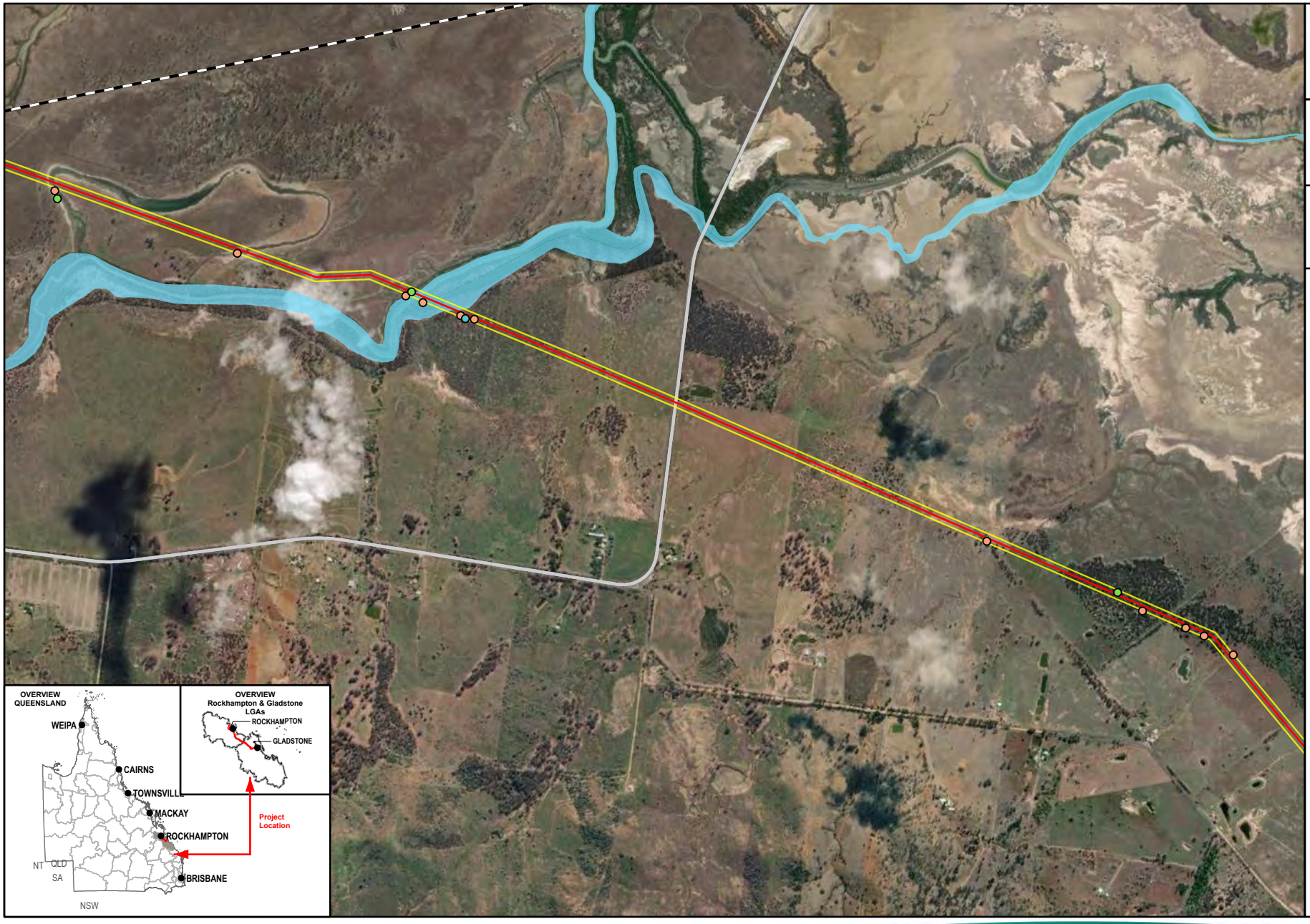
Figure 4-j
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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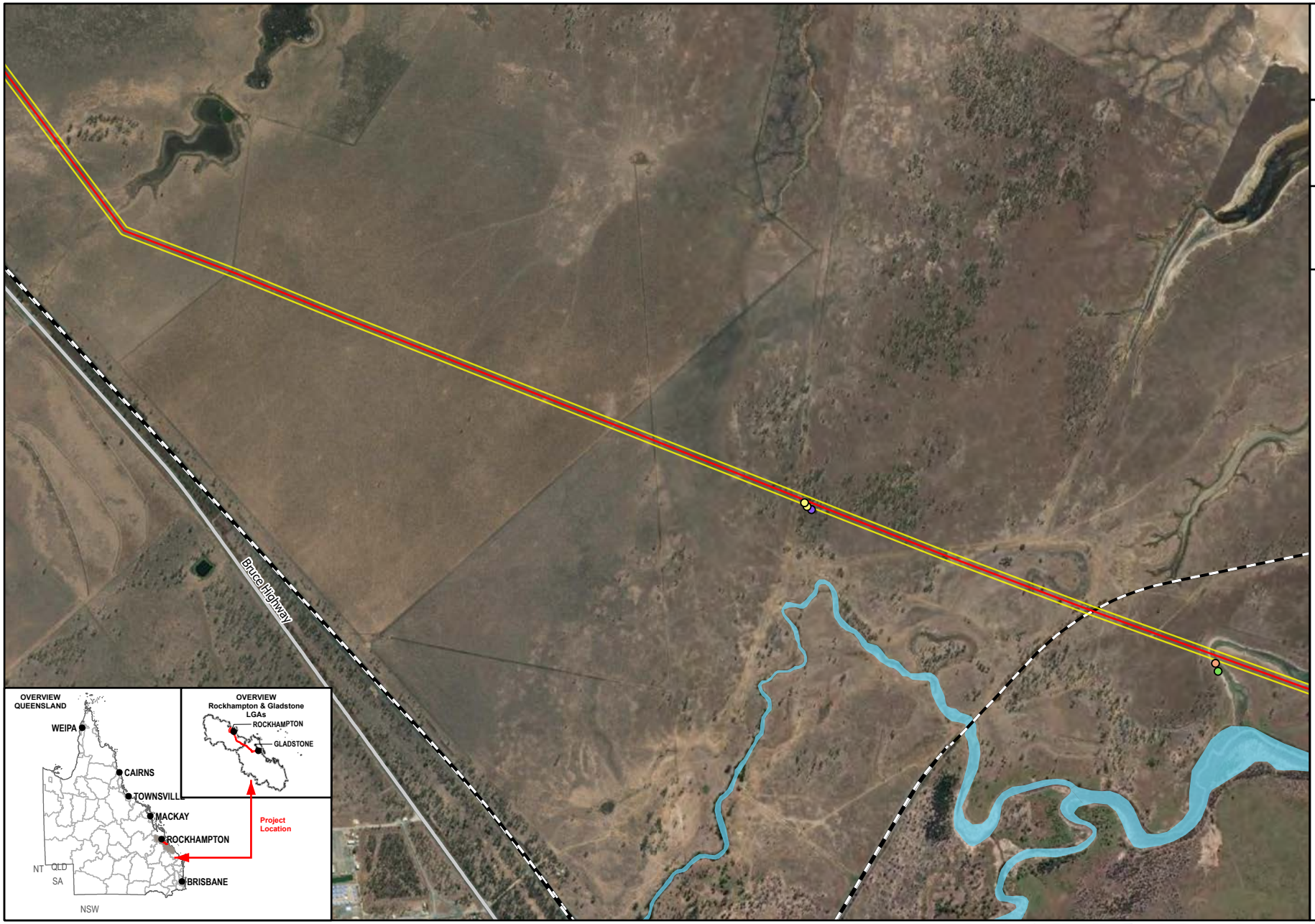
Figure 4-k
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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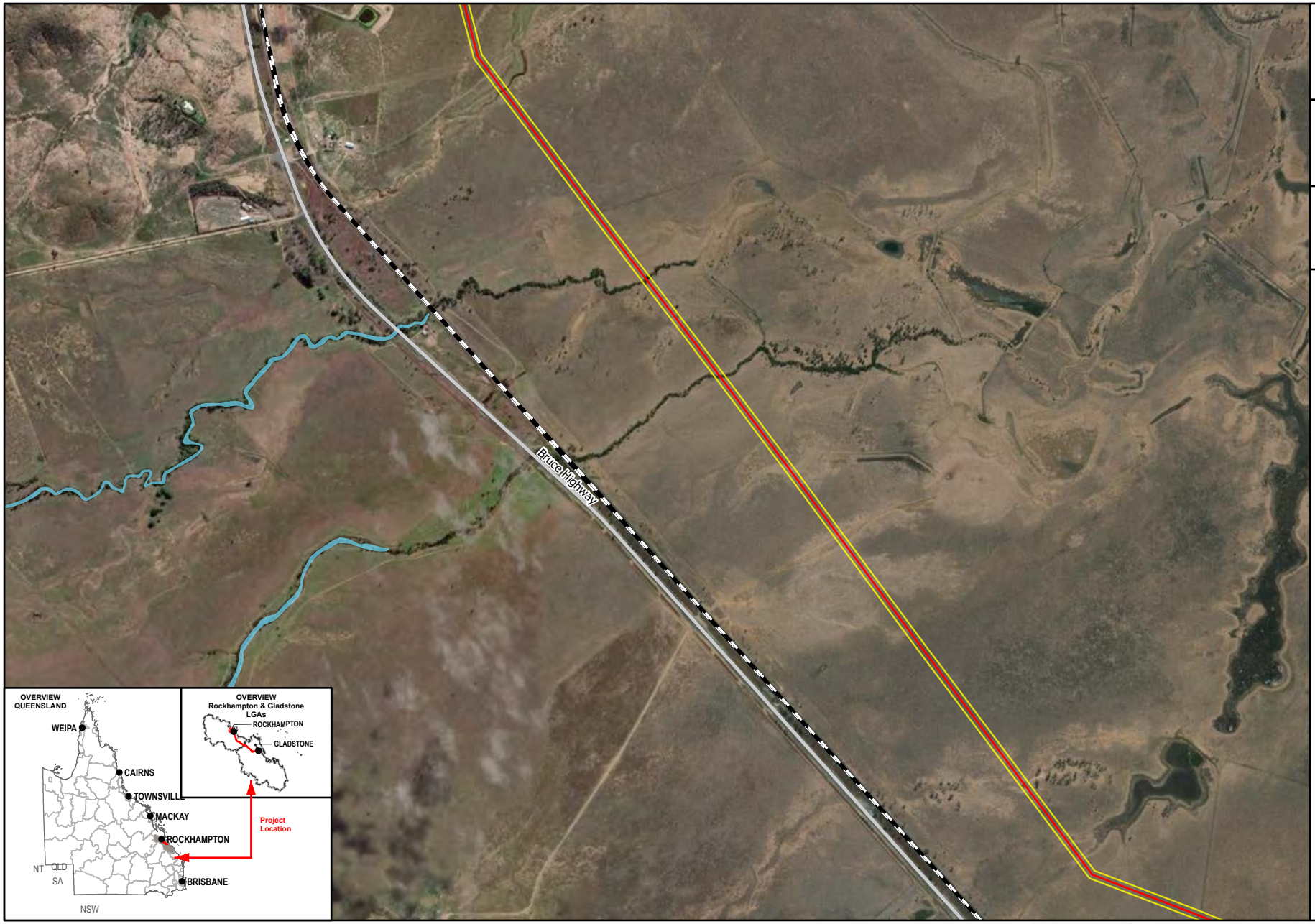
Figure 4-I
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Legend

- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
(Datum GDA2020)

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Figure 4-m
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000-G-MAP-2402 Version:2 Date: 3/08/2022

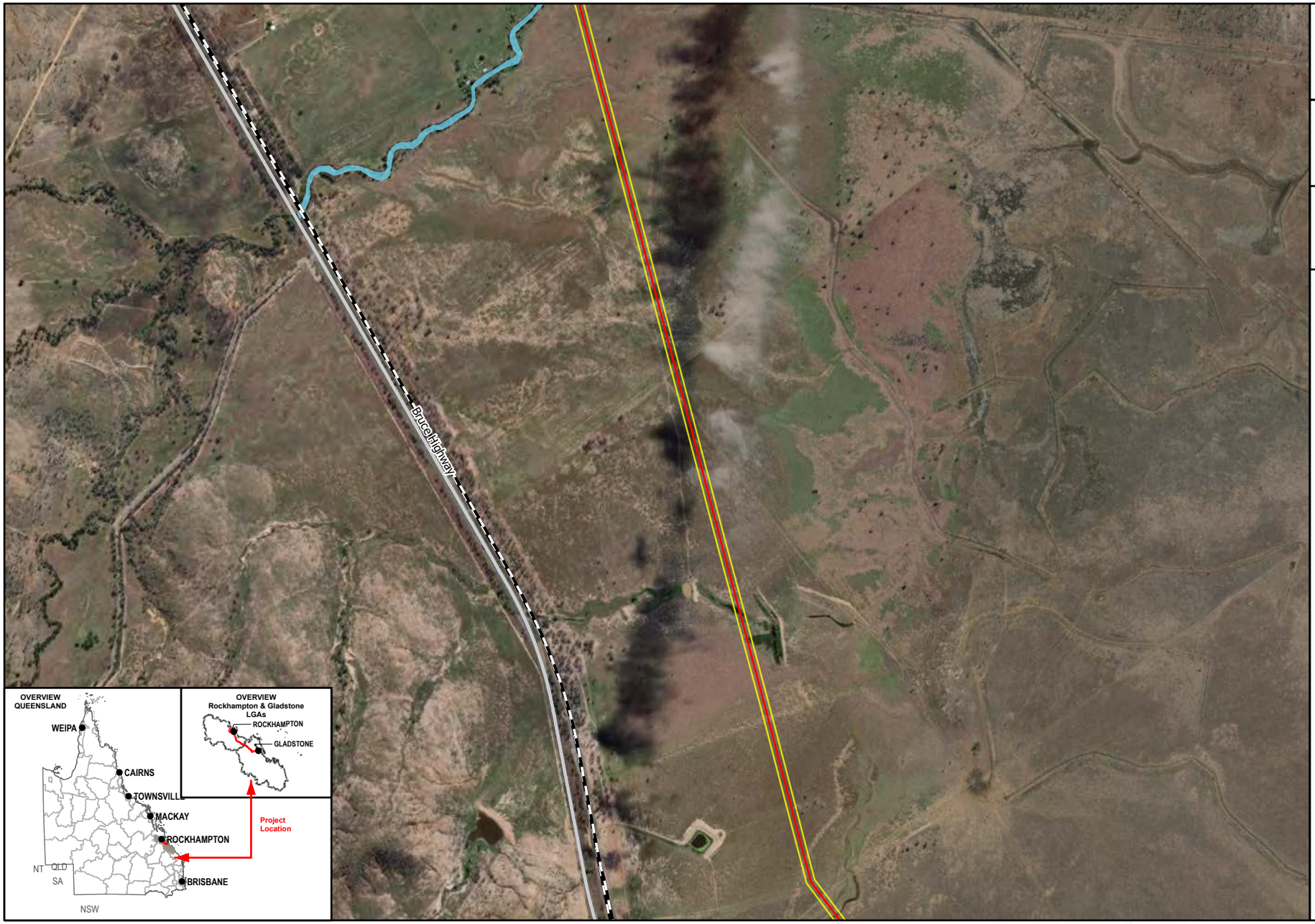

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Figure 4-n
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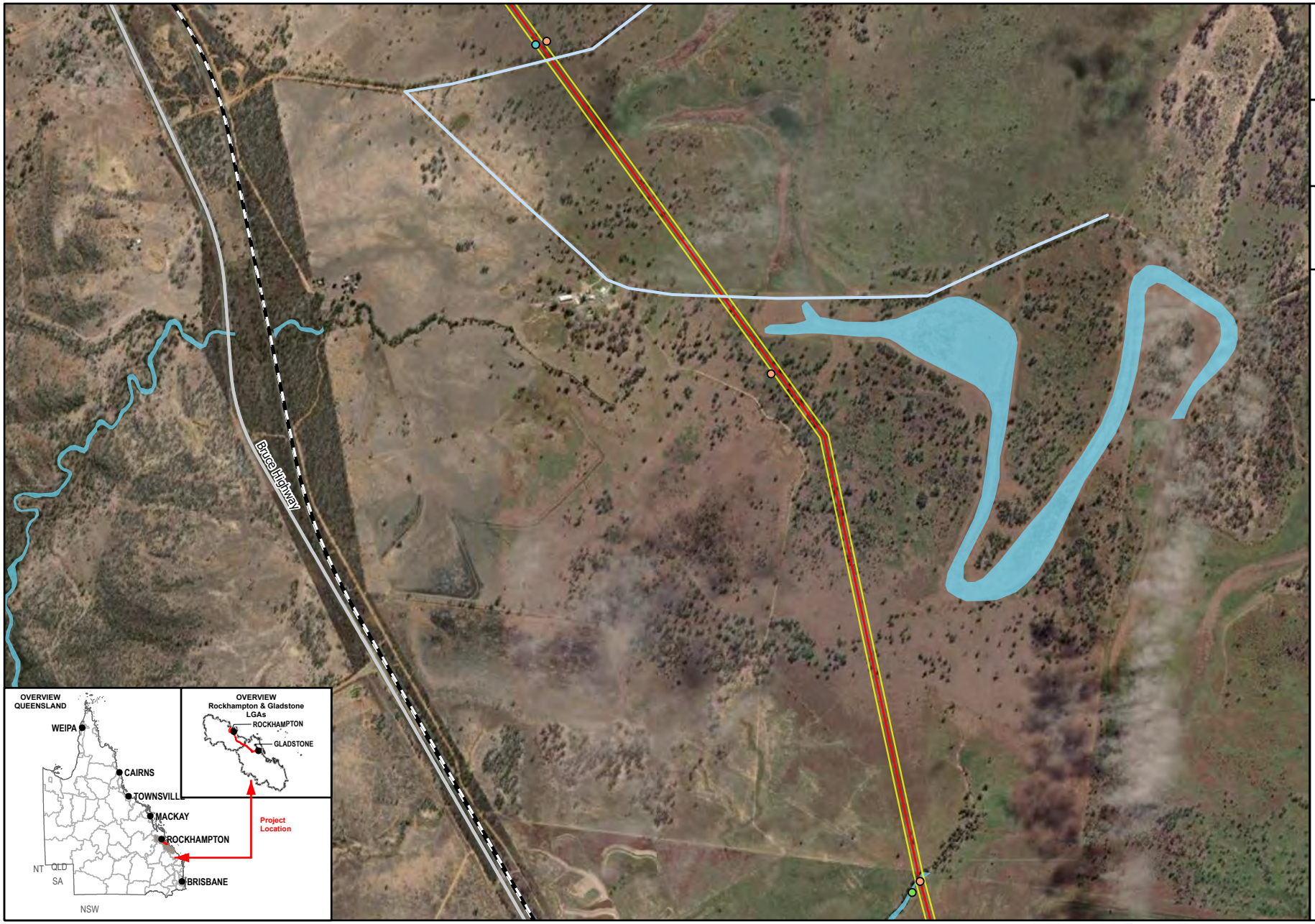

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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Terrestrial Fauna Assessment Site
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
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Figure 4-o
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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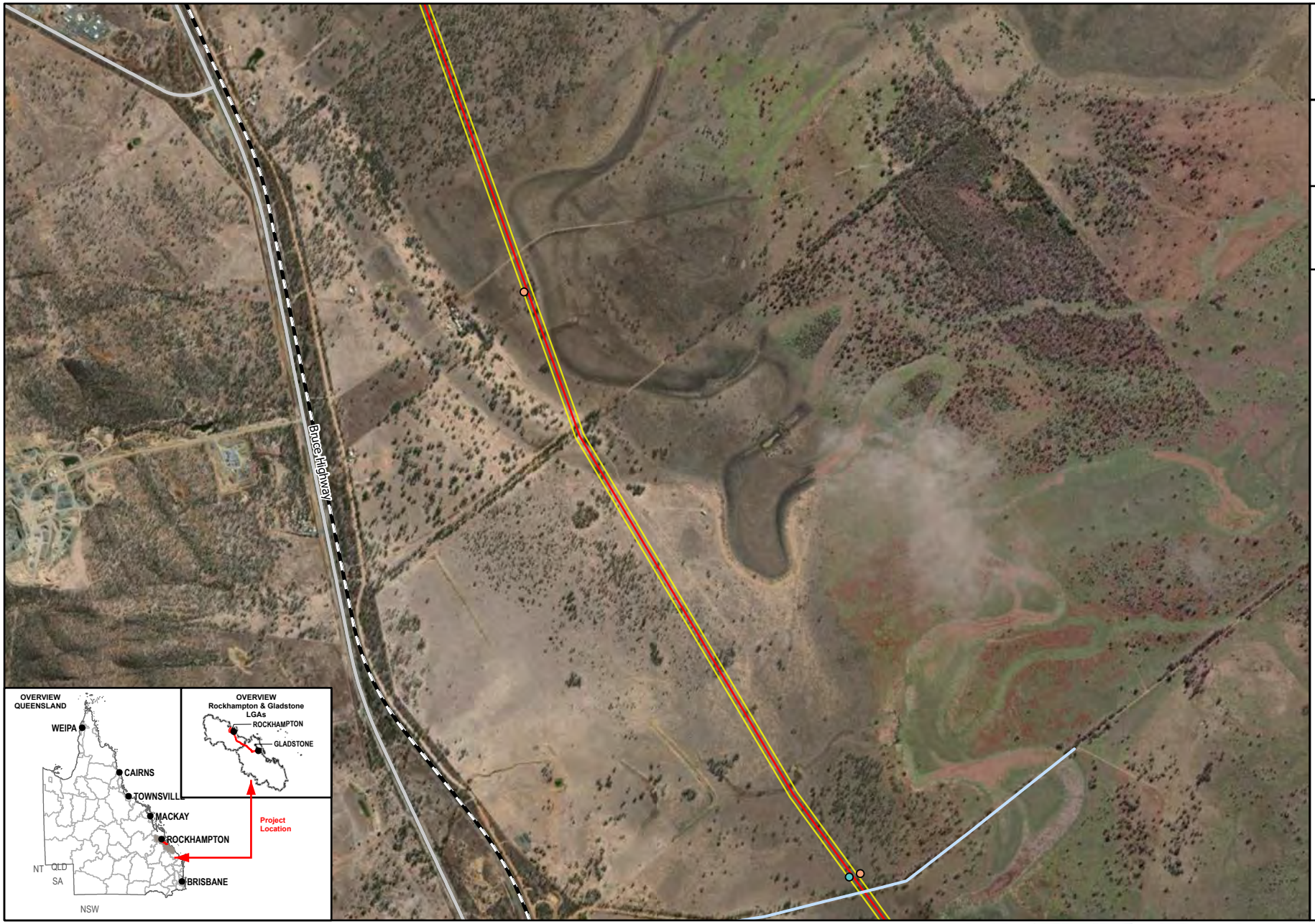

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Terrestrial Fauna Assessment Site

- Active Searches
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Figure 4-p
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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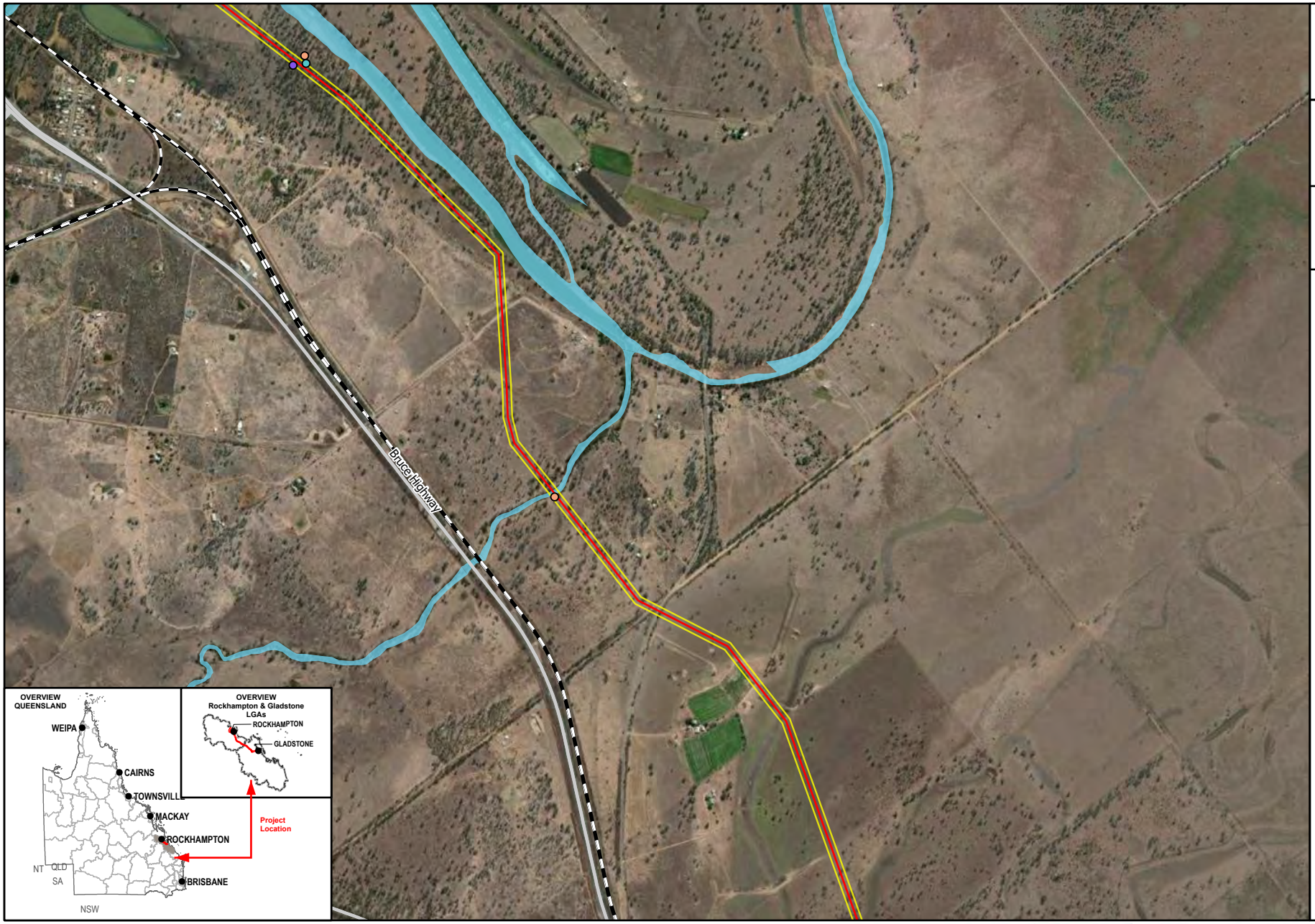

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Terrestrial Fauna Assessment Site

- Active Searches
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
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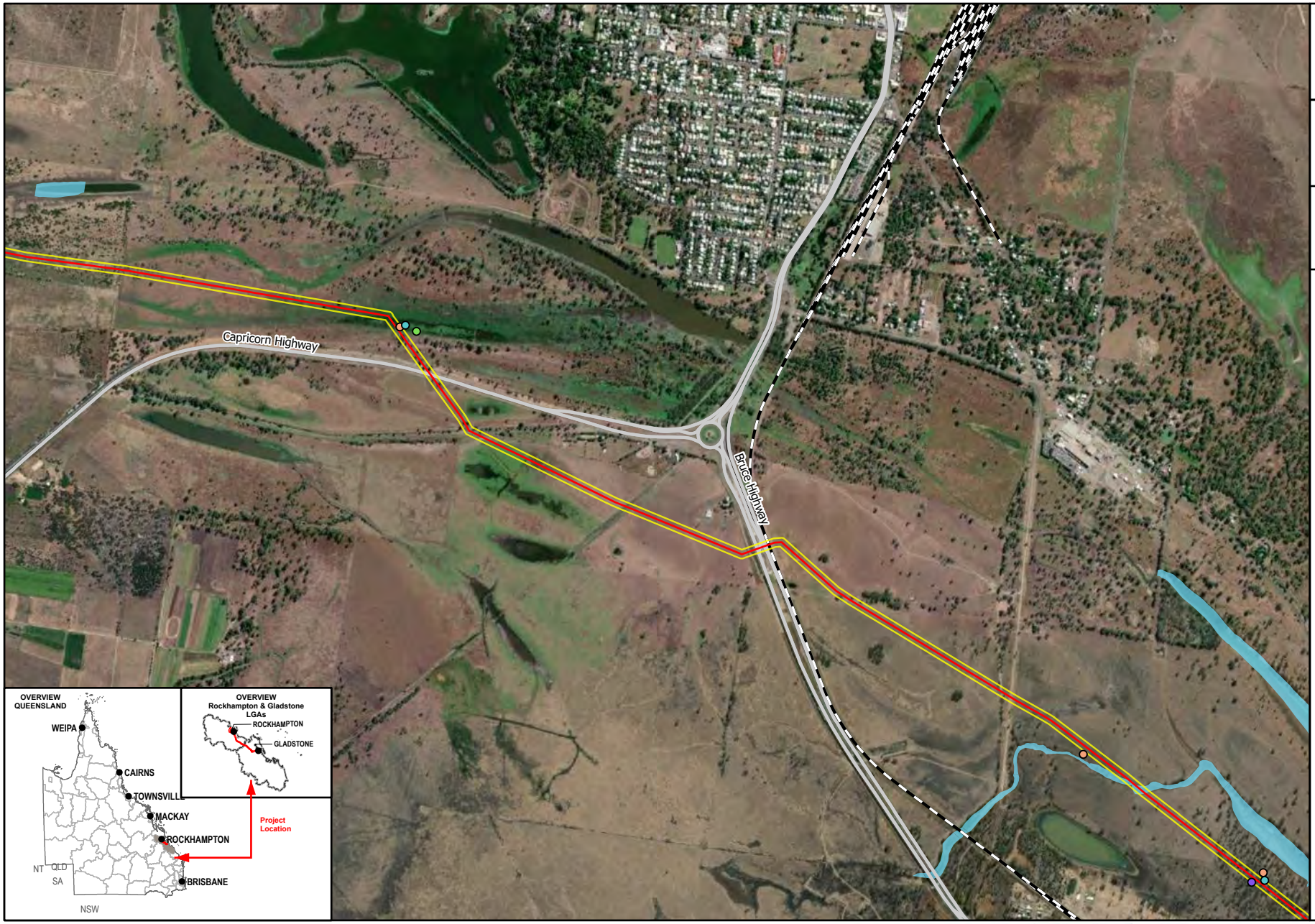
Figure 4-q
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

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- Fitzroy to Gladstone Pipeline Alignment
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Figure 4-r
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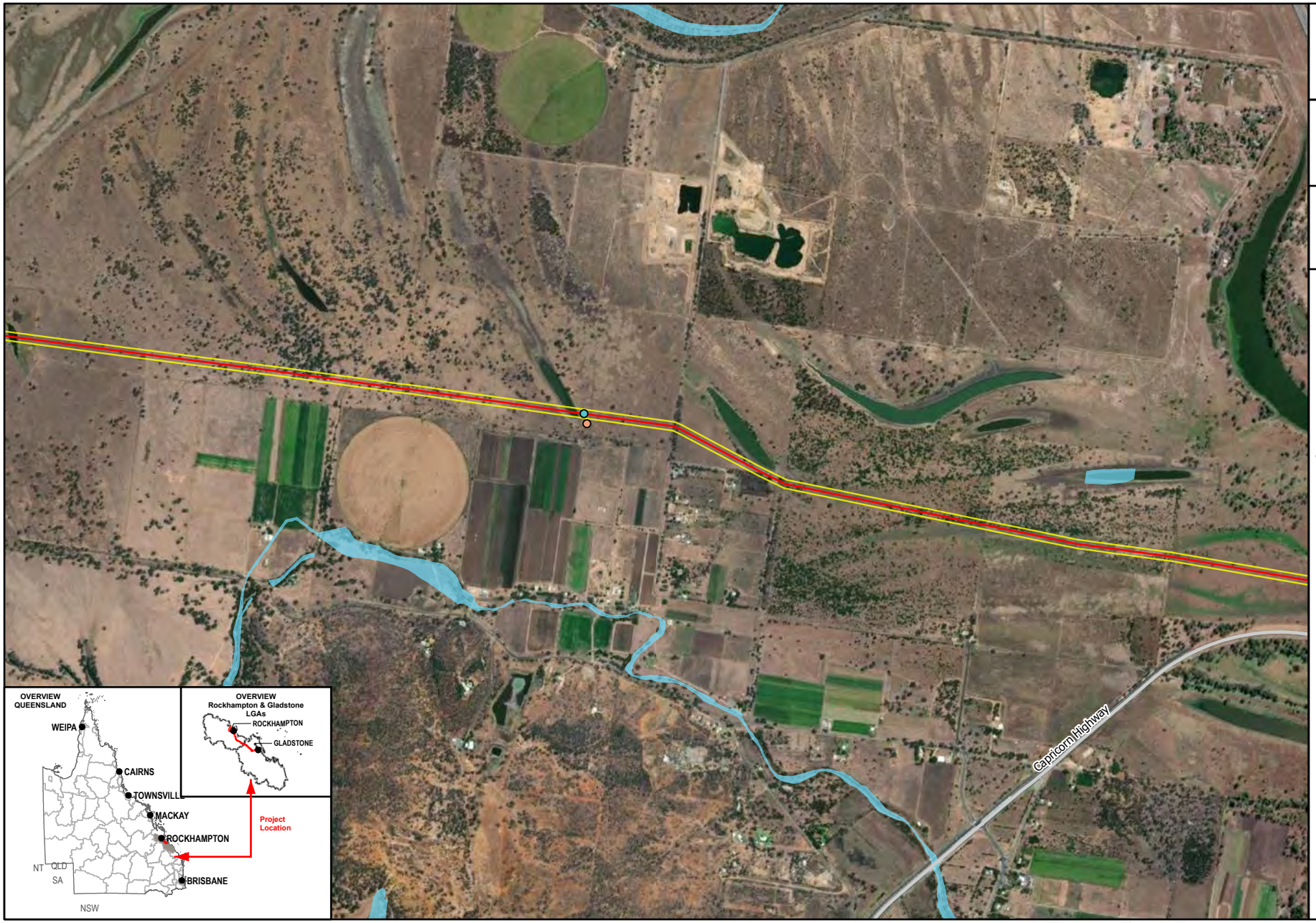

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Terrestrial Fauna Assessment Site

- Active Searches
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
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Figure 4-s
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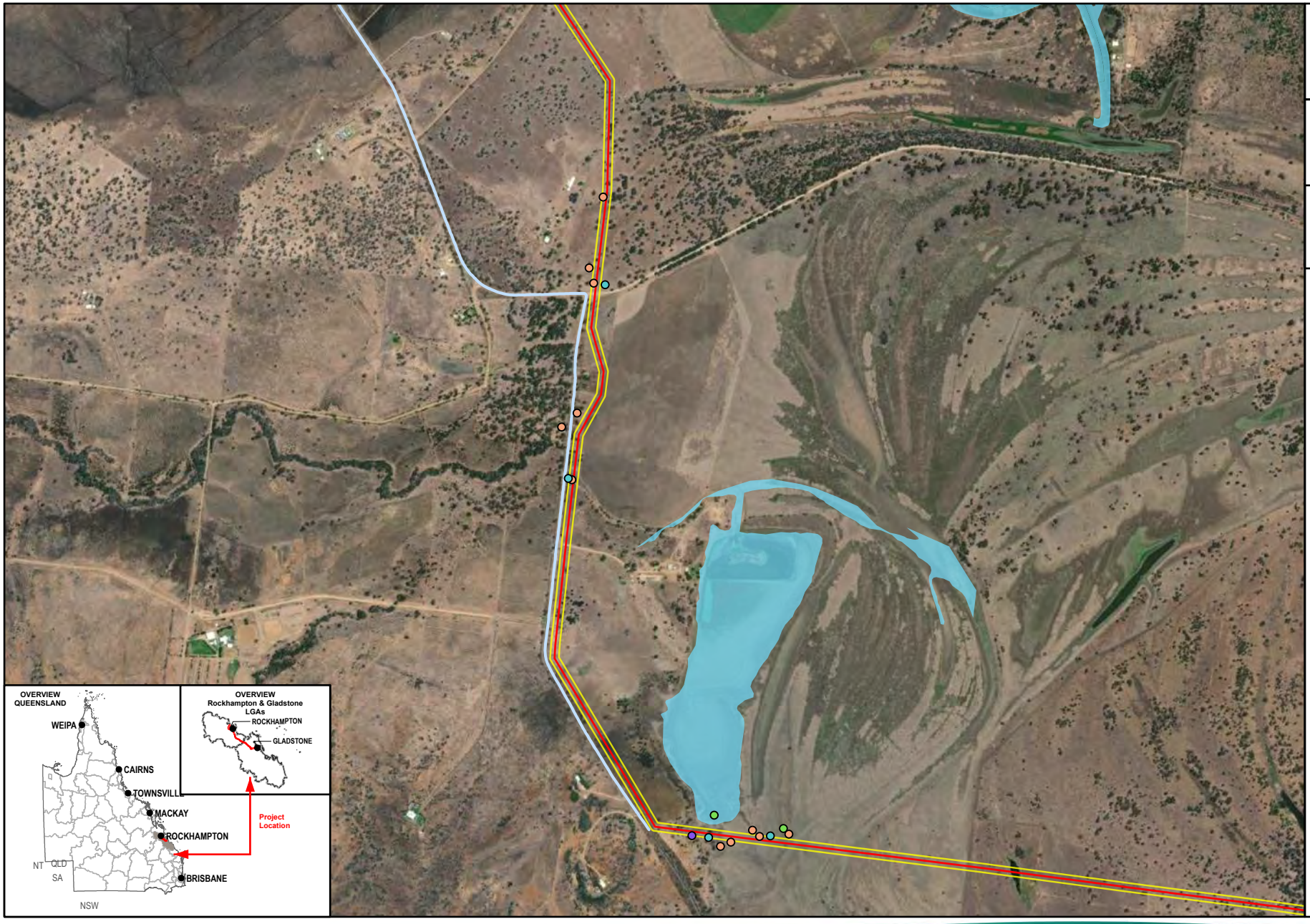

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Terrestrial Fauna Assessment Site

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- Terrestrial Fauna Assessment Site
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Figure 4-t
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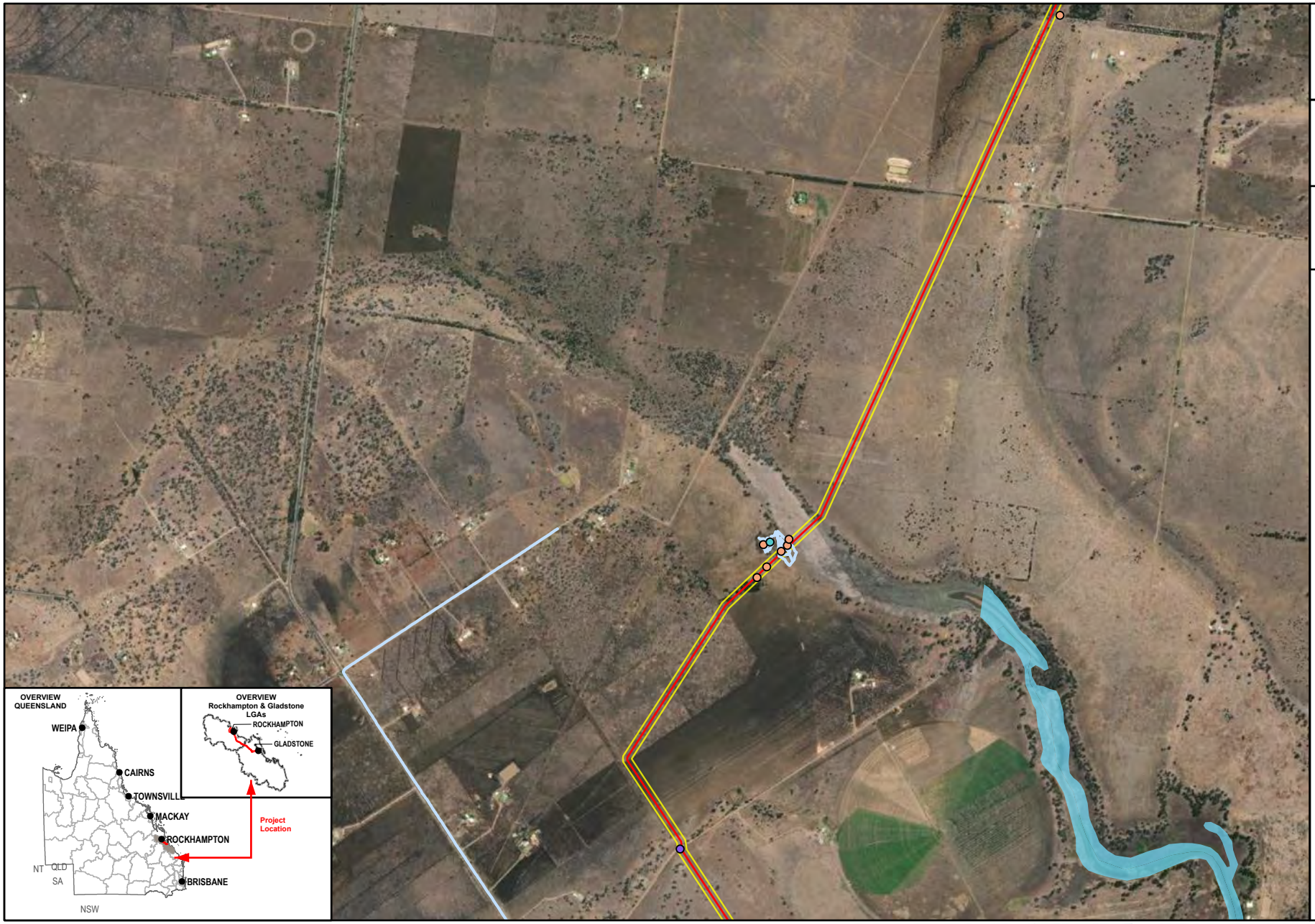

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Figure 4-u
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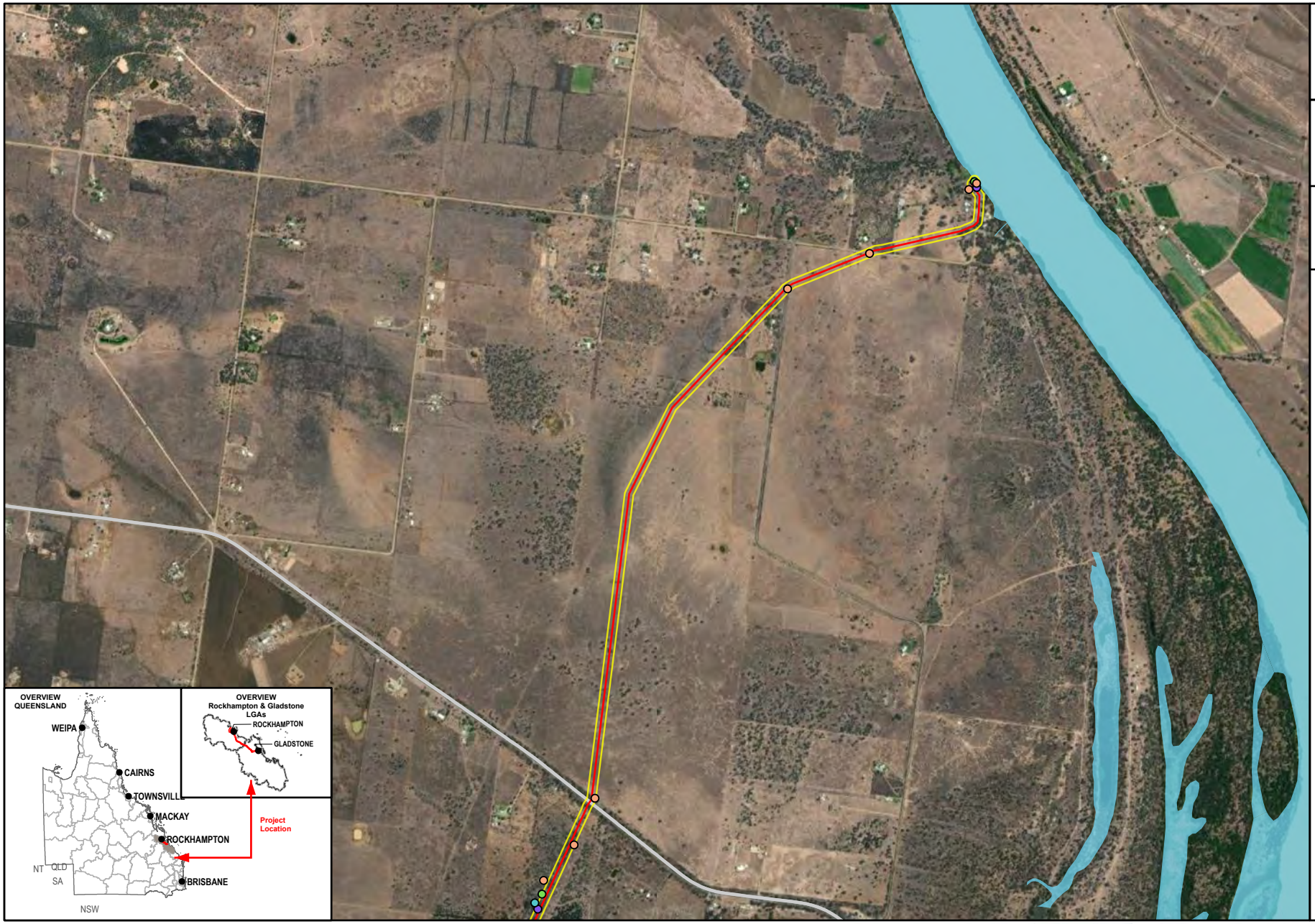

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Legend

Terrestrial Fauna Assessment Site

- Active Searches
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- Study Area
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- Waterbody

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Figure 4-v
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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4.2 Applicable species

The relevant terrestrial fauna species covered by this SMP are derived from the site-specific ecological survey results described in the Baseline Terrestrial and Aquatic Ecology Assessment undertaken by GHD (2022) in support of the Project's State approvals (GHDa, 2022; Appendix A). Applicable species are those that were confirmed as present during the 2022 surveys and that are likely to have breeding habitat within the ROW (e.g. Microchiroptera bats and Squatter Pigeons) and those that were not directly observed but potentially suitable breeding places were observed (e.g. Greater Glider). Habitats are likely to be used by native fauna for roosting and breeding.

For the purposes of this SMP, the species have been divided into several groups as follows:

- Fauna species listed EVNT under the NC Act identified as known to occur and have breeding habitat within the Project. Table 2 presents these species along with information on their distribution, habitat preferences and potential habitat in the Project area.
- Fauna species confirmed as occurring within the Project area that are listed as special least concern under the NC Act including those avian species listed under the JAMBA, CAMBA and ROKAMA agreements and least concern colonial breeding species (Table 3).
- Least concern colonial breeding bats that have been confirmed as occurring within the Project area (Table 4).

Table 2 ENVT species with the potential to occur within the Project area

Species name **(common name)**	**NC Reg. status**	**Habitat preferences**	**Applicable pipeline section**		
			GSDA	**SGIC**	**Northern**
Birds					
Calyptorhynchus lathami Glossy Black-cockatoo	V	**Description:** The Glossy Black-cockatoo is a smaller cockatoo of eastern Australia with a brown-black head, neck and underparts, with orange or red tail panels and an otherwise dull black body. The crest is small and inconspicuous whilst the bill is broad and bulbous. **General habitat preferences:** The Glossy Black-cockatoo is highly dependent on the distribution of *Allocasuarina* species and is found in woodland dominated by *Allocasuarina* and in open forests where it forms a substantial middle layer. Often confined to remnant *Allocasuarina* patches surrounded by cleared farmlands. Requires tree hollows for breeding. **Breeding:** The Glossy Black-cockatoo mates for life, with pairs maintaining their bond all year round. The female prepares the nest hollow and incubates the eggs, only leaving the nest to feed herself after the newly hatched nestling is a week old. Males feed the female and nestling throughout the incubation and brooding period. Once fledged, the young bird is fed by both parents for up to four months and remains with them until the next breeding season. **Feeding habitat:** The Glossy Black-cockatoo feeds almost exclusively on *Allocasuarina* seeds in a particular area, birds may feed only on a single species. It may also sometimes eat wood-boring larvae. Feeds in threes, less commonly in pairs or small groups or in large flocks of up to 60 birds. Tame and easily approached when feeding, they can be detected by the clicking of their bills and the falling debris of casuarina cones and twigs.	X		

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Nearest record: The Glossy Black-cockatoo was confirmed present during the 2008 field surveys (ARUP, 2008) and potentially suitable foraging and nesting habitat was recorded within the GSDA study area during the 2022 field surveys.			
Epthianura crocea macgregori Yellow Chat (Dawson)	E	**Description:** The Yellow Chat (Dawson) is about 11 cm in length and has a mass of about 9 grams (Higgins, et al., 2001). When breeding, the adult male plumage is mainly yellow-olive above, with dusky streaking, a rich golden-yellow head and rump, and white edges to the feathers of the wings. The breeding adult male plumage is lemon yellow below, with a distinct black crescent or bar across the breast. Adult females in breeding plumage are broadly similar to adult males (in breeding plumage) but lack the distinct black mark on the breast and are generally bright yellow rather than golden-yellow in colour (DCCEEW, 2022). **General habitat preferences:** The Yellow Chat (Dawson) inhabits marine plain wetlands that are subject to extensive seasonal inundation and varying degrees of both fresh and saltwater (tidal) influence (DCCEEW, 2022). **Breeding:** The Yellow Chat (Dawson) builds a small cup-shaped nest that is placed close to the ground in rushes and/or grasses. Breeding takes place in Spring, Summer and Autumn, with evidence suggesting breeding take place following heavy rainfall. **Feeding habitat:** The Yellow Chat (Dawson) feeds on insects, such as moths, damselflies, caterpillars and mosquito larvae, and other invertebrates, such as spiders. The anatomy of the tongue suggests that it could also feed on nectar.		X	

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Nearest record: Four individuals were confirmed present during the 2008 surveys (ARUP, 2008). Species were recorded at two (2) locations along Twelve Mile Creek, just north of the SGIC SDA pipeline alignment.			
Geophaps scripta scripta Squatter Pigeon (southern)	V	**Description:** The Squatter Pigeon (southern) is a medium-sized ground dwelling pigeon approximately 30 cm long. Adults of both sexes are generally grey-brown with black and white stripes on the face and throat, have iridescent green or violet patches on the wings, a blue-grey lower breast and white flanks and lower belly. The southern Squatter Pigeon sub-species has a patch of blue-grey skin around the eye, whereas the northern Squatter Pigeon has an orange-red orbital skin patch. **General habitat preferences:** Squatter Pigeons can occur in tropical dry, open sclerophyll woodlands and occasionally in savannah habitats with overstorey species of *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris*. Patchy groundcover layer is typical and generally consists of native, perennial tussock grasses or a mix of grasses and low shrubs or forbs. The groundcover layer rarely exceeds 33% of the ground area. It appears to favour sandy soil dissected with low gravely ridges and is less common on heavier soils with dense grass cover. Squatter Pigeons are regularly found in close proximity (within 1 km) to permanent water, wetlands and >third order streams. **Foraging habitat:** Squatter Pigeon foraging habitat occurs in any remnant or regrowth open forest to sparse, open woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy or gravelly soils. It feeds primarily on seeds of grasses, herbs and shrubs but is also known to consume legumes, herbs and forbs, acacia seeds, insects and ticks. **Breeding:** Squatter Pigeons nest on the ground, usually laying two eggs in sheltered positions, generally amongst vegetation. They prefer to nest on	X	X	X

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		stony rises on sandy or gravelly soils (i.e. land zones 5 and 7), within 1 km of a suitable (and permanent) water body. Squatter Pigeons typically breed from April to October, although this is variable and highly dependent on food availability. Nests are depressions scraped into the ground beneath a tussock of grass, bush, fallen tree or log, and sparsely lined with grass. Usually, two eggs are laid and incubated for about 17 days. Chicks remain in the nest for two to three weeks and are dependent on their parents for around four weeks. **Dispersal habitat:** Dispersal habitat can be any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies and may include denser patches of vegetation not suitable for foraging or breeding. **Nearest record:** The Squatter Pigeon (southern) was confirmed present during the 2022 field surveys. Two individuals were recorded along two waterways (unnamed tributary of Larcom Creek and unnamed tributary of Police Creek) within the western corner of the GSDA Project area.			
Mammals					
Petauroides volans Greater Glider	V	**Description:** The Greater Glider is the largest gliding possum in Australia, with a head and body length of approximately 35−46 cm and a long furry tail measuring approximately 45 to 60 cm. The Greater Glider has thick fur that is white or cream below and varies from dark grey, dusky brown through to light mottled grey and cream above. The Greater Glider is nocturnal and uses tree hollows during the day to rest and/or nest. **General habitat preferences:** The Greater Glider occurs in a range of eucalypt-dominated habitats, including low open forests on the coast to tall	X	X	

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		forests in the ranges and low woodland westwards of the Dividing Range. It does not use rainforest habitats. This species favours taller, montane, moist eucalypt forests with relatively old trees and abundant hollows and a diversity of *Eucalyptus* species. **Breeding**: Breeding occurs between March and June with only a single young born. The young stays with the mother or is left in the nest and becomes independent at about 9 months of age. **Foraging habitat:** The Greater Glider has an almost exclusive diet of eucalypt leaves and occasionally flowers or buds. Although the species is known to feed on a range of eucalypt species, in any area it is likely to only forage on a select number of species. **Additional information:** Greater Gliders can glide over distances of up to 100 m and appear to have low dispersal ability with small home ranges of approximately 1 to 4 ha which appear to be related to food and nest availability. In lower productivity forests, home ranges may be as large as 16 ha for males. In general, home ranges of males do not typically overlap which suggests a degree of territorial behaviour **Nearest record**: Although no Greater glider were observed during field surveys, suitable denning habitat was recorded in eucalypt woodland areas retaining preferred tree species at numerous locations along the GSDA and SGIC SDA Project areas, especially along waterways and drainage lines.			
Petaurus australis *Australis*	V	**Description:** The Yellow-bellied Glider is a large, active, sociable and vocal glider. Adults weigh 450 to 700 grams, have a head and body length of about 30 cm and a large bushy tail that is about 45 cm long. It has grey to brown fur above with a cream to yellow belly, which is paler in young animals. The dark	X	X	

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
Yellow-bellied Glider		stripe down the back is characteristic of the group. It has a large gliding membrane that extends from the wrist to the ankle. It has a loud, distinctive call, beginning with a high-pitched shriek and subsiding into a throaty rattle. **General habitat requirements:** The subspecies occurs in eucalypt dominated forest and woodland. The yellow-bellied glider can occur in dry and wet sclerophyll, with abundance highly dependent on forest age and floristics preferring large tracts of mature, old growth forest that are able to provide suitable habitat for foraging and denning requirements. These requirements include floristic diversity, high proportion of winter-flowering and smooth-barked gums to provide year-round foraging resources. The yellow-bellied glider is nocturnal, during the day yellow-bellied glider (south-eastern) dens in hollow-bearing trees, usually over one meter in diameter at breast height, primarily, living hollow-bearing smooth-barked eucalypts are. The subspecies occurs in family groups of between two to six individuals, covering a home range of approximately 50 to 65 ha. **Breeding:** Typically, females bear a single young, although twins have been observed. Breeding is limited to August through December in Victoria but occurs throughout the year in Queensland. Young are carried in the mother's pouch for about 100 days, after which time they are left in a nest for an additional 60 days. Both parents provide care for the young, which become independent after 18 to 24 months, and become sexually mature at about 2 years of age **Foraging habitat:** The yellow-bellied glider feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. The species extracts sap by incising (or biting into) the			

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. **Nearest record:** Although no yellow-bellied gliders were observed during field surveys, suitable denning habitat was recorded in eucalypt woodland along the GSDA and SGIC SDA Project areas, especially along waterways and drainage lines.			
Reptiles					
Denisonia maculata Ornamental Snake	V	**Description:** The Ornamental Snake is a stout brown, grey-brown or grey-black snake with a darkly flecked or overall darker head with the lips distinctly barred in white/cream. The belly is white or cream with dark spots/flecks on the outer edges. The iris is usually golden, and the tail often grades to a lighter orange-brown at the tip. The Ornamental Snake is nocturnal, moving only at night. It is probably active year-round but can remain inactive in shelters for periods of months during dry conditions. Peak activity is likely to be late spring to early summer, although Ornamental Snakes have also been recorded as active in April. **General habitat preferences:** Ornamental Snakes are found in close association with frogs which form the majority of its prey and is known to favor woodlands and open forests associated with moist areas, particularly gilgais with clay soils but is also known from lake margins, wetlands and waterways. This species is most likely to be found in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolabah (*Eucalyptus coolabah*) - dominated vegetation communities or pure grassland associated with gilgais. REs where it has been recorded include 11.4.3, 11.4.6, 11.4.8 and 11.4.9 and 11.3.3 and 11.5.16.		X	

Species name (common name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Ornamental Snakes tend to shelter in logs, under coarse woody debris and in ground litter and seem to prefer a diversity of gilgai size and depth, with some fringing groundcover vegetation and timber debris, where soils are of a high clay content with deep-cracking characteristics. Habitat patches greater than 10 ha and connected to larger areas of remnant vegetation are preferred. The Draft Referral guidelines for the nationally listed Brigalow Belt reptiles describes gilgai depressions and mounds as being important habitat with habitat connectivity between gilgai and other suitable habitats also being important. **Foraging and refuge habitat:** Soil cracks on the high ground of gilgai development provide shelter for Ornamental Snakes during dry periods, and an abundance of frogs in gilgai areas provide food resources during wet periods. Ornamental Snakes prefer areas with ground cover such as logs and coarse woody debris, and ground litter, which it uses for shelter. **Nearest record:** The Ornamental Snake was confirmed present during the Arup (2008) field surveys. Two individuals were recorded in a vegetated area adjoining a seasonal wetland near Casuarina Road, Midgee.			
Key: CE – critically endangered; E – endangered; V – vulnerable; NT – near threatened; SL – special least concern.					

