

APPENDIX

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Terrestrial and Aquatic Ecology Technical Report

Part 5 of 7

BORDER TO GOWRIE REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT

APPENDIX

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Terrestrial and Aquatic Ecology Technical Report

Appendix G Species profiles

BORDER TO GOWRIE REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
ALA	Atlas of Living Australia
DoE	Department of the Environment
DCCEEW	Department of Climate Change, the Environment, Energy and Water
DERM	Department of Environment and Resource Management
DES	Department of Environment and Science
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
MSES	Matters of State Environmental Significance
NC Act	<i>Nature Conservation Act 1992</i>
SPRAT	Species Profile and Threats Database
TSSC	Threatened Species Scientific Committee

1. SPECIES PROFILES

This document outlines and describes the profiles for all Matters of State Environmental Significance (MSES) including listed threatened species under the *Nature Conservation Act 1992* (NC Act) known, likely, and potential to occur within the Border to Gowrie Project (the Project).

All TEC and listed threatened species profiles describe their status, characteristics, known distribution, distribution in relation to the Project Area, biology and reproduction, habitat, threatening processes, threat abatement/recovery plans and a summary of the priority actions listed in the relevant threat abatement and recovery plans.

Profiles are presented for the following:

- Flora:
 - Threatened flora, and
 - Special least concern flora.
- Fauna:
 - Threatened reptiles;
 - Threatened mammals;
 - Special least concern mammals;
 - Threatened birds;
 - Threatened invertebrates; and
 - Special least concern migratory birds.

In each of the profiles, commentary is provided on the distribution of the community or species in relation to the Project. This commentary is based on the distribution for each community or species as indicated by the predictive habitat mapping that has been developed as part of the Border to Gowrie Project Environmental Impact Statement. This mapping will be verified through detailed ecological surveys of the Project footprint in parallel to the development of the detail design. The reported distribution of communities or species will be amended, as required, following the completion of the detailed ecological surveys.

2. FLORA SPECIES – THREATENED FLORA

2.1 BRACKER WATTLE (*ACACIA ARGYROTRICHA*)

2.1.1 STATUS

Bracker wattle (*Acacia argyrotricha*) is listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.1.2 BIOLOGY AND ECOLOGY

2.1.2.1 CHARACTERISTIC

Bracker wattle is a woody shrub that grows up to 2 m high. The species features angular branches covered with dense, long white hairs (however, these can appear brown on new shoots) (Pedley, 2018). Bracker wattle has flat phyllodes which are straight or slightly sickle shaped, approximately 10 – 15 cm long and 1 – 1.8 mm wide (Pedley, 2018). The species produces small, yellow flower heads with 30 to 40 flowers clustered together in a ball shape at the base of phyllodes. Seed pods can be either straight or slightly irregularly curved and are approximately 7.5 cm long and 2.5 mm wide. Seed pods have a leathery texture and are raised over the seeds. Seeds are longitudinal, oblong, and approximately 3 – 4 mm long and 1.7 mm – 2 mm wide (refer to Plate 2-1; Pedley, 2018).

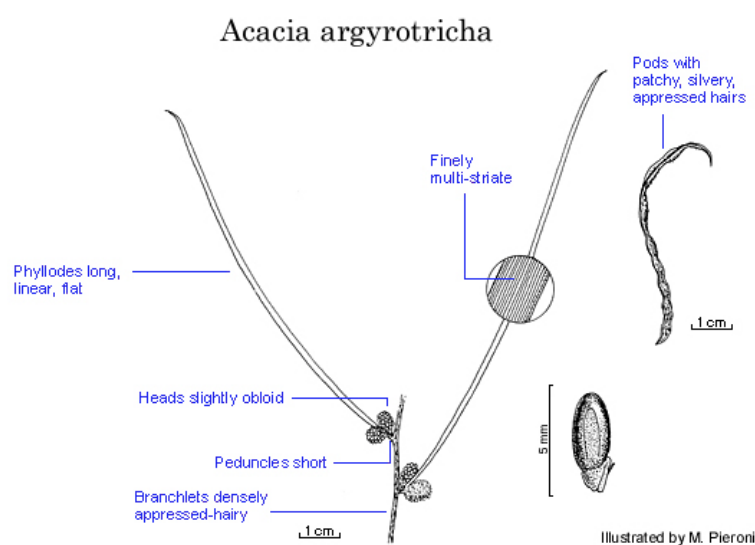


PLATE 2-1: BRACKER WATTLE (*ACACIA ARGYROTRICHA*)

Source: Pedley (2018)

2.1.2.2 KNOWN DISTRIBUTION

Bracker wattle is endemic to a small area within the Darling Downs district, particularly within Bracker State Forest, south of Inglewood (refer to Plate 2-2). Currently, there is only one known population of the species. Bracker wattle is native to Australia.



PLATE 2-2: DISTRIBUTION RANGE OF BRACKER WATTLE (*ACACIA ARGYROTRICHA*)

Source: ALA (2024)

2.1.2.3 DISTRIBUTION IN RELATION TO PROJECT

Bracker wattle is assessed as having the potential to occur within the Project footprint due to the presence of species' habitat; however, the species was not recorded during targeted surveys.

There are no database records (i.e., ALA) of the species within the Project footprint. The nearest record is located along Inglewood-Texas Road, approximately 9 km east of the Project footprint near Inglewood and was recorded in 1997. There are 13 other records of the species, all located in Yelarbon State Forest, approximately 12 km east of the Project footprint, and were all recorded between 1989 – 1994 (refer to Plate 2-3). These limited records are the only records of the species in Australia.

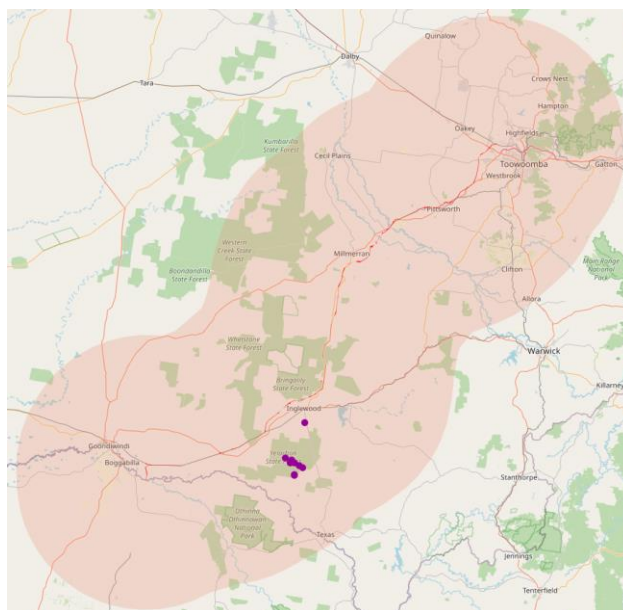


PLATE 2-3: DISTRIBUTION RANGE OF BRACKER WATTLE (*ACACIA ARGYROTRICHA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

2.1.2.4 BIOLOGY AND REPRODUCTION

The biology of bracker wattle is currently unknown, however, the species is thought to flower between September and October and produce fruit in December, based on specimens collected (Pedley, 2018).

2.1.3 HABITAT

Bracker Wattle (*Acacia argyrotricha*) is endemic to the Yelarbon State Forest (previously Bracker) and occurs on sandy soil in *Eucalyptus* woodland (L. Pedley, 2001). There is limited information available regarding Bracker Wattle.

The railway alignment occurs to the north, and outside, of Yelarbon State Forest where Bracker Wattle occurs.

2.1.4 THREATENING PROCESSES

Threatening processes to bracker wattle are currently unknown, however, Australian wattle species are generally threatened by clearing, urban development, road maintenance, recreational use of habitats, grazing by domestic livestock and the introduction of weed species.

2.1.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for bracker wattle.

2.1.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Acacia argyrotricha* Pedley. Available from: <https://profiles.ala.org.au/opus/foa/profile/Acacia%20cultriformis> [Accessed 29 January 2024].

Flora of Australia Volumes 11A (2001), 11B (2001) and 12 (L. Pedley 1998).

Greig, D. 2018. Bracker Wattle (*Acacia argyrotricha*) (Image) [Online] Available from:
<https://images.ala.org.au/image/details?imageId=0f494d79-1de9-49bb-964a-00df4b61fcbe>.

Pedley. 2018. Acacias of Australia - *Acacia argyrotricha* Pedley. Available from:
https://apps.lucidcentral.org/wattle/text/entities/acacia_argyrotricha.htm [Accessed 29 January 2024].

The State of Queensland, Department of Environment, Land and Water (DELW) URL
<https://apps.des.qld.gov.au/species-search/details/?id=3361> (accessed 2.7.24).

2.2 CAMPTACRA PERDITA

2.2.1 STATUS

Camptacra perdita is listed as Endangered under the NC Act and is not listed under the EPBC Act.

2.2.2 BIOLOGY AND ECOLOGY

2.2.2.1 CHARACTERISTIC

Camptacra perdita is an erect herb growing up to 35 cm tall. The species has densely woolly hairy stems which are snowy white in colouration, glandular-hairy involucral bracts and a consistently unlobed leaf apex and small capitula and florets (Bean, 2020). The leaves are small, narrowly elliptical, and oblanceolate, approximately 14 – 24 mm long and 2 – 5 mm wide and are sparsely covered in woolly-hairs (Bean, 2020) (Plate 2-2).



PLATE 2-4: CAMPTACRA PERDITA

Source: ALA (2024)

2.2.2.2 KNOWN DISTRIBUTION

Camptacra perdita is known from four collections in southern Queensland and from one location in New South Wales (refer to Plate 2-5). In Queensland, the species is known to occur near Oakey, St George and Roma (Bean, 2020).



PLATE 2-5: DISTRIBUTION RANGE OF *CAMPTACRA PERDITA*

Source: ALA (2024)

2.2.2.3 DISTRIBUTION IN RELATION TO PROJECT

Camptacra perdita is assessed as having the potential to occur within the Project footprint due to the presence of species' habitat; however, the species was not recorded during targeted surveys.

There are no database records (i.e., ALA) of the species within the Project footprint. The two nearest records are located along Oakey Cutella Road, approximately 9 km north-west of the Project footprint, and were both recorded in 2001. There is one record of the species along the Warrego Highway between Oakey and Dalby, which was recorded in 2013 (refer to Plate 2-6). Other records outside of the 50 km buffer are located 140 km south (in New South Wales), 190 km west and 300 km north-west of the Project footprint.

These limited records are the only records of the species in Australia.

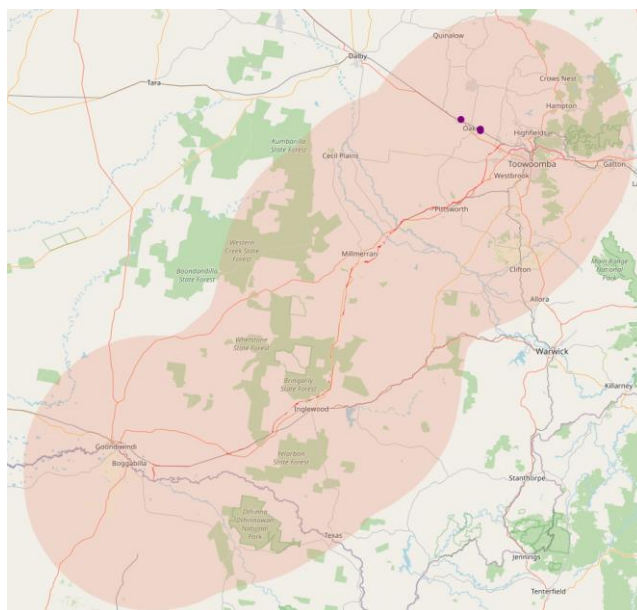


PLATE 2-6: DISTRIBUTION RANGE OF *CAMPTACRA PERDITA* IN RELATION TO THE PROJECT

Source: ALA (2024)

2.2.2.4 BIOLOGY AND REPRODUCTION

Based on previous records, *Camptacra perdita* flowers and fruits in March, May, September, October and November (Bean, 2020).

2.2.3 HABITAT

Camptacra perdita is known from only four collections in southern Queensland (two from near Oakey, one near St George and one near Roma), and from a single location in New South Wales and has been recorded in grassland on heavy black soil on alluvium, at least two sites dominated by *Dichanthium sericeum* (A.R. Bean, 2020).

2.2.4 THREATENING PROCESSES

Camptacra perdita habitat is threatened by extensive clearing for cropping and grazing purposes (Bean, 2020).

2.2.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for *Camptacra perdita*.

2.2.6 REFERENCES

A taxonomic revision of *Camptacra* (A.R. Bean, 2020)

Atlas of Living Australia (ALA). 2024. *Camptacra perdita*. Available from:

https://bie.ala.org.au/species/ALA_DR652_482#overview [Accessed 29 January 2024].

Bean, A.R. 2020. A taxonomic revision of *Camptacra* N.T.Burb. (Asteraceae: Astereae). *Austrobaileya* 10(4): 564–575.

Species profile—*Camptacra perdita* The State of Queensland, Department of Environment, Land and Water (DELW) URL [Species profile—Camptacra perdita | Environment, land and water | Queensland Government \(des.qld.gov.au\)](https://des.qld.gov.au/species-profile/camptacra-perdita) (accessed 2.7.24).

2.3 CYMBONOTUS MAIDENII

2.3.1 STATUS

Cymbonotus maidenii is listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.3.2 BIOLOGY AND ECOLOGY

2.3.2.1 CHARACTERISTIC

Cymbonotus maidenii is a small herb growing a maximum of 40 cm tall. The plant features erect, lance-shaped leaves approximately 10 – 40 cm long and 3 – 9 cm wide which are divided into triangular or oblong lobes (Holland and Funk, 2006). Leaves are dark green in colouration and sparsely hairy on the upper surface, and light green to greenish-grey with dense cottony hairs on the underside (Holland and Funk, 2006). *Cymbonotus maidenii* produces single yellow flowers on stems approximately 2 – 30 cm tall, with elliptic petals approximately 15 – 28 mm long and 3 – 6 mm wide (Holland and Funk, 2006) (Plate 2-3).



PLATE 2-7: CYMBONOTUS MAIDENII

Source: ALA (2024)

2.3.2.2 KNOWN DISTRIBUTION

Cymbonotus maidenii is endemic to eastern Australia, with known, isolated populations occurring in inland southern Queensland and northern New South Wales (refer to Plate 2-8). In southern Queensland, the species occurs to west of Mitchell and north to Emerald (ALA, 2024). In New South Wales, the species occurs north of the Darling and Barwon Rivers (ALA, 2024)



PLATE 2-8: DISTRIBUTION RANGE OF *CYMBONOTUS MAIDENII*

Source: ALA (2024)

2.3.2.3 DISTRIBUTION IN RELATION TO PROJECT

Cymbonotus maidenii is assessed as having the potential to occur within the Project footprint due to the presence of species' habitat; however, the species was not recorded during targeted surveys.

There are no database records (i.e., ALA) of the species within the Project footprint. The nearest record of the species is located in North Toowoomba, approximately 13 km east of the northern-most portion of the alignment and was recorded in 2003. There is one record in south Toowoomba (approximately 14 km east of the Project footprint), recorded on two occasions in 1940 and 1953, however this location is now used as an industrial site (refer to Plate 2-9). These records are the only records of the species east of the Project footprint. There are an additional 6 records of the species to the west of the Project footprint (> 20 km), of which, two were recorded along Pampas-Horrane Road in 2007 (one is not dated); one was recorded along Pipeline Road in 1951; one was recorded near Olsen's Road in 2021; one was recorded along Jondaryan Saint Ruth Road in 2007; and one near Bowenville Blaxland Road in 1973 (refer to Plate 2-9) (ALA, 2024).

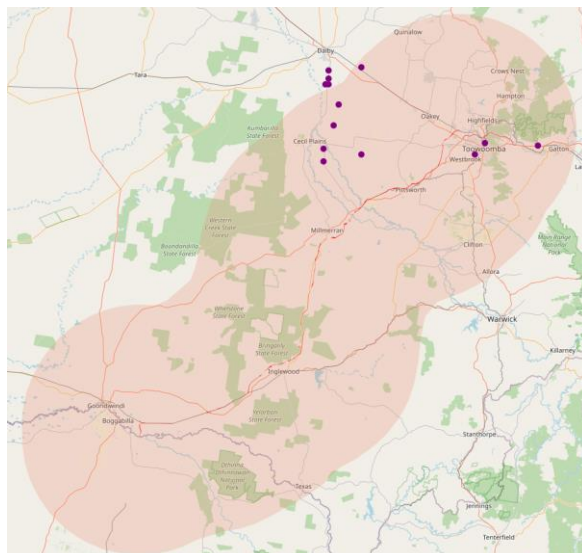


PLATE 2-9: DISTRIBUTION RANGE OF *CYMBONOTUS MAIDENII* IN RELATION TO THE PROJECT

Source: ALA (2024)

2.3.2.4 BIOLOGY AND REPRODUCTION

Cymbonotus maidenii produces flowers throughout the year; however, is predominantly recorded to flower in Spring. The species germinates, grows, and flowers in response to rain (Holland and Funk, 2006).

2.3.3 HABITAT

Cymbonotus maidenii is found in isolated patches in inland areas of southern Queensland; west to Mitchell and north to Emerald and occurs on open grassland, along roadsides or beside watercourses. It grows on black, brown or grey heavy, cracking clay soils. (Holland & Funk, 2006).

2.3.4 THREATENING PROCESSES

Threats to *Cymbonotus maidenii* are not currently known.

2.3.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for *Cymbonotus maidenii*.

2.3.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Cymbonotus maidenii*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2890645> [Accessed 29 January 2024].

Holland, A.E. and Funk, V.A. (2006). A revision of *Cymbonotus* (Compositae: Arctotidae, Arctotidinae). *Telopea*, vol. 11(3), pp. 266-275.

The State of Queensland, Department of Environment, Land and Water (DELW) URL [Species profile—Cymbonotus maidenii | Environment, land and water | Queensland Government \(des.qld.gov.au\)](https://des.qld.gov.au/species-profile/cymbonotus-maidenii) (accessed 2.7.24).

2.4 CYPERUS CLARUS

2.4.1 STATUS

Cyperus clarus is listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.4.2 BIOLOGY AND ECOLOGY

2.4.2.1 CHARACTERISTIC

Cyperus clarus is a slender tufted perennial with erect and rigid stems growing up to 80 cm in height and up to 2.5 mm in thickness. The stems can vary in texture, from smooth to scabrous at the tip (ALA, 2024). The plant's leaves can be either flat or folded and are generally 2 – 6 mm wide. *Cyperus clarus* produces multiple flowers per stem, with flower heads containing 3 – 6 branches approximately 10 cm long (refer to Plate 2-4). Each branch consists of dense clusters made up of 8 – 20 short, flattened spikelets which are 7 – 18 mm long and 3 – 4.5 mm wide (side view). The glumes (scales enclosing the flower) are golden brown to brown and are 2.5 – 4 mm long with the sides having 3 – 4 nerves and an excurved tip up to 0.8 mm long (ALA, 2024). The egg-shaped nuts are dusky brown to black in colour, 1.6 – 1.9 mm long and 0.6 – 0.8 mm diameter (Wilson, 1991; Wilson, 2008).



PLATE 2-10: *CYPERUS CLARUS*

Source: Sharp n.d.

2.4.2.2 KNOWN DISTRIBUTION

Cyperus clarus is endemic to eastern Australia, occurring from Emerald in Central Queensland, south to Delungra in New South Wales (ALA, 2024). Specimens of *C. clarus* have been recorded in the Queensland Central Highlands, west of Brisbane near Toowoomba and in New South Wales near Inverell (ALA, 2024) (refer to Plate 2-11).



PLATE 2-11: DISTRIBUTION RANGE OF *CYPERUS CLARUS*

Source: ALA (2024)

2.4.2.3 DISTRIBUTION IN RELATION TO PROJECT

Cyperus clarus is assessed as known to occur within the Project footprint due to direct observations of the species between Brookstead and Gowrie.

Additionally, there is one database record (ALA) of the species within the Project footprint, recorded in 2021 near Murlaggan Road, south of Pittsworth. There is one record of the species along Linthrope Road, approximately 300 m from the Project footprint, recorded in 1976. There are another two records in close vicinity of the Project footprint to the northern end, including one along the Gore Highway, approximately 950 m east of the footprint, between Southbrook and Westbrook (1981); and one along Robson Road, approximately 500 m east of the footprint (1934) (refer to Plate 2-12). There are an additional 30 records of the species within 50 km of the Project footprint between 1934 – 2021, with records occurring in/near Toowoomba, Nobby, Greenmount, Clifton, Allora and south of the Queensland/New South Wales border.

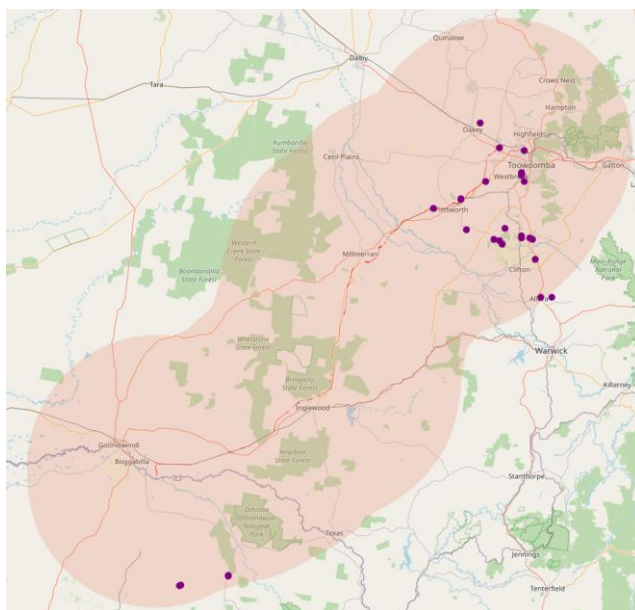


PLATE 2-12: DISTRIBUTION RANGE OF *CYPERUS CLARUS* IN RELATION TO THE PROJECT

Source: ALA (2024)

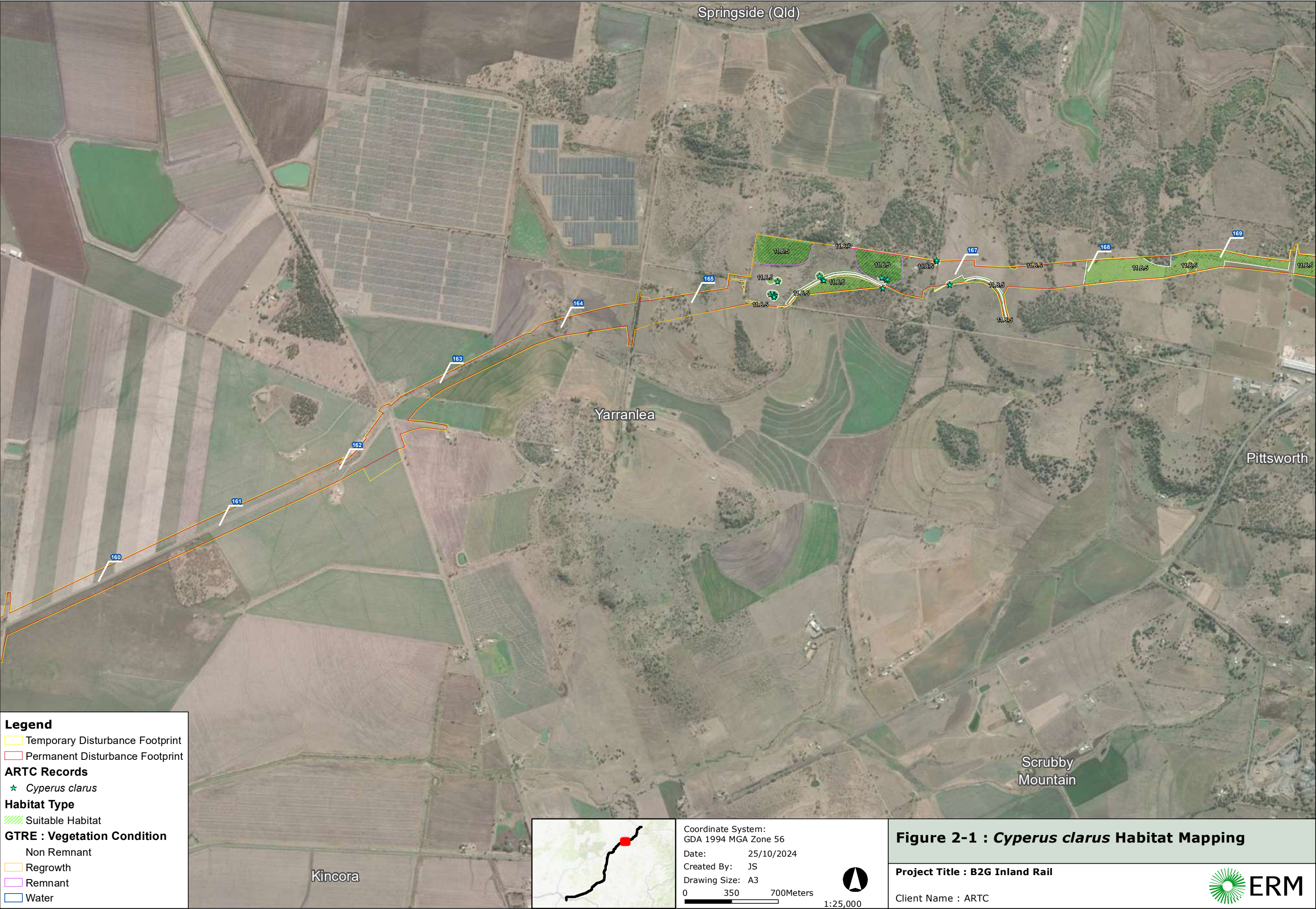
2.4.2.4 BIOLOGY AND REPRODUCTION

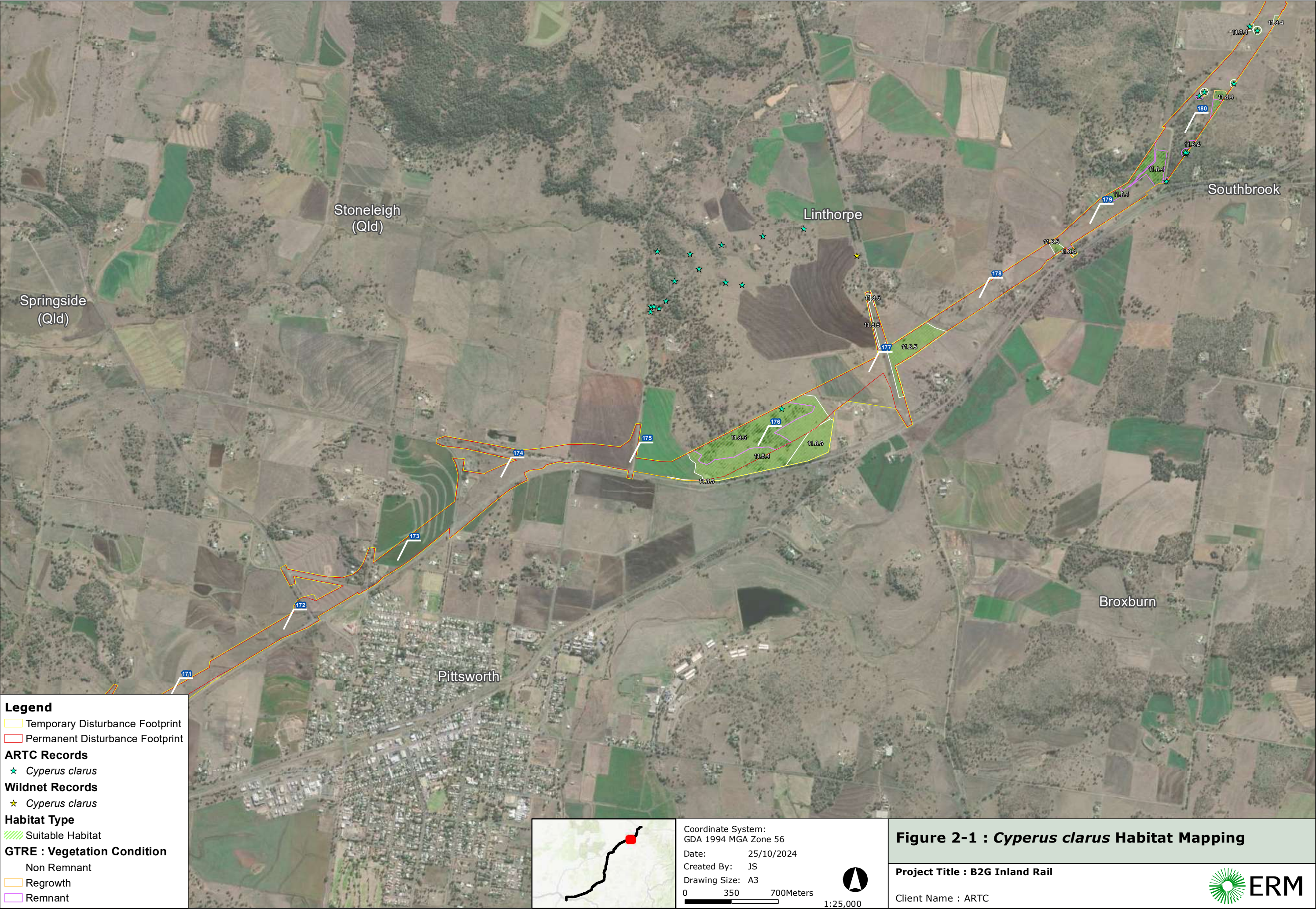
Cyperus clarus produces flowers from spring to summer (Wilson, 2008).

2.4.3 HABITAT

Cyperus clarus grows in grassland or open woodlands, in heavy soils derived from basalt. The species is associated with grasslands where *Aristida leptopoda* and *Panicum queenslandicum* occur on deep alluvial black clay; in *Eucalyptus melanophloia* woodland with mid-dense ground stratum of *Chrysopogon fallax*; growing with *Stemmacantha australis* in mountain coolibah woodland on basalt ridges; and in *Dichanthium* grassland with *Cyperus bifax* and *Fimbristylis* spp. (Queensland Herbarium, 2011; Wilson, 2008).

Habitat mapping for areas subject to detailed surveys was conducted in accordance with the Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (DPIE, 2020). Individuals identified by point locations were buffered by a 30 m radius, with overlapping boundaries combined to form complete polygons. For all other flora records, habitat was mapped in accordance with the Method for mapping matters of state environmental significance (Version 7) (DESI, 2024) where all flora records were compiled, vetted and buffered by 1 km to map areas of suitable habitat. Areas mapped as Essential Habitat for this species were also included. Habitat mapping for this species within the Project footprint is presented in Figure 2-1.











Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

ARTC Records

★ *Cyperus clarus*

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Non Remnant

Regrowth



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters

1:25,000

Figure 2-1 : *Cyperus clarus* Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC

2.4.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to *C. clarus*:

- Land clearing for agriculture and subsequent invasion of competitive weeds;
- Mining activities which remove individuals and disrupts pollinator and disperser interactions (DERM, 2010a);
- Urban development; and
- Grazing, particularly in the south-west management region (DERM, 2010b).

2.4.5 THREAT ABATEMENT/RECOVERY PLANS

The following threat abatement/recovery plans have been identified as relevant for the species.

- Border Rivers Maranoa-Balonne Natural Resource Management Region Back on Track Actions for Biodiversity (DERM 2010a).

2.4.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLAN

Cyperus clarus has been identified as a 'high priority' species of 'major' importance. Threats identified in this action plan for this species includes:

- Loss and removal of individual plants and habitat as a result of land clearing for agriculture and mining activities;
- Competition with exotic invasive weeds; and
- Disruption of the pollinator and disperser interaction.

Management actions identified in this action plan for the species includes:

- Implement control measures for weed species in areas across the Border Rivers Maranoa-Balonne NRM region;
- Provide input into impact assessments for mining activities within the region and encourage rehabilitation of abandoned mine sites; and
- Coordinate the Nature Refuges and Land for Wildlife Programs incentivising landholders to conserve and manage natural and cultural resources under a perpetual nature refuge agreement.

2.4.7 REFERENCES

Atlas of Living Australia (ALA). 2024. *Cyperus clarus*. Available from:

https://bie.ala.org.au/species/http://id.biodiversity.org.au/node/apni/2889591#tab_recordsView [Accessed 29 January 2024].

Department of Environment and Resource Management (2010a). Border Rivers Maranoa-Balonne Natural Resource Management Region Back on Track Actions for Biodiversity. Department of Environment and Resource Management, Brisbane. Available from: <https://qldgov.softlinkhosting.com.au/liberty/opac/search.do?queryTerm=Border%20Rivers%20Maranoa-Balonne%20Natural%20Resource%20Management%20Region%20Back%20on%20Track%20Actions%20for%20Biodiversity&mode=ADVANCED&modeRadio=KEYWORD&operator=AND&activeMenuItem=false>

- Department of Environment and Resource Management (2010b). South West Natural Resource Management Region Back on Track Actions for Biodiversity. Department of Environment and Resource Management, Brisbane.
- Queensland Herbarium (2007). Department of Science, Information Technology and Innovation (DSITI), Queensland Government.
- Queensland Herbarium (2011). Specimen label information. Queensland Herbarium. [Accessed 27 August 2018].
- Sharp, D. (nd). Queensland Herbarium, Department of Science, Information Technology and Innovation (DSITI), Queensland Government.
- Wilson K.L. (1991). Systematic studies in *Cyperus* section Pinnati (Cyperaceae). *Telopea* 4 (3): 480.

2.5 FINGER PANIC GRASS (*DIGITARIA PORRECTA*)

2.5.1 STATUS

Finger panic grass (*Digitaria porrecta*) is listed as Near Threatened under the NC Act and is not listed under the EPBC Act.

2.5.2 BIOLOGY AND ECOLOGY

2.5.2.1 CHARACTERISTICS

Finger panic grass is a perennial, loosely tufted, erect or ascending grass growing up to 60 cm tall (TSSC, 2013). The plant has pubescent nodes, branched culms, smooth leaf sheaths and membranous ligules approximately 2 – 3 mm long. The leaf blades are linear, the apex is reinforced, 5 – 15 cm x 0.3 – 0.4 cm, and can be either pubescent or smooth (refer to Plate 2-5). Finger panic grass has a loose branching cluster of several racemes up to 25 cm in length; the lower racemes are mostly convoluted, branched divaricately 3 – 10 cm long, whilst the upper racemes are individual with spikelets in pairs, 5 – 7 mm long. The lower glume is approximately 1 – 1.5 mm long and the upper glume is known to be shorter than spikelet, covered with short, soft hair between the outer nerves. The plant has lower florets which are as long as the spikelet's and are smooth between the outer nerves. Flowers appear in a cylindrical cluster along the stalk and spread stiffly from the flowering stem, with the lower clusters arranged in a whorl of four to six, each up to 30 cm long.

Finger panic grass has a similar appearance to hairy panic (*Panicum effusum*) and Queensland panic (*Panicum queenslandicum*), both of which are found in Queensland.



PLATE 2-13: FINGER PANIC GRASS (*DIGITARIA PORRECTA*)

Source: readleaf environmental, n.d

2.5.2.2 KNOWN DISTRIBUTION

Finger panic grass is endemic to eastern Australia, occurring in Queensland and New South Wales (refer to Plate 2-14). In Queensland, finger panic grass occurs in the Nebo district (south-west of Mackay), the Central Highlands between Springsure and Rolleston and from Jandowae south to Warwick (TSSC, 2013). In Queensland, finger panic grass occurs in communities dominated by mountain coolibah (*Eucalyptus orgadophila*) on hills and slopes and forest red gum (*E. tereticornis*) and poplar box (*E. populnea*) in drainage lines (Halford 1995).



PLATE 2-14: DISTRIBUTION RANGE OF FINGER PANIC GRASS (*DIGITARIA PORRECTA*)

Source: ALA (2024)

2.5.2.3 DISTRIBUTION IN RELATION TO PROJECT

Finger panic grass is assessed as known to occur within the Project footprint due to direct sightings between Brookstead and Gowrie.

There are four database records of the species within the Project footprint, located in Pittsworth (1995); along the Warrego Highway (2018); along a Gowrie Creek tributary (2021) and along Draper Road (2022). There are numerous additional records of the species within 50 km of the Project footprint, particularly located along the Warrego Highway between Kingsthorpe and Oakey (recorded in 2017, 2018 and 2021); west of Cotswold Hills (2023); near Wyreema and Cambooya (1931 – 2023). Additionally, there are scattered records of the species between Oakey and Cecil Plains (1985 – 2019) and east to between Pittsworth and Allora (1995 – 2023) (refer to Plate 2-15). Towards the southern end of the Project footprint, there are numerous records located along North Star Road (2021) and two clusters located along Bruxner Way (2021).

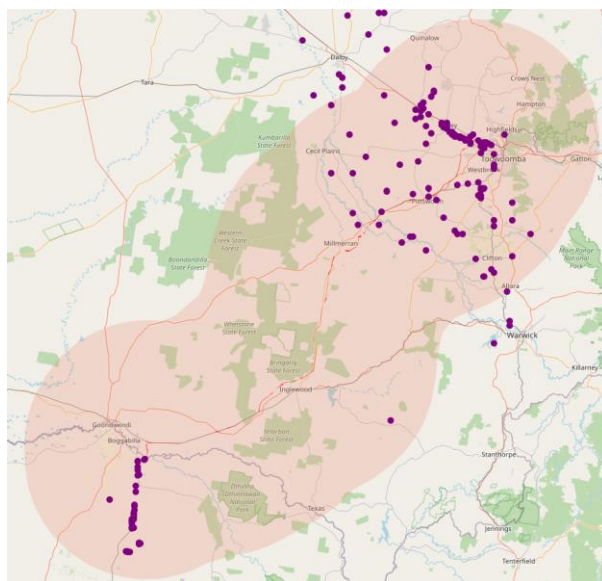


PLATE 2-15: DISTRIBUTION RANGE OF FINGER PANIC GRASS (*DIGITARIA PORRECTA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

2.5.2.4 BIOLOGY AND REPRODUCTION

Finger panic grass seeds from March to April and produces flowers during late summer. The species is known to reproduce vegetatively by dying back to the tussock base, from which it re-sprouts in summer.

2.5.3 HABITAT

Finger panic grass grows in grasslands on extensive basaltic plains with dark and fine textured soils and some degree of seasonal cracking. The species occupies undulating woodlands and open forests, as well as tussock grasslands, box or forest red gum, alluvial plains and disturbed habitats (i.e., fallow paddocks and road reserves), however, the species' capability to maintain a viable population is unknown (TSSC, 2013; Halford, 1995).

2.5.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the Finger panic:

- Clearing of grasslands for agriculture;
- Habitat fragmentation;
- Fire;
- Trampling and grazing by livestock;
- Physical disturbance by machinery and urban expansion; and
- Introduction of invasive species including Rhodes grass (*Chloris gayana*) and liverseed grass (*Urochloa panicoides*) (TSSC, 2013).

2.5.5 THREAT ABATEMENT/RECOVERY PLAN

There is no adopted or made recovery plan or threat abatement plan relevant to finger panic grass (DoE, 2024).

2.5.6 REFERENCES

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<http://www.environment.gov.au/biodiversity/threatened/species/pubs/12768-listing-advice.pdf>. In effect under the EPBC Act from 14-Dec-2013. [Accessed 30 January 2024].

2.6 MILLMERRAN MINT BUSH (*COLEUS INSULARIS*)

2.6.1 STATUS

Millmerran mint bush (*Coleus insularis*) is listed as Critically Endangered under the NC ACT and is not listed under the EPBC ACT.

2.6.2 BIOLOGY AND ECOLOGY

2.6.2.1 CHARACTERISTICS

The Millmerran mint bush has been suggested to be the most distinctive species in the genus in Australia, due to its characteristic extreme lobing with the marginal teeth generally up to 5 mm in length. Species can be identified as a erect to decumbent herb which has the capacity to grow to 50 cm in height. A thickened tuberous root system is present, which acts as a storage organ for the species. If observed in close proximity, the foliage can be slightly scented, and not clammy to touch. One key characteristic is the markedly crenated leaf, which can display between 5-8 pairs with teeth length being over 1/3 of the lamina width at its midpoint. Measurements for the marginal teeth length are recorded to be between 1.5-5 mm. Literature has best described the species floral bracts as lanceolate-ovate (wider at the base than midpoint), with 10-12 flowers per verticillaster with a blue to purple tinge (Forster, 2011) (Plate 3-10).



PLATE 2-16: MILLMERRAN MINT BUSH (*COLEUS INSULARIS*)

Source: (Grimshaw & Van Baalen, 1997)

2.6.2.2 KNOWN DISTRIBUTION

The Millmerran mint bush has a current distribution restricted to a secluded State Forest situated south of the town of Millmerran in the south eastern sector of Queensland (Millmerran State Forest) (Jones, 2023). The species is known from a single population with a very limited range of occupancy, approximately less than 20km² (Forster, 2011). The known distribution of this species is known within and adjacent to Millmerran State Forest (refer to Figure 3-13).



PLATE 2-17: DISTRIBUTION RANGE OF MILLMERRAN MINT BUSH

Source: (ALA, 2024)

2.6.2.3 DISTRIBUTION IN RELATION TO THE PROJECT

The Millmerran mint bush is assessed as potential to occur within the Project footprint. Recent and old records of this species are located within the locality of the Project, however the presence of the species habitat is limited and specialised (species not recorded during targeted surveys).

There are no database records (ALA, 2024) of the species within the Project Footprint. There are 6 database records for this species located within Australia. Five known database records for this species are located within and in close proximity to Millmerran State Forest (within locality of the Project) (ALA, 2024). Majority of the records are situated within the Millmerran State Forest and are approximately 2 – 3 km east from Project Footprint (4 records), the other record is located approximately 1.5 km east of the Project footprint at Mount Domville (ALA, 2024).

These 5 limited records are the only records of the species in Queensland.

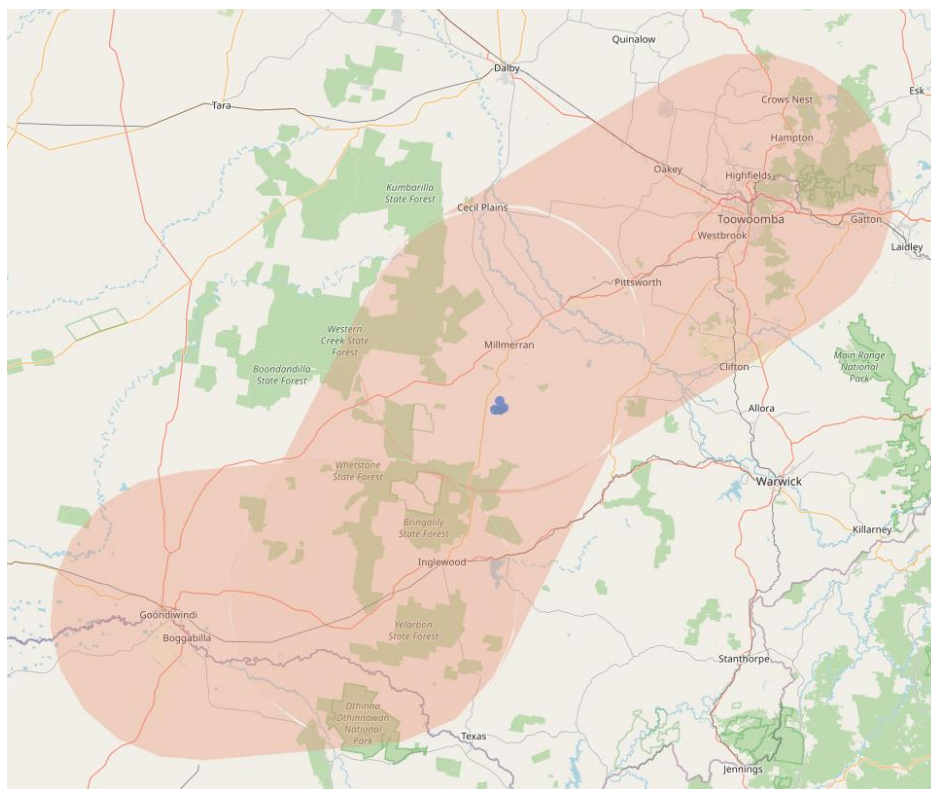


PLATE 2-18: DISTRIBUTION RANGE OF MILLMERRAN MINT BUSH IN RELATION TO THE PROJECT.

Source: (ALA, 2024)

2.6.2.4 BIOLOGY AND REPRODUCTION

The biology of the Millmerran mint bush is currently misunderstood, suggested affinities are fairly challenging to determine based purely on morphology, but do incorporate *Coleus australis* (Which is closest geographically), this species tends to flower throughout the year (Conn, 1992).

2.6.3 HABITAT

The locality and secluded nature of this species is unusual in being an outlier of granite (in particular, pavements found within Millmerran State Forest and outcrops) accompanying shrubland and low eucalypt woodland neighbored by contradictory geology (heavy clay soils) that used to support brigalow open forest prior to anthropogenic change to farm land (Forster, 2011).

2.6.4 THREATENING PROCESSES

The threatening processes for the Millmerran mint bush are currently misunderstood, however the species has been observed to either die or shrivel back to the rootstocks during periods of drought. Due to its restricted area of occupancy (<20 km²) it is prone to stochastic events (mortality events) in the short to long term (Forster, 2011).

2.6.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for Millmerran mint bush.