Table 3 Special least concern and least concern colonial and migratory avian breeders

Species name Common name	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
Himantopus himantopus Black-winged Stilt	LC – Colonial Breeders	**Description:** The Black-winged Stilt is a large black and white wader with long orange-red legs and a straight black bill. It has black on the back of the neck, a white collar and a red iris. Both sexes are similar, and the plumage does not change during the year. Black-winged Stilts give a repeated high-pitched barking call. Young black-winged Stilts lack black on the back of the neck and have grey-brown wings and back, speckled with white. They have a smudged grey crown, which extends down the back of the neck as the birds get older. **General habitat preferences:** Black-winged Stilts prefer freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers. **Breeding:** Black-winged Stilts nest in small colonies; within these, the mated pairs strongly defend their individual territories. The nest may be anything from a simple shallow scrape on the ground to a mound of vegetation placed in or near the water. Both sexes incubate the eggs and look after the young. **Feeding habitat:** Insect are the staple food for the Black-winged Stilt but will also take molluscs and crustaceans. They rarely swim for food preferring instead to wade in shallow water and seize prey on or near the surface. **Nearest record:** The Black-winged Stilt was confirmed present during the 2022 surveys within the SGIC SDA section of the pipeline alignment.		X	
Microcarbo melanoleucos Little Pied Cormorant	LC – Colonial breeders	**Description:** The Little Pied Cormorant is entirely black above and with a white underbody. The face can be dusky in adult birds and the white of the underbody extends to above the eye.			X

Species name Common name	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		General habitat preferences: Fresh or saltwater in open waterways as well as along the coast. The Little Pied Cormorant will also inhabit inland streams and dams. **Breeding:** Little Pied Cormorants breed either in colonies or, less commonly, in single pairs. The nest is a flat platform of sticks, lined with green leaves and is usually placed in a tree. Both adults share in egg incubation and care of the young. **Feeding habitat:** Little Pied Cormorants feed on a wide variety of aquatic animals, from insects to fish. On inland streams and dams they turn to their most favoured food: yabbies (freshwater crayfish). These are caught by deep underwater dives with both feet kicking outward in unison. Other crustaceans are also taken, with shrimps being a large part of their diet in winter months. **Nearest record:** The Little Pied Cormorant was confirmed present in the northern section of the pipeline alignment.			
Petrochelidon ariel Fairy Martin	LC – Colonial breeders	**Description:** Fairy Martin is a small swallow with a white rump and short, slightly forked tail that looks square in flight. This species has a short, black bill, ginger crown, pale cheeks and white underparts. Flies with quick, clipped wingbeats and glides. Often in mixed flocks with Tree Martins. **General habitat preferences:** This species is usually found in open country with large trees, especially in areas near Watercourses. **Breeding:** Fairy Martin breeds from July to January and is the only Australian bird to build a mud-bottle nest. These nests have a drooping, narrow entrance-spout. Fairy Martins form colonies of few to dozens whose nests are often fused together on walls, ceilings of caves, overhung banks, road culverts. Nests are often reused by Tree Martins and microbats, among other species.		X	X

Species name Common name	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Feeding habitat: This species is an aerial forager that hunts small invertebrates through open woodlands, above paddocks and also through swarms above water. Fairy Martin will also dive to eat insects from the water surface. **Nearest record:** The Fairy Martin was recorded incidentally throughout the SGIC SDA and Northern Project areas.			
Struthidea cinerea Apostlebird	LC – Colonial breeders	**Description:** The Apostlebird is a highly social bird that congregates in flocks of 100+ in winter. This species has a grey body with pale streaks and brown wings. Birds walk on the ground foraging in groups and preen and roost in rows on branches. **General habitat preferences:** This species is usually found near water in drier open forests, woodlands and scrub. Nests are a large mud bowl reinforced with grass attached to a horizontal branch at a height of 3 to 20 m. **Breeding:** Apostlebirds breed from August to March in family packs of 8 to 14 individuals. This species is very communal in its breeding from building a communal nest to shared incubation of eggs laid by several females. **Feeding habitat:** Apostlebirds eat vegetable matter, invertebrates, and small vertebrates in summer; seeds, herbs and grasses become an important food source in winter. Apostlebirds forage on the ground in groups and often feed with poultry. **Nearest record:** This species was recorded incidentally throughout the SGIC SDa and Northern Project areas.		X	X

Table 4 Microchiropteran Bats

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
Austronomus australis White-striped Free-tailed Bat	LC – Colonial breeders	**Description:** This species is the largest of all the free-tail bats. **General habitat preferences:** These are tree dwelling bats and can be found in rainforest, forest, open woodlands, arid shrubland, agricultural and urban areas. Roosting locations include hollows in old trees and under loose bark, in dead stumps and the ceilings of buildings. **Breeding:** Mating occurs in late August with single young being born between mid-December and late-January. Up to several hundred bats live together in a colony. **Feeding habitat:** White-striped Free-tailed Bats feed on flying insects above the tree canopy. They fly quickly and eat their prey as they fly. **Nearest record:** The White-striped Free-tailed Bat was confirmed present along the SGIC SDA Project area.		X	
Chaerephon jobensis Northern Freetail Bat	LC – Colonial breeders	**Description**: The Northern Freetail Bat has a Darth Vader like appearance and is chocolate to grey-brown above and slightly greyer below with a head-body length of approximately 80 to 90 mm. **General habitat preferences**: Occurs in mangroves, monsoon forests, paperbark-lined creeks, open forest and woodlands and savannah. They are also known to forage over agricultural areas. Northern Freetail Bats roost in tree hollows in colonies of 10 to 15. However, they have also been found in caves and buildings in colonies of up to 300 individuals. **Breeding**: Pregnant Northern Freetail Bats have been captured in October and November with young found within colonies in December and January.	X	X	

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Feeding habitat: Primary food source are insects which are captured whilst flying though open forests and woodland. **Nearest record:** Northern Freetail Bat was confirmed present along the GSDA and SGIC SDA Project areas.			
Chalinolobus gouldii Gould's Wattled Bat	LC – Colonial breeders	**Description**: This species is the largest lobe-lipped bat in Australia. Fur of its underparts are distinctly bicoloured with their head blackish and shoulders brownish. There is a distinct fleshly lobe at the base of ear near the corner of the mouth and a distinct lobe on the lower lip. **General habitat preferences:** The species roosts in tree hallows and buildings throughout its range. It is common throughout mainland Australia except near Cape York Peninsula and is found in most habitats except for treeless deserts. It is also common in many towns and cities. **Breeding:** Females form colonies of up to 40 in tree hollows and up to 80 in buildings; males are usually solitary. Breeding season is March to June with births occurring in November to January where twins are common. **Feeding habitat:** Gould's Wattled Bat feed on a variety of insects, including scarab beetles, caterpillars, crickets and moths, depending on the time of year. **Nearest record:** Gould's Wattled Bat was confirmed present along the GSDA and SGIC SDA Project areas.	X	X	
Chalinolobus nigrogriseus	LC – Colonial breeders	**Description:** The Hoary Wattled Bat has shaggy dark grey fur with pale tips giving it a frosted appearance whilst the underparts are grey-brown. The head and body length is between 45 and 55 mm long with a tail between 35 and 42 mm long.	X	X	

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
Hoary Wattled Bat		**General habitat preferences:** Hoary Wattled Bats are common across northern Australia from near Derby in Western Australia to Cape York in Queensland. Occurrences of the species are less common to north-eastern New South Wales. The species inhabits a range of habitats including vine forest, tropical savannah, dry sclerophyll forest and coastal scrub. This species is known to roosts in tree hollows and in rock crevices. **Breeding:** Little is known about the breeding biology of the species, but pregnant females have been recorded in October and lactating females observed between October and November. **Feeding habitat:** Hoary Wattled Bats feed primarily on beetles, moths, flying ants, bugs leaf hoppers, cockroaches, spiders and lacewings. They catch some prey in flight but can also land and crawl quickly after non-flying prey. **Nearest record:** Hoary Wattled Bat was confirmed present along the GSDA and SGIC SDA Project areas.			
Chalinolobus picatus Little Pied Bat	LC – Colonial breeders	**Description:** The Little Pied Bat is a distinctive black and white bat weighing 4 to 8 grams and with a head-body length of 45 mm and a tail length of 35 mm. Their fur is glossy black on the back, grey on the belly, there are two white stripes that run on the sides of the body forming a 'V' in the pubic area. **General habitat preferences:** Little Pied Bats occur in a range of habitat types including dry open forest, open woodland, Mulga woodlands, Mallee and Bimbil box woodlands. They are known to roost in caves, rocky outcrops, mine shafts, tunnels, tree hollows and buildings but do need access to water. Colonies of up to 40 individuals have been found in abandoned buildings but individuals can also roost in isolation.		X	

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Breeding: Pregnant females have been observed from mid-September with females giving birth to one or two young in November. Young are left in a maternity creche and begin to forage in early March. **Feeding habitat:** This species primarily feeds on moths and possibly other flying invertebrates. **Nearest record:** The Little Pied Bat was confirmed present along the SGIC SDA Project area.			
Miniopterus australis Little Bent-wing Bat	LC – Colonial breeders	**Description:** The Little Bent-wing bats fur is long and thick, especially over the crown and around the neck, and is slightly lighter in colour on the belly. They have distinctly short muzzles, and short, rounded roughly triangular shaped ears. Individuals generally weigh approximately 7 grams and have a head and body length of about 45 mm. **General habitat preferences:** Little bent-wing bats prefer well-timbered areas where they feed primarily in the shrub and canopy layers. Roosting occurs in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They form maternal colonies which are often shared with the Common-bent-winged bat. **Breeding:** Females congregate in maternity colonies with the eastern bent-wing bat from August. Young are born in December. Maternity colonies can have populations up to 100,000 individuals. **Feeding habitat:** Like most microbats, the primary food sources for the Little Bent-wing Bat is insects such as moths and beetles. Individuals primarily forage in open areas or above the tree canopy.	X	X	

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Nearest record: Little Bent-wing Bat was confirmed present along the GSDA and SGIC SDA Project areas.			
Miniopterus orianae Large Bent-winged Bat	LC – Colonial breeders	**Description:** The Large Bent-wingedbat lives along the eastern coastline of Australia. It has dark reddish-brown fur that is slightly lighter on its belly. They have a short-domed head with rounded ears. They are a cave dwelling species and will live in man-made structures like abandoned mines and road culverts. **General habitat preferences:** These bats will live in tall timbered forest to open grasslands. In forested areas, they are known to forage for flies, cockroaches and beetles well above the canopy but in grasslands they stay to within a few metres above the ground. Some individuals have been known to travel up to 65 km in one night. **Breeding:** Females will congregate in maternity colonies in October (up to 100,000 individuals), where they will give birth to a single young in December. **Feeding habitat:** Like most microbats, the primary food sources for microbats are insects such as moths and beetles. Individuals primarily forage in open areas or above the tree canopy. **Nearest record:** The Large Bent-winged Bat was confirmed present along the SGIC SDA Project area.		X	
Ozimops ridei Ride's Free-tailed Bat	LC – Colonial breeders	**Description:** The Ride's Free-tailed Bat smaller than most members of the same genus, with a body mass of 5 to 11 grams. Its forearm is 30 to 35 mm long. Fur colour is highly variable among individuals, with some bats a light brownish-grey while others are darker brown. **General habitat preferences:** Its preferred habitat is Eucalypt woodland where is utilises tree hollows to roost. Roosting is also known to occur under ceilings in buildings.	X	X	

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
		Breeding: Usually solitary but also recorded roosting communally. **Feeding habitat:** Insectivore commonly found around habitat edges. **Nearest record:** The Ride's Free-tailed Bat was confirmed present in the GSDA and SGIC SDA Project areas.			
Saccolaimus flaviventris Yellow-bellied sheath-tailed Bat	LC – Colonial breeders	**Description:** The Yellow-bellied Sheath-tailed Bat is quite large that weigh between 28 to 60 grams and with a head-body length 72 to 91 mm. It has distinct fur colouration, with the dorsal back being a shiny, jet black and the ventral underside a contrasting creamy, white. **General habitat preferences:** This species roosts in large tree hollows in mixed sex groups of generally 2 to 6 individuals but sometimes up to 30. They have also been reported to occasionally hang from the outside of walls of buildings. The Yellow-bellied Sheath-tailed Bat occurs in almost all habitat types including wet and dry sclerophyll forest, open woodland, Acacia shrubland and desert. **Breeding:** Mating occurs in August and single young is born between December and March. **Feeding habitat:** Like most microbats, the primary food sources for Yellow-bellied Sheath-tail Bats are insects such as moths and beetles. **Nearest record:** The Yellow-bellied Sheath-tailed Bat was confirmed present in the GSDA and SGIC SDA Project areas.	X	X	
Scotorepens greyii	LC – Colonial breeders	**Description:** The Little Broad-nosed Bat has bi-coloured brown to grey-brown fur that is lighter at the base compared to the fur tips. **General habitat preferences:** The Little Broad-nosed Bat roosts in hollows; usually of trees but also in old fence posts as well as in old buildings where colonies of up to 20		X	

Common name (species name)	NC Reg. status	Habitat preferences	Applicable pipeline section		
			GSDA	SGIC	Northern
Little Broad-nosed Bat		individuals have been reported. The species occurs in forests, woodlands and within riparian zones. **Breeding:** Pregnancies in the Little Broad-nosed Bat usually lasts from late-August until early-November when twins are usually born. Not all females breed every year. **Feeding habitat:** Similar to most microbats, this species generally feeds on a varied diet including insects, moths, cockroaches, lace wings and beetles by foraging on the wing. **Nearest record:** This species was confirmed present in the GSDA Project area.			
Scotorepens sanborni Northern Broad-nosed Bat	LC – Colonial breeders	**Description:** The muzzle is hairless and has prominent glands that are characteristic of the genus. The pelage colour is variable among individuals, the hair over the upper-parts is a uniform sandy to tawny olive and darker than the bi-coloured ventral fur, which is a pale greyish brown with whitish tips. **General habitat preferences:** Northern Broad-nosed Bats are often found in mangroves and open forest, may also be found in buildings. They roost together in small colonies, though when roosting in houses the colonies can be large and smelly. **Feeding habitat:** Small flying insects such as midges, mosquitoes and mayflies. They fly quickly, diving and twisting as they chase and catch their prey in flight. **Nearest record:** This species was confirmed present in the GSDA Project area.	X		

5.0 Impact assessment

This section of the report outlines the potential impacts of the Project on the species outlined in Section 4.2 and includes the species and their classification under the NC Act and associated Animals Regulation:

- Endangered – Yellow Chat (Dawson)
- Vulnerable – Glossy Black- cockatoo, Squatter Pigeon (Southern), Greater Glider, Yellow-bellied Glider and Ornamental Snake
- Least Concern Colonial Breeders – Birds
- Least Concern Colonial Breeders – Bats.

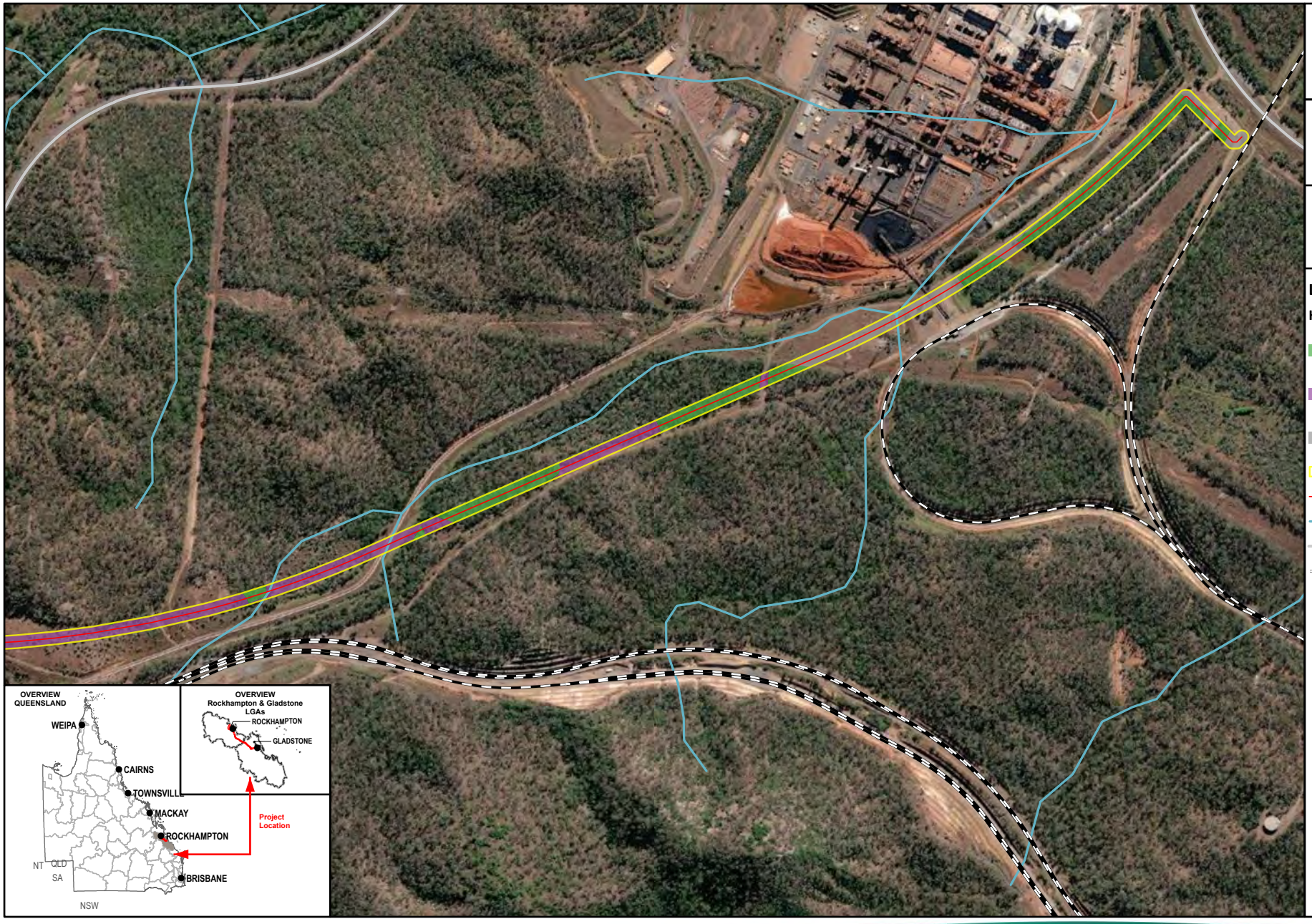
Potential impacts for each species and/or group will constitute direct impacts such as vegetation loss, and habitat clearing and indirect impacts such as vehicle strikes, increased noise and vibration, increased dust, lighting, erosion and sediment control, and the spread or introduction of invasive species. A summary of potential impacts is outlined in the below sections with more detailed information provided in GHD (2022) in Appendix A.

5.1 Direct impacts

The FGP alignment and ROW is shown on Figure 1 with habitat types shown on Figure 5. The Project involves clearing of remnant and non-remnant vegetation for installation of the pipeline and associated infrastructure. including:

The proposed disturbance footprint encompasses an area of approximately 375.1 ha comprising approximately 65.6 ha of vegetation, of which approximately 17.5 ha is mapped as remnant vegetation (GHD 2022; Appendix A). The proposed disturbance footprint has been designed to avoid impacts to remnant vegetation and fauna habitat as much as practically possible. In areas where impacts to vegetation communities, flora species and fauna habitat cannot be avoided, control measures have been designed to minimise impacts on vegetation and habitat as far as practical. Clearing for the construction of the FGP will be undertaken over approximately 12-24 months.

Clearing will cause a direct impact by removing areas of vegetation that may also support habitat features for threatened species. Disturbed areas will be progressively rehabilitated with final rehabilitation completed once construction has ceased. This will minimise the area of disturbed ground at any one time and encourage fauna to move away from the disturbance area of their own accord.



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Legend

Habitat Type

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Cleared and Highly Modified Landscapes
- Study Area
- GSDA Pipeline Alignment
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline

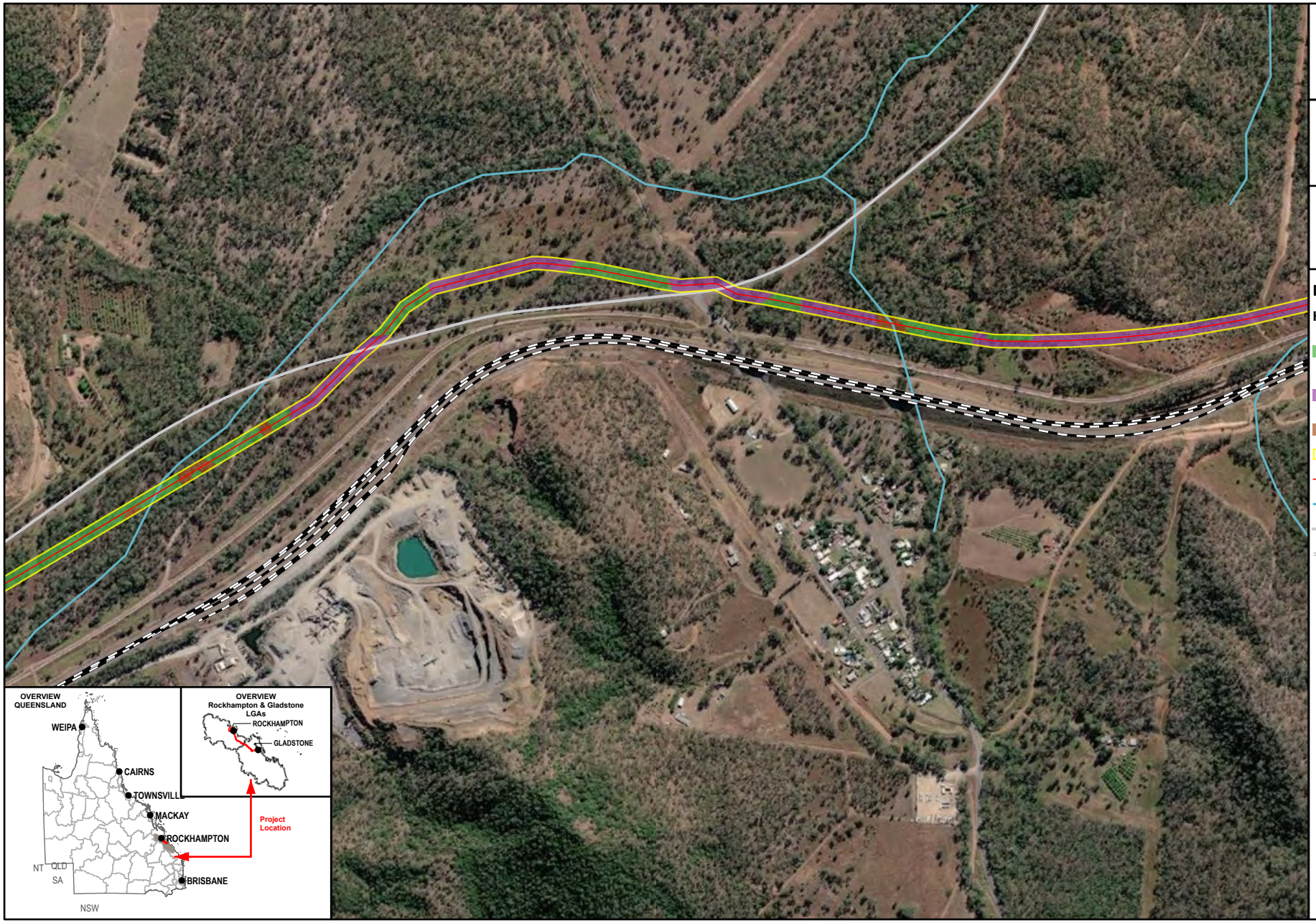
Gladstone Area Water Board
P.O. Box 466, Gladstone QLD 4680
Ph: 07 4976 3000 www.gawb.qld.gov.au

PROJECTION UTM Zone 56
(Datum GDA2020)

Compiled by:YS16239

Figure 5-a
Habitat Types Identified
Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Legend

Habitat Type

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Study Area
- GSDA Pipeline Alignment
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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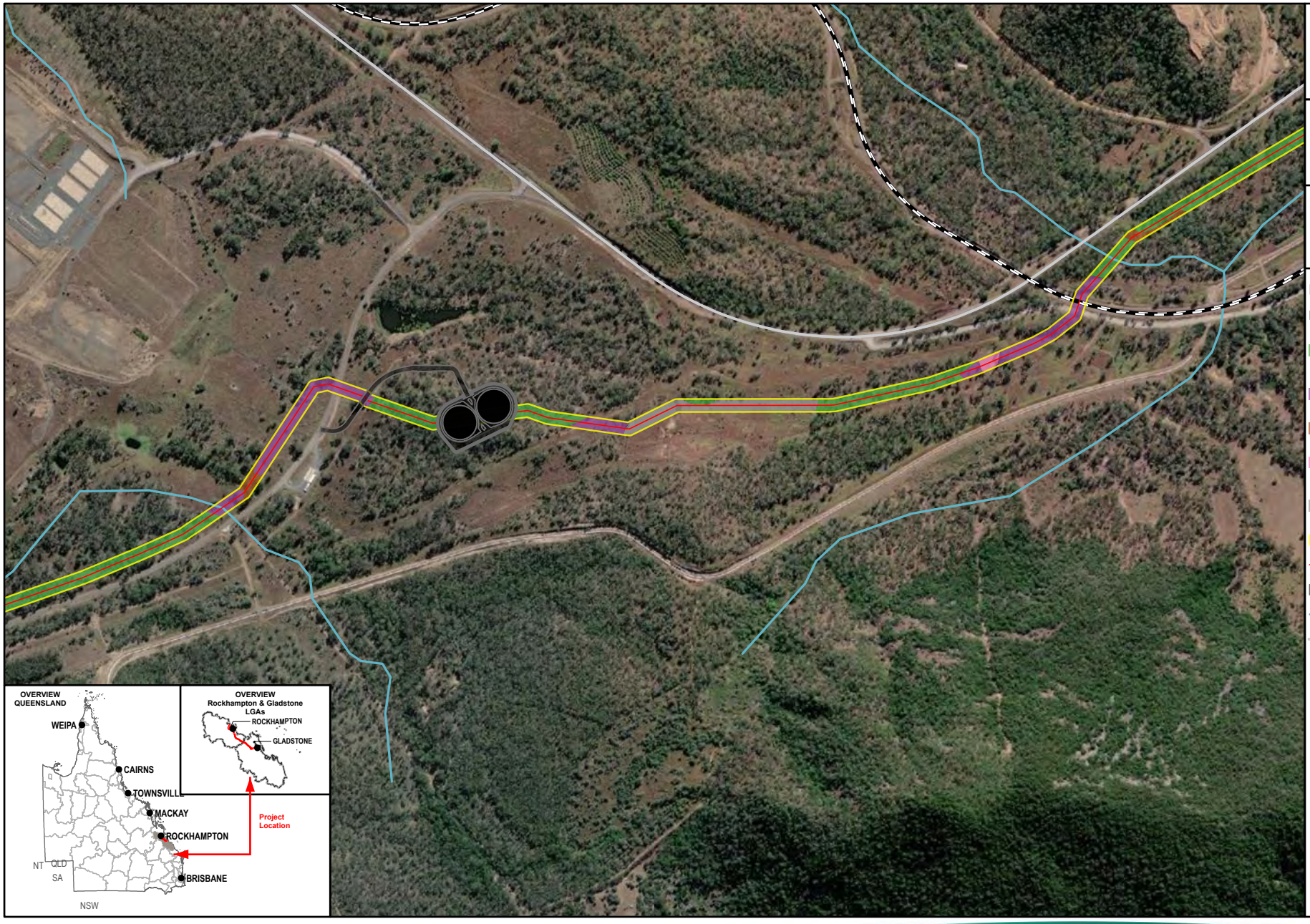
Figure 5-b
Habitat Types Identified Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Member of the Surbana Jurong Group

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Legend

Habitat Type

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- GSDA Pipeline Alignment
- Aldoga Reservoirs Layout
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
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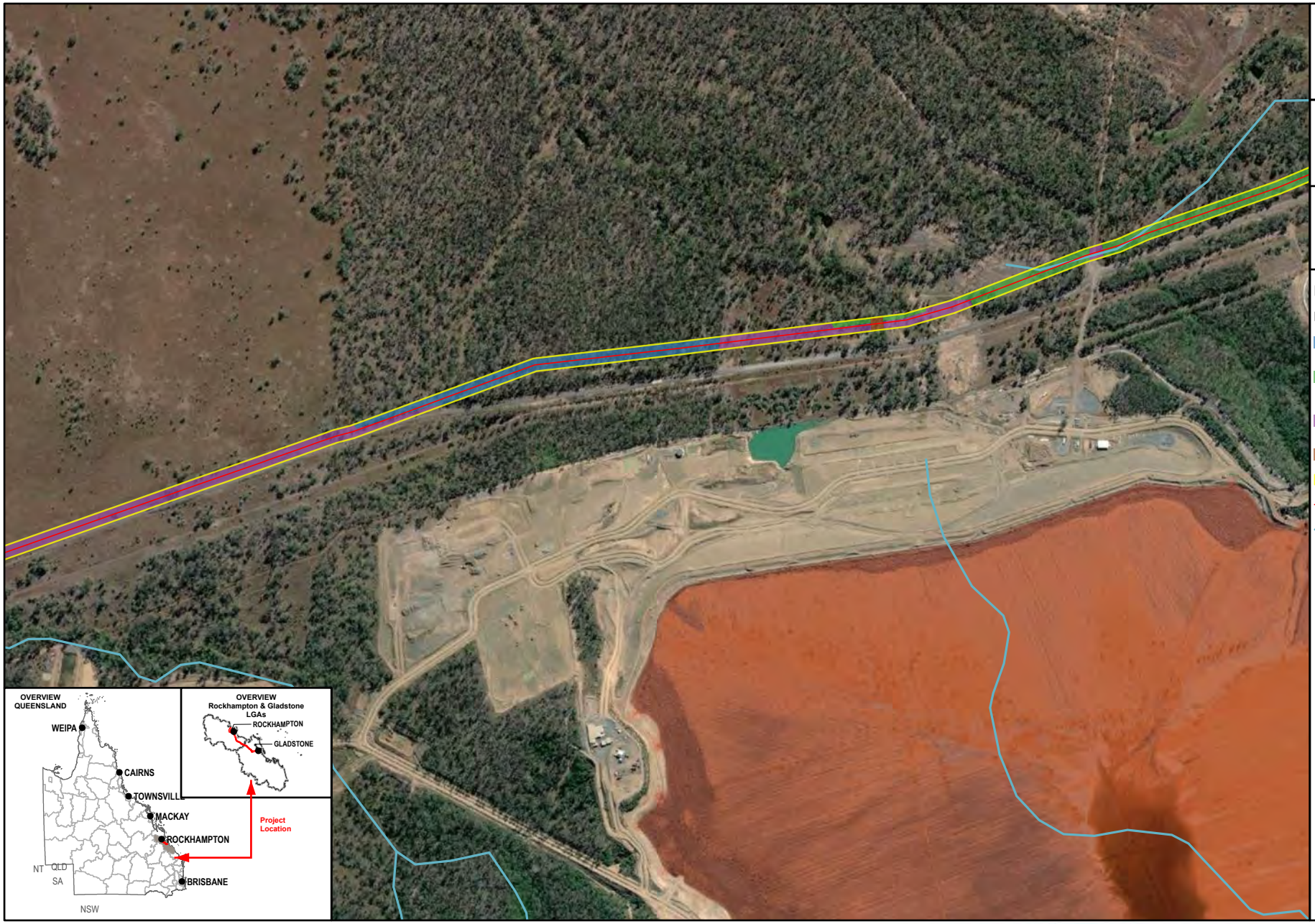
Figure 5-c
Habitat Types Identified Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Queensland Government

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Member of the Surbana Jurong Group

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Legend

Habitat Type

- Mature Eucalypt Woodland
- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Study Area
- GSDA Pipeline Alignment
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
(Datum GDA2020)

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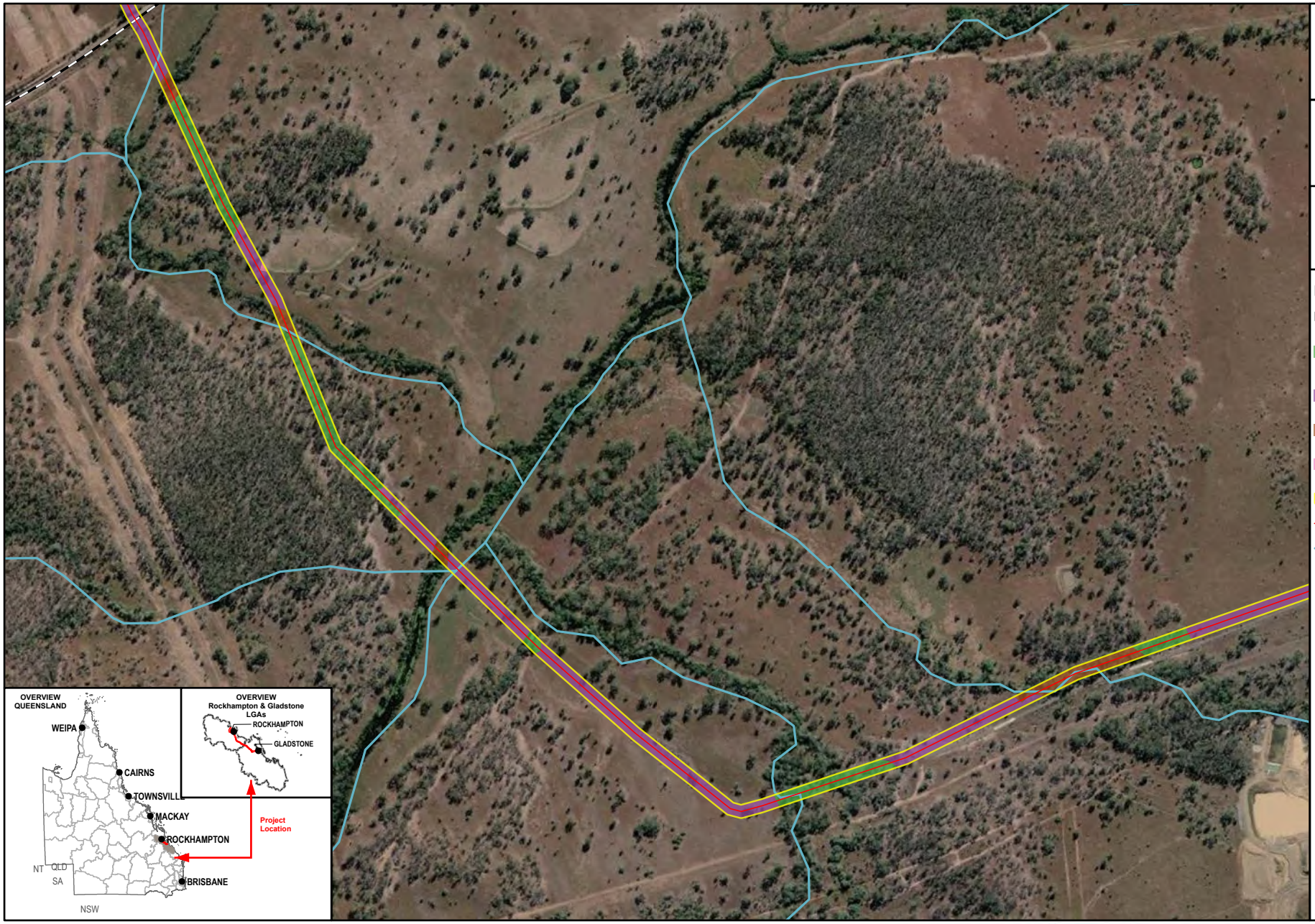
Figure 5-d
Habitat Types Identified
Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Legend

Habitat Type

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Study Area
- GSDA Pipeline Alignment
- Waterways
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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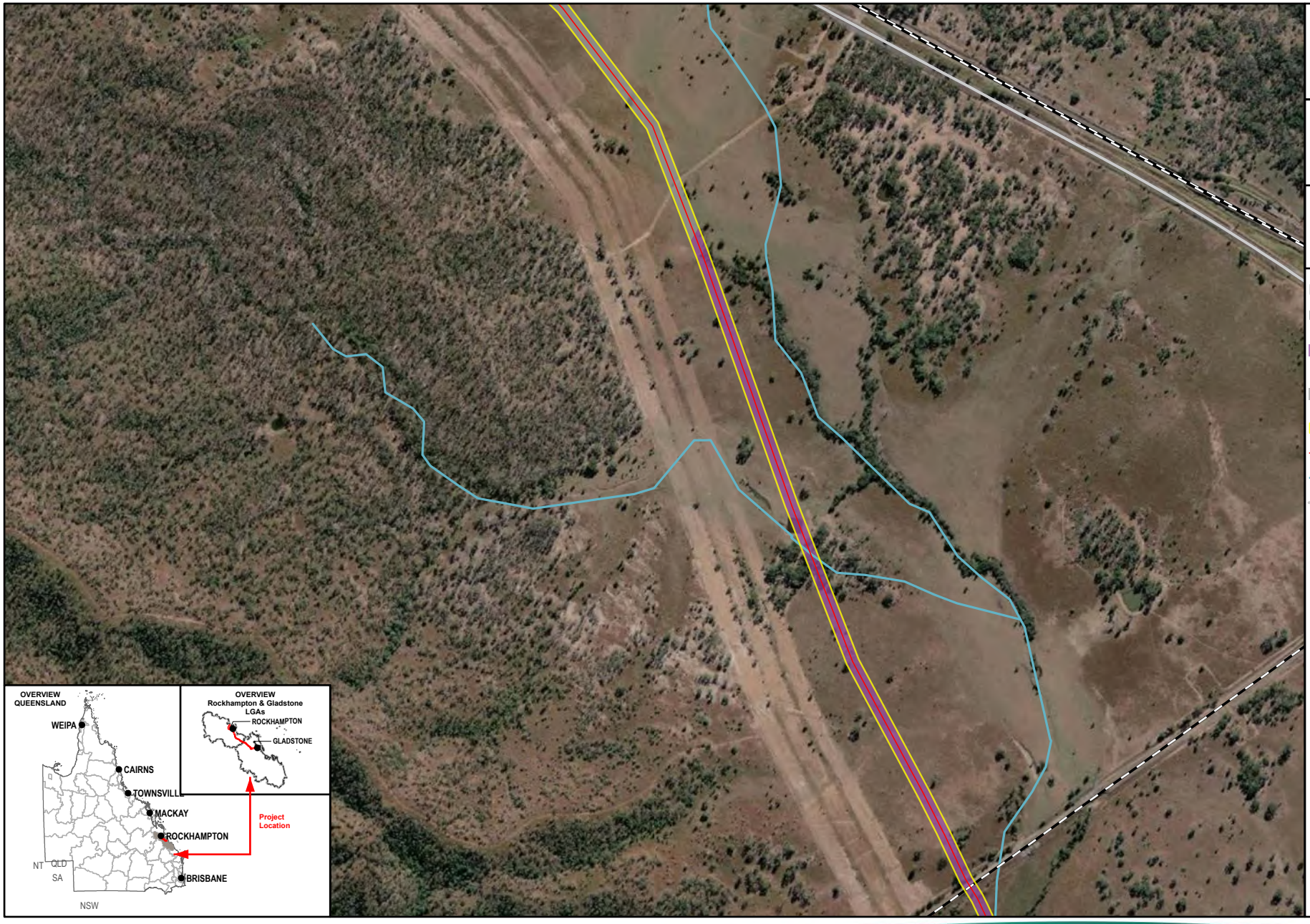
Figure 5-e
Habitat Types Identified
Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Legend

Habitat Type

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Cleared and Highly Modified Landscapes
- Study Area
- GSDA Pipeline Alignment
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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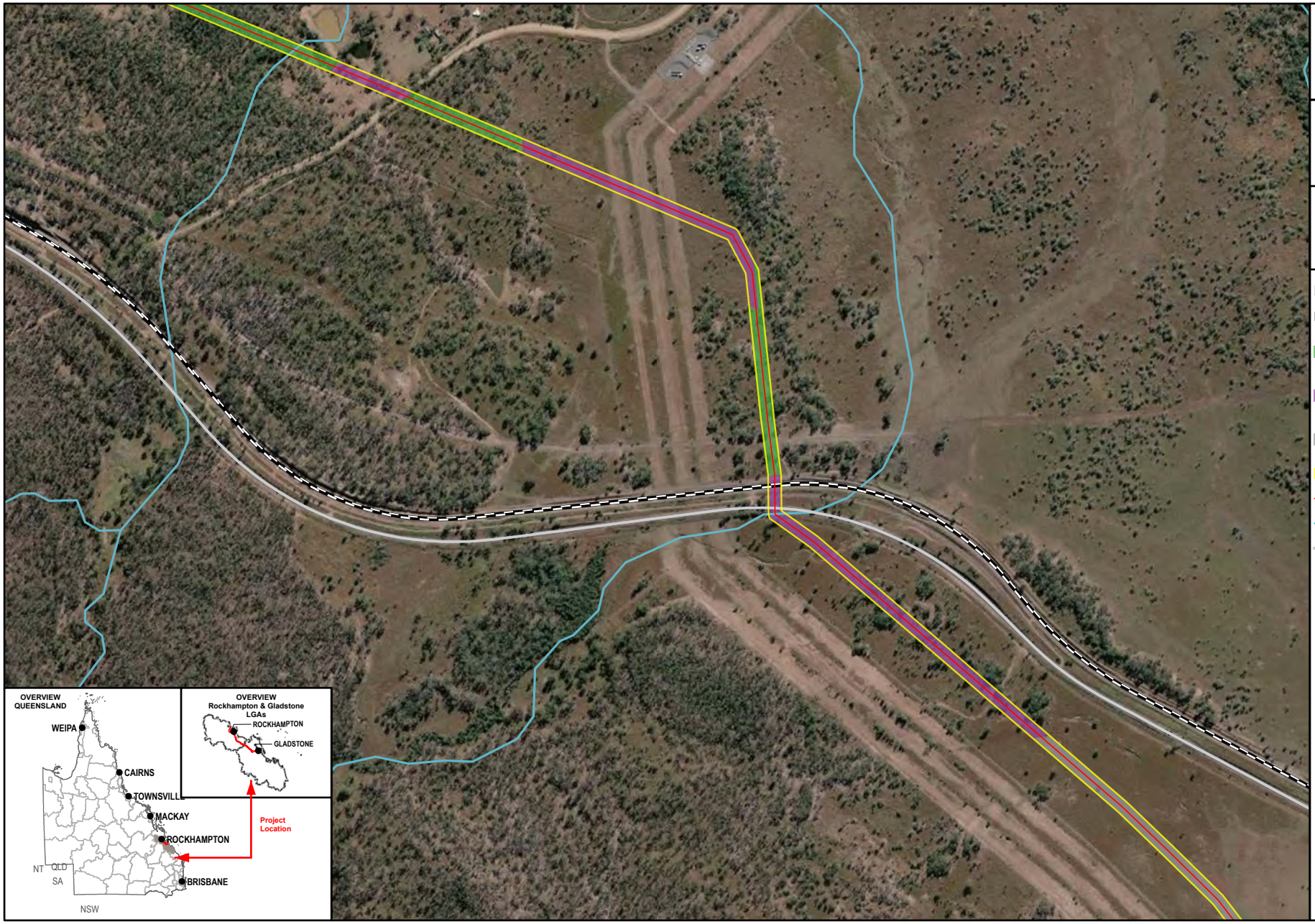
Figure 5-f
Habitat Types Identified Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Legend

Habitat Type

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Cleared and Highly Modified Landscapes
- Study Area
- GSDA Pipeline Alignment
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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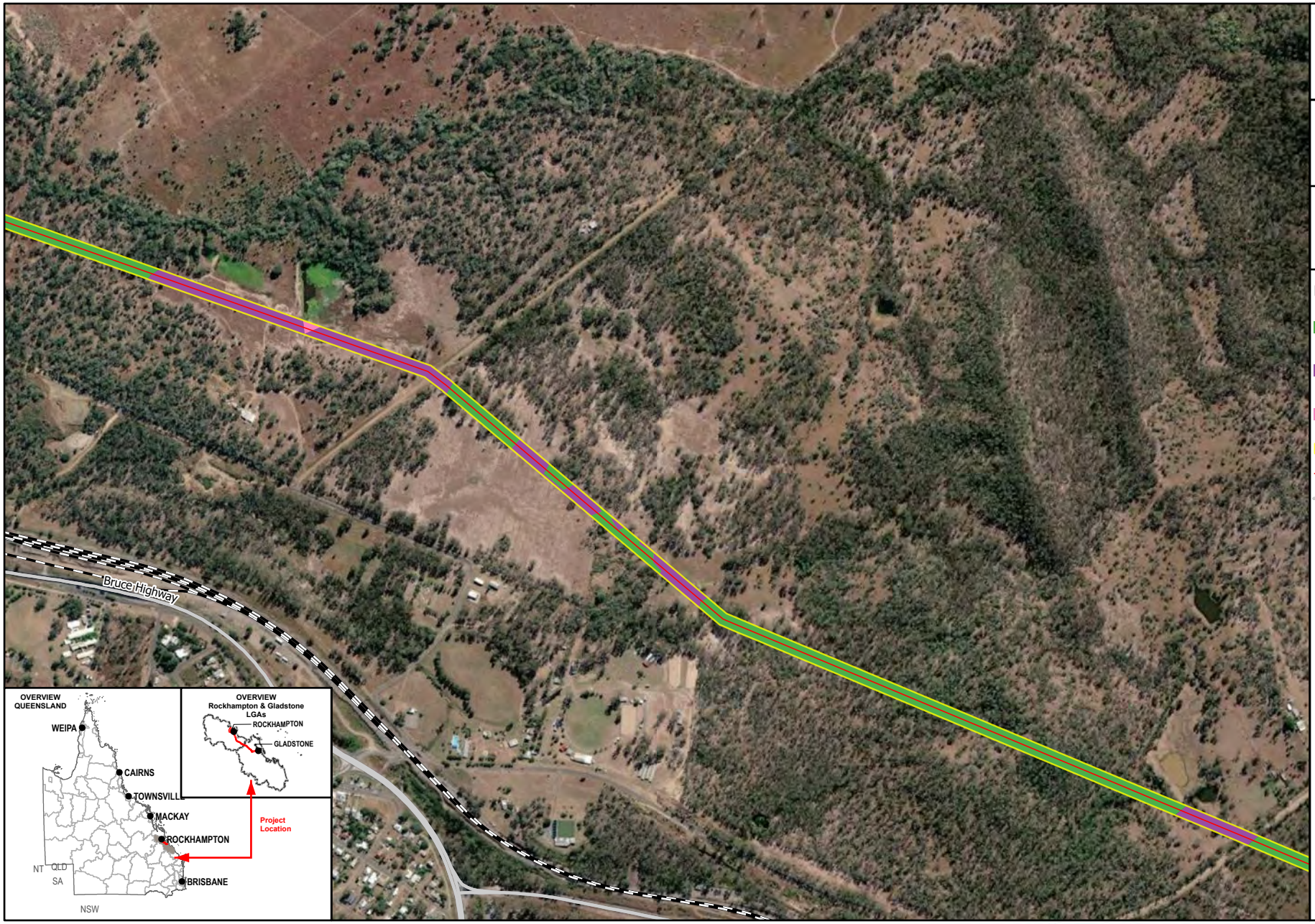
Figure 5-g
Habitat Types Identified Within the GSDA Study Area

000-G-MAP-2407 Version:4 Date:19/09/2022



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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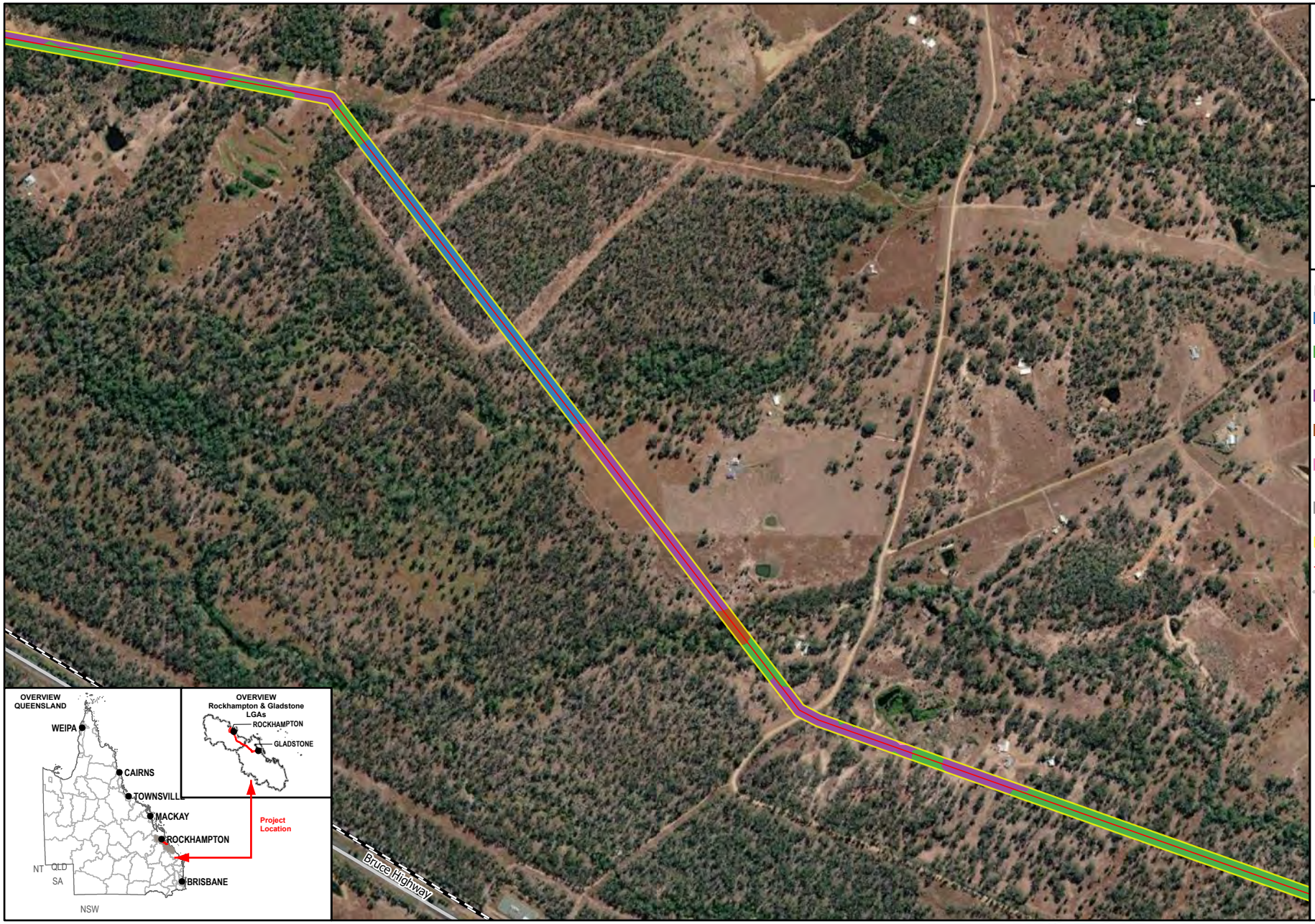
Compiled by:YS16239

Figure 5-h
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mature Eucalypt Woodland
- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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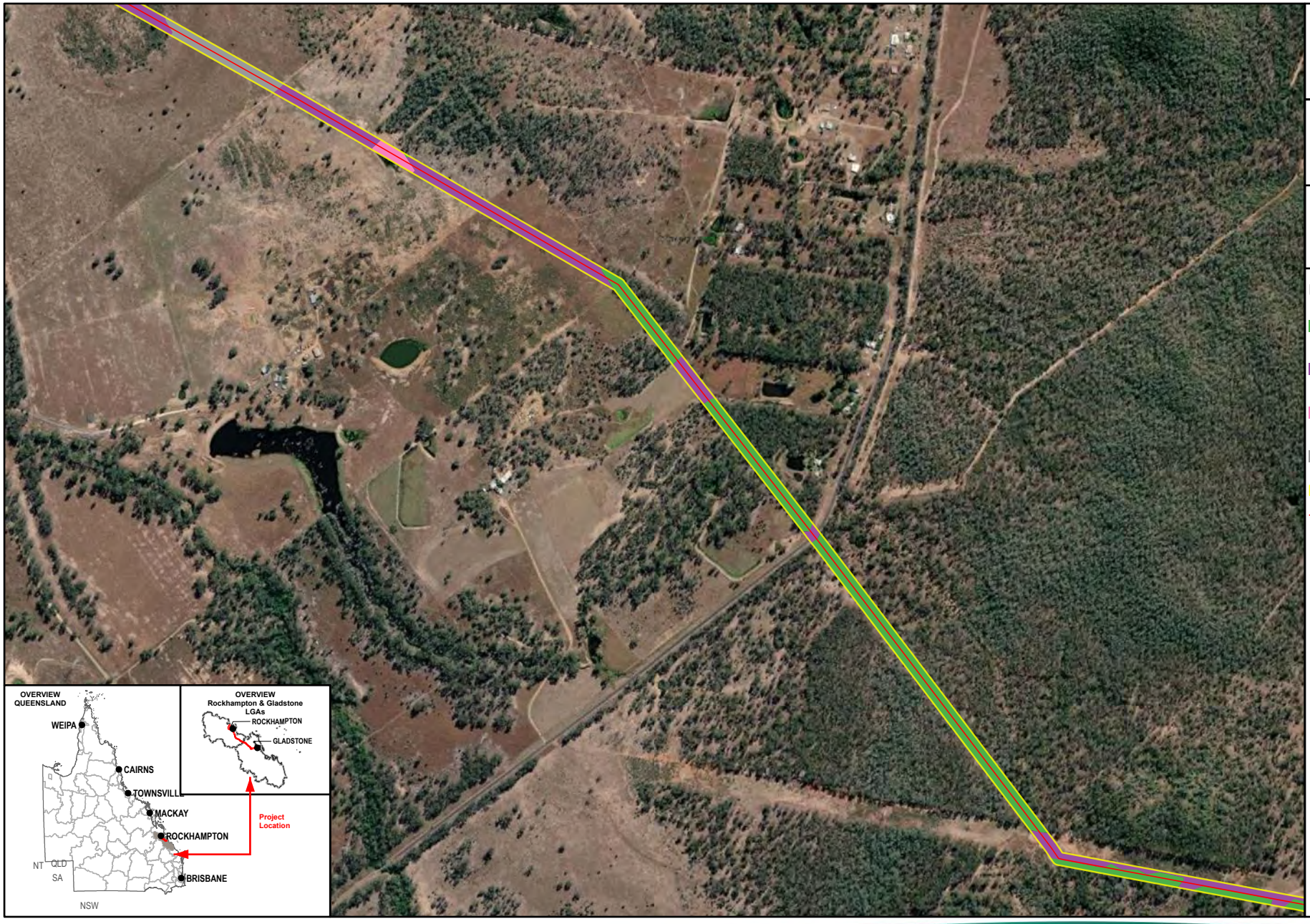
Figure 5-i
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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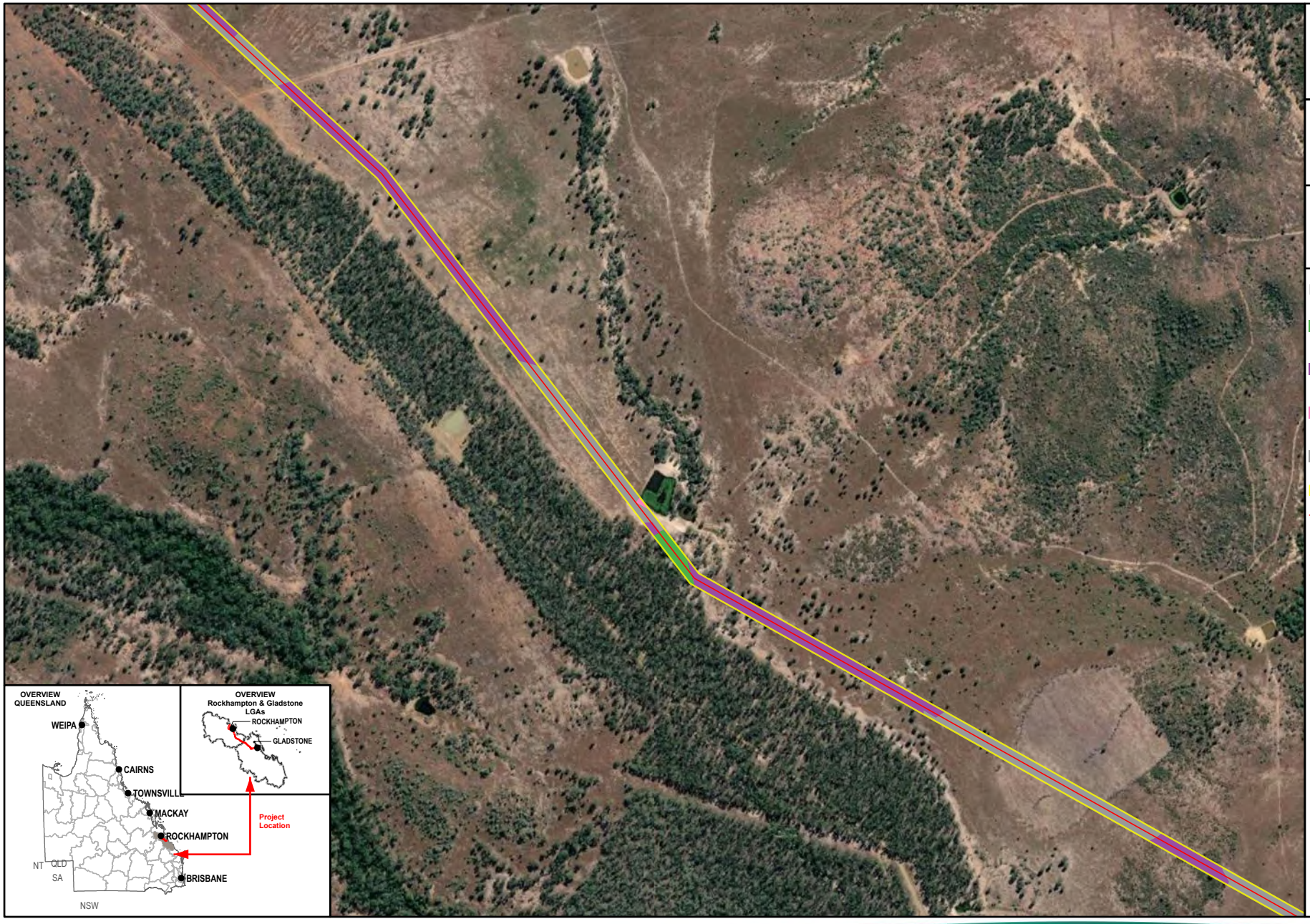
Figure 5-j
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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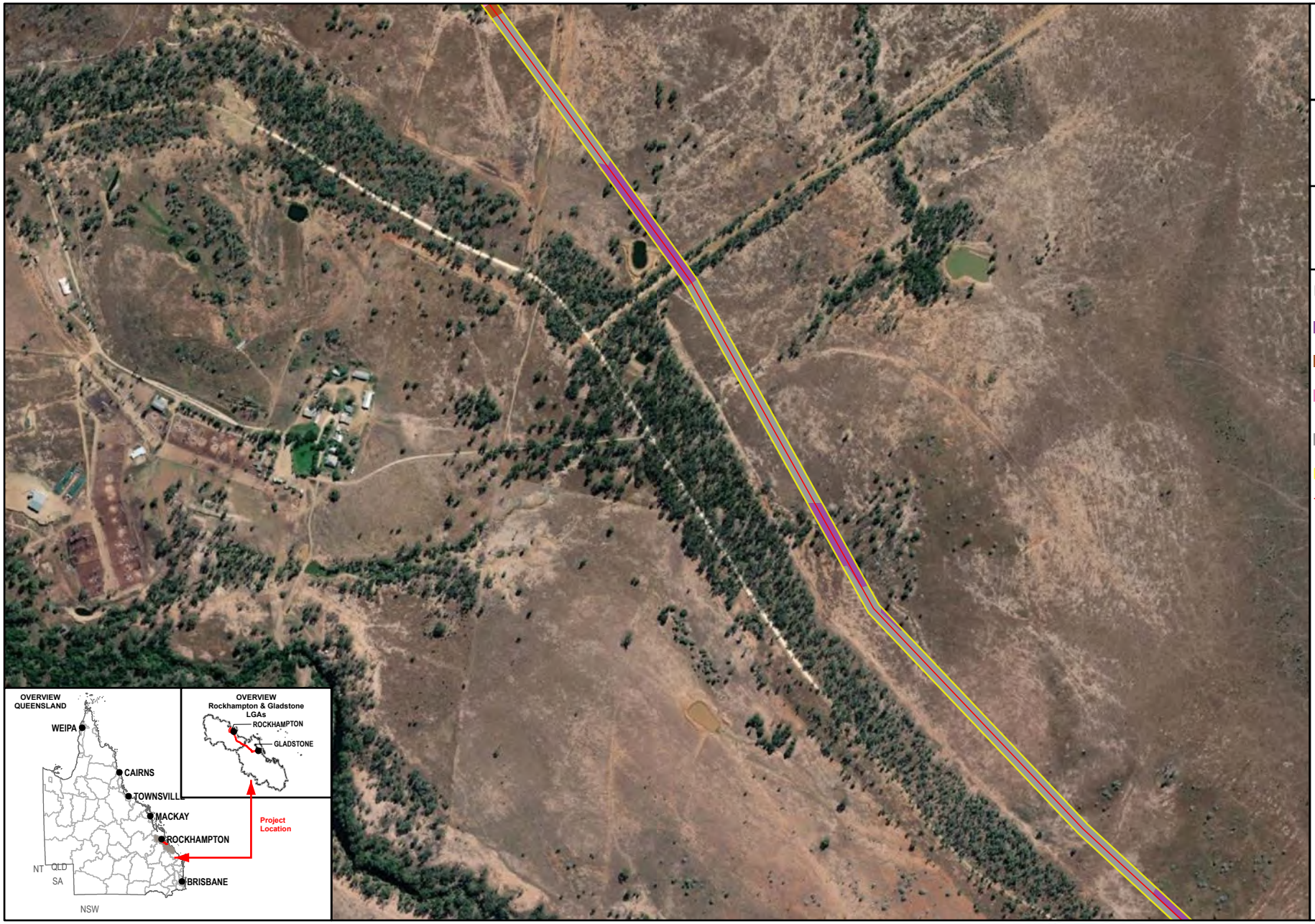
Figure 5-k
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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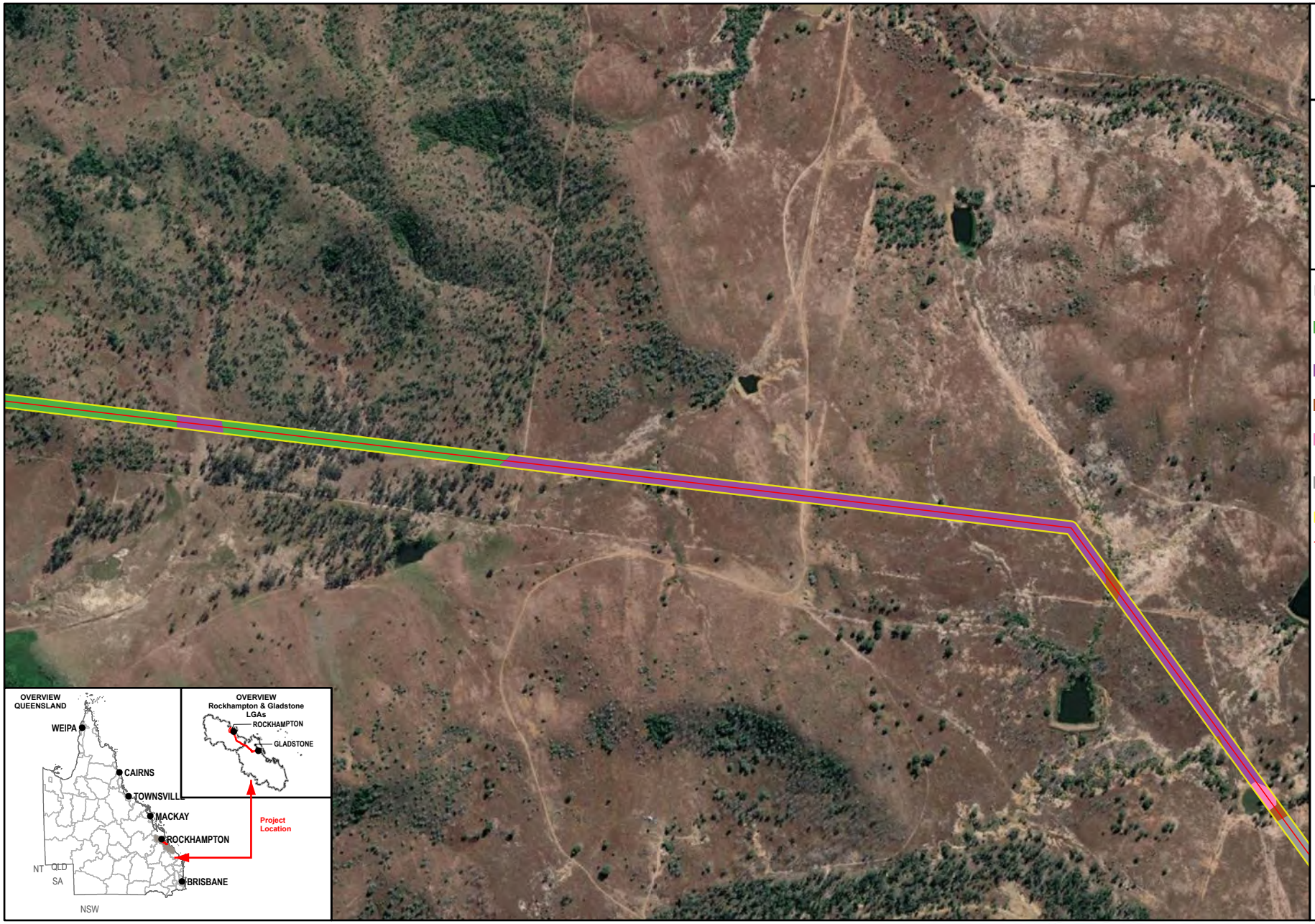
Figure 5-I
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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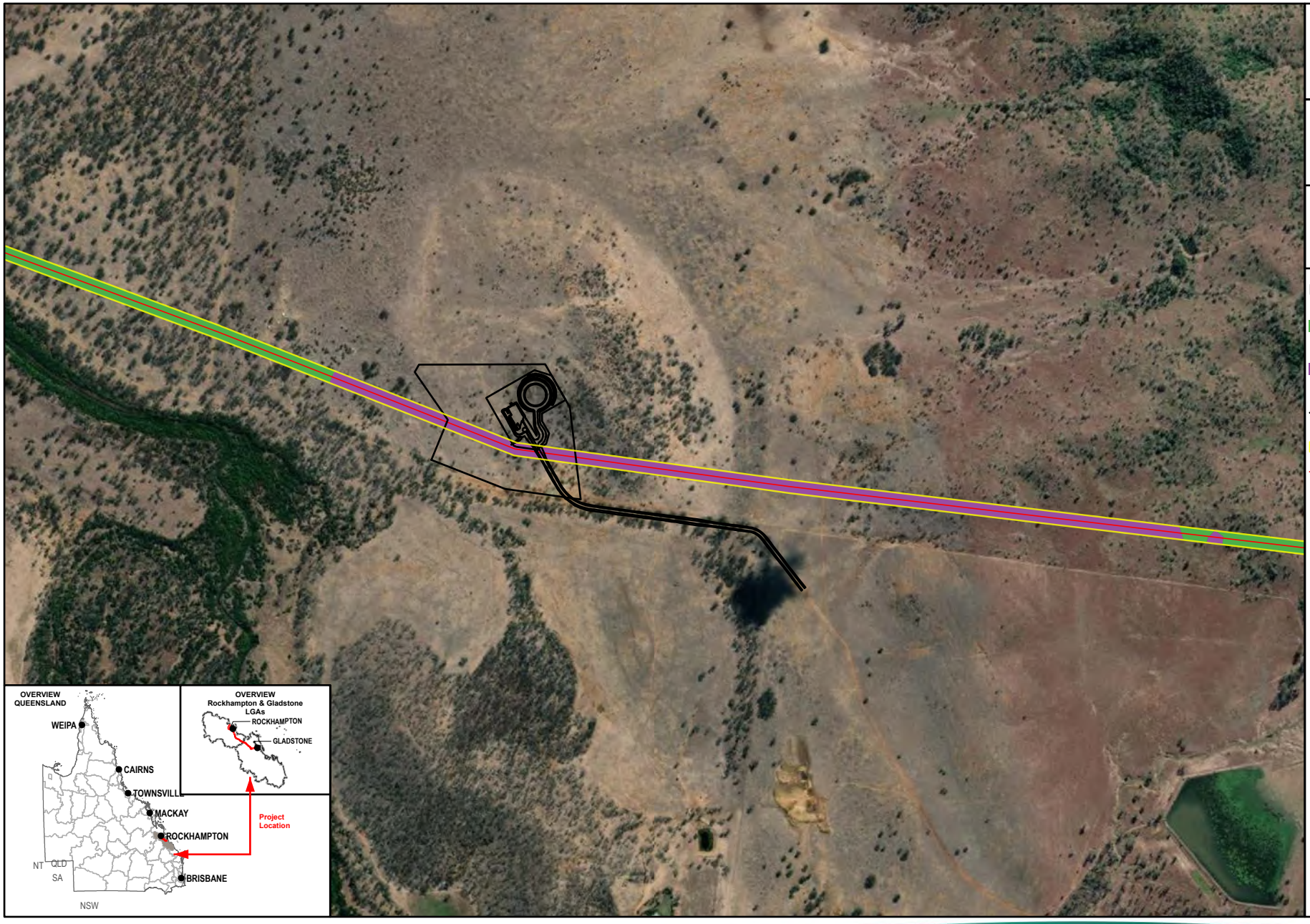
Figure 5-m
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Raglan Pump Station and Reservoir Layout
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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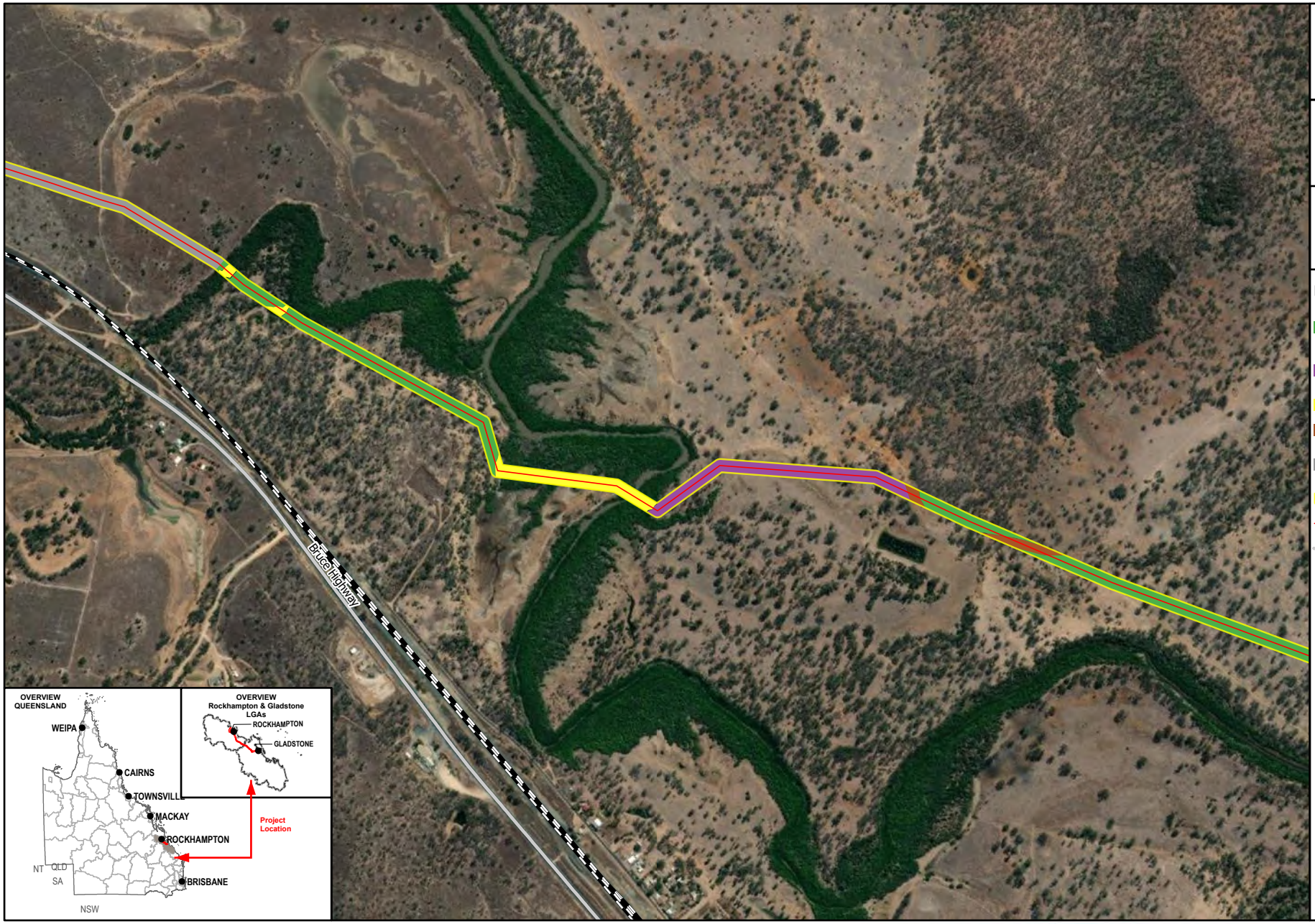
Figure 5-n
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Estuarine Environments
- Fringing Riparian Vegetation
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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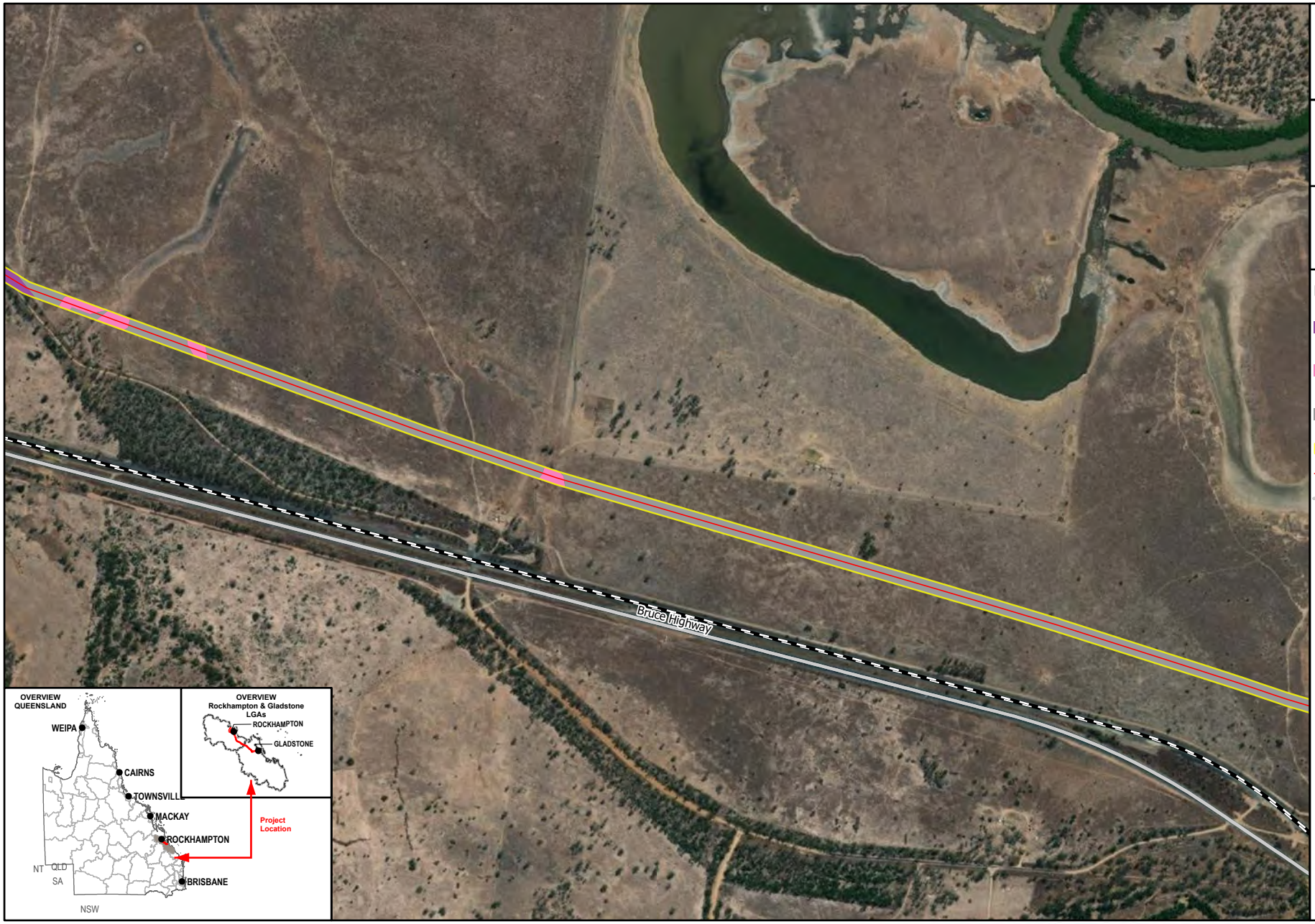
Figure 5-o
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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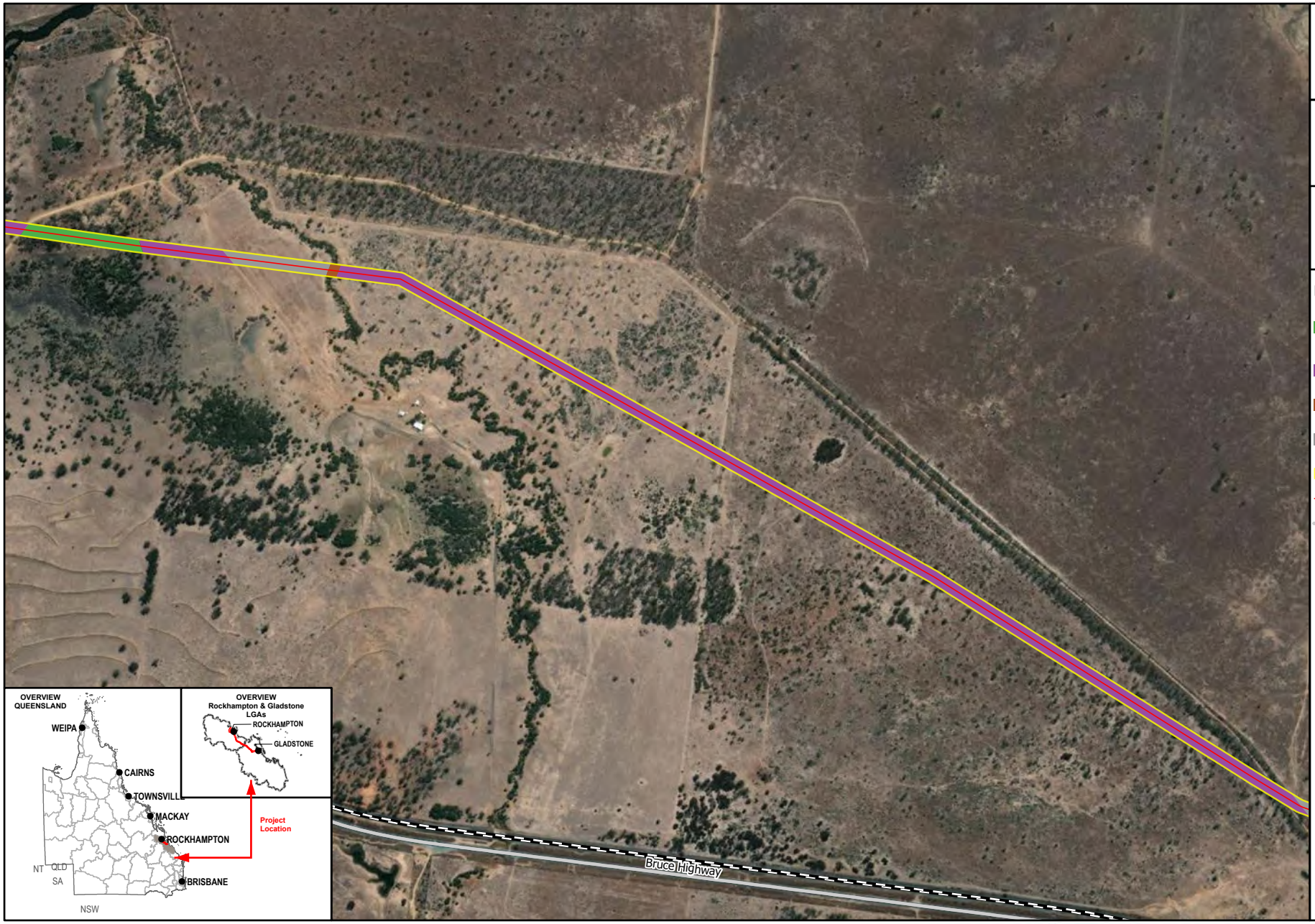
Figure 5-p
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Meters

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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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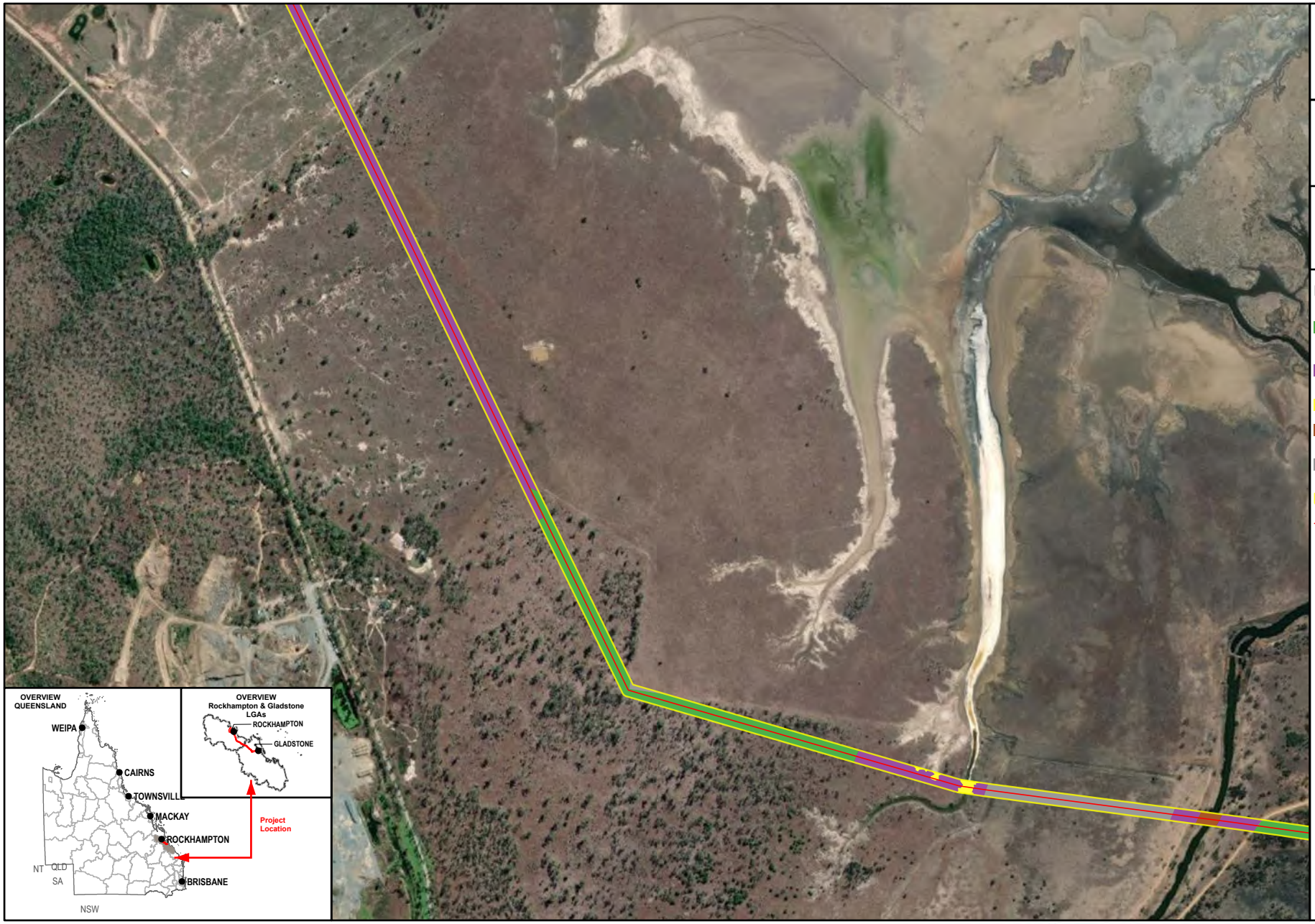
Figure 5-q
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Meters

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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Estuarine Environments
- Fringing Riparian Vegetation
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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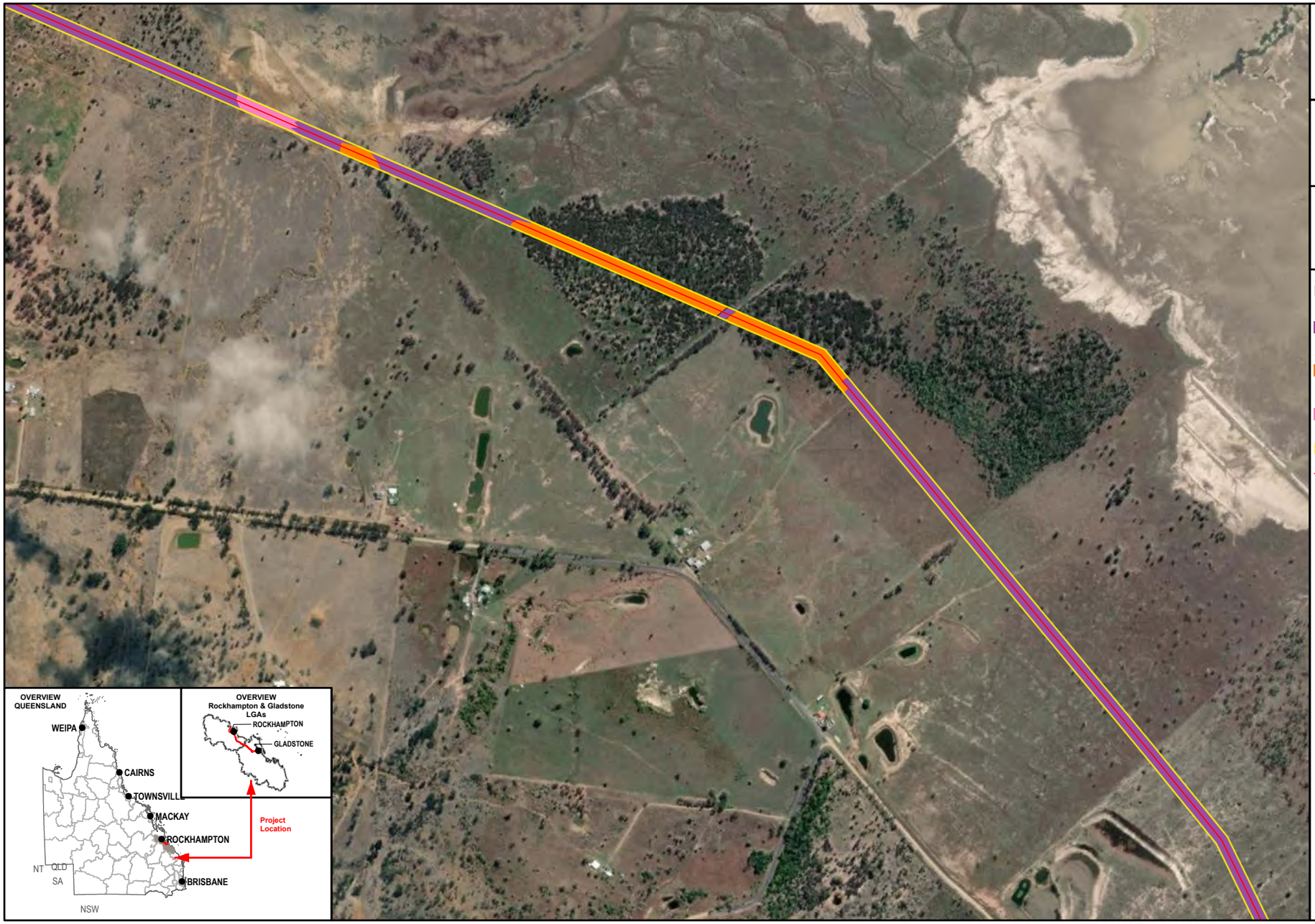
Figure 5-r
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Brigalow (Acacia harpophylla) Woodland
- Freshwater Waterbodies and Seasonal Wetlands
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline

Gladstone Area Water Board
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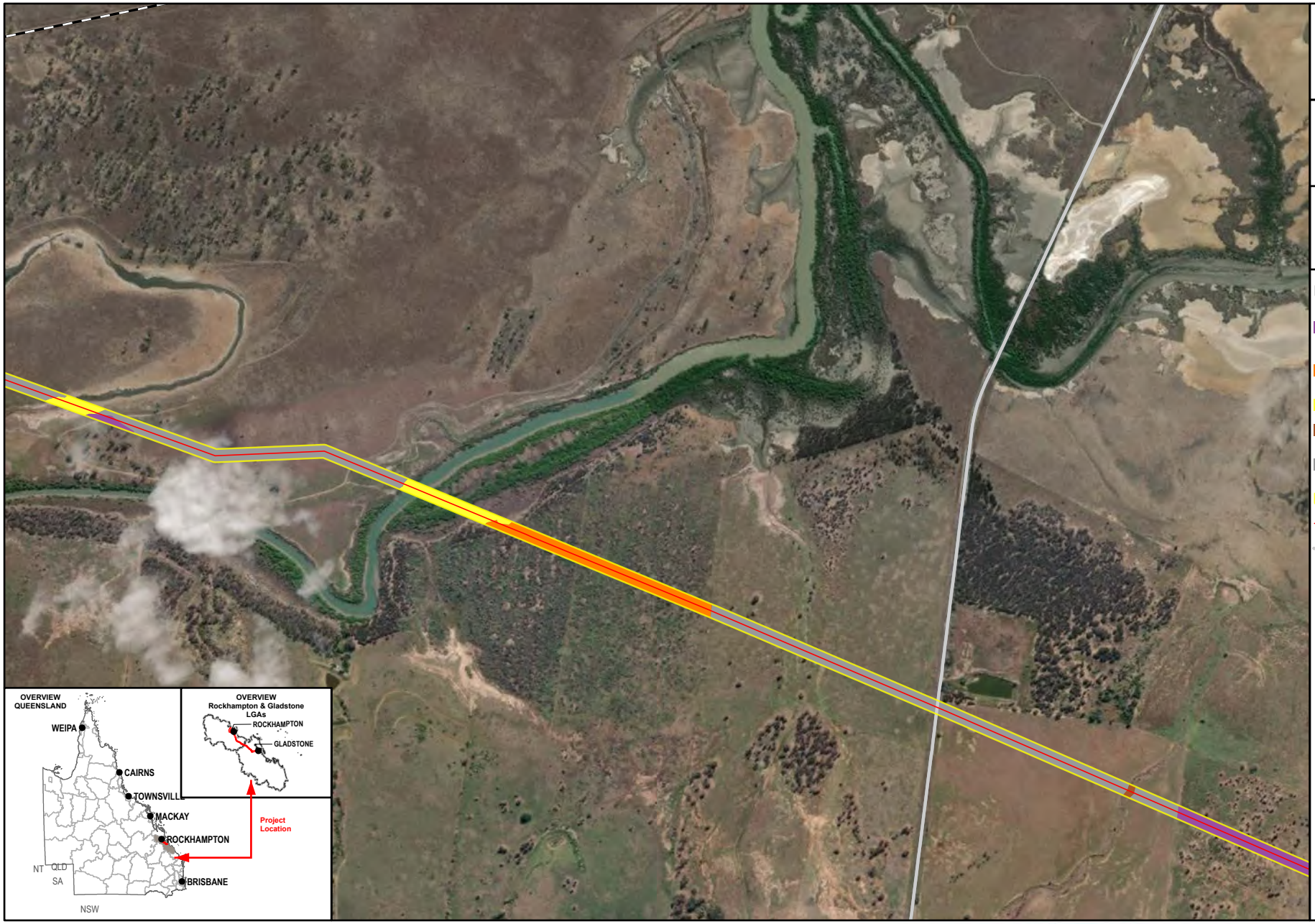
Ph: 07 4976 3000 www.gawb.qld.gov.au

PROJECTION UTM Zone 56
(Datum GDA2020)

Compiled by:YS16239

Figure 5-s
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Brigalow (Acacia harpophylla) Woodland
- Estuarine Environments
- Fringing Riparian Vegetation
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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PROJECTION UTM Zone 56
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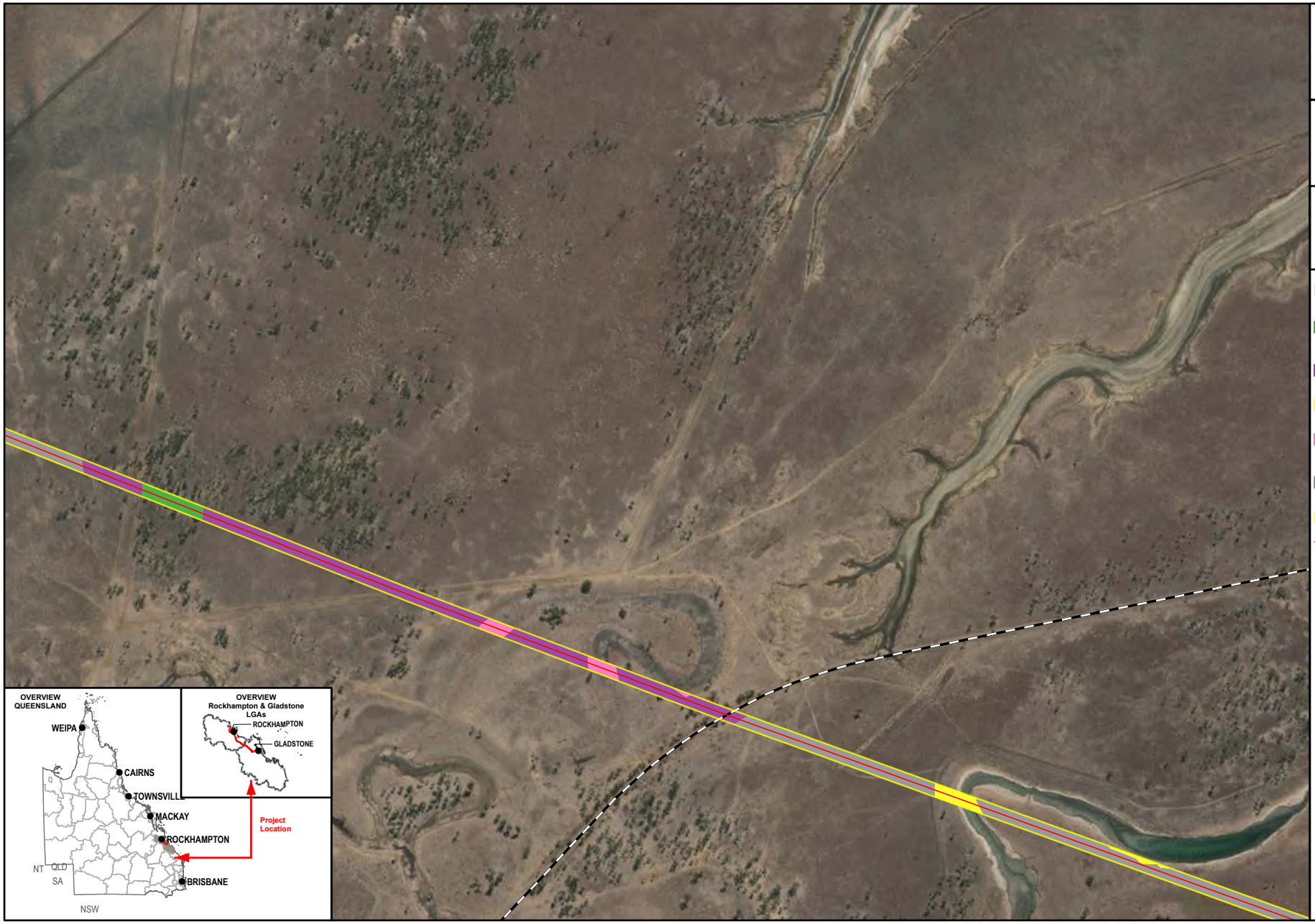
Figure 5-t
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Estuarine Environments
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Railways

Data Sources:
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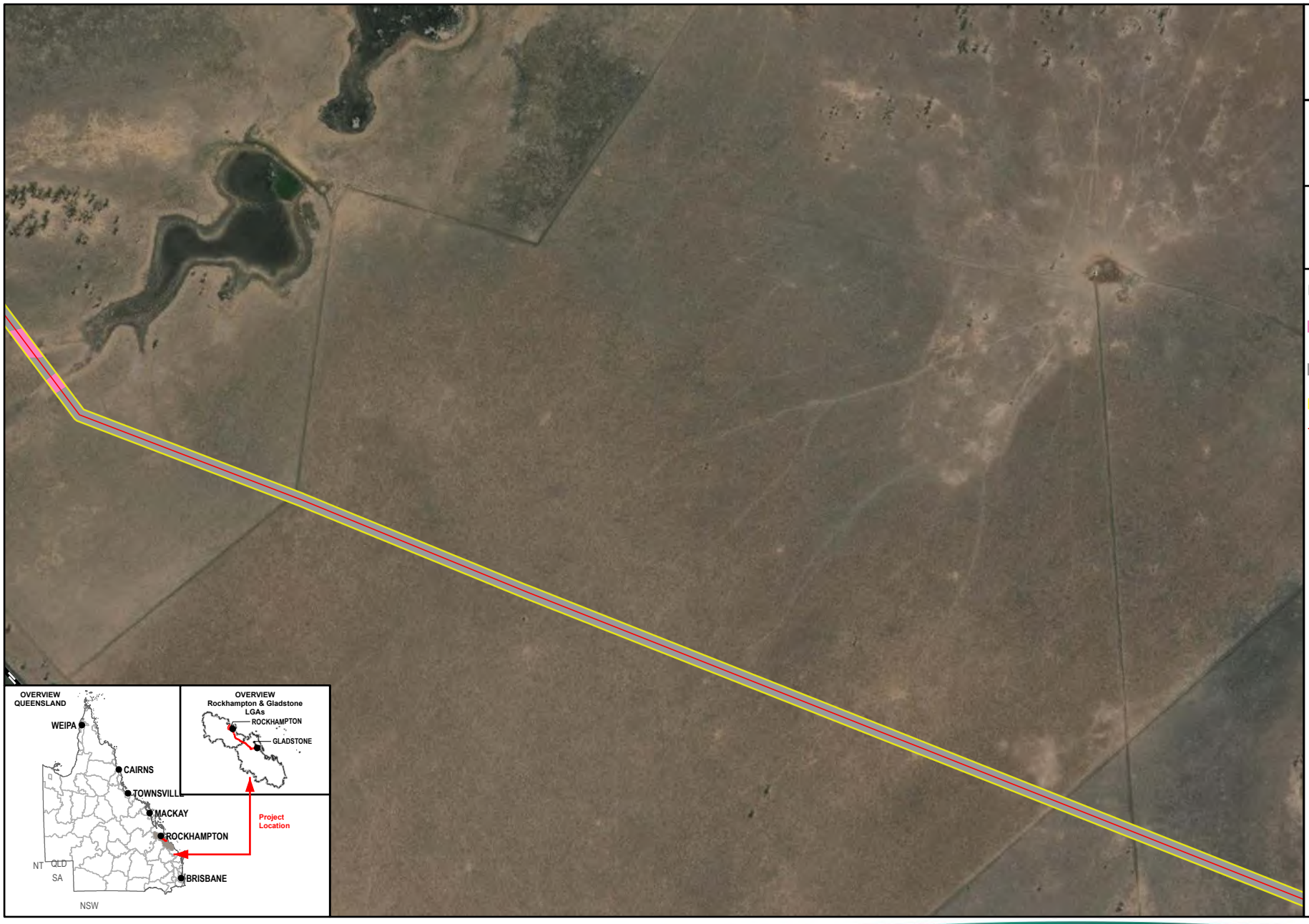
Figure 5-u
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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Figure 5-v
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12

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Legend

- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

Data Sources:
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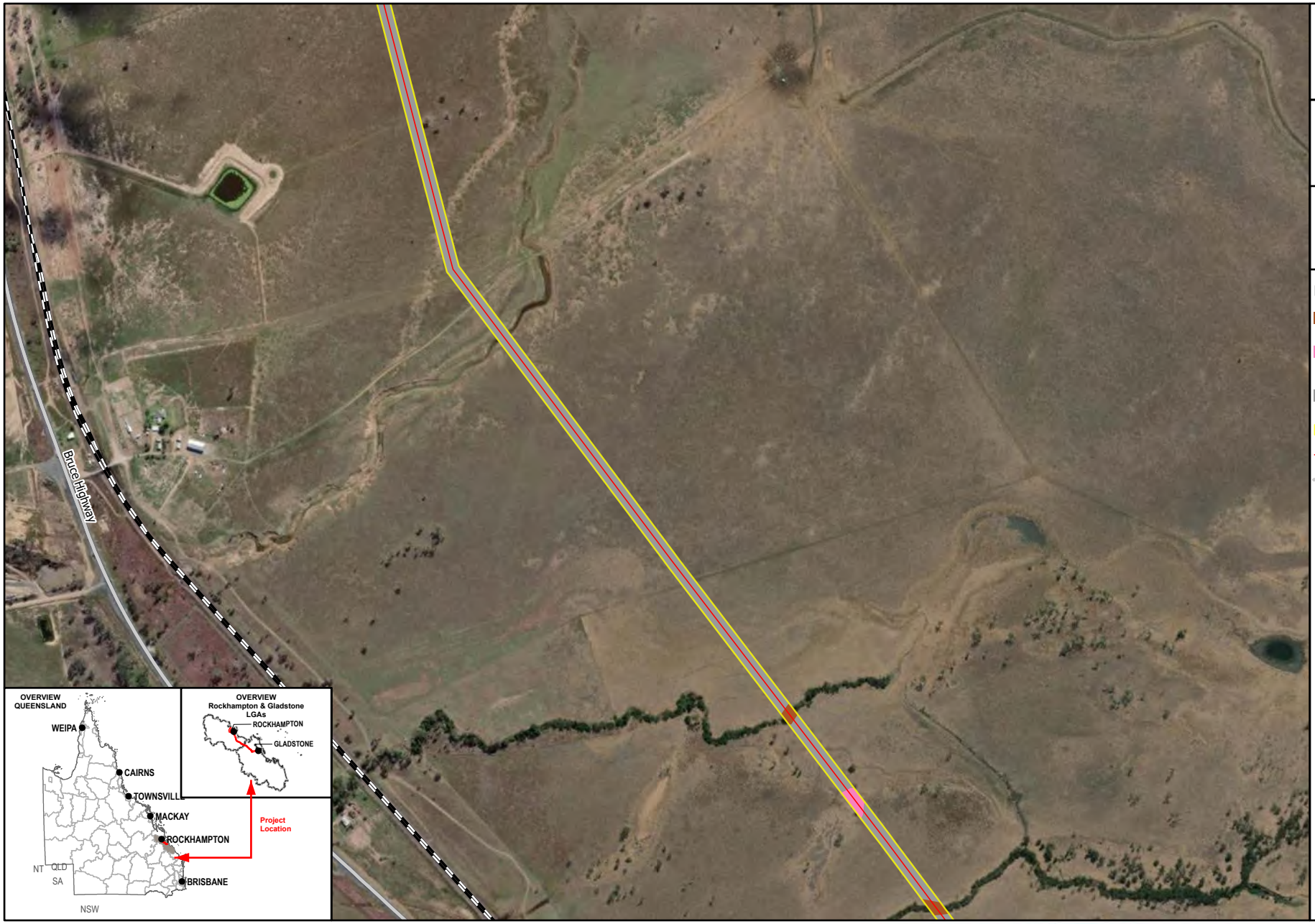
Figure 5-w
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

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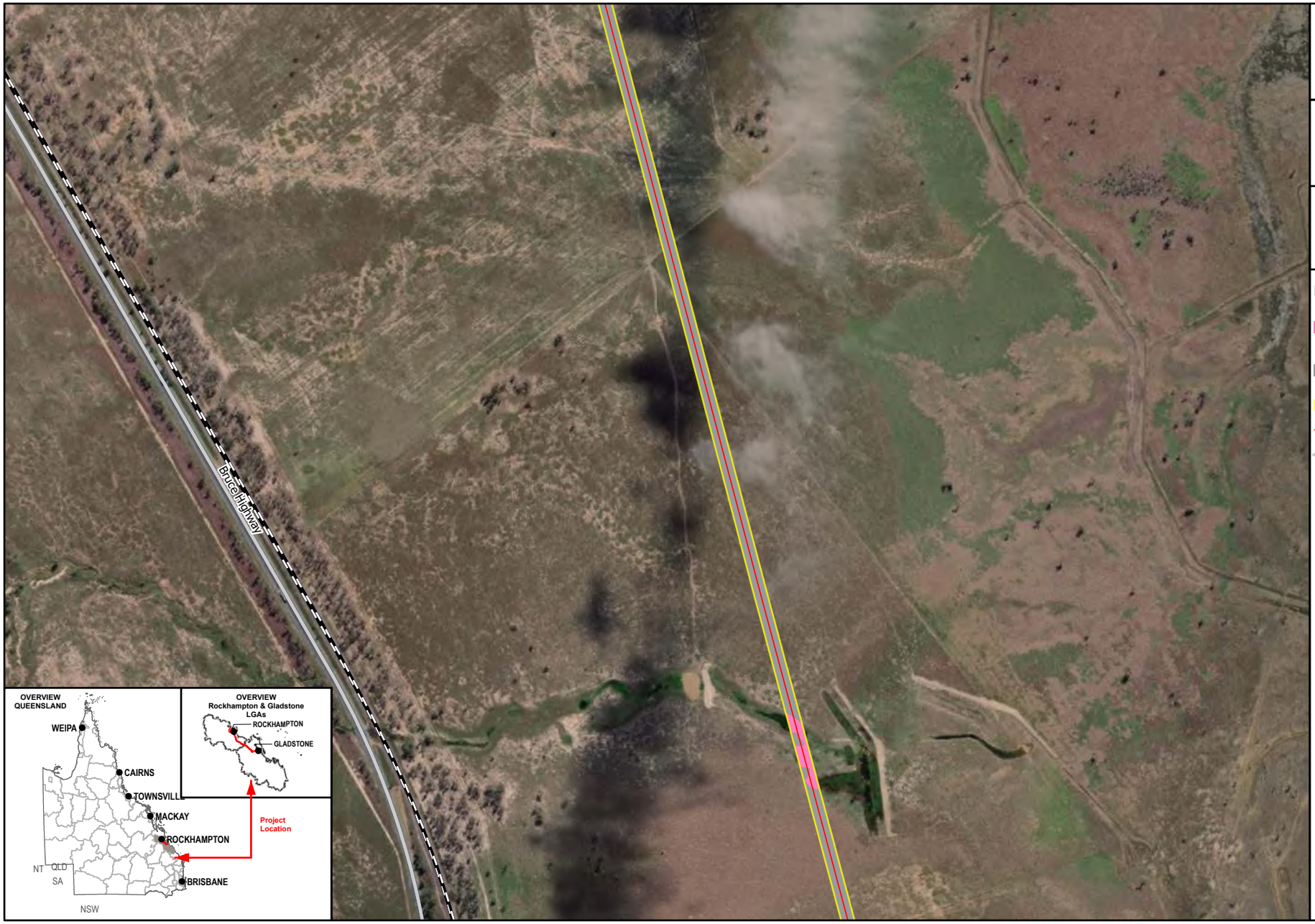
Figure 5-x
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

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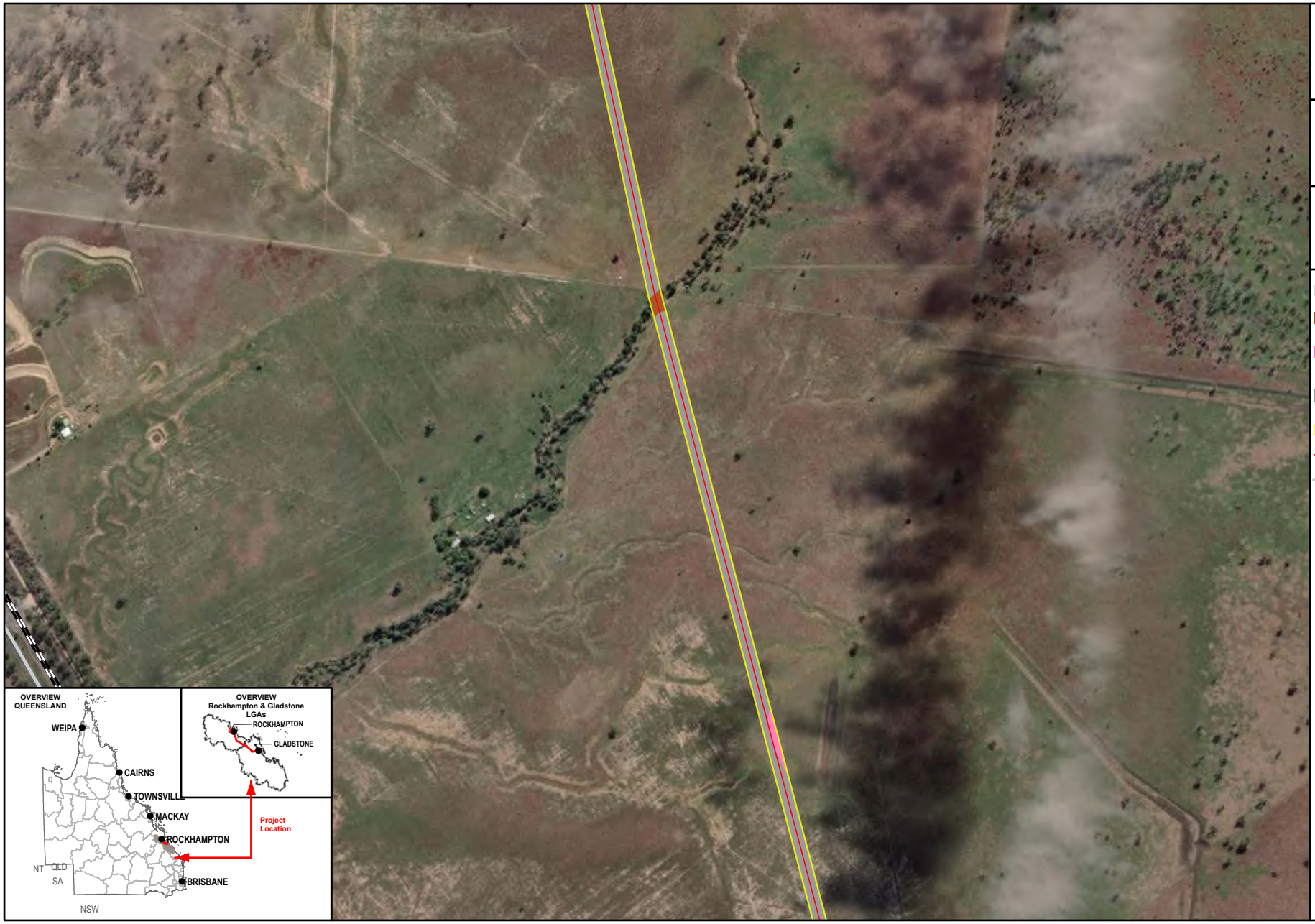
Figure 5-y
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