2.6.6 REFERENCES

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- Grimshaw, P., & Van Baalen, K. (1997). *Coleus insularis* [Review of *Coleus insularis*]. Atlas of Living Australia. Available from:
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2.7 *PICRIS BARBARORUM*

2.7.1 STATUS

Picris barbarorum is listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.7.2 BIOLOGY AND ECOLOGY

2.7.2.1 CHARACTERISTIC

Picris barbarorum is an erect annual herb growing up to 60 cm tall. The plant species features basal leaves which are petiolate, native obovate to oblanceolate, and attenuate at the base, growing 4 – 30 cm by 0.4 – 2.5 cm. The cauline leaves are reduced upwards, sessile and truncate to cordate at the base (refer to Plate 2-6). Additionally, *Picris barbarorum* features sparse simple to bifid hooked hairs. The inflorescence is a loose terminal corymb; heads pedunculate with up to 2 bracts at the base, 5 – 8 mm in diameter; involucre bracts 2 – 15 mm long, outer tomentose or with simple or hooked hairs 3 – 7 mm long on the midrib. The floret is bisexual, with ligules 8 – 12.5 mm long and yellow in colouration. The cypselas are 4 – 7.5 mm long with a beak shorter than the body, 5-ribbed and glabrous. The pappus is 5.5 – 7 mm long, of inner barbellate bristles and outer plumose bristles. *Picris barbarorum* is extremely similar to *Picris evae*, however records suggest the species is distinguished through height by being taller (Holzapfel 1994; Walsh 1999).



PLATE 2-19: *PICRIS BARBARORUM*

Source: Blair (2018), ALA (2024)

2.7.2.2 KNOWN DISTRIBUTION

Picris barbarorum occurs in eastern Australia, including in Queensland and New South Wales; however, it is thought to be uncommon within both states. Historically, *Picris barbarorum* occurred in Victoria, however, is now extinct within the state. The species has been recorded concentrated pockets in the Western Downs region of Queensland, further west towards the New South Wales border, and south to Bourke and the Darling River floodplain (ALA, 2024) (refer to Plate 2-20).

2.7.2.4 BIOLOGY AND REPRODUCTION

Picris barbarorum flowers and fruits from July to November (Holzapfel, 1994; Walsh, 1999).

2.7.3 HABITAT

Picris barbarorum typically occurs along roadsides on dark, productive soils and grey cracking clays (ALA, 2024).

Habitat mapping for areas subject to detailed surveys was conducted in accordance with the Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (DPIE, 2020). Individuals identified by point locations were buffered by a 30 m radius, with overlapping boundaries combined to form complete polygons. For all other flora records, habitat was mapped in accordance with the Method for mapping matters of state environmental significance (Version 7) (DESI, 2024) where all flora records were compiled, vetted and buffered by 1 km to map areas of suitable habitat. No Essential Habitat for this species occurs within the Project footprint. Habitat mapping for this species within the Project footprint is presented in Figure 2-2.

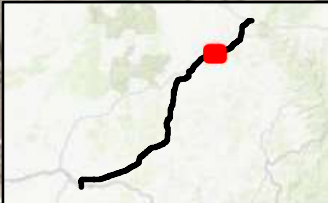






Legend

- Temporary Disturbance Footprint
- Permanent Disturbance Footprint
- ARTC Records**
- ★ *Picris barbarorum*
- Habitat Type**
- Suitable Habitat
- GTRE : Vegetation Condition**
- Non Remnant
- Regrowth
- Remnant
- Water



Coordinate System:
GDA 1994 MGA Zone 56
Date: 25/10/2024
Created By: JS
Drawing Size: A3
0 350 700Meters



1:25,000

Figure 2-2 : *Picris barbarorum* Habitat Mapping

Project Title : B2G Inland Rail
Client Name : ARTC





2.7.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to *Picris barbarorum*:

- Introduction of invasive weeds;
- Inappropriate fire regimes;
- Habitat fragmentation; and
- Clearing of vegetation for cropping and grazing purposes.

2.7.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to *Picris barbarorum*.

2.7.6 REFERENCES

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<https://bie.ala.org.au/species/http://id.biodiversity.org.au/node/apni/2916052#overview> [Accessed 30 January 2024].

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Blair N. (2018). *Picris barbarorum* (Image) [Online] Available from: <https://vicflora.rbg.vic.gov.au/flora/taxon/51f1e0ac-fe12-41b2-bad1-89b87e37332c#andgid=1andpid=2> [Accessed 28 August 2018].

2.8 PLUNKETT MALLEE (*EUCALYPTUS CURTISII*)

2.8.1 STATUS

Plunkett mallee (*Eucalyptus curtisii*) is currently listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.8.2 BIOLOGY AND ECOLOGY

2.8.2.1 CHARACTERISTIC

Plunkett mallee is a slender mallee or small tree growing 7 m in height. The species is distinguishable through the smooth bark which is grey-green to white in colouration. Leaves are lanceolate and differ in age, with juvenile leaves measuring up to 15 cm in length, are lighter underneath and are arranged in opposite pairs along the branch; whilst adult leaves feature dark green colouration above and lighter underneath, are arranged alternately to subopposite and measure up to 13 cm in length by 2.7 cm (ALA, 2024) (refer to Plate 2-7). The petioles are 0.7 – 1.5 cm in length, whilst peduncles are 0.5 – 1.5 cm long and pedicles are 3 – 6 mm long (ALA, 2024). The inflorescences are in terminal or upper axillary racemes of 3 – 8 whitish umbels (ALA, 2024). Plunkett mallee produces cup-shaped fruits 1 cm x 0.8 cm, which are often wrinkled when dry and typically have 5 – 6 internal chambers. The seeds are linear with an internal scar and are yellow brown in colouration (ALA, 2024).



PLATE 2-22: PLUNKETT MALLEE (*EUCALYPTUS CURTISII*)

Source: Australian Seed (2024), ALA (2024)

2.8.2.2 KNOWN DISTRIBUTION

Plunkett mallee has a scattered, natural distribution in south-eastern Queensland which extends 80 km north and south of Brisbane and over 300 km north-west (inland) to Dalby and Miles districts (refer to Plate 2-23). Plunkett mallee has been recorded in Expedition National Park, Robinson Gorge National Park, Isla Gorge National Park, Balloon Forest Reserve, Barakula State Forest, Vickery State Forest, Kumbarilla State Forest, Beerwah Forest Reserve, Bringalily State Forest, Neville Lawrie Reserve (Logan City) and White Rock Conservation Park (DES, 2022).



PLATE 2-23: DISTRIBUTION RANGE OF PLUNKETT MALLEE (*EUCALYPTUS CURTISII*)

Source: ALA (2024)

2.8.2.3 DISTRIBUTION IN RELATION TO PROJECT

Plunkett mallee is assessed as having the potential to occur within the Project footprint, due to the presence of habitat for the species. The species was not directly recorded within the Project footprint during field surveys.

There are no database records of the species within the Project footprint. The nearest records are located in Bringalily State Forest, approximately 7.5 km west of the Project footprint, and were recorded in 1993 and 1998. There are four records of the species located within Devine State Forest, approximately 14 km east of the Project footprint, and were recorded in 1994, 1996 and 2006) (refer to Plate 2-24). There is one record of the species located in Kumbarilla State Forest, approximately 43 km west of the Project footprint, and was recorded in 1989.

There are no other records of the species within 50 km of the Project footprint.

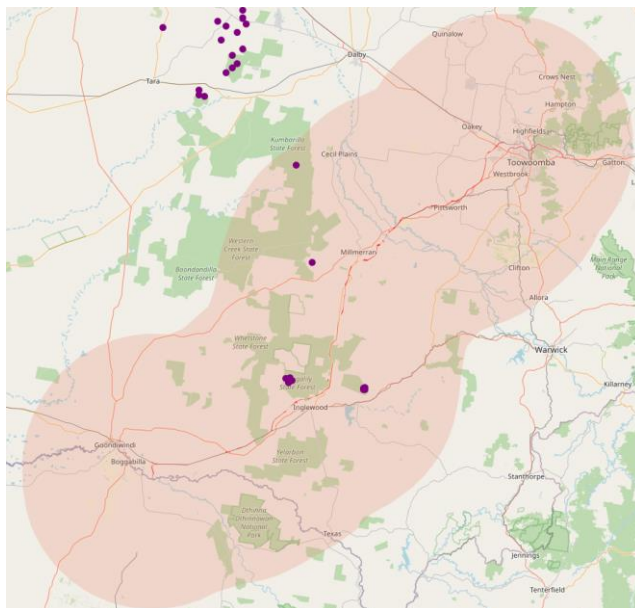


PLATE 2-24: DISTRIBUTION RANGE OF PLUNKETT MALLEE (*EUCALYPTUS CURTISII*) IN RELATION TO THE PROJECT

Source: ALA (2024)

2.8.2.4 BIOLOGY AND REPRODUCTION

Plunkett mallee produces flowers between September and November and fruits throughout the year (ALA, 2024).

2.8.3 HABITAT

Throughout their natural range, plunkett mallee grows in two varying habitat types, with the shorter growth form occurring as the only eucalypt species on poorly drained lowland sites in shrubland dominated by banksia and with an understorey of heath plants; whilst the larger growth form occurs as scattered individuals on well-drained soils in open areas of mixed eucalypt forests and is more commonly associated with spotted gum (*Corymbia citriodora* subsp. *Variegata*), brown bloodwood (*C. trachyphloia*) and black cypress pine (*Callitris endlicheri*), and may also be associated with red ironbark (*E. fibrosa*), needle stringybark (*E. planchoniana*) and white mahogany (*E. acmenoides*) (DES, 2022).

Additionally, the species has been recorded to occur on sandy podsoils with impeded drainage, shallow stony soils, clay loams and stony clays with loose stones on the surface (DES, 2022).

2.8.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to plunkett mallee:

- Destruction of habitat as a result of clearing activities;
- Habitat disturbance as a result of timber harvesting;
- Inappropriate fire regimes; and
- Inappropriate grazing regimes (Wang and Borsboom, 1996).

2.8.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for plunkett mallee, however, the following management profile is relevant:

- *Eucalyptus curtisii* Species Management Profile (Wang and Borsboom, 1996).

2.8.6 SUMMARY OF MANAGEMENT PROFILE

Management objectives outlined in the *Eucalyptus curtisii* Species Management Profile (Wang and Borsboom, 1996) include:

- No timber harvesting of *E. curtisii*;
- Establishment of a protective buffer (0.3 ha) that excludes clearing where plunkett mallee occurs;
- Interval between prescribed burns should be greater than three years; and
- Monitor impact of grazing and adjust grazing management to ameliorate adverse impacts.

2.8.7 REFERENCES

Atlas of Living Australia (ALA). 2024. *Eucalyptus curtisii*. Available from:

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2.9 POMADERRIS COOMINGALENSIS

2.9.1 STATUS

Pomaderris coomingalensis is currently listed as Endangered under the NC Act and is not listed under the EPBC Act.

2.9.2 BIOLOGY AND ECOLOGY

2.9.2.1 CHARACTERISTIC

Pomaderris coomingalensis is a small shrub growing approximately 5 m tall. The species is distinguishable by the leaves being glabrous on the upper surface and lacking simple hairs on the internerves of the lower surface; other than which, the species is similar to *P. clivicola* (ALA, 2024). The leaves are ovate or elliptic approximately 20 – 60 mm long by 7 – 18 mm wide; the base is wedge-shaped; margins are entire, and the apex is obtuse (ALA, 2024). The young stems are covered with dense, grey star-shaped hairs (DES, 2022). The petiole is 2 – 5 mm long and stipes are narrow and triangular, acute and 2 – 3 mm long. The inflorescence is 1 – 1.8 cm long by 1 – 1.5 cm wide and consists of 20 – 50 flowers (ALA, 2024). The plant produces cream or yellow flowers which are densely pubescent and consist of sparse to moderate greyish or rusty hairs (ALA, 2024) (Plate 2-8). The sepals are 1.2 – 1.5 mm long and petals are absent (ALA, 2024).



PLATE 2-25: POMADERRIS COOMINGALENSIS

Source: ALA (2024)

2.9.2.2 KNOWN DISTRIBUTION

Pomaderris coomingalensis is endemic to Queensland, with specimens collected from Coomingleh State Forest, between Monto and Theodore; as well as, near Kingaroy, Proston, and Dalby (refer to Plate 2-26) (ALA, 2024). The species occurs within Braemar State Forest, Coomingleh State Forest, Devine State Forest and Durikai State Forest (ALA, 2024).



PLATE 2-26: DISTRIBUTION RANGE OF *POMADERRIS COOMINGALENSIS*

Source: ALA (2024)

2.9.2.3 DISTRIBUTION IN RELATION TO PROJECT

Pomaderris coomingalensis is assessed as having potential to occur within the Project footprint due to the presence of habitat and suitable microhabitat features. However, the species was not recorded during the field surveys.

There are no database records of the species within the Project footprint. The nearest record of the species is located in Devine State Forest, approximately 14 km east of the Project footprint, recorded twice in 2006 (refer to Plate 2-27). There is another record of the species in Durikai State Forest, approximately 43 km east of the Project footprint, recorded three times in 1971, 1988 and 1994. There are no additional records within 50 km of the Project footprint.

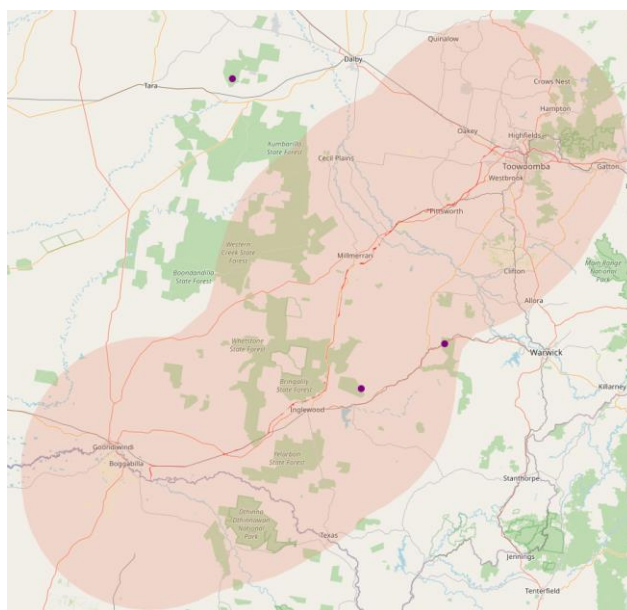


PLATE 2-27: DISTRIBUTION RANGE OF *POMADERRIS COOMINGALENSIS* IN RELATION TO THE PROJECT

Source: ALA (2024)

2.9.2.4 BIOLOGY AND REPRODUCTION

Pomaderris coomingalensis produces flowers from October to December (DES, 2022).

2.9.3 HABITAT

The species occurs within Braemar State Forest, Coomingleh State Forest, Devine State Forest and Durikai State Forest (Walsh and Coates, 1997). This species has been recorded in *Eucalyptus decorticans*, and *Corymbia citriodora* open forest on red soil; and *E. crebra* and *E. fibrosa* subsp. *Nubila* woodland on stony brown clay loam.

2.9.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to *Pomaderris coomingalensis*:

- Inappropriate fire regimes;
- Introduction of invasive weeds, particularly grassy weeds; and
- Inappropriate grazing regimes (DES, 2022).

2.9.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to *Pomaderris coomingalensis*. Recommended management actions for *Pomaderris coomingalensis* are described in:

- Burnett Mary Natural Resource Management Region Back on Track Actions for Biodiversity (DERM, 2010)

2.9.6 REFERENCES

- Atlas of Living Australia (ALA). 2024. *Pomaderris coomingalensis*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2906250#overview> [Accessed 31 January 2024].
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- Department of Environment and Science (2022). Species profile – *Pomaderris coomingalensis*. Available at: <https://apps.des.qld.gov.au/species-search/details/?id=18233> [Accessed 31 January 2024].
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2.10 *RUTIDOSIS GLANDULOSA*

2.10.1 STATUS

Rutidosia glandulosa is currently listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.10.2 BIOLOGY AND ECOLOGY

2.10.2.1 CHARACTERISTIC

Rutidosia glandulosa is an erect herb with a woody base, growing approximately 30 cm long. The stems are often branches and covered with dense, glandular hairs of various lengths; the leaves are sessile, linear, and acute at the apex, approximately 9 – 70 cm long and 1.5 – 5 mm wide (ALA, 2024). The inflorescences are 9 – 21 mm in diameter and occur in hemispherical capitulum with 30 – 70 florets. The florets are typically equal to or longer than the bracts (which are generally 1.5 – 7 mm long and 2 – 4 mm wide), bisexual with a few female outer florets (ALA, 2024). The plant produces yellow, glabrous flowers approximately 4 – 5.5 mm long (Plate 2-9). The seeds are dark brown and glabrous and approximately 1 mm by 0.5 mm in size (ALA, 2024).



PLATE 2-28: *RUTIDOSIA GLANDULOSA*

Source: ALA (2024)

2.10.2.2 KNOWN DISTRIBUTION

Rutidosia glandulosa is endemic to Queensland and is only known from approximately 15 populations across six distinct localities; with records observed in Blackdown Tableland National Park, south of the Planet Downs Pastoral Holdings; Carnarvon National Park; south of the Carnarvon Range (Saddler Springs); Gwambygine; Barakula State Forest (near Chinchilla) and Thulimbah (near Stanhope) (refer to Plate 2-29) (ALA, 2024).

2.10.2.4 BIOLOGY AND REPRODUCTION

Rutidosia glandulosa produces yellow flowers and fruits in February, March, May – June, September, November and December (ALA, 2024).

2.10.3 HABITAT

Rutidosia glandulosa grows on sandy or gravelly, well-drained soils in grassy open eucalypt woodland. The species has been observed in habitats dominated by various differing species, based on location, including:

- Blackdown Tablelands National Park populations – open woodland dominated by *Eucalyptus interstans*, *E. sphaerocarpa* and *Angophora leiocarpa*;
- Carnarvon Gorge National Park – dense woodland dominated by *Corymbia clarksoniana*, *E. crebra* and *Callitris glaucophylla* with a dense understorey composed of eucalypt saplings, *Petalostigma pubescens*, *Cassinia laevis*, *Acacia pustula*, *A. leiocalyx* and ground layer dominated by grasses and *Vittadinia* spp.;
- Gwambygine – spinifex heathland with scattered trees of *Angophora leiocarpa*, *Corymbia bunites*, *Allocasuarina inophloia*, *Lysicarpus* spp. and *Xylomelum* spp. overlying sandstone, skeletal soil; and
- Barakula State Forest – open forest dominated by *Corymbia citriodora*, *Eucalyptus crebra*, *Allocasuarina luehmannii* with herb understorey on fine sandy-silty loam over clay (ALA, 2024).

2.10.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to *Rutidosia glandulosa*:

- Habitat destruction;
- Inappropriate grazing regimes;
- Introduction of invasive weeds; and
- Inappropriate fire regimes (DES, 2022).

2.10.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to *Rutidosia glandulosa*; however, management actions for the protection of the species and species' habitat are outlined in:

- *Rutidosia* spp. (Blackdown Tableland) Species Management Profile (Barker, 1997).

2.10.6 SUMMARY OF MANAGEMENT ACTIONS

Management actions outlined in Barker (1997) include:

- Establishment of protective buffers in areas of *R. glandulosa* (0.25 ha) which excludes clearing;
- Evaluation of the impact of timber harvesting and operations within *R. glandulosa* habitat;
- Control and eradication of pasture grasses (including buffel grass (*Cenchrus ciliaris*);
- Monitoring the impacts of grazing and adjust accordingly to prevent impacts; and
- In areas of *Rutidosia glandulosa* follow fire management guidelines.

2.10.7 REFERENCES

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Available at: <https://apps.des.qld.gov.au/species-search/details/?id=22335> [Accessed
31 January 2024].
- Barker, M. (1997). *Rutidosia* spp. (Blackdown Tableland) Species Management Profile,
Department of Natural Resources, Queensland.

2.11 SOLANUM PAPAVERIFOLIUM

2.11.1 STATUS

Solanum papaverifolium is listed as Endangered under the NC ACT and is not listed under the EPBC ACT.

2.11.2 BIOLOGY AND ECOLOGY

2.11.2.1 CHARACTERISTICS

Solanum papaverifolium is described as a rhizomatous perennial forb, displaying a weak stem growing up to 0.6 m in height. The species leaves are spiny (up to 5 mm in length), broadly ovate and are deeply lobed (grow between 4-7 cm long, 3-5 cm wide) (Conn, 1992). Mostly glabrous except young specimens of this species have been observed to display minute glandular hairs. The spiny nature of this species is abundant on the stem, leaves, calyx and pedicels. The berry of this species is measured to grow between 10-12 mm in diameter with a colour of a greenish yellow with dim green stripes (Osazuwa et.al, 2022).

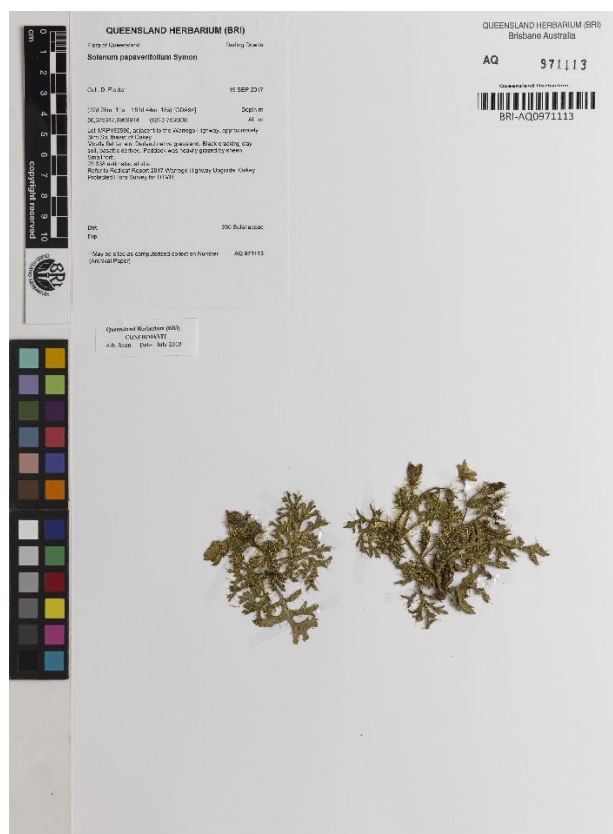


PLATE 2-31: *SOLANUM PAPAVERIFOLIUM*

Source: (Fielder, 2017)

2.11.2.2 KNOWN DISTRIBUTION

The *Solanum papaverifolium* has a current distribution in the south eastern sector of Queensland which extends southwards into the north eastern sector of New South Wales (Darling Downs District and Northern slopes District of NSW) (Electronic Flora of South

Australia). In Queensland the species is known to occur near Toowoomba, Oakey, Warwick (ALA, 2024).



PLATE 2-32: DISTRIBUTION RANGE OF *SOLANUM PAPAVERIFOLIUM*

Source: (ALA, 2024)

2.11.2.3 DISTRIBUTION IN RELATION TO THE PROJECT

Solanum papaverifolium is assessed as having the potential to occur within the Project footprint due to the presence of the species habitat; however, the species was not recorded during target surveys and the two records within the locality of the alignment are from 1957 & 1959. There are no database records (ALA and Wildnet) of the species within the Project footprint. There are two records within the locality of the alignment, approximately 3km northwest & 2.3 km south of the Project footprint. Both records are within close proximity of the town of Pittsworth (5km west of Pittsworth & 20km west of Pittsworth). There are 319 other records for this species within the 40km buffer but are outside of the locality (<10km²). Most of these records are congregated within and adjacent to Oakey (refer to Plate 2-32). Other records of this species are found in Warwick (QLD) and in northern NSW.

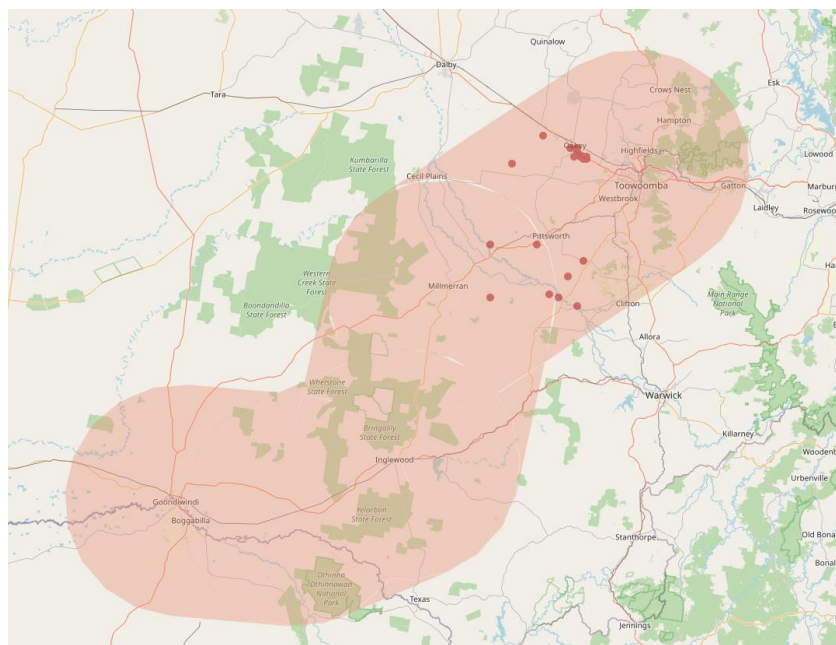


PLATE 2-33: DISTRIBUTION RANGE OF *SOLANUM PAPAVERIFOLIUM* IN RELATION TO THE PROJECT

Source: (ALA, 2024)

2.11.2.4 BIOLOGY AND REPRODUCTION

Literature has determined that the *Solanum papaverifolium* flowers from October to March and fruits from November to April (Electronic Flora of South Australia). The species will produce three to five solitary flowers, the flowers can be identified by its purple colour (Osazuwa et.al, 2022).

2.11.3 HABITAT

Solanum papaverifolium grows commonly on heavy clay in eucalypt woodland and grassland (Electronic Flora of South Australia). These districts have seen drastic anthropogenic change (agriculture, road), as such it now grows in areas more utilised by farming and roadsides (Osazuwa et.al, 2022).

2.11.4 THREATENING PROCESSES

Solanum papaverifolium habitat is threatened by extensive clearing for cropping and grazing purposes (agricultural practices) (Osazuwa et.al, 2022).

2.11.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for *Solanum papaverifolium*.

2.11.6 REFERENCES

Electronic Flora of South Australia. (n.d.). *Solanum papaverifolium*. Adelaide: South Australia government.

Conn, B. (1992) *Solanum papaverifolium* Symon. Sydney, NSW: NEW SOUTH WALES FLORA ONLINE. Available from: <https://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Solanum~papaverifolium>

Osazuwa, O. K., Dwyer, J. M., & Fensham, R. J. (2022). How important is fire-induced disturbance in the maintenance of a threatened perennial forb, *Solanum papaverifolium*? *Australian Journal of Botany*, 70(5), 335-343.

Fielder, P. (2017) *Solanum papaverifolium* [Review of *Solanum papaverifolium*]. Atlas of Living Australia. Available from: <https://images.ala.org.au/image/07194884-b7f6-4240-8d06-526a06fdf228>

Atlas of Living Australia (2024). *Solanum papaverifolium*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2893502>.

2.12 SOLANUM STENOPTERUM

2.12.1 STATUS

Solanum stenopterum is currently listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

2.12.2 BIOLOGY AND ECOLOGY

2.12.2.1 CHARACTERISTIC

Solanum stenopterum is an erect herb growing to 40 cm tall. The species has green branchlets covered in needle-shaped prickles which are 2 – 8 mm long; leaves are linear to ovate and may be either entire or have 2 – 3 lobes on each side, measuring 4 – 7 cm long and 0.5 – 2.6 cm wide (ALA, 2024). The upper leaf surface has 3 – 15 prickles (1 – 4 mm long) and is green in colouration; whilst the lower leaf surface is green with 1 – 15 prickles. The plant produces 1 – 2 flowers per flowerhead, which are purple in colouration and approximately 14 – 18 mm long (Plate 2-10). One mature fruit is produced per flower head, which is globular and 10 mm in diameter (ALA, 2024).



PLATE 2-34: *SOLANUM STENOPTERUM*

Source: ALA (2024)

2.12.2.2 KNOWN DISTRIBUTION

Solanum stenopterum has a patchy distribution across the Darling Downs in Queensland, from Gayndah south to Goondiwindi, west to Jackson and east to Oakey (DES, 2022). The species is also known to occur in the north-west slopes of New South Wales (refer to Plate 2-35).



PLATE 2-35: DISTRIBUTION RANGE OF *SOLANUM STENOPTERUM*

Source: ALA (2024)

2.12.2.3 DISTRIBUTION IN RELATION TO PROJECT

Solanum stenopterum is assessed as having the potential to occur within the Project footprint due to the presence of habitat; however, despite targeted surveys, the species was not recorded during field investigations.

There are no database records of the species within the Project footprint. The nearest record is located just outside Bringalily State Forest, approximately 2 km east of the Project footprint, and was recorded in 2022. Within 50 km of the Project footprint, there are three records located near Oakey; one at the Oakey Army Aviation Centre in 2001; and two along Hamlyn Road (2006); a small cluster along the Warrego Highway between Oakey and Jondaryan, recorded in 2000 and 2001; a cluster along Toowoomba Cecil Plains Road and Pampas-Horrane Road, recorded between 1995 – 2020; and one record north of Bendidee State Forest, recorded on two occasions in 1966 and 1979 (refer to Plate 2-36).

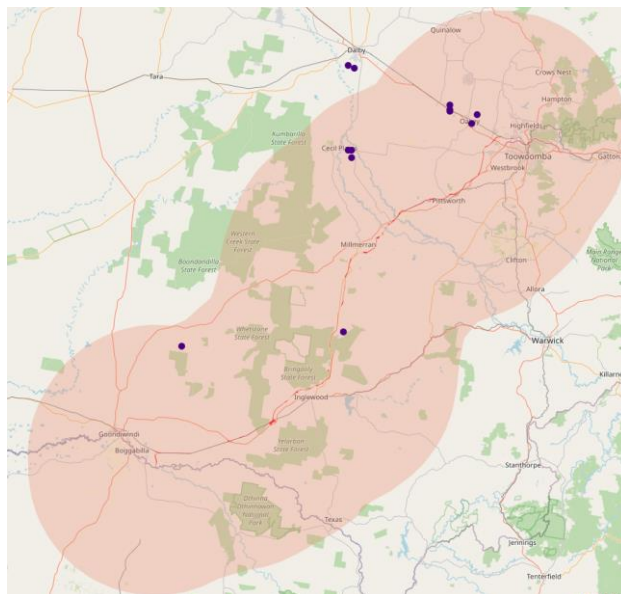


PLATE 2-36: DISTRIBUTION RANGE OF *SOLANUM STENOPTERUM* IN RELATION TO THE PROJECT

Source: ALA (2024)

2.12.2.4 BIOLOGY AND REPRODUCTION

Solanum stenopterum produces flowers from October to March and mature fruits have been recorded in March (ALA, 2024).

2.12.3 HABITAT

Solanum stenopterum is patchily distributed across the Darling Downs in Queensland, from Gayndah south to Goondiwindi, west to Jackson and east to Oakey. This species inhabits grassland or woodlands of belah and poplar box (*Eucalyptus populnea*) on black, brown or red clay loam soils. It also grows on loamy ridges, along roadsides and in paddocks. (Bean, 2004).

2.12.4 THREATENING PROCESSES

Threatening processes to *Solanum stenopterum* are not currently known.

2.12.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to *Solanum stenopterum*.

2.12.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Solanum stenopterum*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2910955#overview> [Accessed 31 January 2024].

Bean, A.R., 2004. The taxonomy and ecology of *Solanum* subg. *Leptostemonum* (Dunal) Bitter (Solanaceae) in Queensland and far north-eastern New South Wales, Australia. *Austrobaileya: A Journal of Plant Systematics* 6, 639--816. <https://doi.org/10.5962/p.299696>

Department of Environment and Science (DES). 2022. Species profile - *Solanum stenopterum*. Available from: <https://apps.des.qld.gov.au/species-search/details/?id=29794> [Accessed 31 January 2024].

Species profile— *Solanum stenopterum* The State of Queensland, Department of Environment, Land and Water (DELW) URL Species profile— <https://apps.des.qld.gov.au/species-search/details/?id=29794> (accessed 2.7.24).

3. FLORA SPECIES – SPECIAL LEAST CONCERN FLORA

3.1 BLACK ORCHID (*CYMBIDIUM CANALICULATUM*)

3.1.1 STATUS

Black orchid (*Cymbidium canaliculatum*) is currently listed as Special Least Concern under the NC Act and is not listed under the EPBC Act.

3.1.2 BIOLOGY AND ECOLOGY

3.1.2.1 CHARACTERISTIC

Black orchid is an epiphytic herb with pseudobulbs 80 – 120 mm in length and 30 – 40 mm wide, which have 2 – 6 rigid, curved and deeply channeling leaves approximately 300 – 500 mm long and 30 – 40 mm wide (ALA, 2024). The species produces olive green, yellow, brown or purple flowers which are often spotted or blotchy (refer to Plate 3-1). Sepals are typically 15 – 25 mm long and 7 – 10 mm wide; the labellum is typically 15 – 20 mm long and 8 – 10 mm wide, with three lobes and white with red or purple markings (ALA, 2024). The side lobes are erect and middle lobes curve downwards with a warty upper surface.



PLATE 3-1: BLACK ORCHID (*CYMBIDIUM CANALICULATUM*)

Source: ALA (2024)

3.1.2.2 KNOWN DISTRIBUTION

Black orchid occurs across the northern and eastern coast of Australia, from the Kimberly region of Western Australia to the northern Northern Territory, east to Cape York in Queensland and south to the Hunter River in New South Wales (ALA, 2024) (refer to Plate 3-1).

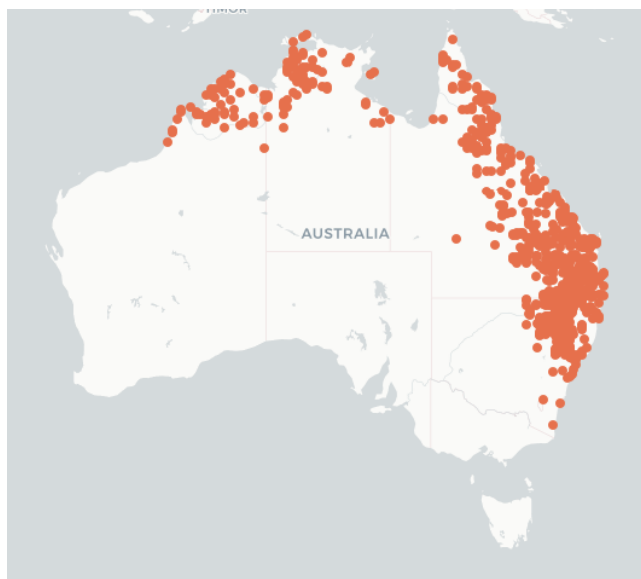


PLATE 3-2: DISTRIBUTION RANGE OF BLACK ORCHID (*CYMBIDIUM CANALICULATUM*)

Source: ALA (2024)

3.1.2.3 DISTRIBUTION IN RELATION TO PROJECT

Black orchid is assessed as known to occur within the Project footprint due to direct records during field investigations.

There are no database records of the species within the Project footprint. The nearest record is located between Inglewood and Millmerran, approximately 3 km east of the Project footprint, and was recorded in 1992. There is one record of the species, approximately 4 km east of the northern-most point of the Project footprint which was recorded in 2021. Additionally, there is one record along the Gore Highway south of Millmerran, approximately 5 km west of the Project footprint, recorded in 2014. All other records of the species are located more than 5 km from the Project footprint, notably west of the Project footprint between Inglewood and Millmerran (2006 and 2022); between Goondiwindi and Cecil Plains (1939 – 2023); east of the Project footprint between Toowoomba, Gatton and Clifton (2022 and 2023); and south of Clifton to just below the Queensland/New South Wales border (east and south-east of the Project footprint, recorded in 1986 – 2024) (refer to Plate 3-3).

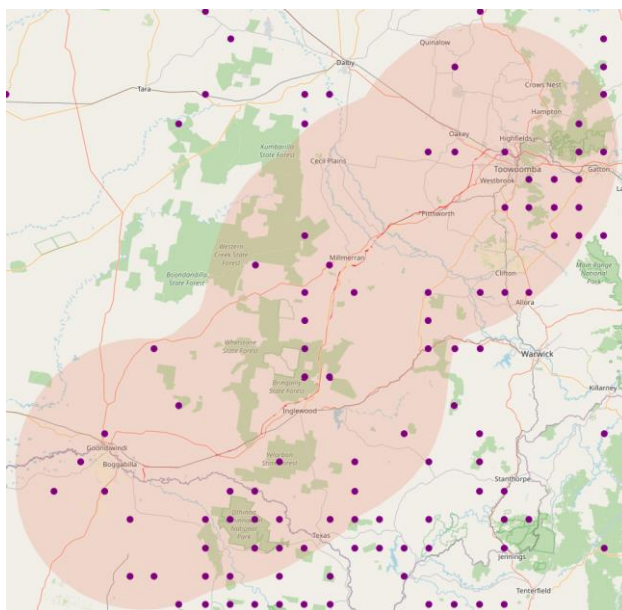


PLATE 3-3: DISTRIBUTION RANGE OF BLACK ORCHID (*CYMBIDIUM CANALICULATUM*) IN RELATION TO THE PROJECT

Source: ALA (2024)

3.1.2.4 BIOLOGY AND REPRODUCTION

Black orchid produces flowers between September and October (ALA, 2024).

3.1.3 HABITAT

Black orchid grows in the forks or hollows of trees in dry sclerophyll forests and woodlands (ALA, 2024).

3.1.4 THREATENING PROCESSES

Black orchid is currently threatened by land clearing and fragmentation of habitat, the ongoing removal of remnant trees and illegal collection.

3.1.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to black orchid.

3.1.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Cymbidium canaliculatum*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/taxon/apni/51401317#overview> [Accessed 31 January 2024].

3.2 TALL BLUEBELL (*WAHLENBERGIA STRICTA*)

3.2.1 STATUS

Tall bluebell (*Wahlenbergia stricta*) is currently listed as Special Least Concern under the NC Act and is not listed under the EPBC Act.

3.2.2 BIOLOGY AND ECOLOGY

3.2.2.1 CHARACTERISTIC

Tall bluebell is an upright herb stemming to 90 cm tall. The species features hairy leaves, oblong in shape and approximately 70 mm long and 13 mm wide (Ecolinc, n.d). The species is distinctive through the large bell-like five-petalled flowers, pale blue or mauve in colouration and approximately 2 cm wide (refer to Plate 3-2). The flowers form a tube, approximately the same length as the lobes, and is held at the end of the stem (Ecolinc, n.d).



PLATE 3-4: TALL BLUEBELL (*WAHLENBERGIA STRICTA*)

Source: ALA (2024)

3.2.2.2 KNOWN DISTRIBUTION

Tall bluebell has a widespread distribution, occurring in all Australian states, with the exception of the Northern Territory, however as per Plate 3-5, few records exist. In Queensland, the species occurs from Cairns south to the Queensland/New South Wales border (refer to Plate 3-5).

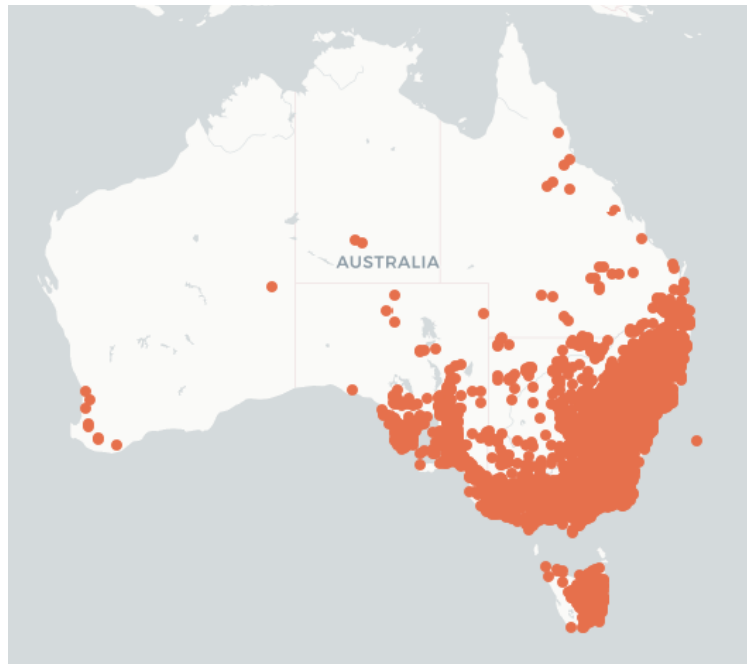


PLATE 3-5: DISTRIBUTION RANGE OF TALL BLUEBELL (*WAHLENBERGIA STRICTA*)

Source: ALA (2024)

3.2.2.3 DISTRIBUTION IN RELATION TO PROJECT

Tall bluebell is assessed as known to occur within the Project footprint as a result of direct records during field investigations.

There are no database records of the species within the Project footprint. The nearest record is located in Bringalily State Forest, approximately 2 km east of the Project footprint between Inglewood and Millmerran and was recorded in 2006. There are several records of the species to the north of the Project footprint, in Westbrook (2000 and 2017); Oakey (2017); north of Cecil Plains (2022); near Crows Nest (2000); in Deangwar State Forest (1958) north and south-west of Highfields (both recorded in 2024); near Helidon (2022); north-west of Harlaxton (2005); and in Lockyer National Park (2012) (refer to Plate 3-6). Within 50 km of the southern portion of the footprint, records occur in Texas (2001 and 2020); Boggabilla and south of Boggabilla (1986); Whetstone State Forest (2009); Bendidee State Forest (2022); and in Western Creek State Forest (2023).

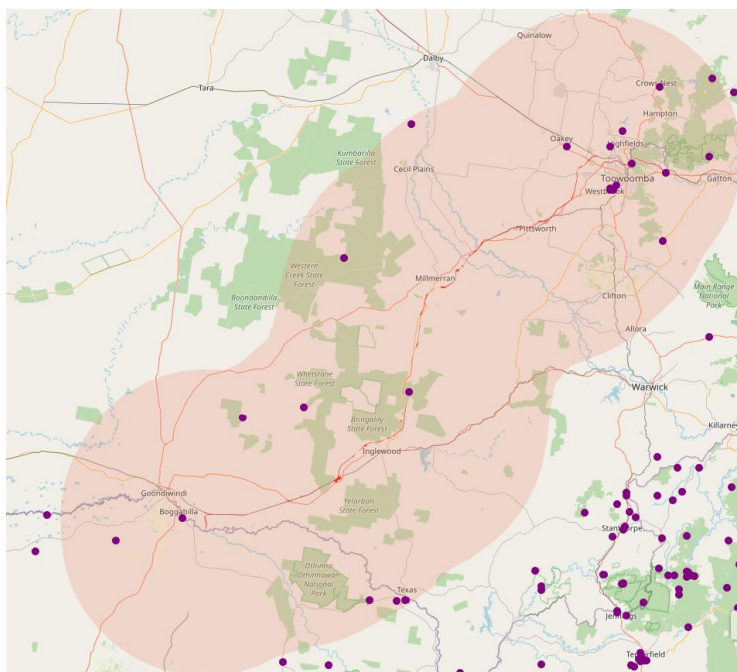


PLATE 3-6: DISTRIBUTION RANGE OF TALL BLUEBELL (*WAHLENBERGIA STRICTA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

3.2.2.4 BIOLOGY AND REPRODUCTION

Tall bluebell produces flowers between August and January.

3.2.3 HABITAT

Tall bluebell grows on shallow stony soils on hillslopes, and loams and clay loams in open woodlands and grasslands. The species has also been recorded on roadsides.

3.2.4 THREATENING PROCESSES

Threats to tall bluebell are currently unknown.

3.2.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to tall bluebell.

3.2.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Wahlenbergia stricta*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2896294#overview> [Accessed 1 February 2024].

Ecolinc. No date. Tall bluebell. Available from: <https://grasslands.ecolinc.vic.edu.au/fieldguide/flora/tall-bluebell#details> [Accessed 1 February 2024].

3.3 CRINUM LILY (*CRINUM ARENARIUM*)

3.3.1 STATUS

Crinum lily (*Crinum arenarium*) is currently listed as Special Least Concern under the NC Act and is not listed under the EPBC Act.

3.3.2 BIOLOGY AND ECOLOGY

3.3.2.1 CHARACTERISTIC

Crinum lily is a large, bulbous herb reaching approximately 2 m in height. The species features white, elongated leaves with smooth to wavy leaf margins. The species produces flowers with long sepals and the petals are produced in clusters of 10 – 50 (refer to Plate 3-3).



PLATE 3-7: CRINUM LILY (*CRINUM ARENARIUM*)

Source: ALA (2024)

3.3.2.2 KNOWN DISTRIBUTION

Crinum lily is widely distributed from the Kimberley region in Western Australia, east to Northern Territory and Cape York in Queensland, and south to northern New South Wales (refer to Plate 3-8).