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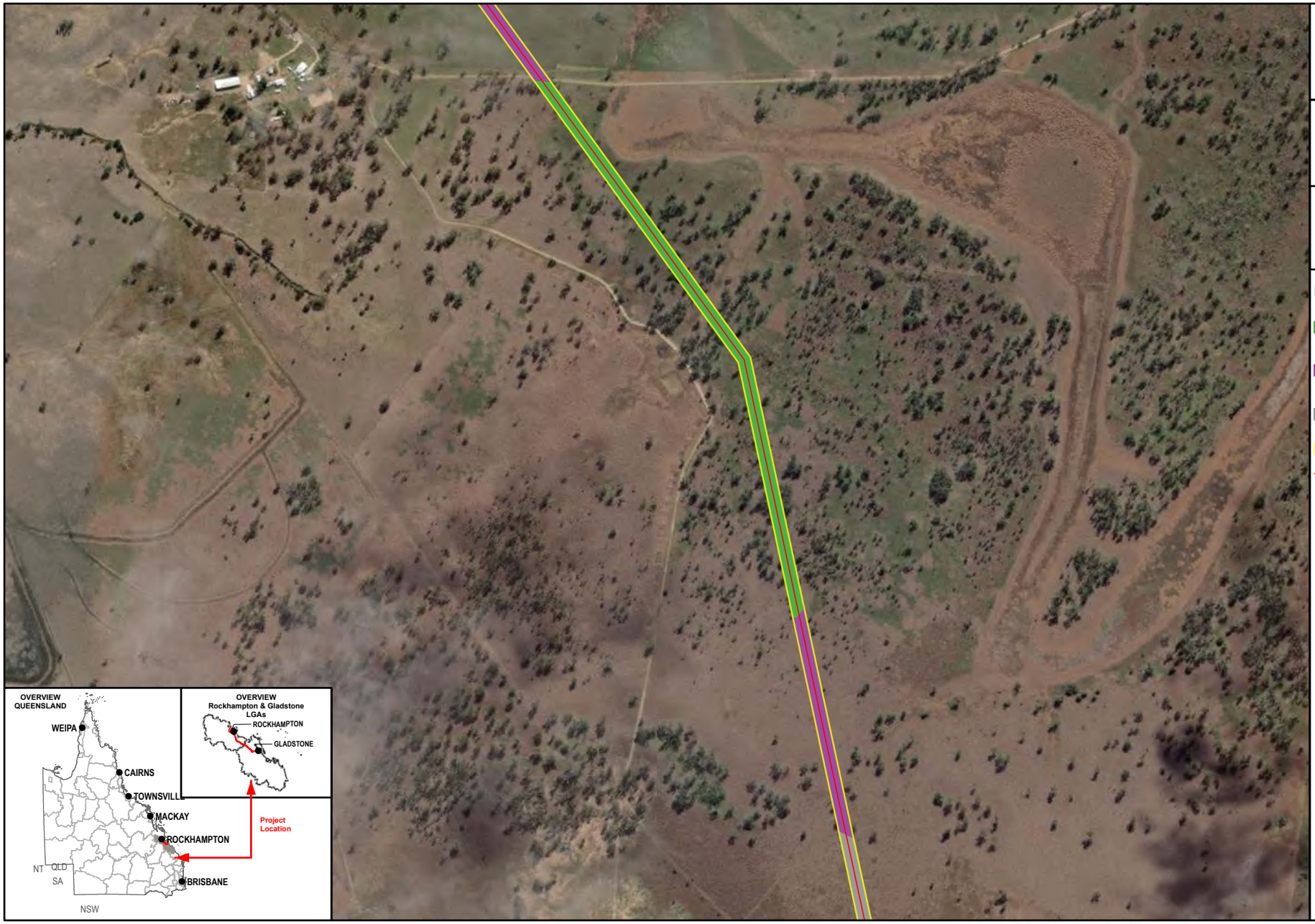
Figure 5-z
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
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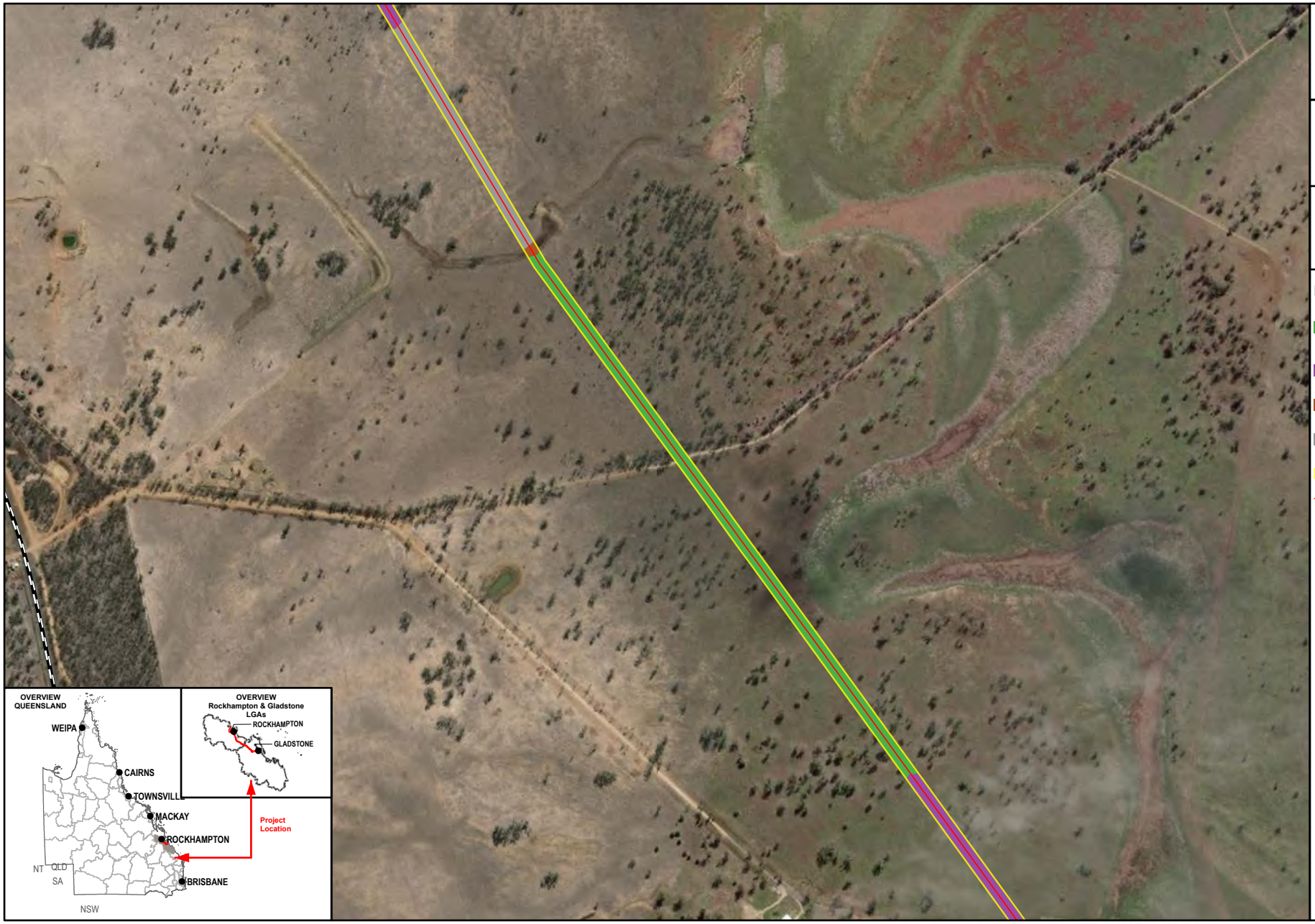
Figure 5-a1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
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- Railways

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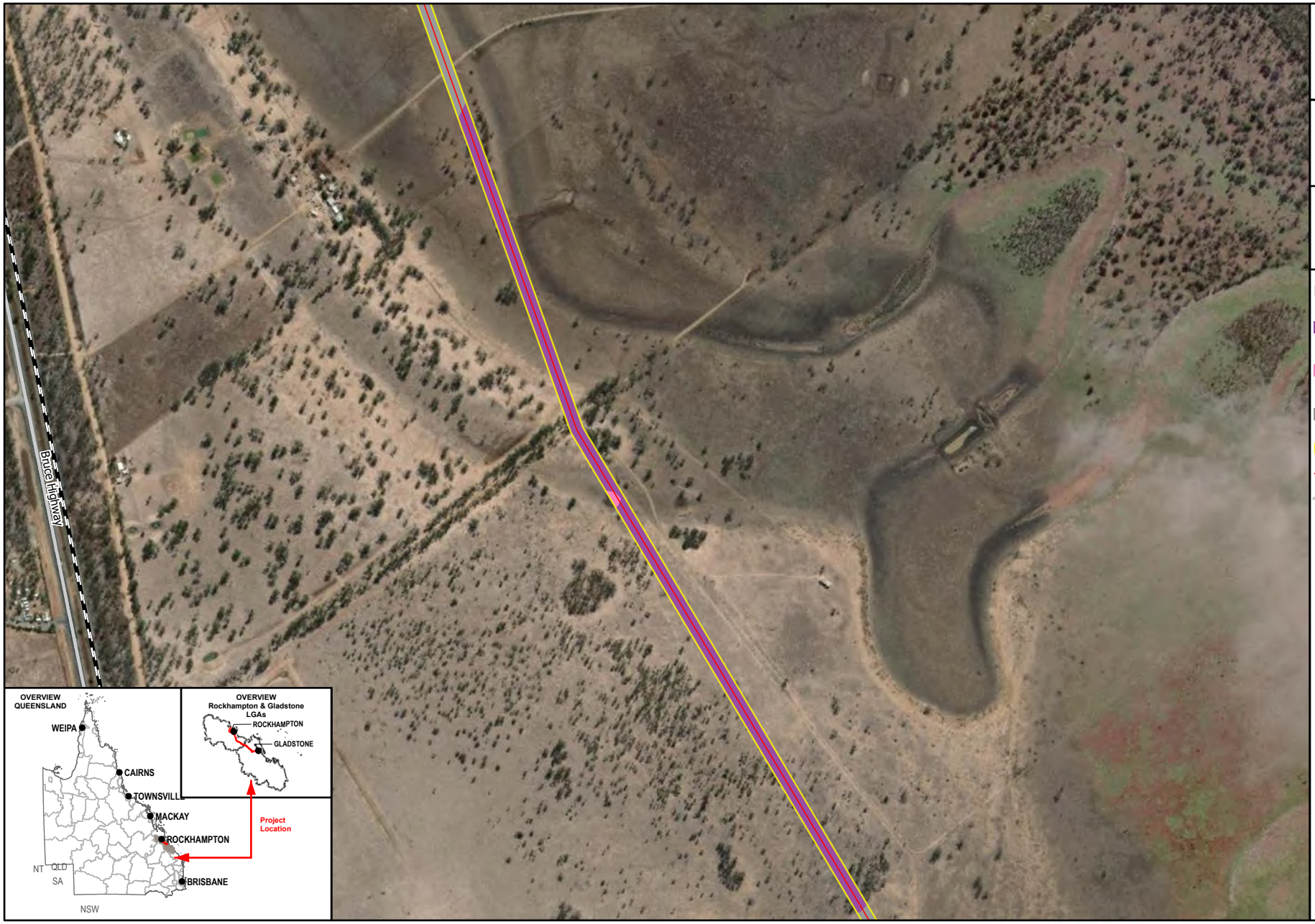
Figure 5-b1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
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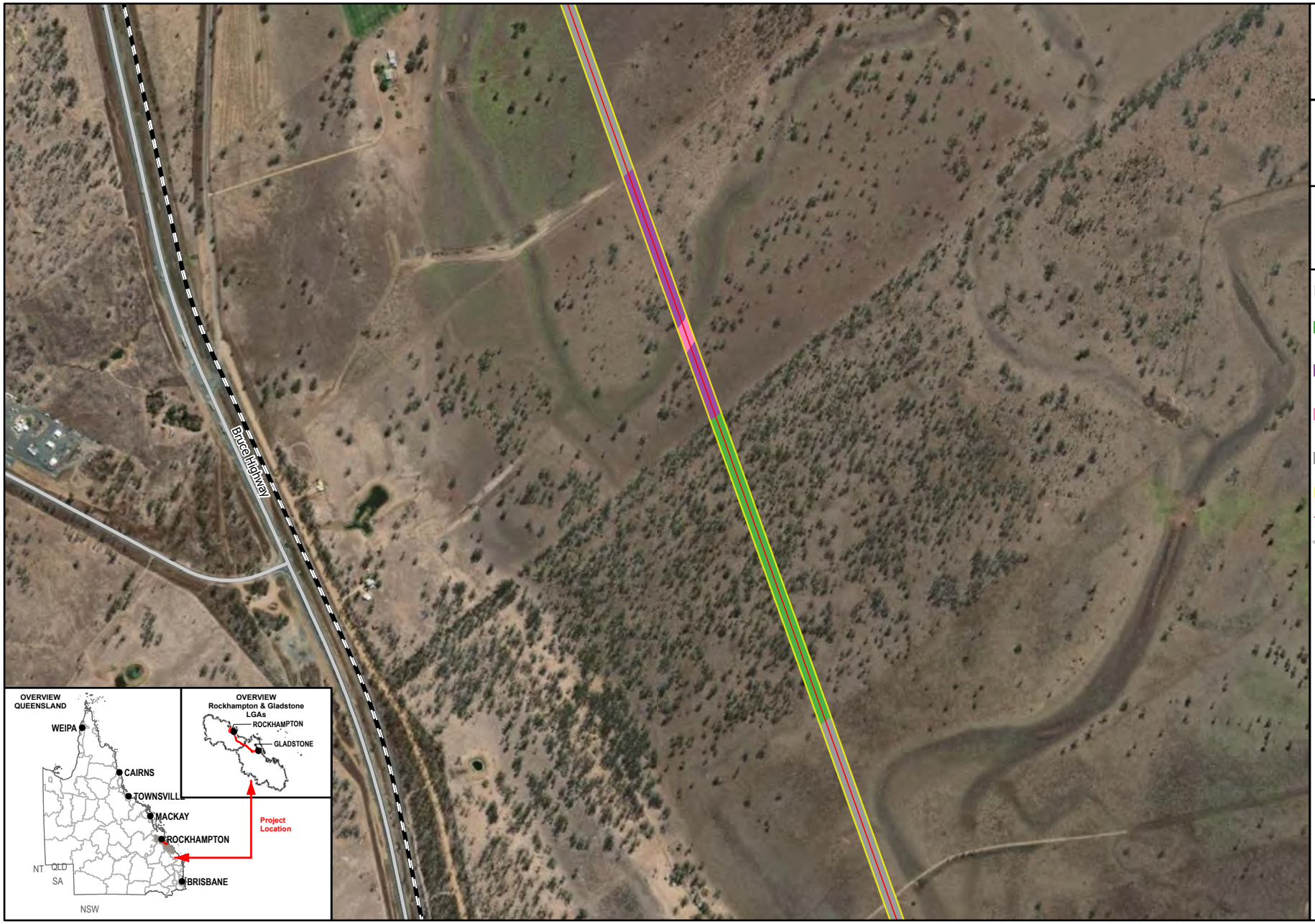
Figure 5-c1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
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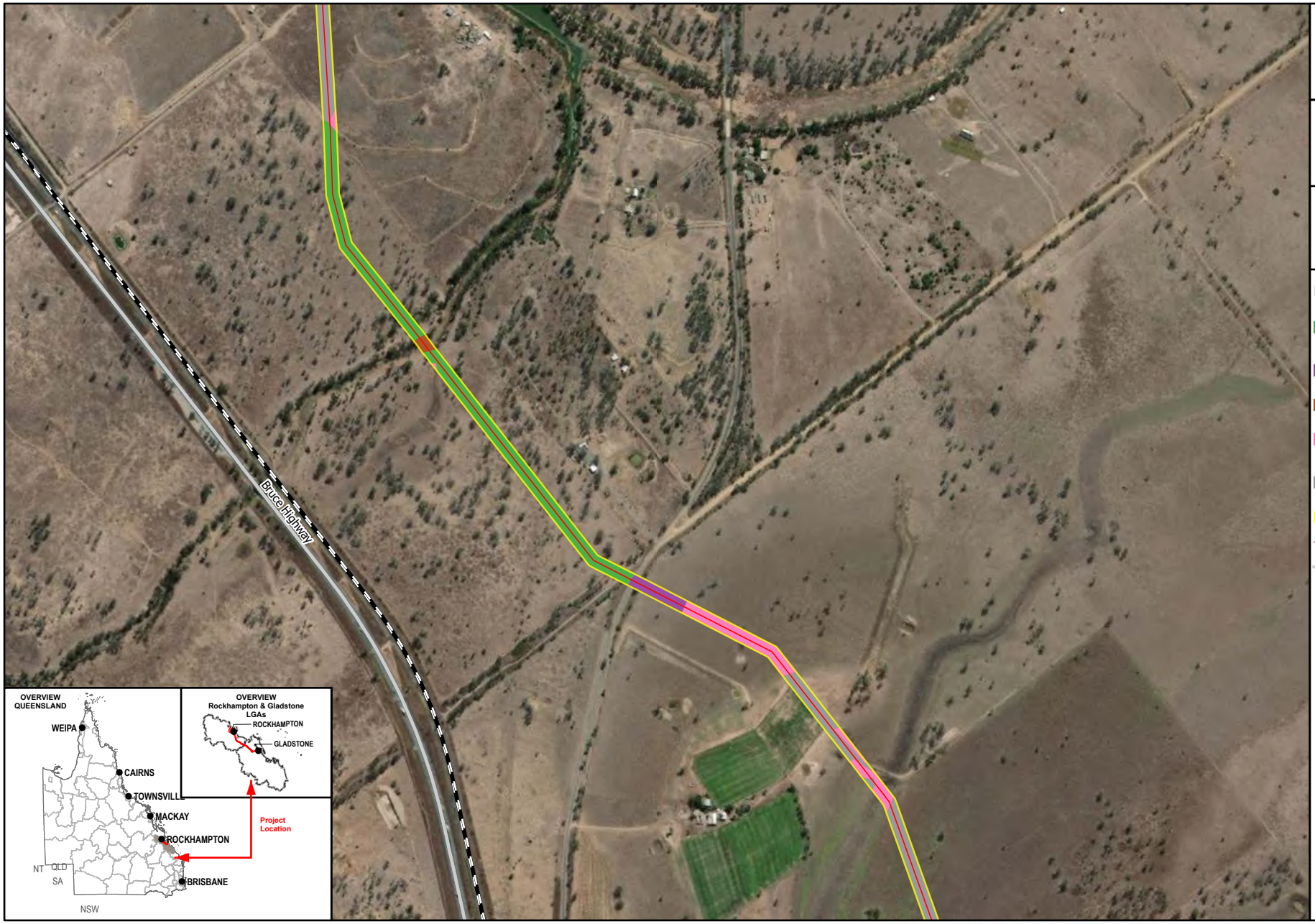
Figure 5-d1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
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- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

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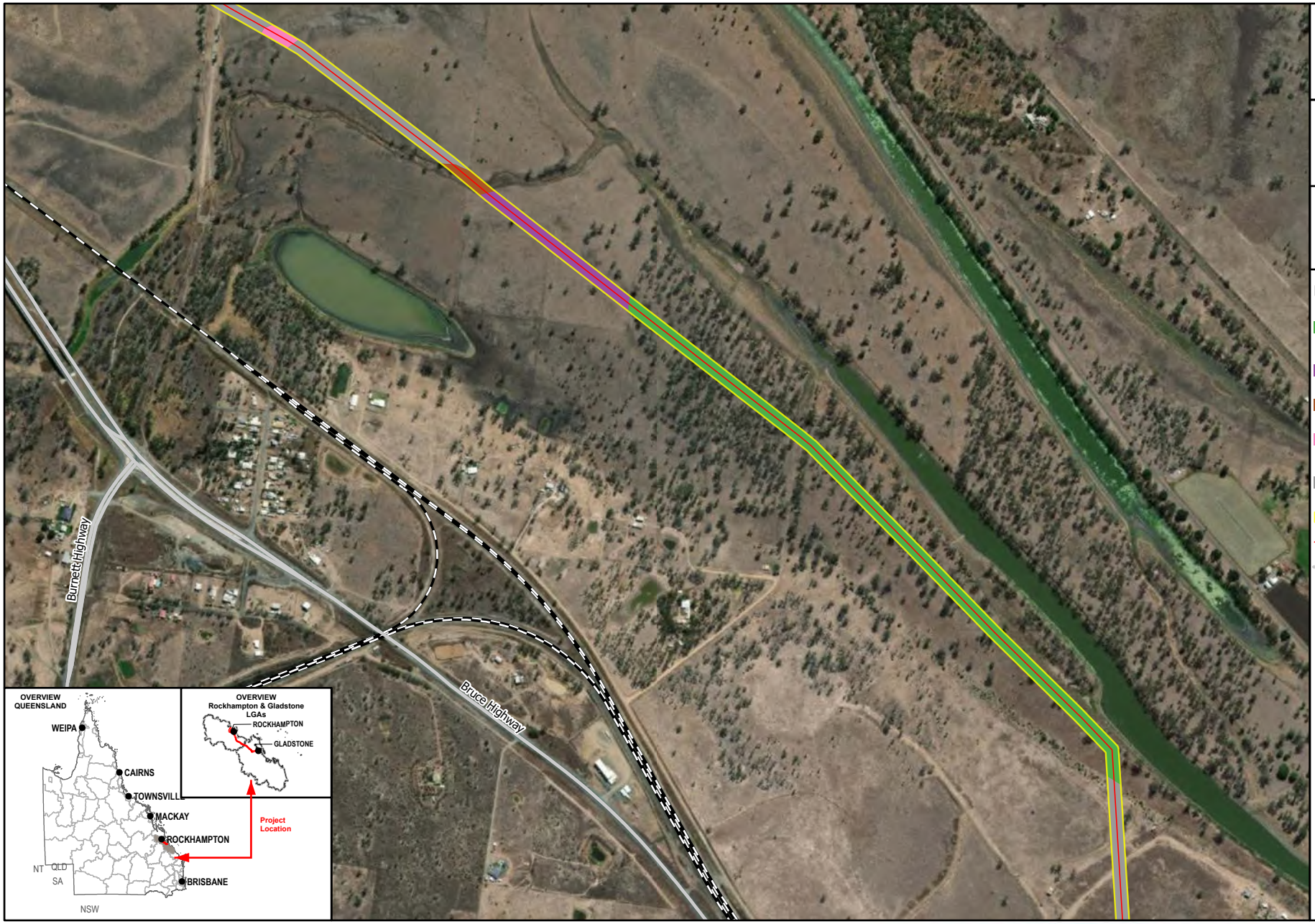
Figure 5-e1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

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- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
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- Railways

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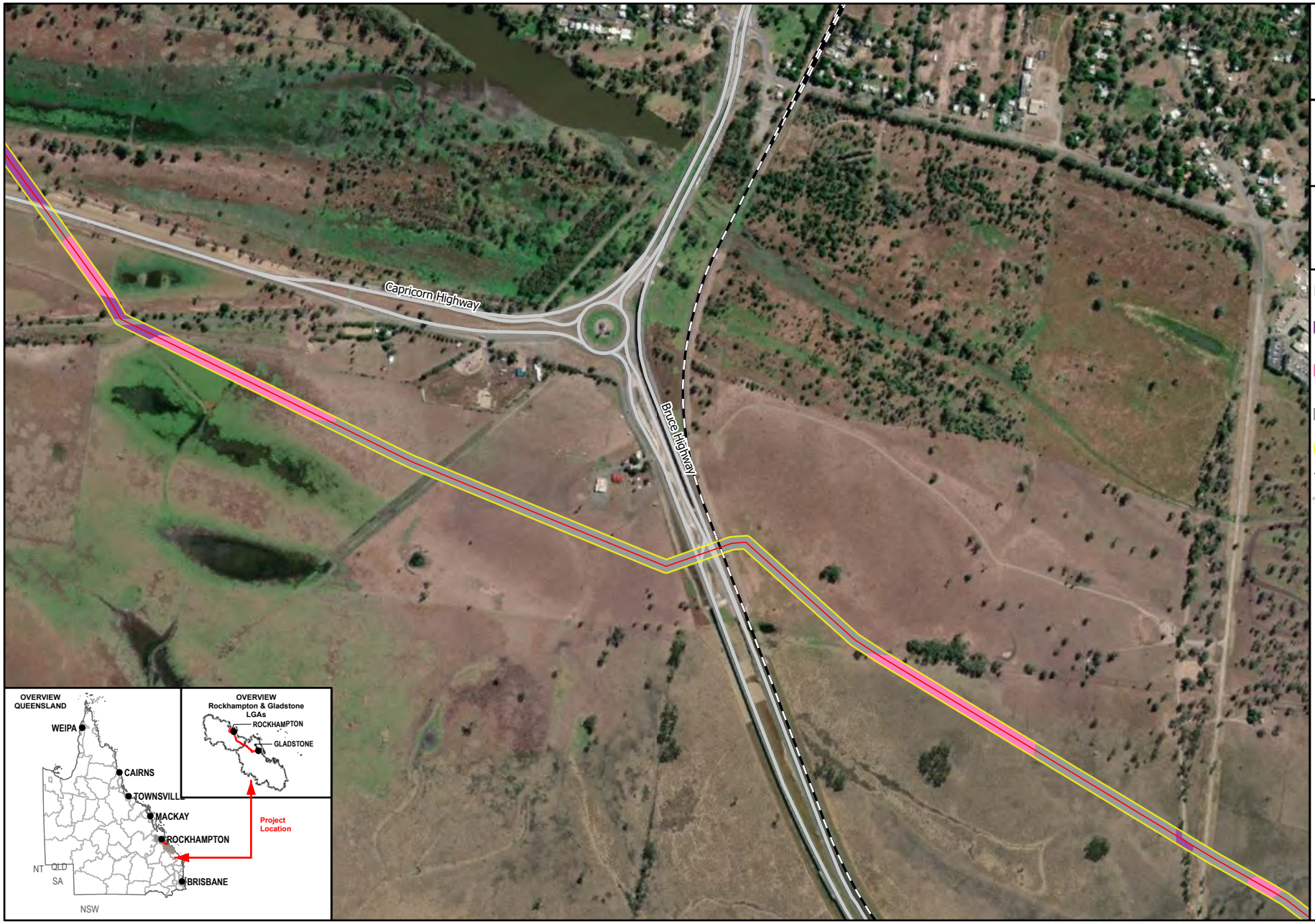
Figure 5-f1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads
- Railways

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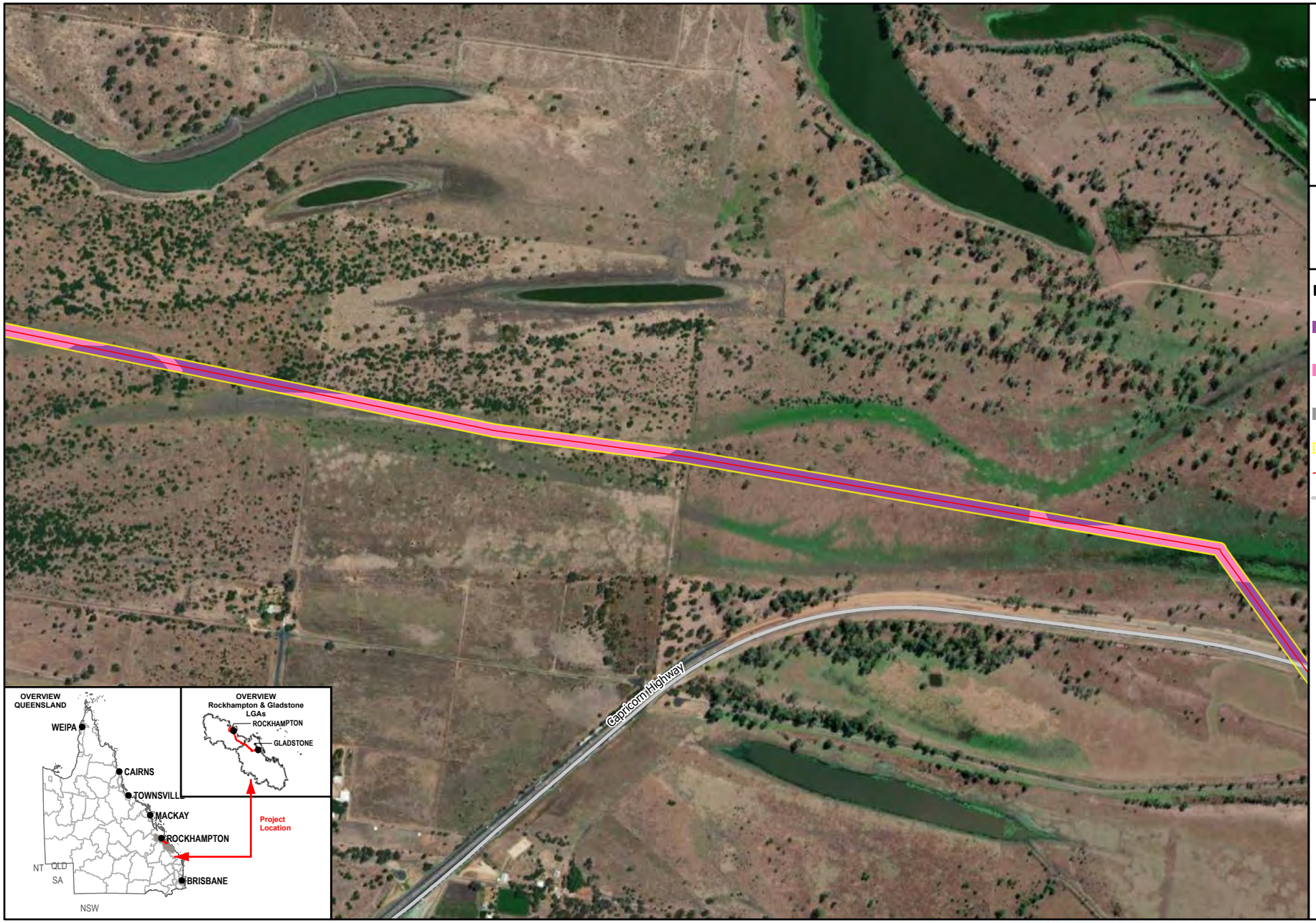
Figure 5-g1
Habitat Types Identified
Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment
- Main Roads

Data Sources:
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2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline

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PROJECTION UTM Zone 56
(Datum GDA2020)

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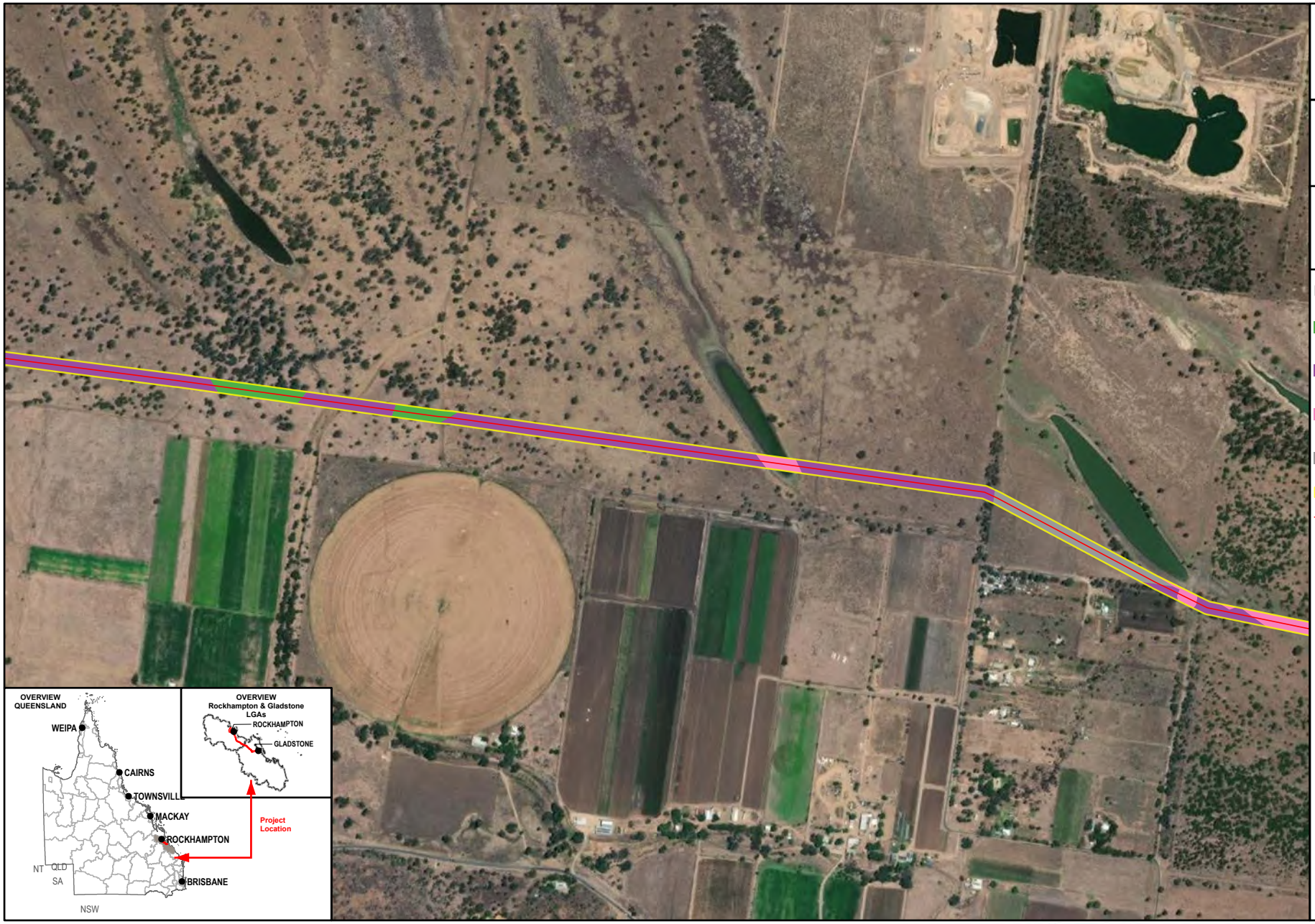
Figure 5-h1
Habitat Types Identified Within the SGIC SDA Study Area
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Study Area
- SGIC SDA Pipeline Alignment

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Figure 5-i1
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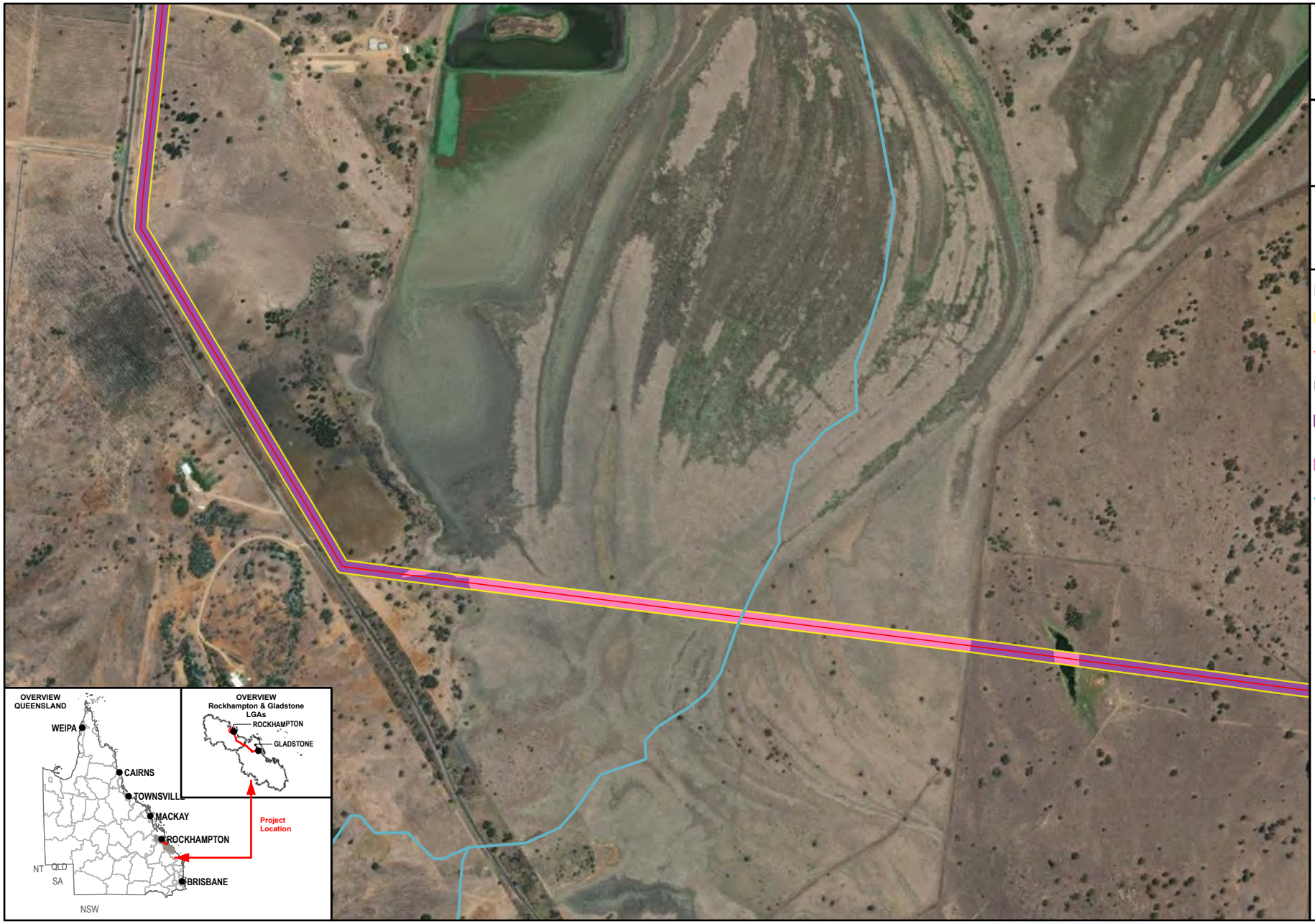
000-G-MAP-2415 Version:3 Date:2022/09/12



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Legend

- Study Area
- Northern Section Pipeline Alignment

Habitat Type

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Freshwater Waterbodies and Seasonal Wetlands
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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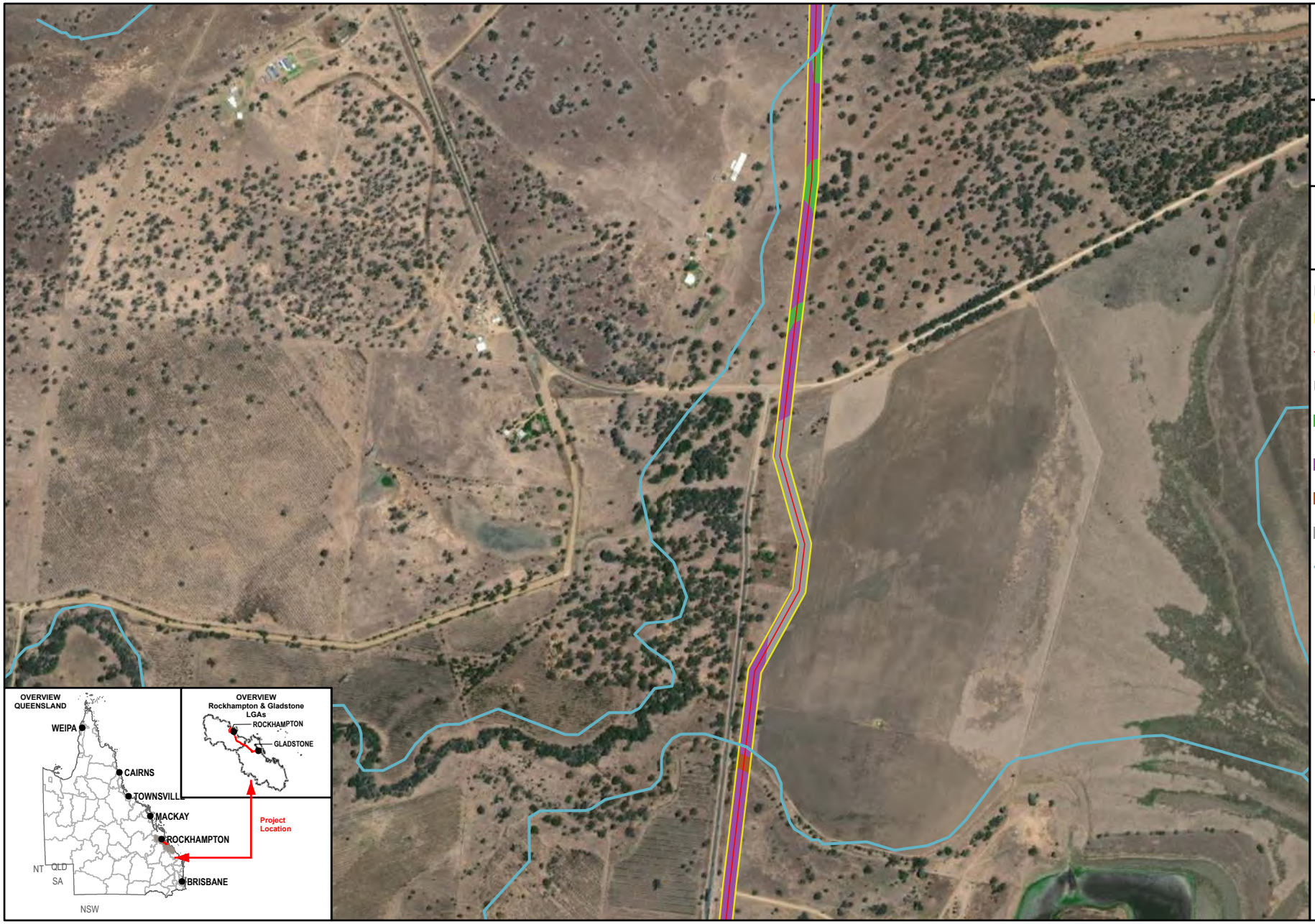
Figure 5-j1
Habitat Types Identified
Within the Northern Section Study Area
000-G-MAP-2421 Version:3 Date:2022/09/12



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Legend

- Study Area
- Northern Section Pipeline Alignment

Habitat Type

- Mixed Eucalyptus/Corymbia Woodland
- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Cleared and Highly Modified Landscapes
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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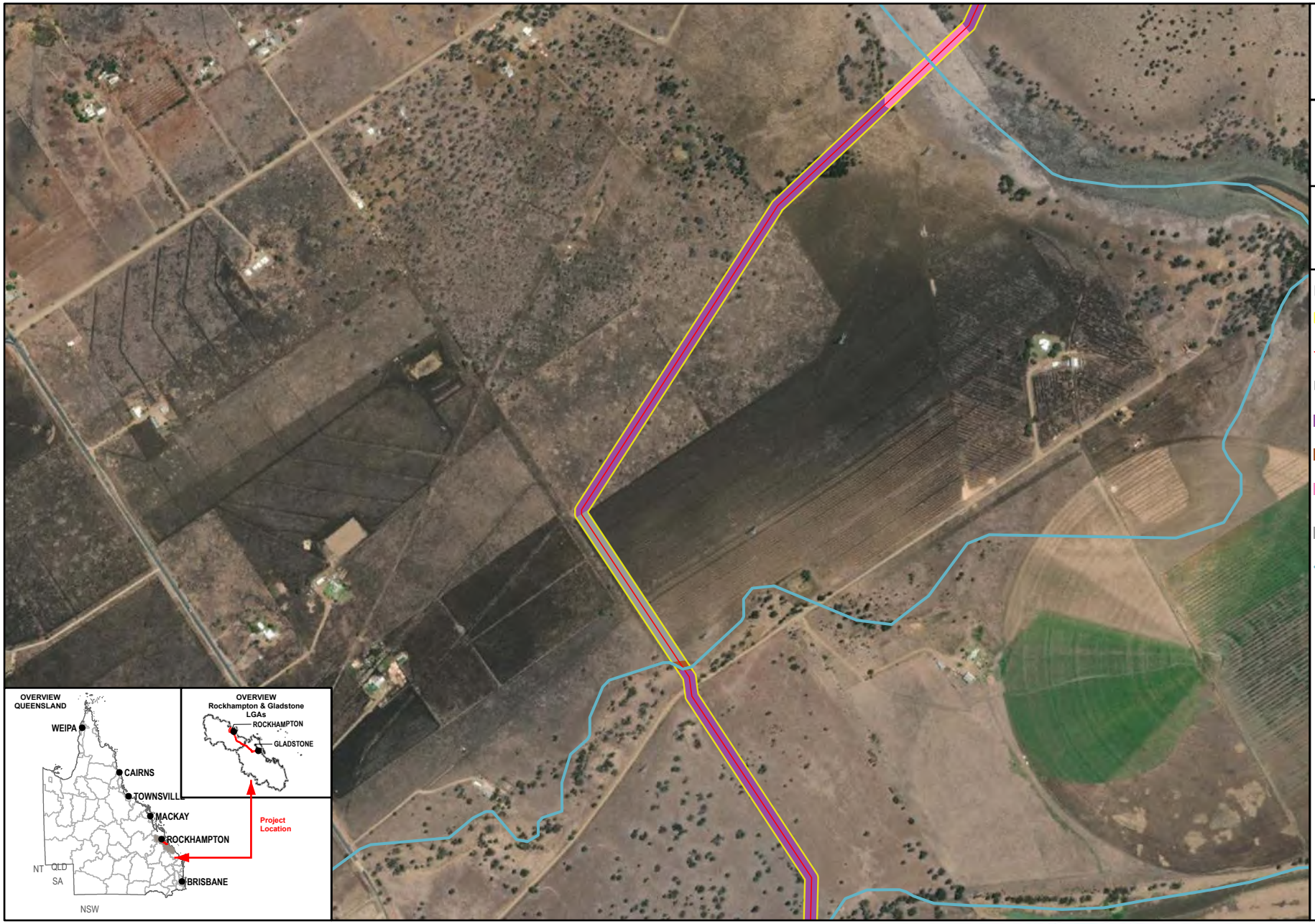
Figure 5-k1
Habitat Types Identified
Within the Northern Section Study Area
000-G-MAP-2421 Version:3 Date:2022/09/12



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- Study Area
- Northern Section Pipeline Alignment

Habitat Type

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Waterways

Data Sources:
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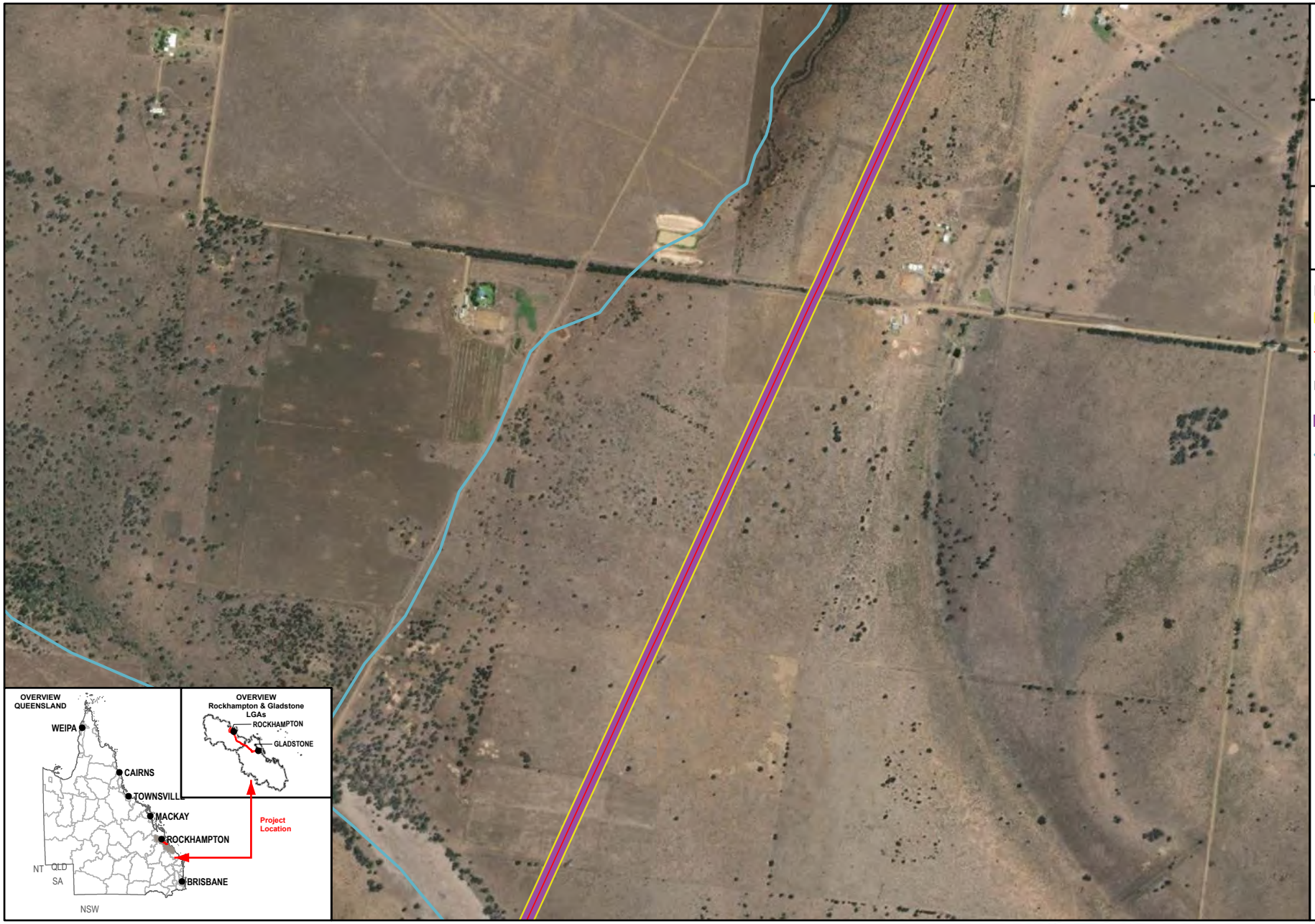

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- Study Area
- Northern Section Pipeline Alignment

Habitat Type

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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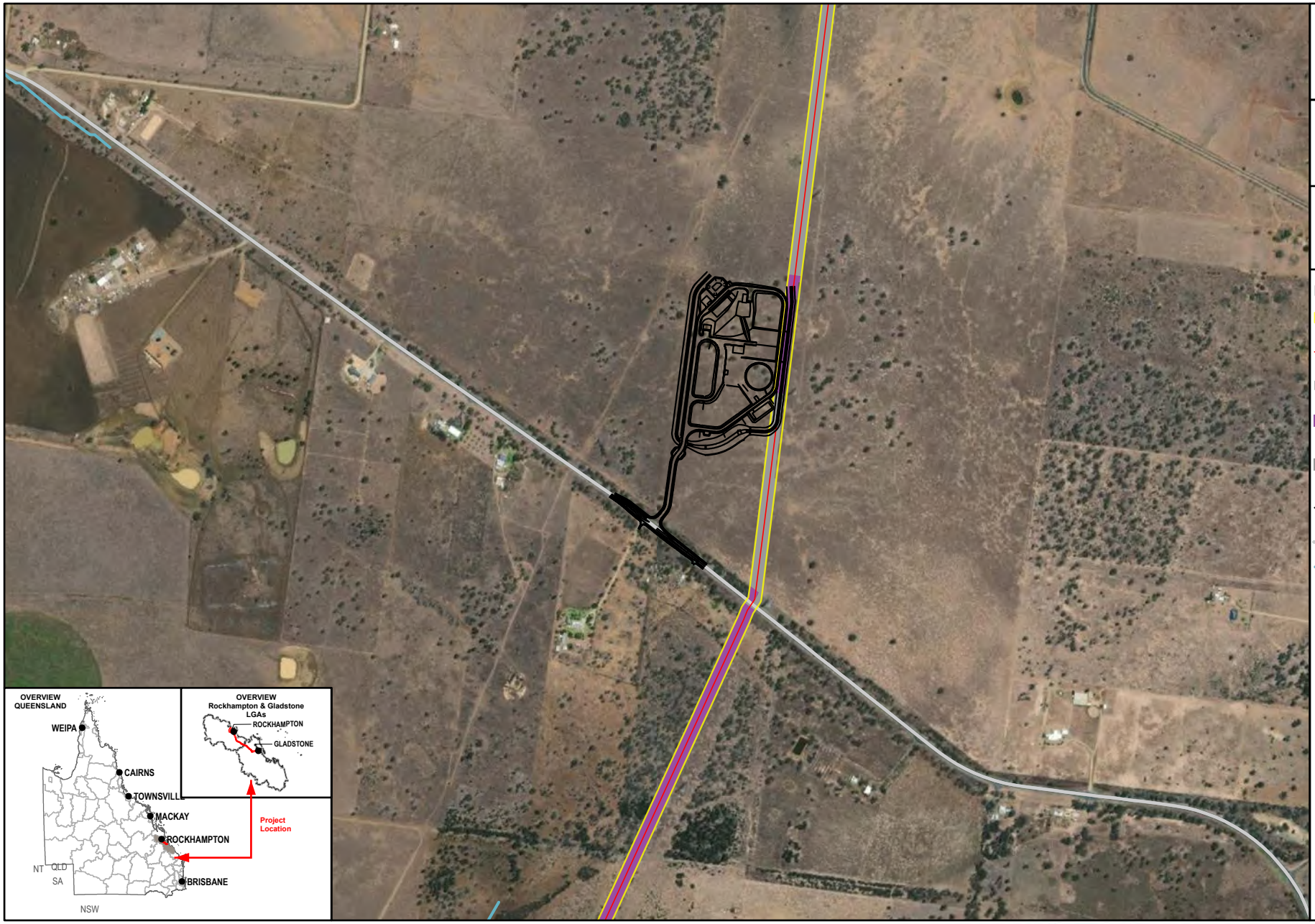
Figure 5-m1
Habitat Types Identified
Within the Northern Section Study Area
000-G-MAP-2421 Version:3 Date:2022/09/12



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Legend

- Study Area
- Northern Section Pipeline Alignment

Habitat Type

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Cleared and Highly Modified Landscapes
- Alton Down WTP, Pump Station and Reservoir Layout
- Main Roads
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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Figure 5-n1
Habitat Types Identified
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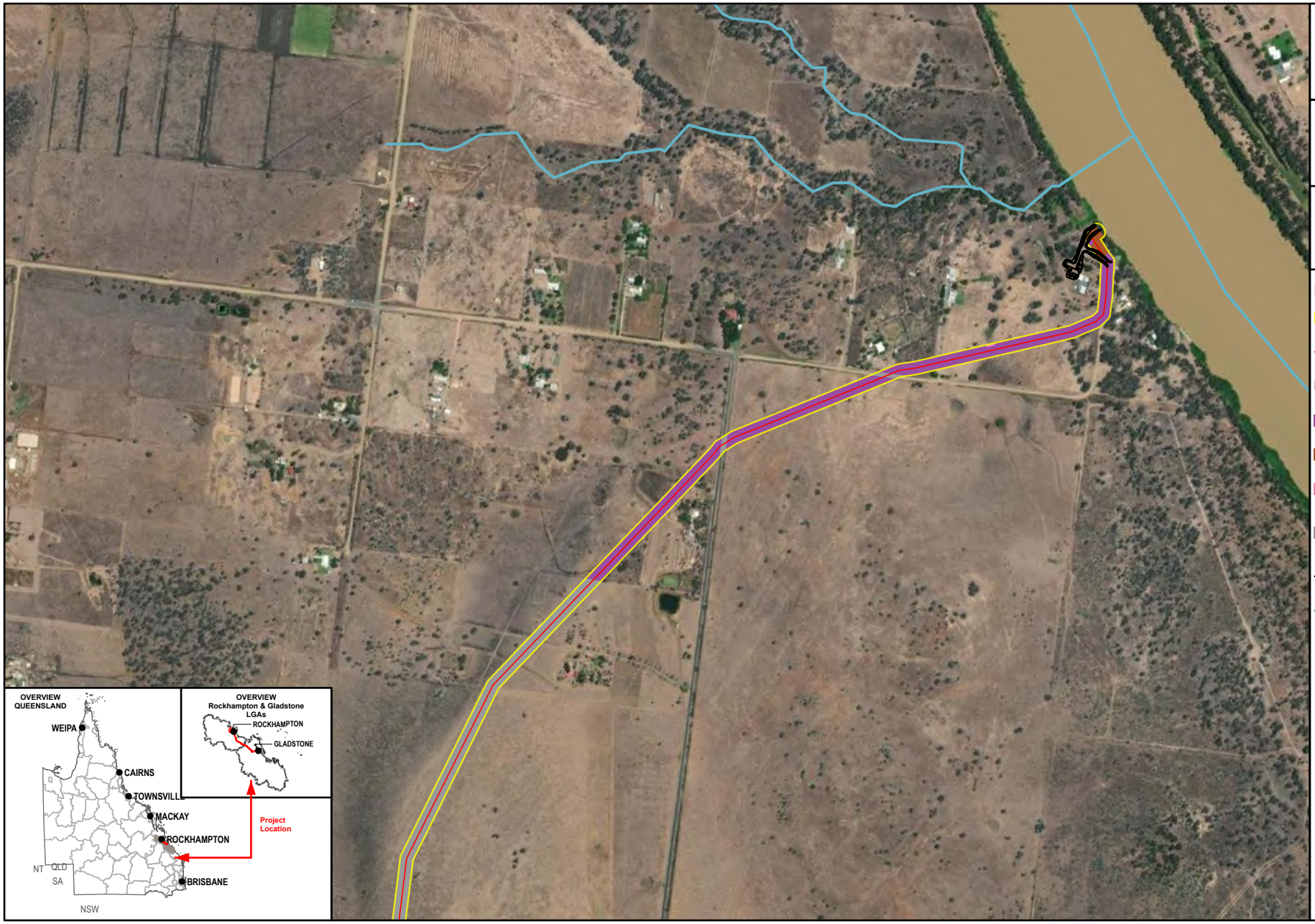

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Legend

- Study Area
- Northern Section Pipeline Alignment

Habitat Type

- Regrowth and/or scattered Eucalyptus/Corymbia/Acacia Trees
- Fringing Riparian Vegetation
- Freshwater Waterbodies and Seasonal Wetlands
- Cleared and Highly Modified Landscapes
- Fitzroy River Intake and Pump Station Layout
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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Figure 5-o1
Habitat Types Identified
Within the Northern Section Study Area
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5.1.1 Impacts to potential breeding places

The primary impact to fauna breeding places is expected to be from vegetation clearing which will result in the loss and reduction in species habitat. The majority of clearing associated with the Project will occur within non-remnant vegetation. However, approximately 65.6 ha of vegetation (17.5 ha is mapped remnant vegetation) will be cleared as a result of the Project (refer to Figure 5 for habitat types). Further, some areas of non-remnant vegetation that will be impacted provide suitable habitat (e.g. gilgai) for various threatened species (refer to Figure 5). The proposed clearing footprint includes some areas of endangered Brigalow woodland (which are also a part of the Brigalow TEC) vegetation, regulated vegetation (e.g. of concern REs, vegetation management wetlands and watercourse REs) and protected wildlife habitat (refer to GHD, 2022 in Appendix A).