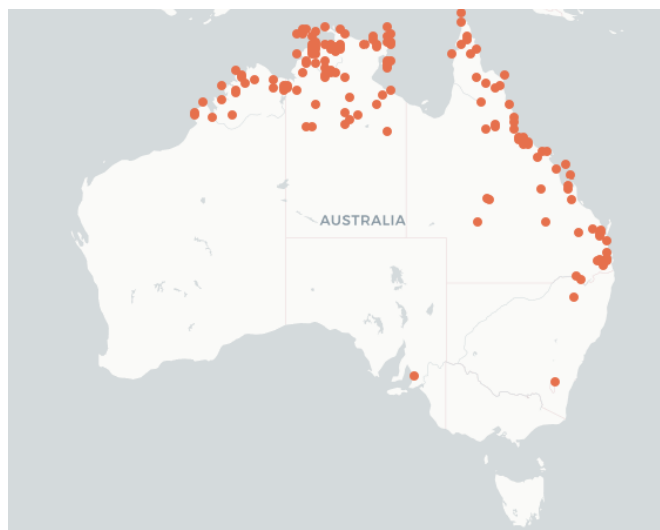


PLATE 3-8: DISTRIBUTION RANGE OF CRINUM LILY (*CRINUM ARENARIUM*)

Source: ALA (2024)

3.3.2.3 DISTRIBUTION IN RELATION TO PROJECT

Crinum lily is assessed as known to occur within the Project footprint due to direct records during field investigations.

There are no records of the species within the Project footprint. The nearest record is located along the Cunningham Highway near Yelarbon, within 1 km of the Project footprint, and was recorded in 2018 (refer to Plate 3-9). There is one additional record within 50 km of the Project footprint, recorded along the Texas-Yelarbon Road in 1995.

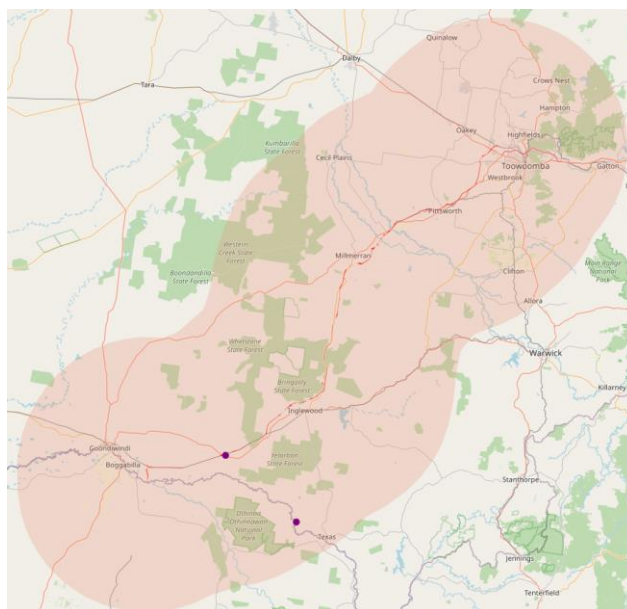


PLATE 3-9: DISTRIBUTION RANGE OF CRINUM LILY (*CRINUM ARENARIUM*) IN RELATION TO THE PROJECT

Source: ALA (2024)

3.3.2.4 BIOLOGY AND REPRODUCTION

There is limited information available regarding the biology and reproduction of *Crinum lily*.

3.3.3 HABITAT

Crinum lily grows in riverine and riparian forests, littoral rainforest and within beach scrub.

3.3.4 THREATENING PROCESSES

Threats to *crinum lily* are currently unknown.

3.3.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to *Crinum lily*.

3.3.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Crinum arenarium*. Available from:

<https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/6890787#overview> [Accessed 1 February 2024].

3.4 PINK FINGERS (*CALADENIA CARNEA*)

3.4.1 STATUS

Pink fingers (*Caladenia carnea*) is currently listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

3.4.2 BIOLOGY AND ECOLOGY

3.4.2.1 CHARACTERISTIC

Pink fingers is a perennial herb with an underground tuber and a single hairy, narrow linear leaf, approximately 90 – 150 mm long and 3 – 4 mm wide (ALA, 2024). The inflorescence is a raceme with 1 – 5 flowers and is approximately 120 – 150 mm tall. The species produces musky and occasionally sweet scented, pinkish-white flowers, with petals which are 8 – 15 mm long (ALA, 2024) (refer to Plate 3-4). The outer surface of the petals are covered with glandular hairs, and greenish-pink in colouration, sometimes striped; whilst the inner surface is pinkish or greenish white. The dorsal sepal is erect, 10 – 15 mm long and 2-4 mm wide; the labellum is egg-shaped, 5 – 8 mm long and wide, featuring white or pinkish colouration and prominent red stripes (ALA, 2024).



PLATE 3-10: PINK FINGERS (*CALADENIA CARNEA*)

Source: ALA (2024)

3.4.2.2 KNOWN DISTRIBUTION

Pink fingers is widely distributed along eastern Australia, from Hervey Bay (Queensland), along eastern New South Wales, majority of Victoria (excluding the alps and far north west of the state) and to south-eastern South Australia (refer to Plate 3-11) (ALA, 2024). The species also occurs in Tasmania.

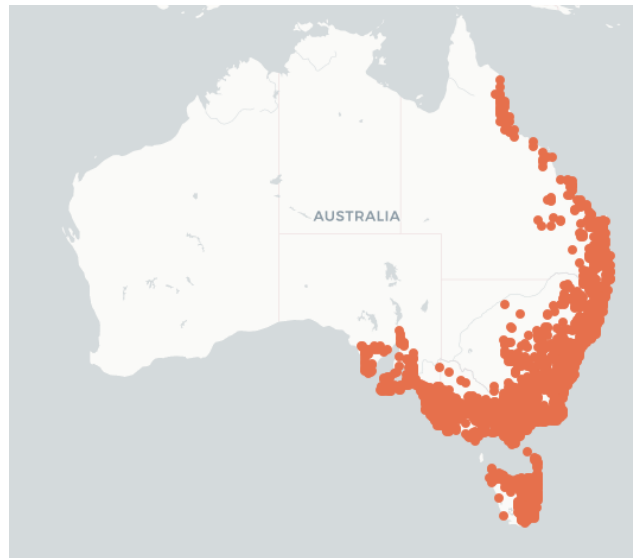


PLATE 3-11: DISTRIBUTION RANGE OF PINK FINGERS (*CALADENIA CARNEA*)

Source: ALA (2024)

3.4.2.3 DISTRIBUTION IN RELATION TO PROJECT

Pink fingers is assessed as known to occur within the Project footprint through direct sightings during field investigations.

There are no database records of the species within the Project footprint. The nearest record is located along Mallen Road, approximately 8 km east of the Project footprint between Inglewood and Millmerran and was recorded in 1912 (refer to Plate 3-12). Within 50 km of the Project footprint there are multiple records within the Toowoomba region, including in Westbrook (2000), Lockyer National Park (2022), Crows Nest National Park (1992), between Cabarlah and Hampton (2022), east of Blue Mountain Heights (1996) and between Middle Ridge and Gatton (1978 – 2021). There is an additional record south of Durikai State Forest, recorded in 2021.

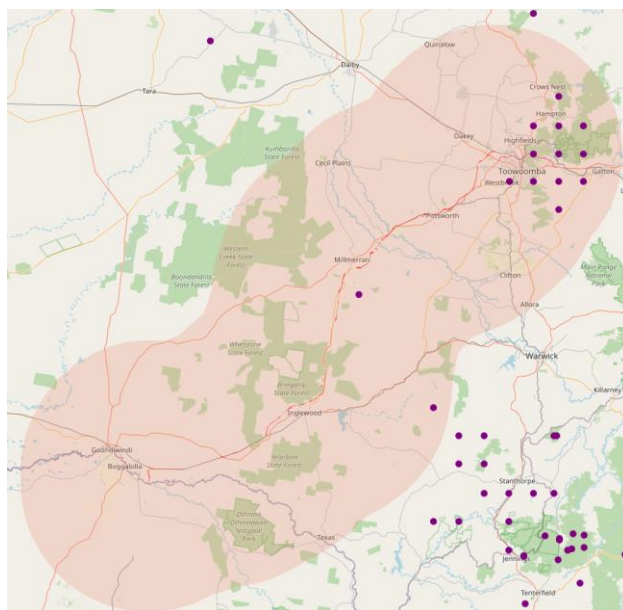


PLATE 3-12: DISTRIBUTION RANGE OF PINK FINGERS (*CALADENIA CARNEA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

3.4.2.4 BIOLOGY AND REPRODUCTION

Pink fingers produces flowers between August and November and is followed by a non-fleshy, dehiscent capsule containing multiple seeds (ALA, 2024).

3.4.3 HABITAT

Pink fingers grows in a wide range of habitats including heath, scrubland, woodland and forests, and is known to favour well-drained soils.

3.4.4 THREATENING PROCESSES

Threatening processes to pink fingers include:

- Land clearing;
- Overgrazing by cattle and rabbits; and
- Competition from invasive weed species.

3.4.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant for pink fingers.

3.4.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Caladenia carnea*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/taxon/apni/51398879#overview> [Accessed 1 February 2024].

3.5 SPRAWLING BLUEBELL (*WAHLENBERGIA GRACILIS*)

3.5.1 STATUS

Sprawling bluebell (*Wahlenbergia gracilis*) is currently listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

3.5.2 BIOLOGY AND ECOLOGY

3.5.2.1 CHARACTERISTIC

Sprawling bluebell is a perennial forb growing approximately 80 cm tall. The leaves are alternating up the stems, approximately 0.2 – 6 cm long and 0.2 – 10 mm wide, flat to linear up the stem and hairless (Lucidcentral, n.d). The lower leaves are sparsely hairy, the edges entire or occasionally with small teeth and wavy. The species produces blue flowers, which may be pink or white on occasion which are tubular with 5 lobes (Lucidcentral, n.d) (refer to Plate 3-5).



PLATE 3-13: SPRAWLING BLUEBELL (*WAHLENBERGIA GRACILIS*)

Source: ALA (2024)

3.5.2.2 KNOWN DISTRIBUTION

Sprawling bluebell is naturally distributed across all states in Australia, with the exception of the Northern Territory; however ALA records in Plate 3-14 suggests otherwise. The species is most prominent in Victoria and New South Wales. In Queensland, the species has been recorded from Cape York, south to the Queensland/New South Wales border and west to the Queensland/Northern Territory border.

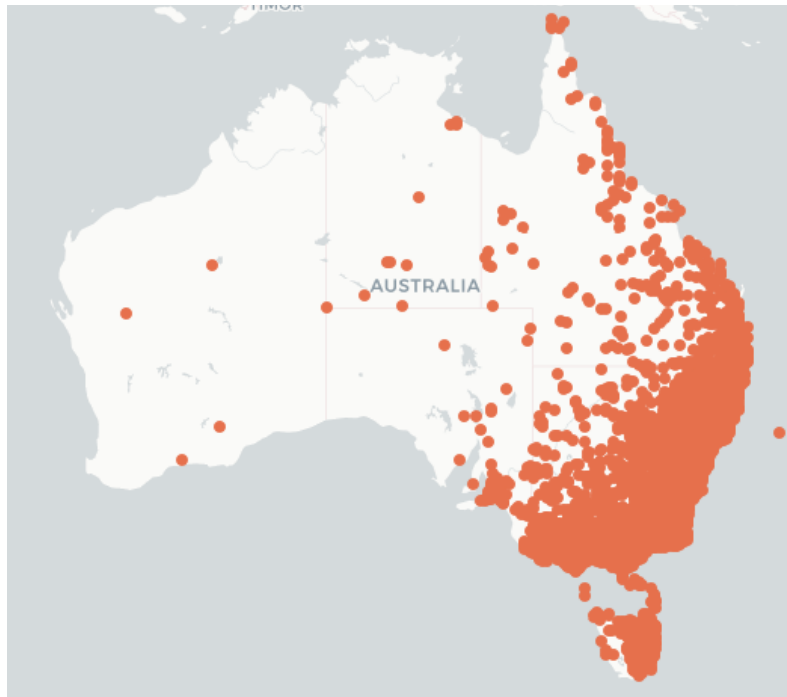


PLATE 3-14: DISTRIBUTION RANGE OF SPRAWLING BLUEBELL (*WAHLENBERGIA GRACILIS*)

Source: ALA (2024)

3.5.2.3 DISTRIBUTION IN RELATION TO PROJECT

Sprawling bluebell is assessed as known to occur within the Project footprint as a result of direct records during field investigations.

There are no database records of the species within the Project footprint. There are three records of the species within 1 km of the Project footprint in Yelarbon, recorded in 1983 and 2006 (refer to Plate 3-15). There are scattered records of the species within 50 km of the Project footprint, including in Toowoomba, east to Gatton and south-east to Clifton; there are records near Oakey, Cecil Plains, Millmerran, Allora, Inglewood, Texas, and Boggabilla (all recorded between 1974 – 2024).

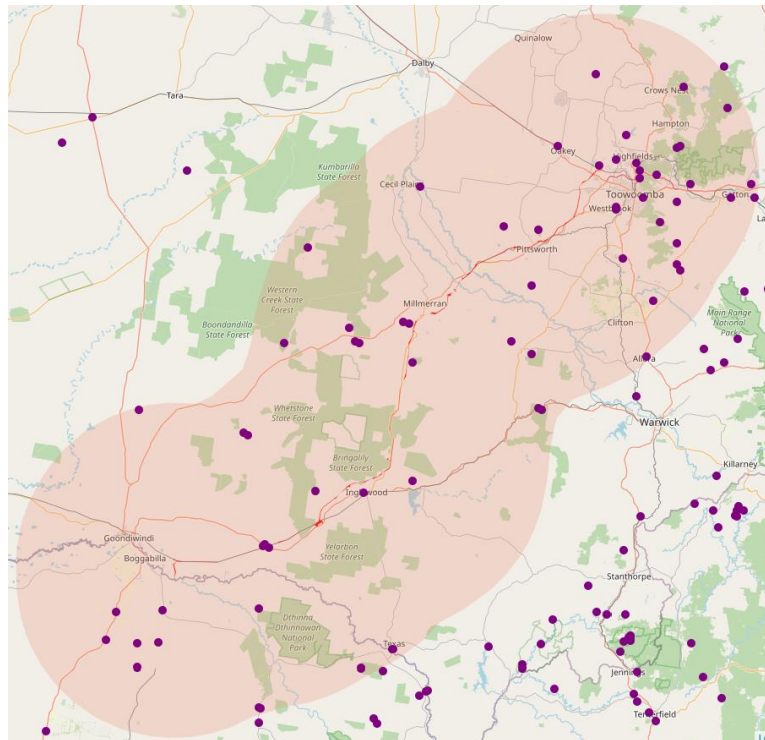


PLATE 3-15: DISTRIBUTION RANGE OF SPRAWLING BLUEBELL (*WAHLENBERGIA GRACILIS*) IN RELATION TO THE PROJECT

Source: ALA (2024)

3.5.2.4 BIOLOGY AND REPRODUCTION

Sprawling bluebell produces flowers from January to February.

3.5.3 HABITAT

Sprawling bluebell has been recorded growing in grassland and along roadsides.

3.5.4 THREATENING PROCESSES

Threats to sprawling bluebell are currently unknown.

3.5.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to sprawling bluebell.

3.5.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Wahlenbergia gracilis*. Available from: <https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2912378> [Accessed 1 February 2024].

Lucidcentral. No date. *Wahlenbergia gracilis*. Available from: https://keys.lucidcentral.org/keys/v3/scotia/key/Plants%20and%20Fungi%20of%20south%20western%20NSW/Media/Html/Wahlenbergia_gracilis.htm [Accessed 1 February 2024].

3.6 TUFTED BLUEBELL (*WAHLENBERGIA COMMUNIS*) (SYN. *W. CAPILLARIS*)

3.6.1 STATUS

Tufted bluebell (*Wahlenbergia capillaris*; formerly *W. communis*) is currently listed as Special Least Concern under the NC Act and is not listed under the EPBC Act.

3.6.2 BIOLOGY AND ECOLOGY

3.6.2.1 CHARACTERISTIC

Tufted bluebell is a perennial herb growing approximately 50 cm tall. The species has a thickened taproot and thin erect branched stems; linear leaves, approximately 4 – 50 mm long and 0.5 – 6 mm wide, and often with teeth along the leaf's edge (ALA, 2024). The species produces blue flowers with 5 petals each and narrow triangular lobes, approximately 2 – 6 mm long (Plate 3-6). Petals are joined at the base, forming a narrow bell-shaped tube (4 – 9 mm long), with elliptic/egg-shaped lobes (6 – 15 mm long, 2.5 – 6 mm wide); the style features three lobes on the end and is 4.5 – 9.5 mm long; whilst the capsule is oval or cone-shaped, 4 – 9 mm long and 1.5 – 5 mm wide (ALA, 2024).



PLATE 3-16: TUFTED BLUEBELL (*WAHLENBERGIA COMMUNIS*)

Source: ALA (2024)

3.6.2.2 KNOWN DISTRIBUTION

Tufted bluebell is widespread throughout all states and territories in Australia, however it is most prominent in Victoria and New South Wales (refer to Plate 3-17) (ALA, 2024).

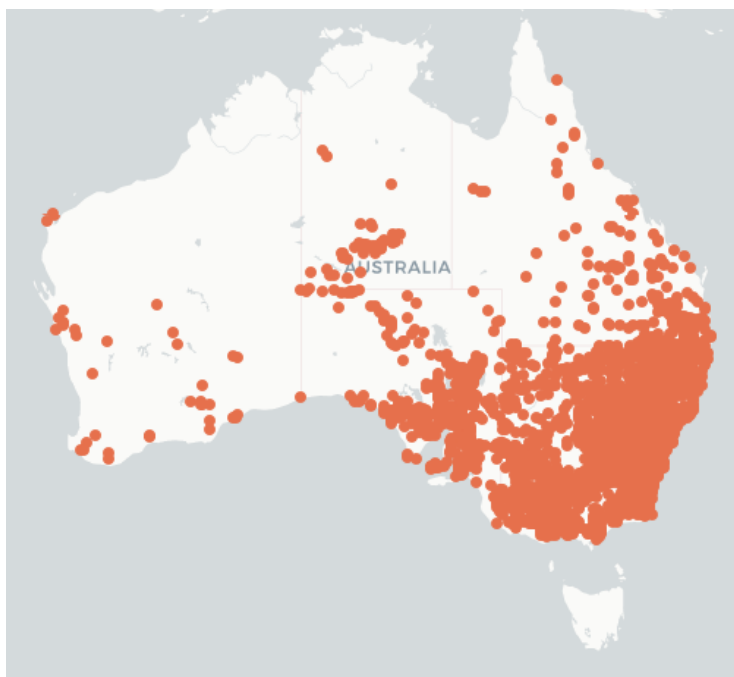


PLATE 3-17: DISTRIBUTION RANGE OF TUFTED BLUEBELL (*WAHLENBERGIA COMMUNIS*)

Source: ALA (2024)

3.6.2.3 DISTRIBUTION IN RELATION TO PROJECT

Tufted bluebell is assessed as known to occur within the Project footprint as a result of direct records during field investigations. The species was recorded as *Wahlenbergia communis* at one location near Inglewood.

There are no database records of the species within the Project footprint. The nearest records are located along Tucka Tucka Road, approximately 0.6 km south of the Project footprint (2018); along Millmerran-Inglewood Road, approximately 1.8 km east of the Project footprint (2005); and 2 records south of Millmerran, approximately 1.6 km west of the Project footprint (2014 and 2020) (refer to Plate 3-18). Additionally, there is one record at the junction of the Gore Highway and Millmerran Leyburn Road (2010) and one record in close proximity to McIntosh Road (2003). There are several other records of the species within 50 km of the Project footprint, including in/near Toowoomba, south of Toowoomba, Oakey, Cecil Plains, Helidon and Dthinna Dthinnawan National Park (all recorded between 1963 – 2021).

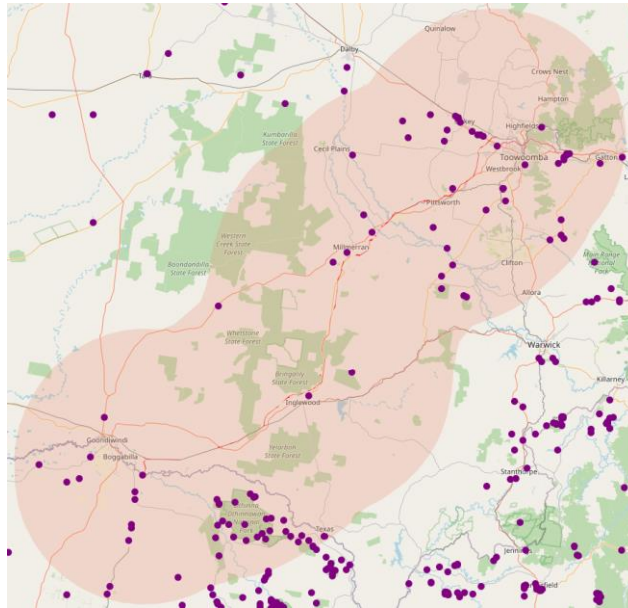


PLATE 3-18: DISTRIBUTION RANGE OF TUFTED BLUEBELL (*WAHLENBERGIA COMMUNIS*)
IN RELATION TO THE PROJECT

Source: ALA (2024)

3.6.2.4 BIOLOGY AND REPRODUCTION

Tufted bluebell produces flowers between October and March (ALA, 2024).

3.6.3 HABITAT

Tufted bluebell most commonly grows in disturbed areas and along roadsides (ALA, 2024).

3.6.4 THREATENING PROCESSES

Threats to tufted bluebell are currently unknown.

3.6.5 THREAT ABATEMENT/RECOVERY PLANS

There is no adopted or made recovery plan or threat abatement plan relevant to tufted bluebell.

3.6.6 REFERENCES

Atlas of Living Australia (ALA). 2024. *Wahlenbergia capillaris*. Available from:

<https://bie.ala.org.au/species/https://id.biodiversity.org.au/taxon/apni/51269908#overview> [Accessed 1 February 2024].

4. FAUNA SPECIES – THREATENED REPTILES

4.1 COMMON DEATH ADDER (*ACANTHOPHIS ANTARCTICUS*)

4.1.1 STATUS

Common death adder (*Acanthophis antarcticus*) is listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

4.1.2 BIOLOGY AND ECOLOGY

4.1.2.1 CHARACTERISTIC

The common death adder has a short, stout body and is sexually dimorphic. Males average at 44 cm in length, and females averaging at 58 cm but may grow up to 100 cm long. Like other members of the genus, it has a large, triangular head with small and inconspicuous eyes. The body colouration varies and tends to be blackish to grey to rich reddish-brown and is marked with irregular dark-edged cross-bands (refer to Plate 4-1). The underside is whitish with black or brown flecks. The thin rat-like tail ends in a curved, soft spine with a cream or black tip which has been observed to be wriggled to lure prey within striking range (DES 2022).



PLATE 4-1: COMMON DEATH ADDER (*ACANTHOPHIS ANTARCTICUS*)

Source: Hay (2015)

4.1.2.2 KNOWN DISTRIBUTION

The common death adder occurs from Darwin in the Northern Territory, to central and eastern Queensland and New South Wales, and through to the southern parts of South Australia and Western Australia (DES 2022) (refer to Plate 4-2).

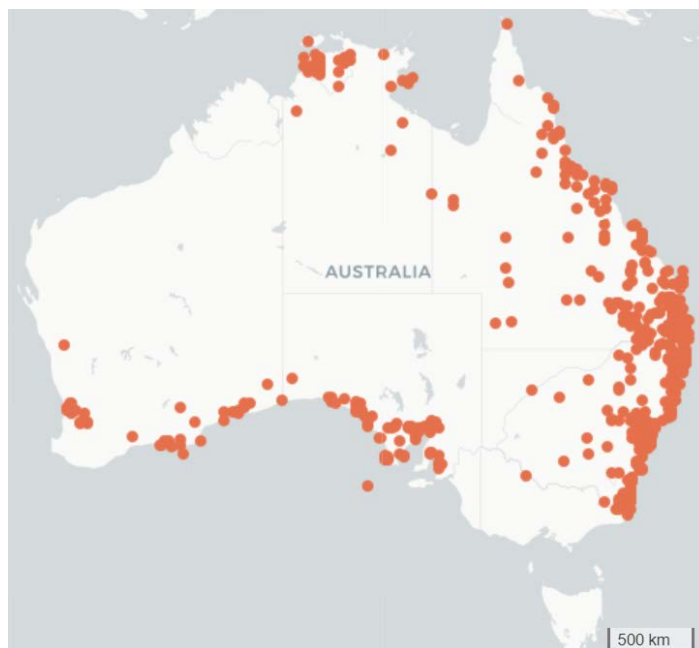


PLATE 4-2: DISTRIBUTION RANGE OF THE COMMON DEATH ADDER (*ACANTHOPHIS ANTARCTICUS*)

Source: ALA (2024)

4.1.2.3 DISTRIBUTION IN RELATION TO PROJECT

Common death adder is assessed as likely to occur within the Project footprint, as habitat has been identified within the Study Area. No individuals were detected during targeted surveys in the Project footprint, however recent supplementary surveys by USQ recorded road-killed individuals in Bringalily State Forest.

Database records as recent as 2022 were identified within the 50 km buffer zone, mostly around Inglewood and the surrounding State Forests of Yelarbon, Whetstone and Bringalily (refer to Plate 4-3).

No individuals were detected during targeted surveys in the Project footprint, however recent supplementary surveys by USQ (2023) have recorded six specimens, including two within the Project footprint.

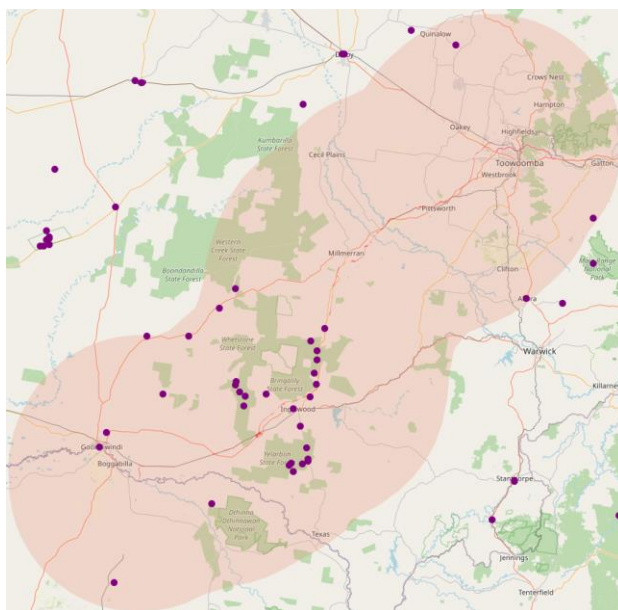


PLATE 4-3: DISTRIBUTION RANGE OF THE COMMON DEATH ADDER (*ACANTHOPHIS ANTARCTICUS*) IN RELATION TO THE PROJECT

Source: ALA (2024)

4.1.2.4 BIOLOGY AND REPRODUCTION

The common death adder is active both day and night, with cryptic colouration to avoid detection. When threatened this species flattens its entire body into a rigid, curved coil as a defensive posture, allowing it to make short, rapid strikes (DES, 2022). Unlike most venomous snakes in Australia, the common death adder is an ambush predator, burrowing into loose sand or covering itself with foliage or leaf litter and using the tip of its tail to mimic the movement of a worm to lure prey within striking range. While lying in wait the body is coiled with the tail tip close to the mouth. The venom of the common death adder contains a highly toxic neurotoxin. The diet of this species consists primarily of lizards, small mammals, birds, and frogs. However, this diet is not consistent throughout an individual's life. Juveniles have been observed primarily feeding on smaller prey such as lizards and frogs, while adults are able to consume small mammals and birds (Mahony, 2020; DES, 2022).

Males reach sexual maturity at 24 months and females at 42 months. Mating usually occurs in spring, however females reproduce only every second year. Common death adders give birth to live young in litters of 10 to 20, but can be up to 24. Typically, young are born in February or March (Mahony, 2020; DES, 2022).

4.1.3 HABITAT DESCRIPTION AND DEFINITION

The common death adder is known to occur in fragmented populations in the Mitchell Grass Downs of western Queensland, the Barkly Tableland on the Northern Territory / Queensland border and east of Darwin in the Northern Territory. However, the exact distribution of this species is unknown.

This species inhabits forests and woodlands, grasslands and heathland environments. Deep leaf litter, ground cover or woody debris provide cover when hunting. When based on suitable habitat for the species, the species distribution ranges from Western Queensland, the Northern Territory to north-eastern Western Australia. The common death adder inhabits pastoral

leases, national parks, Indigenous land and military land. Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 4-1 and is presented in Figure 4-1

TABLE 4-1 HABITAT CRITERIA FOR COMMON DEATH ADDER WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Suitable habitat	Forests, woodlands, shrublands and grasslands on well-draining soils with leaf litter present, particularly when undisturbed.	11.3.1 11.3.2 11.3.14 11.3.17 11.3.18 11.3.21 11.3.24 11.3.25 11.3.27i 11.3.4 11.4.3 11.4.10 11.5.1 11.5.1a 11.5.4 11.5.14 11.5.20 11.7.4 11.7.5 11.7.7 11.8.3 11.8.4 11.8.5 11.8.11 11.9.5 11.9.7 11.9.9a 11.9.10	Forests, woodlands, shrublands and grasslands. Requires well-draining soils (sandy and loamy) and common to abundant undisturbed leaf litter. Areas mapped as Essential Habitat.
Not suitable habitat	Areas with clay soils and absent to scattered leaf litter. Areas with a disturbed ground layer, particularly when degraded by grazing. Wetlands.	11.3.27 11.3.27b	Areas not mapped as habitat. Wetlands, areas with clay soils and absent to scattered leaf litter. Areas with a disturbed ground layer (i.e. grazed areas). Areas outside the species modelled distribution.

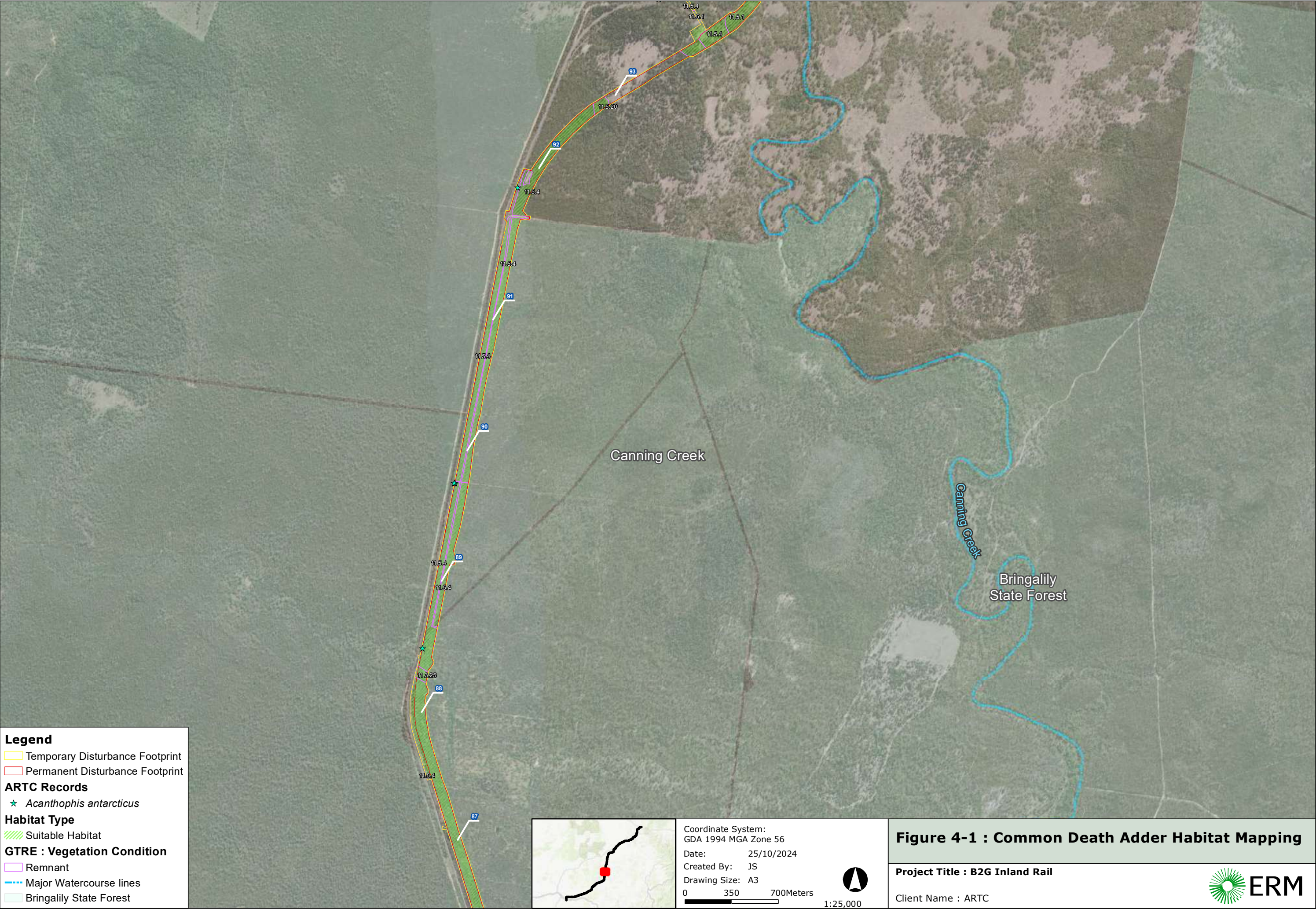












Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

ARTC Records

★ *Acanthopis antarcticus*

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Remnant

Major Watercourse lines

Bringalily State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



Figure 4-1 : Common Death Adder Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





4.1.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the common death adder:

- Road kills;
- Inappropriate grazing and fire regimes;
- Trampling by livestock;
- Predation by feral cats (*Felis catus*), red foxes (*Vulpes vulpes*) and pigs (*Sus scrofa*);
- Deliberate killings of snakes by humans;
- Death by taking poisoned rodents (e.g., house mouse - *Mus musculus*);
- Poisoning by cane toads (*Rhinella marina*); and
- Clearing of vegetation, including loss of habitat through coastal development (DES, 2022).

4.1.5 THREAT ABATEMENT/RECOVERY PLANS

No threat abatement/recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats (DoE, 2015);
- Threat abatement plan for predation by the European red fox (DEWHA, 2008);
- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (DoEE, 2017); and
- Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPC, 2011).

4.1.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

Threats identified in the Threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Competition for food with species they share dietary overlap.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the Threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Competition for food with species they share dietary overlap.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;

- Barriers;
- Habitat management; and
- Shooting and bounties.

Threats identified in the Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs include:

- Impacts to plant species composition and succession;
- Impacts to nutrient and water cycles, and water quality, especially in warmer areas where they are restricted to the vicinity of watercourses and floodplains;
- Alteration of soil structure through digging and rooting;
- Competition for food with species they share dietary overlap.

Threat abatement actions for feral pigs include:

- Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management;
- Integrate of feral pig management into land management activities;
- Encourage further scientific research into feral pig impacts on nationally threatened species and ecological communities, and feral pig ecology and control;
- Record, monitor and evaluate feral pig control programs;
- Build capacity for feral pig management;
- Improve public awareness about feral pigs.

Threats identified in the Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads include:

- Lethal toxic poisoning through ingestion of cane toad;
- Larval competition with frog tadpoles; and
- Competition for shelter sites.

Threat abatement actions for cane toads include:

- Identify priority native species and ecological communities under threat;
- Reduce the impacts of cane toads on populations of priority native species and ecological communities; and
- Communicate information about cane toads, their impacts and the threat abatement plan to the wider community.

4.1.7 REFERENCES

Atlas of Living Australia (ALA). 2024. *Acanthophis antarcticus*. Available from:

<https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:25b1747b-a67b-4603-9d13-e98da9a0122e#overview> [Accessed 17 January 2024].

Department of Environment and Science (DES). 2022. Common death adder. Available from:

https://www.ehp.qld.gov.au/wildlife/animals-az/common_death_adder.html [Accessed 17 January 2024].

- Department of the Environment (DoE) (2015). Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats>. In effect under the EPBC Act from 23 July 2015.
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Threat abatement plan for predation by the European red fox. DEWHA, Canberra. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/predation-european-red-fox>. In effect under the EPBC Act from 01-Oct-2008.
- Department of the Environment and Energy (2017). Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*). Commonwealth of Australia. Available from: <https://www.dcceew.gov.au/sites/default/files/documents/tap-feral-pigs-2017.pdf>. Revised plan in effect under the EPBC Act from 2017.
- Department of Sustainability, Environment, Water, Population and Communities (2011). Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads. Canberra, ACT: Commonwealth of Australia. Available from: <https://www.dcceew.gov.au/sites/default/files/documents/tap-cane-toads.pdf>
- Hay, C. 2015. *Acanthophis antarcticus* (Image) [Online] Available from: <https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:2a5645ea-e3af-4810-9f6e-c84279cca737#gallery> [Accessed 3 September 2018].
- Mahony, S. 2020. Common Death Adder - Scientific name: *Acanthophis antarcticus*. Available from: <https://australian.museum/learn/animals/reptiles/common-death-adder/> [Accessed 17 January 2024].

4.2 GREY SNAKE (*HEMIASPIS DAMELII*)

4.2.1 STATUS

Grey snake (*Hemiaspis damelii*) is listed as Endangered under the NC Act and Endangered (effective 05/10/2022) under the EPBC Act.

4.2.2 BIOLOGY AND ECOLOGY

4.2.2.1 CHARACTERISTIC

The grey snake is a relatively small venomous snake, with large eyes and a snout to vent length of 42 to 60 cm (ALA, 2024; Rowland, 2012). There is a minor size difference between males and females, with males being larger (ALA, 2024). Scales are smooth and the body colour of this snake is a uniform pale, dark or olive grey (refer to Plate 4-2). The underside is white, cream or pale yellow, often with dark flecks and visible black skin between scales. In juveniles, the top of the head and few scales of the nape of neck are black. This is either a small crescent, a narrow bar or absent in adults (DCCEEW, 2022; Rowland, 2012).



PLATE 4-4: GREY SNAKE (*HEMIASPIS DAMELII*)

Source: ALA (2024)

4.2.2.2 KNOWN DISTRIBUTION

This species occurs as a series of fragmented subpopulations throughout New South Wales and Queensland (refer to Plate 4-5). In Queensland, the grey snake has a broader and more dispersed distribution, with most records along the Macintyre and Condamine Rivers and associated floodplains of the southern Brigalow Belt from Goondiwindi and Dalby west to Glenmorgan, on the Darling Downs and western Lockyer Valley, near Rockhampton on the central Queensland coast, and on the Darling Riverine Plains near Currawinya in south-western Queensland (DCCEEW, 2022).

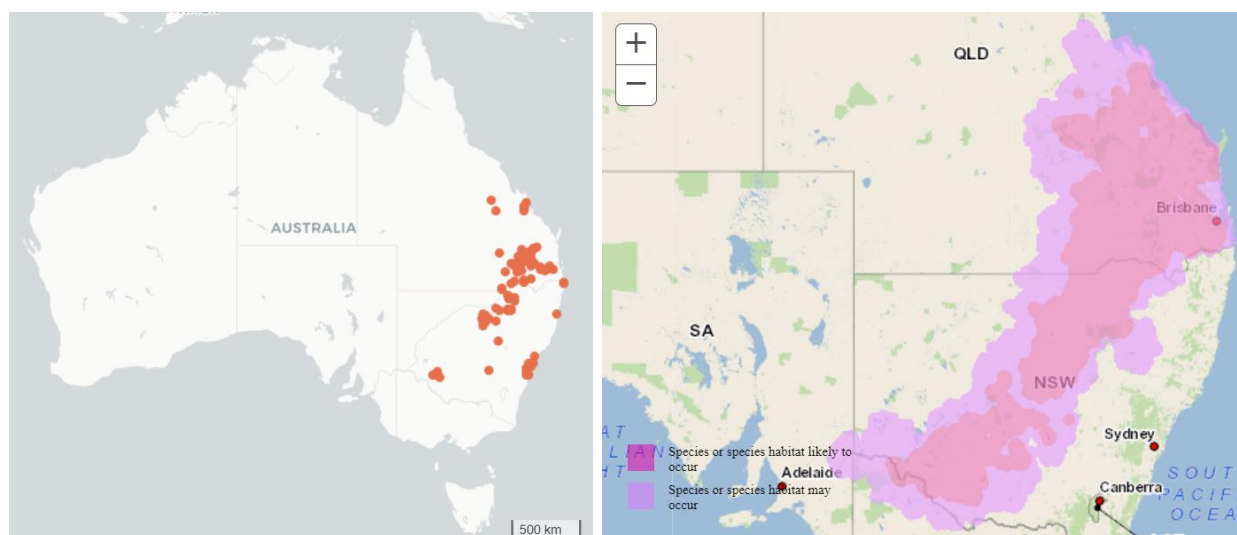


PLATE 4-5: DISTRIBUTION RANGE OF THE GREY SNAKE (*HEMIASPIS DAMELII*)

Source: ALA (2024); DoE (2024).

4.2.2.3 DISTRIBUTION IN RELATION TO PROJECT

The grey snake is assessed as known to occur within the Project footprint, due to the presence of suitable habitat and the species was recorded during targeted surveys.

The most recent database record (i.e. ALA and WildNet) is from 2024, in Wondul Range National Park. Additionally, twelve historic records were identified within the 50 km buffer zone, between 1900 and 2009. Four records are located near Goondiwindi, around the Bendidee State Forest and Kerimbilla State Forest. The remaining eight records are located near Toowoomba, Oakey, regions west of Oakey and Gatton (refer to Plate 4-6). However, it is likely that additional species records exist that are not present on either of the ALA and WildNet databases (DCCEEW, 2022).

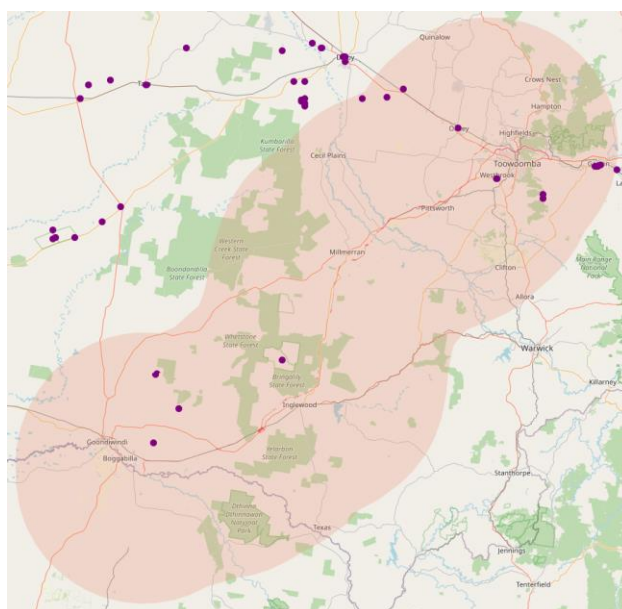


PLATE 4-6: DISTRIBUTION RANGE OF THE GREY SNAKE (*HEMIASPIS DAMELII*) IN RELATION TO THE PROJECT

Source: ALA (2024)

4.2.2.4 BIOLOGY AND REPRODUCTION

The grey snake predominantly feeds on ground dwelling frogs, although two arboreal frogs (*Litoria fallax* and *L. gracilentia*) have also been identified as prey items. Lizards are conspicuously absent from the known diet, possibly due to the locations and times at which they forage so they do not encounter lizards, or they do encounter lizards and are unable to capture them (DCCEEW, 2022). Grey snakes are nocturnal, and forage for 1 to 2 hours after sunset (ALA, 2024). They forage during warm weather in floodplains within soil cracks, beneath vegetation or in the open, especially after heavy rain when soil cracks are inundated (DCCEEW, 2022). During the day they can be found sheltering under rocks, logs and flood debris, as well as in soil cracks or abandoned burrows within these moist/seasonally inundated habitats (Rowland, 2012).

Grey snakes are viviparous and give birth to live young in clutches of between 4 and 16 young. The breeding season is in spring, and juveniles are born between January and March at approximately 140 mm in length. Males mature at seven months, while females mature at 12 months of age (ALA, 2024; DCCEEW, 2022).

There is no information available in the literature about the home range or dispersal of this species, largely due to the low detectability of the species. Given that it is a small species, and it is strongly affiliated with discrete wetlands, it is likely that the grey snake has limited dispersal ability and is restricted to the local area of the floodplain where the individual was sighted (DCCEEW, 2022).

4.2.3 HABITAT DESCRIPTION AND DEFINITION

In Queensland, grey snakes are broadly distributed, with most records detected along the Macintyre and Condamine Rivers and associated floodplains of the southern Brigalow Belt region. The species is most commonly detected in areas from 70 m above sea level to 540 m above sea level. The railway alignment is located within the species distribution of modelled habitat likely to occur and may occur (as per the modelled habitat on the species SPRAT profile (DoE 2023)).

Within their Queensland distribution, grey snakes inhabit brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*) woodlands on dark brown to black cracking clay soil particularly in association with water bodies, areas with small gullies and ditches, and floodplain environments where the species shelters beneath logs, rocks and soil cracks (Rowland, 2012). Additionally, the species is commonly found in Queensland bluegrass (*Dichanthium sericeum*) and/or Mitchell grass (*Astrebla* spp.) grasslands on alluvial plains with cracking clay soils, and red sodosol soils on the western downs of Queensland. Habitats in close association with waterbodies, particularly ephemeral wetlands and floodplains, with microhabitat including cracks, rocks, logs, flood debris and abandoned burrows.

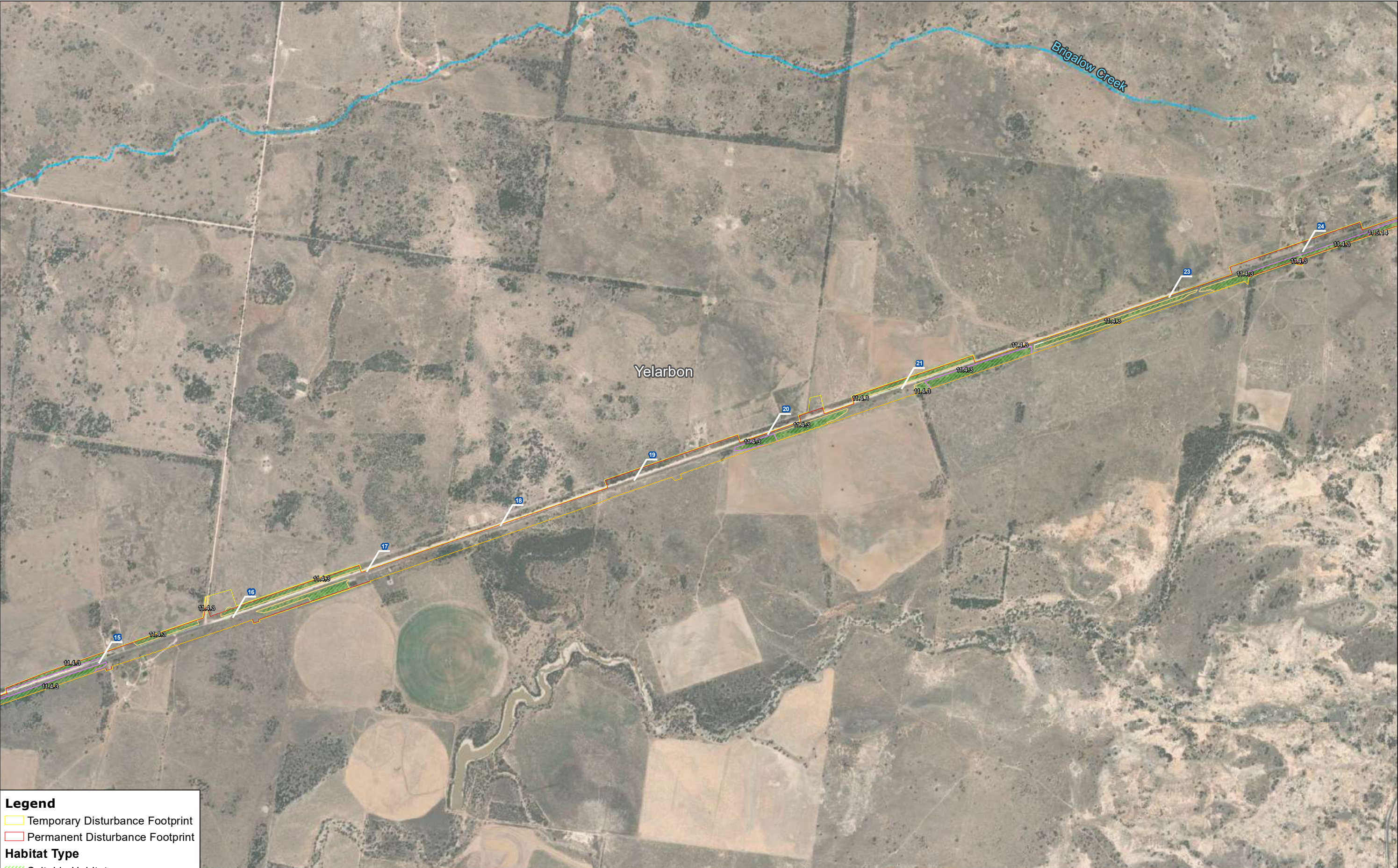
As per the species conservation advice, there is no information available on the dispersal ability of the species, and as such, only suitable habitat and not suitable habitat are defined in Table 4-2. Habitat mapping for this species within the Project footprint is presented in Figure 4-2.

TABLE 4-2 HABITAT CRITERIA FOR GREY SNAKE WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Suitable habitat	General habitat comprises brigalow and belah woodlands, Queensland bluegrass and Mitchell grass grasslands on alluvial plains with cracking clay soils and red sodosols, and adjacent ephemeral wetlands and other waterbodies. This species has also been found in <i>Melaleuca</i> and <i>Eucalyptus</i> woodlands in the eastern extent of range. The species forages for frogs in and around temporary water bodies, including small gullies and ditches, ephemeral wetlands, and floodplains. Uses soil cracks and crevices for cover when hunting. Key attributes of grey snake habitat are the floodplains and ephemeral wetlands.	11.3.1 11.3.2 11.3.4 11.3.14 11.3.17 11.3.18 11.3.21 11.3.25 11.3.27 11.3.27i 11.4.3 11.4.10 11.5.1 11.5.1a 11.5.4 11.5.14 11.5.20 11.7.4 11.7.7 11.8.4 11.8.5 11.8.11 11.9.5 11.9.7 11.9.9a 11.9.10	Larger contiguous areas of brigalow, belah, <i>Melaleuca</i> and <i>Eucalyptus</i> woodlands, Queensland bluegrass and Mitchell grass grasslands on cracking clay soils and red sodosols, within the species modelled distribution. Temporary water bodies, including small gullies and ditches, ephemeral wetlands, and floodplains, where soil cracks and crevices are present, within the species modelled distribution.
Not suitable habitat	Other vegetation types adjacent to wetlands. Habitats where waterbodies, cracking clay soils and red sodosols are absent.	11.3.24 11.3.27b 11.7.5 11.8.3	Areas not mapped as suitable habitat, including areas where waterbodies, cracking clay soils and red sodosols are absent. Areas outside the species modelled distribution.







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Non Remnant

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



Figure 4-2 : Grey Snake Habitat Mapping

Project Title : B2G Inland Rail

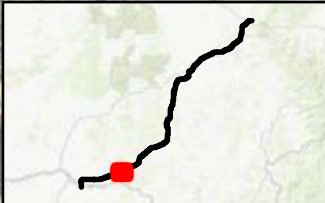
Client Name : ARTC





Legend

- Temporary Disturbance Footprint
- Permanent Disturbance Footprint
- ARTC Records**
- ★ *Hemiaspis damelii*
- Habitat Type**
- Suitable Habitat
- GTRE : Vegetation Condition**
- Non Remnant
- Regrowth
- Remnant
- Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56
Date: 25/10/2024
Created By: JS
Drawing Size: A3
0 350 700Meters

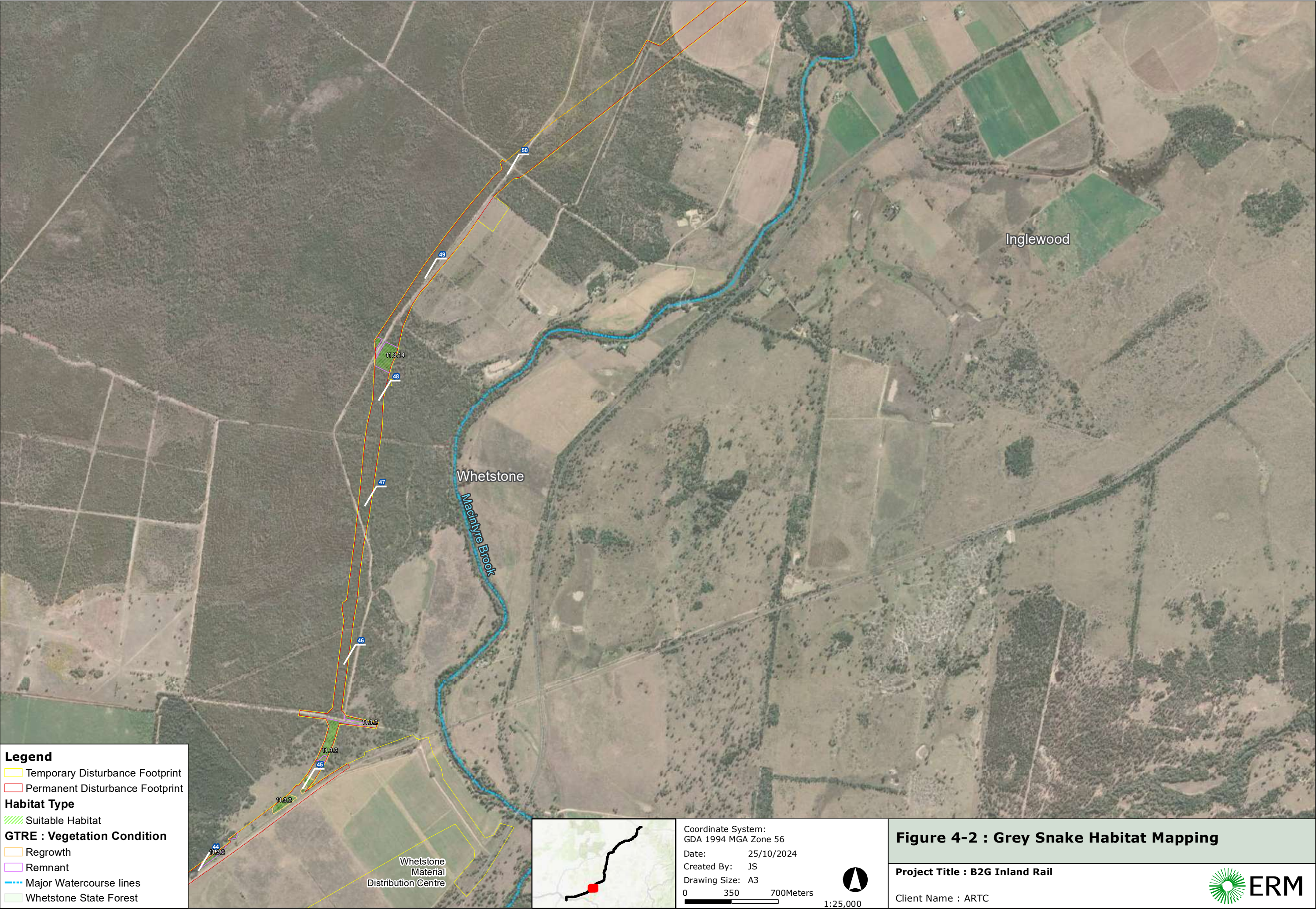


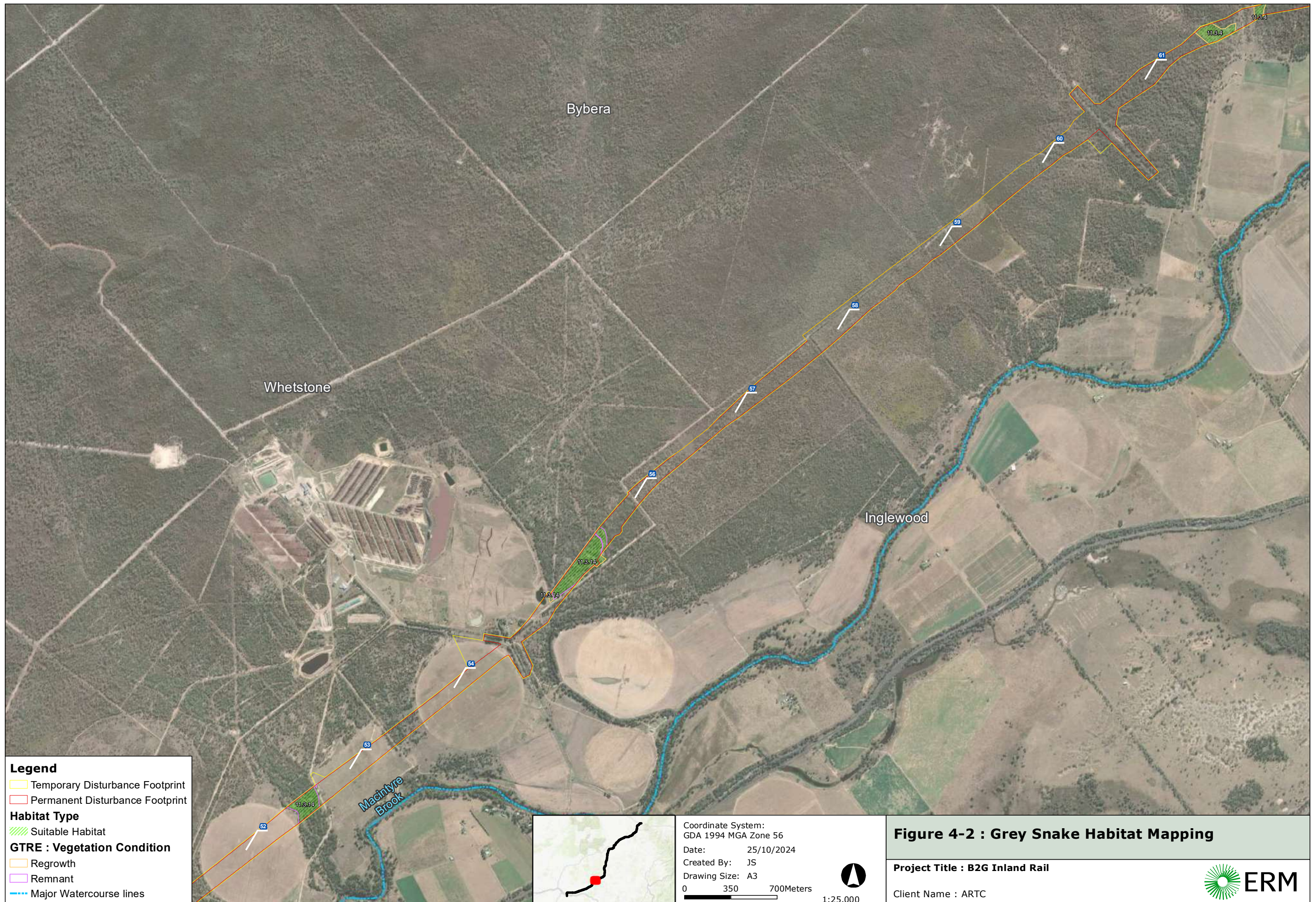
Figure 4-2 : Grey Snake Habitat Mapping

Project Title : B2G Inland Rail
Client Name : ARTC









Legend

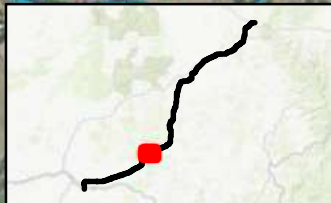
Temporary Disturbance Footprint
Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Regrowth
Remnant
Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters

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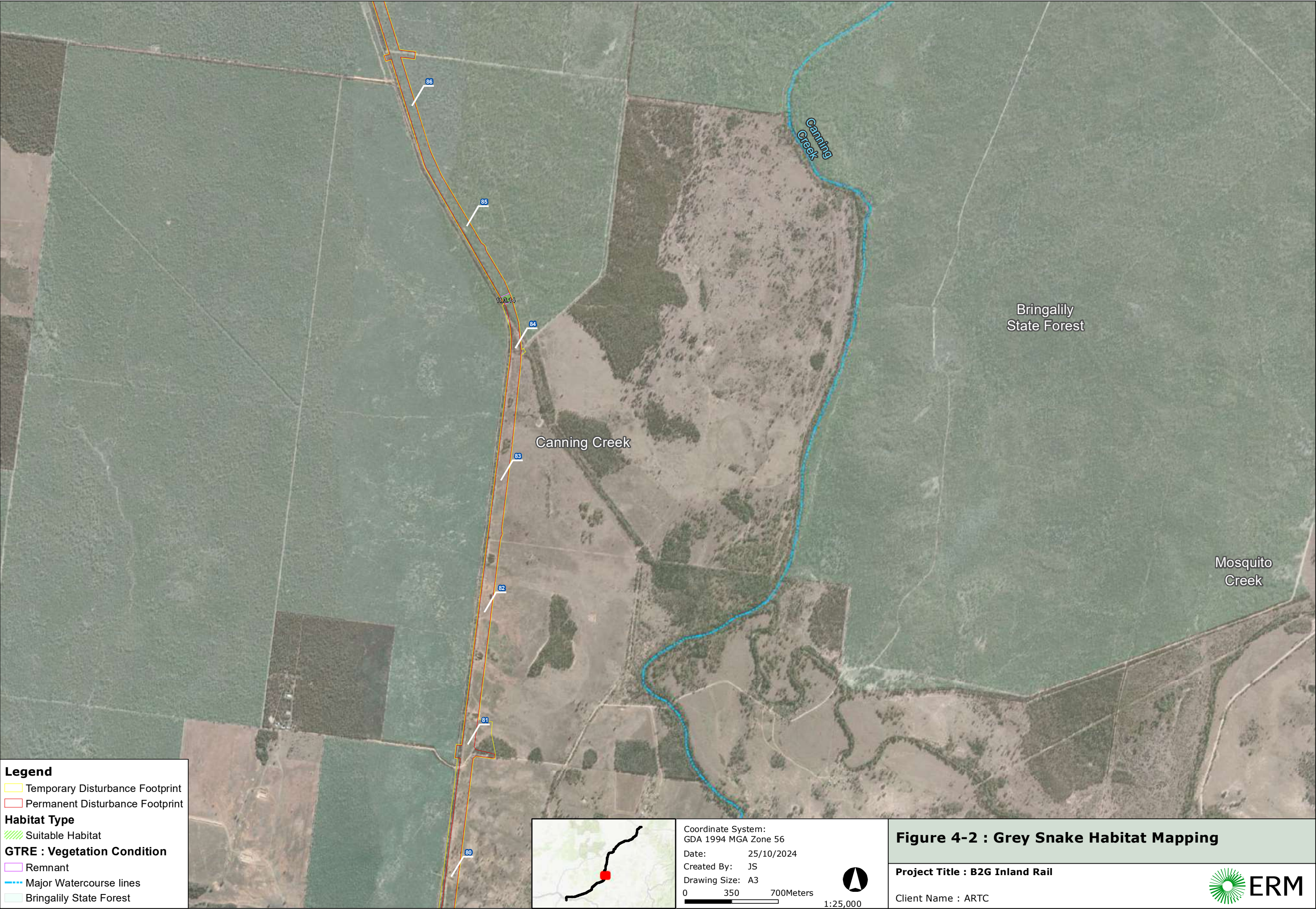
Figure 4-2 : Grey Snake Habitat Mapping

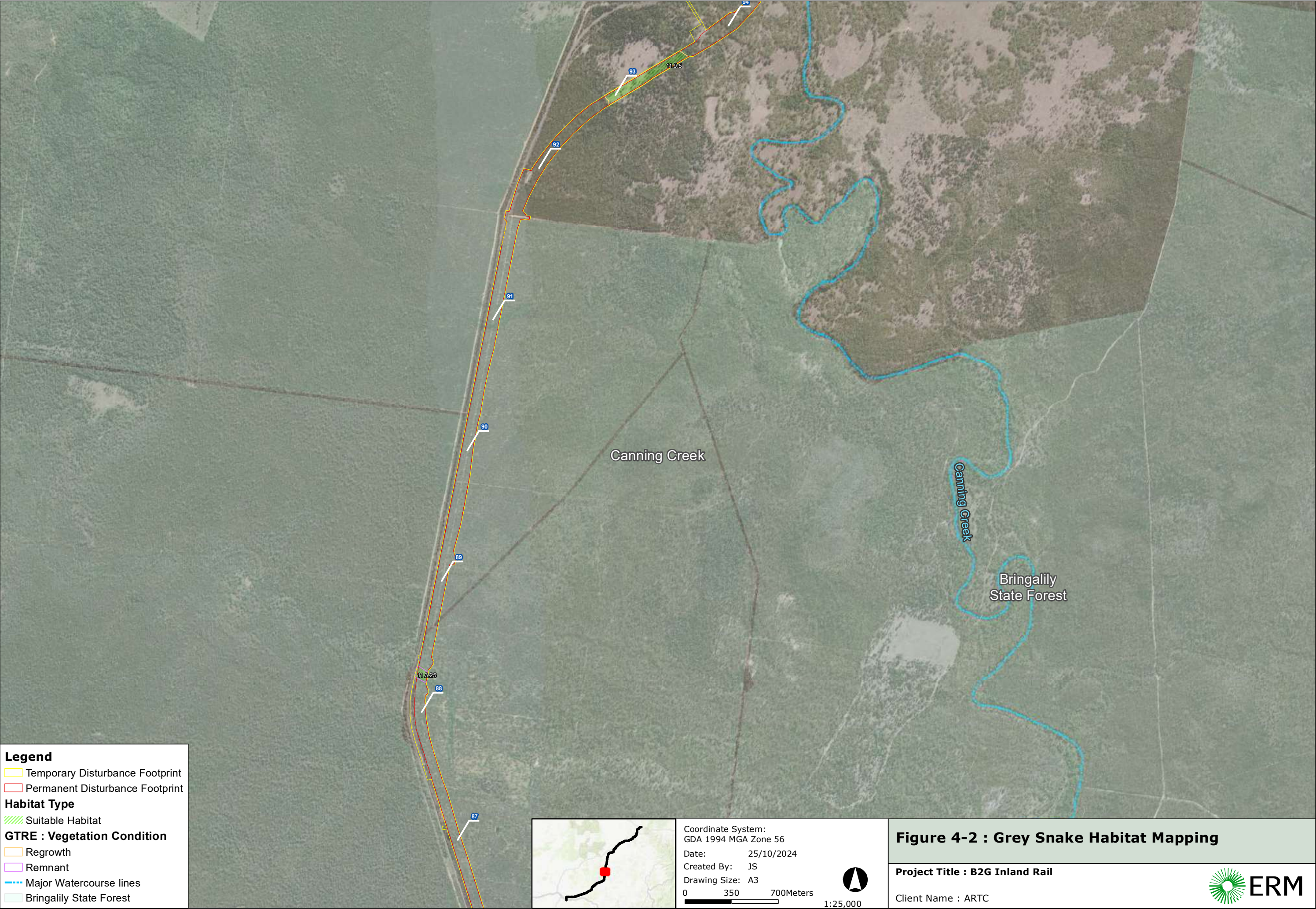
Project Title : B2G Inland Rail

Client Name : ARTC









Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines

Bringalily State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters

1:25,000

Figure 4-2 : Grey Snake Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





Legend

- Temporary Disturbance Footprint
- Permanent Disturbance Footprint
- Habitat Type**
- Suitable Habitat
- GTRE : Vegetation Condition**
- Non Remnant
- Regrowth
- Remnant
- Major Watercourse lines
- Bringalily State Forest



Coordinate System:
GDA 1994 MGA Zone 56
Date: 25/10/2024
Created By: JS
Drawing Size: A3
0 350 700Meters



Figure 4-2 : Grey Snake Habitat Mapping

Project Title : B2G Inland Rail
Client Name : ARTC

















Legend

Temporary Disturbance Footprint

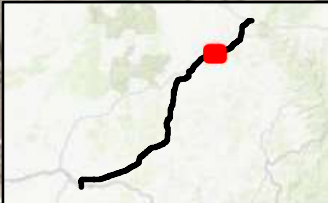
Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Regrowth



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



1:25,000

Figure 4-2 : Grey Snake Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





4.2.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the grey snake:

- Land clearing, pasture improvement and cultivation;
- Water extraction and diversions that result in changes to hydrological floodplains;
- Contamination from pesticides and herbicides;
- Reduced environmental water flow;
- High frequency of high severity fire;
- Coal and gas extraction;
- Predation by feral cats (*Felis catus*), red foxes (*Vulpes vulpes*) and pigs (*Sus scrofa*); and
- Poisoning by cane toads (*Rhinella marina*) (DCCEEW, 2022).

4.2.5 THREAT ABATEMENT/RECOVERY PLANS

No threat abatement/recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats (DoE, 2015);
- Threat abatement plan for predation by the European red fox (DEWHA, 2008);
- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (DoEE, 2017); and
- Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPC, 2011).

4.2.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

Threats identified in the Threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Competition for food with species they share dietary overlap.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the Threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Competition for food with species they share dietary overlap.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;

- Habitat management; and
- Shooting and bounties.

Threats identified in the Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs include:

- Impacts to plant species composition and succession;
- Impacts to nutrient and water cycles, and water quality, especially in warmer areas where they are restricted to the vicinity of watercourses and floodplains;
- Alteration of soil structure through digging and rooting; and
- Competition for food with species they share dietary overlap.

Threat abatement actions for feral pigs include:

- Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management;
- Integrate of feral pig management into land management activities;
- Encourage further scientific research into feral pig impacts on nationally threatened species and ecological communities, and feral pig ecology and control;
- Record, monitor and evaluate feral pig control programs;
- Build capacity for feral pig management;
- Improve public awareness about feral pigs.

Threats identified in the Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads include:

- Lethal toxic poisoning through ingestion of cane toad;
- Larval competition with frog tadpoles; and
- Competition for shelter sites.

Threat abatement actions for cane toads include:

- Identify priority native species and ecological communities under threat;
- Reduce the impacts of cane toads on populations of priority native species and ecological communities; and
- Communicate information about cane toads, their impacts and the threat abatement plan to the wider community.

4.2.7 REFERENCES

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5. FAUNA SPECIES – THREATENED MAMMALS

5.1 YELLOW-BELLIED GLIDER (SOUTH-EASTERN) (*PETAURUS AUSTRALIS AUSTRALIS*)

5.1.1 STATUS

Yellow-bellied glider (south-eastern) (*Petaurus australis australis*) is listed as Vulnerable under the NC Act and Vulnerable under the EPBC Act.

5.1.2 BIOLOGY AND ECOLOGY

5.1.2.1 CHARACTERISTIC

The yellow-bellied glider (south-eastern) is a medium-sized arboreal marsupial, the largest Australian petaurid (Russell, 1995) and the second largest Australian glider. Males weigh between 470 and 725 grams and have a head and body length of 260 to 300 mm and a tail length of 390 to 460 mm. Comparatively females are smaller, weighing between 435 and 660 grams, with a head and body length of 240 to 310 mm and a tail length of 380 to 470 mm. Typically, the tail is 1.5 times as long as the head and body length. The body is grey above, with a distinct black dorsal stripe that extends from the head to the tail. The tail is mostly black with grey edging at the base. Yellow-bellied glider (south-eastern) have black markings on their feet, on the edge of their gliding membrane and in a stripe running down each thigh (Baker and Gynther, 2023). The belly is white to yellow, typically white or pale yellow in young individuals and becoming more yellow with age (refer to Plate 5-1) (DCCEEW, 2022).



PLATE 5-1: YELLOW-BELLIED GLIDER (SOUTH-EASTERN) (*PETAURUS AUSTRALIS*)

Source: ALA (2022)

5.1.2.2 KNOWN DISTRIBUTION

The yellow-bellied glider (south-eastern) is found at altitudes ranging from sea level to 1400 m above sea level and has a widespread but patchy distribution from south-eastern Queensland to far south-eastern South Australia, near the South Australian/Victorian border (refer to Plate 5-1). Most of the Queensland distribution is coastal, extending southward along the eastern seaboard from north of Mackay and continuing through the New South Wales/Queensland border. However, the distribution also extends inland to the western slopes of the Great Dividing Range in parts of New South Wales and Queensland and isolated subpopulations are found inland in the Blackdown and Canarvon Ranges of central Queensland (DAWE, 2022). The distribution of the yellow-bellied glider (south-eastern) overlaps with the Gondwana Rainforests of Australia World Heritage (DCCEEW, 2022).

Across the range of the subspecies, the distribution is highly disjunct due to biogeographic process, land clearing and specific habitat requirements, even in continuous forested areas. Small social groups occupy large and exclusive home ranges and occur at low densities (0.03-0.14 individuals/ha). Home ranges are necessarily large (50-65 ha), because the trees used for foraging are dispersed and use of trees varies spatially and temporally. As a result of the large home ranges, the minimum habitat area required to sustain a viable subpopulation in southern Queensland is approximately 320 km² (DAWE, 2022).

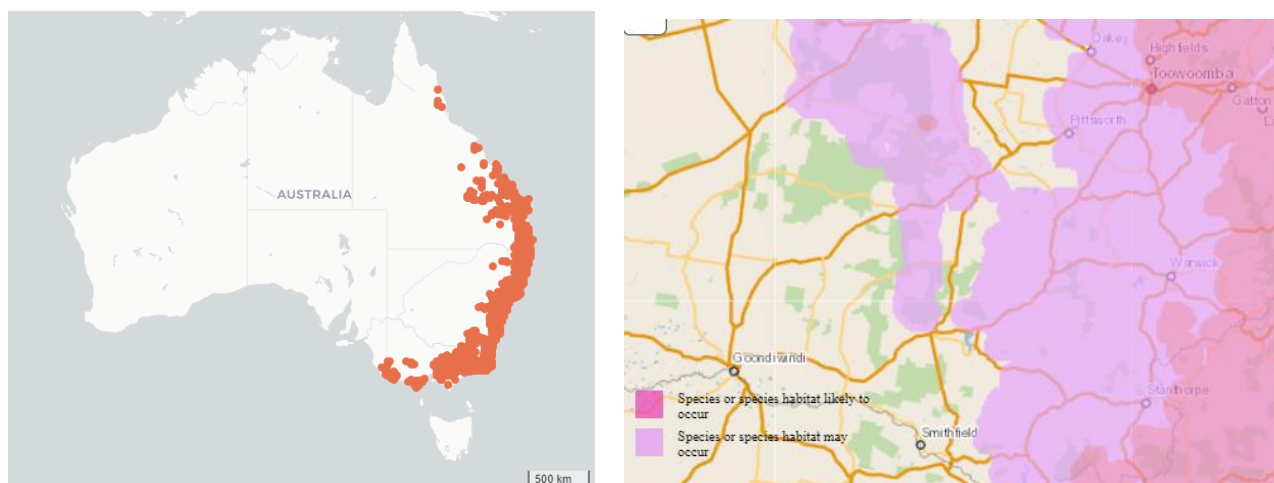


PLATE 5-2: DISTRIBUTION RANGE OF THE YELLOW-BELLIED GLIDER (SOUTH-EASTERN)

Source: ALA (2024), DoE (2023)

5.1.2.3 DISTRIBUTION IN RELATION TO PROJECT

Yellow-bellied glider (south-eastern) has been assessed as having the potential to occur within the impact assessment area, due to the presence of suitable habitat and a potential scat (that is unable to be confirmed) found during field surveys in Whetstone State Forest. The railway alignment partly overlaps subspecies modelled distribution of habitat that may occur, there are portions of the railway alignment located outside of the modelled species distribution (as per the modelled distribution mapping on the species SPRAT profile - refer to Plate 5-1 and Plate 5-3) (DoE, 2023). Additionally, four historic records were identified in the nature refuges and national parks north-east of Toowoomba. Two were identified in Crows Nest National Park in 1974, and one was identified nearby in 2001. Another individual was identified in 1993 in The Gullies Nature Refuge (ALA, 2024).

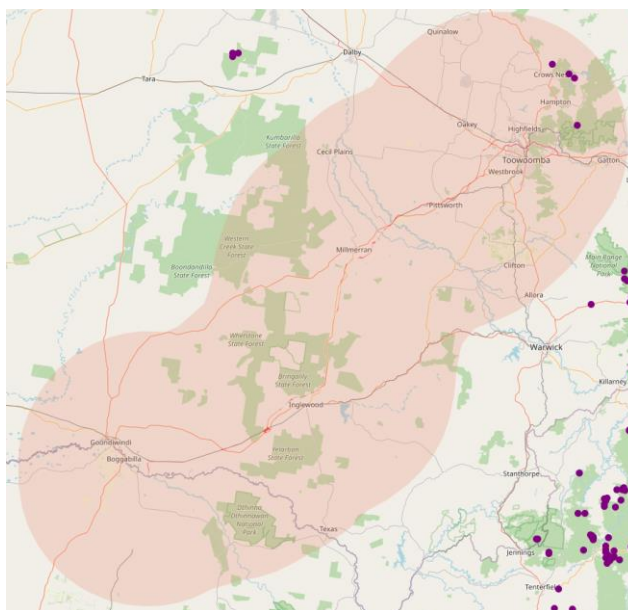


PLATE 5-3: DISTRIBUTION RANGE OF THE YELLOW-BELLIED GLIDER (SOUTH-EASTERN) IN RELATION TO THE PROJECT

Source: ALA (2024), DCCEEW (2022)

5.1.2.4 BIOLOGY AND REPRODUCTION

The yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (DCCEEW, 2022). Abundance is highly dependent on habitat suitability, which is in turn determined by forest age and floristics (Woinarski et al., 2014). The subspecies shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter. There is also a clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts. Smooth-barked eucalypts are important due to the range of foraging substrates (and therefore food resources) they provide, as loose bark hanging in strips from these trees provides shelter for insect prey (DCCEEW, 2022).

The yellow-bellied glider (south-eastern) is nocturnal, and active for most of the night, devoting 90 percent of the time spent outside the den to foraging-related activities. This species may travel up to 2 kilometres in one night to forage, as gliding requires minimal energy expenditure. However, they have very low dispersal capabilities over spaces larger than its gliding distance. The maximum gliding distance may be up to 120 m – 140 m, and an average gliding performance of 40 m in high-canopy forest and 25.2 m in low-canopy forest (Baker and Gynther, 2023; DCCEEW, 2022). As there is a glide ratio of 2.0 (horizontal distance travelled / height dropped), taller old growth trees are preferred. During the day, the yellow-bellied glider (south-eastern) shelters in hollows found in large, old, living trees, usually more than one metre in diameter, although a minimum of 50 cm has been identified. These hollows are critical habitat because they are also used for dens (DAWE, 2022).

The subspecies includes tree sap in its diet, which is drawn from excisions in sap trees, especially when alternative food sources are limited. The animals use their large lower incisor teeth to make characteristic V-shaped cuts and vertical furrows in the tree trunk. Yellow-bellied gliders also feed on insects, spiders, eucalypt nectar and pollen, insect exudates and manna (DCCEEW, 2022).

Yellow-bellied gliders live in family groups of two to six individuals, commonly sharing a tree hollow which is changed throughout the year depending on availability of food. A family group consists of one male, one or more females and their offspring. Group size is determined by food availability and habitat quality. They reproduce seasonally, with timing varying across its broad range, although peak births are seen between July and September each year (Baker and Gynther, 2023). Litter size is typically one, and individuals reach sexual maturity at around two years of age (Woinarski et al., 2014). Juveniles remain with the family group for 12 to 18 months before dispersing (Baker and Gynther, 2023). Once sexual maturity is reached, individuals will pair up with each other, usually in a monogamous relationship. The subspecies' lifespan is a minimum of six years in the wild, and the generation length is four to five years (DCCEEW, 2022).

5.1.3 HABITAT DESCRIPTION AND DEFINITION

The yellow-bellied glider (south-eastern) is found at altitudes ranging from sea level to 1400 m above sea level and has a widespread but patchy distribution from south-eastern Queensland (Qld) to far south-eastern SA, near the SA-Vic border. Most of the Qld distribution is coastal, extending southward along the eastern seaboard from north of Mackay and continuing through the NSW-Qld border. However, the distribution also extends inland to the western slopes of the Great Dividing Range in parts of NSW and Qld and isolated subpopulations are found inland in the Blackdown and Carnarvon Ranges of central Qld (DAWE, 2022).

The railway alignment partly overlaps with the south-eastern subspecies modelled distribution of habitat that may occur, there are portions of the railway alignment located outside of the modelled species distribution (as per the modelled distribution mapping on the species SPRAT profile) (DoE, 2023).

Across the range of the subspecies, the distribution is highly disjunct due to biogeographic processes, land clearing and highly specialised habitat requirements, even in continuous forested areas. Small social groups occupy large and exclusive home ranges and occur at low densities (0.03-0.14 individuals/ha). Home ranges are necessarily large (50-65 ha), because the trees used for foraging are dispersed and use of trees varies spatially and temporally. As a result of the large home ranges, the minimum habitat area required to sustain a viable subpopulation in southern Qld is approximately 320 km² (DAWE, 2023).

The yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests. The subspecies shows a preference for large patches of mature old growth forest that provide suitable trees for shelter, and for forests with a high proportion of winter-flowering and smooth-barked eucalypts, particularly species identified as sap trees: *Angophora subvelutina*, *A. leiocarpa*, *Corymbia* spp., *Eucalyptus* spp., *Lophostemon confertus*, and *Syncarpia glomulifera*. Loose bark hanging in strips from smooth-barked eucalypts provides shelter for insect and spider prey. Yellow-bellied gliders also require floristic diversity to provide a consistent food supply, and they are unlikely to persist in forests dominated by only one or two tree species (DAWE, 2022). A study based in southern Queensland identified 13 species used as sap trees, with *Eucalyptus longirostrata*, *E. biturbinata*, *E. major*, *E. resinifera*, and *E. racemosa* being favoured (Eyre & Goldingay, 2005). *Corymbia citriodora* was the most widely used species, however it was not selected more than would be expected based on its abundance (Eyre & Goldingay, 2005). Other sap trees included *E. melliodora*, *E. moluccana*, *E. tereticornis*, *E. laevopinea*, *E. sphaerocarpa*, *C. intermedia*, and *Angophora leiocarpa* (Eyre & Goldingay, 2005).

This species has low dispersal ability, with a maximum gliding distance of 120-140 m (dependent on tree height), and an average gliding performance of 25.2 m in low-canopy forest. Trees in southern Queensland are generally lower in height than trees further south, and therefore it is unlikely that maximum glide distances would be achievable in the Project area. As there is a glide ratio of 2.0 (horizontal distance travelled / height dropped), taller old growth trees within habitat areas are preferred. During the day, the yellow-bellied glider (south-eastern) shelters in hollows found in large, old, living trees, usually more than one metre in diameter, although a minimum of 50 cm has been identified. These hollows are critical habitat because they are also used for dens (DAWE, 2022).

As defined in the Conservation Advice (DAWE, 2022) habitat critical to the survival of the species is:

- “large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees;
- areas identified as refuges under future climate change scenarios;
- short or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas;
- habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonization or movement away from threats. Yellow-bellied gliders (south-eastern) have a glide ratio (horizontal distance/height dropped) of around 2.0, and corridors spanning gaps larger than the distance gliders are likely to be able to travel should be considered critical to the survival. There is not enough evidence to define the canopy and width characteristics of appropriate corridors. In the absence of such information, a precautionary approach should be taken to maximise dispersal by considering all habitat corridors in the species’ range to be habitat critical to the survival; and
- areas in which some trees have evidence of use for sap extraction by yellow-bellied glider (south-eastern).”

Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 5-1 and is presented in Figure 5-1.

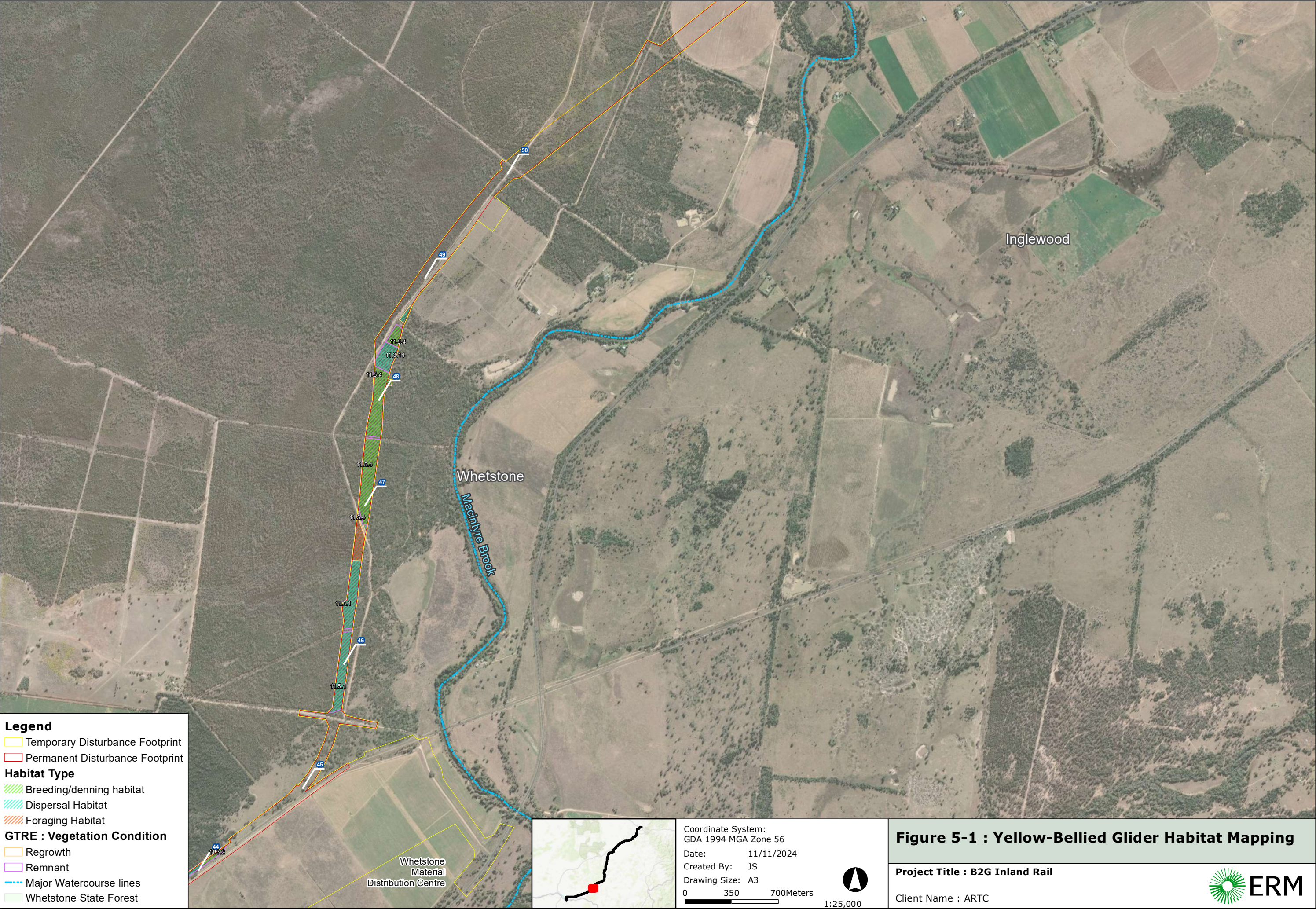
TABLE 5-1 HABITAT CRITERIA FOR YELLOW-BELLIED GLIDER WITHIN THE STUDY AREA

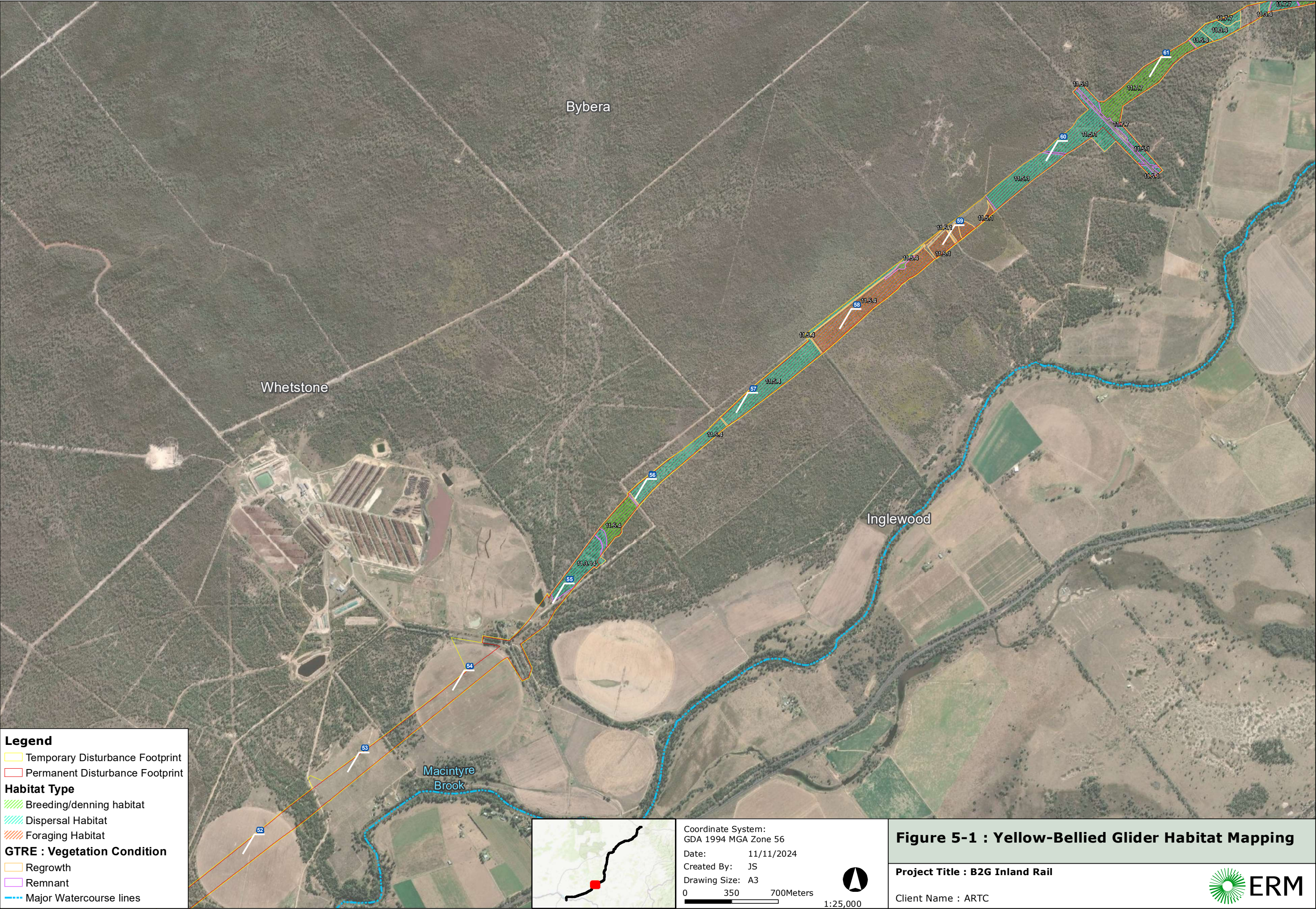
Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/denning habitat	Large contiguous areas of floristically diverse eucalypt woodland and forest, dominated by winter-flowering and smooth-barked eucalypts. This must include mature living hollow-bearing trees and sap trees. Forest areas currently unoccupied may still represent habitat critical to survival, if the	11.3.4, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.27i, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.4, 11.7.7, 11.8.4, 11.8.5, 11.9.7, 11.9.9a, 11.9.10	Large contiguous areas of remnant eucalypt woodland and forest with large, old, hollow-bearing trees, preferably live trees rather than standing dead trees. A diverse range of preferred tree species should be present.