The FGP design include measures to reduce the impact to fauna habitats such as the stipulating the use of trenchless pipeline construction methods at major crossings including creek crossing. At these locations, clearing impacts to riparian vegetation will be: 1) avoided wherever possible; and 2) minimised.

5.2 Indirect impacts

The Project is likely to have several indirect impacts on the ecological values of the vegetation and habitat remaining following the proposed clearing. The potential for indirect impacts to occur are primarily related to:

- Habitat Fragmentation and associated habitat degradation such as edge effects
- Potential spread and/or introduction of weeds and pest animals
- Increased dust
- Potential fauna mortality due to vehicle strikes
- Erosion of disturbed areas leading to increased sedimentation of waterways.

5.2.1 Habitat fragmentation and degradation

Vegetation clearing can result in fragmenting the remaining habitat which can have adverse impacts on fauna species by restricting or inhibiting fauna movement. Clearing for this Project has the potential to further fragment habitat which may impair movement of some species and impact habitat connectivity.

The FGP alignment occurs in a landscape that has been transformed by agricultural and mining land use, to varying degrees. As such, habitat fragmentation from the Project is unlikely to have a regional impact on fauna species due to already modified nature of the landscape matrix. However, noting that the effects of fragmentation operate at multiple spatial scales, and manifest differently for species based on their ecological traits and life history attributes, it is likely to cause localised impacts for some less mobile and/or more specialised species, by intersecting corridors that may be important conduits for local wildlife movement (e.g. along watercourses).

5.2.2 Pest plants and animals

Weeds species were commonly observed throughout all sections of the Project. Weeds of National Significance (WoNS) and restricted invasive weeds (listed under the *Biosecurity Act 2015*) that were observed are listed in Table 5. Construction and operational activities have the potential to introduce and disperse invasive weeds through the movement of people and machinery. Given the Project is

located within a predominantly agricultural landscape, the risks of weed introductions carry heightened consequences.

Table 5 Weed species identified within the Project area

Species Name	Common Name	WoNS	State declaration Biosecurity Act	Applicable pipeline Section		
				GSDA	SGIC SDA	Northern
Parthenium hysterophorus	Parthenium	X	Category 3	X	X	X
Lantana camara	Lantana	X	Category 3	X	X	X
Opuntia stricta	Common pest pear	X	Category 3	X	X	X
Opuntia tomentosa	Velvety tree pear	X	Category 3	X	X	X
Sporobolus pyramidalis	Giant rat's tail grass		Category 3	X	X	X
Cryptostegia grandiflora	Rubber vine	X	Category 3	X	X	X
Cascabela thevetia syn. Thevetia peruviana	Yellow oleander		Category 3	X	X	
Baccharis halimifolia	Groundsel bush		Category 3		X	
Harrisia martinii	Harrisia cactus		Category 3	X	X	X
Parkinsonia aculeata	Parkinsonia	X	Category 3	X		X
Cardiospermum grandiflorum	Ballon vine		Category 3			X
Hymenachne amplexicaulis	Hymenachne		Category 3			X
Eichhornia crassipes syn. Pontederia crassipes	Water hyacinth	X	Category 3			X

Species Name	Common Name	WoNS	State declaration Biosecurity Act	Applicable pipeline Section		
				GSDA	SGIC SDA	Northern
Lantana montevidensis	Creeping lantana		Category 3	X		X

Introduced fauna species were identified in all sections of the Project area. Table 6 below summarises the introduced fauna observed within each section of the alignment and the relevant Biosecurity category for each species. A maximum width of 10 m adjacent to the pipeline alignment will be permanently cleared to allow access for service and maintenance vehicles during the operation phase. Although access tracks could facilitate movement by feral predators, particularly wild dogs and foxes, it is unlikely that the Project will increase introduced fauna species abundance beyond existing levels due to the current fragmented nature of the surrounding area.

Table 6 Introduced fauna species recorded within the Project area

Species Name	Common Name	State declaration Biosecurity Act	Applicable pipeline Section		
			GSDA	SGIC SDA	Northern
Canis lupus familiaris	Wild dog	Category 3, 4 and 6		X	X
Felis catus	Feral cat	Category 3, 4 and 6			X
Oryctolagus cuniculus	European rabbit	Category 3, 4 and 6	X	X	X
Rhinella marina	Cane toad	-	X	X	X
Sturnus tristis	Common myna	-		X	
Sus scrofa	Feral pig	Category 3, 4 and 6	X	X	X
Vulpes vulpes	European red fox	Category 3, 4 and 6		X	X

Although the Project is unlikely to introduce new plant and animal pests or lead to an increase of pests, management measures have bene proposed to manage plant and animal pests. These measures are defined in Section 6.0.

5.2.3 Predation

The ecological assessments identified wild dogs, feral cats, feral pigs and the European fox as being present in the Project area. The Squatter Pigeon (southern), Ornamental Snake and Glider species, in particular, are subject to predation to varying degrees and predation is listed as a threat within the EPBC

Act conservation advice. Predation impacts will be mitigated through the implementation of plant and pest animal management and monitoring measures, based on the existing draft Construction Environmental Management Plan (GHDb, 2022).

5.2.4 Dust

Fugitive dust emissions from construction and operation has the potential to impact fauna habitat through reducing the health of vegetation and foraging resources for fauna that are in close proximity to disturbed areas.

Management measures for dust minimisation and suppression are detailed in the CEMP including but not limited to, watering of access tracks, limiting ground disturbance activities, limiting the time between disturbance, stabilisation and rehabilitation. These management actions will continue with this Project and are outlined in Section 6.0. Further, vegetation clearing will be progressive and gradual, which will minimise disturbance areas and areas of bare ground with the potential to generate dust. These disturbed areas will undergo rehabilitation as soon as practical to further reduce dust generation and any potential associated impact to vegetation and fauna.

5.2.5 Erosion and sediment control

The Project has the potential to cause erosion from vegetation clearing within the ROW and Project areas. As the soils are generally considered highly dispersive, rain events or other contact with water is likely to result in the break-down of soils into clays, sand silt and clay, creating sediment and nutrient laden runoff into local waterways.

The CEMP for the Project outlines general erosion and sediment control measures which aim to minimise erosion or sedimentation as a result of construction activities. Management actions involve minimising surface disturbance extent, duration, and timing of significant ground disturbances scheduled for the dry season reasonably practical. Further details of management actions are outlined in Section 6.0.

5.3 Impact duration

Vegetation clearing for the ROW is the principal direct impact from this Project to vegetation communities and fauna habitat. The proposed construction works once commenced, will be completed within approximately 24 months.

5.4 Summary of impacts

Table 7 outlines all the potential impacts of the Project that are applicable to the NC Act listed species or fauna groups and in relation to the Project phase where the impact is likely to occur.

Table 7 Summary of impacts

Impacts	Potential impacts associated with the project	Impacted species	Project phase
Vegetation clearing / habitat loss	Removal of remnant vegetation that is considered habitat for fauna species threatened species.	All	Pre-construction, construction and operation

Impacts	Potential impacts associated with the project	Impacted species	Project phase
Habitat degradation	Loss of food resources due to grazing by resident introduced herbivores (i.e. rabbits) and habitat degradation by inappropriate vegetation management. Degradation can also occur via destruction of nests by vehicles and machinery, people, and large herbivores.	Squatter Pigeon, Glider species, Ornamental Snake and Yellow Chat (Dawson)	Construction and operation
Habitat fragmentation	Removal of remnant vegetation with minor fragmentation including fragmentation of existing remnant patch of vegetation which the ROW will intersect.	All	Pre-construction, construction and operation
Introduced plant and animal pests	Dispersal of weeds throughout the Project area by vehicles, machinery, and people, degrading habitat and outcompeting food resources in and adjacent to the Project Area. Increased incidence of fauna pests leading to predation on native fauna and habitat degradation.	All	Construction and operation
Predation by invasive fauna	Loss of individuals to predation by feral foxes, dogs and cats, which are known to increase in abundance around human habitation in dryland areas.	Squatter Pigeon, Yellow Chat (Dawson), Apostlebird, Little Pied Cormorant, Ornamental Snake and Black-winged Stilt	Construction and operation
Dust	Particulate emissions may reduce ground vegetation cover, food resources quality and vegetation quality.	All	Construction and operation
Vehicle strike	Mortality and injury from vehicle strike, due to an increased number of vehicles and access routes.	All	Construction and operation
Erosion and sedimentation	Increased erosion of disturbed surfaces and increased sedimentation of waterways. Severe	Squatter Pigeon, Yellow Chat (Dawson), Little Pied Cormorant, Ornamental Snake	Construction and operation

Impacts	Potential impacts associated with the project	Impacted species	Project phase
	erosion can alter surface water flows and local hydrological regimes.	and Black-winged Stilt.	

6.0 Management measures

6.1 Objectives

The objectives of this SMP are to:

- Ensure no accidental clearing/disturbance to breeding places beyond the approved disturbance limits
- Implement all reasonable measures to minimise direct mortality of fauna during construction and operation of the Project
- Manage remaining breeding places to minimise impacts to habitat quality for the native fauna species outlined in Section 4.2 through management of potential impacts.

6.2 Relevant plans and guidelines

The following conservation advice and plans have been reviewed during the preparation of this SMP to include management measures specific to the fauna species outlined in Section 4 and in response to key threatening processes identified for these species.

- Approved Conservation Advice for *Geophaps scripta scripta* (Squatter Pigeon (southern)) (TSSC, 2008)
- Approved Conservation Advice for *Denisonia maculata* (Ornamental Snake) (DotE, 2014)
- Approved Conservation Advice for *Petauroides volans* (Greater Glider) (DCCEEW , 2022)
- Yellow chat (Capricorn subspecies) *Epthianura crocea macgregori* recovery plan (DEWHA, 2008)
- Action Plan for Australian Bats (Duncan, et al., 1999)
- Threat Abatement Plan for predation by feral cats (DotE, 2015)
- Threat Abatement Plan for predation, habitat competition, and disease transmission by feral pigs (DEH, 2005)
- Draft CEMP (GHDb, 2022)

Measures consistent with these plans are in relation to:

- Minimising the risk of direct harm to fauna breeding places during vegetation clearing and construction of the Project
- Staff and contractor awareness of fauna breeding places in the Project area
- Minimising the risk of vehicle strike to native fauna during construction and operation of the Project
- Pest plant and animal management within the Project area to minimise the spread of weeds and reduce the extent of weed species and pest animals within and in habitats adjacent the Project area
- Appropriate rehabilitation in accordance with the CEMP, approval conditions and final Construction Contractor Rehabilitation Plan.

6.3 General management actions

Planning and management of disturbances for the Project were assessed taking into consideration of a set of hierarchical management principles that are designed to avoid, minimise and mitigate potential impacts to the environmental values including native fauna and fauna breeding places.

This SMP has been developed considering these management principles (in order of preference) with relevance to impacts on fauna species:

- *Avoidance:* Avoiding direct and indirect adverse impacts where possible through Project design
- *Minimise:* Minimising direct and indirect adverse impacts where impacts cannot be avoided through modifying design, the timing of construction or employing specialist clearing and construction methods
- *Mitigate:* Implement mitigation and management actions to unavoidable impacts, through design recovering, translocation and rehabilitation
- *Remediation and rehabilitation:* Progressively remediate and rehabilitate impacted areas to promote and maintain long-term recovery
- *Provide offsets:* The proponent will provide suitable offsets for activities that result in unavoidable significant residual adverse impacts to Matters of State Environmental Significance (MSES) in accordance with approval conditions.

The hierarchy of management will be applied with the overall aim of minimising impacts to EVNT, special least concern, least concern colonial breeders and least concern native fauna in order to meet the management objectives of Section 73 of the NC Act.

6.4 Pre-construction and construction phase strategy

As part of the vegetation clearing and soil disturbance phases of the activity, pre-clearance surveys undertaken by suitably qualified ecologists will assess the presence of listed threatened fauna species within 24 hours of the disturbance activities and relocate any detected native fauna to suitable habitat outside of the disturbance areas. Qualified Fauna Spotter/Catchers will oversee all vegetation clearing works, with the most suitable ratio of Fauna Spotter/Catcher per machine undertaking clearing activities to be determined by the Qualified Fauna Spotter prior to commencement of clearing activities. This will allow animals to be relocated away from the disturbance area if necessary and for disturbance activities to cease until any danger to the health and wellbeing of fauna has passed.

6.5 Rehabilitation, operation and maintenance phase strategy

Rehabilitation measures will be conducted according to recommendations in the Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines 2017, relevant development permit/approval conditions and the Construction Contractors Rehabilitation Plan. It will consider application of vegetation regeneration and/or revegetation techniques to encourage natural regeneration of disturbed vegetation.

6.6 Offsets

Any required offsets will be in accordance with approval conditions and the requirements of the *Environmental Offsets Act 2014*.

6.7 Management measures

This section of the SMP outlines a series of management measures designed to minimise and/or mitigate potential impacts to fauna and fauna breeding places. Table 8 outlines relevant management measures that will be employed during the pre-construction (clearing and site preparation), construction and operation stages of the Project to minimise direct or indirect impacts to native fauna and fauna breeding places. Each mitigation measure is also referenced to the species and/or fauna group most likely to require the management measure.

General mitigation measures for the Project outlined in the draft CEMP prepared by GHD (GHDb, 2022; Appendix B). This SMP specifically addresses impacts to breeding places for the species listed in Section 4.2, and should also be read in conjunction with the CEMP and the special area plans for impacts to the Ornamental Snake and Yellow Chat that are appended to the CEMP as per the Coordinator General's approval conditions for the Project.

Table 8 Measures aimed at minimising impacts to native animal breeding places

Activity	Mitigation measure	Relevant species
Pre-construction and design phase		
Infrastructure planning and staging	Infrastructure will be sited in accordance with the approved State and Commonwealth approval conditions.	All
	Site stormwater management will be undertaken in accordance with an Erosion and Sediment Control Plan (ESCP) required under the CEMP and approval conditions, to minimise alterations to the natural surface water hydrology within or adjacent to the Project area.	Echidna, Squatter Pigeon, Yellow Chat (Dawson), Little Pied Cormorant, Ornamental Snake and Black-winged Stilt.
	The primary breeding season of the majority of impacted fauna will be considered prior to the commencement of vegetation clearing.	All
	Environmental exclusion zones will be established around key habitat features to be retained within the Project area.	All
Site induction and work instruction	Prior to construction works commencing, all relevant site personnel including contractors will be made aware via toolbox talks and site information sheets, of the sensitive environs they will be working in and around and be advised of specific limitations to construction works being undertaken in or adjacent to threatened fauna habitat. All staff and contractors will be required to report sightings of SMP relevant fauna in the activity area to the EO (or equivalent position) immediately.	All

Activity	Mitigation measure	Relevant species
	A poster/information sheets will be developed and displayed in meeting areas that reminds staff and contractors about the relevant fauna species present in the Project area.	All
	An internal 'Permit to Disturb' system (or similar process) will be used by the Construction Contractor to ensure that all clearing activities are authorised prior to disturbance.	All
Site preparation	Clearly delineate areas requiring vegetation removal to ensure disturbance to areas being retained is minimised. Limits of clearing are to be delineated on-ground using barricading or temporary fencing and signage where practical, prior to works commencing. Environmental buffers and exclusion areas are to be clearly shown and labelled on all operational and management drawings and plans.	All
	Active breeding places are to be actively monitored by a suitably qualified person until the breeding place has been vacated.	All
	Prior to vegetation clearing, limits of disturbance including 'no-go zones' (i.e. exclusions areas and environmental buffers) will be delineated with appropriate flagging material and/or barricade webbing as determined by the EO (or equivalent) to prevent unnecessary encroachment of disturbance into vegetation and/or habitat to be retained. The EO (or equivalent) will routinely inspect the disturbance limit boundaries to ensure that no clearing or disturbance of vegetation or habitat beyond the approved limits has taken place.	All
	Pre-clearance surveys to assess the presence of fauna breeding paces will be undertaken by a suitably qualified ecologist using approved State and Commonwealth survey guidelines. The pre-clearance survey will be undertaken in order to: • Identify and mark any potential breeding places for checking immediately prior to clearing activities • Where present, relocate these places, salvage and relocate potential breeding micro-habitat • Record the location of all breeding sites using a GPS. Features of tree hollows (diameter,	All

Activity	Mitigation measure	Relevant species
	number and whether active/inactive) should be recorded in the Environmental Diary/Register • Relocate all non-breeding animals captured.	
	Where occupied breeding places are identified as part of the pre-clearance survey, these are to be left undisturbed, marked and a temporary buffer clearly established around the breeding place. A minimum 20 m temporary buffer will be established for ground habitat features. The temporary buffer is to remain in place until the breeding period has finished or until the young have been relocated by a fauna spotter.	All
	Boundaries of areas to be cleared will be clearly defined on all plans.	All
	Signage, including road signage, will be erected in the vicinity of exclusion areas and environmental buffer areas to warn of the potential presence of fauna in the area.	All
	Where temporary fencing is required, consideration will be given to fauna movement, current land uses and worker safety requirements.	All
	Barbed wire will be avoided when erecting both temporary and permanent Project-related fencing.	Squatter Pigeon, Yellow Chat (Dawson), Little Pied Cormorant, Black-winged Stilt and least concern colonial breeding bats
Lighting	Any temporary lighting will be directed away from vegetation and habitat to be retained.	All
Construction and operation phases		
Vegetation clearing	Where clearing within vegetated fauna habitat, efforts to retain mature trees will be taken where practical.	Glider species, Glossy Black-cockatoo, Ornamental Snake and least concern colonial breeding bats

Activity	Mitigation measure	Relevant species
	All vegetation clearing will comply with all approval conditions, the CEMP and be limited to the approved clearing areas.	All
	The clearing footprint and areas of exclusion will remain adequately marked for the duration of the clearing activities.	All
	A spotter/catcher will be present for all clearing activities and will conduct a walk-through survey prior to commencement of clearing and prior to clearing works each day to check vegetation and other fauna habitats. The spotter/catcher will reinspect the area of cleared vegetation immediately after clearing to locate any potentially injured fauna that will then be taken to a wildlife carer or veterinarian.	All
	Vegetation clearing will be undertaken progressively, and vegetation will be felled in the direction of the clearance zone to avoid impacts to adjoining retained vegetation and habitat.	All
	Non-hollow bearing trees will be cleared before hollow bearing trees in order to allow fauna the opportunity to relocate of their own accord.	Glider species, Glossy Black-cockatoo and least concern colonial breeders
	During clearing, it is preferable that fauna move of their own accord into the adjacent areas of habitat to be retained. Any fauna that is captured will be relocated into the adjacent habitat at least 200 m from the clearing area if clearing works are yet to be completed.	All
	Where occupied breeding places are identified and delaying the clearing of the breeding place is not feasible, (i.e. the clearing is critical to the activity schedule) the breeding place must not be disturbed for a minimum of 24 hours while clearing is undertaken around the breeding place as recommended by a spotter/catcher. After this time a spotter/catcher will relocate the breeding animal and breeding place to suitable habitat at least 200 m away from the clearing area. Where survival of young or eggs is unlikely as a result of the disturbance, these are to be handed over to a previously identified wildlife carer or veterinarian. It is preferable to allow eggs to hatch and/or young to mature and move away from the breeding place.	All

Activity	Mitigation measure	Relevant species
	Where unoccupied breeding places are identified and where feasible, consideration will be given to relocating the breeding structure by the fauna spotter to suitable habitat at least 200 m away from the clearing area.	Special least concern migratory birds and least concern colonial breeders
	Relocated occupied or unoccupied breeding places are to be retained intact to the greatest extent possible. As far as practical, the site of the relocation is to replicate the height and orientation of the original breeding or nesting structure. Sections of hollow branches or logs should be secured in the new location by mechanical means deemed appropriate by the fauna spotter/catcher (e.g. bolts, metal bands). Relocation is to be undertaken under the supervision of a spotter/catcher.	Glider species, Glossy Black-cockatoo and least concern colonial breeders
	Hollow bearing trees will be clearly flagged and surrounding vegetation removed with the hollow bearing tree left standing for at least one night to encourage fauna to relocate of its own accord. Hollow bearing trees will preferably be inspected to determine if hollows are occupied. If hollows are found not to be occupied, hollows can be salvaged and the tree felled.	Glider species, Glossy Black-cockatoo and least concern colonial breeders
	If after one night the resident fauna have not moved on, the hollow-bearing trees will be felled using a tree grab or similar that can remove the tree in a controlled fashion. If possible and safe to do so, hollow trees will be felled at dusk to allow fauna to present the opportunity to disperse during their normal activity period. These trees will be felled away from hollow openings. The tree will be knocked at the base several times prior to felling to encourage fauna to relocate of their own accord. Once the tree is felled, it will be inspected for any fauna and any injured fauna rescued and taken to a wildlife carer or veterinarian.	Glider species, Glossy Black-cockatoo and least concern colonial breeders
	Selected trees and/or logs will be salvaged where practical and reused as fauna habitat in rehabilitation areas where the final landform will mimic fauna habitat (e.g. riparian habitats). Trees and other habitat features to be salvaged will be identified and flagged by the spotter/catcher during the walk-through survey and/or clearance activities.	Glider species, Glossy Black-cockatoo and least concern colonial breeders
	Where inadvertent disturbance to fauna and/or habitat occurs, an investigation will be undertaken, and further measures implemented to avoid inadvertent disturbance in the future.	All

Activity	Mitigation measure	Relevant species
	All injured fauna encountered during the construction and operation of the activity is to be taken to a wildlife carer/facility or veterinarian. If fauna is found to be badly injured and considered unlikely to survive, and the journey to the nearest veterinarian would be likely to unnecessarily prolong the suffering of the animal, the spotter/ catcher will euthanize the animal using approved emergency euthanasia techniques.	All
Work instruction	The EO (or equivalent) is to have available the names and contacts of wildlife carers and veterinarians in the local area.	All
Dust	Dust suppression will be undertaken to manage the risk of adverse impacts associated with excessive dust deposition. The agreed dust suppression rates will be increased during periods of high wind and when prevailing winds are directed toward sensitive receptors. The following dust control measures will be implemented: • Speed limits on unsealed roads will be limited to a maximum speed consistent with the minimisation of dust generation • Earthworks supervisors will pay particular attention to the management of topsoil stripping such that dust not become a safety hazard or severe nuisance • Stockpiles will be stablised or mulched • Dust suppression will be used as required • Land disturbance will be restricted to that necessary for the works • Vegetation will not be burned • All complaints about dust will be investigated promptly and appropriate action taken to reduce dust nuisance • A register of dust complaints will be maintained on-site.	All
Pest and weed management	Construction Contractor will prepare and implement at Biosecurity Management Plan that will provide weed and pest control procedures (or similar) to be implemented to minimise the introduction or spread of pest and weed species.	All

Activity	Mitigation measure	Relevant species
	The activity area is to be maintained as a clean, rubbish-free environment.	All
Access	Site access is only to occur along designated site access tracks.	All
	Vehicle must abide by vehicle speed limits and access to any restricted areas or exclusion zones must be limited to critical site-specific activities. Alternate approved routes are to be sought by all other Project traffic.	All
	Where practicable, travel during dusk, dawn and at night when fauna is most active, will be avoided.	All
	The status of known populations in areas adjacent to disturbances will be regularly inspected in a way that does not risk abandonment by the residing individuals.	All
Revegetation and rehabilitation	Disturbed areas will be revegetated as soon as practicable and following construction. Revegetation and rehabilitation will be undertaken in accordance with the approval conditions and the Construction Contractor's Rehabilitation Plan.	All
Erosion and sedimentation	An ESCP, will be developed and implemented by the Construction Contractor with the aim of minimising erosion, minimising mobilisation of sediments, minimising erosion related disturbances to the current hydrological regime of the Project area and minimising sediment transport and deposition in waterways.	All

7.0 Performance criteria, monitoring and reporting

7.1 Performance criteria

In order to assess the effectiveness or performance of the proposed management measures and the monitoring program, certain criteria are proposed including:

- No known injury or fatalities to fauna species are to occur as a result of construction and operational activities.
- Sightings of individuals and/or active breeding places are appropriately documented, submitted to relevant government agencies and recorded within the relevant Project reports and databases.
- Vegetation and fauna habitat features are only cleared or tampered with within approved areas and boundaries. No non-approved areas are to be destroyed.
- Rehabilitation is completed as per the Construction Contractors Rehabilitation Plan and approval conditions.
- Appropriate corrective actions are effectively implemented in accordance with the corrective action protocol.

7.2 Monitoring

A monitoring program will be prepared and implemented to assess the effectiveness of management measures outlined in Section 6.0. Monitoring events will commence prior to clearing activities being undertaken (in order to continue a baseline understanding of existing conditions) and continue during clearing and construction of the Project.

A post-clearing monitoring program will also be undertaken to assess the success of any relocated fauna and/or breeding places and the continued presence of species outlined in this SMP.

This monitoring will include, at a minimum:

- Daily monitoring for 48 hours post-relocation/release. If relocation/release is considered unsuccessful, the animal is to be transferred to a suitably qualified wildlife carer or veterinarian for rehabilitation / medical attention.
- Fortnightly monitoring for a period of one month following clearing activities.
- Annual follow-up monitoring for two years after the relocation/release and clearing activities.

Where occupied breeding places have been identified and buffers established, these breeding places should be monitored daily during surrounding vegetation clearing or while other disturbance activities are taking place.

The results and observations made throughout the monitoring programs will be used to update this SMP as part of the review process to ensure that management processes and measures are adapted as required.

7.3 Auditing

Internal audits of all activities will be undertaken in response to potential non-compliance with SMP requirements. A review of spotter/catcher data will be undertaken during vegetation clearing for construction. External auditing will be undertaken in accordance with approval condition requirements.

The effectiveness of actions within this SMP will be reviewed after two years of implementation and the SMP will be adapted to include additional or revised actions where necessary. The SMP will then be reviewed every five years and immediately prior to the decommissioning phase of the Project.

7.4 Corrective action

All incidents relating to native fauna are to be reported in the projects incident management database and investigated. Corrective actions are to be carried out based on findings from incident investigations and audit results.

Detailed below are actions that will be undertaken should an incident relating directly to native fauna species:

- If a fauna species is known to be killed or injured during the construction or operational phases of the project, the activity will be reviewed to identify any additional measures that can be implemented to reduce the potential for fauna to be killed or injured.
- If clearing of fauna habitat beyond the approved disturbance occurs during the construction or operation process, the activity will be reviewed to identify any additional measures that can be implemented to reduce the risk of further unauthorised clearing.
- If a native animal is injured on site, the EO (or equivalent) or registered fauna spotter-catcher who holds appropriate qualifications under the NC Act, will be immediately notified to attend to and handle the animal. The animal will be wrapped in a dry and warm blanket and transferred to an approved wildfire carer or veterinarian.
- Where measures are not effectively managing introduction or spread of weed species or pest animals, the need for further targeted and intensive actions will be investigated.
- Where injured fauna is encountered, and it is unsafe to handle the animals, the following should be undertaken:
    - The location of the injured animal will be identified so it can be located again
    - The species of animal will be identified if possible and its sex and approximate size determined
    - The type of injury sustained will be identified if possible
    - The EO (or equivalent) will contact DES within 24 hours and report the animal and arrange for its capture and transportation to a wildlife carer or veterinarian.

7.5 Reporting

The results of all pre-clearance surveys, monitoring surveys and audits will be documented in stand-alone progress reports and combined into an annual report. All other activities, including spotter/catcher works, injuries and deaths, disturbance to habitats and sightings are to be recorded in an on-site environmental works diary / register. The following information is to be recorded as a minimum:

- Dates, location and description of fauna breeding places
- Detection / monitoring methods used
- Number and location of each breeding place identified
- A record, including locations of all breeding places and individuals including young

- Methods of survey or rehabilitation (e.g. targeted, standard or incidental observations)
- All incidences of injury or death to native fauna
- Details of any non-compliance with the SMP
- Dates, location and area of fauna habitat cleared to ensure disturbance limits are observed and tracked.

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Appendix A

Fitzroy to Gladstone Pipeline: Baseline terrestrial and aquatic ecology technical report (2022)

Fitzroy to Gladstone Pipeline

Baseline terrestrial and aquatic ecology technical report

Gladstone Area Water Board

4 November 2022

The Power of Commitment

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Abbreviations and acronyms

Abbreviation / acronym	Definition
ADR	Accepted Development Requirements
ALA	Atlas of Living Australia
ASS	Acid Sulfate Soils
CEMP	Construction Environmental Management Plan
DAF	Department of Agriculture and Fisheries
DAWE	Department of Agriculture Water and the Environment (presently Department of Climate Change, Energy, the Environment and Water)
DBH	Diameter Breast Height
DEHP	Department of Environment and Heritage Protection
DES	Department of Environment and Science
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DoE	Commonwealth Department of the Environment
DoR	The Department of Resources
EPA	Environmental Protection Agency (Queensland) (presently Department of Environment and Science)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
ESCP	Erosion and Sediment Control Plan
FGP	Fitzroy to Gladstone Pipeline
GAWB	Gladstone Area Water board
GBR	Great Barrier Reef
GSDA	Gladstone State Development Area
HAT	Highest Astronomical Tide
HDD	Horizontal Directional Drilling
HES	High Ecological Significance
LGA	Local Government Areas
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NCA	*Nature Conservation Act 1992*
OEMP	Operations Environmental Management Plan
PMAV	Property Maps of Assessable Vegetation
PMST	EPBC Act Protected Matters Search Tool
ROW	Pipeline Right of Way
RE	Regional Ecosystem
SDWO	*State Development and Public Works Act 1971*
SMP	Species Management Plan
SRI	Significant Residual Impact
SGIC SDA	Stanwell to Gladstone Infrastructure Corridor State Development Area

Abbreviation / acronym	Definition
TEC	Threatened Ecological Community
VMA	Vegetation Management Act
WoNS	Weeds of National Significance
WQMP	Water Quality Management Plan
WWBW	Queensland waterways for waterway barrier works

1. Introduction

1.1 Project overview

Gladstone Area Water Board (GAWB) is a Queensland Government statutory Water Authority with the purpose of ensuring the long- and short-term water needs of current and future customers are met in ways that are environmentally, socially and commercially sustainable.

On 1 October 2000, GAWB commenced operations as a Category 1 commercialised Water Authority under the *Water Act 2000* (Qld). From the 1st of July 2008, GAWB became a registered service provider under the *Water Supply (Safety and Reliability) Act 2008* (Qld). GAWB is responsible to the Minister for Regional Development and Manufacturing.

The Department of Regional Development, Manufacturing and Water has appointed GAWB as the Delivery Management Proponent for the pre-construction activities associated with the proposed Fitzroy to Gladstone Pipeline (FGP) (previously referred to as the Gladstone to Fitzroy Pipeline/GFP) project (the project).

The project is an option to address the single source water supply risk from Awoonga Dam, enabling long-term water security for urban and industrial customers in the Gladstone region. The project also has the potential to provide water for the emerging hydrogen industry.

The project traverses the Rockhampton Regional Council and Gladstone Regional Council Local Government Areas (LGAs) (Figure 1-1). The 116 kilometre (km) long pipeline will commence on the lower Fitzroy River at Laurel Bank (Northern Section), with the majority of its length within the Stanwell-Gladstone Infrastructure Corridor State Development Area (SGIC SDA). The pipeline then connects with GAWB's existing water infrastructure near Yarwun within the Gladstone State Development Area (GSDA).

The pre-construction activities being delivered by GAWB include:

– Appointing key advisors
– Addressing land tenure, permits and approvals
– Determining long lead time items (if required)
– Determining and commencing the preferred construction procurement strategy.

In addition, GAWB is undertaking several technical investigations and baseline surveys for the project to understand the existing environment and the potential impacts. Environmental management plans and procedures to manage potential impacts from the project are also being progressed.

1.2 Project background

In 2007, the Coordinator-General declared the project a 'significant project', requiring an Environmental Impact Statement (EIS) under Section 26(1) of the *State Development and Public Works Act 1971* (SDPWO Act). Further, in 2007 the then Commonwealth Department of Environment and Water Resources issued a notification of referral decision and designated the project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as a 'controlled action' to be assessed under the bilateral agreement as per the SDPWO Act. The controlled action decision identified that the project required assessment and approval under the EPBC Act for potential significant impact on listed threatened species and communities which are Matters of National Environmental Significance (MNES).

An EIS was prepared for the project in 2008 (Arup 2008) with the Supplementary EIS finalised in 2009.

Following the EIS process, the project obtained the following primary environmental approvals:

– The Commonwealth government approved the EIS (EPBC Act reference: EPBC 2007/3501), on 4 November 2011, with conditions varied on 29 October 2021 and 20 June 2022:
    - The approval is for the proposed construction and operation of a 116 km pipeline and associated infrastructure to transport up to 30 gigalitres of water per annum from an intake point at Laurel Bank on the Fitzroy River to Gladstone, near Aldoga, Queensland

- The controlling provisions were listed threatened species and communities (Sections 18 and 18A).

– Coordinator-General EIS evaluation report under Section 26(1) of the SDPWO Act:
  - The Coordinator-General issued an evaluation of the project's EIS on 2 February 2010 which established the framework for the State approvals required for the project (noting the report lapsed in February 2018).

The Commonwealth listed threatened species and communities that were identified as controlling provisions and considered in the EPBC Act decision at 4 November 2011 (i.e. MNES controlling provisions) are listed in Table 1-1 below. The MNES identified in Table 1-1 are considered the MNES for the purpose of this Ecology Assessment Report.

Table 1-1 MNES values previously assessed controlling provisions as part of the EPBC Approval

Species / ecological community	Common name	EPBC Act status*
TECs		
Brigalow (*Acacia harpophylla* dominant and co-dominant)		E
Semi-evergreen vine thickets of the brigalow belt		E
Flora		
Atalaya collina		E
Cycas megacarpa		E
Cycas ophiolitica		E
Quassia bidwillii (*Samadera bidwillii***)		V
Fauna		
Delma torquata	Collared delma	V
Denisonia maculata	Ornamental snake	V
Egernia rugosa	Yakka skink	V
Epthianura crocea macgregori	Yellow chat (Dawson subspecies)	CE
Erythrotriorchis radiatus	Red goshawk	V
Geophaps scripta scripta	Squatter pigeon (southern)	V
Nyctophilus corbeni (formally listed as *N. timoriensis*)	Greater long-eared bat	V
Paradelma orientalis	Brigalow scaly-foot	NL
Pteropus poliocephalus	Grey-headed flying-fox	V
Rheodytes leukops	Fitzroy River turtle	V
Rostratula australis (formally listed as *R. benghalensis*)	Australian painted snipe	E

Key to table:
– CE – critically endangered; E – endangered; V – vulnerable; LC – least concern;
– * – Status under the EPBC Act as at June 2022
– ** - *Quassia bidwillii* is now known as *Samadera bidwillii*

1.3 Purpose of this report

GAWB commissioned GHD to conduct terrestrial and aquatic ecological assessments at locations that will or may be affected by the project (Figure 1-1). This assessment involved identifying the existing terrestrial and aquatic ecological values within the study area, including vegetation communities, identifying terrestrial and aquatic flora and fauna species that are present and describing the type, condition and context of ecosystems and habitat.

This report documents the findings of the ecological assessment from desktop assessment and field investigations. Based on the description of ecological values, an assessment of impacts was conducted, options to

avoid and mitigate impacts were identified, and a rigorous analysis was conducted to identify if any matters of state environmental significance (MSES) will experience a significant residual impact (SRI) from the project, in accordance with the Queensland *Significant Residual Impact Guideline* (Department Environment and Heritage Protection (DEHP) 2014).

As identified in Section 1.2, the project is subject to a current EPBC approval with the controlling provisions being those threatened species and communities listed at the time of the approval. The EPBC approval identified significant impacts to the yellow chat that required offsets; no other MNES were identified as requiring offsets. Those threatened species and communities that have been listed or had classification amendments since issuing of the EPBC approval are not required to be managed under the EPBC approval. Therefore, detailed assessment of MNES and associated significant residual impacts as a result of the project is not required for species listed after the approval was granted.

To assist GAWB in meeting the requirements of the EPBC approval and their general environmental duty, this current ecological assessment has included:

– A review of MNES that were listed at the time of the EPBC approval with an aim to identify any significant changes to ground conditions since preparation of the EIS assessment of controlling provisions.
– Identification of MNES (species and species' habitat) that have been listed under the EPBC Act since issuing of the EPBC approval to assist GAWB in meeting their general environmental duty to minimise environmental impacts of the project where possible (noting these are outside of the controlling provisions of the EPBC approval).

This report will:

– Support the implementation of the EPBC approval
– Support State environmental and planning approvals required for the project
– Provide guidance for environmental management of ecological values throughout the project
– Assist GAWB, in meeting their general environmental duty of care as related to ecological values (such as those outlined in proponent Environmental Policies or Environmental Management Systems).

1.4 Definitions

For the purposes of this report, definitions as described in Table 1-2 apply:

Table 1-2 Report Definitions

Subject	Definition
The project	Pre-construction activities for the proposed Fitzroy to Gladstone Pipeline (FGP)
Pre-construction	Activities, including but not limited to planning, design, and surveys, that occur within study area prior to the commencement of construction activities
Pipeline alignment	The area proposed to be directly impacted by the project which includes the alignment an approximate 30 m right of way (ROW)
Project footprint	The area proposed to be directly impacted by the project which includes the pipeline alignment, the telecommunication and power supply easements, access tracks and laydown areas
Study area	The area subject to ecological field surveys and includes the pipeline alignment and supporting infrastructure locations
Desktop search extent	10 km buffer around the pipeline alignment used for desktop searches of environmental values
Conservation significant	Any species or ecological community that is listed as critically endangered, endangered, vulnerable or near threatened under the EPBC Act or the *Nature Conservation Act 1992* (NC Act)
Northern Section	Refers to approximately 15 km of pipeline, the intake facility of the southern bank of the Lower Fitzroy River and the pump station, and the Alton Downs Water Treatment Plant

Subject	Definition
SGIC SDA Section	Refers to works within the Stanwell to Gladstone Infrastructure Corridor State Development Area (SGIC SDA) comprising approximately 80 km of pipeline and the Raglan Pump Station and Reservoir
GSDA Section	Refers to works within the Gladstone State Development Area (GSDA) comprising approximately 21 km of pipeline and the Aldoga Reservoirs

1.5 Limitations

This Ecology Technical Report was prepared by GHD in performing services under the Service Provider Agreement dated 4 June 2015 between GHD and GAWB (the Contract). The report does not amend the Contract or take away from the rights or obligations of GAWB and GHD under the Contract or in respect of the standard and quality of the services performed under the Contract. If there is any inconsistency between the Contract and this report, the Contract prevails to the extent of the inconsistency.

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

GHD has prepared this report on the basis of information provided by GAWB and others who provided information to GHD (including Government authorities), 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 assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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

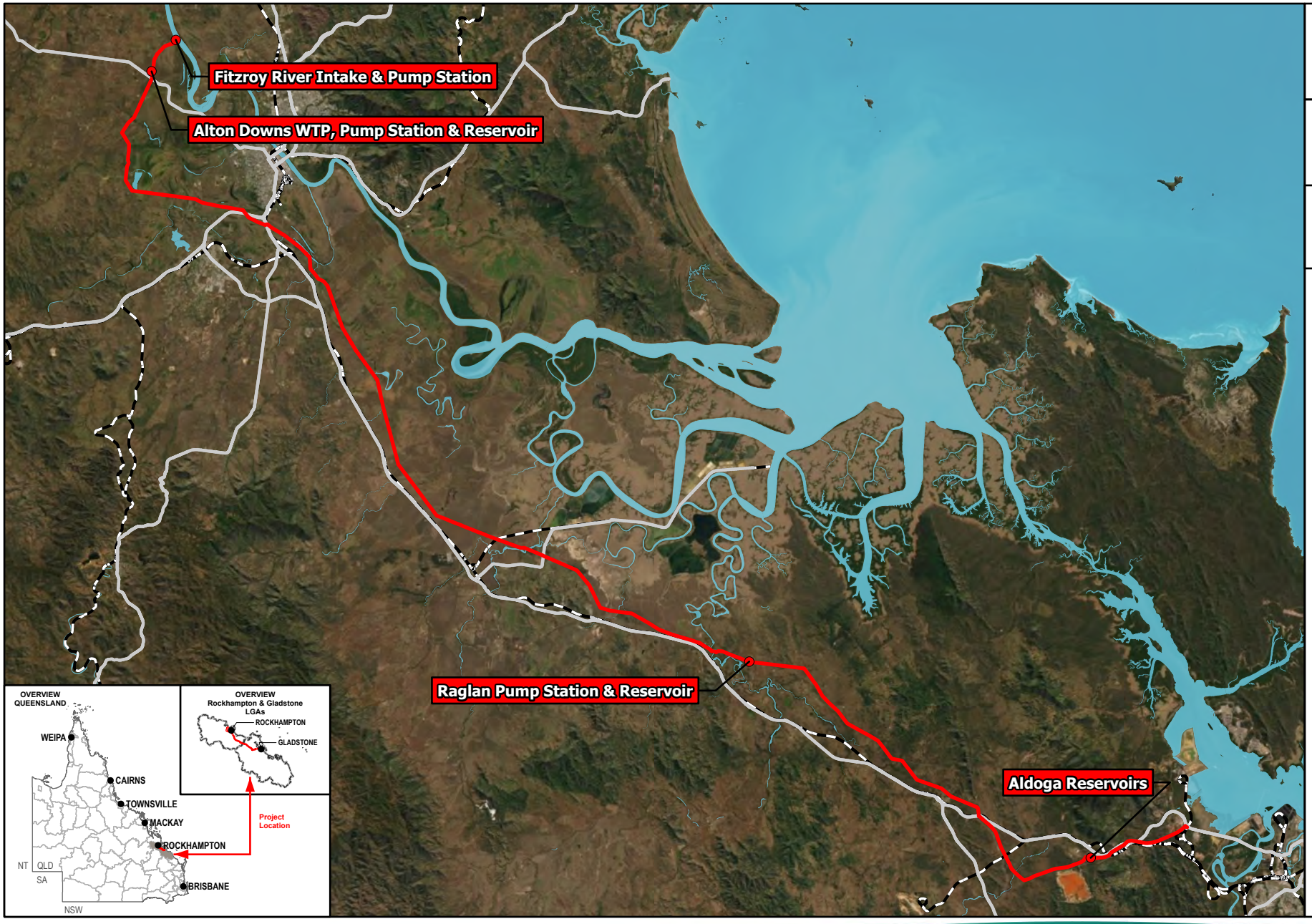
Investigations undertaken in respect of this report are constrained by the particular survey conditions, such as land access, geographic constraints and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of flora and fauna populations) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.6 Assumptions

This report should be read with respect to the following:

– Access was not available to all areas within the study area during the field survey. The ecological values of areas that were unable to be assessed has been based on desktop assessment results and ground-truthing of environmental conditions within the broader study area
– The assessment presents field survey results from two seasonal field surveys undertaken in summer (February 2022) and autumn (May 2022). The presence and detectability of terrestrial and aquatic flora and fauna species during the field assessments is strongly influenced by seasonality and therefore survey results have been interpreted with consideration of this potential variability. The description of environmental values and impact assessment presented in this report are informed by the results of the two seasonal surveys.



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- Facility Locations
- Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report Figure 1-1 Project Locality

000-G-MAP-2214 Version:0 Date: 13/06/2022

2. Methodology

2.1 List of relevant legislation

The key legislation of relevance to the project are:

– *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
– *State Development and Public Works Organisation Act 1971*
– *Vegetation Management Act 1999*
– *Biosecurity Act 2014*
– *Nature Conservation Act 1992*
– *Fisheries Act 1994.*
– *Environmental Offsets Act 2014*.

The significant impact assessments were undertaken in accordance with the following guidelines:

– Commonwealth *Significant Impact Guidelines 1.1* (DoE 2013)
– Queensland *Significant Residual Impact Guideline* (DEHP 2014b).

Consideration has been given to these in developing this report.

2.2 Approach

The ecological assessment for the project included a combination of desktop review of environmental databases, relevant mapping layers and a field assessment of the terrestrial flora and fauna, and aquatic ecological values within the study area. Together, these assessments allowed for a baseline description of the ecological values of the study area to be compiled, against which an assessment of the project's impacts to Commonwealth MNES and Queensland MSES could be made.

2.3 Desktop assessment

A number of ecological assessments have been undertaken for the project, and now form part of the desktop analysis for the current assessment, as outlined in Table 2-1.

Table 2-1 Previous ecological assessments undertaken for the project

Year	Author	Report title
2008	Arup	Gladstone-Fitzroy Pipeline Project Environmental Impact Statement – CH 6 Terrestrial Flora
2008	Arup	Gladstone-Fitzroy Pipeline Project Environmental Impact Statement – CH 7 Terrestrial Fauna
2021	SMEC	Gladstone to Fitzroy Pipeline Stage 2 – Detailed Assessment – Environmental Technical Report

The desktop assessment was undertaken to identify and collate existing information on the ecological values of the environment within the study area. Desktop searches were undertaken for the study area to provide location-specific information on EPBC Act and NC Act listed threatened species, threatened ecological communities (TECs) and ecosystems/habitats with the potential to occur. For all desktop searches, the search extent encompassed a 10 km buffer around each of the three pipeline alignment sections as outlined in section 1.1 (Northern Section, SGIC SDA and GSDA). This was undertaken to provide context about the potential presence of mobile species or cryptic species that are known to occur in similar habitat within the region. To gain a full understanding of the potential ecological values present, desktop results present current listed MNES species and communities. However, those that were listed following the EPBC approval are not addressed further, apart from those species that are co-listed with State legislation.

The desktop assessment used the information sources listed in Table 2-2.

Table 2-2 Information sources used for the desktop assessment

Information sources	Comments
Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Act Protected Matters Search Tool (PMST)	The DCCEEW PMST was used to identify conservation significant flora and fauna species and TECs listed under the EPBC Act (MNES) that have the potential to occur in the vicinity of the study area (Appendix A).
Department of Environment and Science (DES) WildNet database	The DES WildNet database was searched to retrieve historical records of flora and fauna species previously recorded in the vicinity of the study area (Appendix A).
DES Species Profile Search database	The DES Species Profile Search was undertaken to obtain spatial data records for conservation significant flora and fauna species including those responsible for generating high-risk trigger areas and essential habitat intersecting the study area. The search was also undertaken to gain an understanding of the location and collection date of any conservation significant flora and fauna records in proximity to the study area.
Atlas of Living Australia database	The Atlas of Living Australia database was searched to retrieve historical records of flora and fauna species previously observed in the vicinity of the study area.
DES Biomaps	The DES Biomaps mapping tool was used to review specific locations, collection date and details of records of species of conservation significance in the study area.
The Department of Resources (DoR) Regulated Vegetation Mapping	The DoR Vegetation Management Regional Ecosystem and Remnant Map spatial layer (version 12.1) was viewed to determine the extent and type of Regional Ecosystems (REs) mapped in the study area.
DoR Essential Habitat Mapping	The DoR Essential Habitat Map spatial layer (version 6.13) was viewed to determine if vegetation within the study area has been identified as essential habitat for any conservation significant species listed under provisions of the NC Act.
DES Protected plants flora survey trigger mapping	The DES protected plants flora trigger map spatial layer (version 8.0) was viewed to identify whether the vegetation within the study area was in proximity to a record of a conservation significant flora species.

2.4 Ecological field assessment

2.4.1 Overview

Terrestrial surveys were undertaken by principal flora ecologist Peter Moonie (Red Ash Consulting) and senior fauna ecologist Shannon Blatchford (GHD). Peter has a Bachelor of Science in Ecology with over 20 years' experience in the fields of ecology and natural resource management. Shannon has a Bachelor of Science in Ecology and Conservation Biology with 12 years' experience in environmental management and ecological assessments. Aquatic surveys were undertaken by senior aquatic ecologist Lauren Pratt, and aquatic ecologists James Wyatt, and Tim Moeser. Lauren has a Bachelor of Marine Studies in Marine Biology and Ecology with Honours and has 13 years' experience in freshwater aquatic ecosystem monitoring. James has a Bachelor of Environmental Management and Ecology with honours and has 12 years' experience in freshwater ecosystem monitoring. Tim has a Bachelor of Science in Aquatic Resource Management and has 6 years' experience in aquatic ecology. Terrestrial and aquatic field team curriculum vitae (CVs) are provided in Appendix C.

Two ecological field surveys were undertaken in February (wet season) and May (post wet season) in 2022 at representative locations throughout the study area to gather information about the environmental values associated with the existing environment, confirm the presence of species of conservation significance, and record any key ecological features that should be avoided or considered for the proposed Project. Field survey dates are listed in Table 2-3.

Aquatic surveys were conducted during summer (wet season) and autumn (post wet season) conditions to provide the best opportunity to capture and/or observe the highest diversity of aquatic flora and fauna species, including fish, crocodiles, and turtles, noting that some watercourses in the region are ephemeral.

Table 2-3 Timing of the terrestrial and aquatic field survey events

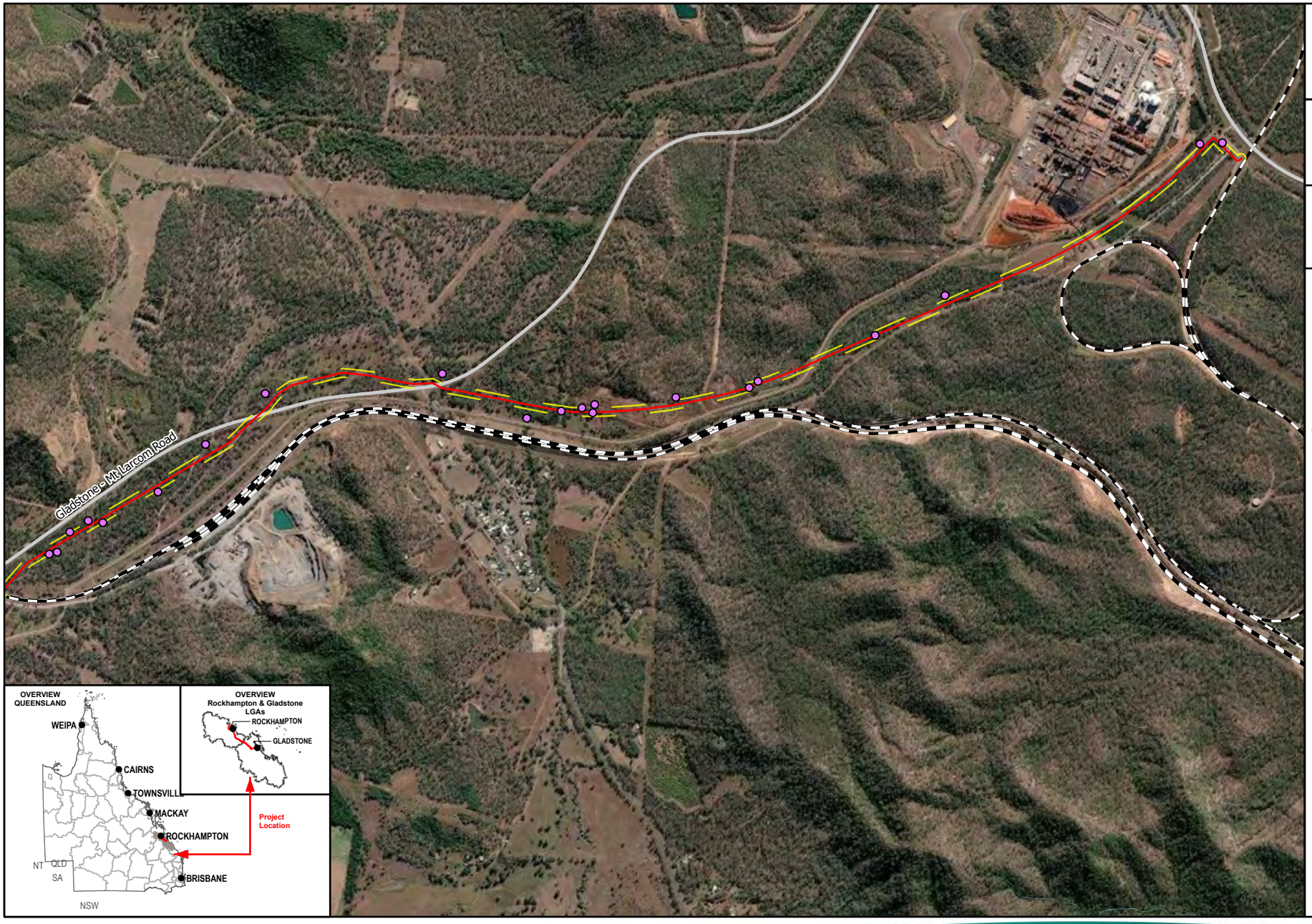
Terrestrial field survey events			Aquatic field survey events		
Season	**Date**	**Days**	**Season**	**Date**	**Days**
Summer	21 – 25 February 2022	5	Summer	21 – 23 February 2022	3
Autumn	2 – 9 May 2022	8	Autumn	3 – 10 May 2022	8

2.4.2 Vegetation communities and flora survey methods

A total of 207 vegetation and flora field survey sites were assessed during the two ecological field surveys, as presented in Figure 2-1. Surveys were undertaken in accordance with relevant Commonwealth/State guidelines. A description of survey methods employed for relevant environmental matters is provided in Table 2-4.

Table 2-4 Vegetation communities and flora survey methods used within the study area

Assessment	Survey method
Threatened Ecological Communities	The structural and compositional characteristics of vegetation communities across the study area were compared with DCCEEW's approved conservation advice of TECs to assess whether any vegetation communities present met the requirements necessary to constitute a TEC, noting that assessments were restricted to those communities that were accessible and mapped as comprising REs equivalent to TECs identified in the EPBC Act PMST.
Regional Ecosystems	Verification of REs accessed during the ecological field surveys were undertaken using a combination of Quaternary level assessments and informal observations (as described in Neldner *et al*. 2020). Data and observations were collected on the structural and floristic composition of vegetation communities as well as soils, geology and landform to determine the RE type. Where a mapped RE did not accurately reflect on-site observations, it was assigned an RE from the REDD (Queensland herbarium 2019) that most closely matched the Land Zone and vegetation attributes observed. Discrepancies in RE boundaries were also noted. Height and cover measurements at survey sites were also assessed against relevant RE benchmark data where initial observations suggested that mapped regrowth vegetation may have achieved remnant status. RE verification was restricted to the project corridor only and not all polygons were verified. Where RE verifications were not completed, DoR mapping was accepted by default.
Threatened flora species	Threatened flora searches within high-risk flora trigger areas were undertaken in accordance with the *Flora Survey Guidelines – Protected Plants* (2020) (referred to herein as the flora survey guidelines). A combination of timed meander and systematic transect search methods (as described in the flora survey guidelines) were employed. The timed meander method was principally used in highly modified areas (e.g. paddocks) where plant diversity was low and access, particularly through tall dense exotic grasses, was problematic. The seasonality of the flora survey was considered suitable for the detection of all threatened flora species considered to have a moderate or high potential to occur in the clearing impact area. The survey was co-ordinated and led by a suitably qualified person who has appropriate qualifications, training and experience in undertaking such surveys. Opportunistic searches for conservation significant flora species were also undertaken in potentially suitable habitat beyond the high-risk flora trigger areas. Species targeted included those identified during desktop searches that were considered potentially present based on habitat requirements and known distributions.
Marine plants	Marine plant surveys were undertaken within and adjacent to tidal lands in the study area, whereby tidal lands were considered to include portions of the study area at or below highest astronomical tide (HAT). The marine plants definition specified in the *Fisheries Act 1994* and qualifications made in the Department of Agriculture and Fisheries (DAF) Fish Habitat Management Operational Policy FHMOP001 (2007) were used for the purposes of the survey. Data collected included marine plant species present, extents and whether impacts would be of a temporary or permanent basis. An impact was considered to be of a permanent nature where the marine plant could not reasonably be replaced (naturally or via assisted regeneration) within a 5-year period as per the Queensland Significant Residual Impact Guideline (DEHP 2014b). Scaled plans showing the location and extent of marine plans were prepared with reference to Marine plant Appendix 3 of the State Development Assessment Provisions Guideline State code 11: Removal, destruction, or damage of marine plants (DAF 2022).
Weeds	Opportunistic observations of introduced flora species listed under the *Biosecurity Act 2014* were also undertaken.