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
	recruitment of hollow-bearing trees in the future could allow the species to colonise these areas and ensure persistence of a population.		Forested areas with potential for hollow-bearing trees.
Foraging habitat	Large contiguous areas of old-growth eucalyptus woodland and forest dominated by winter-flowering and smooth-barked eucalypts, particularly species identified as preferred sap trees: <i>Eucalyptus longirostrata</i> , <i>E. biturbinata</i> , <i>E. major</i> , <i>E. resinifera</i> , and <i>E. racemosa</i> . Other sap trees identified included <i>E. melliodora</i> , <i>E. moluccana</i> , <i>E. tereticornis</i> , <i>E. laevopinea</i> , <i>E. sphaerocarpa</i> , <i>C. intermedia</i> , and <i>Angophora leiocarpa</i> (Eyre & Goldingay, 2005).	11.3.4, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.27i, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.4, 11.7.7, 11.8.4, 11.8.5, 11.9.7, 11.9.9a, 11.9.10	Large contiguous areas of remnant or high-value regrowth eucalypt woodland and forest containing a diverse range of preferred tree species that is connected to breeding/denning habitat by tall trees <40 m apart.
Dispersal habitat	Habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonisation or movement away from threats. There is not enough evidence to define the canopy characteristics of appropriate corridors, therefore all habitat corridors that are a minimum of 100 m wide (Gracanin and Mikae, 2023) in the species' range should be considered to be critical habitat.		Small habitat patches (<5 ha) or corridors with tall native trees that connect patches of breeding/denning and foraging habitat by tall trees <40 m apart. Connecting patches of habitat must be at ≥100 m wide.
Generally unsuitable habitat	Forested areas without smooth-barked eucalyptus species, or without the required floristic diversity suitable for breeding/denning or foraging. Areas that are fragmented or outside of dispersal range are also unsuitable.	11.3.1, 11.3.2, 11.3.21, 11.3.24, 11.3.27, 11.3.27b, 11.4.3, 11.5.14, 11.7.5, 11.8.3, 11.8.11, 11.9.5	Areas not mapped as breeding/denning, foraging or dispersal habitat. (e.g., natural and non-remnant grassland, water bodies, shrubland, and forests and woodland that are not dominated by large eucalypt trees that have been identified as sap trees).



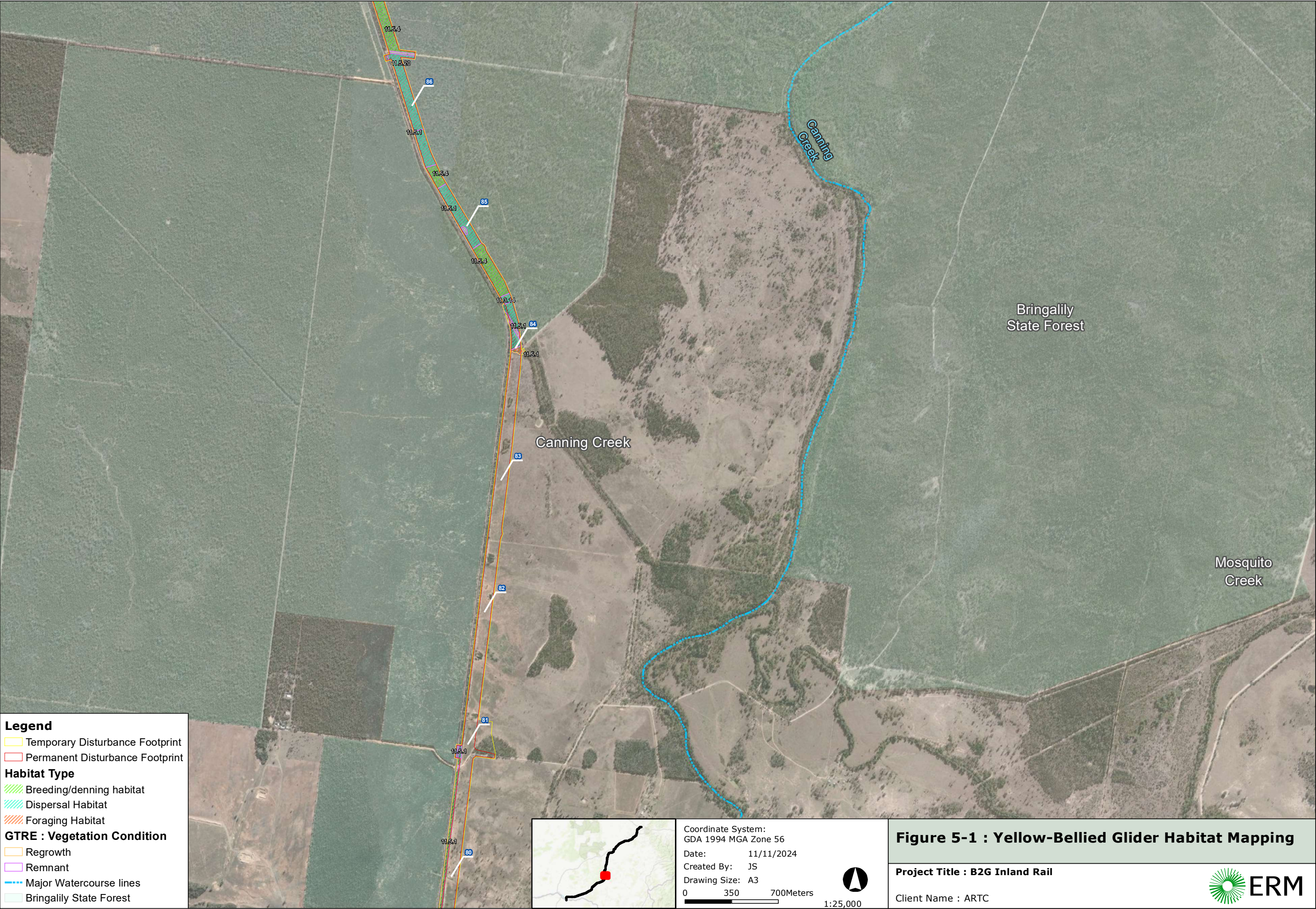


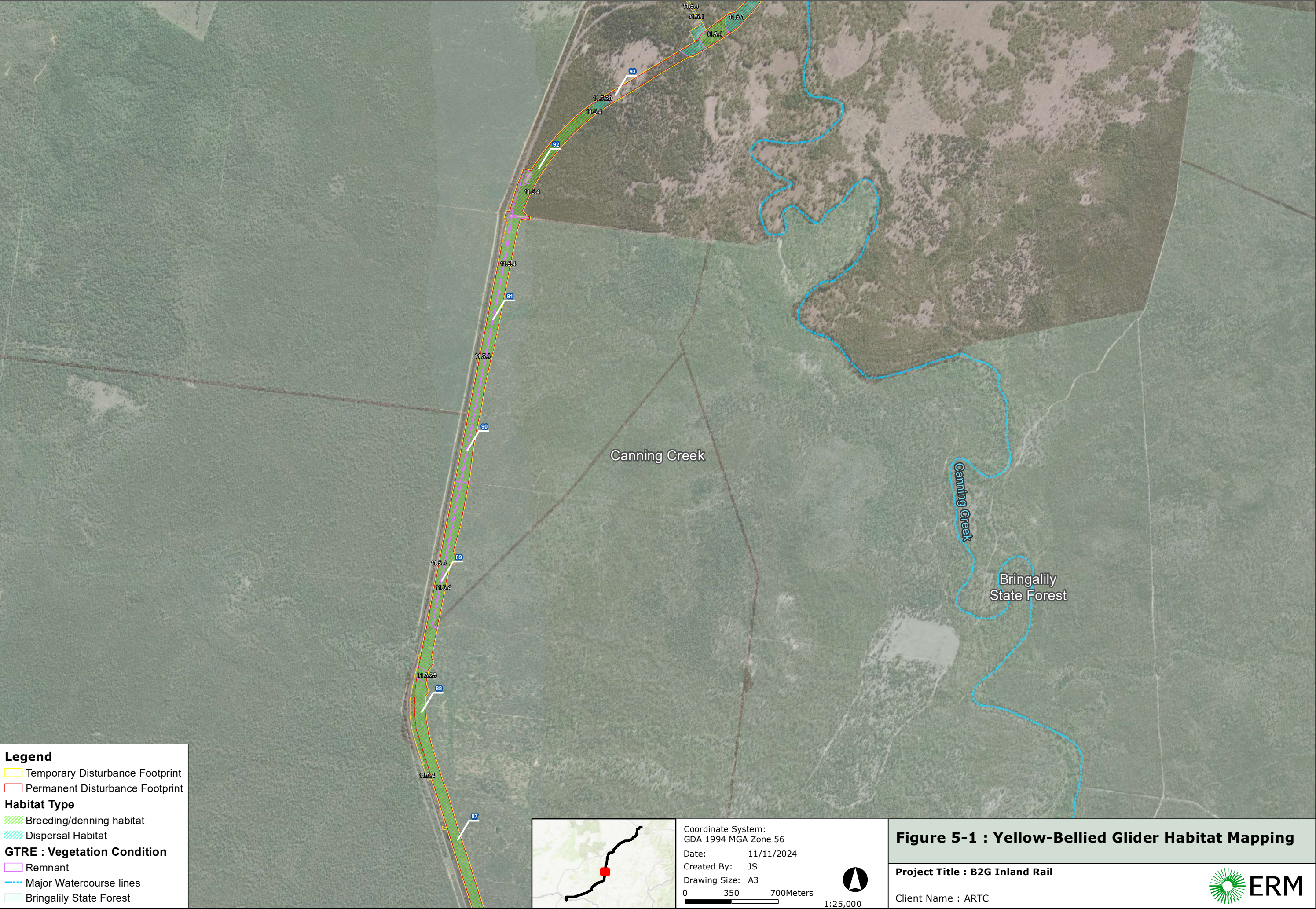
















Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Breeding/denning habitat

GTRE : Vegetation Condition

Non Remnant; Infrastructure

Remnant

Figure 5-1 : Yellow-Bellied Glider Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC







5.1.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the yellow-bellied glider:

- Increased fire intensity and frequency due to climate change;
- Altered fire regimes;
- Clearing;
- Fragmentation; and
- Logging (DAWE, 2022).

Other minor threatening processes to the subspecies have been identified to include:

- Invasive species have been recorded preying on the subspecies, though it is unknown if this is having an overall population-level impact;
- Mortality by barbed wire fencing;
- Habitat degradation by feral deer (*Cervidae* spp.); and
- Dieback caused by *Phytophthora cinnamomi* may also be impacting the subspecies through habitat degradation, though more research is required to determine the scale of the pathogen impact on the subspecies (DAWE, 2022).

5.1.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia (DoE, 2015); and
- Threat abatement plan for predation by the European red fox (DEWHA, 2008).

5.1.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

Threats identified in the Threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups;
- Competition for food with species they share dietary overlap and disease transmission; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the Threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

5.1.7 REFERENCES

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6. FAUNA SPECIES – SPECIAL LEAST CONCERN MAMMALS

6.1 PLATYPUS (*ORNITHORHYNCHUS ANATINUS*)

6.1.1 STATUS

Platypus (*Ornithorhynchus anatinus*) is listed as Special Least Concern under the NC Act and is not listed under the EPBC Act.

6.1.2 BIOLOGY AND ECOLOGY

6.1.2.1 CHARACTERISTIC

The platypus has a distinctive streamlined shape with a pliable, leathery snout resembling a duck bill, short limbs, webbed feet with claws, and broad flat tail. A distinctive size cline exists from northern Queensland to Tasmania, where individuals in the southern populations are significantly larger than the northern populations. Males are between 800 grams and 3 kilograms, and have a length of 400 to 630 mm from the tip of the bill to the tip of the tail. They are distinctively larger than females, which are between 600 grams and 1700 grams, and have a length of 370 to 550 mm from the tip of the bill to the tip of the tail. Recently emerged juveniles are 83-87% of the male adult length and 65-70% of the female adult length (Baker and Gynther, 2023). The fur of the upper body is dark brown to reddish-brown and the fur of the belly is light brown to silver (refer to Plate 6-1). Adult males are equipped with a 12 mm long spur on the inside of each hind ankle which can inject venom when active during the breeding season (DES, 2018; Baker and Gynther, 2023; Menkhorst and Knight, 2011).



PLATE 6-1: PLATYPUS (*ORNITHORHYNCHUS ANATINUS*)

Source: Wormleaton (2018)

6.1.2.2 KNOWN DISTRIBUTION

Platypuses are only found in east and south-eastern Australia, from the Annan River in northern Queensland to the far south of Victoria and Tasmania (refer to Plate 6-2). They are found in freshwater creeks and rivers of Queensland, New South Wales, Victoria, Tasmania and South Australia. They can live in many habitats, from tropical rainforest creeks to streams in alpine areas (Bush Heritage, 2023). In Queensland, platypus live east of the Great Dividing Range, and in some western-flowing streams. In north Queensland, the range of the Platypus is closer to the coast (DES, 2016; OEH, 2018).



PLATE 6-2: DISTRIBUTION RANGE OF THE PLATYPUS (*ORNITHORHYNCHUS ANATINUS*)

Source: ALA (2023)

6.1.2.3 DISTRIBUTION IN RELATION TO PROJECT

The platypus has been identified as known to occur within the impact assessment area, as habitat was identified within the Study Area and individuals were detected both during targeted surveys and with eDNA samples. Platypus were also detected in five eDNA survey locations. These were on the southern branch of the Condamine River near Yandilla, Bringalily Creek, and at three survey sites along Back Creek near Millmerran (Hydrobiology, 2023).

There are several database records (i.e. ALA, WildNet) in 2002 within approximately 3 km of the Project footprint near Inglewood, associated with the Macintyre River catchment (refer to Plate 6-3). The nearest of these is a record from Macintyre Brook located 2.5 km south of the Project footprint. Further east of Inglewood there are two records (including from 2018) from Coolmunda Dam. Further west there is a 2019 record approximately 5 km south of the Project footprint near Kurumbul. Further downstream there are records from the Macintyre River near Goondiwindi and Boggabilla. There are no records from the Condamine River catchment except a single record in the vicinity of Miles. Other records exist within 50 km of the Project footprint at the southern end of the Project near Goondiwindi, the central region in Lake Coolmunda near Inglewood, and the northern end at the Toowoomba Range.

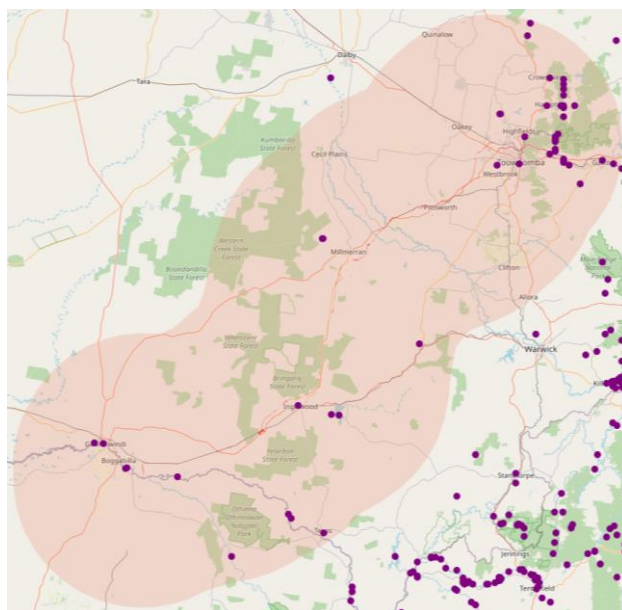


PLATE 6-3: DISTRIBUTION RANGE OF THE PLATYPUS (*ORNITHORHYNCHUS ANATINUS*) IN RELATION TO THE PROJECT

Source: ALA (2024)

6.1.2.4 BIOLOGY AND REPRODUCTION

The platypus is a cryptic species that is most often seen swimming at dawn and dusk while they forage and disperse in streams and other bodies of freshwater. The diet of the Platypus consists mainly of both adult and larvae benthic invertebrates. They are also known to feed on shrimps, water bugs, swimming beetles, tadpoles, worms, freshwater pea mussels and snails. Occasionally they will also catch cicadas and moths. Smaller prey is sifted from the substrate with their pliable bill, while larger prey are caught individually. Platypus is mainly crepuscular and rely on receptors in their sensitive bill to locate and catch prey. Foraging dives last less than 60 seconds, with 10 to 15 seconds between each dive to rest, breathe and chew (Australian Museum, 2015; Baker and Gynther, 2023; DES, 2016).

No social organization or hierarchy has been described despite several individuals being found to occupy the same section of a water body. As such, it is assumed that platypuses are mostly solitary. Stable home ranges have been described, with males observed to disperse further than females, although the size of each home range has not been quantified. When not foraging or swimming platypuses reside in their burrows, a simple construction in the bank (Baker and Gynther, 2023).

In Queensland, platypus mate in August, and approximately a month later in southern populations when it is warmer. After mating, females build nesting burrows up to 30 metres long with a small nest of wet debris that was collected from the water in the terminating chamber. After collecting the debris, the female plugs the burrow with earth in intervals for protection. Once secured within the burrow the female lays one to three eggs which she incubates for approximately 10 days by holding them to her body with her tail. Hatchlings suckle milk from the teat-less mammary ducts on the female's abdomen. The young remain in the nesting burrow for a further four months and are fed by their mother while she leaves periodically to forage. After four months, the young leave the burrow to disperse and reach maturity at one year old (DES, 2016; Baker and Gynther, 2023; Menkhorst and Knight, 2011).

6.1.3 HABITAT DESCRIPTION AND DEFINITION

Platypuses are only found in east and south-eastern Australia. They're found in freshwater creeks and rivers of Queensland, New South Wales, Victoria, Tasmania and South Australia. They can live in many habitats, from tropical rainforest creeks to streams in alpine areas (Bush Heritage, 2023).

The platypus is largely a solitary animal, but several individuals can share the same body of water, and they also tend to be more abundant in areas with pool-riffle sequences. They are mostly nocturnal, and the activity patterns of these animals are determined by a number of factors including: locality, human activity, ambient temperatures, day length and food availability (Divljan, 2022).

They feed in both slow-moving and rapid (riffle) parts of streams, but show preference to coarser bottom substrates, particularly cobbles and gravel (Divljan, 2022). Out of the water, platypuses spend most of their time in burrows which have been dug into the riverbank, with their entrances usually above water level. The animals use a number of short resting burrows (3 to 5 metres long) as protection from predators and temperature extremes. Burrows used for nesting tend to be more elaborate, with many side branches (DPE, 2020). They prefer areas with steep, vegetated banks for their burrows which are also concealed by vegetation (Menkhorst and Knight, 2011).

At times, the individuals use rocky crevices and stream debris as shelters, or they burrow under the roots of vegetation near the stream. Hence, the ideal habitat for the species includes a river or a stream with earth banks and native vegetation that provides shading of the stream and cover near the bank. The presence of logs, twigs, and roots, as well as cobbled or gravel water substrate (microhabitat) result in increased microinvertebrate fauna (a main food source) (Divljan, 2022). Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 6-1 and is presented in Figure 6-1.

TABLE 6-1 HABITAT CRITERIA FOR PLAYTPUS WITHIN THE STUDY AREA

Habitat function	General habitat	REs	Habitat mapping rules
Habitat	All rivers, creeks, lakes and streams with earth banks and native riparian vegetation to provide shade to the bank and water, and debris in the water to facilitate feeding. Areas with pool—riffle sequences in waterbodies and shallow cobbled or gravel substrate are preferred.	11.3.25 11.3.27 11.3.27b 11.3.27i	Rivers, streams, lakes, and creeks with suitable microhabitat or riparian vegetation present.
Generally unsuitable habitat	Sealed roads, dwellings and habitat that is not within 500 m of a waterbody (rivers, creeks, lakes and streams). Areas that do not feature riparian habitat. Desnagged stretches of river, creek or stream that have had microhabitat features removed. Areas of cleared bank without riparian habitat. Waterbodies without earth banks, Dams that prevent or disrupt the flow of water and/or dramatically increase depth of the water column.	-	Sealed roads, dwellings, habitat that is not within 500 m of a waterbody, and areas without riparian habitat. Dams, and stretches of water without earth banks, microhabitat or riparian vegetation present.





Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

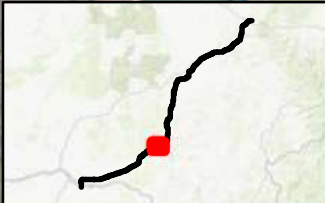
Suitable Habitat

GTRE : Vegetation Condition

Remnant

Major Watercourse lines

Bringalily State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



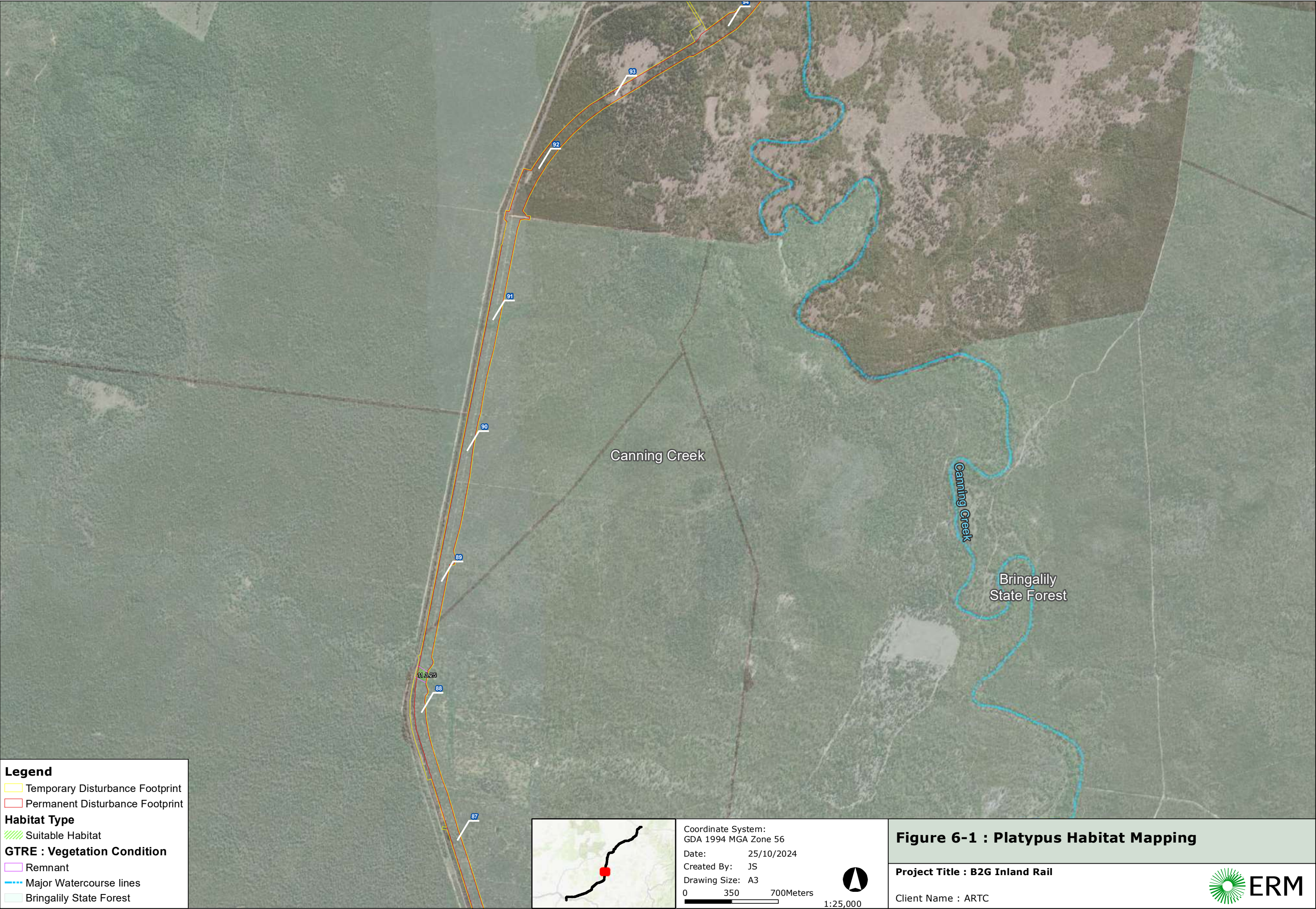
Figure 6-1 : Platypus Habitat Mapping

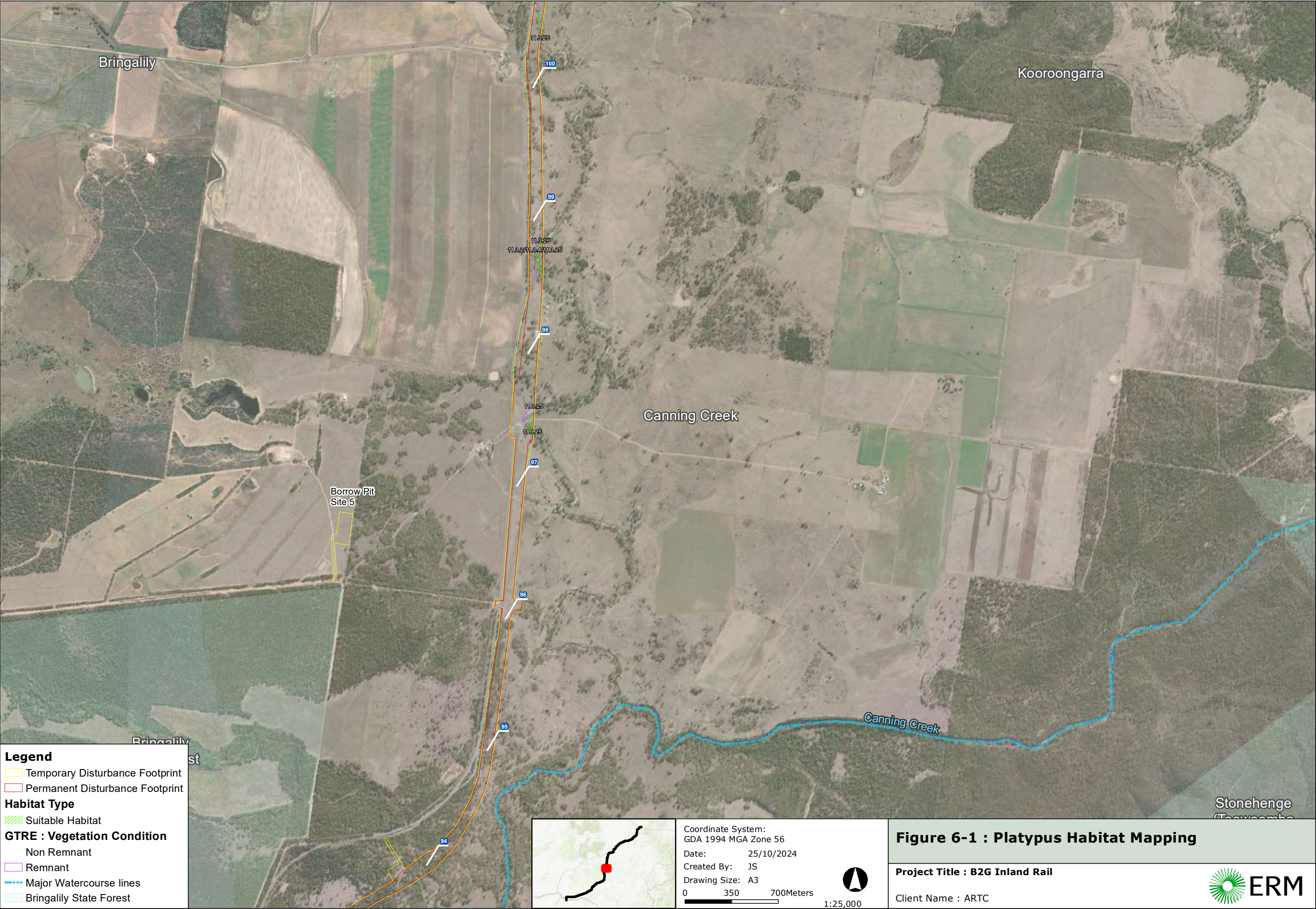
Project Title : B2G Inland Rail

Client Name : ARTC



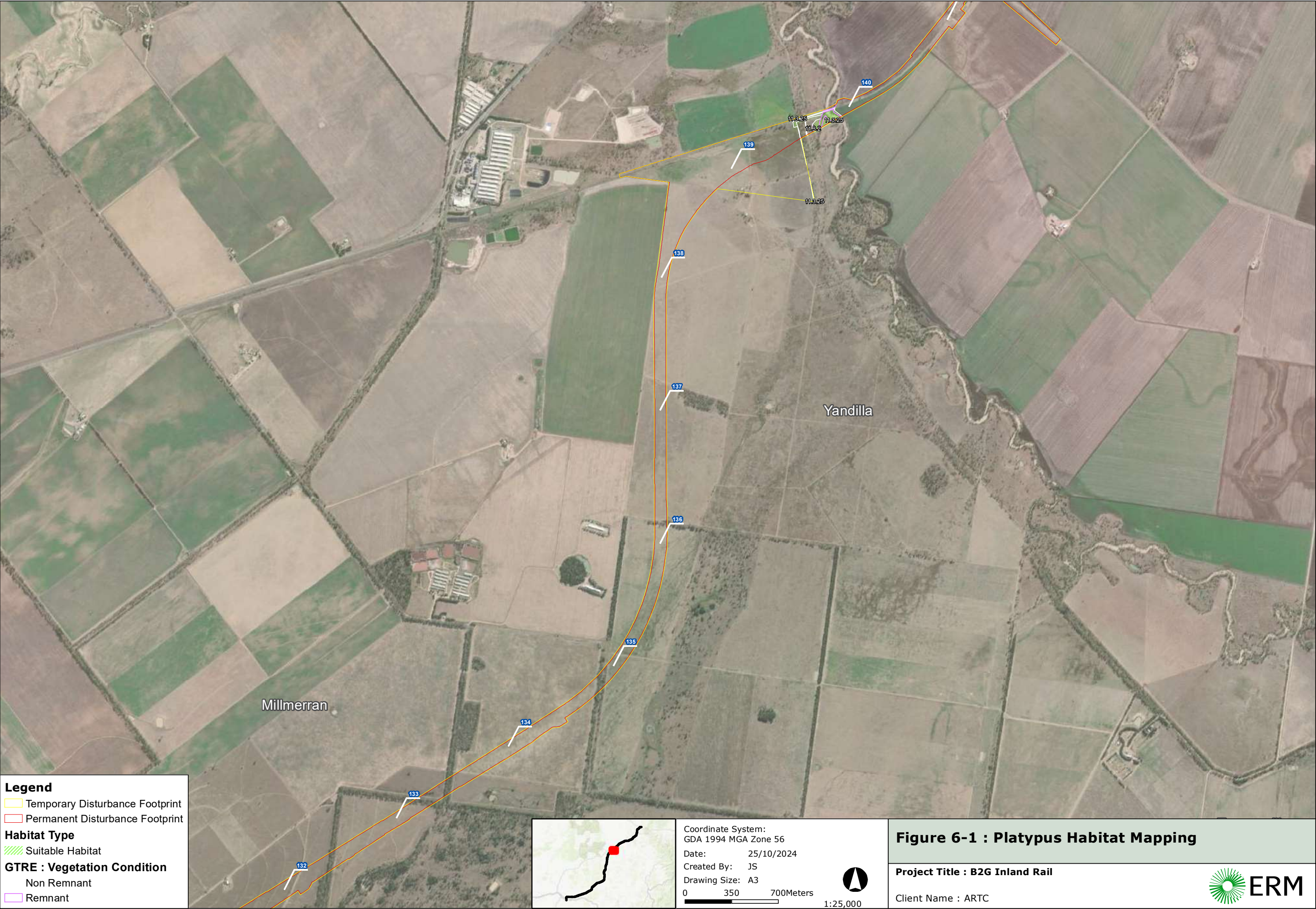
















6.1.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the Platypus:

- Loss of habitat, especially land clearing and dams that disrupt the natural water flow;
- Predation by introduced species such as foxes, cats and dogs;
- Entanglement in litter, such as fishing line and yabby traps;
- Pollution, algal growths, and siltation; and
- Destruction of creek banks where burrows may be located (DES, 2016; OEH, 2018).

6.1.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia (DoE, 2015); and
- Threat abatement plan for predation by the European red fox (DEWHA, 2008).

6.1.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

Threats identified in the threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

6.1.7 REFERENCES

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6.2 SHORT-BEAKED ECHIDNA (*TACHYGLOSSUS ACULEATUS*)

6.2.1 STATUS

Short-beaked echidna (*Tachyglossus aculeatus*) is listed as Special Lease Concern under the NC Act and is not listed under the EPBC Act.

6.2.2 BIOLOGY AND ECOLOGY

6.2.2.1 CHARACTERISTIC

The short-beaked echidna is recognized by the extensive coverage of spines. It has a length of up to 45 cm and weighs up to 7 kg (females will usually weigh less). It also has hair present between the spines and they range in colour from light brown in the northern, hotter parts of Australia to darker in the south. The snout is 7 to 8 cm long and is rigid (refer to Plate 6-2). It has short, stout limbs and on the front feet they have five flattened claws which for digging. The back feet point backwards and help to push the soil away when the animal is burrowing (NPWS, 1999; Queensland Museum, 1995).



PLATE 6-4: SHORT-BEAKED ECHIDNA (*TACHYGLOSSUS ACULEATUS*)

Source: Edmonds (2015)

6.2.2.2 KNOWN DISTRIBUTION

The Short-beaked echidna is found across all states and territories but appears to be most abundant in central and eastern Australia (ALA, 2018) (refer to Plate 6-5).

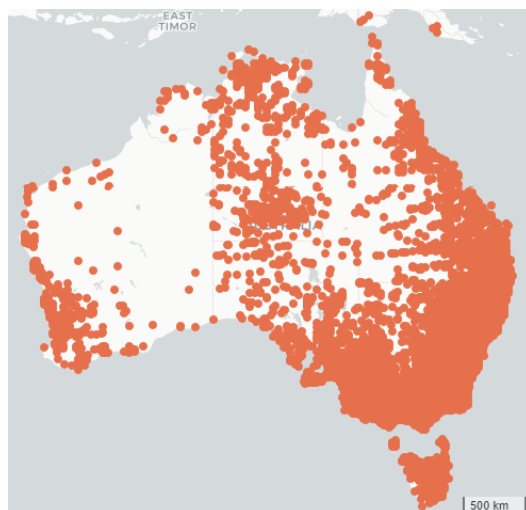


PLATE 6-5: DISTRIBUTION RANGE OF THE SHORT-BEAKED ECHIDNA (*TACHYGLOSSUS ACULEATUS*)

Source: ALA (2024)

6.2.2.3 DISTRIBUTION IN RELATION TO PROJECT

The short-beaked echidna has been identified as known to occur within the impact assessment area based on database records (i.e. ALA and WildNet), habitat being identified in the Study Area and four individuals being observed during targeted surveys. Echidnas were located at Whetstone State Forest, just north of Inglewood, near the northern end of Bringalily State Forest (outside footprint), and near Millmerran.

Numerous records exist within 5 km of the Project footprint near Toowoomba, Pampas (north-east of Millmerran), Millmerran and at the end of the rail alignment on the Queensland/New South Wales border. The most recent of these records is from 2022 near Toowoomba (refer to Plate 6-6). Records exist within a 50 km buffer of the Project footprint in all directions.

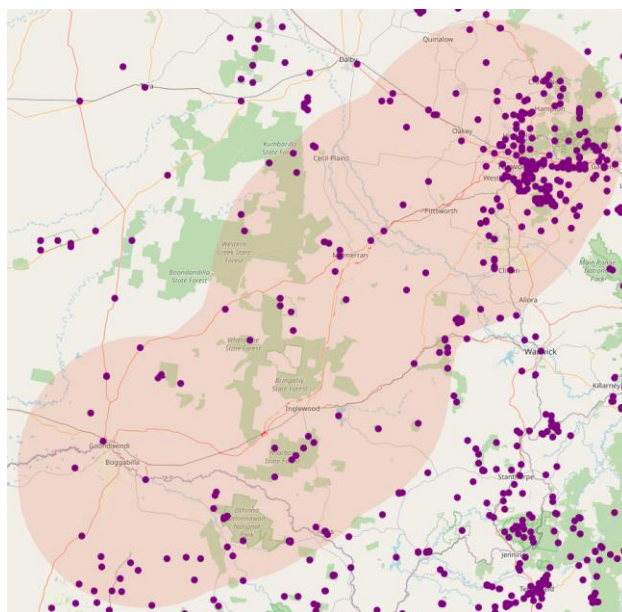


PLATE 6-6: DISTRIBUTION RANGE OF THE SHORT-BEAKED ECHIDNA (*TACHYGLOSSUS ACULEATUS*) IN RELATION TO THE PROJECT

Source: ALA (2024)

6.2.2.4 BIOLOGY AND REPRODUCTION

The short-beaked echidna diet primarily consists of ants, termites, and beetle larvae, however earthworms, beetles and moth larvae may also be eaten when available. The musculature of the face, jaw and tongue is specialized for feeding. The tongue is the animal's sole means of catching prey; it is covered in a sticky mucus and can protrude up to 18 cm outside the snout. The double wedge-shaped snout allows for efficient digging to reach prey or dig a burrow. When the tongue is retracted, the prey is caught on backward-facing keratinous "teeth", located along the roof of the buccal cavity, allowing the animal both to capture and grind food (ALA, 2023; Baker and Gynther, 2023).

Echidnas are solitary and utilise a promiscuous mating system to maximise genetic diversity. Females have home ranges of 10 to 80 hectares that often slightly overlap and are dependent on availability of shelters such as tussock grass, rocks, and hollow logs. Male home ranges are much larger and overlap with many other individuals, both male and female (Baker and Gynther 2023). They are not territorial and will sometimes share shelter sites if there are not enough available for each animal to have one individually (ALA, 2023).

Short-beaked echidnas breed from the end of June to early September. A particular characteristic displayed by echidnas during the breeding season is the formation of 'trains' of up to 10 males following one female (Baker and Gynther 2023). After an 18 - 22 day pregnancy a female lays a single egg, which is incubated in the pouch and takes approximately ten days to hatch. The young echidna is suckled by its mother from mammary glands in the pouch and is carried in the pouch for 45 to 50 days. After this time the female will leave her young in a burrow while foraging, returning to feed it at 5 - 7 day intervals. The young echidna will leave the burrow at around 12 months of age. They have been known to live 10 to 16 years in the wild (Rismiller 1993, Rismiller and Seymour, 1991; Baker and Gynther, 2023).

6.2.3 HABITAT DESCRIPTION AND DEFINITION

Short-beaked echidnas are widely distributed across Australia, being Australia's most widespread native animal. Short-beaked echidnas inhabit a wide range of terrestrial habitats, particularly where favourable food sources (i.e., ants and termites) are abundant. The species inhabits deserts, rainforests, open forest, bushland, farmland, suburban backyards, and snow, where it burrows into soil and shelters in hollow logs, rock crevices and vegetation (WPSQ, 2022). The species is also able to inhabit rivers and beaches due to its strong swimming ability (Bush Heritage Australia, 2023). Within these habitats, short-beaked echidna is most active at night, with activity affected by the temperatures.

Short-beaked echidnas have large, overlapping home ranges (up to 50 hectares), only maintaining a fixed address when rearing their young in a burrow (Bush Heritage Australia, 2023). Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 6-2 and is presented in Figure 6-2.

TABLE 6-2 HABITAT CRITERIA FOR SHORT-BEAKED ECHIDNA WITHIN THE STUDY AREA

Habitat function	General habitat	REs	Habitat mapping rules
Habitat	All terrestrial habitats ranging from deserts, rainforests, open forest, open heathland, bushland, farmland, suburban backyards, and snow. The species inhabits both disturbed and undisturbed habitats.	11.3.1, 11.3.2, 11.3.14, 11.3.17, 11.3.18, 11.3.21, 11.3.24, 11.3.25, 11.3.27i, 11.3.4, 11.4.3, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.14, 11.5.20, 11.7.4, 11.7.5, 11.7.7, 11.8.3, 11.8.4, 11.8.5, 11.8.11, 11.9.5, 11.9.7, 11.9.9a, 11.9.10, 11.3.27, and 11.3.27b.	Deserts, rainforests, open forest, open heathland, bushland, rocky outcrops, roadside habitats, farmland, suburban backyards, and snow. Disturbed and undisturbed habitats are suitable.
Generally unsuitable habitat	Sealed roads, dwellings and non-tussock grasslands greater than 2 km wide. Areas cleared of understory vegetation, fallen logs, rocks and tree stumps.	-	Sealed roads, dwellings and non-tussock grasslands greater than 2 km wide. Completely cleared areas.







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

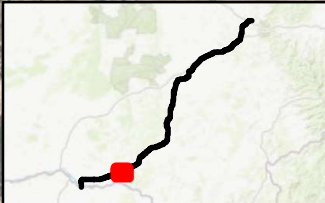
GTRE : Vegetation Condition

Non Remnant; Infrastructure

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

0 300 600Meters



1:25,000

Figure 6-2 : Short-Beaked Echidna Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC









Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

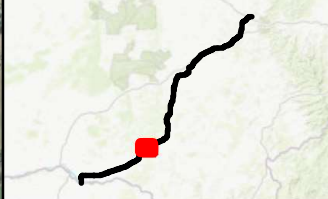
Suitable Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

0 300 600Meters



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Figure 6-2 : Short-Beaked Echidna Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines

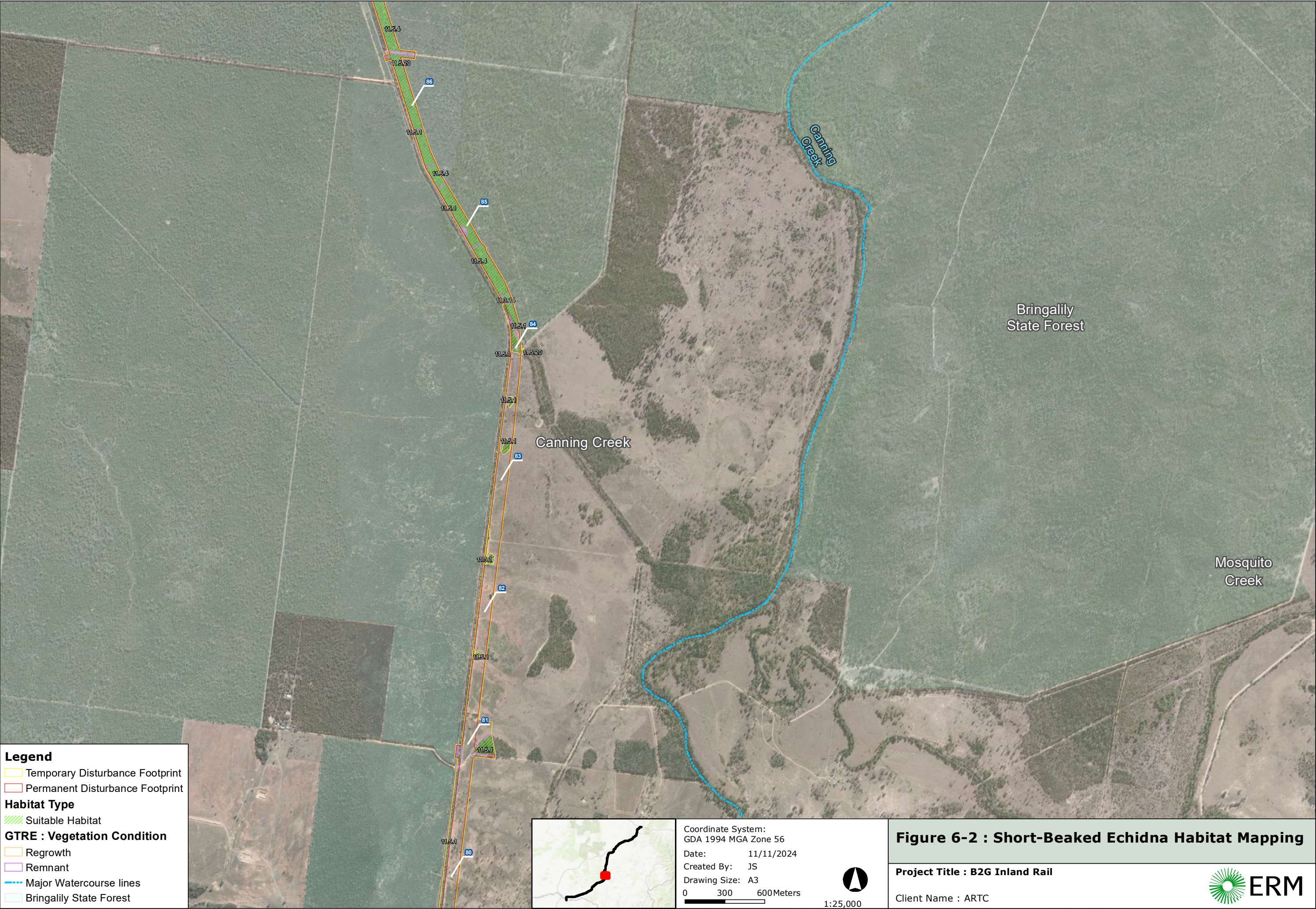
Bringalily State Forest

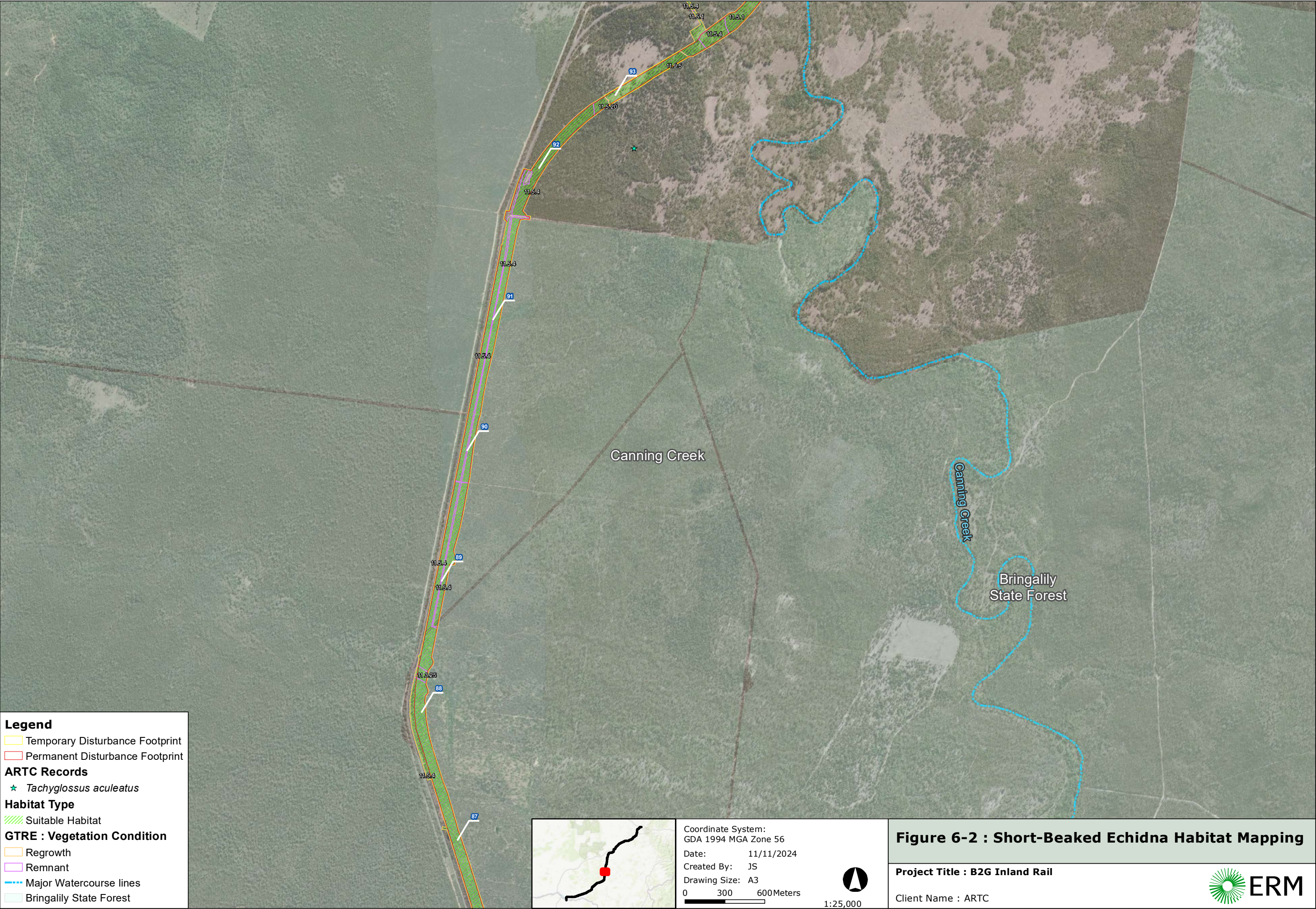
Figure 6-2 : Short-Beaked Echidna Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC











Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

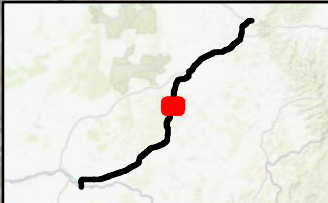
Suitable Habitat

GTRE : Vegetation Condition

Non Remnant; Infrastructure

Regrowth

Remnant



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

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Figure 6-2 : Short-Beaked Echidna Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC







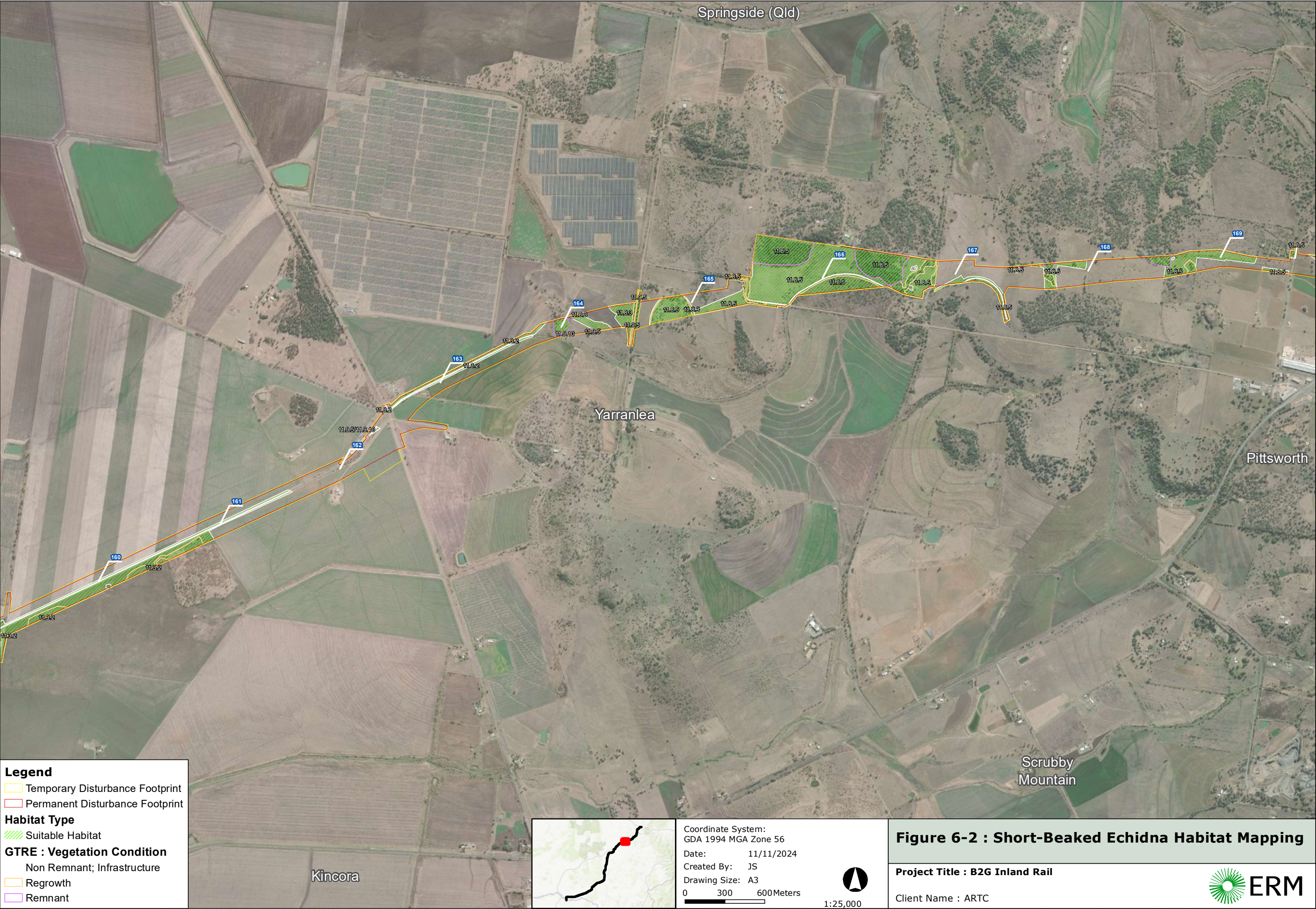


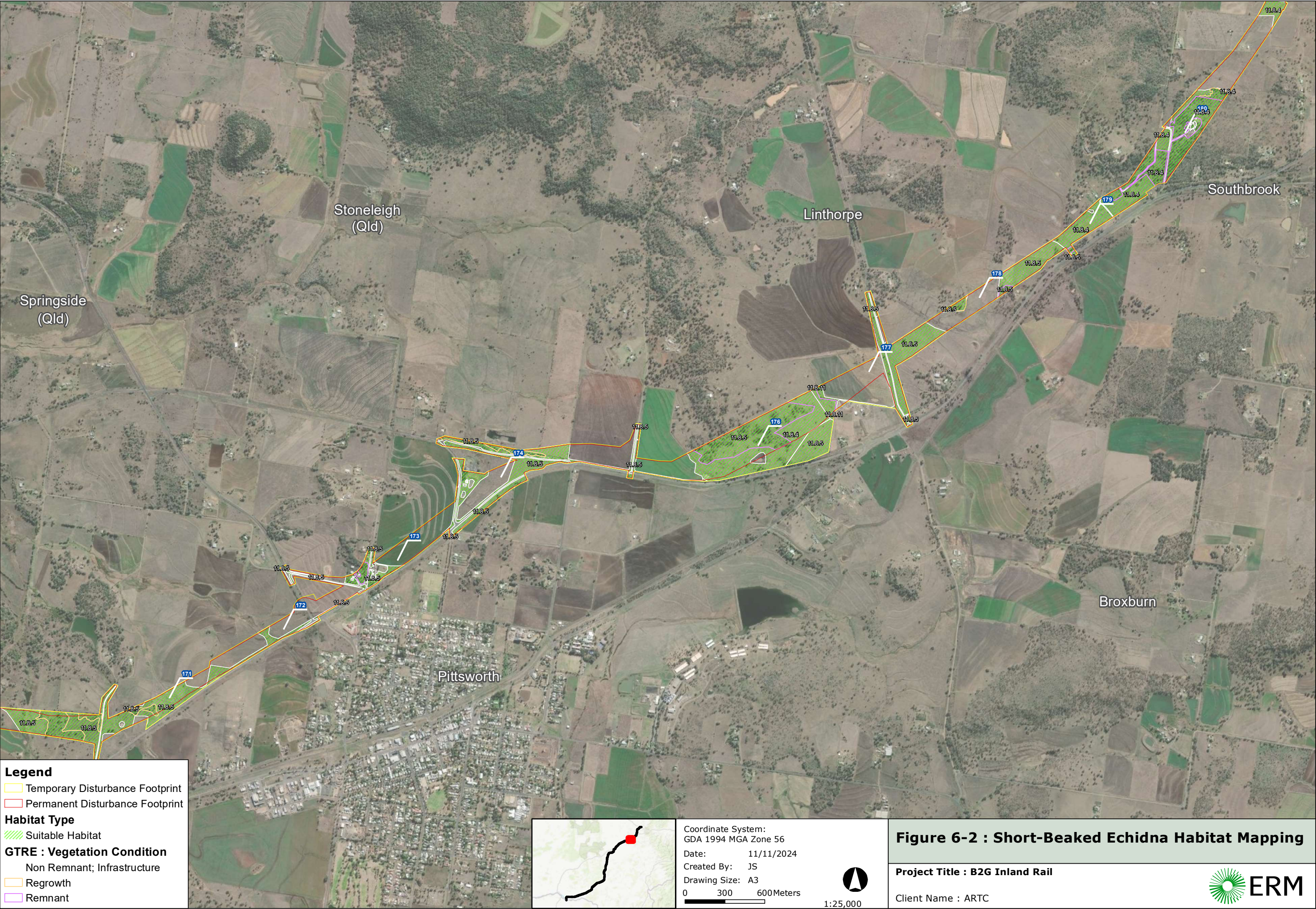








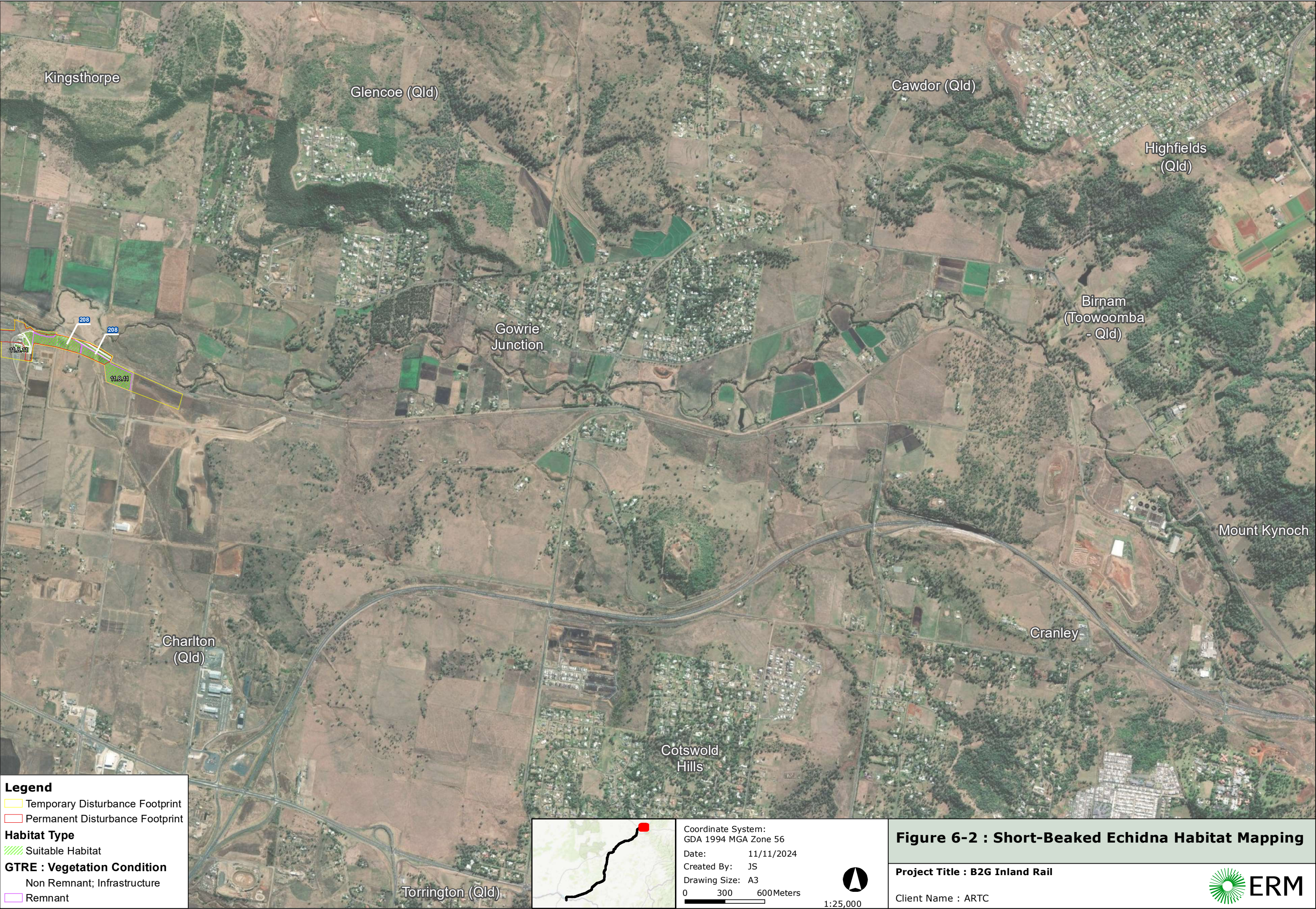












6.2.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the short-beaked echidna:

- Habitat loss – urban development;
- Roadkill on roads; and
- Invasive predators, mostly domestic dogs (NPWS, 1999).

6.2.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia (DoE, 2015); and
- Threat abatement plan for predation by the European red fox (DEWHA, 2008).

6.2.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

Threats identified in the Threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the Threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

6.2.7 REFERENCES

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7. FAUNA SPECIES – THREATENED BIRDS

7.1 BROWN TREECREEPER (SOUTH-EASTERN) (*CLIMACTERIS PICUMNUS VICTORIAE*)

7.1.1 STATUS

Brown treecreeper (south-eastern) (*Climacteris picumnus victoriae*) is listed as Vulnerable under the NC Act and Vulnerable (effective 31/03/2023) under the EPBC Act.

7.1.2 BIOLOGY AND ECOLOGY

7.1.2.1 CHARACTERISTIC

The brown treecreeper is Australia's largest treecreeper, ranging between 16 and 18 cm in length. The crown of the head is dark, the head and neck is grey, while the rest of the upperparts are a soft brown. They have a short buff coloured eyebrow and a slight dark mark through the eye. The upper breast is 'mouse' grey with sexually dimorphic streaks in the centre. Males display a cluster of fine black and white streaks, while females have a cluster of fine rufous and white streaks. The underparts of both sexes are covered by pale buff streaks edged in black, and the undertail with black bars (refer to Plate 7-1) (DCCEEW, 2023b; Pizzey and Knight, 2007).



PLATE 7-1: BROWN TREECREEPER (SOUTH-EASTERN) (*CLIMACTERIS PICUMNUS VICTORIAE*)

Source: Dew (2015)

7.1.2.2 KNOWN DISTRIBUTION

Brown treecreepers (south-eastern) are distributed from the Grampians in western Victoria to the Bunya mountains in Queensland, and from the coast to the inland slopes of the Great Dividing Range (refer to Plate 7-2). The subspecies is found less commonly on the coast and in wetter forests and woodlands (DCCEEW, 2023b; Pizzey and Knight, 1997).

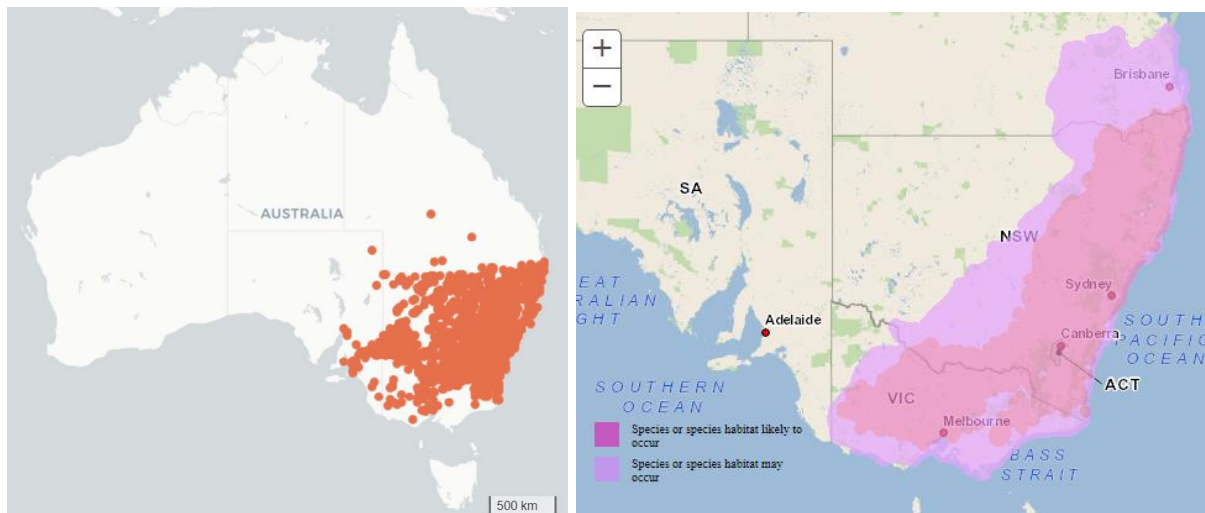


PLATE 7-2: DISTRIBUTION RANGE OF THE BROWN TREECREEPER (SOUTH-EASTERN)
(*CLIMACTERIS PICUMNUS VICTORIAE*)

Source: ALA (2024), DCCEEW (2023a)

7.1.2.3 DISTRIBUTION IN RELATION TO PROJECT

Brown treecreeper (south-eastern) is assessed as known to occur within the Project footprint, due to the presence of one database record and habitat identified within the within the footprint. However, the species was not recorded during targeted surveys.

The railway alignment is located entirely within the species modelled distribution of habitat may occur (as per the modelled habitat on the species SPRAT profile (DoE, 2023)). There is one desktop record (WildNet) of the species within the Project footprint near Yelarbon in 2021 (DES, 2024). There are numerous historic database records exist in the vicinity of the southern portion of the rail alignment near the Queensland-New South Wales border (i.e., ALA), with the closest being a record approximately 3.5 km from the Project footprint in 1985. Several other records were identified in the Dhinna Dhinawan National Park (NSW) and Bebo State Forest (NSW), the majority of which were in 2001 and 2002, and one in 2019 (refer to Plate 7-3).

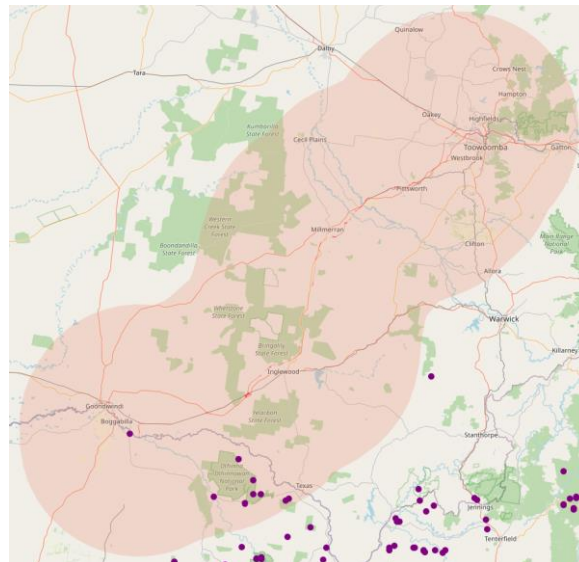


PLATE 7-3: DISTRIBUTION RANGE OF THE BROWN TREECREEPER (SOUTH-EASTERN) (*CLIMACTERIS PICUMNUS VICTORIAE*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.1.2.4 BIOLOGY AND REPRODUCTION

Brown treecreepers (south-eastern) are active birds, frequently foraging on the ground and can be found well out of cover at times (Pizzey and Knight, 2007). This subspecies has a broad diet, including nectar from eucalypts such as mugga ironbark (*Eucalyptus sideroxylon*), lizards, food scraps and a variety of invertebrates including ants, beetles, insect larvae, spiders, moths, flies, cockroaches, termites, and lacewings (DCCEEW, 2023b).

This subspecies is usually observed in pairs or small family groups of three while occupying their permanent territories. They nest and roost in eucalyptus tree cavities. Brown treecreepers breed cooperatively, where several subordinate males support the breeding pair (DCCEEW, 2023b). This breeding group builds the nest over one to two weeks in live or standing dead tree hollows 3-10 m above the ground, tree stumps or in fence posts near the ground. The nest is a cup shape made of grass lined with fur or feathers (DCCEEW, 2023b; Pizzey and Knight, 2007). Breeding takes place between July and February (DCCEEW, 2023b). Females typically lay two or three eggs that are pink to purple, and thickly freckled or streaked red (Pizzey and Knight, 2007). Pairs typically have two broods in each season. Young females will disperse from the nest but are often unwilling to cross large open areas. The highest breeding success has been observed in areas with low shrub densities, moderate ground cover density, and greater amounts of foraging substrates and invertebrate biomass (DCCEEW, 2023b).

7.1.3 HABITAT DESCRIPTION AND DEFINITION

Brown treecreeper (south-eastern) inhabit dry open eucalypt forests and woodlands (DCCEEW, 2023). The species prefers woodlands dominated by stringybarks and other rough-barked eucalypts, usually with an open grassy understorey. The subspecies is not usually found in woodlands with a dense shrub layer, and it is absent from heavily degraded woodlands and steep rocky hills (DCCEEW, 2023b).

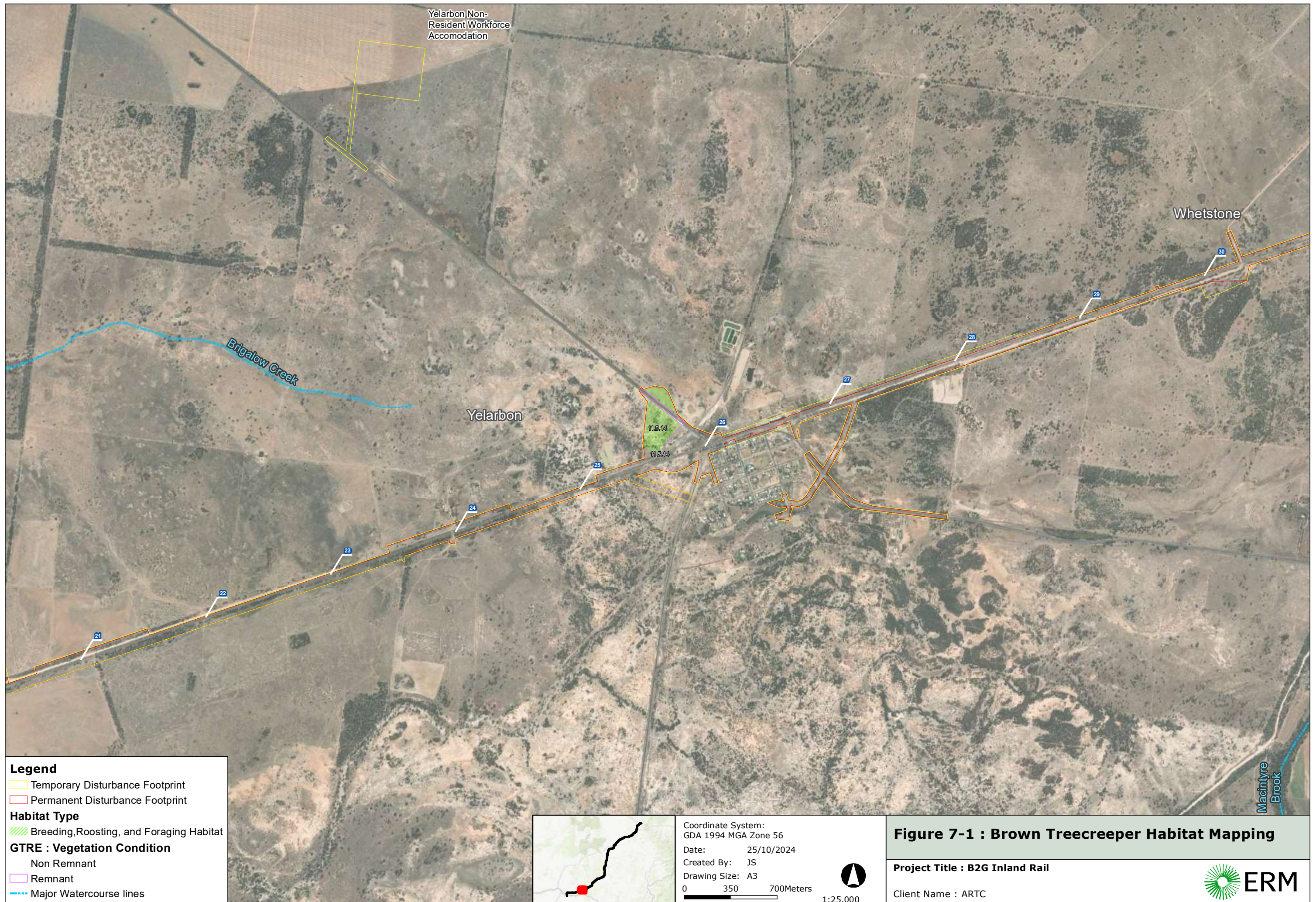
Habitat critical to the survival of the species includes any areas with relatively undisturbed grassy woodland with a native understorey, large living and dead trees for roosting, nesting,

and foraging, fallen timber for foraging, and hollows in standing dead or live trees and tree stumps for nesting. Additionally, any known or likely habitat should be considered as habitat critical to the survival of the species, including areas not currently occupied due to disturbance but may be suitable again in the future. Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 7-1 and is presented in Figure 7-1.

TABLE 7-1 HABITAT CRITERIA FOR BROWN TREECREEPER (SOUTH-EASTERN) WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/roosting and foraging habitat	Breeding, roosting and foraging habitat include undisturbed woodlands with an open native understorey. Nesting and roosting in naturally occurring tree cavities in a variety of eucalypt species or rough-barked species. Species requires hollows in standing dead and/or live trees and tree stumps for nesting.	11.3.2, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.27i, 11.3.4, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.14 (remnant only, where scattered trees are present), 11.5.20, 11.7.4, 11.7.7, 11.8.4, 11.8.5, 11.9.7, 11.9.9a, 11.9.10	Large continuous patches of remnant Eucalypt woodlands that are relatively intact and undisturbed. Areas of regrowth where surrounded by adjacent remnant. Regrowth areas need to be adjacent to (no more than a 100m gap) a patch of connected habitat more than 200 ha. Microhabitat features include a mix of leaf litter, coarse woody debris, grass cover and bare ground. Cattle grazing is absent and habitat is relatively undisturbed. Hollows in standing dead or live trees are essential and must be abundant. Areas mapped as Essential Habitat.
Unsuitable habitat	Heavily degraded woodlands and steep rocky hills.	11.3.1 11.3.21 11.3.24 11.3.27 11.3.27b 11.4.3 11.5.14 11.7.5 11.8.3 11.8.11 11.9.5	Areas not mapped as breeding/roosting and foraging habitat (i.e., degraded woodlands and steep rocky hills). Areas outside the species modelled distribution.





Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

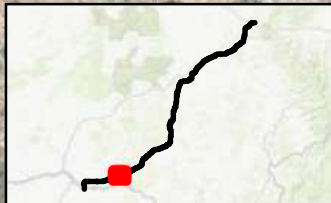
Breeding, Roosting, and Foraging Habitat

GTRE : Vegetation Condition

Non Remnant

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters

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Figure 7-1 : Brown Treecreeper Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Breeding, Roosting, and Foraging Habitat

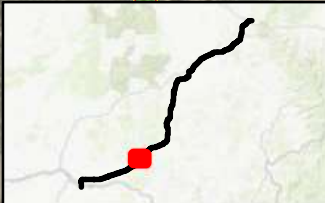
GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines

Whetstone State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

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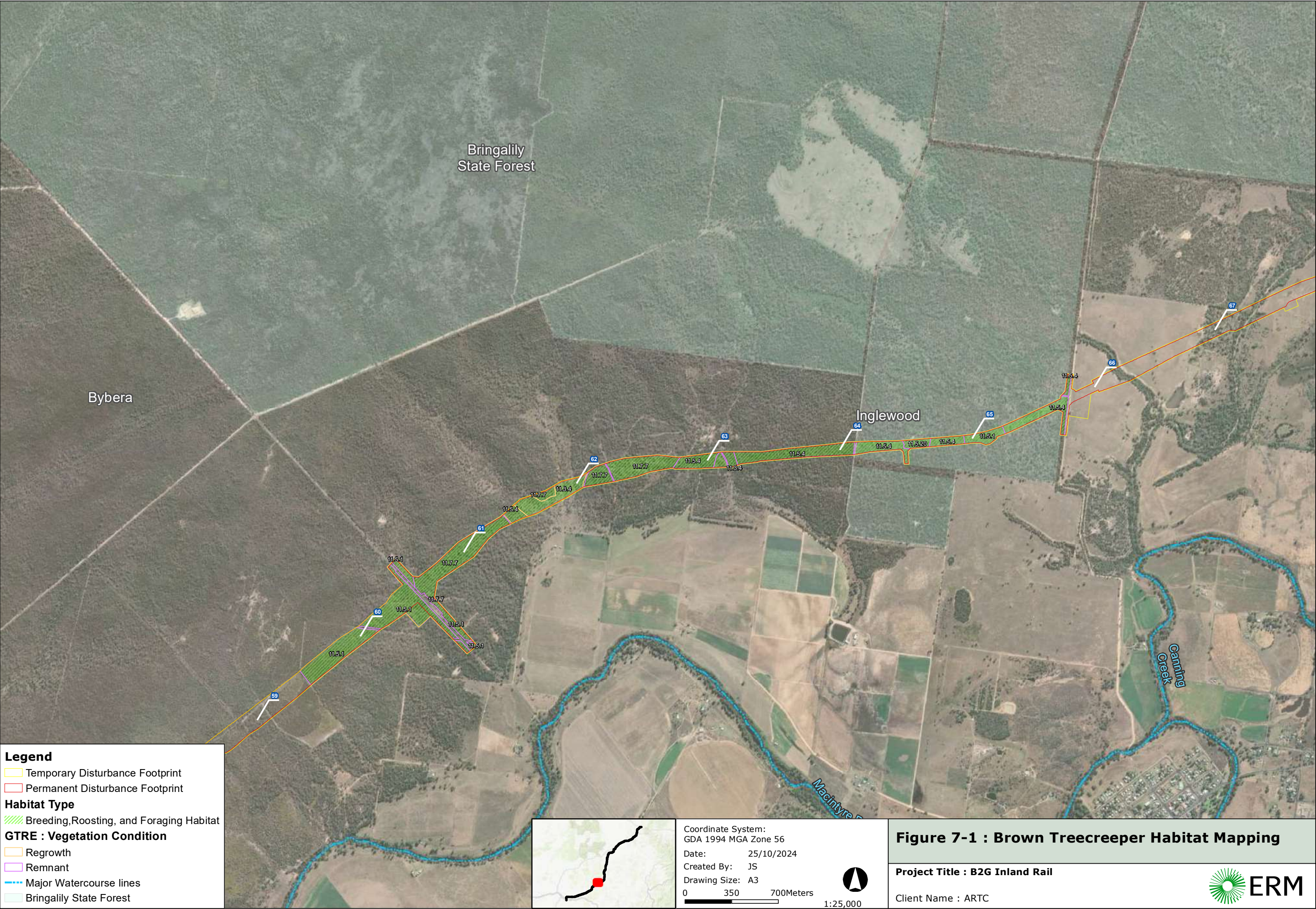


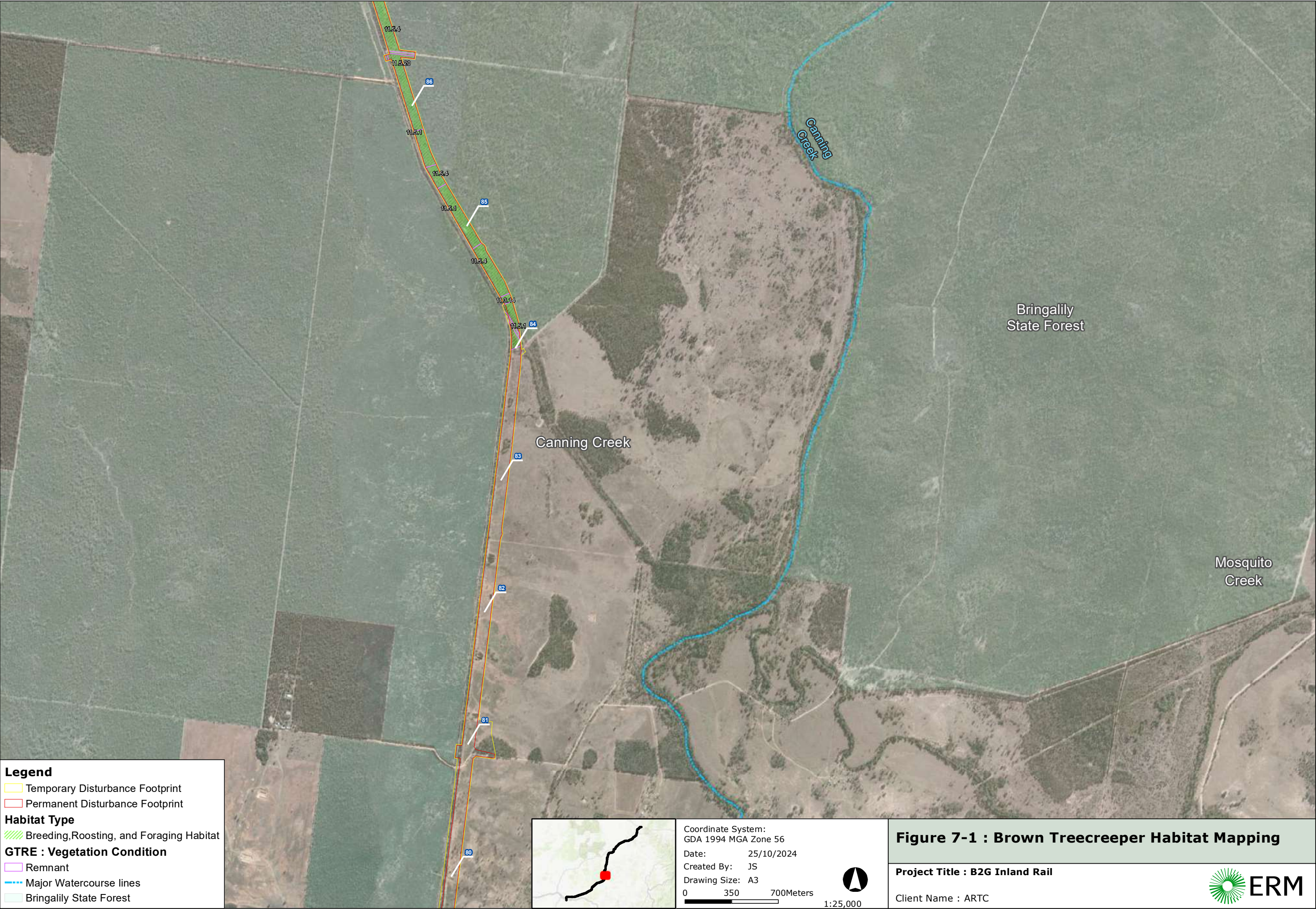
Figure 7-1 : Brown Treecreeper Habitat Mapping

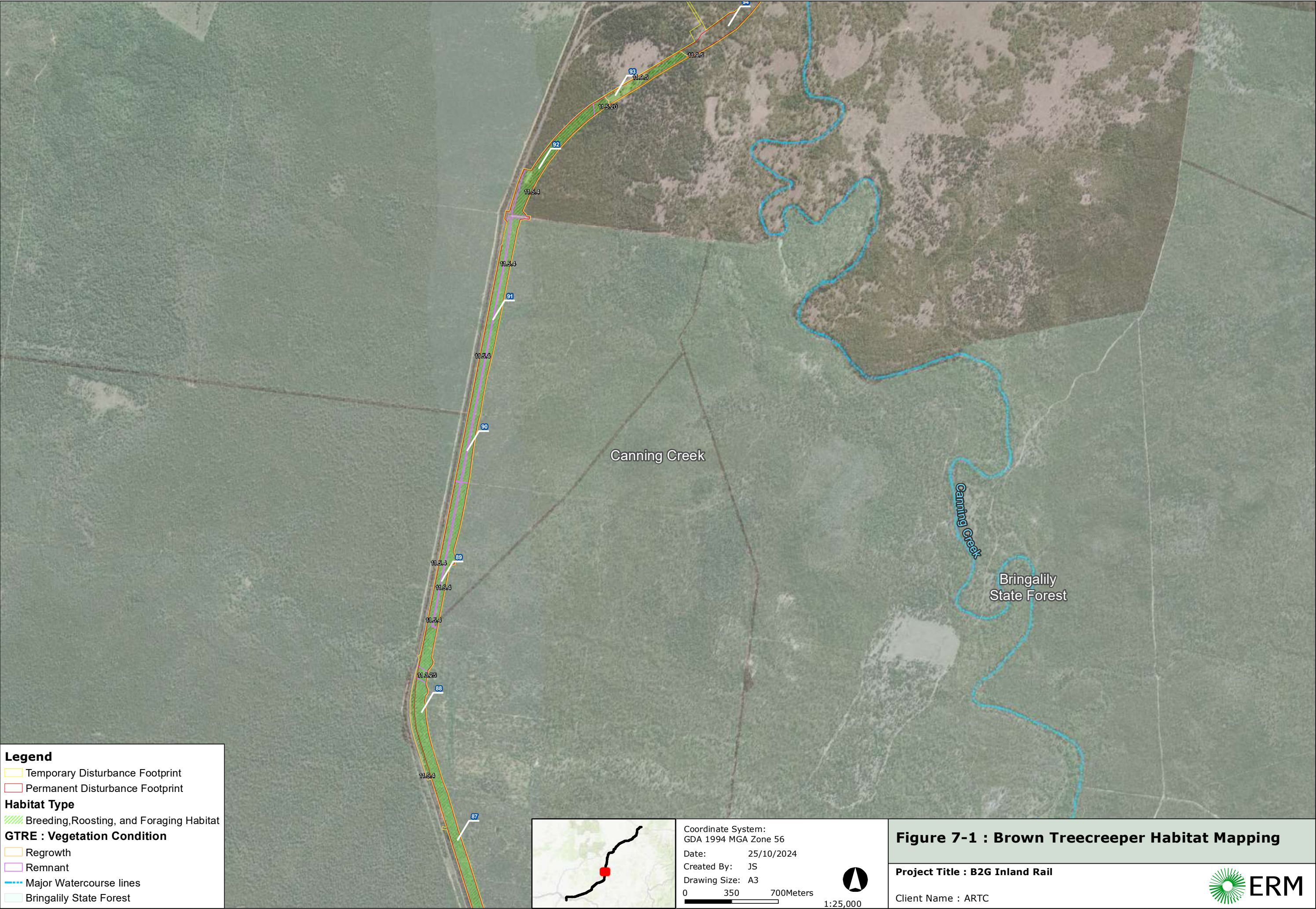
Project Title : B2G Inland Rail

Client Name : ARTC











Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Breeding, Roosting, and Foraging Habitat

GTRE : Vegetation Condition

Non Remnant

Remnant



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



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Figure 7-1 : Brown Treecreeper Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





7.1.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the brown treecreeper (south-eastern):

- Habitat loss and fragmentation – urban development;
- Habitat degradation – grazing pressure; and
- Invasive competition, mostly noisy miners (*Manorina melanocephala*) (DCCEEW, 2023b).

Other minor threatening processes to the subspecies have been identified to include:

- Altered fire regimes;
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought); and
- Widespread, conventional grazing practices that do not allow for the regeneration of native woodlands (DCCEEW, 2023b).

These minor threats are more pronounced when impacted by edge effects, and therefore are exacerbated by habitat fragmentation.

7.1.5 THREAT ABATEMENT/RECOVERY PLANS

No threat abatement/recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats (DoE, 2015);
- Threat abatement plan for predation by the European red fox (DEWHA, 2008); and
- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*) (TSSC, 2013).

7.1.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLAN

Threats identified in the threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

Threats identified in the threat abatement plan for avifauna exclusion by over-abundant noisy miners include:

- Physical and numerical domination of other avifauna;
- Exacerbation of existing threats, such as habitat fragmentation, habitat structure, or grazing; and
- Broad scale canopy dieback.

Threat abatement actions for noisy miners include:

- Habitat revegetation; and
- Local culling.

7.1.7 REFERENCES

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7.2 DIAMOND FIRETAIL (*STAGONOPLEURA GUTTATA*)

7.2.1 STATUS

Diamond firetail (*Stagonopleura guttata*) is listed as Vulnerable under the NC Act and Vulnerable (effective 31/03/2023) under the EPBC Act.

7.2.2 BIOLOGY AND ECOLOGY

7.2.2.1 CHARACTERISTIC

The diamond firetail is a large, striking finch with a bright red bill, and red eyes and rump. This species head and body length is between 10 to 12 cm, and weight is approximately 17 grams. The white throat and lower breast are separated by a broad black breast-band that extends into the strongly white-spotted, black flanks (DCCEEW, 2023b). The breast-band is narrower in females than males (Pizzey and Knight, 2007). It has a grey back and head, and ashy-brown wings (refer to Plate 7-2). The juvenile diamond firetail has a black bill and is duller in colour (DCCEEW, 2023b).



PLATE 7-4: DIAMOND FIRETAIL (*STAGONOPLEURA GUTTATA*)

Source: Hains (2019)

7.2.2.2 KNOWN DISTRIBUTION

Diamond firetails occur on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 km inland from the sea (DCCEEW, 2023b) (refer to Plate 7-5). Their range once extended to north Queensland inland from Cardwell, but they now occur continuously in the very south of the state, with some patchy distribution north to Rockhampton and inland to Longreach and Cunnamulla (DCCEEW, 2023b; Pizzey and Knight, 2007). They have disappeared from many of the more settled parts of New South Wales, Australian Capital Territory and Victoria, and birds in South Australia appear to have been separated into three isolated subpopulations (Eyre Peninsula, Mt Lofty to Southern Flinders Ranges, and the south-east), with few records from a fourth (Yorke Peninsula) in the last decade (DCCEEW, 2023b).