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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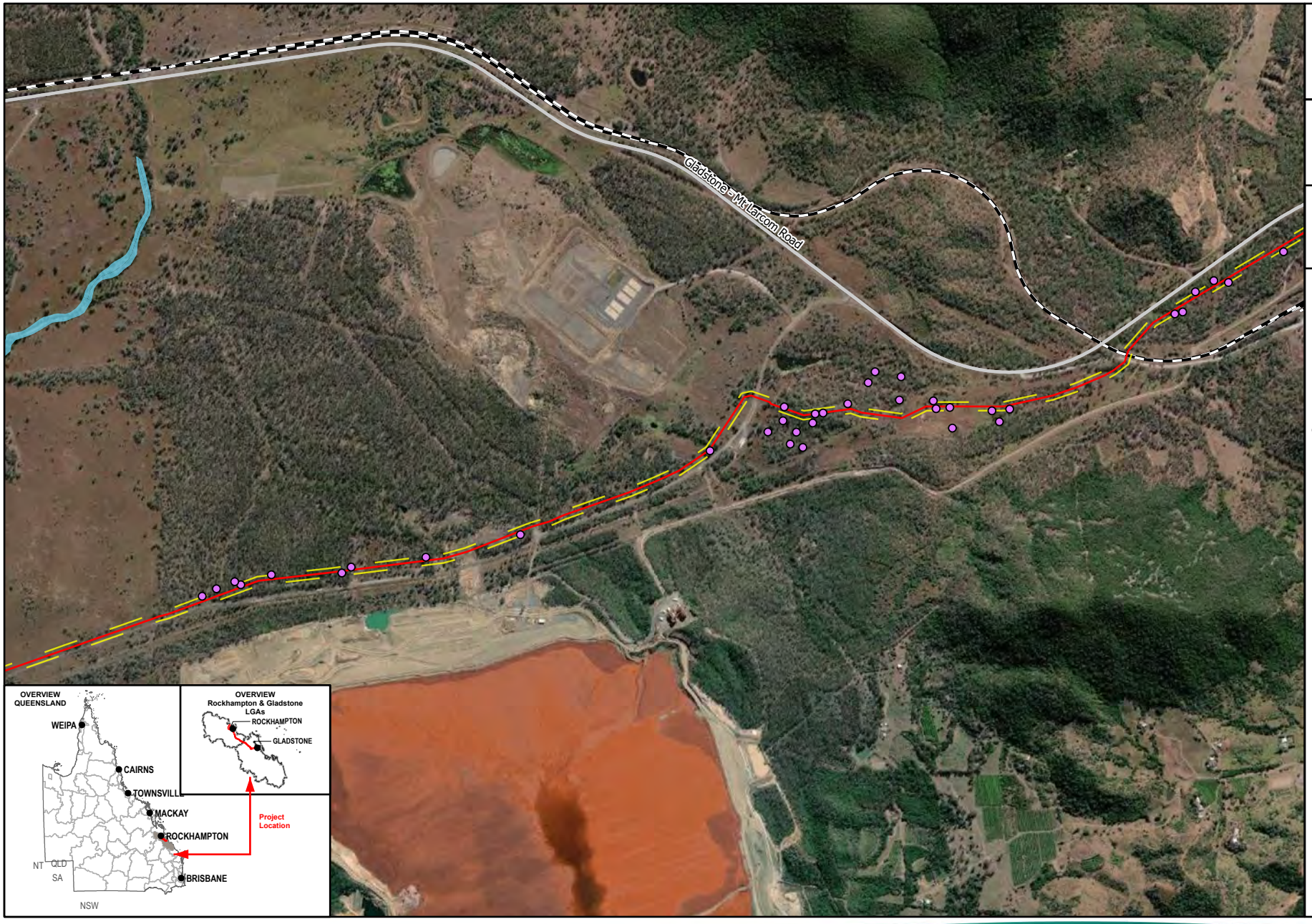
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1a
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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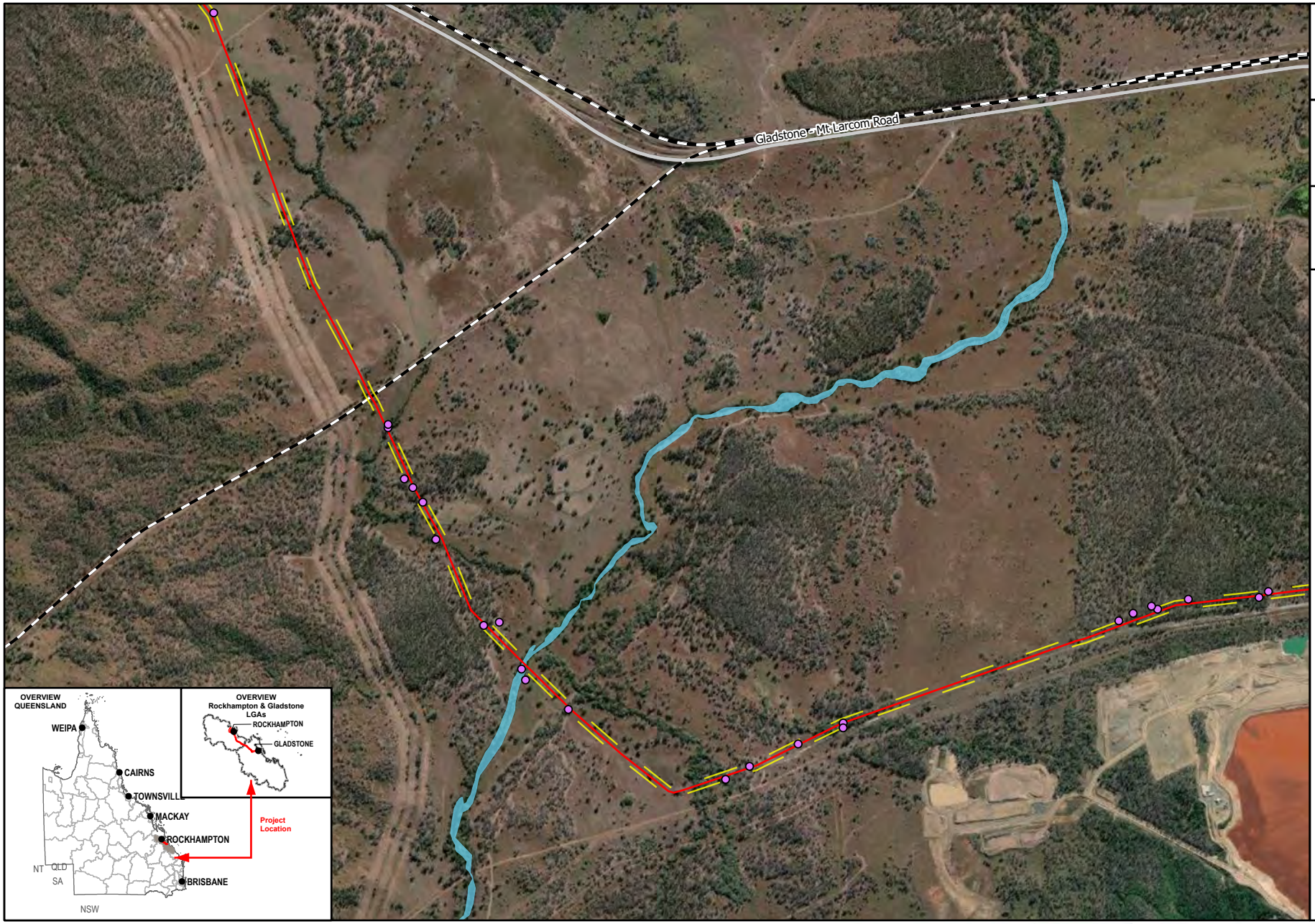
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1b
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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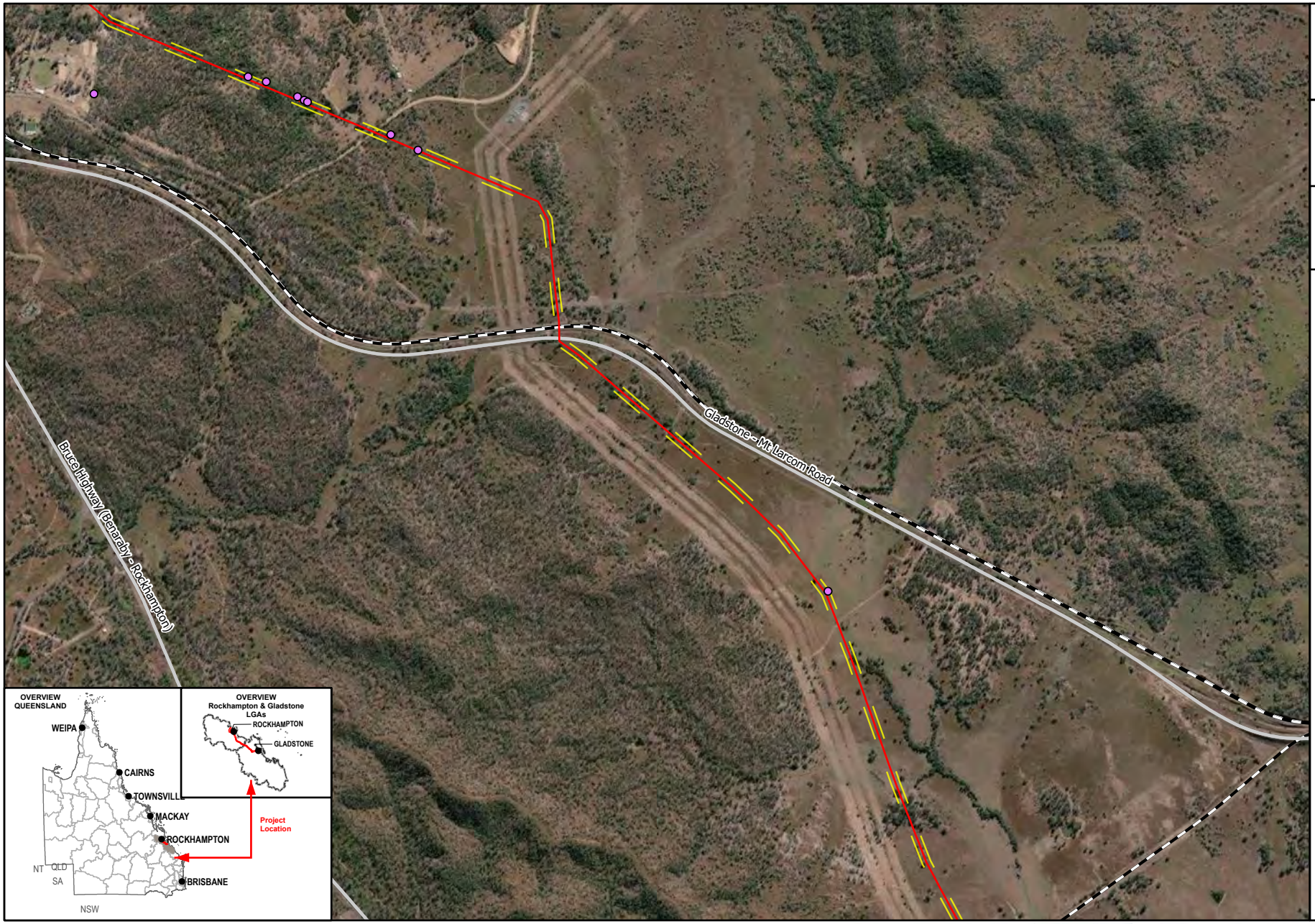
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1c
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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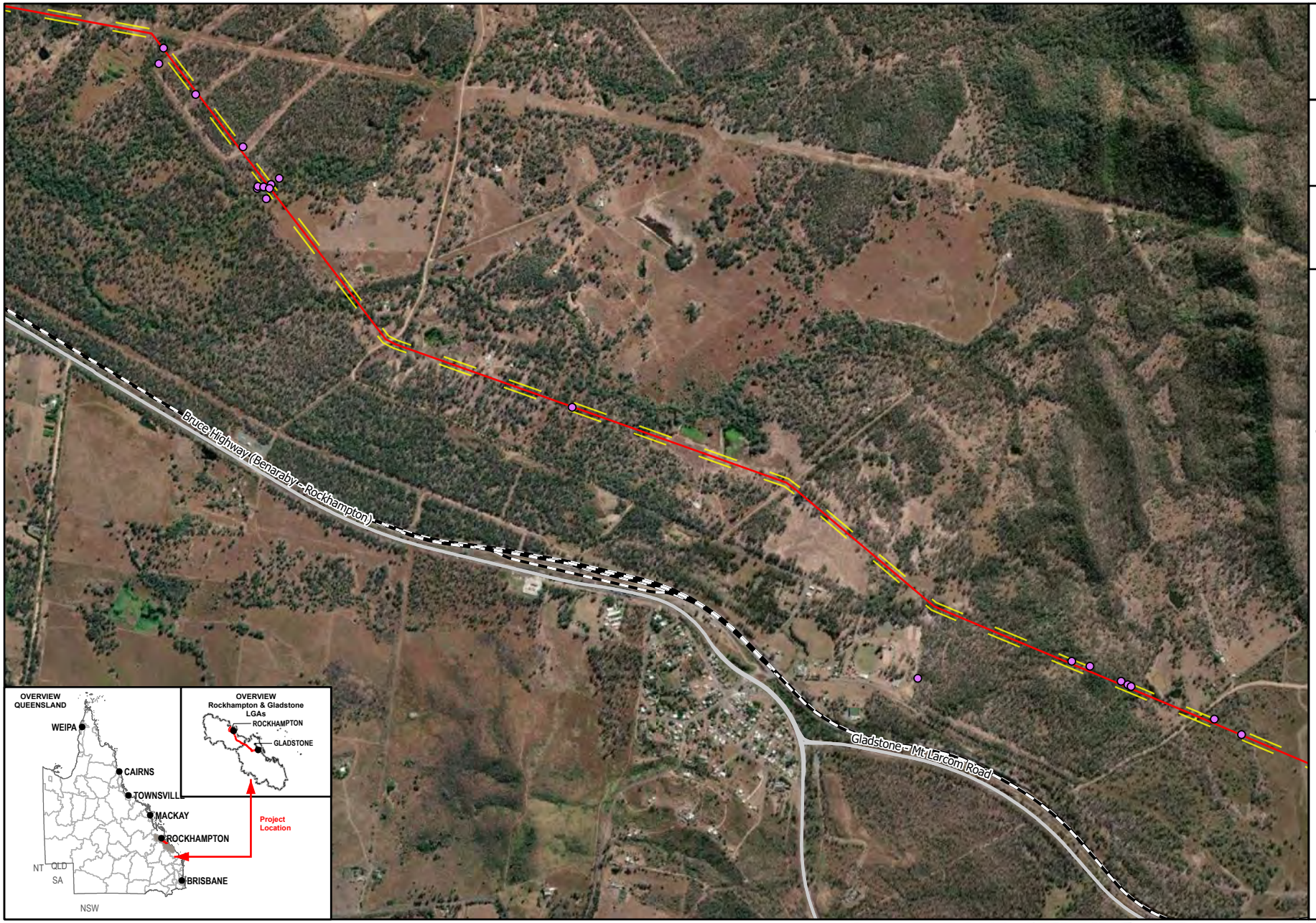
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1d
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
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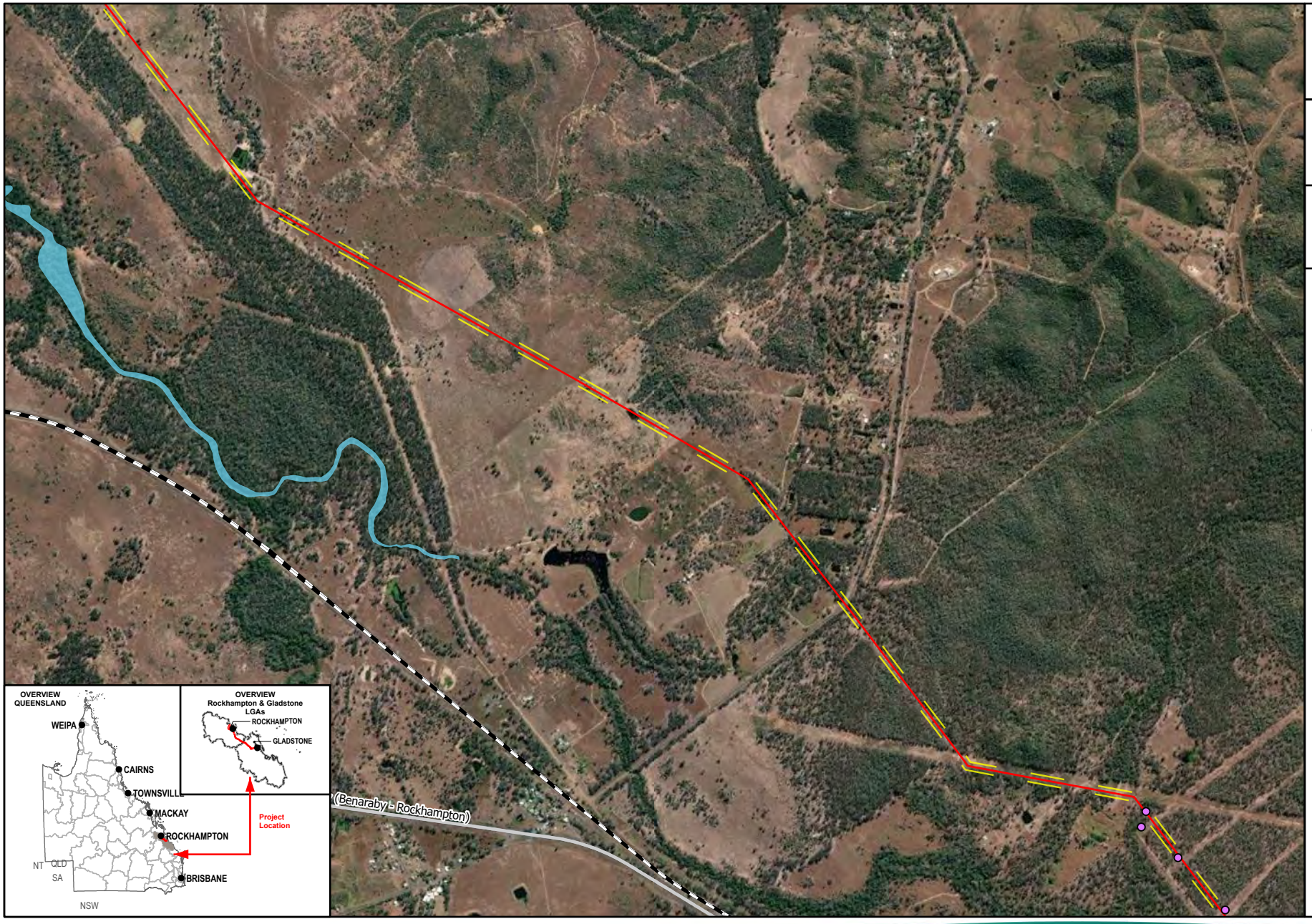
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1e
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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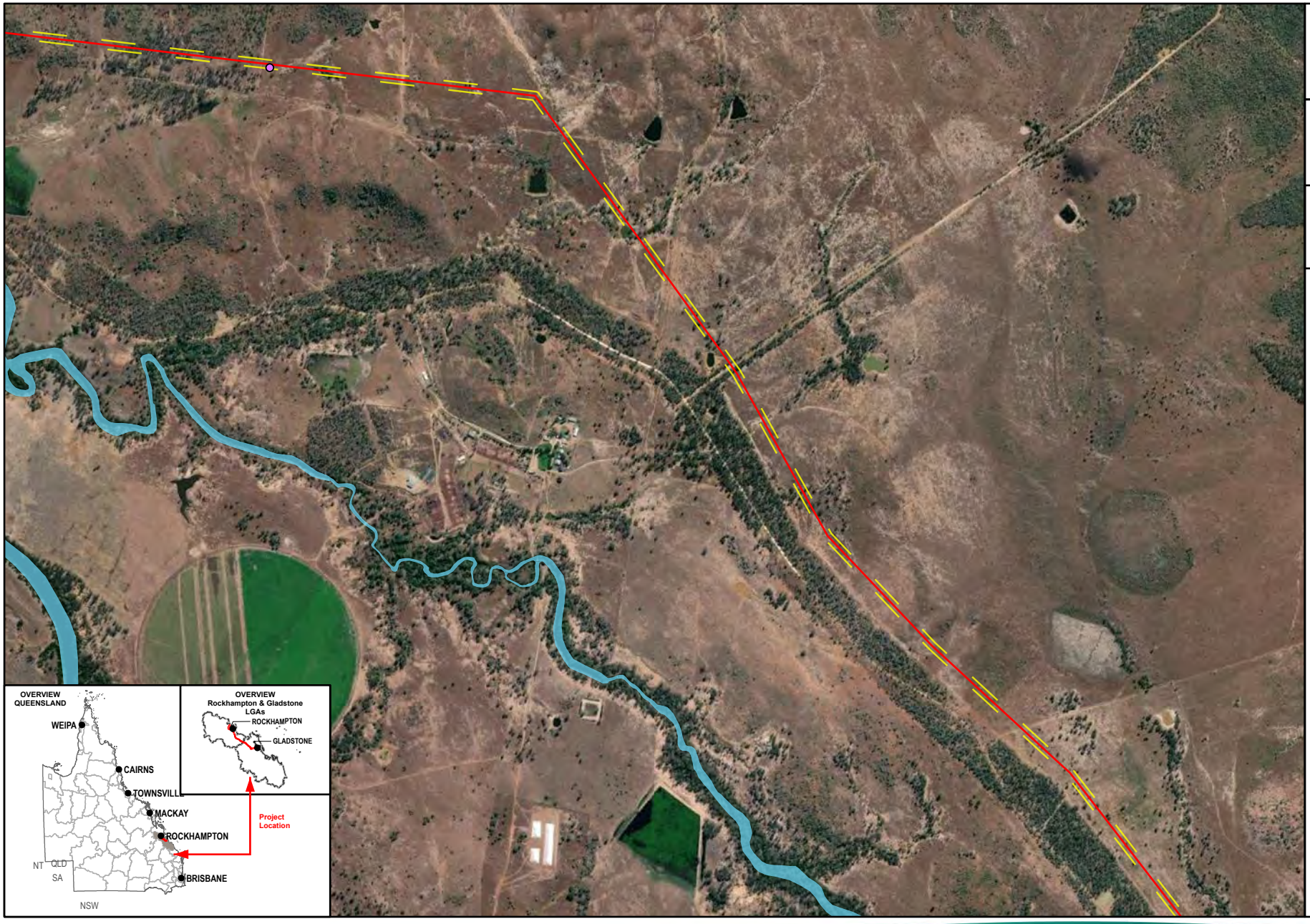
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1f
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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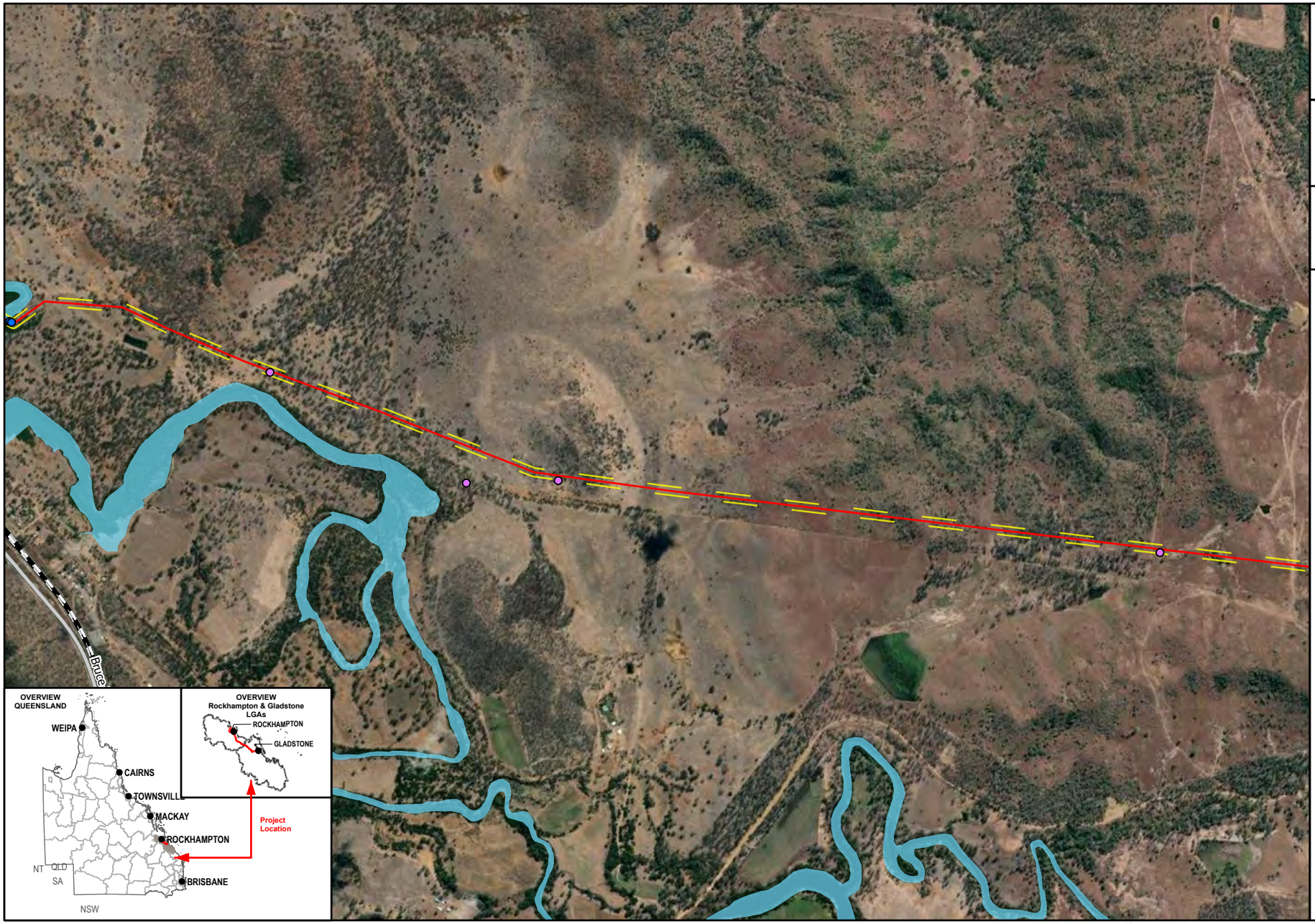
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1g
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1h
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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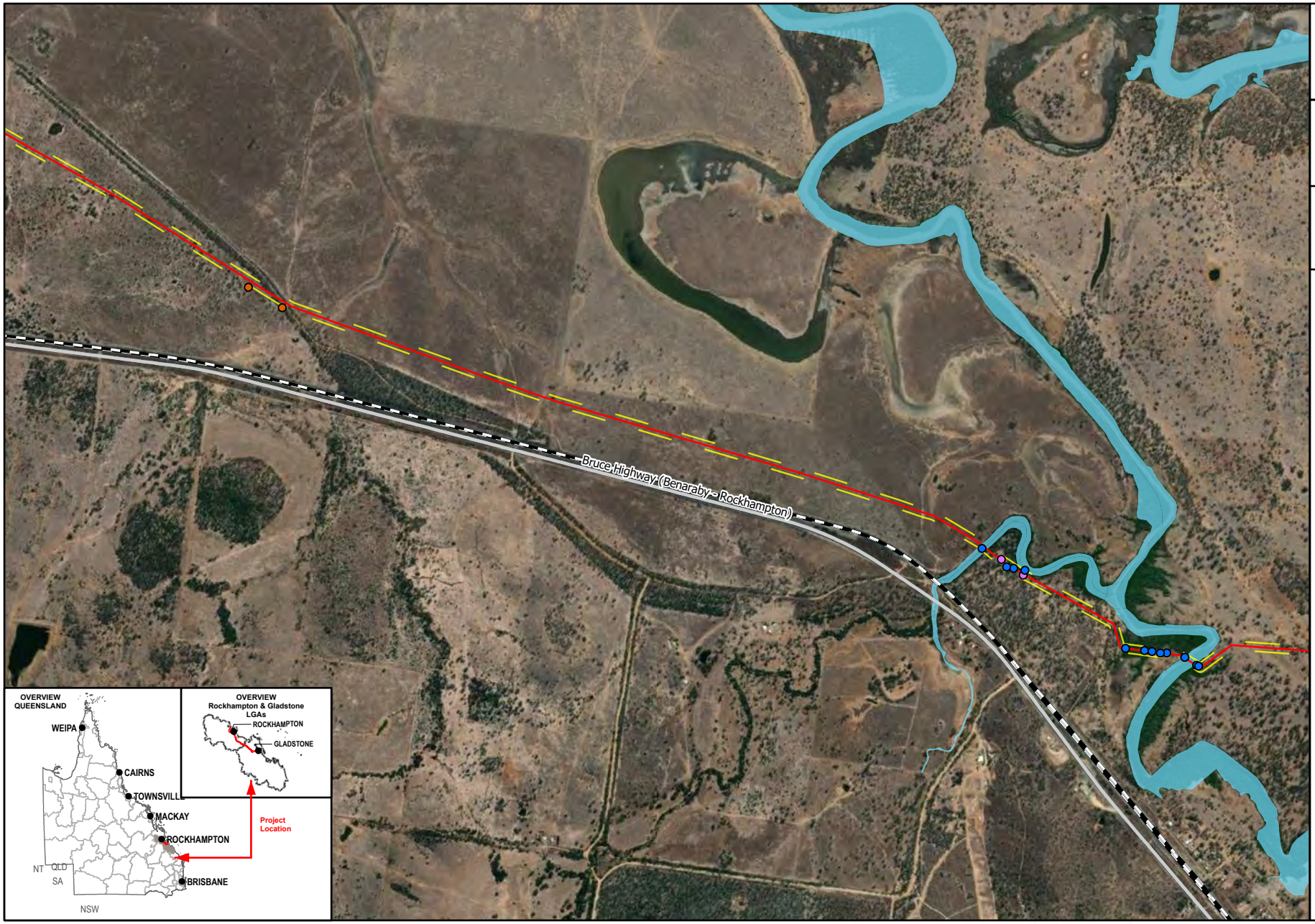

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Flora Survey Type

- Marine Plant Survey Site
- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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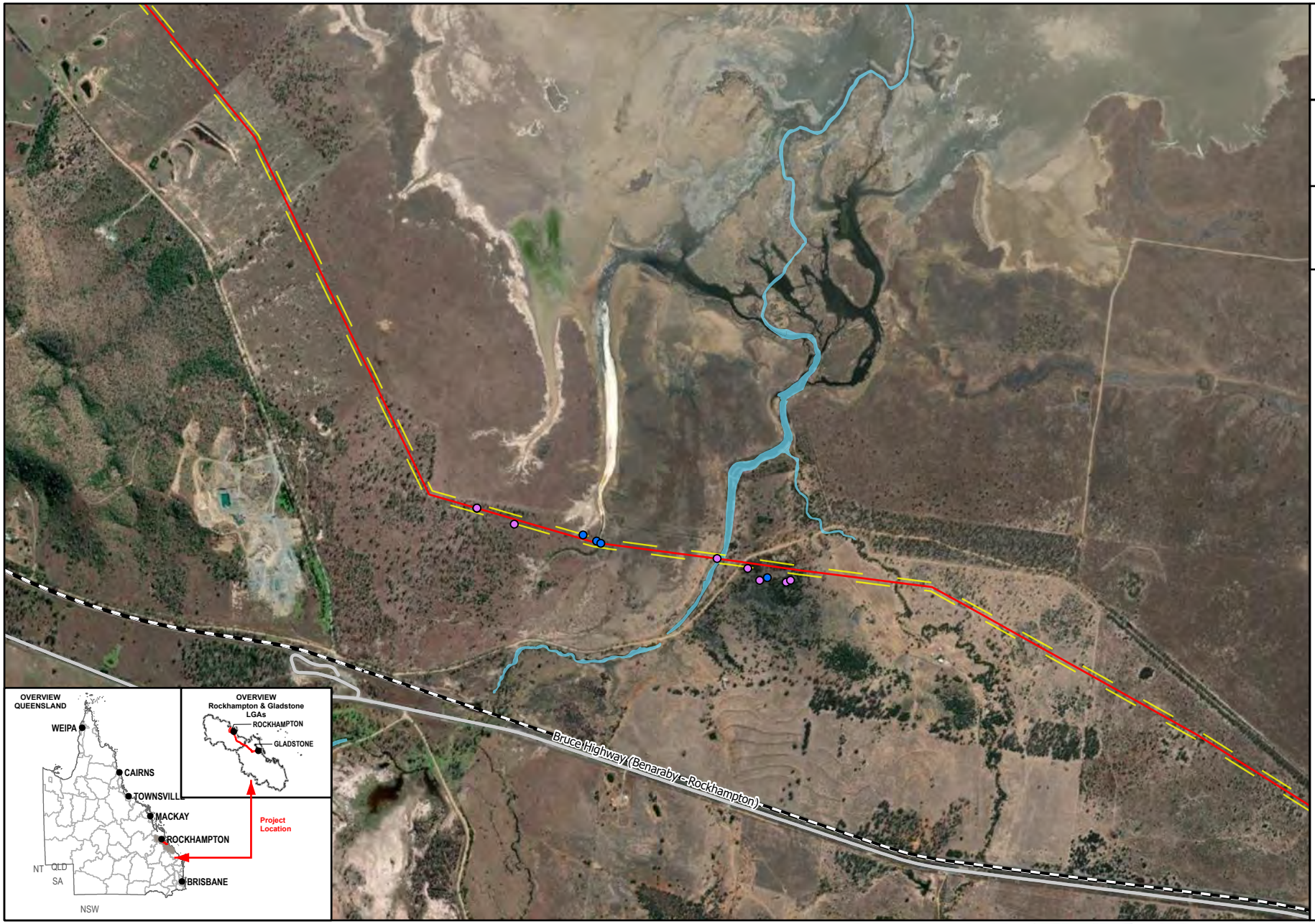
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1i
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

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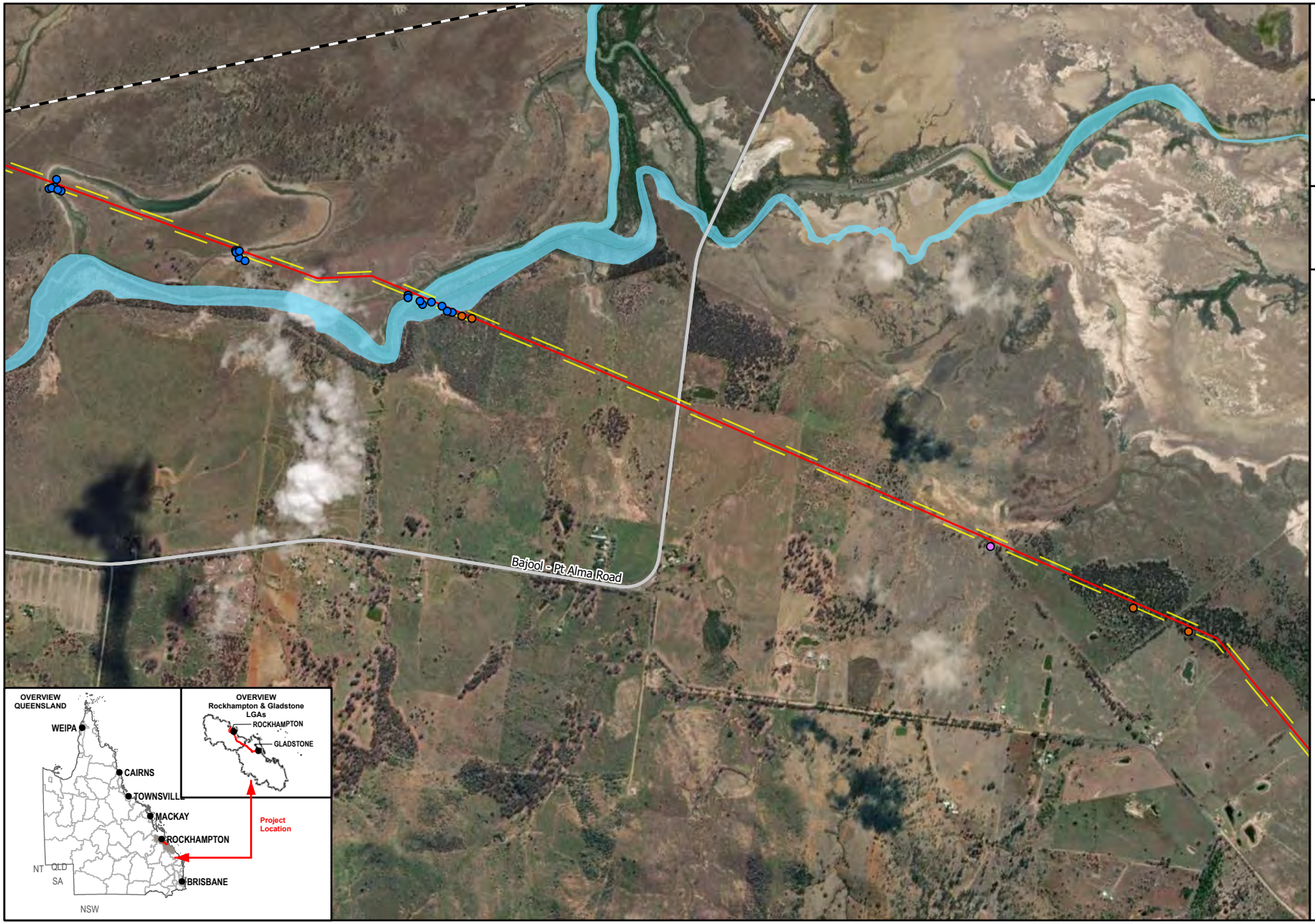
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1j
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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Figure 2-1k
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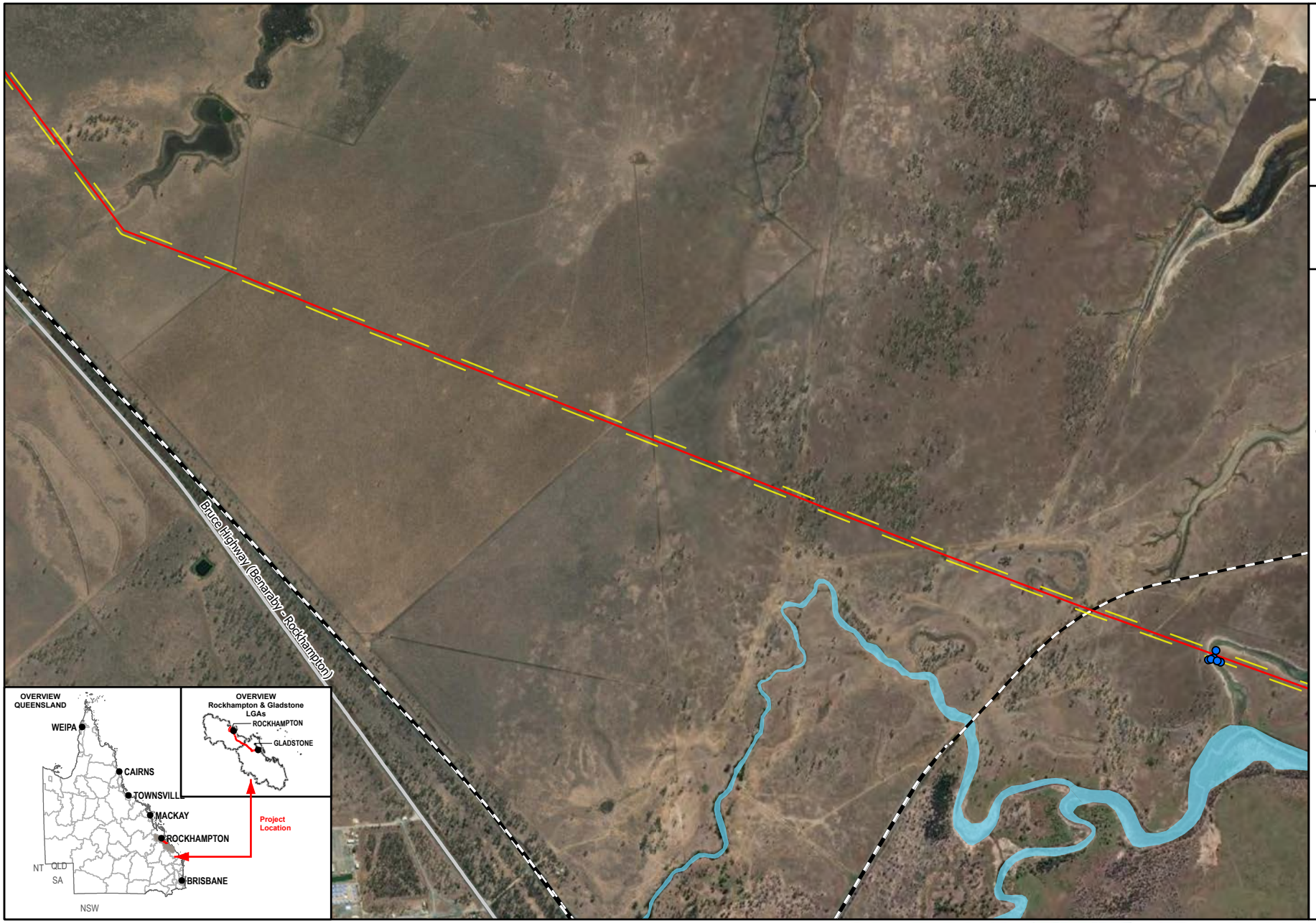
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Marine Plant Survey Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1l
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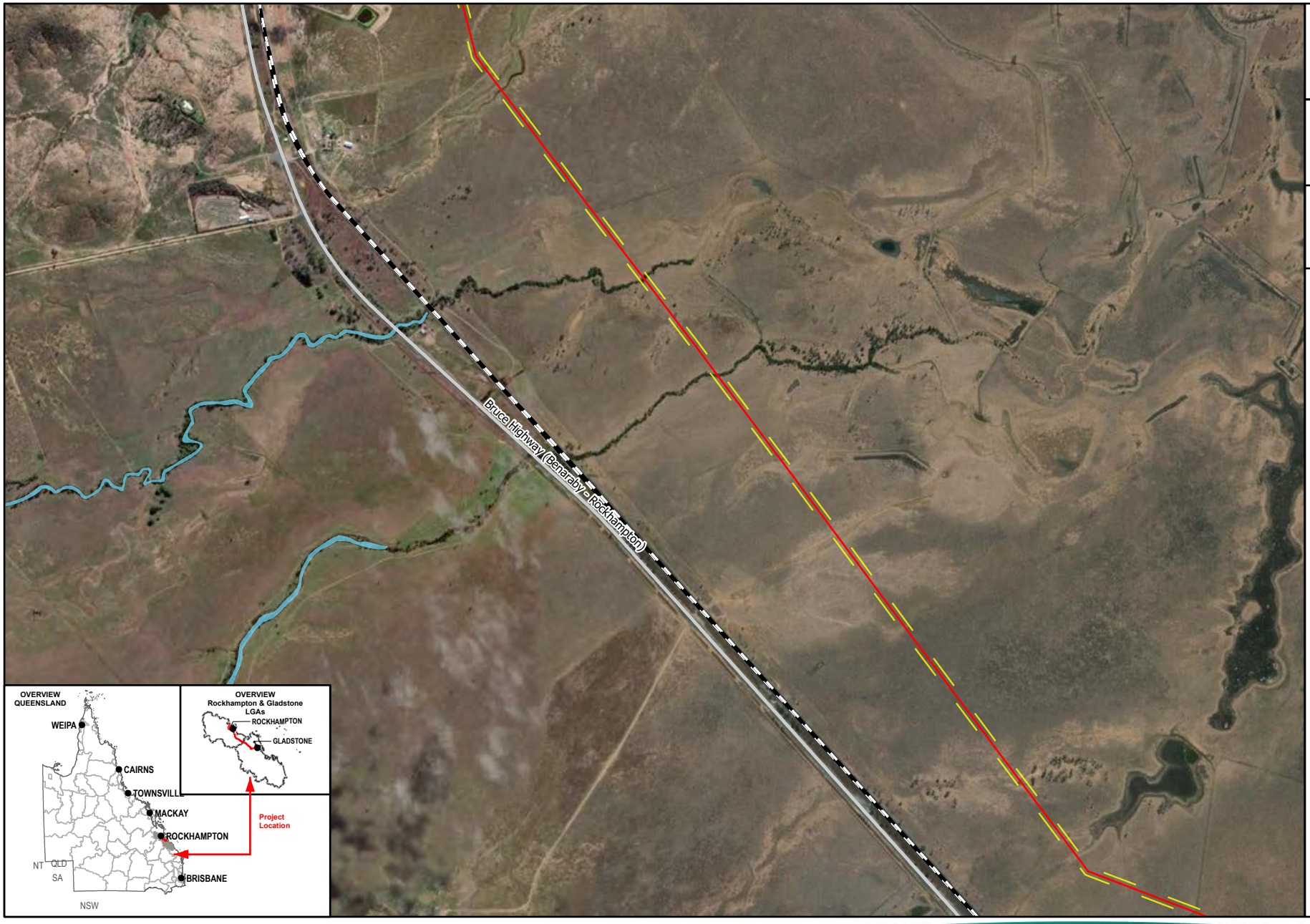

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Legend

- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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Figure 2-1m
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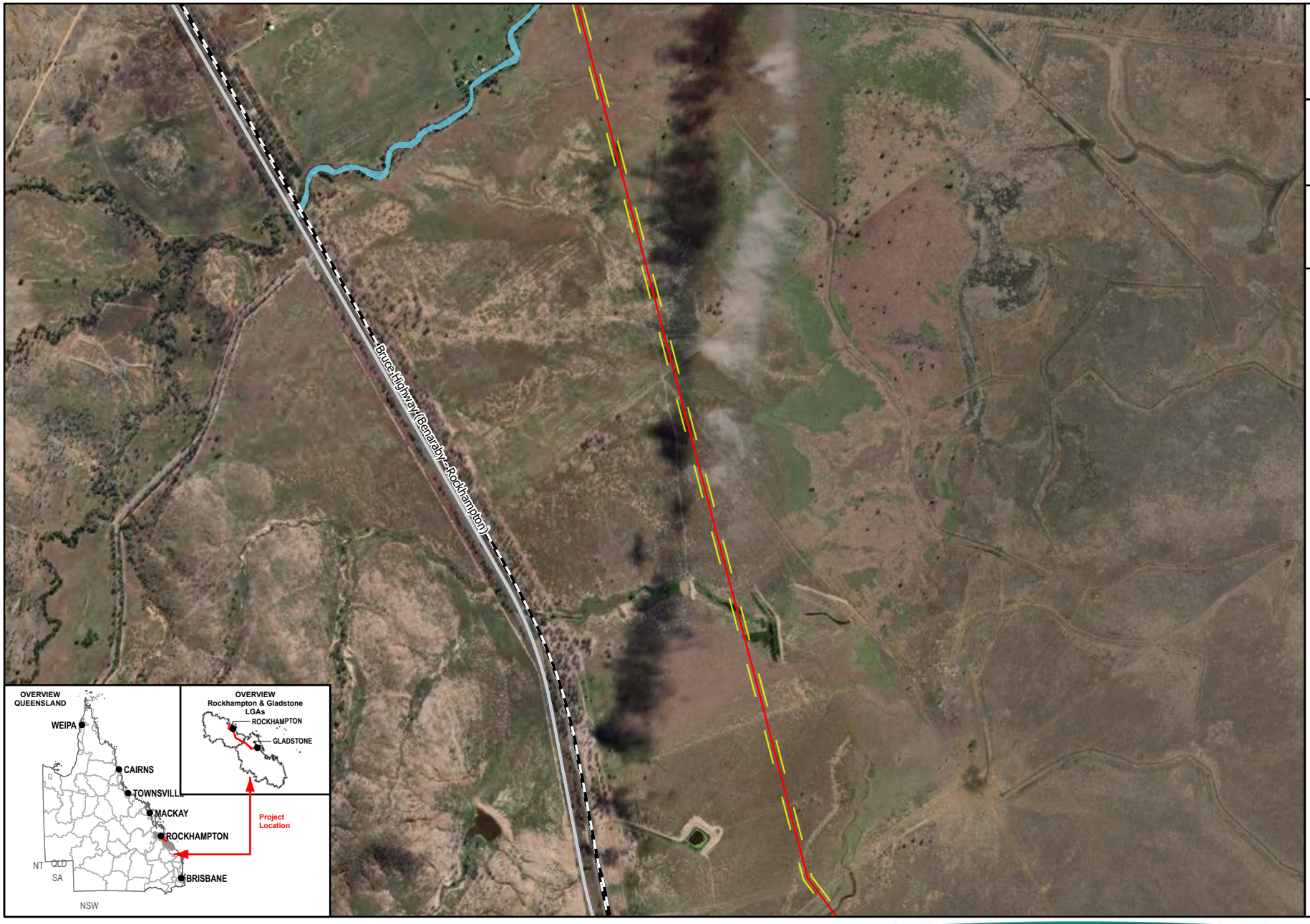
000-G-MAP-2401 Version:0 Date: 7/07/2022



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- Study Area
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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1n
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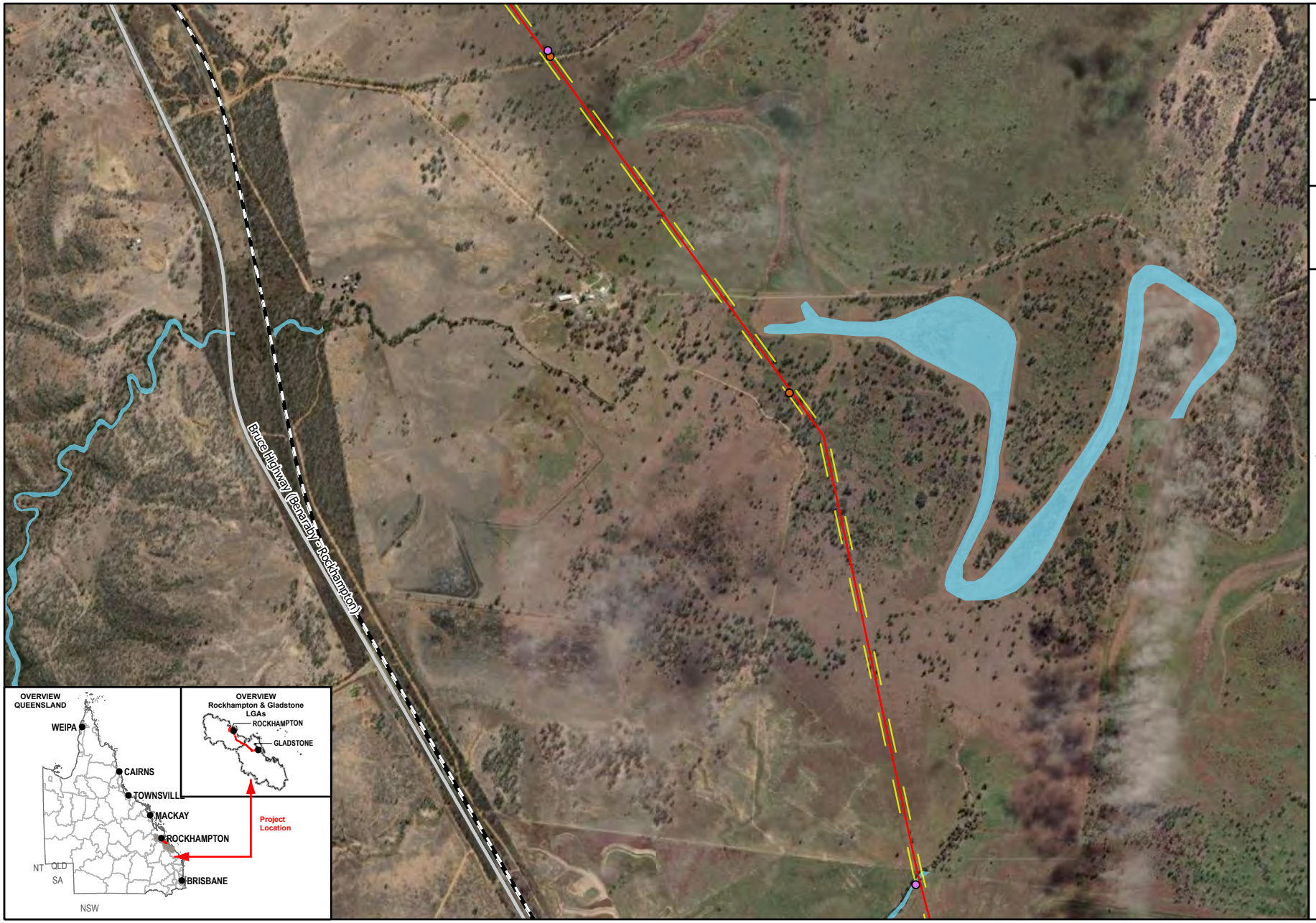
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- TEC Assessment Site
- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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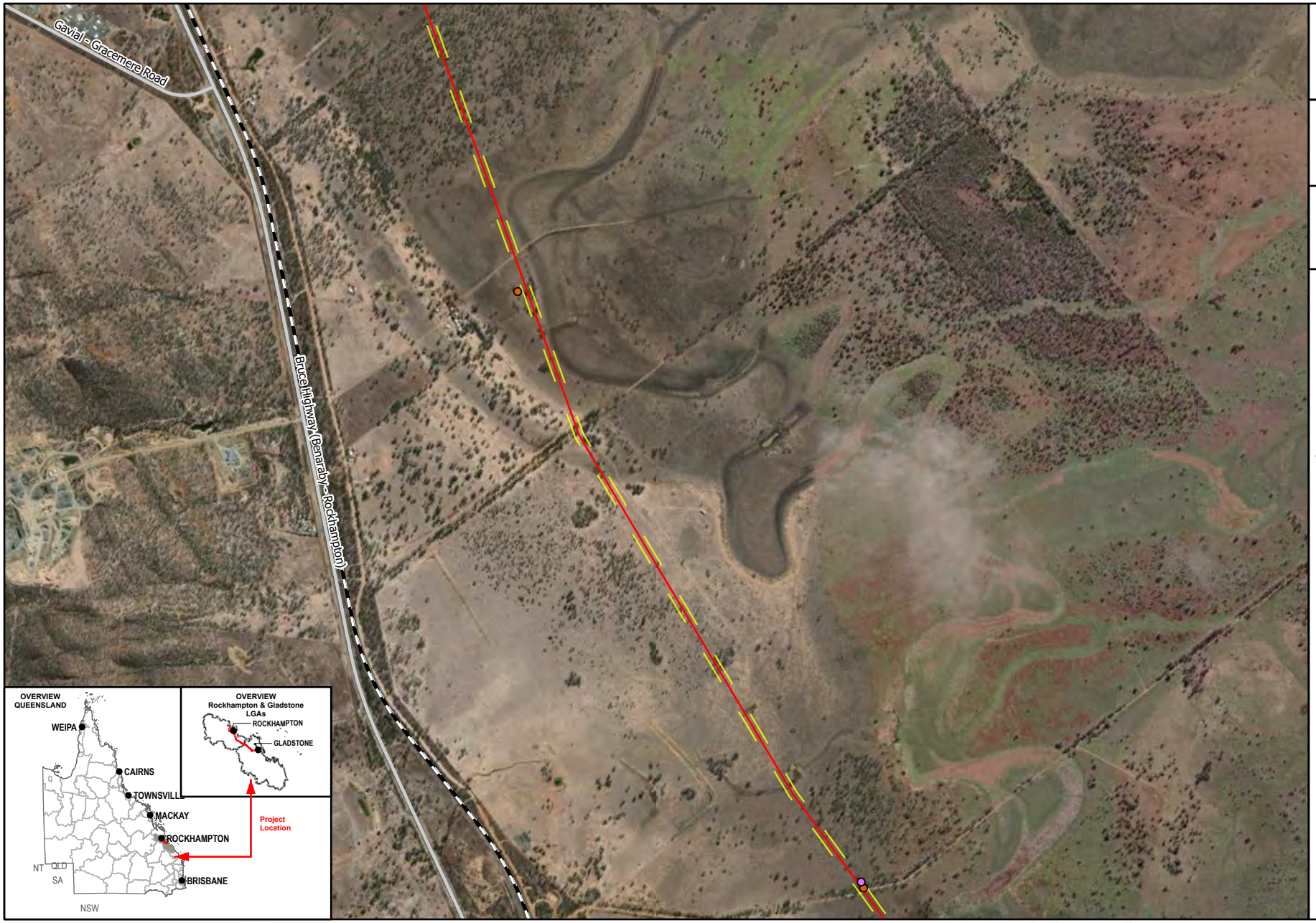
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1o
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- TEC Assessment Site
- Quaternary Assessment Site
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- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
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Data Sources:

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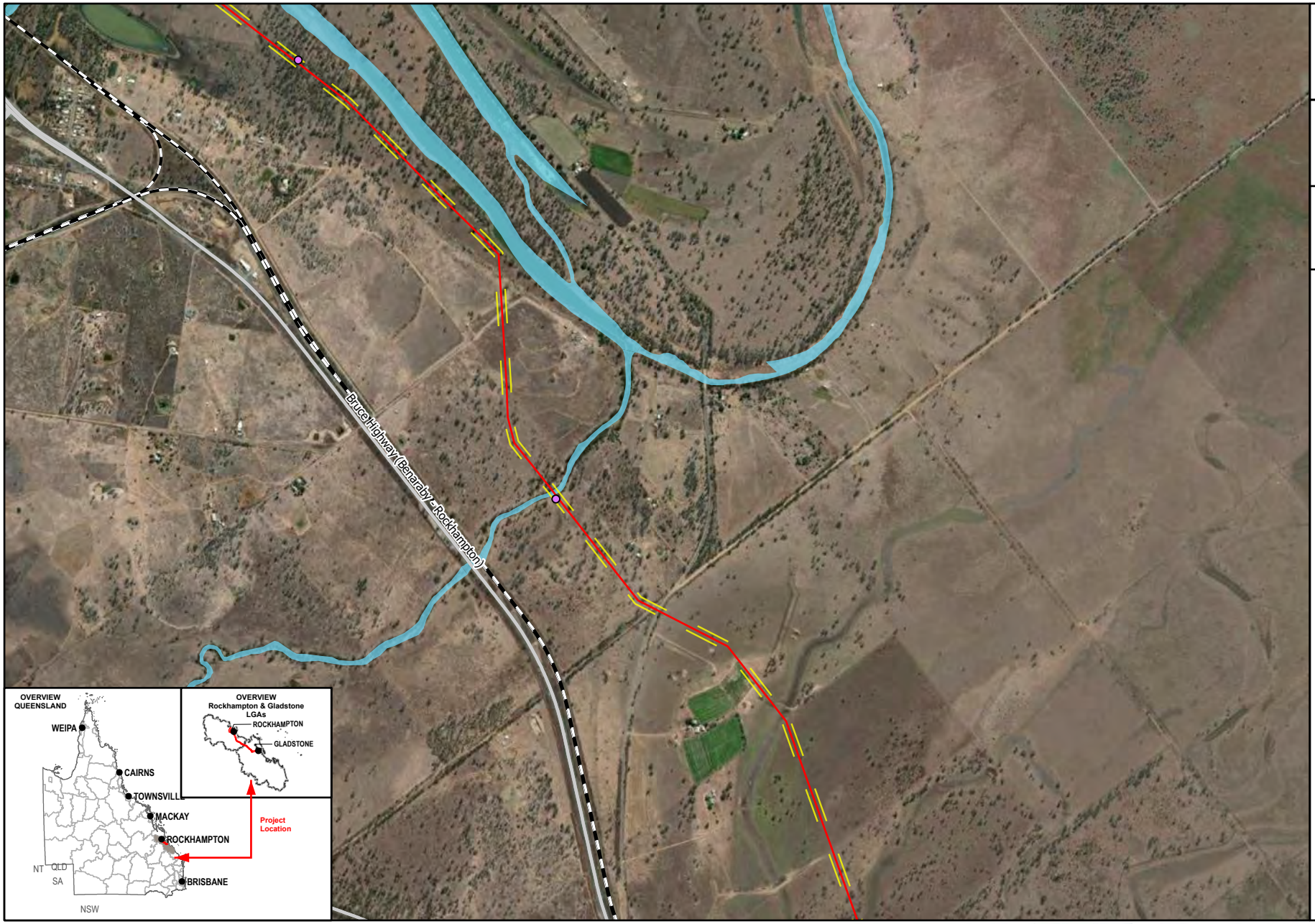
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1p
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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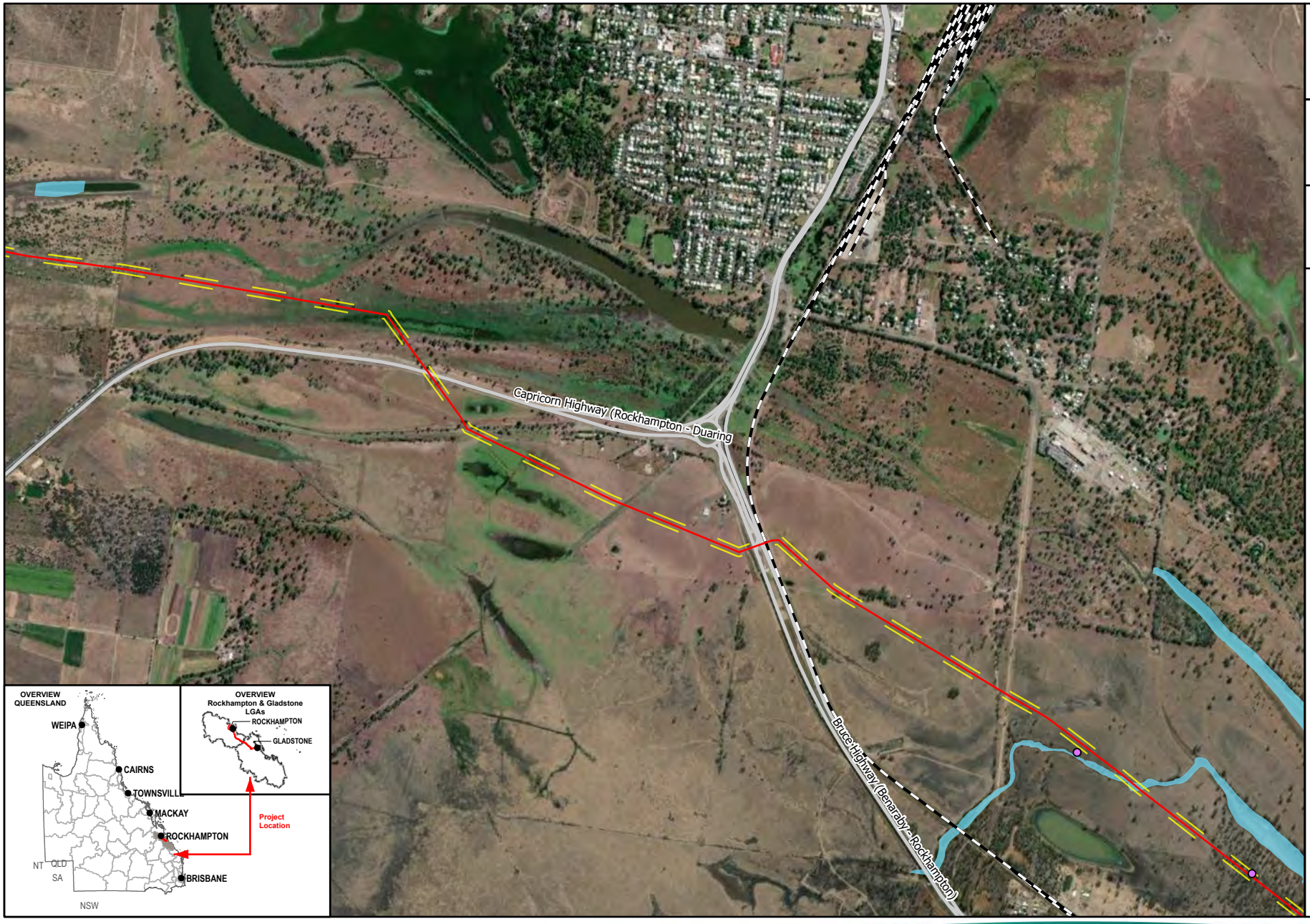
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1q
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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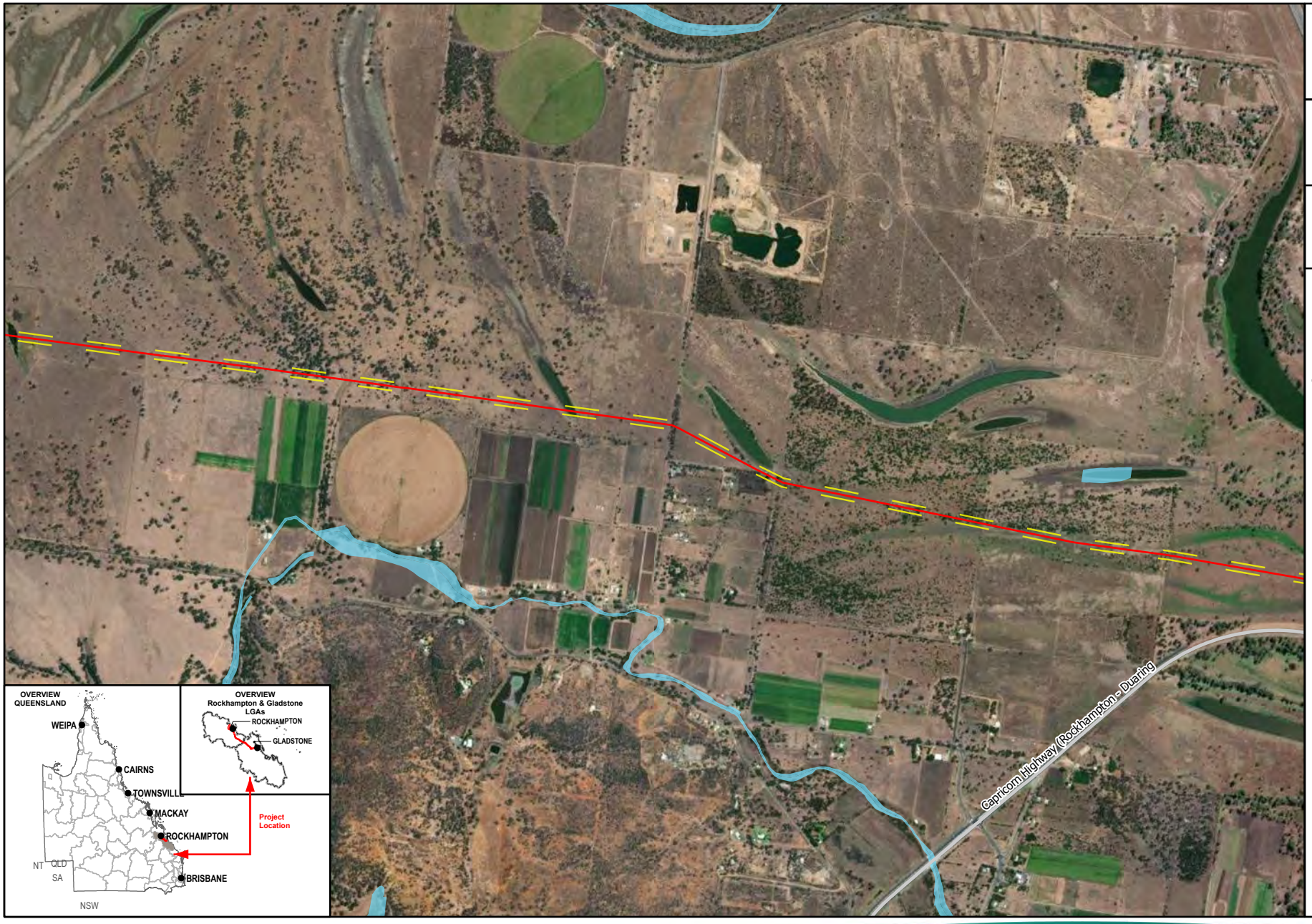
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1r
Distribution of Vegetation and Flora Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Waterbody

Data Sources:

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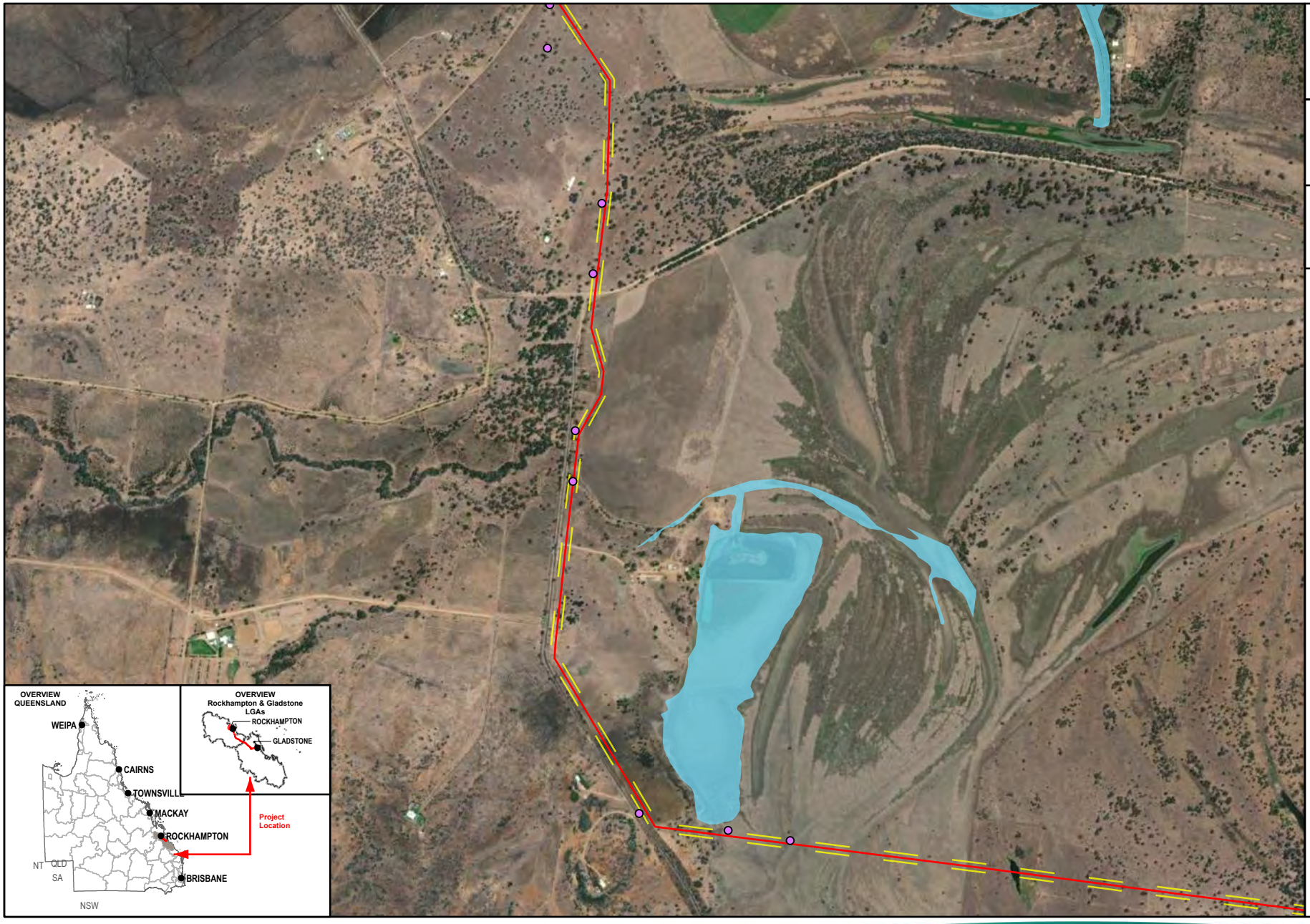
Baseline Terrestrial and Aquatic
Ecology Technical Report
Figure 2-1s
Distribution of Vegetation and Flora
Survey Sites Within the Study Area
000-G-MAP-2401 Version:0 Date: 7/07/2022



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Flora Survey Type

- Quaternary Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Waterbody

Data Sources:

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1t
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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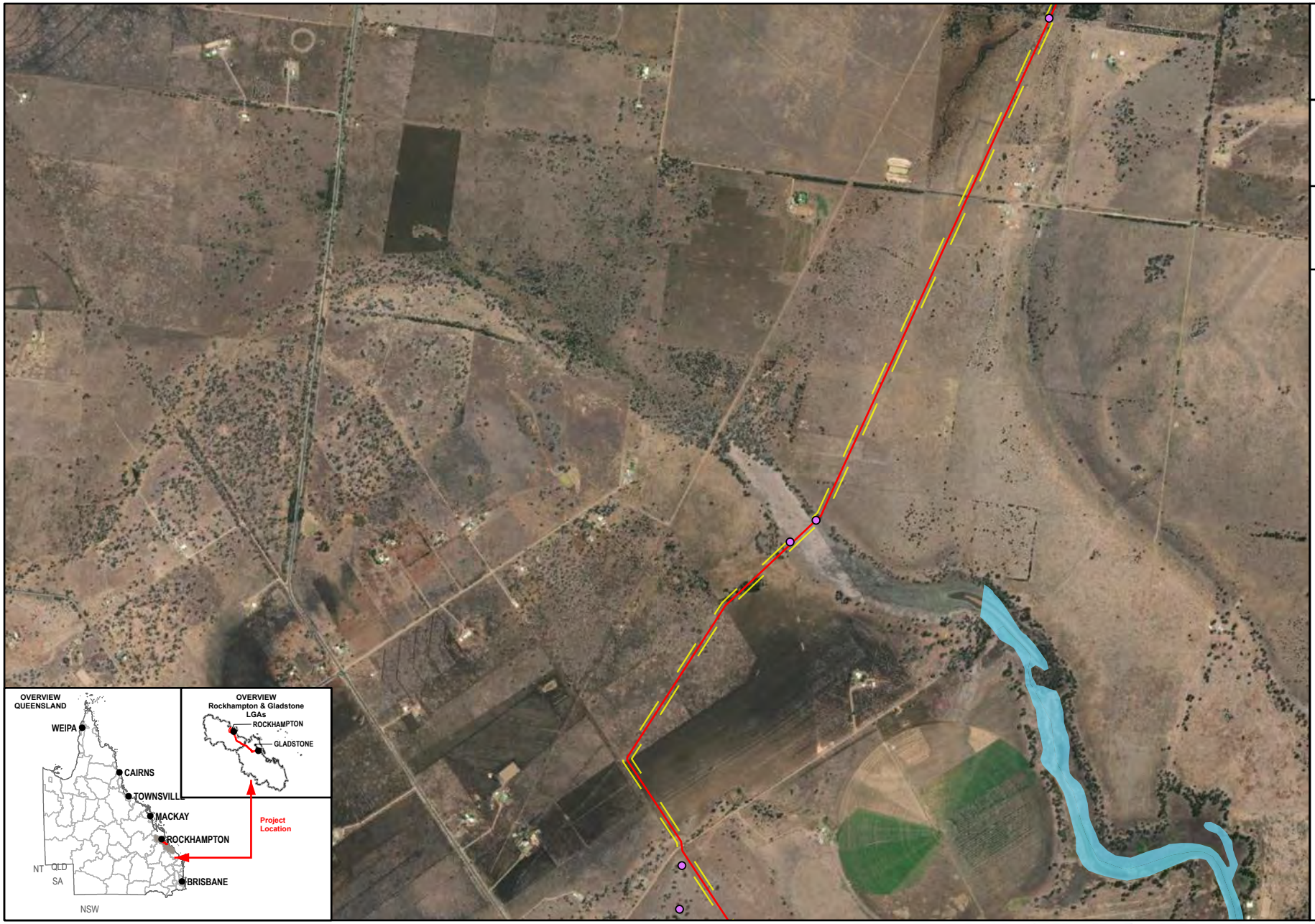

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Flora Survey Type

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-1u
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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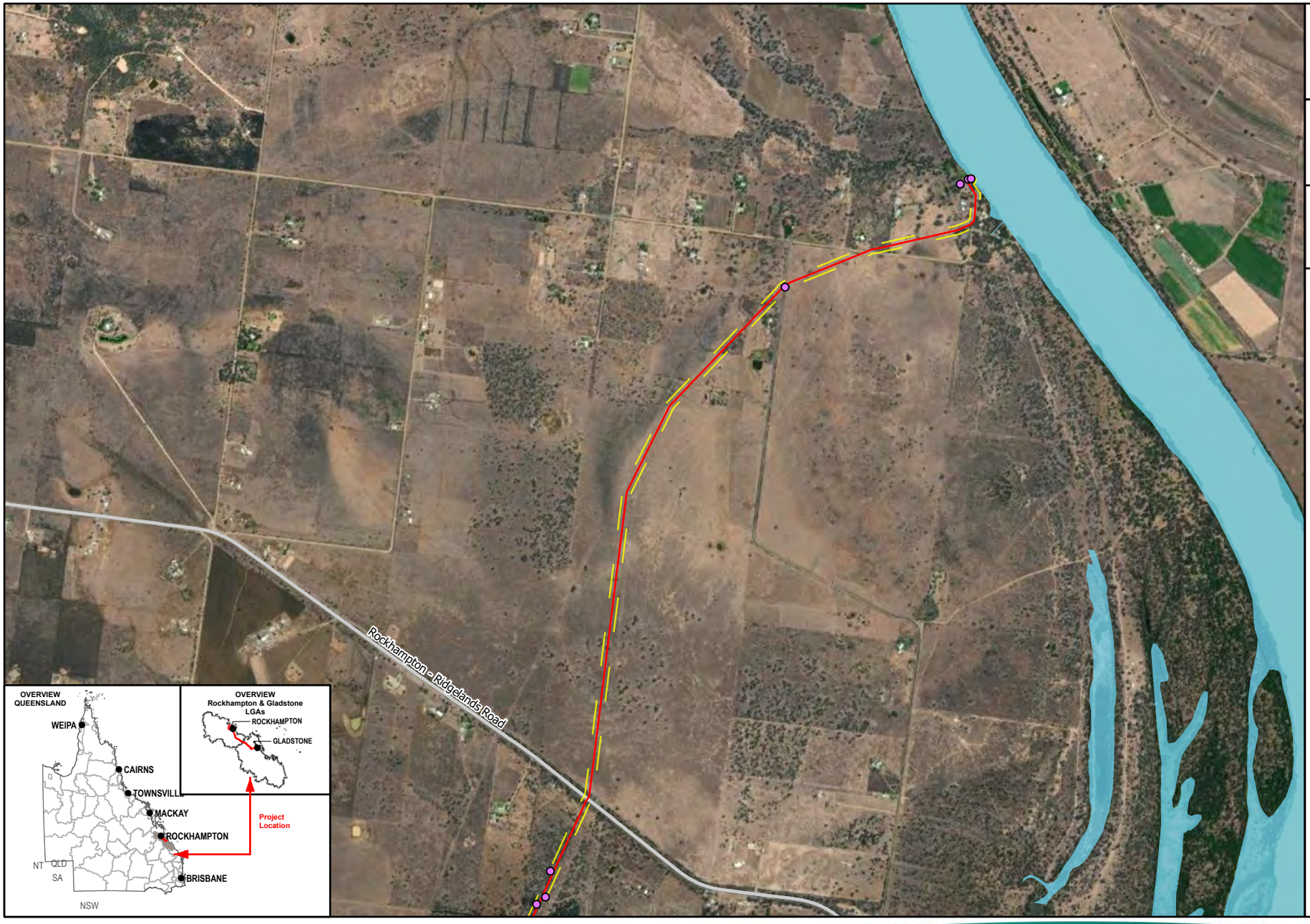

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Flora Survey Type

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Figure 2-1v
Distribution of Vegetation and Flora Survey Sites Within the Study Area
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2.4.3 Terrestrial fauna survey methods

A total of 145 fauna field survey sites were assessed during the ecological field surveys as presented in Figure 2-2. To supplement the targeted species searches, habitat assessments were undertaken to determine the suitability of habitat types for fauna species of conservation significance. The habitat assessments characterised vegetation communities into broad habitat types based on shared ecological characteristics such as (1) the structure and composition of vegetation at canopy, shrub and ground layers; (2) the presence of foraging, nesting and refuge resources; and (3) key habitat features such as rocky outcrops, leaf litter, woody debris and hollow-bearing trees.

Targeted searches were undertaken for conservation significant fauna species that were considered as potentially occurring within the study area based on the desktop search results including the PMST and WildNet results (Table 3-6, Table 4-9 and Table 5-6), previous field survey results provided in the EIS undertaken by Arup in 2007 (Arup 2008) and Detailed Assessment undertaken by SMEC (2021). Fauna surveys were undertaken in accordance with relevant Commonwealth and Queensland guidelines during the ecological field surveys. The fauna survey methods that were applied within the study area are outlined in Table 2-5. Further details of how each survey methods targeted each threatened species predicted and recorded to occur within the study area is outlined in Table 2-6.

Table 2-5 Fauna survey methods used within the study area

Assessment	Survey methods
Habitat assessments	Targeted surveys were conducted at each habitat assessment site. Targeted surveys assessed the suitability of habitat for conservation significant species - with active searches (described below) conducted in areas of high habitat quality. As part of the targeted surveys, conservation significant species reported within the desktop assessment were considered at each habitat assessment site to assist with determining potential habitat mapping. The assessment involved documenting the presence / abundance of habitat features (e.g. hollow-bearing trees, certain vegetation communities, etc.) which are often utilised by multiple conservation significant species.
Bird surveys	Surveys for birds were undertaken through a series of standardised 2 hectares (ha) area searches using the Birds Australia census method. All birds seen and heard calling were recorded. Opportunistic bird surveys were also undertaken throughout the study area, recording birds seen or heard that had not been recorded during standardised 2 ha searches.
Active searches	Active searches were undertaken to detect reptile and amphibian species by actively searching beneath rocks, logs, bark, leaf litter and other suitable microhabitats.
Anabat detectors	Anabat detectors were deployed at six different locations and were left overnight for nine nights to record calls from Microchiroptera bat species. The data from the Anabat detectors were analysed by Greg Ford (Balance Environmental) to confirm species present. Greg is a terrestrial ecologist with more than 25 years' experience in ecological research and is an active member of the Australasian Bat Society (Appendix C).
Remote cameras	Remote cameras were baited with a mixture of rolled oats, peanut butter, honey and sardines and set at six locations and were left overnight for a total of nine nights. The remote cameras were used to detect fauna, with particular focus on threatened species.
Large tree density assessment	Suitable greater glider habitat assessments were undertaken in accordance with the *Guide to greater glider habitat in Queensland* (Eyre 2022). Large tree counts were undertaken to assess the density of large trees within an area. This involved measuring the diameter at breast height (DBH) of trees within a 1 ha plot. Large tree benchmarks were determined based on the Brigalow Belt bioregion, as being greater than 46.5 ± 7.5 cm DBH, with a density of more than 20 large trees.
Hollow-bearing tree counts	Hollow-bearing tree count transects (200 m x 50 m) were undertaken within suitable glider habitat to assist in the mapping of predicted habitat for the species. Hollow size and number of total hollows within the transect were recorded.
Nocturnal searches and spotlighting	Nocturnal active searches and spotlighting surveys involved active searches with head torches Surveys were conducted in the most suitable woodland environments for nocturnal species, where access and terrain permitted. Spotlighting was undertaken over four nights, with 2-3 hours spent spotlighting each night.
Opportunistic searches	All incidental records of fauna observed during the ecological field surveys were recorded. Bones, feather, skulls, sloughed skins, faecal pellets, tracks, burrows, scratchings and other wildlife traces were also recorded.

Table 2-6 Threatened fauna species survey methods

Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Birds				
Calidris ferruginea Curlew sandpiper	– Mainly occurs on intertidal mudflats in sheltered coastal areas (DoE 2022) – Forages mainly on invertebrates in tidal and non-tidal habitats, such as mudflats, sandy shores, flooded paddocks and inundated saltflats (DoE 2015a) – Roosts around coastal or near-coastal lagoons and other wetlands on open substrates. Recorded roosting in mangroves (DoE 2015a) – Breeding range is restricted to the Arctic of northern Siberia (DoE 2015a).	Surveys for the curlew sandpiper were undertaken in accordance with the *EPBC Act Policy Statement 3.21 – Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DotEE 2017): – Surveys for roosting shorebirds in suitable habitat – Surveys for foraging shorebirds in suitable habitat.	Survey effort for the curlew sandpiper included: – Fauna habitat assessments at 39 sites – Bird census surveys were undertaken at two roosting habitat sites and six foraging habitat sites.	SGIC SDA
Calyptorhynchus lathami Glossy black-cockatoo	– Occur in forest and open woodland areas of south-east Queensland and coastal New South Wales (Glossy Black Conservancy 2010). – Feeds selectively on cones of *Casuarina* and *Allocasuarina* (Glossy Black Conservancy 2010). – Key food tree species include *Allocasuarina littoralis* (black she-oak), *Allocasuarina torulosa* (forest she-oak) and to a lesser extent, *Casuarina equisetifolia* (coastal she-oak), *Casuarina cunninghamiana* (river she-oak) and *Casuarina cristata* (belah) (Glossy Black Conservancy 2010). – Nest in large living or dead hollow-bearing trees, typically in vertical chimneys 10 – 20 m above ground-level (Glossy Black Conservancy 2010).	Surveys for the glossy black-cockatoo were undertaken in accordance with the *Glossy black-cockatoo – targeted species survey guidelines* (Hourigan 2012): – Diurnal bird survey – Search for foraging and nesting signs.	Survey effort for the glossy black-cockatoo included: – Fauna habitat assessments at 35 sites – Bird census at 11 sites for 20 minutes.	GSDA

Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Denisonia maculata Ornamental snake	– Occurs in vegetation communities dominated by brigalow (*Acacia harpophylla*), gidgee (*Acacia cambagei*), blackwood (*A. argyrodendron*) or coolibah (*Eucalyptus coolabah*), or grassland associated with gilgais (Brigalow Belt Reptile Workshop 2010) – Species prefer moist areas; however, species have been recorded from riparian areas (Brigalow Belt Reptile Workshop 2010) – Species has been commonly recorded from RE 11.4.3, 11.4.6, 11.4.8 and 11.4.9. Other REs the species has also been recorded in include, 11.3.3 and 11.5.16 – Occurs in shallow water where some aquatic vegetation is present, and shelters in deep-cracking soils and ground timber (DAWE 2020).	Surveys for the ornamental snake were undertaken in accordance with the *Survey guidelines for Australia's threatened reptiles* (Commonwealth of Australia 2011c) and *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (Commonwealth of Australia 2011a): – Surveys to be undertaken during the wet weather/season – Active searches under sheltering sites within suitable habitat – Opportunistic surveys of roads – Nocturnal spotlighting within suitable habitat (particularly after wet weather when frogs are active) – Pitfall and funnel trapping (likely to yield low returns).	Survey effort for the ornamental snake included: – Fauna habitat assessments at 64 sites – Active searches at 16 sites for 20 minutes – Spotlighting whilst driving along nearby roads and on foot within suitable habitat. Spotlighting occurred after recent rainfall, with two people over two nights, with 2-3 hours spotlighting each night (total of 12 person hours). Spotlighting was undertaken during wet weather	– SGIC SDA – Northern Section
Epthianura crocea macgregori Yellow chat (Dawson)	– Inhabits marine wetlands that are subjected to extensive seasonal inundation (DoE 2022) – occupy marine plains that have a network of shallow drainage channels with a large variety of vegetation (DoE 2022) – Nests are often found close to the ground in grasses and/or rushes while supporting a small cup shape (DoE 2022) – Diet consists of invertebrates and are often targeted from surface of shallow water, stems of rushes, grasses and occasionally low shrubs (DoE 2022).	Surveys for the yellow chat (Dawson) were undertaken in accordance with the *Survey guidelines for Australia's threatened birds* (Commonwealth of Australia 2010b): – Area searches or transect-point surveys of all suitable habitat, preferably in the early morning or late afternoon.	Survey effort for the yellow chat (Dawson) included: – Fauna habitat assessments at 39 sites – Area searches/bird census within suitable habitat at five sites.	SGIC SDA

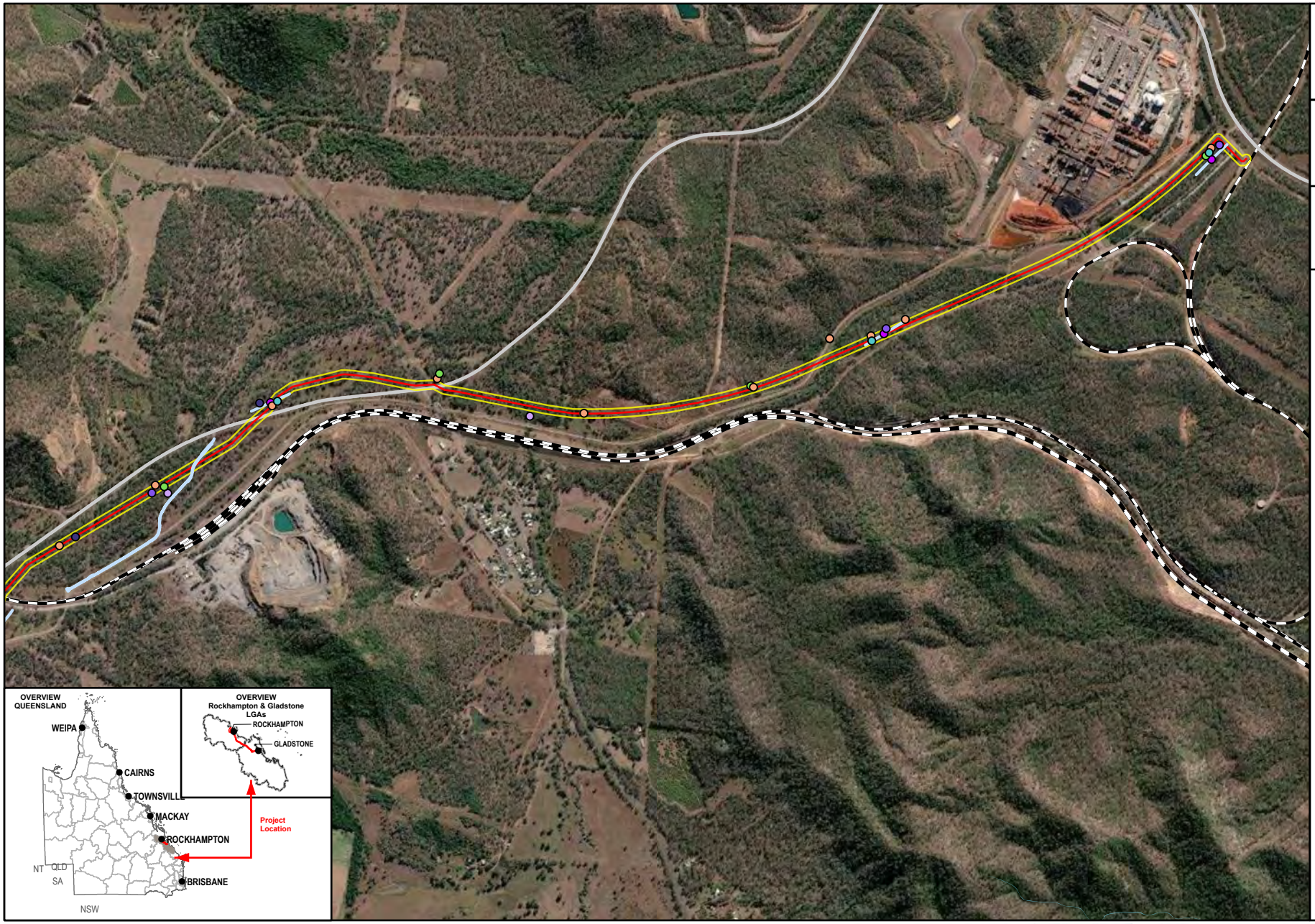
Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Geophaps scripta scripta Squatter pigeon (southern)	– Occurs in remnant and regrowth open forest and woodland dominated by *Eucalyptus*, *Corymbia*, *Acacia* and *Callitris* species with tussock grassy understorey within 3 km of water sources (DoE 2022) – In Queensland, the Commonwealth approved conservation advice specifically nominates RE Land Zone 5 (well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills) and RE Land Zone 7 (lateritic (duplex) soils on low 'jump-ups' and escarpments) as suitable foraging and breeding habitat for the subspecies (DoE 2022) – Waterbodies that are suitable for the squatter pigeon (southern) occur on RE Land Zones 10, 3 and 4 (DoE 2022) – Restricted to well-draining, gravelly, sandy or loamy soils (Squatter Pigeon Workshop 2011) – Breeding habitats are typically on stony rises within 1 km of permanent water (Squatter Pigeon Workshop 2011) – Individuals may be found foraging in or moving across modified or degraded environments within 3 km of permanent water (Squatter Pigeon Workshop 2011).	Surveys for the squatter pigeon (southern) utilised methods consistent with those recommended for the species in the Commonwealth Survey Guidelines for Australia's Threatened Birds (Commonwealth of Australia 2010b). These methods include: – Area searches or transect surveys – Flushing surveys.	Survey effort for the squatter pigeon (southern) included: – Fauna habitat assessments at 99 sites – Bird census at 27 sites for 20 minutes – Area searches and driving / flushing surveys were undertaken within suitable habitat for a minimum of 100 km.	– GSDA – SGIC SDA – Northern Section

Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Hemiaspis damelii Grey snake	– Prefers woodlands, generally brigalow and belah, on cracking clay soils near waterbodies (DES 2011) – Shelter under rocks, logs and flood debris, as well as in soil cracks or abandoned burrows in moist/seasonally inundated habitats (DES 2011) – Feeds exclusively on frogs (DES 2011).	Surveys for the grey snake were undertaken in accordance with the *Targeted species survey guidelines* (DES 2021): – Nocturnal spotlighting within suitable habitat during optimal conditions (spring/summer months, preferably after rainfall) – Nocturnal spotlighting via vehicle on roads – Active searches under sheltering sites within suitable habitat – Pitfall and funnel trapping.	Survey effort for the grey snake included: – Fauna habitat assessments at 64 sites – Active searches at 16 sites – Spotlighting whilst driving along nearby roads and on foot within suitable habitat. Spotlighting occurred after recent rainfall, with two people over two nights, with 2-3 hours spotlighting each night (total of 12 person hours). Spotlighting was undertaken during wet weather	– SGIC SDA – Northern Section
Hirundapus caudacutus White-throated needletail	– Almost exclusively aerial, foraging at heights up to cloud height (DCCEEW 2022) – Occurs over most types of habitats, but are most often above wooded areas (DCCEEW 2022) – Roosts in trees amongst dense foliage in the canopy or in hollows (DCCEEW 2022).	Survey guidelines for the white-throated needletail are detailed in the SPRAT database (DCCEEW 2022): – Surveys to be undertaken between October and April in northern and eastern Australia.	Survey effort for the white-throated needletail: – Bird census at 27 sites for 20 minutes.	– GSDA – SGIC SDA – Northern Section
Ninox strenua Powerful owl	– Wet and dry tall open eucalypt forest (*Eucalyptus pilularis, E. acmenoides, E. tereticornis, E. camaldulensis, E. crebra, E. melliodora, Corymbia citriodora* and *C. intermedia*) (DoR 2022a) – Roosts in dense foliage of closed forest and forages in open forest and woodland (DoR 2022a) – Nests in large hollows (DoR 2022a) – Presence of mature, hollow-bearing trees which provide den sites for the hollow-dwelling arboreal mammals which form the bulk of its prey (DoR 2022a).	Surveys for the powerful owl were undertaken in accordance with the *Approved Survey Standards: Powerful Owl* Ninox strenua (DSE 2011a): – Call playback of 2 to 5 minutes of continuous calls – Dusk or dawn watches – Daytime searches of the species roosting among the foliage and signs on the ground.	Survey effort for the powerful owl included: – Fauna habitat assessments at 74 sites – Bird surveys at dusk at three sites for 20 minutes – Bird census at 23 sites for 20 minutes Opportunistic searches for the species and indirect traces including faeces and owl pellets in suitable habitat.	– GSDA – SGIC SDA

Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Petauroides volans Greater glider (southern and central)	– Restricted to mature eucalypt forests and woodlands with a high density of mature hollow-bearing trees (DCCEEW 2022a) – Species dens in large hollows (diameter >10 cm) in mature trees (DCCEEW 2022a) – Species requires a diversity of suitable foraging trees. Species forages on eucalypt leaves and occasionally flowers (DCCEEW 2022a). The species has been most frequently recorded feeding on trees including *Corymbia citriodora*, *C. intermedia*, *Eucalyptus fibrosa*, *E. moluccana* and *E. portuensis*, with *C. citriodora* and *E. tereticornis* being important species in greater glider habitat (Eyre *et al.* 2022) – Species has a relatively small home range, typically 1-4 ha (DCCEEW 2022a). Studies revealed that the occupation of a small (< 3 ha) home range is consistent throughout the species Australian geographic range (Eyre *et al.* 2022).	In the absence of Commonwealth survey guidelines, survey methods were designed to align with the following guidelines and recommended survey approaches: – The Action Plan for Australian Mammals 2012 (Woinarski *et al*. 2014) – The Survey Guidelines for Australia's Threatened Mammals: Guidelines for detecting mammals listed under the EPBC Act (Commonwealth of Australia 2010c) – Survey Standards: Greater Glider, *Petauroides volans* (MacHunter *et al*. 2011) – Terrestrial Vertebrate Survey Guidelines for Queensland (Eyre *et al*. 2018).	Survey effort for the greater glider included: – Faecal pellet searches at 21 sites to detect species presence – Fauna habitat assessments at 74 sites – Nocturnal spotlighting transects within suitable woodland environments, where access and terrain permitted. Spotlighting was undertaken by two people over four nights, with 2-3 hours spotlighting each night, equating to a total of 24 person hours. Spotlighting transects are considered to be the most effective and efficient method for identifying the greater glider (Lindenmayer *et al*. 2001) – Large tree density assessment using the *Guide to greater glider habitat in Queensland* (Eyre 2022) at eight sites – Hollow-bearing tree count transects were undertaken at 15 sites within suitable glider habitat to assist in the mapping of predicted habitat for the species.	– GSDA – SGIC SDA

Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Petaurus australis australis Yellow-bellied glider (south-eastern)	– Inhabits eucalypt dominated woodlands and forests, including wet and dry sclerophyll (DAWE 2022a) – Subspecies prefers large patches of mature old growth forests as well as forests retaining a high proportion of winter-flowering and smooth-barked eucalypts (DAWE 2022a) – Require floristic diversity – species are unlikely to persist in forests dominated by only one to two tree species (DAWE 2022a) – During the day, the species shelters in hollows of large, old trees, typically more than one metre in diameter (DAWE 2022a).U	Surveys for the yellow-bellied glider were undertaken in accordance with the *Approved Survey Standards: Yellow-bellied Glider* Petaurus australis (DSE 2011b): – Spotlighting transects (minimum 1 km) after dusk – Listening periods (10 minutes) – Call playback of predator calls to elicit response (three minutes broadcast of powerful owl, two minutes listening period).	Survey effort for the yellow-bellied glider included: – Faecal pellet searches at 21 sites to detect species presence – Fauna habitat assessments at 74 sites – Nocturnal spotlighting transects within suitable woodland environments, where access and terrain permitted. Spotlighting was undertaken by two people over four nights, with 2-3 hours spotlighting each night, equating to a total of 24 hours. – Hollow-bearing tree count transects were undertaken at 15 sites within suitable glider habitat to assist in the mapping of predicted habitat for the species.	– GSDA – SGIC SDA
Phascolarctos cinereus Koala	– Feeds on the leaves of select species of *Eucalyptus*, *Lophostemon*, *Corymbia*, *Angophora* and occasionally *Melaleuca* and *Leptospermum* (DAWE 2022c) – Coastal koala habitat includes forest and woodland mostly dominated by *Eucalyptus* species (or those of related genera) and also those dominated by *Melaleuca* or *Casuarina* species (with emergent food trees). It also includes small, isolated patches of native vegetation in rural areas, windbreaks and narrow areas of native vegetation along riparian areas or linear infrastructure, and isolated koala food trees in open landscapes (DoE 2014).	Surveys for the koala were undertaken using methods recommended in Section 5 of the 'Referral guidelines for the vulnerable koala' (DoE 2014).	Survey effort for the koala included: – Faecal pellet searches using the SAT survey method (Phillips and Callaghan 2011) at 25 sites – Fauna habitat assessments at 99 sites – Nocturnal spotlighting transects within suitable woodland environments, where access and terrain permitted. Spotlighting was undertaken by two people over four nights, with 2-3 hours spotlighting each night, equating to a total of 24 hours.	– GSDA – Northern Section – SGIC SDA

Species	Habitat requirements	Survey guidelines	Survey effort	Pipeline Section
Pteropus poliocephalus Grey-headed flying-fox	– Highly colonial species (DAWE 2021) – Forests and woodland vegetation communities providing roosting opportunities, with foraging resources within foraging distance (40 km) (DAWE 2022b; DAWE 2021) – Forage on fruit and blossom of myrtaceous and rainforest species, diet is supplemented with leaves (DAWE 2021) – Roost in large aggregations (camps) used as day refuges to rest between foraging in surrounding areas, and refuge for significant stages of the species lifecycle (DAWE 2021).	Surveys for the grey-headed flying-fox were undertaken in accordance with the *Survey guidelines for Australia's threatened bats* (Commonwealth of Australia 2010a). – Desktop review of known flying-fox camps prior to the field survey – Daytime searches for flying-fox camps – Surveys of vegetation communities and food plants – Night time surveys to detect species	Survey effort for the grey-headed flying-fox included: – Desktop review of the National flying-fox monitoring viewer (DAWE 2020) as well as WildNet and ALA – Fauna habitat assessments at 74 sites – Nocturnal spotlighting transects within suitable woodland environments, where access and terrain permitted. Spotlighting was undertaken by two people over four nights, with 2-3 hours spotlighting each night, equating to a total of 24 hours.	– GSDA – SGIC SDA
Rostratula australis Australian painted snipe	– Inhabits shallow terrestrial freshwater and brackish wetlands, including temporary and permanent lakes, swamps and claypans. The Murray Darling Basin is considered a stronghold for the species (DCCEEW 2022) – Species requires specific breeding habitat – shallow wetlands with areas of bare wet mud and nearby canopy cover (DCCEEW 2022) – Species is more active at dawn, dusk and during night, and shelters under grass, reeds or other dense vegetation during the day (DCCEEW 2022).	Surveys for the Australian painted snipe were undertaken in accordance with the *Survey guidelines for Australia's threatened birds* (Commonwealth of Australia 2010b): – Area searches or transects through suitable wetlands – Dawn and dusk stationary bird surveys – Brief spotlight search just after dusk.	Survey effort for the Australian painted snipe included: – Fauna habitat assessments at 102 sites – Area searches and flushing surveys in suitable wetland habitats for a minimal of 30 km – Bird census at 22 sites for 20 minutes.	– SGIC SDA – Northern Section
Key to table: (*) – introduced flora species.				



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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Hollow-bearing Tree Counts
- Spotlighting Transect
- Study Area
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- Railways
- Waterbody

Data Sources:
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Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2a
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022

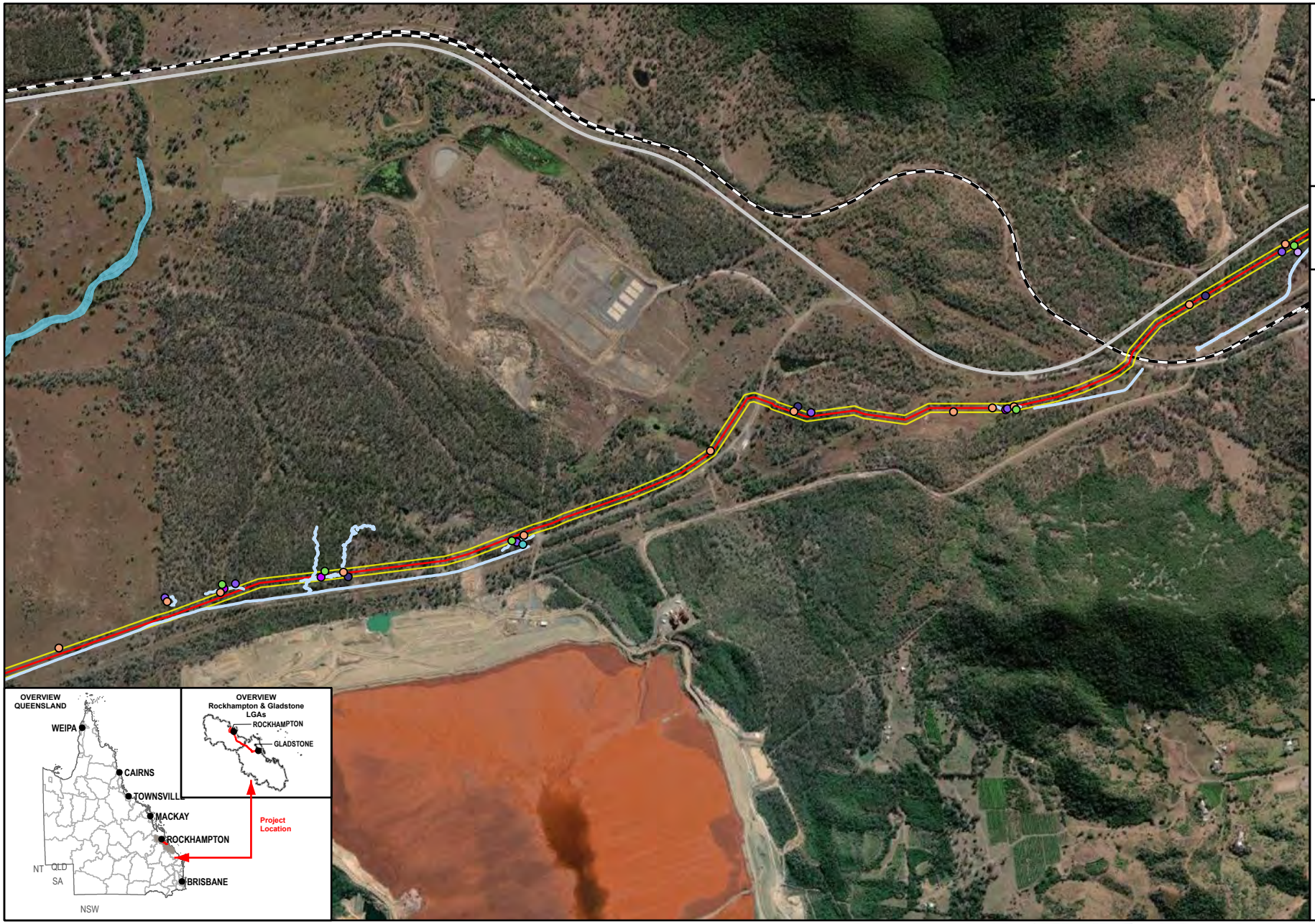

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Figure 2-2b
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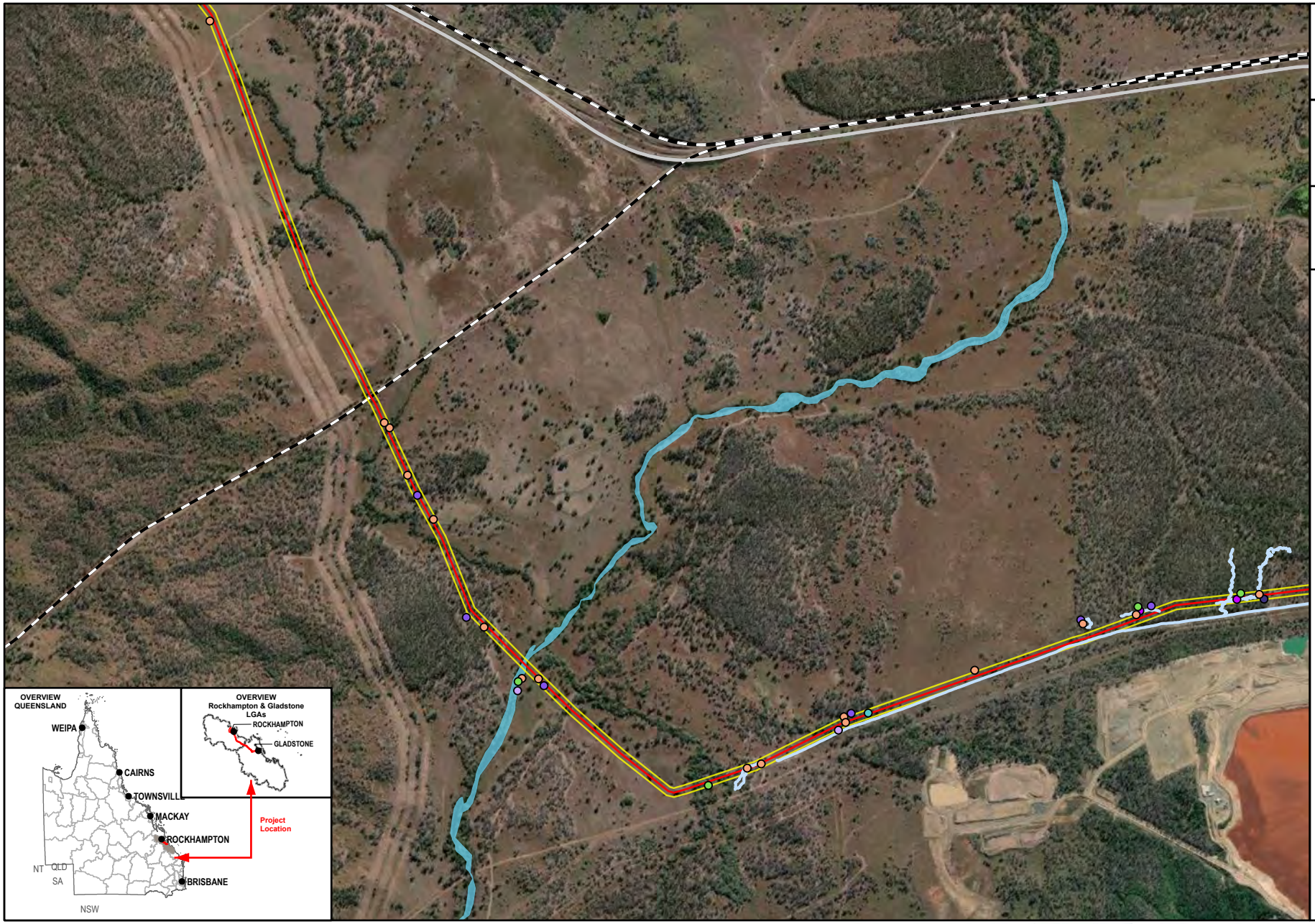

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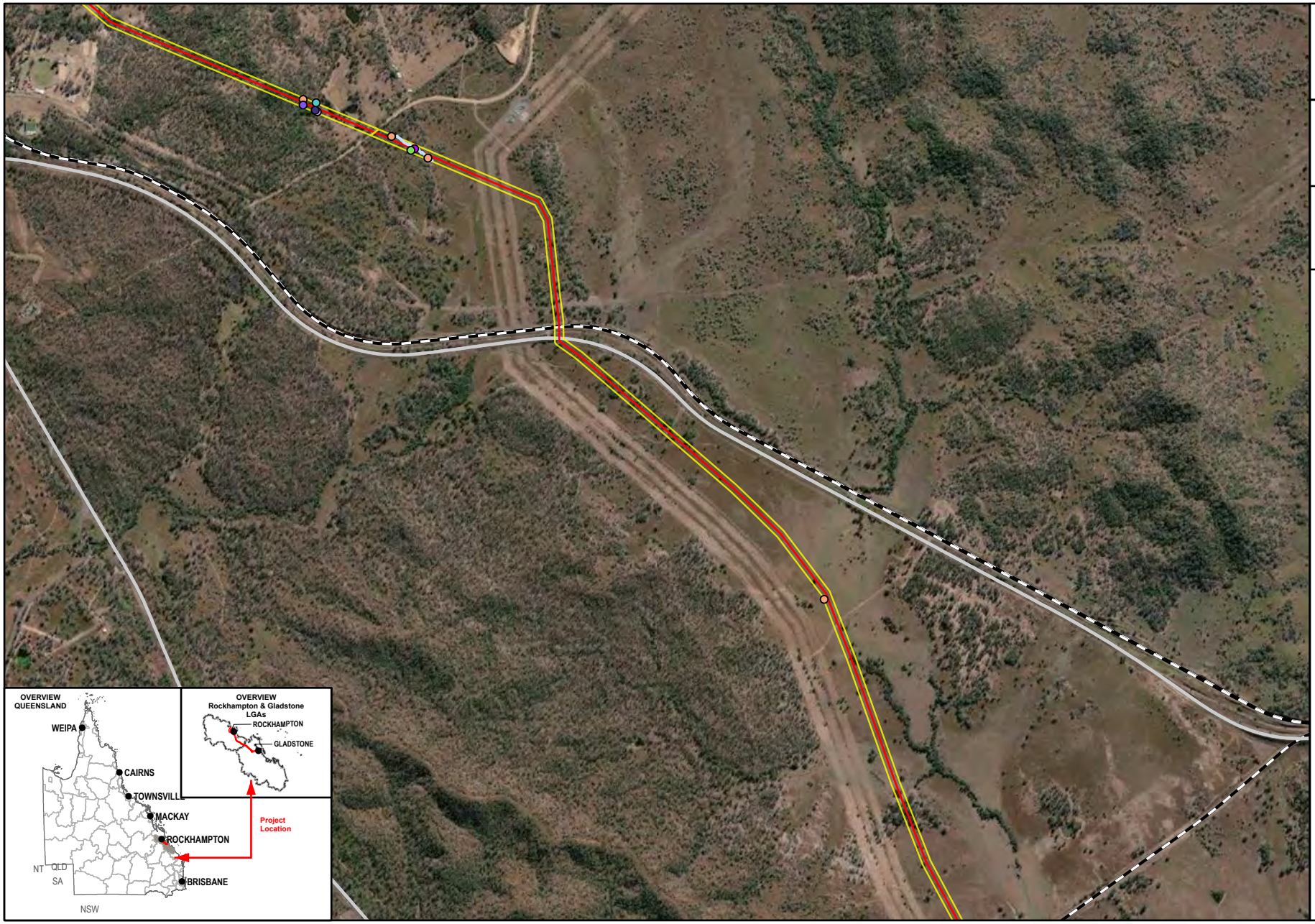