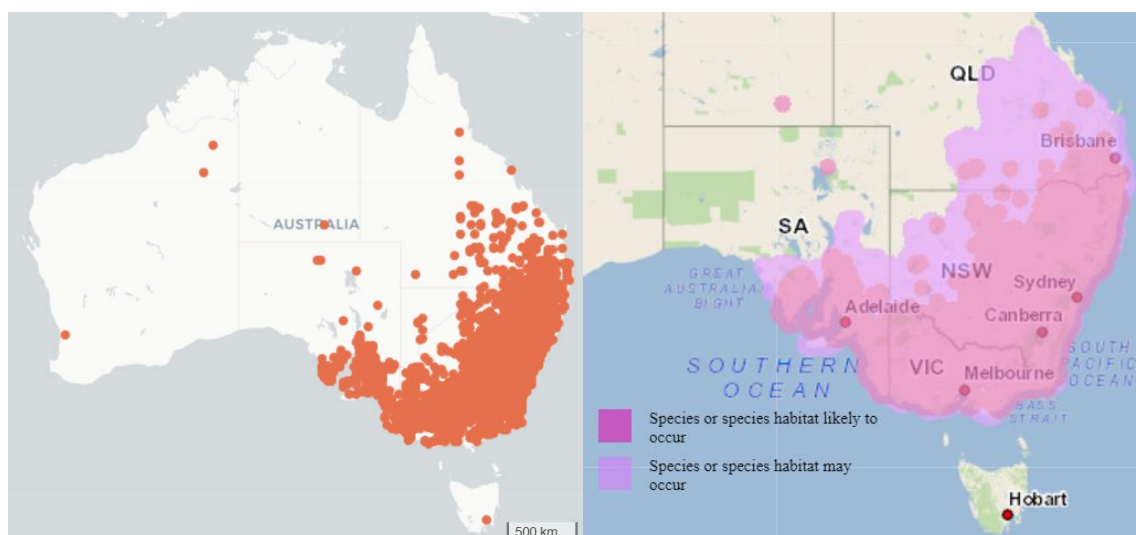


PLATE 7-5: DISTRIBUTION RANGE OF THE DIAMOND FIRETAIL (*STAGONOPLEURA GUTTATA*)

Source: ALA (2024), DCCEEW (2023a)

7.2.2.3 DISTRIBUTION IN RELATION TO PROJECT

The diamond firetail has been identified as likely to occur within the Study Area as database records (i.e. ALA and WildNet) have been identified, and habitat was detected; however no individuals were detected during targeted surveys. Within the study area, 287 records were identified since 2020, with the closest being a record in Inglewood in 2021 approximately 2.3 km from the Project footprint. Numerous historic records also exist across the Study Area, the closest being a historic record directly in the impact assessment area in 1972 (refer to Plate 7-6). The railway alignment is located entirely within the species modelled distribution of habitat known or likely to occur (as per the modelled habitat on the species SPRAT profile (DCCEWW, 2024).

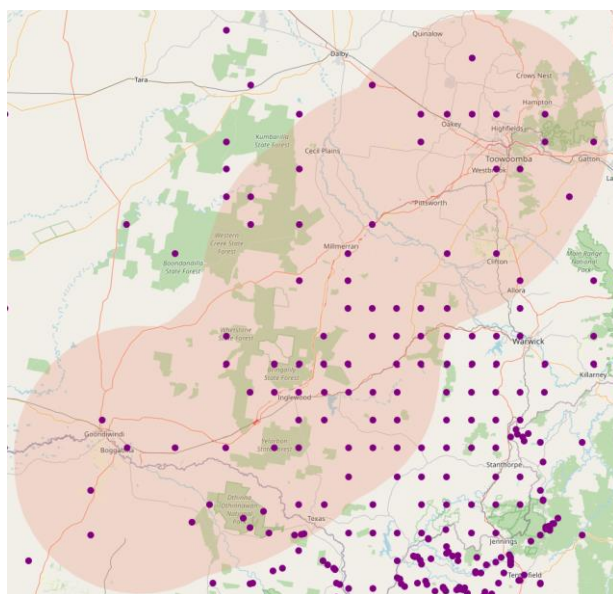


PLATE 7-6: DISTRIBUTION RANGE OF THE DIAMOND FIRETAIL (*STAGONOPLEURA GUTTATA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.2.2.4 BIOLOGY AND REPRODUCTION

Diamond firetails can be found in flocks of between 5 and 40 in the non-breeding season (DCCEEW, 2023b). They are generally sedentary, although some populations have been observed to move locally, such as the population in the Grampians, Victoria that relocates to nearby northern mallee areas during winter (DEH, 2008). This species roosts in dense shrubs or in small nests built especially for roosting (DCCEEW, 2023b).

Diamond firetails are primarily granivores, although they will eat insects during breeding season. They can often be seen hopping on the ground as they feed predominantly at ground level, consuming green leaves, and ripe or partly-ripe grass and herb seeds, either directly from the plant or from the ground if fallen (DCCEEW, 2023b). It is likely that green vegetation may be a means of supplementing the water intake (DEH, 2008).

This species appears to have a loose breeding season between August and January, that relies on appropriate conditions rather than behaviour. The large flocks separate into small colonies of pairs to breed, often sharing one tree to nest in (DCCEEW, 2023b; DEH, 2008). Both sexes contribute to the nest building, although only the female weaves the green grass to form the outer structure (DEH, 2008). The nest is bottle shaped with a long tunnel entrance, and unlike the roosting nest, they are lined with fine grasses, feathers, or fur (DCCEEW, 2023b; Pizzey and Knight, 2007). For protection nests are often built into thorny or prickly shrubs, disguised in mistletoe, or built directly into the base of the larger stick nests of a local raptor species. This can include birds such as a whistling kite (*Haliastur sphenurus*), white-bellied seaeagle (*Haliaeetus leucogaster*), wedge-tailed eagle (*Aquila audax*), brown falcon (*Falco berigora*), nankeen kestrel (*Falco cenchroides*) or a square-tailed kite (*Lophoictinia isura*) (DCCEEW, 2023b; DEH, 2008).

After the nest has been constructed, the female lays between 4 to 6 oval shaped, white eggs, although a clutch can contain up to 9 eggs. One clutch is laid per season, and both partners contribute to the egg incubation and the care of the hatchlings (DCCEEW, 2023b; DEH, 2008; Pizzey and Knight, 2007). Hatchlings remain in the nest for 24 to 25 days before fledging (DEH, 2008).

7.2.3 HABITAT DESCRIPTION AND DEFINITION

The conservation advice lists diamond firetails as occurring in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees (Higgins et al., 2007 referenced in the Conservation Advice). This would indicate that there are large areas of available habitat for the species (including cleared and farming areas). The advice also states the species prefers areas with “relatively low tree density, few large logs, and little litter cover but high grass cover” and references the study by Antos et al. (2008) as one of the few studies into this species. This statement and reference in the advice is often interpreted as the species preference for non-remnant, cleared areas with high grass cover and scattered paddock trees which overestimates the species habitat and undervalues areas that do provide the appropriate microhabitat requirements.

It should be noted that the Antos et al. (2008) study was conducted in and compared preferences only to associated wooded remnant in areas >1,500 ha. It does not proclaim to show the species preference within the preferred remnant itself, just the species preference compared to areas it did not forage in. Therefore, it showed the species preference for lower tree density, fewer large

logs, and less litter cover and higher grass cover compared to adjacent vegetation (random sites), but all of these factors were still present in the vegetation.

The use of litter, grasses and bare ground was compared to other woodland bird species in the Antos and Bennett (2006) study. What this study shows is that the diamond firetail foraged exclusively on the ground and used bare ground, leaf litter, herbs and grass as foraging substrates. It did not use trunks, branches, canopy, shrubs or air. In comparison to other species, it used grass more, and it used leaf litter and bare ground less but it did still use all of these substrates for its ground foraging behaviour (Antos and Bennett, 2006). The habitat where the diamond firetail was studied in this research contained widespread substrates, with leaf litter accounting for 40–70% and bare ground 15–27% of the total ground cover (Antos and Bennett, 2006). Both leaf litter and bare ground are utilised substrates according to Antos and Bennett (2006) study and a matrix of ground layers including all of these factors are likely to be important, not the dominance of grasses.

A look further into the known research states the diamond firetail as threatened by clearance and fragmentation of habitat. Isolation and reductions in remnant areas inhibit dispersal and increase their vulnerability to local extinction via stochastic events. Small, isolated populations also lose their long-term genetic viability (Barrett et al. 1994). Further, diamond firetail populations appear unable to persist in areas which lack remnants of native vegetation larger than 200 ha (N. Schrader, pers. comm. cited in NSW Scientific Committee 2000 and OEH, 2021). It also noted a high diversity of native grasses with differing maturation patterns as also essential to maintain populations throughout the year (DEH, 2008).

Ausecology also undertook an analysis of the records in Queensland and found that 70% of records (recorded since 1975 and >2,000 m accuracy) were located in large tracts of remnant vegetation, with 15% of records outside of remnant patches located within 200 m and the other 15% all located within 2 km of remnant vegetation.

Diamond firetail inhabit woodlands (*Eucalyptus*, *Acacia*, or *Casuarina*) throughout their distribution of south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia (DCCEEW, 2023). Ausecology has researched the Queensland records and found a strong association with remnant 13.11.8 and this has been used as a benchmark of canopy and grass cover requirements when analysing other woodland habitats.

Nest locations for this species is predominantly at the base of large stick nests made from birds of prey (believed to safeguard the nest from predators) but without such nests being present are known to nest within shrubs (e.g., hakeas, rose bushes, boxthorn and sea urchin hakea) (DCCEEW, 2024).

As defined in the Conservation Advice (DCCEEW, 2023) habitat critical to the survival of the species “includes areas of:

- Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats;
- low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding;
- Drooping she-oak (*Allocasuarina verticillata*) within the Mt Lofty Ranges.”

Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 7-2 and is presented in Figure 7-2.

TABLE 7-2 HABITAT CRITERIA FOR DIAMOND FIRETAIL WITHIN THE STUDY AREA

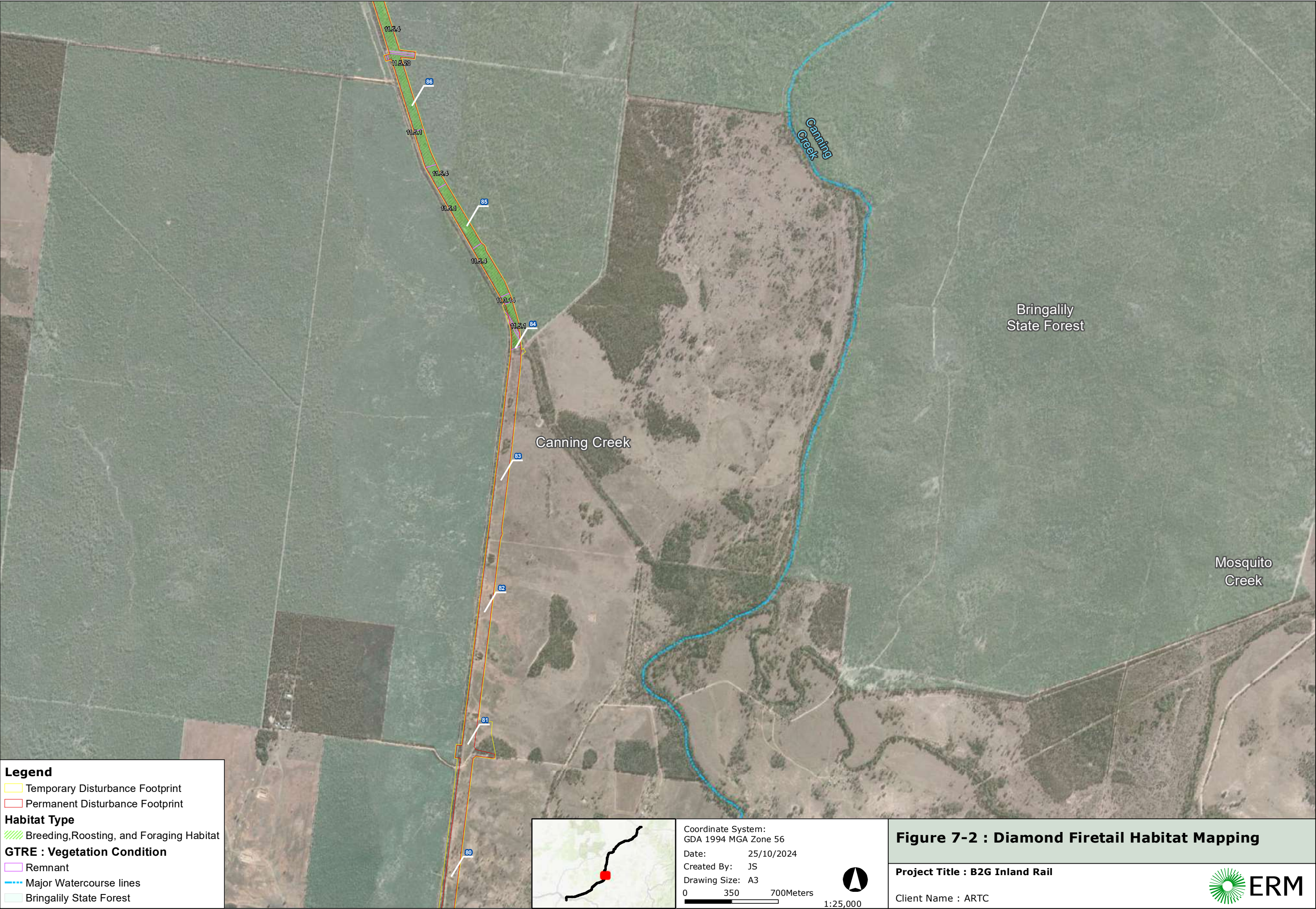
Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/roosting and foraging habitat	Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats.	11.3.1, 11.3.2, 11.3.17, 11.3.25, 11.3.27i, 11.3.4, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.4, 11.8.4, 11.8.5, 11.9.7, 11.9.9a	Remnant woodlands >200 including riparian corridors with canopy cover <50% and native grass cover >20%. Microhabitat features include a mix of leaf litter, grass cover and bare ground.
Unsuitable habitat	Areas of non-remnant cleared areas, grasslands, fragmented areas <200 ha, areas subject to grazing and cropping.	11.3.14, 11.3.18, 11.3.21, 11.3.24, 11.3.27, 11.3.27b, 11.4.3, 11.5.14, 11.7.5, 11.7.7, 11.8.3, 11.8.11, 11.9.5, 11.9.10	Areas not mapped as foraging, roosting or breeding habitat, including forests and woodland with >50% canopy cover, grasslands, non-remnant grazing country and cleared areas.

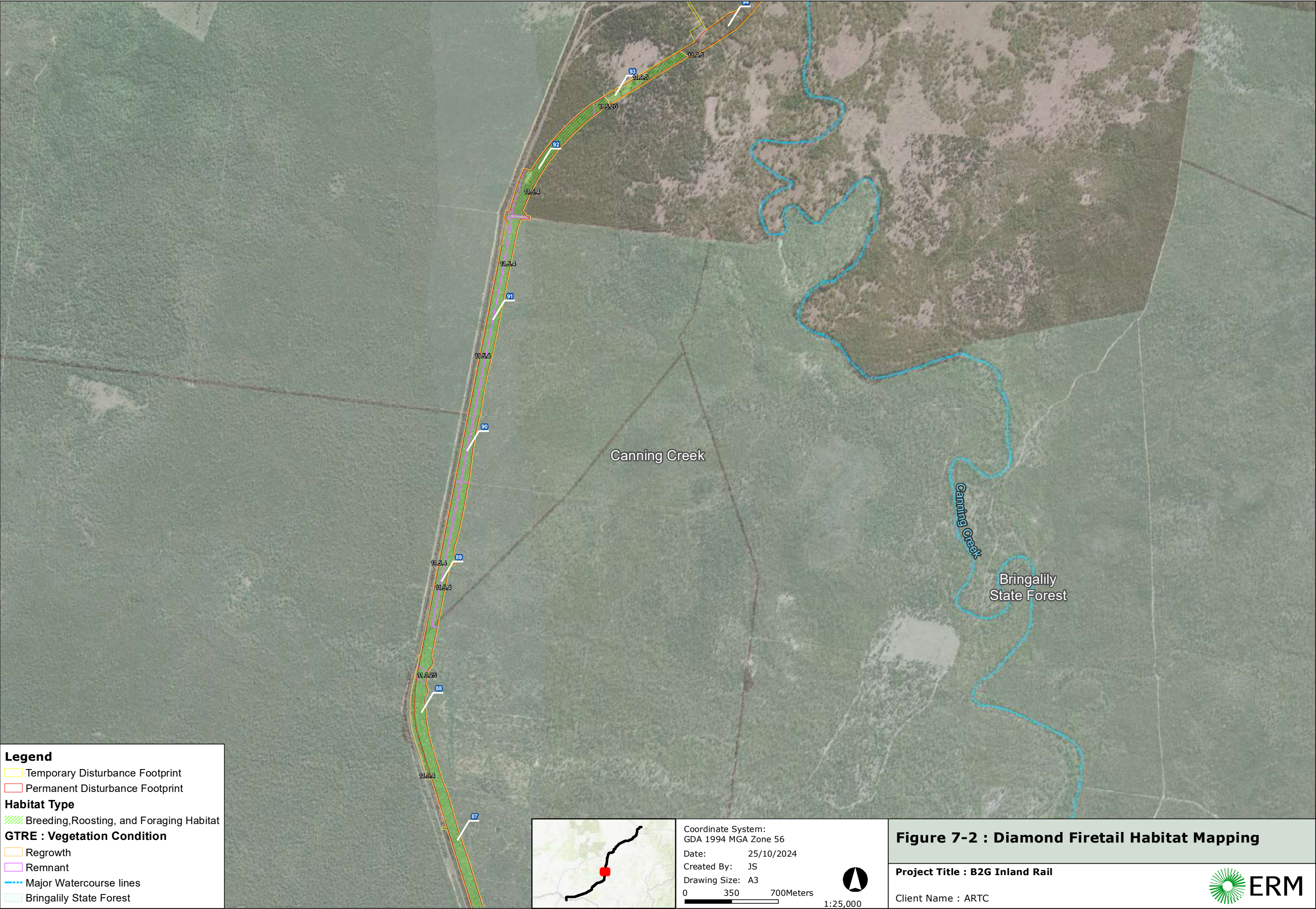












Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Breeding, Roosting, and Foraging Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines

Bringalily State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



Figure 7-2 : Diamond Firetail Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC



7.2.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the diamond firetail:

- Habitat loss and fragmentation;
- Habitat degradation;
- Replacement of native perennial grasses with exotic annual grasses;
- Altered fire regimes;
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought);
- Predation by pied currawongs (*Strepera graculina*); and
- Invasive competition, mostly noisy miners (*Manorina melanocephala*) (DCCEEW, 2023b).

These threats are more pronounced when impacted by edge effects, and therefore are exacerbated by habitat fragmentation.

7.2.5 THREAT ABATEMENT/RECOVERY PLANS

No threat abatement/recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats (DoE, 2015);
- Threat abatement plan for predation by the European red fox (DEWHA, 2008); and
- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*) (TSSC, 2013).

7.2.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLAN

Threats identified in the Threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the Threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;

- Barriers;
- Habitat management; and
- Shooting and bounties.

Threats identified in the Threat abatement plan for avifauna exclusion by over-abundant noisy miners include:

- Physical and numerical domination of other avifauna;
- Exacerbation of existing threats, such as habitat fragmentation, habitat structure, or grazing; and
- Broad scale canopy dieback.

Threat abatement actions for noisy miners include:

- Habitat revegetation; and
- Local culling.

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7.3 GLOSSY BLACK-COCKATOO (SOUTH-EASTERN) (*CALYPTORHYNCHUS LATHAMI LATHAMI*)

7.3.1 STATUS

Glossy black-cockatoo (south-eastern) (*Calyptorhynchus lathami lathami*) is listed as Vulnerable under the NC Act and Vulnerable (effective 10/08/2022) under the EPBC Act.

7.3.2 BIOLOGY AND ECOLOGY

7.3.2.1 CHARACTERISTIC

The glossy black-cockatoo (south-eastern) is a small black cockatoo that is approximately 46 to 51 cm in length with a wingspan of 90 cm, a tail 21 to 23 cm and an inconspicuous crest and broad bulbous bill. Adult males have solid bright red panels in the ventral surface of their tail feathers, while females have light orange-red panels with black barring (refer to Plate 7-3). Females also have irregular patches of yellow on the head and neck. Immature individuals also have irregular patches of yellow on the head and wing coverts. Tail barring in males is lost in successive moults as the panels become bright red (Pizzey and Knight 2007; Schodde et al., 1993).

The glossy black-cockatoo (south-eastern) is distinguished from the red-tailed black cockatoo (*C. banksii*) and yellow-tailed black cockatoo (*C. funereus*) by its' smaller size, dull brown tinge to the head and breast, inconspicuous crest, and red rather than yellow panels in the tail (Glossy Black Conservancy, 2010).



PLATE 7-7: GLOSSY BLACK-COCKATOOS (SOUTH-EASTERN) (*CALYPTORHYNCHUS LATHAMI LATHAMI*)

Source: Claridge (2016)

7.3.2.2 KNOWN DISTRIBUTION

The glossy black-cockatoo (south-eastern) has a widespread distribution although they are uncommon, ranging from Gympie, Queensland, through eastern New South Wales to the eastern coastal Gippsland region of Victoria. Their distribution is continuous through the forested parts of the Great Dividing Range but becomes more scattered inland, to as far west as Augathella and Tambo in Queensland, and the Riverina in New South Wales (refer to Plate 7-8) (DCCEEW, 2022; Hourigan 2012; Schodde et al., 1993).

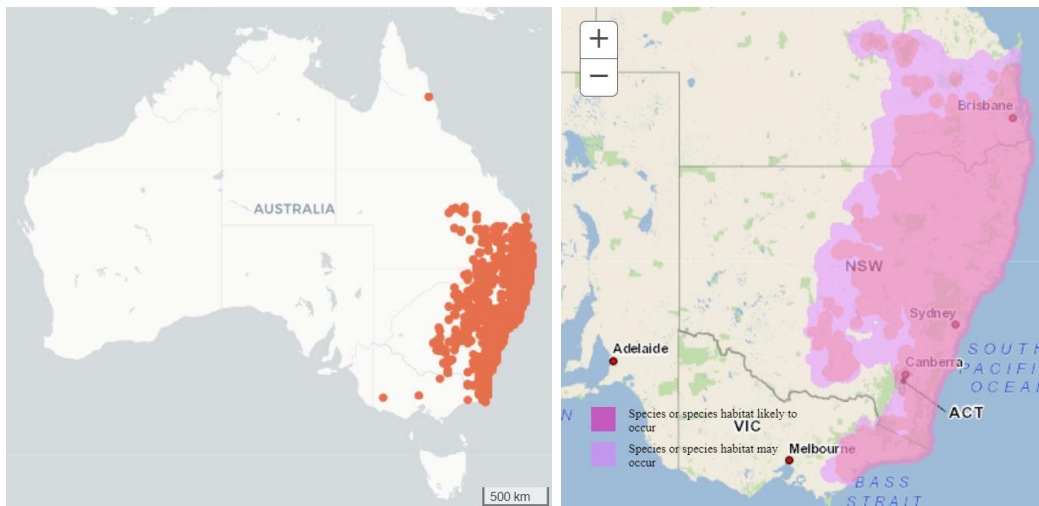


PLATE 7-8: DISTRIBUTION RANGE OF GLOSSY BLACK-COCKATOO (SOUTH-EASTERN)
(*CALYPTORHYNCHUS LATHAMI LATHAMI*)

Source: ALA (2024), DoE (2024)

7.3.2.3 DISTRIBUTION IN RELATION TO PROJECT

Glossy black cockatoo (south-eastern) is assessed as known to occur within the Project footprint, as habitat has been identified within the Study Area and the species was recorded during targeted surveys.

The most recent database records (i.e. ALA and WildNet) for glossy black cockatoo (south-eastern) were in 2021, near Mount Whitestone approximately 34 km from the Project footprint. A record from 2005 occurs where the Project footprint intersects Bringalily State Forest at the northern end of the Study Area (refer to Plate 7-9). Other records from within 50 km of the Project footprint occur at Bringalily and Whetstone State Forests to the west of the Project, Yelarbon State Forest to the south, north-west of Pittsworth and the region to the north-east of the Project footprint where it meets Toowoomba Range.

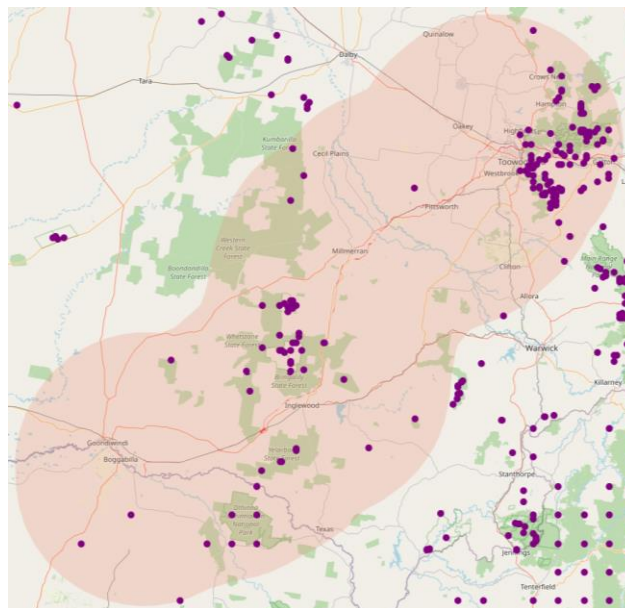


PLATE 7-9: DISTRIBUTION RANGE OF GLOSSY BLACK-COCKATOO (SOUTH-EASTERN)
(*CALYPTORHYNCHUS LATHAMI LATHAMI*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.3.2.4 BIOLOGY AND REPRODUCTION

Glossy black-cockatoos (south-eastern) are usually seen in pairs, family trios or in a small flock, feeding on she-oak seeds where they will often be heard audibly crunching through seed capsules before they are seen. They can also be seen flying high above the canopy or through dense woodland to reach alternative feed trees (Pizzey and Knight, 2007) or drinking sites. Outside of breeding season, they will roost communally in the upper branches of live trees in a flock of up to 40 individuals (Hourigan, 2012). Larger foraging and roosting groups were observed when food resources were limited during drought periods (DCCEEW, 2022).

Glossy black-cockatoos (south-eastern) are known to feed almost exclusively on the seeds of the following species throughout their range: *Allocasuarina torulosa*, *Casuarina equisetifolia*, *A. littoralis*, *A. verticillate*, *C. cristata*, *C. pauper*, *A. gymnanthera*, and *A. diminuta* (OEH, 2017). This is likely because the cones of these species are larger and contain more seeds than other *Allocasuarina* and *Casuarina* species and therefore provide a greater nutritional benefit for the foraging effort expended (DCCEEW, 2022). In addition, within an area, feeding is often restricted to one or two individuals of a single species. This subspecies also shows a strong fidelity to particular feed trees, returning to selected trees over consecutive years (Cameron 2005; Cameron and Cunningham, 2006; Clout, 1989) and can fly more than 10 km from roosting or nesting sites to feeding areas (Hourigan, 2012). They are also known to utilise remnant woodlands, and individual or small pockets of *Allocasuarina* spp. and *Casuarina* spp. feed trees in urban areas (Hourigan, 2012).

Glossy black-cockatoos (south-eastern) are dependent on large hollow-bearing eucalypts for nesting. Hollows used for nests are typically located 10 to 20 m above the ground, in vertical or near vertical branches, stems, and spouts, or in trunk cavities. The same nest will be utilised in successive seasons, and they are known to often nest in close proximity to other nesting pairs. The peak breeding season occurs from March to August in southeast Queensland and northeastern New South Wales and a clutch is typically comprised of one egg (Cameron, 2006; Garnett et al., 1999; Glossy Black Conservancy, 2010; Pizzey and Knight, 2007). Females are exclusively responsible for the incubation and brooding of young, while males are present to feed the female. Fledglings become independent after approximately three months (DCCEEW, 2022).

7.3.3 HABITAT DESCRIPTION AND DEFINITION

South-eastern glossy black-cockatoo distribution occurs from Mitchell (Queensland) as far west as Riverina in New South Wales and south to East Gippsland, occurring throughout the forested regions of the Great Dividing Range (DCCEEW, 2022). The railway alignment is located within the species modelled distribution of both habitat likely to occur and habitat may occur (as per the modelled habitat on the species SPRAT profile (DoE, 2023)).

The glossy black-cockatoo (south-eastern) prefers woodland areas dominated by she-oak (*Allocasuarina* spp.), or open sclerophyll forests/woodlands with a stratum of *Allocasuarina* spp. beneath a canopy of *Eucalyptus* spp., *Corymbia* spp. or *Angophora* spp. Glossy black-cockatoos have also been recorded in mixed *Allocasuarina* spp., *Casuarina* spp., *Callitris* spp. and *Acacia harpophylla* woodland assemblages. South-eastern glossy black-cockatoos are extremely selective, relying on nine species of sheoaks for feeding (DCCEEW, 2022), this may explain the species patchy distribution across its range. In south-east Queensland, south-eastern glossy black-cockatoo show preference for black sheoak (*Allocasuarina littoralis*) and

forest sheoak (*A. torulosa*) for feeding. Additional feed trees can include stringybark sheoak (*A. inophloia*), coastal sheoak (*C. equisetifolia*), and to a lesser extent river sheoak (*C. cunninghamiana*) and swamp sheoak (*C. glauca*). In southeast Queensland, west of the Great Dividing Range, they have been observed feeding in remnant belah (*Casuarina cristata*) and bulloak (*Allocasuarina luehmannii*) forests (Glossy Black Conservancy, 2010).

South-eastern glossy black-cockatoo are hollow nesting birds, utilizing large hollows (entrance diameter of 15 cm) in both living and dead eucalypt trees (DCCEEW, 2022). Suitable hollows for the species must be located more than 8 meters above the ground, in branches more than 30 cm in diameter with a hollow entrance of more than 15 cm in diameter. Additionally, the branch or stem must be no more than 45 degrees from vertical for suitable hollows. Suitable hollow bearing trees include mature trees (more than 100 years old).

Habitat critical to the survival of the species includes all foraging and breeding habitat (including living and dead trees with hollows), as well as any habitats that are not currently occupied by the species but are capable of supporting populations in the future (DCCEEW, 2022). Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 7-3 and is presented in Figure 7-3

TABLE 7-3 HABITAT CRITERIA FOR SOUTH-EASTERN GLOSSY BLACK-COCKATOO WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/roosting habitat	Hollow nesters, utilising large hollows in living and dead eucalypt trees. Potential nest hollows for south-eastern glossy black-cockatoo be more than 8 meters above ground, located in branches more than 30 cm in diameter, have a minimum entrance diameter of more than 15 cm, and be in a branch or stem that is no more than 45 degrees from vertical. Nest hollows lacking the above listed traits are considered unsuitable for the species.	11.3.1 11.3.2 11.3.17 11.3.25, 11.3.27b 11.3.27i 11.5.1 11.5.1a 11.5.20 11.9.5 11.9.7 11.9.9a 11.9.10	Remnant vegetation that contains mature living and dead eucalypt trees with large hollows (>20 cm diameter).
Foraging habitat	Nine species of sheoak (<i>Allocasuarina</i> spp. And <i>Casuarina</i> spp.). In south-east QLD and north-east NSW, preferential foraging habitat consists of black sheoak (<i>A. littoralis</i>) and forest sheoak (<i>A. torulosa</i>), however the species also feeds on stringybark sheoak (<i>A. inophloia</i>), coastal sheoak (<i>C. equisetifolia</i>), river sheoak (<i>C. cunninghamiana</i>) and swamp sheoak (<i>C. glauca</i>).	11.3.1 11.3.17 11.3.18 11.4.3 11.4.10 11.5.1 11.5.1a 11.9.5 11.9.10	Foraging habitat should include remnant vegetation with at least two species of <i>Allocasuarina</i> spp. And/or <i>Casuarina</i> spp. Feed trees include bulloak (<i>A. luehmannii</i>), black sheoak (<i>A. littoralis</i>), forest sheoak (<i>A. torulosa</i>), stringybark sheoak (<i>A. inophloia</i>), coastal sheoak (<i>C. equisetifolia</i>), and to a lesser extent river sheoak (<i>C. cunninghamiana</i>) and swamp sheoak (<i>C. glauca</i>).

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Unsuitable habitat	Hollows that do not meet any of the following characteristics: 8 m above the ground, in branches more than 30 cm in diameter, a hollow entrance of more than 15 cm in diameter and a branch or stem must be no more than 45 degrees from vertical.	11.3.2 11.3.14 11.3.21 11.3.24 11.3.27 11.3.4 11.5.4 11.5.14 11.7.4 11.7.5 11.7.7 11.8.3 11.8.4 11.8.5 11.8.11	Areas not mapped as breeding/roosting or foraging habitat, including hollows that do not meet the minimum requirements of a suitable hollow. Areas outside the species modelled distribution.







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Foraging Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



Figure 7-3 : Glossy Black-Cockatoo Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

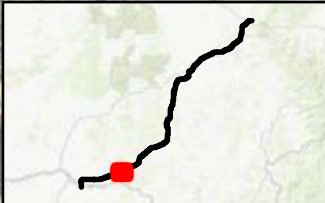
Foraging Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

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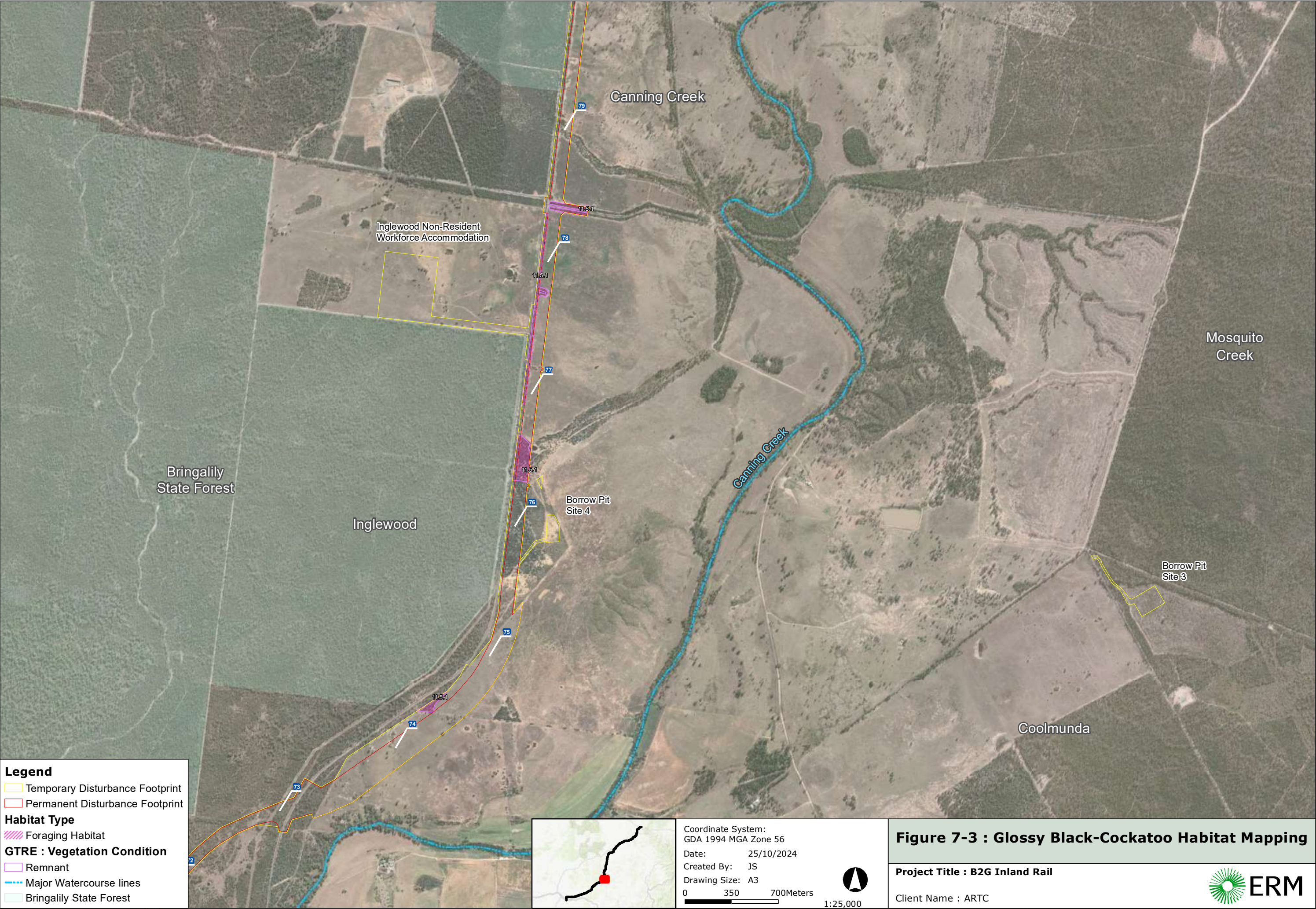
Figure 7-3 : Glossy Black-Cockatoo Habitat Mapping

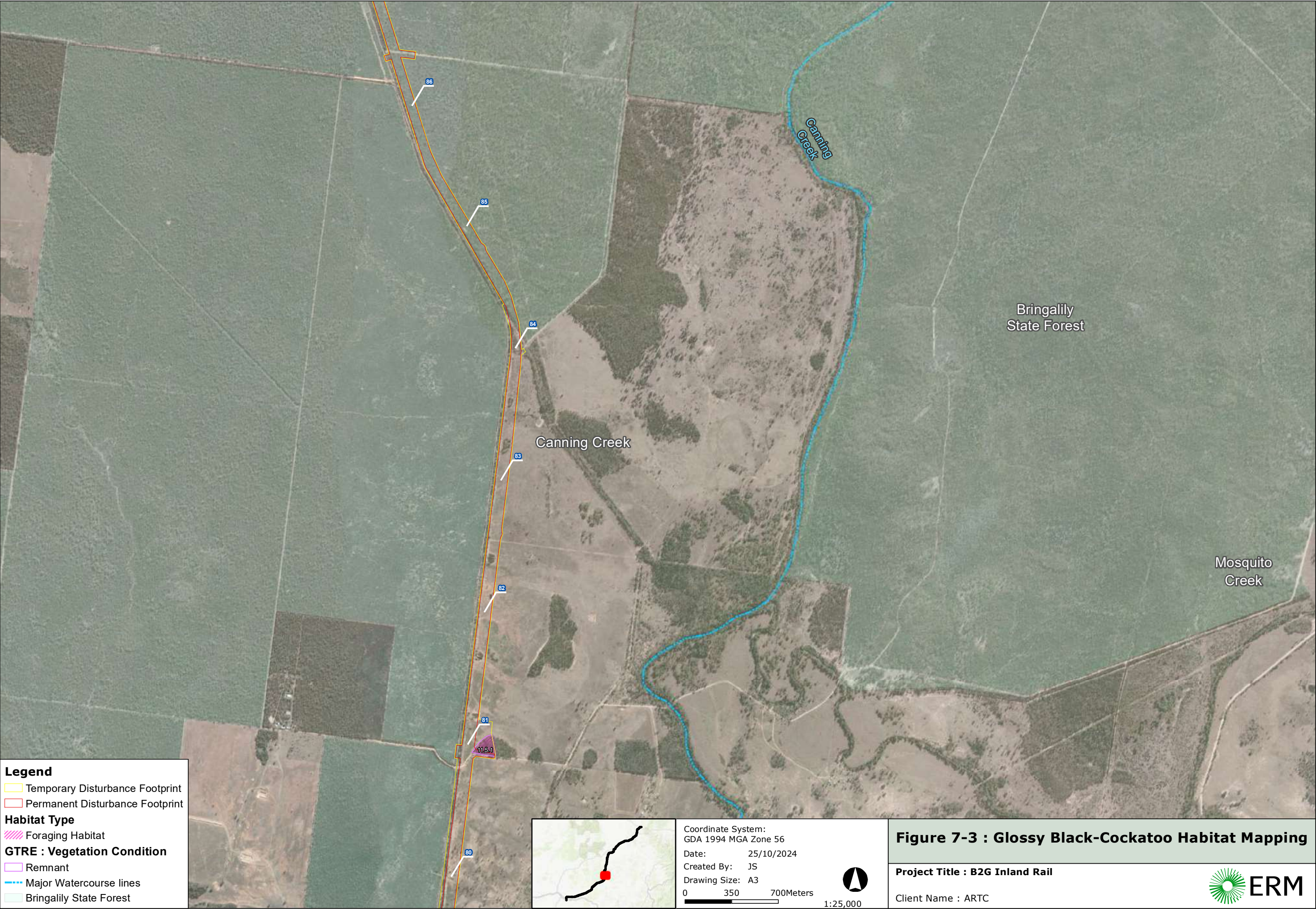
Project Title : B2G Inland Rail

Client Name : ARTC











7.3.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to glossy black-cockatoo (south-eastern):

- Reduction of suitable habitat through clearing for development;
- Decline of hollow bearing trees over time due to land management activities;
- Excessively frequent fire which eliminates sheoaks, depleting habitat and feed trees;
- Limited information on the location of nesting aggregations and the distribution of high-quality breeding habitat;
- Disturbance from coal seam gas and open cut coal mining causing loss of foraging and breeding habitat as well as disturbing reproductive attempts; and
- Illegal bird smuggling and egg-collecting (DCCEEW, 2022).

7.3.5 THREAT ABATEMENT/RECOVERY PLANS

No threat abatement/recovery plan has been established for this species.

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7.4 HOODED ROBIN (SOUTH-EASTERN) (*MELANODRYAS CUCULLATA CUCULLATA*)

7.4.1 STATUS

Hooded robin (south-eastern) (*Melanodryas cucullata cucullata*) is listed as Endangered under the NC Act and Endangered (effective 03/03/2023) under the EPBC Act.

7.4.2 BIOLOGY AND ECOLOGY

7.4.2.1 CHARACTERISTIC

The hooded robin (south-eastern) is a large robin, between 14 and 17 cm in length, with individuals becoming smaller the further north in the distribution they are (Pizzey and Knight, 2007). The male has a bold black hood that meets a white breast and underparts. The black hood extends down the back to the wings and tail, where it has white shoulders and wing bars, and prominent, white, hourglass shaped side panels on the tail (DCCEEW, 2023). Both females and immatures are duller, with grey-white underparts and grey-brown colouring where males are black. However, they all have the characteristic white wing bars and tail panels (refer to Plate 7-4) (DCCEEW, 2023; Pizzey and Knight, 2007).



PLATE 7-10: HOODED ROBINS (SOUTH-EASTERN) (*MELANODRYAS CUCULLATA CUCULLATA*) – MALE AND FEMALE

Source: Forster (2023), Harrison (2019)

7.4.2.2 KNOWN DISTRIBUTION

Hooded robins (south-eastern) are distributed from south-east Queensland to the Yorke Peninsula, South Australia (refer to Plate 7-11). Throughout their range they can be found in drier eucalypt and acacia woodlands and shrublands with an open understorey and complex ground layer (DCCEEW, 2023). This subspecies is not severely fragmented, despite declines in populations in settled areas and some genetically isolated populations (DCCEEW 2023, Pizzey and Knight 2007).

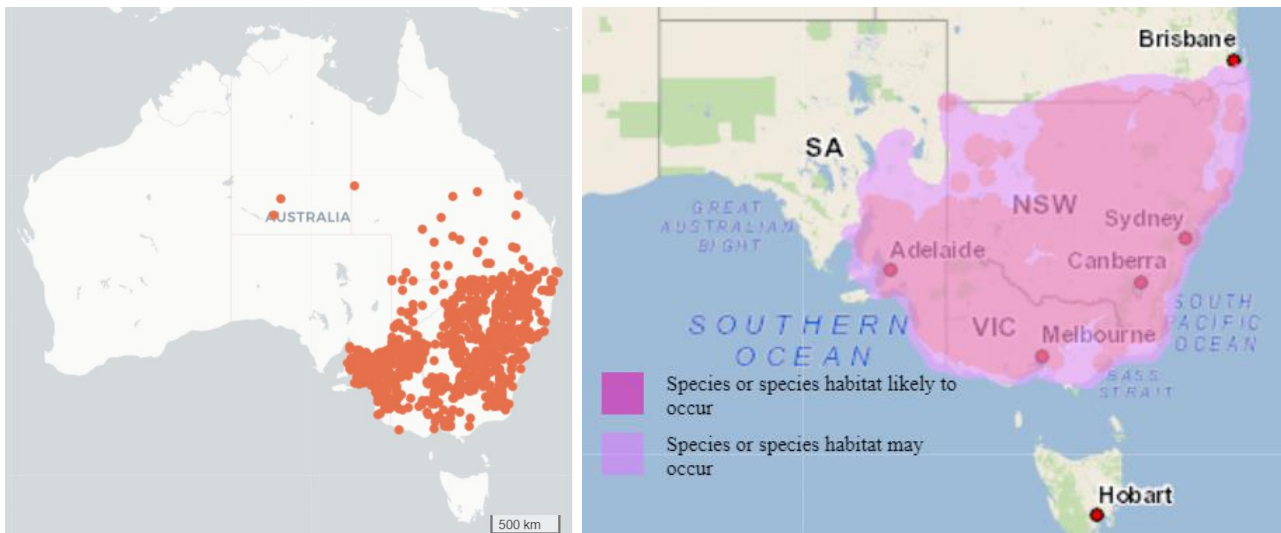


PLATE 7-11: DISTRIBUTION RANGE OF THE HOODED ROBIN (SOUTH-EASTERN)
(*MELANODRYAS CUCULLATA CUCULLATA*)

Source: ALA (2024), DoE (2024)

7.4.2.3 DISTRIBUTION IN RELATION TO PROJECT

Hooded robin (south-eastern) is assessed as having potential to occur within the Project footprint, as habitat has been identified within the Project footprint; however, the subspecies was not recorded during targeted surveys.

Twelve database records (i.e. ALA and WildNet) occur within the surrounding area between the years 1971 and 2021. The nearest record is from 2018 and is approximately 9.5 km from the railway alignment on the Queensland-New South Wales border. The most recent records were in 2021, in the Western Creek State Forest approximately 42 km from the railway alignment (refer to Plate 7-12).