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Figure 2-2d
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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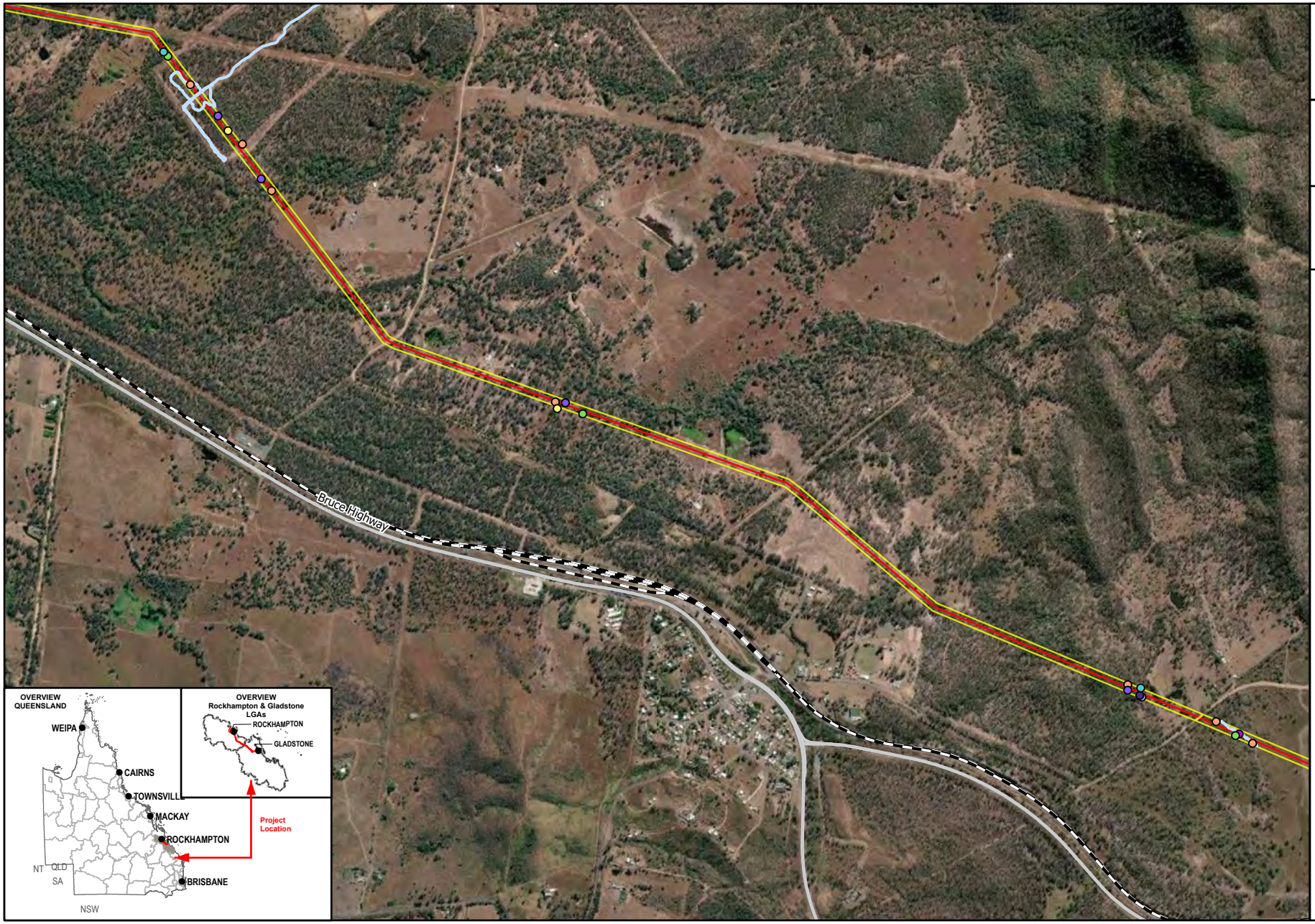

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Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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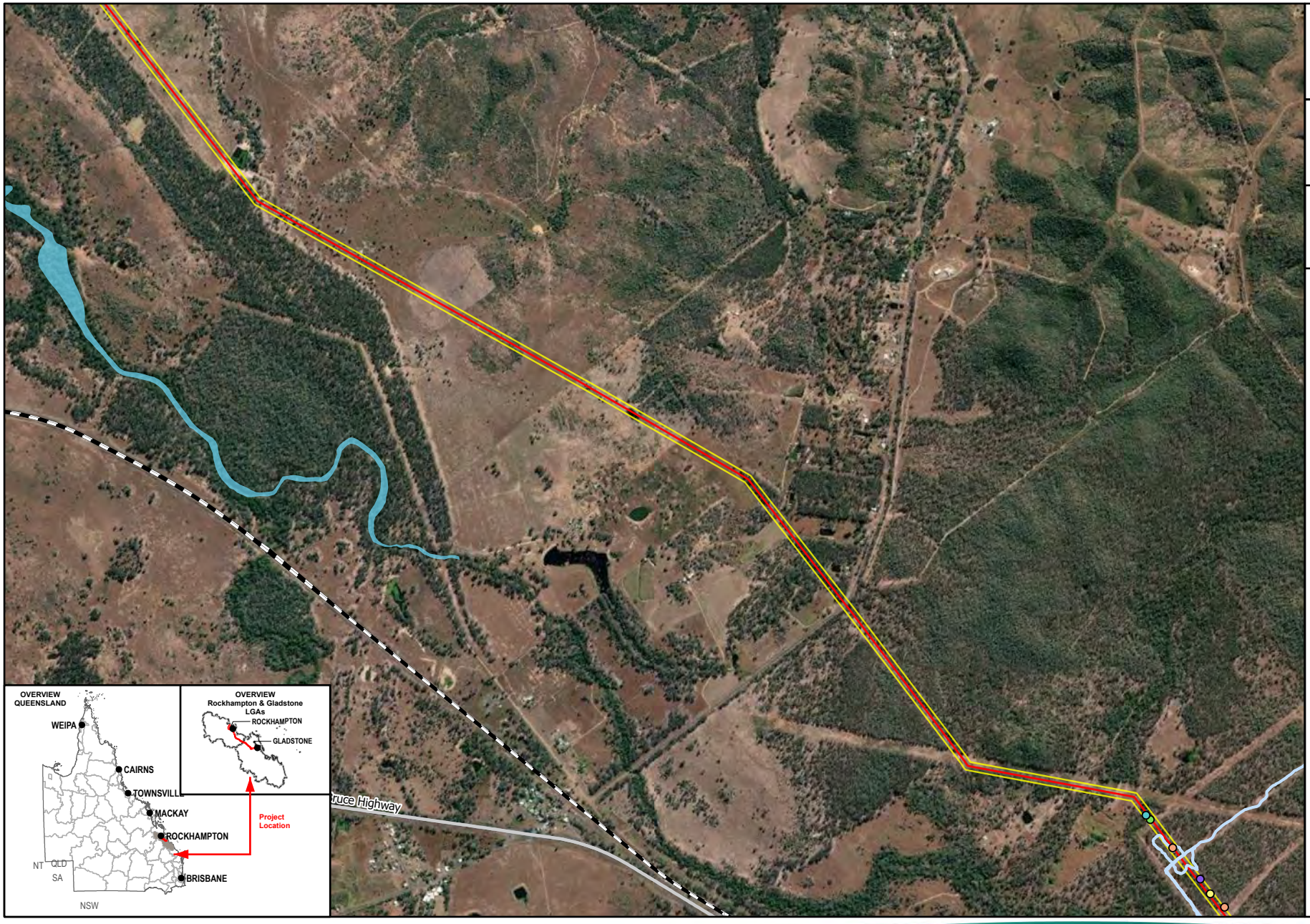

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Figure 2-2f
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
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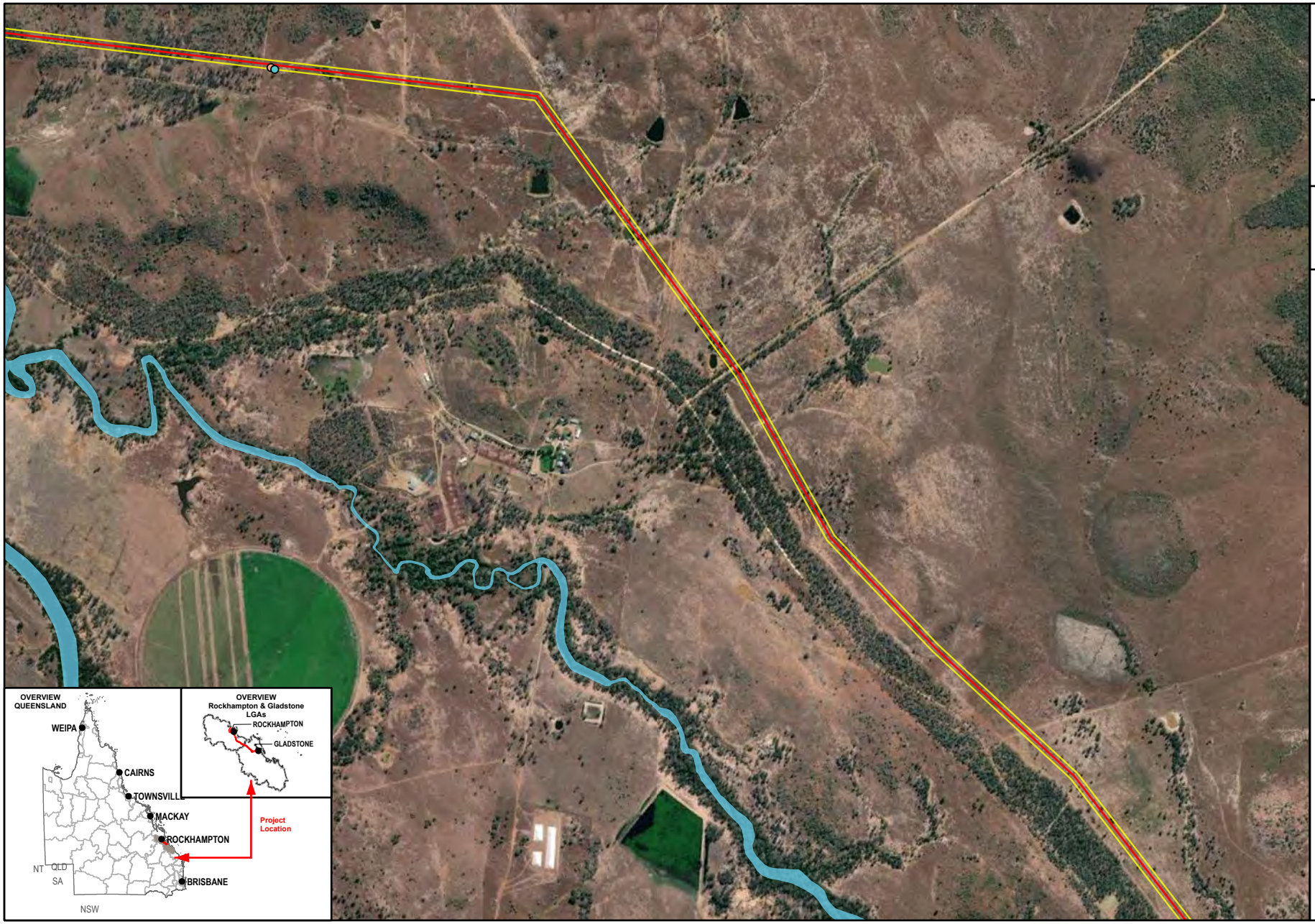

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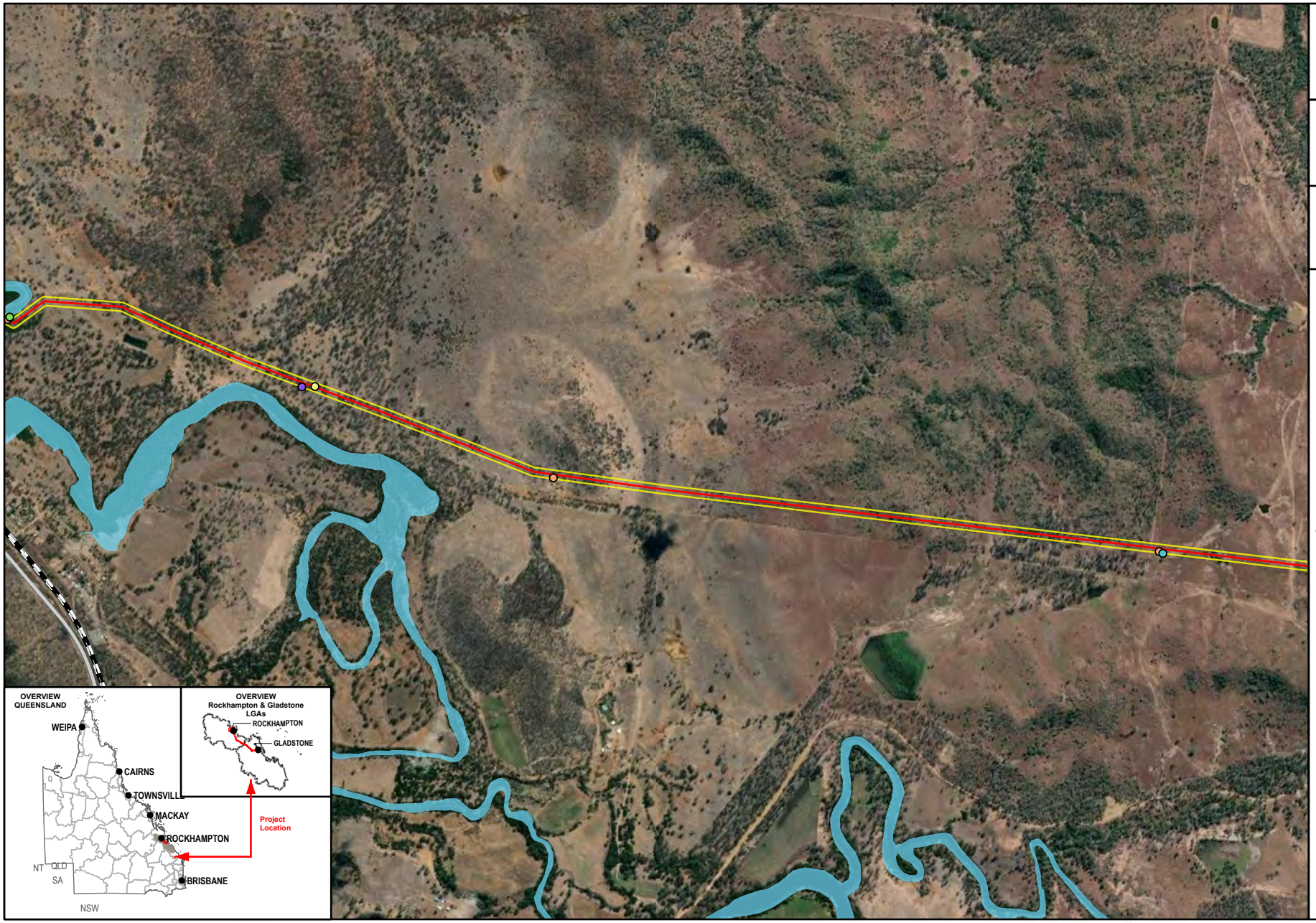
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2g
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Legend

Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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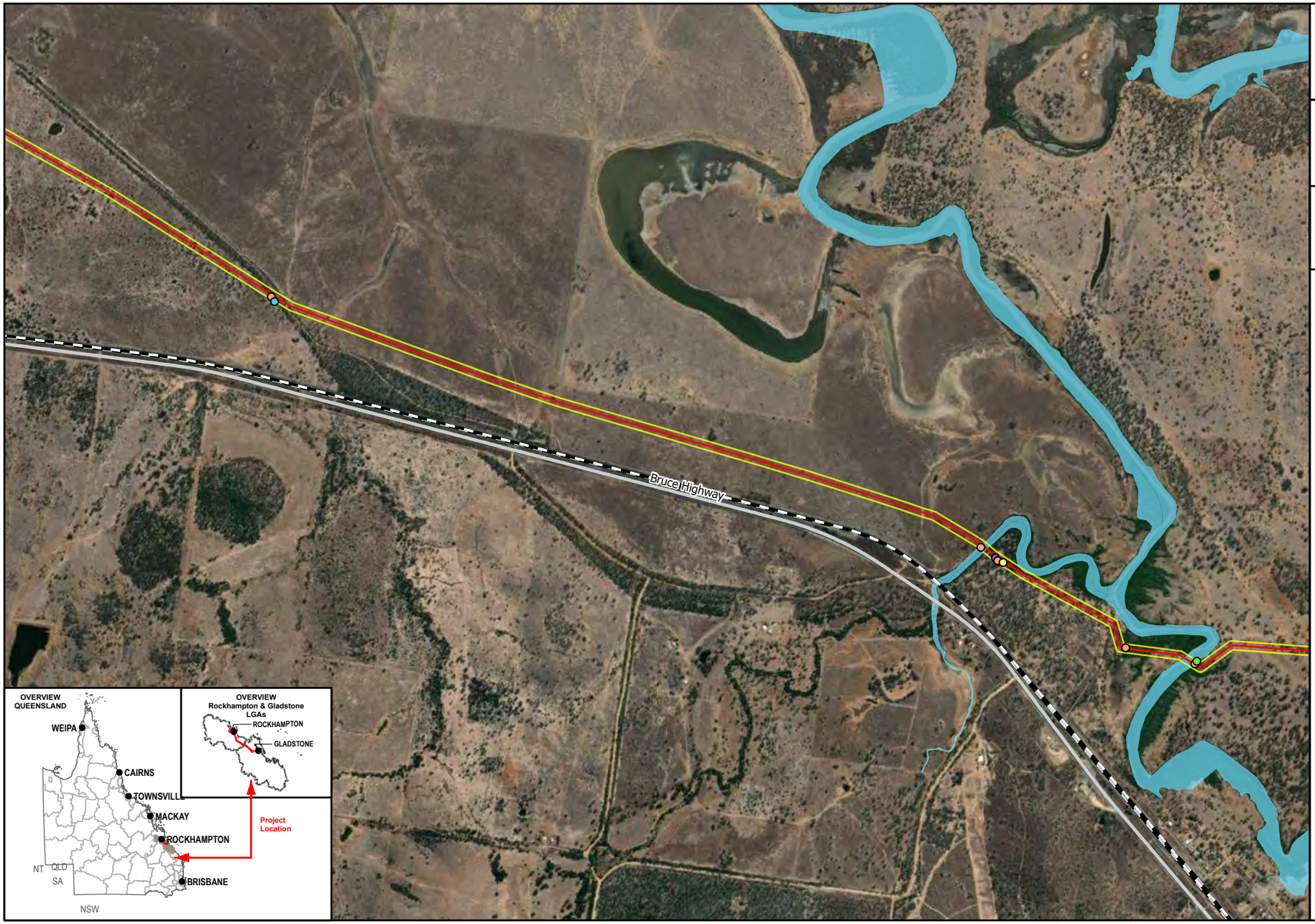
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2h
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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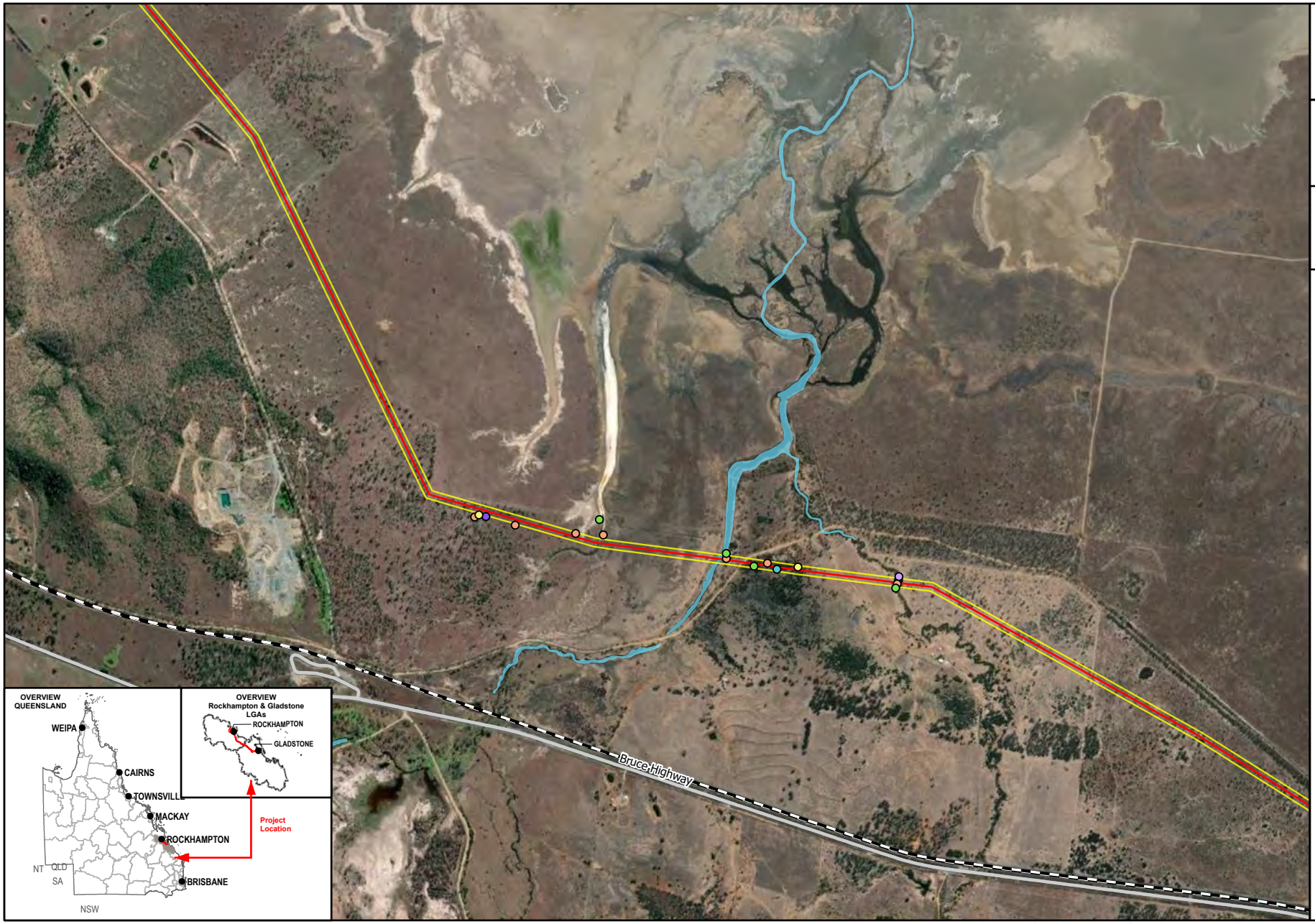
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2i
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Anabat Detector Location
- Bird Surveys
- Large Tree Density Assessment
- Remote Camera Location
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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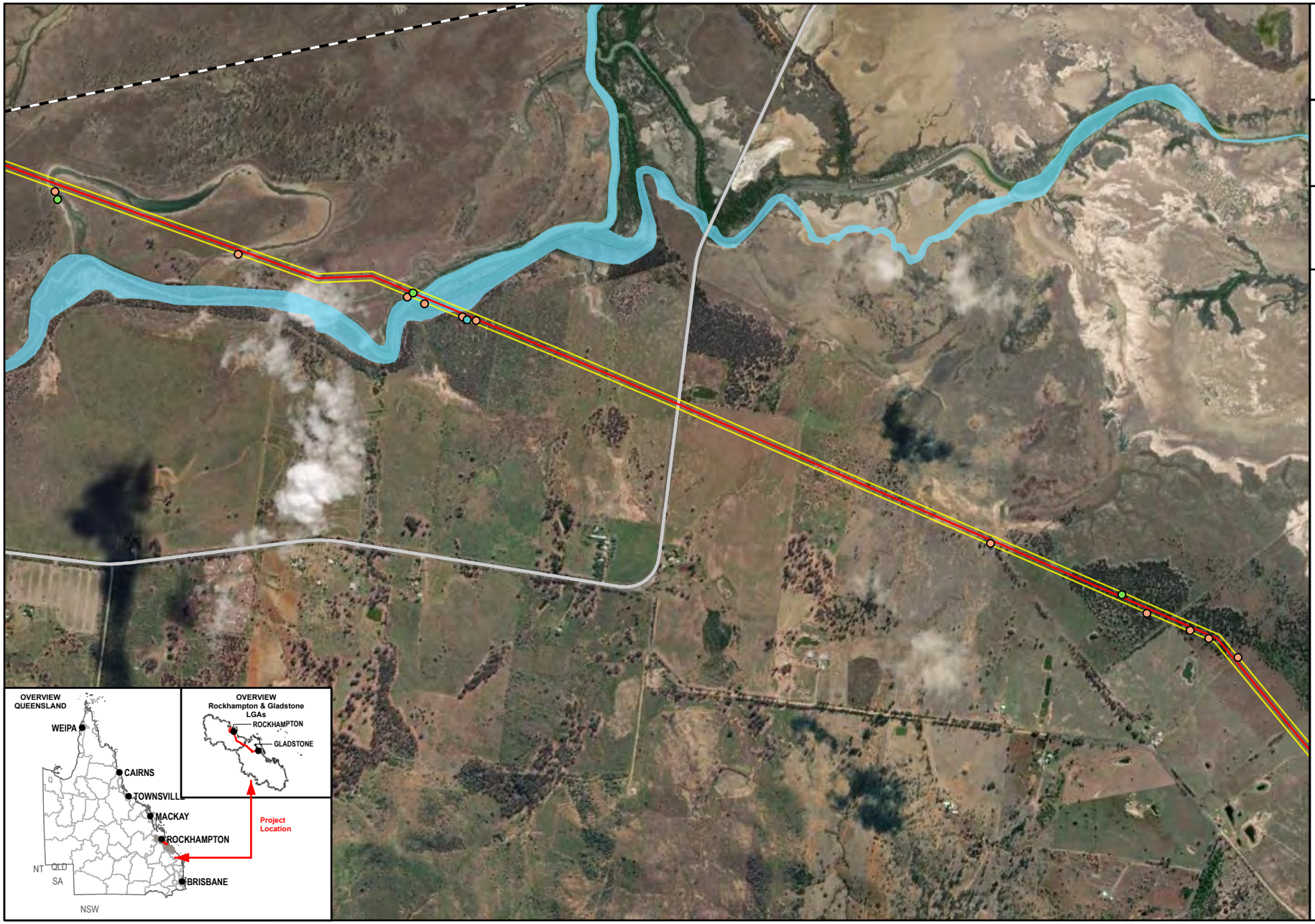
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2j
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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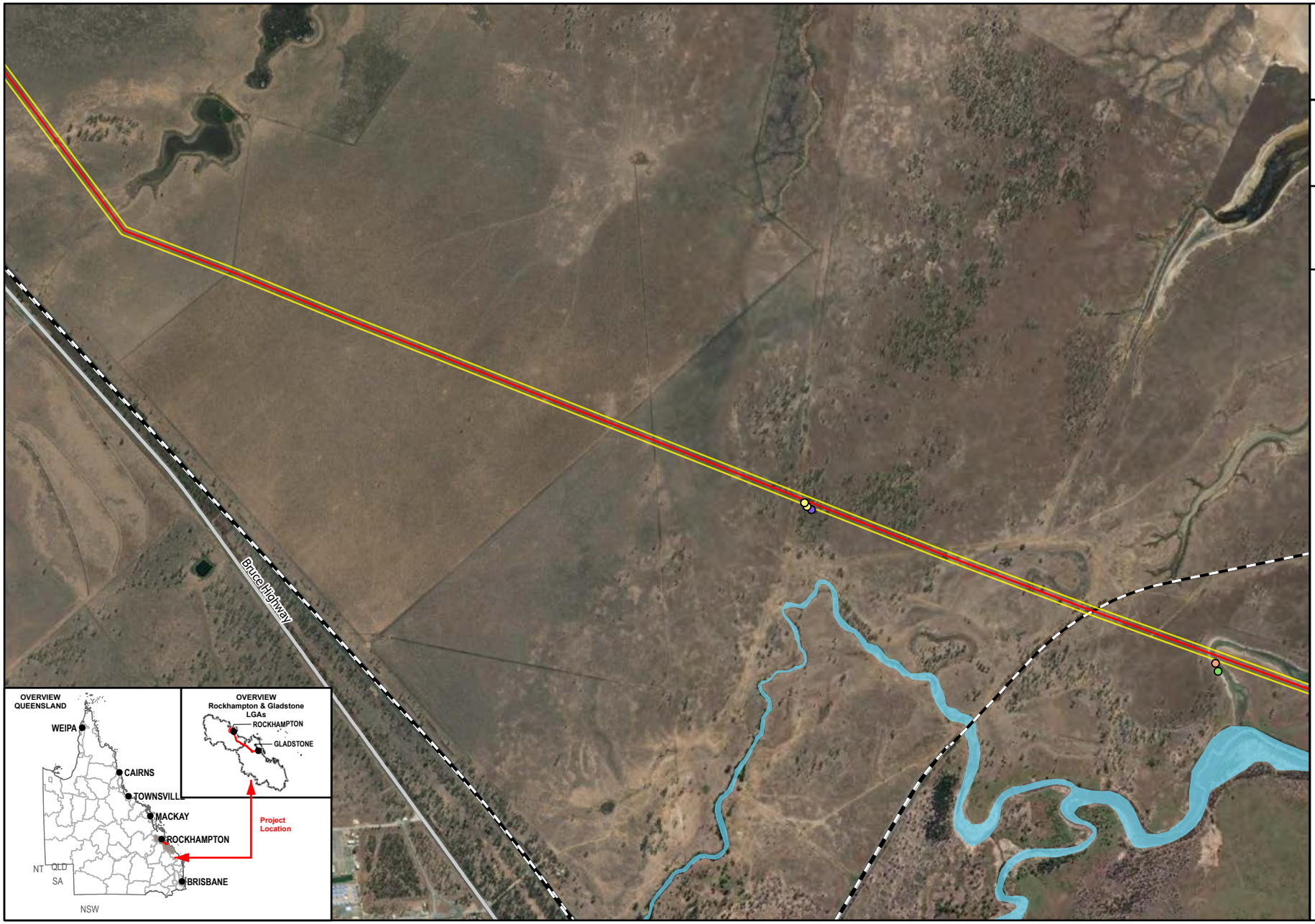
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2k
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Bird Surveys
- Large Tree Density Assessment
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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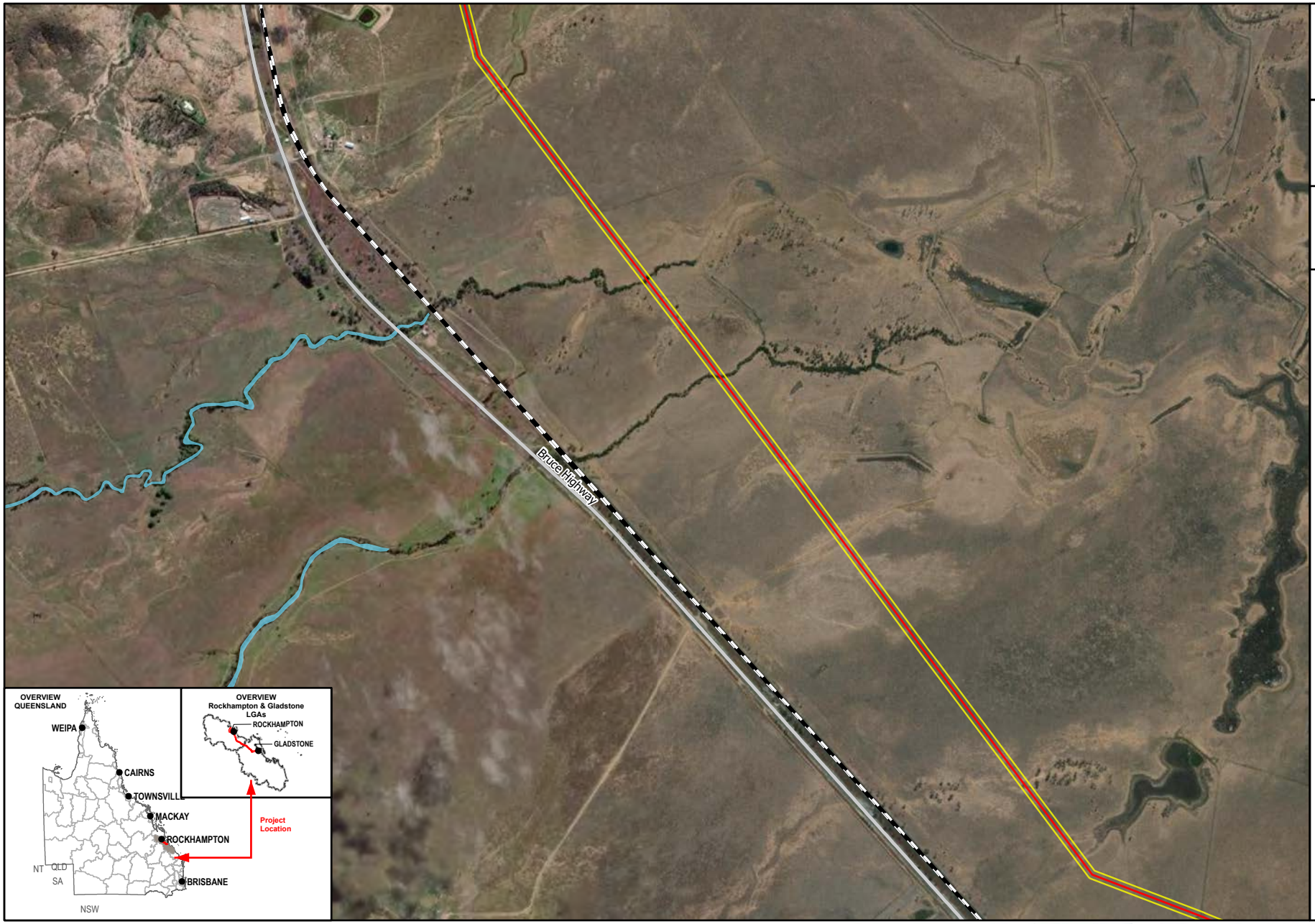
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2l
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:
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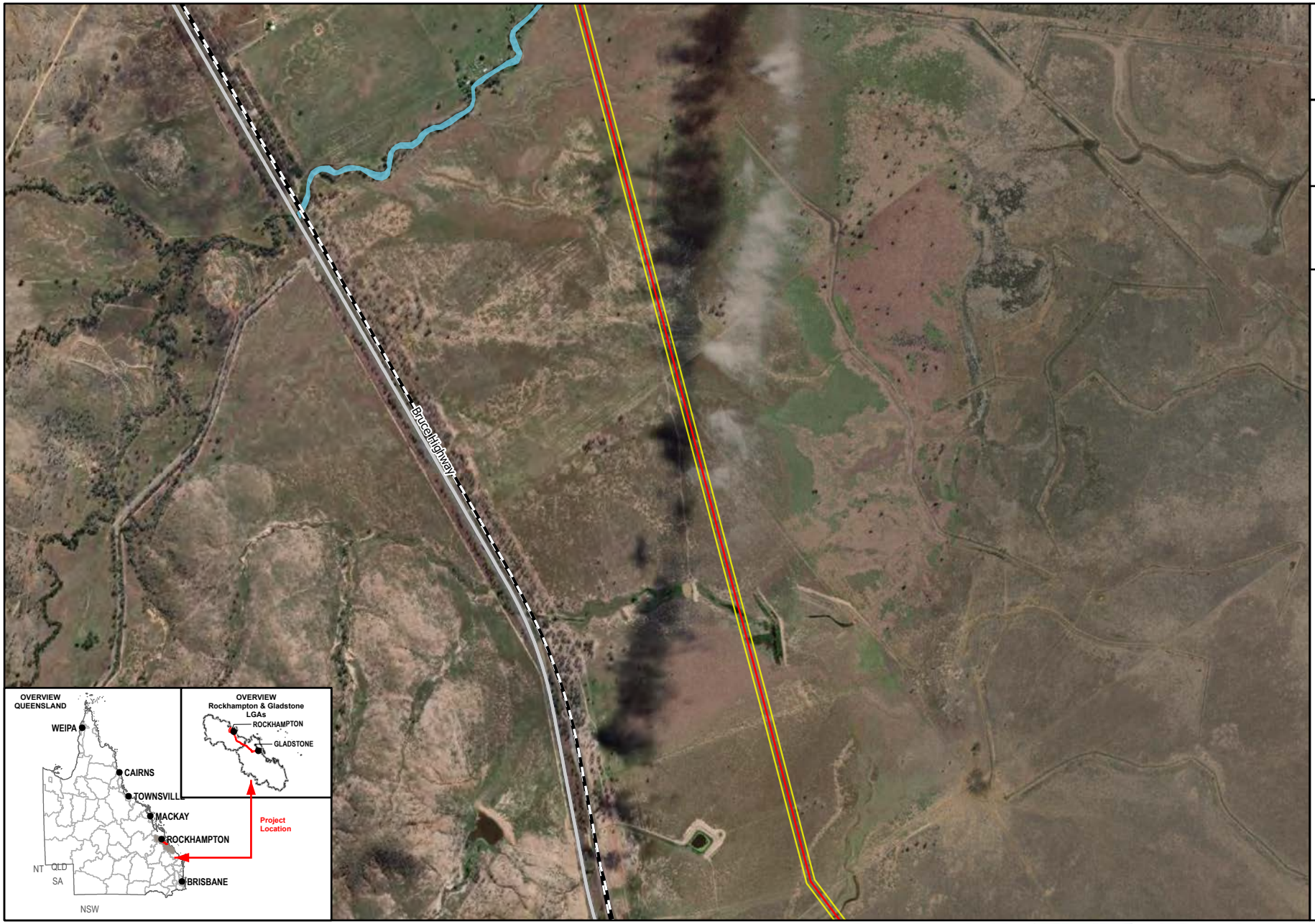
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2m
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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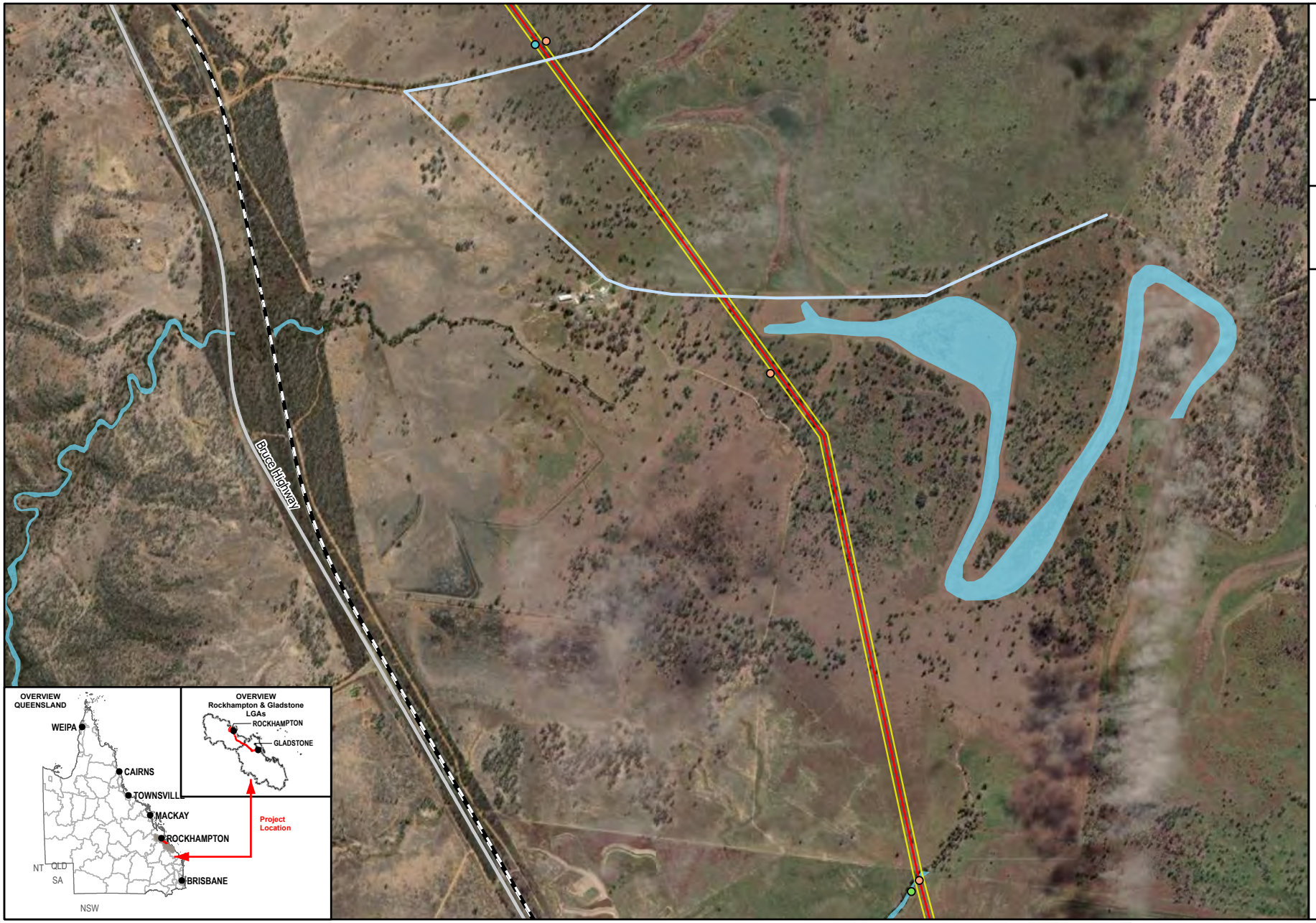
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2n
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- Terrestrial Fauna Assessment Site
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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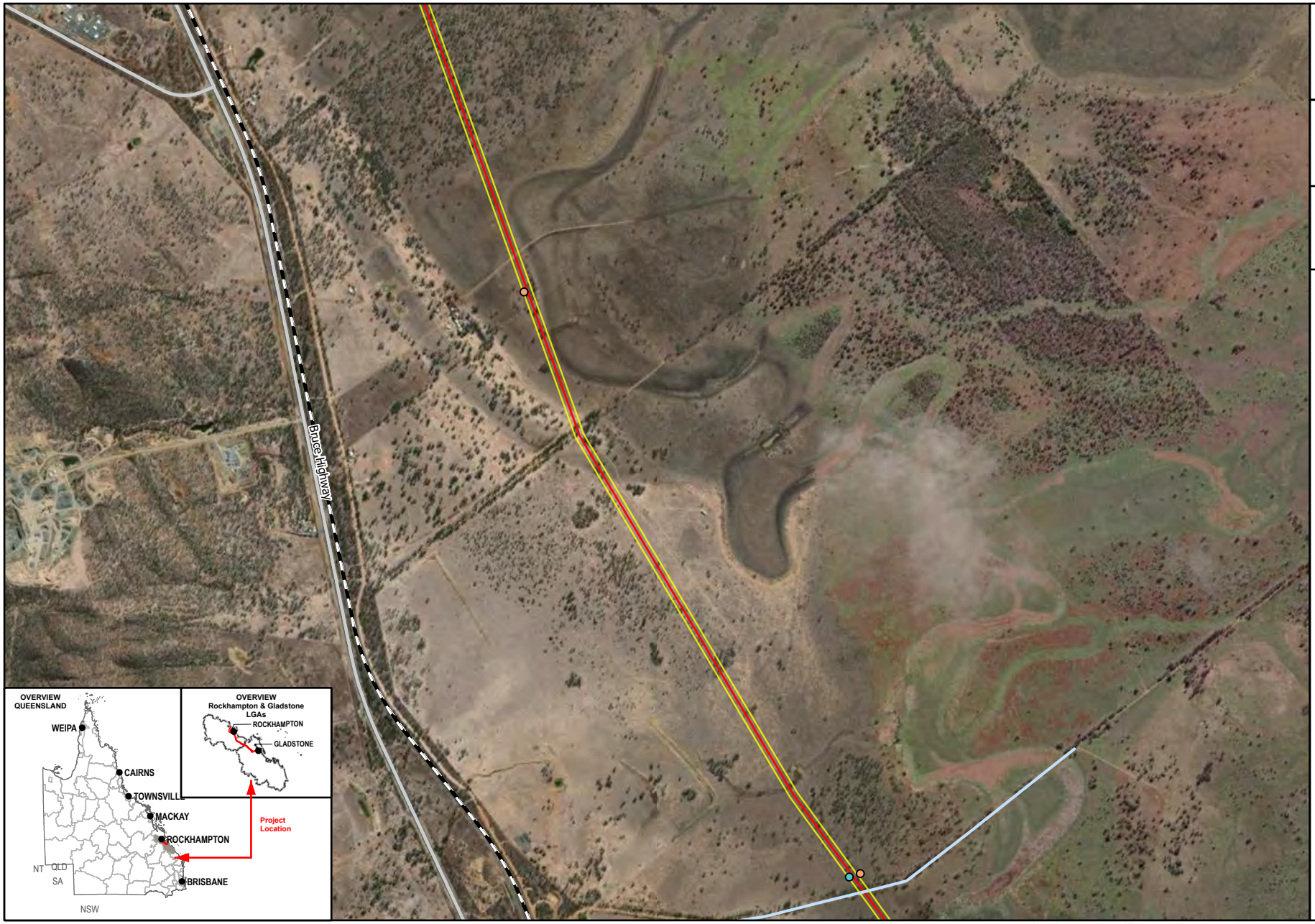
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2o
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Terrestrial Fauna Assessment Site
- Spotlighting Transect
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways

Data Sources:
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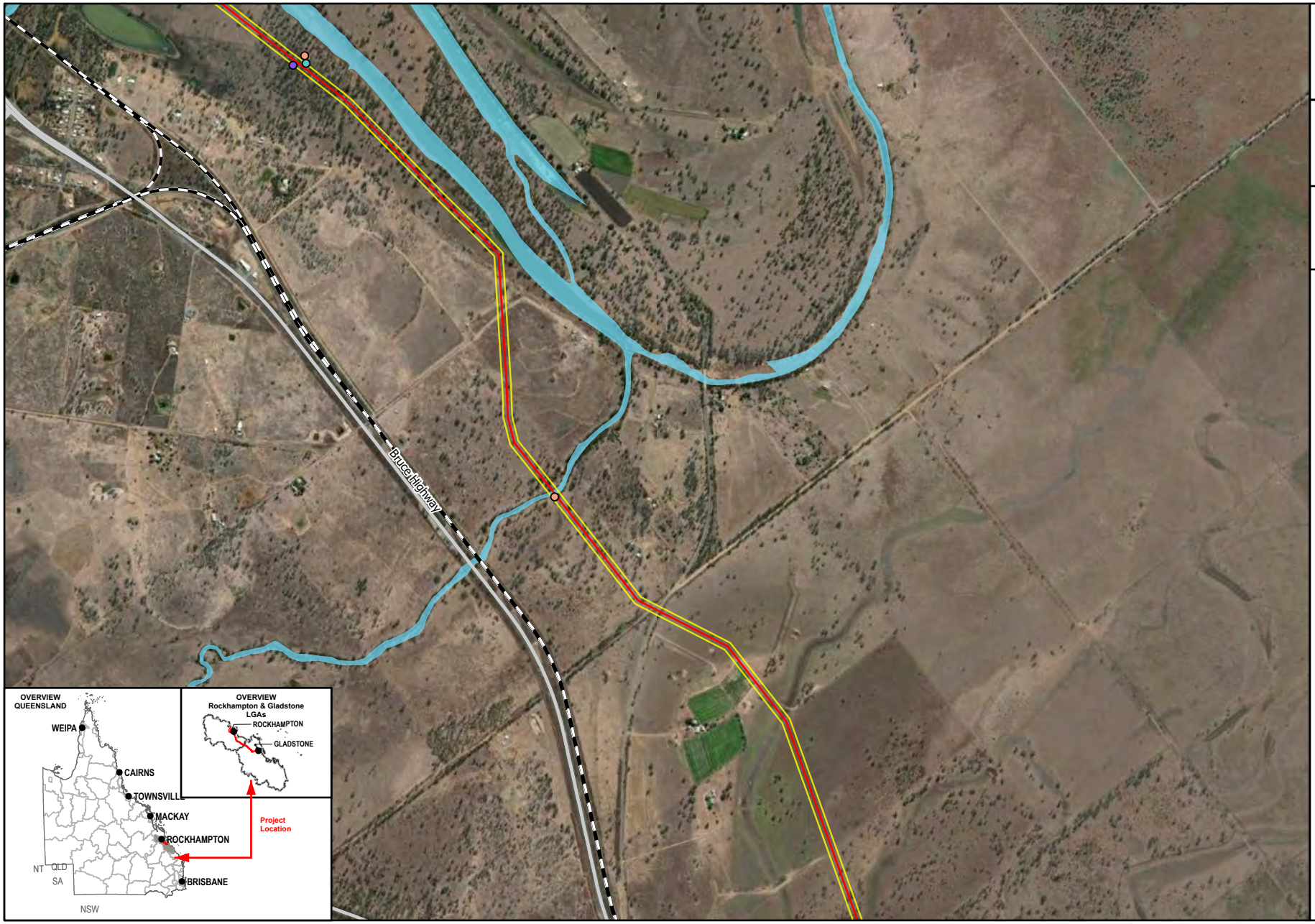
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2p
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

Data Sources:

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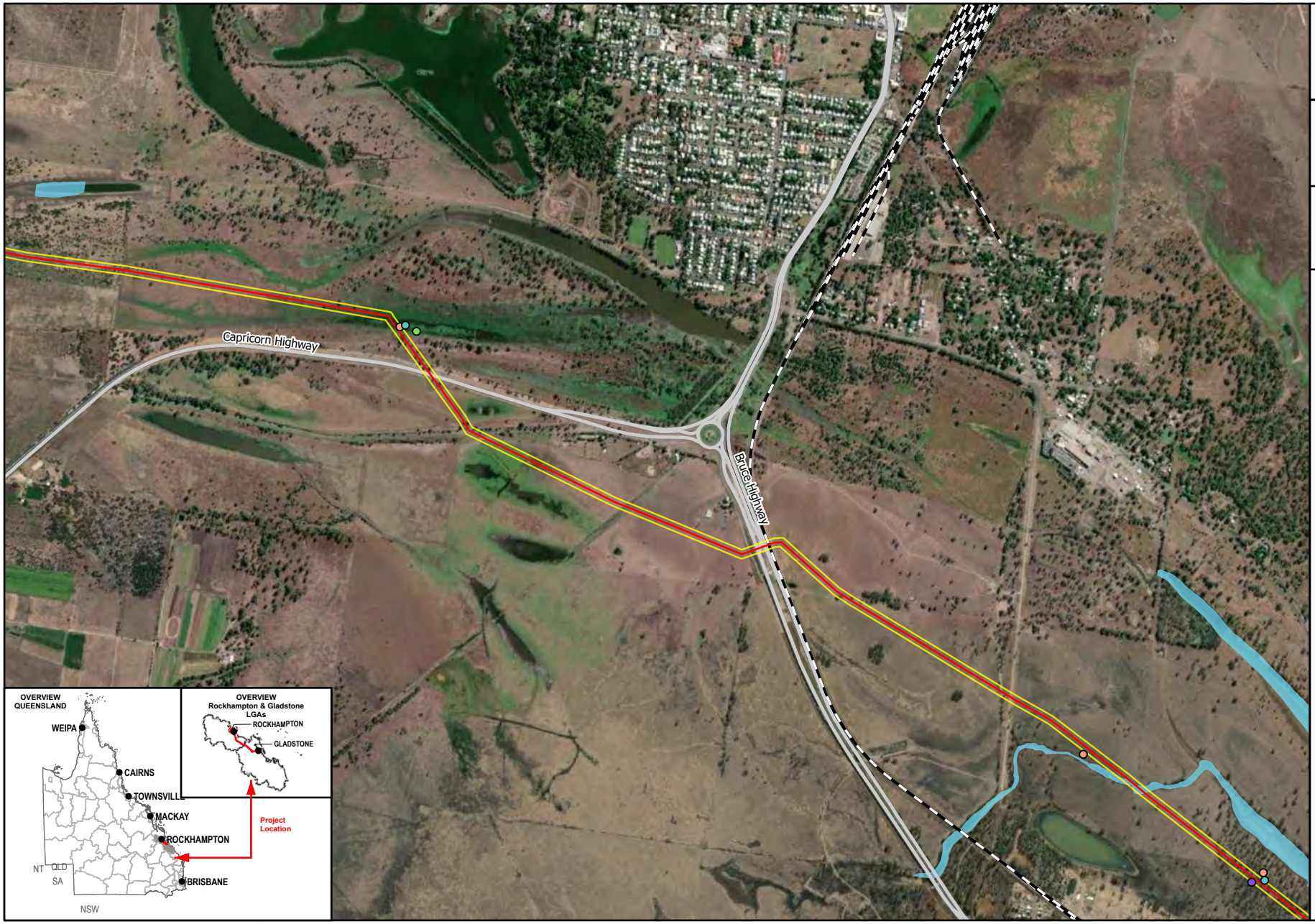
Figure 2-2q
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Bird Surveys
- SAT Survey Site
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Railways
- Waterbody

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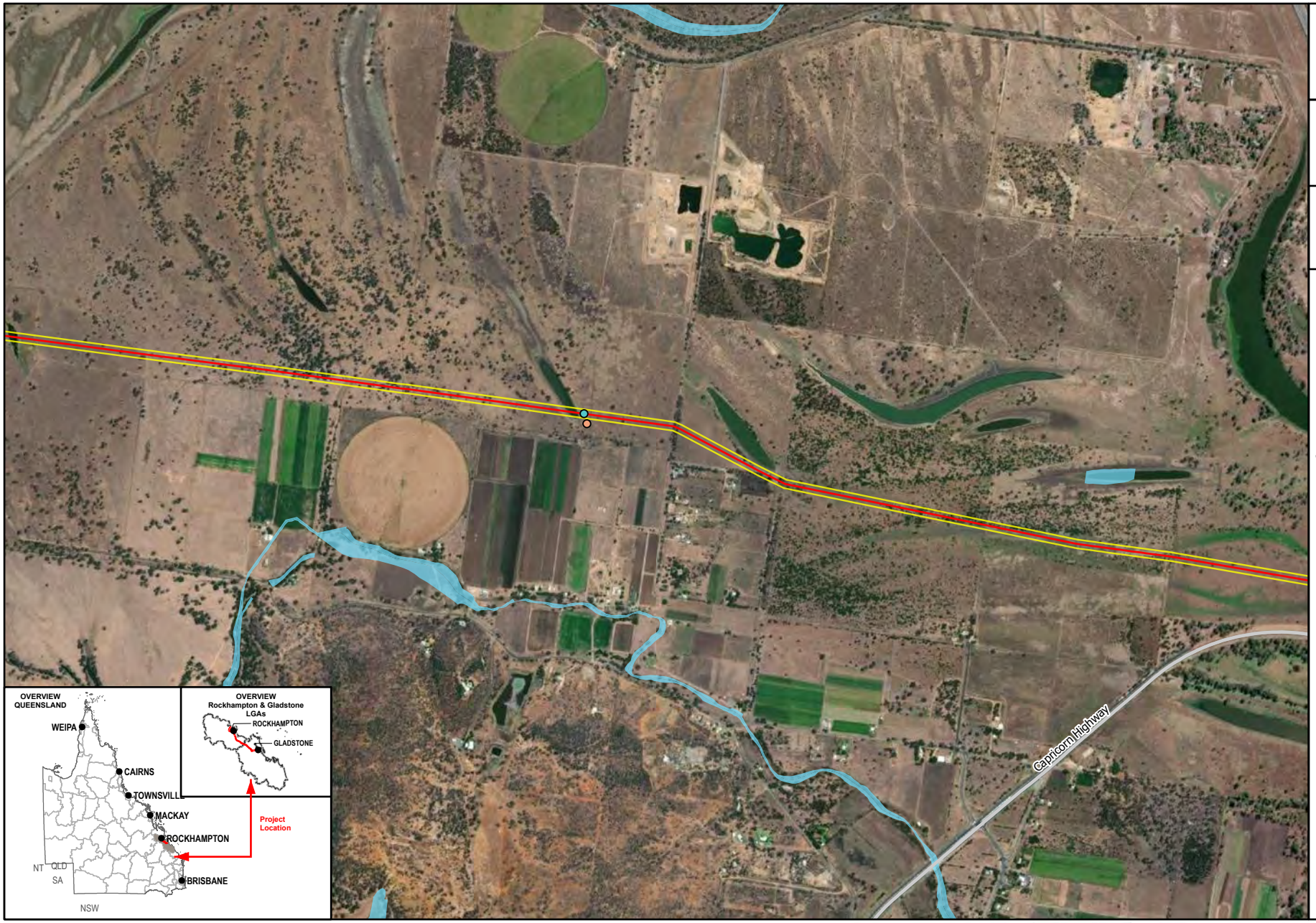
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2r
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022



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Terrestrial Fauna Assessment Site

- Active Searches
- Terrestrial Fauna Assessment Site
- Study Area
- Fitzroy to Gladstone Pipeline Alignment
- Main Roads
- Waterbody

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 2-2s
Distribution of Terrestrial Fauna Survey Sites Within the Study Area
000-G-MAP-2402 Version:2 Date: 3/08/2022