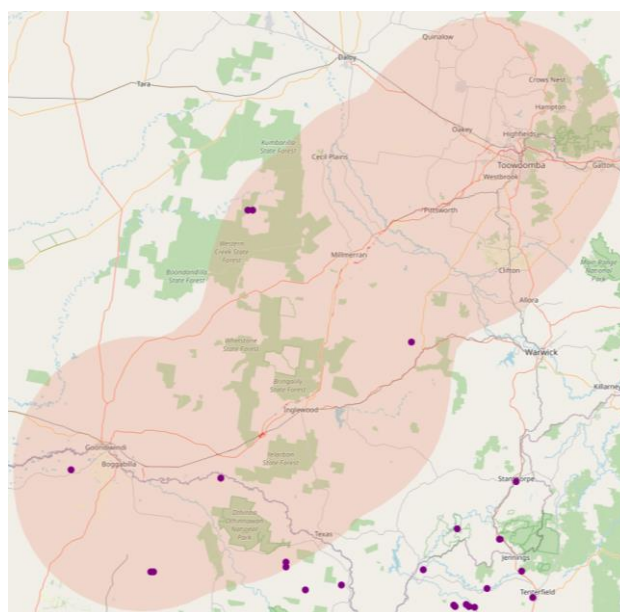


PLATE 7-12: DISTRIBUTION RANGE OF THE HOODED ROBIN (SOUTH-EASTERN)
(*MELANODRYAS CUCULLATA CUCULLATA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.4.2.4 BIOLOGY AND REPRODUCTION

Hooded robins (south-eastern) are a shy and sedentary bird that are mostly seen in pairs or small groups. The species occupies local territories throughout the year, one where they forage outside of breeding season, and another where they nest. The species prefers to forage for insects and lizards in grassy clearings with rocks and fallen timber as litter on the ground, where they are able to hunt using a 'perch and pounce' method (DCCEEW, 2023).

This subspecies generally forms monogamous pairs during breeding season between July and November. Pairs usually return to the same breeding site where they rear several clutches of young each season (DCCEEW, 2023). A nest is built between 1 and 6 m off the ground and is an open cup comprised of bark strips, rootlets, grass or spider web (Pizzey and Knight, 2007). Nests are often built in tree forks, crevices, horizontal branches, cavities in broken tree trunks or on dead wood to ensure nest stability (DCCEEW, 2023; Pizzey and Knight, 2007). After the nest is built, the female lays and incubates 2 to 3 eggs that are apple green or pale olive, with a faint red or brown tinge on large end (Pizzey and Knight, 2007). The female broods the eggs for 14 days. Both sexes defend the nests with displays of injury-feigning, by tumbling across the ground (DCCEEW, 2023). After fledging, young birds disperse to locate a partner and establish their own territory (Pizzey and Knight, 2007).

7.4.3 HABITAT DESCRIPTION AND DEFINITION

The hooded robin (south-eastern) inhabits dry open eucalypt and acacia woodlands or shrublands that contain an open understory with a complex ground layer. They require structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses, standing dead or live trees and tree stumps for nesting. However, this species has an aversion to tall or densely treed woodlands. This species is distributed in south-eastern Australia from far south-east Queensland to Yorke Peninsula, South Australia (DCCEEW, 2023).

Ground-layer is an important component as this species utilises a 'perch and pounce' hunting tactic within grassy clearings in woodlands where rocks and fallen timber are present. (DCCEEW, 2023). They do tend to avoid the driest of deserts and wetter coastal areas that are unsuitable for foraging (Pizzey and Knight, 2007).

As defined in the Conservation Advice (DCCEEW, 2023) habitat critical to the survival of the species "includes areas of:

- dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas;
- structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses;
- standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging;
- moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat."

Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 7-4 and is presented in Figure 7-4.

TABLE 7-4 HABITAT CRITERIA FOR HOODED ROBIN (SOUTH-EASTERN) WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/roosting and foraging habitat	Open eucalypt and acacia woodlands with medium to low tree densities and understorey.	11.3.1, 11.3.2, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.4, 11.4.3, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.4, 11.7.7, 11.8.4, 11.8.5, 11.9.5 (eastern), 11.9.7, 11.9.9a, 11.9.10	Remnant open and relatively intact and undisturbed woodlands (eucalypt or acacia dominant). Areas of regrowth where surrounded by adjacent remnant. Regrowth areas need to be adjacent to (no more than a 100m gap) a patch of connected habitat more than 200 ha. Microhabitat features include a mix of leaf litter, coarse woody debris, grass cover and bare ground.
Unsuitable habitat	Woodlands with dense understory or canopy, areas with no canopy layer or ground layer lacking complexity.	11.3.21, 11.3.24, 11.3.27, 11.3.27b, 11.3.27i, 11.5.14, 11.7.5, 11.8.3, 11.8.11	Any area not mapped as breeding or foraging (inclusive of woodlands that are too dense in canopy and understory, patches less than 10ha within agricultural areas or open woodlands with wetter ground-layers). Areas outside of the QLD modelled distribution.





Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Breeding, Roosting, and Foraging Habitat

GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines

Whetstone State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

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Figure 7-4 : Hooded Robin Habitat Mapping

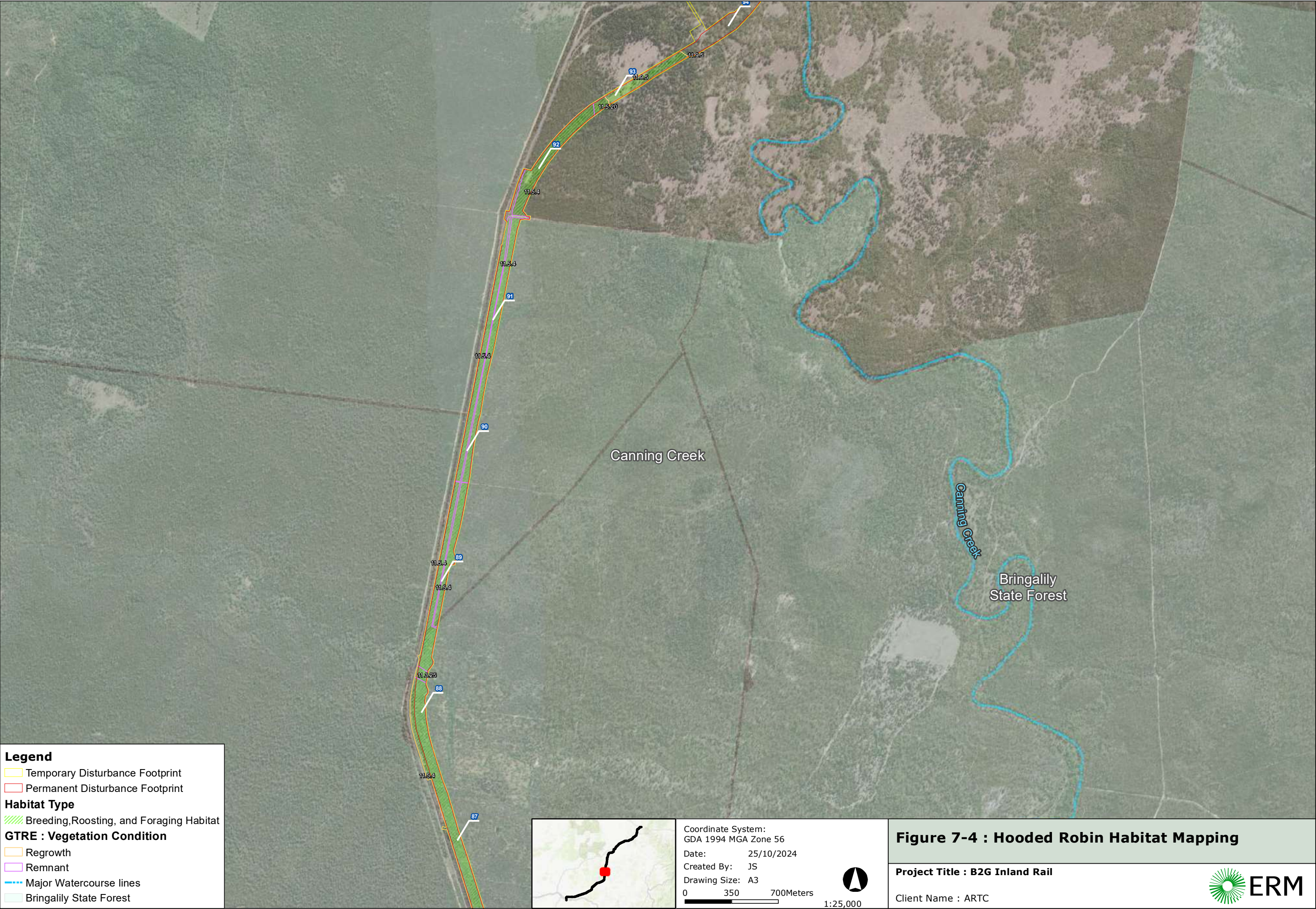
Project Title : B2G Inland Rail

Client Name : ARTC





ullata



7.4.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to hooded robin (south-eastern):

- Habitat loss and fragmentation as a result of land clearing for agriculture;
- Habitat degradation – grazing;
- Invasive weeds altering structural characteristics of habitat;
- Unintentional impacts of firewood collection – reducing habitat availability;
- Altered fire regimes;
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought);
- Predation by feral cats (*Felis catus*) and red foxes (*Vulpes vulpes*); and
- Invasive competition, mostly noisy miners (*Manorina melanocephala*) (DCCEEW, 2023).

These threats are more pronounced when impacted by edge effects, and therefore are exacerbated by habitat fragmentation.

7.4.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats (DoE, 2015);
- Threat abatement plan for predation by the European red fox (DEWHA, 2008); and
- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*) (TSSC, 2013).

7.4.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLAN

Threats identified in the threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

Threats identified in the threat abatement plan for avifauna exclusion by over-abundant noisy miners include:

- Physical and numerical domination of other avifauna;
- Exacerbation of existing threats, such as habitat fragmentation, habitat structure, or grazing; and
- Broad scale canopy dieback.

Threat abatement actions for noisy miners include:

- Habitat revegetation; and
- Local culling.

7.4.7 REFERENCES

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7.5 POWERFUL OWL (*NINOX STRENUA*)

7.5.1 STATUS

Powerful owl (*Ninox strenua*) is listed as Vulnerable under the NC Act and is not listed under the EPBC Act.

7.5.2 BIOLOGY AND ECOLOGY

7.5.2.1 CHARACTERISTIC

Powerful owls are the largest owl species in Australia at 50 to 60 cm in length and with a wingspan of 120 to 140 cm, where males are slightly larger (NSWSC, 2008; Pizzey and Knight, 2007). Powerful owls are a brown hawk-like owl with a small head, flat face (NSWSC 2008), large golden eyes, and a light grey bill (refer to Plate 7-5) (ALA, 2024). Powerful owls are brown to brown-grey dorsally, with narrow white barring, sometimes mottled. The underparts are white or buff-white with many coarse, V-shaped, dark brown bars (ALA, 2024; NSWSC, 2008; Pizzey and Knight, 2007). The tail is long, and dark grey-brown with wide white bars above and below. They have fully feathered legs and large yellow feet that end in powerful, heavy claws (Pizzey and Knight, 2007). Juveniles are mainly white in the face except for the dark eye patches, are paler in the body and wings, and are much downier on the head and underparts. Juveniles also have fine dark streaks on the underparts and faint barring on flanks (ALA 2024, NSWSC, 2008; Pizzey and Knight, 2007).



PLATE 7-13: POWERFUL OWL (*NINOX STRENUA*)

Source: Ruser (2023)

7.5.2.2 KNOWN DISTRIBUTION

The powerful owl occurs in the eastern quarter of New South Wales, from the coast to the inland slopes, as a single population contiguous with that in Queensland and Victoria (refer to Plate 7-14) (NSWSC, 2008). Suitable habitat is mostly found within 200 km of the coast (Pizzey and Knight, 2007).

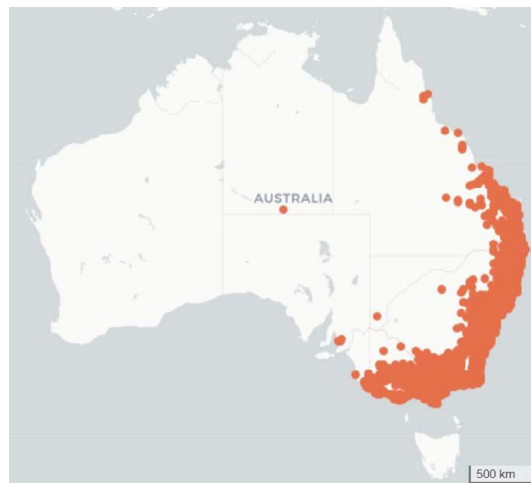


PLATE 7-14: DISTRIBUTION RANGE OF THE POWERFUL OWL (*NINOX STRENUA*)

Source: ALA (2024)

7.5.2.3 DISTRIBUTION IN RELATION TO PROJECT

The powerful owl is assessed as having potential to occur within the Project footprint, as habitat has been identified within the Study Area. An unconfirmed sighting of the species was recorded during microbat surveys in the Study Area.

A total of 232 database records were identified within the Study Area between 1950 and 2023, with seventeen of these records recorded in 2023. Numerous records of the species located in and around Toowoomba, particularly near Lockyer National Park. Four records were located outside of the greater Toowoomba region: one in Bringalily State Forest in 2023 (approximately 2.1 km from the alignment), two in Yelarbon State Forest in 2022 (approximately 22.5 km from the alignment) and one in Texas State Forest in 2003 (approximately 27.9 km from the alignment) (refer to Plate 7-15).

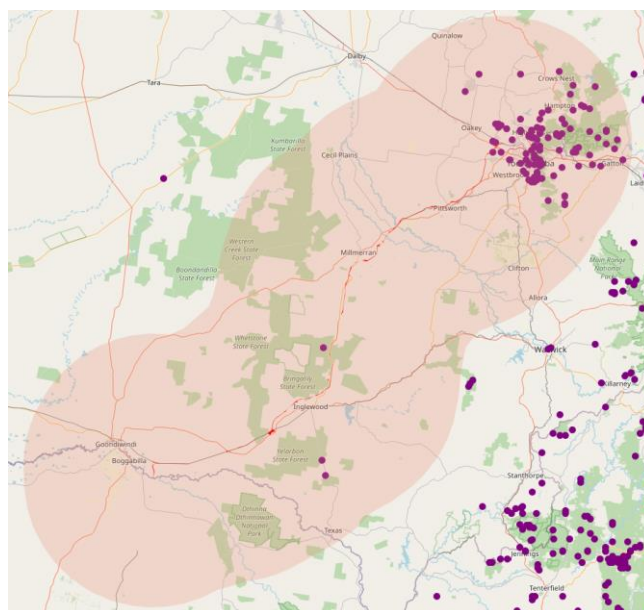


PLATE 7-15: DISTRIBUTION RANGE OF THE POWERFUL OWL (*NINOX STRENUA*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.5.2.4 BIOLOGY AND REPRODUCTION

Powerful owls are nocturnal, spending the night hunting for small to medium mammals such as flying foxes, ringtail possums, and gliders, and small birds such as lorikeets, currawongs, and magpies. During the day the species usually roost in tall trees singly, in pairs or family groups (ALA, 2024; Pizzey and Knight, 2007). Roosts are commonly located in dense eucalypt forest, often in sheltered groves of mid-storey trees. Depending on habitat quality and prey densities, resident breeding pairs defend exclusive nesting territories within larger, defended home ranges of 400-4 000 ha (NSWSC, 2008). This is because roosts and breeding hollows may be occupied intermittently by the same pair for years (Pizzey and Knight, 2007).

The powerful owl builds nests on decayed debris in large hollows up to 1 m wide and 2 m deep in trunks or limbs 8-20 m above the ground (NSWSC, 2008; Pizzey and Knight, 2007). The species appear to show preference for live trees rather than dead. A small clutch of 1 to 2 eggs is laid in autumn or winter, once per year. Eggs are incubated for 38 days before hatching. Young remain in the nest for 2 months, and can at times be dependent on their parents until the start of the next breeding season (NSWSC, 2008).

Powerful owls are generally sedentary, with pairs occupying a large, likely permanent home range. Despite this, young have been observed to disperse up to 18 km after leaving the nest (NSWSC, 2008; Pizzey and Knight, 2007). While dispersal is possible across sparsely wooded areas, it is likely dispersal is limited in urbanised areas (NSWSC, 2008).

7.5.3 HABITAT DESCRIPTION AND DEFINITION

Powerful owl inhabits eastern and south-eastern Australia, from north of Eungella National Park in Queensland to Victoria, mostly east of the Great Dividing Range (BirdLife Australia, 2023; Pizzey and Knight, 2014-2021).

The powerful owl is found in open forests and woodlands, as well as along sheltered gullies in wet forests with dense understoreys, especially along watercourses. They often roost and nest in dense gully eucalypt forest. Common roost sites are sheltered groves of mid-storey trees, e.g., she-oaks, turpentine, acacias, paperbarks, and rainforest trees (NSWSC, 2008). They will sometimes be found in open areas near forests such as farmland, parks, and suburban areas, as well as in remnant bushland patches. The species nests in large old trees, usually in vertical tree hollows and many of its prey species are also hollow-dependent (BirdLife Australia, 2023; NSWSC, 2008). Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 7-5 and is presented in Figure 7-5.

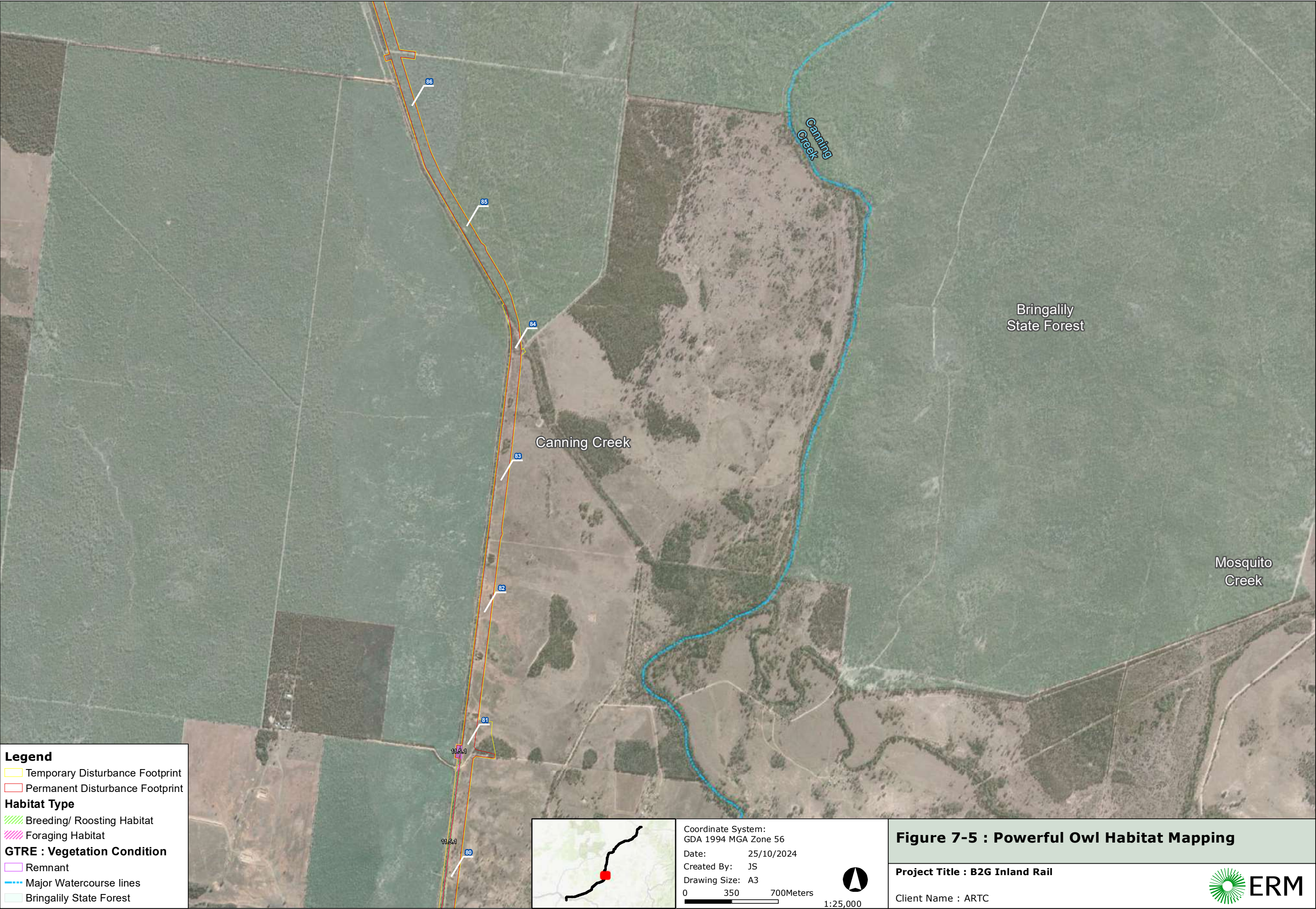
TABLE 7-5 HABITAT CRITERIA FOR POWERFUL OWL WITHIN THE STUDY AREA

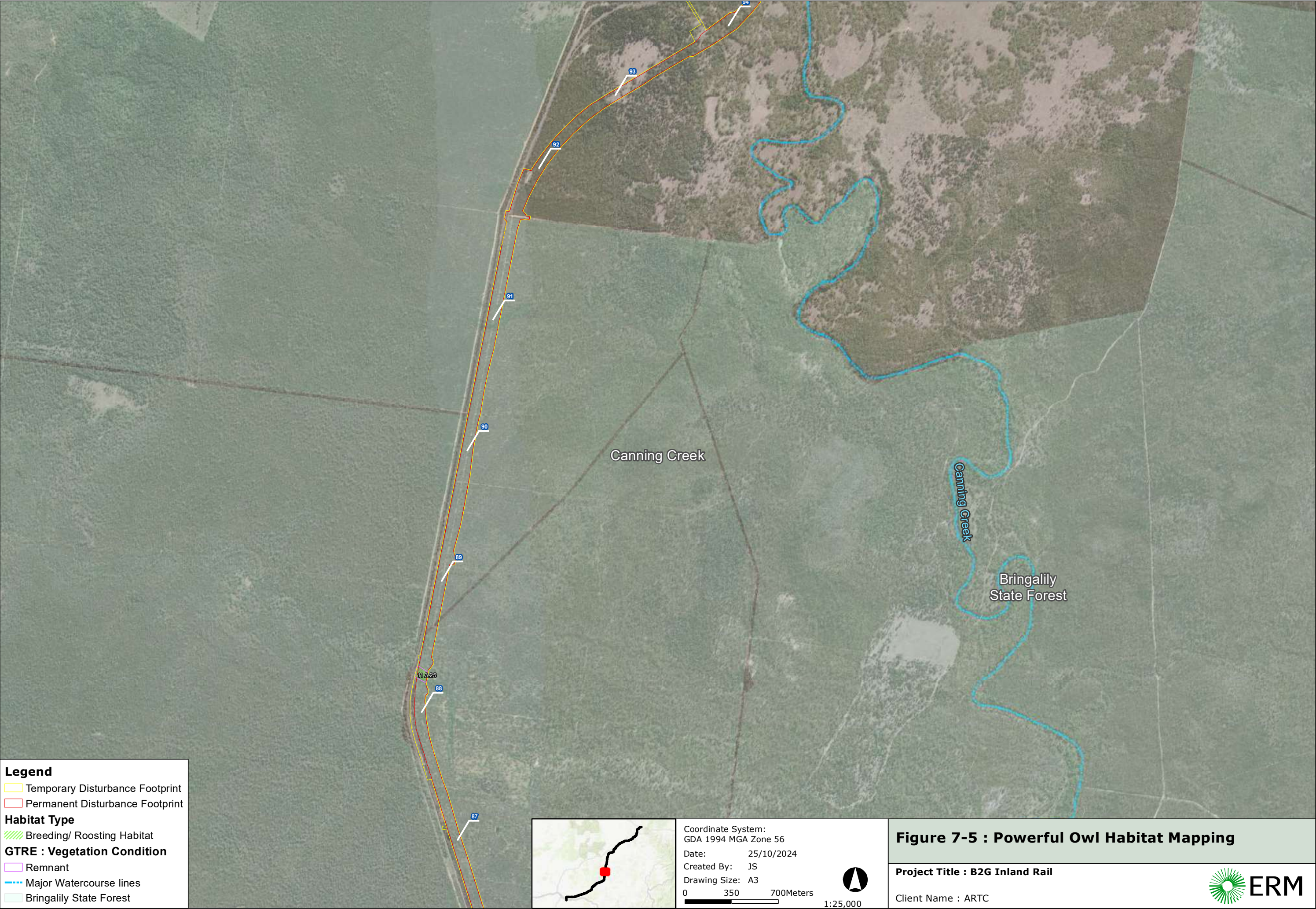
Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/roosting habitat	Mature eucalypt woodlands or rainforest gullies and watercourses.	11.3.25	Remnant woodlands/forests containing large hollows in tall mature woodlands/forests alongside watercourses and within gullies.
Foraging habitat	Mature eucalypt woodlands or rainforest gullies and watercourses adjacent to breeding/roosting habitat.	11.3.2, 11.3.14, 11.3.17,	Remnant and high value regrowth woodlands adjacent to mapped breeding habitat

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
		11.3.18, 11.3.25, 11.3.27i, 11.3.4, 11.4.10, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.4, 11.7.7, 11.8.4, 11.8.5, 11.9.7, 11.9.9a, 11.9.10	with some hollows being present for prey items.
Unsuitable habitat	Areas with no mature trees or that are heavily disturbed.	11.3.1, 11.3.21, 11.3.24, 11.3.27, 11.3.27b, 11.4.3, 11.5.14, 11.7.5, 11.8.11, 11.9.5 (eastern), 11.8.3	Any eucalypt or otherwise woodlands that do not contain large mature hollow bearing trees (generally non-remnant vegetation). Note that usually SEVT (RE 11.8.3) would constitute breeding habitat, however the patch of SEVT within the Project footprint is only 0.02 ha, fragmented and in poor condition.









7.5.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to powerful owl in Queensland:

- Habitat loss and fragmentation as a result of land clearing for agriculture, logging, pine plantations, and urbanisation;
- Habitat degradation – loss of hollow bearing trees;
- Human hazards – roadkill, interaction with overhead wires, and barbed-wire fences;
- Unintentional impacts of firewood collection – reducing habitat availability;
- Altered fire regimes – particularly high frequency in coastal forests;
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought); and
- Predation of fledglings by red foxes (*Vulpes vulpes*) (NSWSC 2008).

7.5.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species. The following threat abatement plan is relevant to this species:

- Threat abatement plan for predation by the European red fox (DEWHA, 2008).

7.5.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLAN

Threats identified in the threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

7.5.7 REFERENCES

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7.6 SOUTHERN WHITEFACE (*APHELOCEPHALA LEUCOPSIS*)

7.6.1 STATUS

Southern whiteface (*Aphelocephala leucopsis*) is listed as Vulnerable under the NC Act and Vulnerable (effective 31/03/2023) under the EPBC Act.

7.6.2 BIOLOGY AND ECOLOGY

7.6.2.1 CHARACTERISTIC

The southern whiteface is a small, stocky bird between 10 and 12.5 cm. The species are usually noticed by calls, although can also be identified by colouring. Both males and females have brown to grey-brown upperparts, dark brown wings, and white or pale grey underparts (refer to Plate 7-6). The facial markings are characteristic of the genus; a short, stubby beak and white band across the forehead with a black margin ending at the cream-coloured eyes (DCCEEW, 2024; Pizzey and Knight, 2007). The tail is short, black and has a narrow white tip. Juveniles can be distinguished by the lack of the black facial margin (DCCEEW, 2024).



PLATE 7-16: SOUTHERN WHITEFACE (*APHELOCEPHALA LEUCOPSIS*)

Source: Lewis (2022)

7.6.2.2 KNOWN DISTRIBUTION

The southern whiteface occurs in drier habitats across most of mainland Australia south of the Tropic of Capricorn, from Carnarvon, Western Australia, to the Great Dividing Range, Queensland (refer to Plate 7-17). The range in Queensland is further south than that in the Northern Territory, as it is confined to the Mitchell Grass Downs and along the Queensland-New South Wales border. There is a hybrid zone between the south-west subspecies *A. l. castaneiventris* and the south-east subspecies *A. l. leucopsis* along the western edge of the Nullarbor Plain. The species are locally common, however, have a patchy distribution throughout their range (DCCEEW, 2023; Pizzey and Knight, 2007).

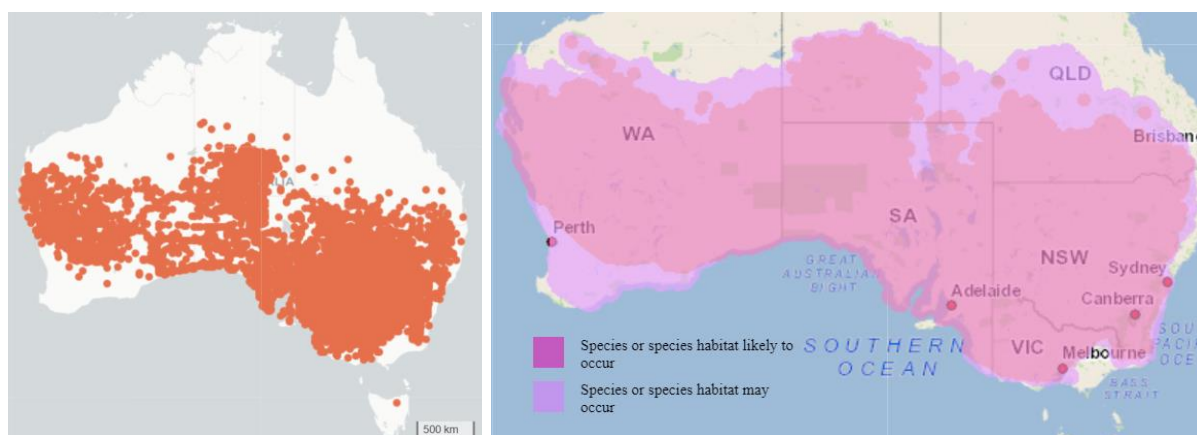


PLATE 7-17: DISTRIBUTION RANGE OF THE SOUTHERN WHITEFACE (*APHELOCEPHALA LEUCOPSIS*)

Source: ALA (2024), DoE (2024)

7.6.2.3 DISTRIBUTION IN RELATION TO PROJECT

Southern whiteface is assessed as known to occur within the Project footprint, as there are records within the footprint and habitat has been identified within the Study Area; however, the species was not recorded during targeted surveys.

Database records (i.e. ALA and WildNet) show that the species has been identified within the Study Area (refer to Plate 7-18). There are 23 database records located in the Project footprint in Yelarbon and were recorded between 2007 and 2022 throughout the town. 159 records were identified outside of the Project footprint across the Study Area between 1932 and 2023. The nearest of these is a single record south of Millmerran, approximately 0.4 km from the alignment, recorded in 1970; however, this site is now cleared for crops. The nearest recent record is south-west of Yelarbon, approximately 3.6 km from the railway alignment. Records are often clustered together, with numerous records located near Lake Coolmunda, Durikai State Forest, Wilga Park Nature Refuge and on roadsides.

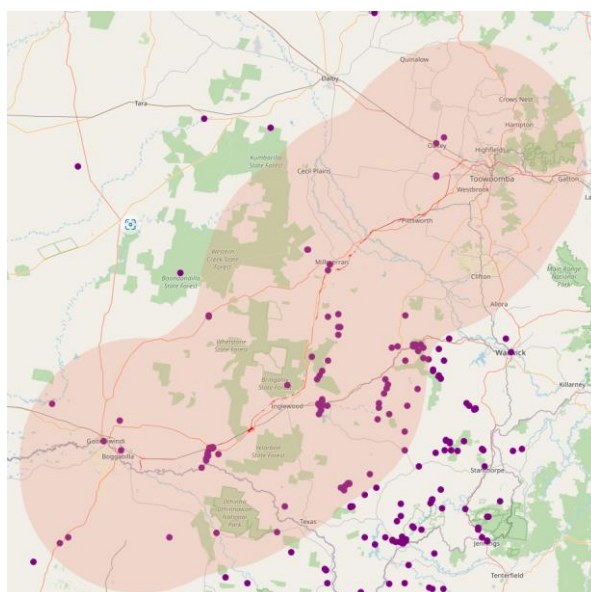


PLATE 7-18: DISTRIBUTION RANGE OF THE SOUTHERN WHITEFACE (*APHELOCEPHALA LEUCOPSIS*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.6.2.4 BIOLOGY AND REPRODUCTION

Southern whiteface are often found on the ground, where they forage almost exclusively for insects, spiders, seeds and leaves. As such, the species favour habitats with low tree density, low litter cover and an herbaceous understory where they can glean prey. The species typically forage in pairs or small groups of up to 8 individuals but can form larger flocks of up to 70 birds in winter, outside of the breeding season. The species have also been observed to participate in multi-species foraging flocks with other whiteface and thornbill species (ALA, 2024; DCCEEW, 2023).

Breeding season for southern whiteface is between July and October for the most part, however, in arid regions the timing is impacted by rainfall. That is, if sufficient rainfall occurs breeding may occur outside their usual season or may not breed at all during drought (DCCEEW, 2023). Nests are built in tree hollows, crevices, or in low bushes and are large, bulky domes made from grass, bark, and roots (DCCEEW, 2023; Pizzey and Knight, 2007), and are often lined with fur or feathers (ALA, 2024). Nesting mostly involves a pair of individuals; however, the species has been observed to be cooperative with up to four adults contributing to all aspects of rearing. Little is known about the social hierarchy of this species, so it is not known why cooperative breeding occurs (ALA, 2024; DCCEEW, 2023). A clutch of eggs is typically between three and 4 (DCCEEW, 2023), but up to 5 can be laid at a time (Pizzey and Knight 2007). The incubation period for this species is currently unknown, but fledging occurs between 14 and 19 days after hatching (ALA, 2024; DCCEEW, 2023).

7.6.3 HABITAT DESCRIPTION AND DEFINITION

The southern whiteface occurs in drier habitats across most of mainland Australia south of the Tropic of Capricorn, from Carnarvon, Western Australia, to the Great Dividing Range, Queensland. The range in Queensland is further south than that in the Northern Territory, as it is confined to the Mitchell Grass Downs and along the Queensland-New South Wales border.

Southern whitefaces are found to live in a variety of dry, open woodlands or shrublands with an understorey of grass and/or shrubs. These inland scrub habitats are usually dominated by acacias or eucalypts, such as mallee, mulga, or black box, however this species has also been observed in cypress pine (DCCEEW, 2023; Pizzey and Knight, 2007). In drought years, southern whitefaces have been observed to move outside of their range into wetter regions.

This species prefers to forage in areas of low tree densities with an herbaceous understorey, where they can forage on the bare ground or in leaf litter. Nests will consist of grass, bark and roots in tree hollows, crevices, or sometimes in low shrubs (DCCEEW, 2023).

As defined in the Conservation Advice (DCCEEW, 2023) habitat critical to the survival of the species “includes areas of:

- relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both;
- habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat;
- living and dead trees with hollows and crevices which are essential for roosting and nesting.”

Habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 7-6 and is presented in Figure 7-6.

TABLE 7-6 HABITAT CRITERIA FOR SOUTHERN WHITEFACE WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Breeding/roosting and foraging habitat	Open woodlands and shrublands with an understorey of shrubs, grasses and/or herbs where living and dead tree hollows and crevices are present. Leaf litter and bare ground are also important. This includes areas dominated by eucalypts, acacias and cypress pines.	11.3.2, 11.3.4, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.4, 11.7.5, 11.7.7, 11.8.4, 11.8.5, 11.9.5, 11.9.7, 11.9.9a	Remnant open, relatively intact and undisturbed woodlands and shrublands dominated by <i>Eucalyptus</i> , <i>Corymbia</i> , <i>Acacia</i> and/or <i>Callitris</i> spp. An understorey of grasses, shrubs, herbs, leaf litter and bare ground is present. Tree hollows and crevices must be present in either living or dead standing trees.
Unsuitable habitat	Forests, closed woodlands and shrublands with high tree densities. Woodlands and shrublands of low tree densities that do not have a grassy, shrubby or herbaceous understorey. Native grasslands and cleared areas.	11.3.1, 11.3.21, 11.3.24, 11.3.27, 11.3.27b, 11.3.27i, 11.4.3, 11.4.10, 11.5.14, 11.8.3, 11.8.11, 11.9.10	Any area not mapped as breeding or foraging (inclusive of woodlands that are too dense in canopy, grasslands, and cleared areas).





Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Breeding, Roosting, and Foraging Habitat

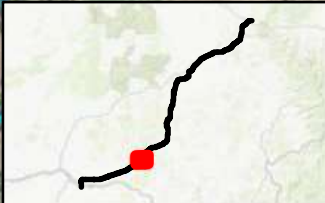
GTRE : Vegetation Condition

Regrowth

Remnant

Major Watercourse lines

Whetstone State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

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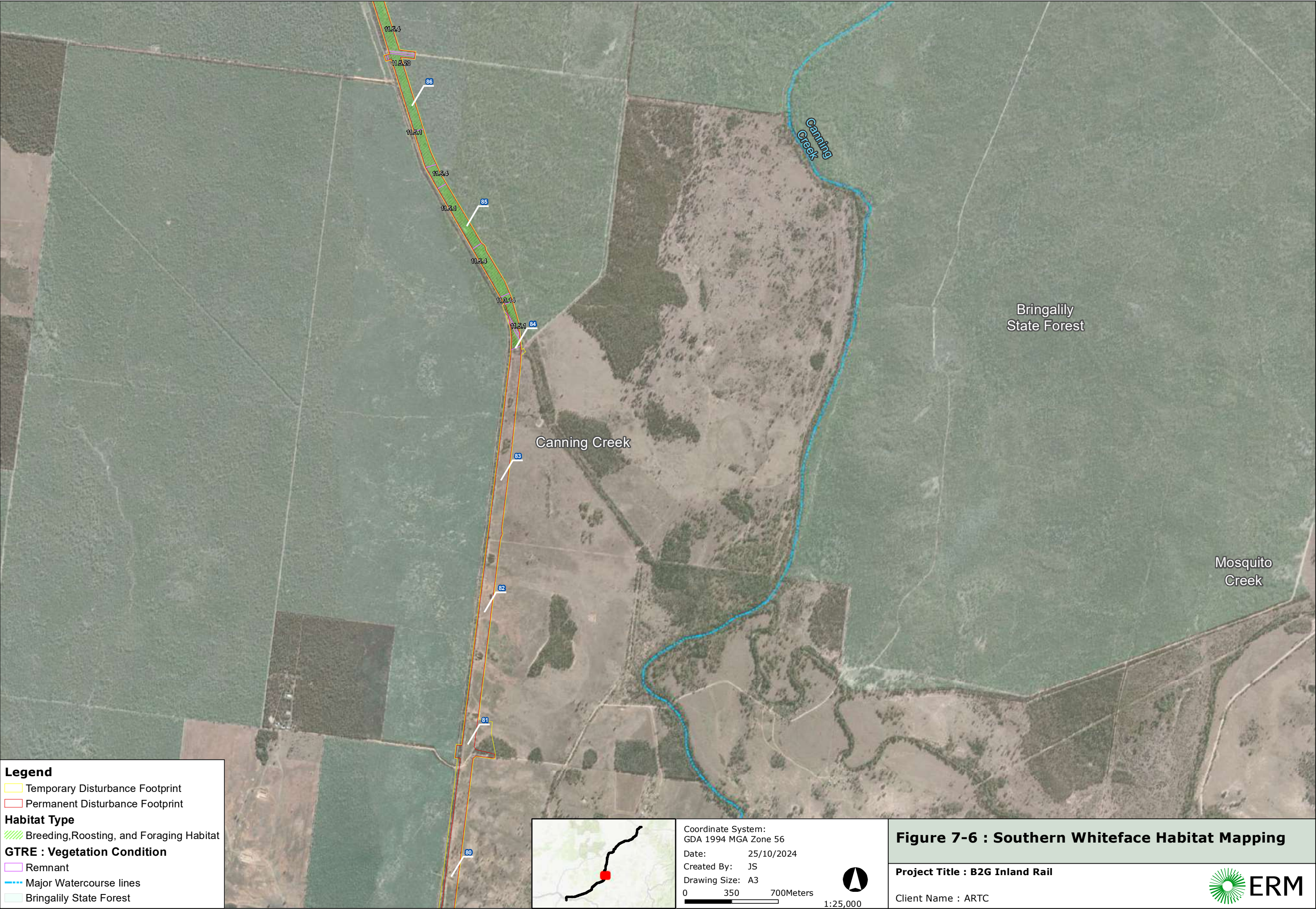
Figure 7-6 : Southern Whiteface Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

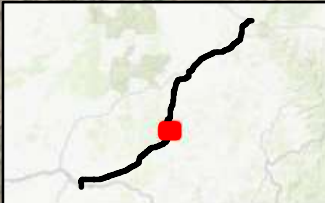
Breeding, Roosting, and Foraging Habitat

GTRE : Vegetation Condition

Remnant

Major Watercourse lines

Bringalily State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

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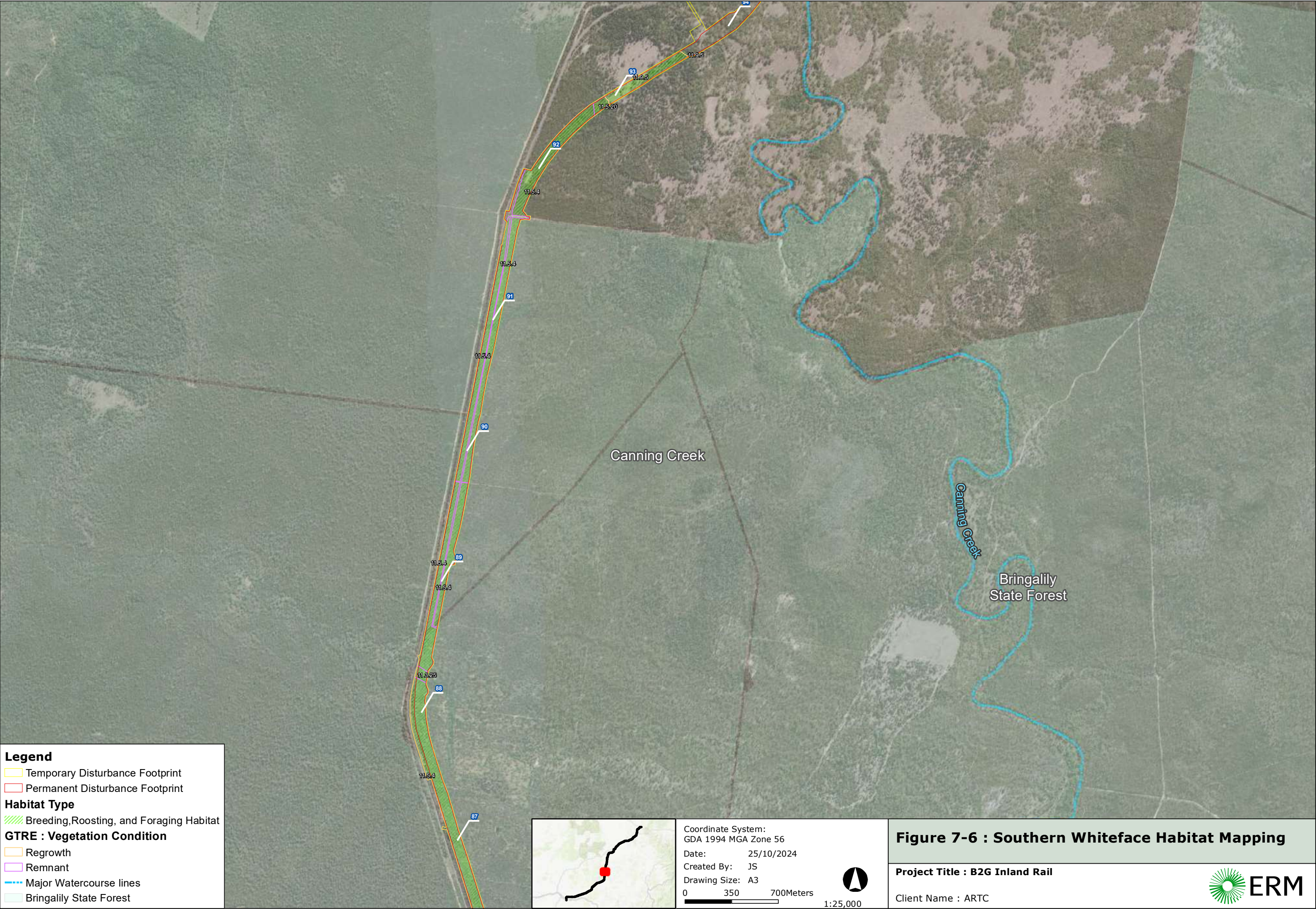
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Figure 7-6 : Southern Whiteface Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC





7.6.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to southern whiteface:

- Habitat loss and fragmentation as a result of land clearing;
- Habitat degradation – grazing;
- Invasive weeds altering structural characteristics of habitat;
- Unintentional impacts of firewood collection – reducing habitat availability;
- Increased likelihood of extreme events as a result of climate change (i.e., wildfire, heatwave, and drought);
- Predation by feral cats (*Felis catus*) and red foxes (*Vulpes vulpes*); and
- Invasive competition, mostly noisy miners (*Manorina melanocephala*) (DoE, 2024).

7.6.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species, although it is expected that one will be developed following the recent EPBC listing. The following threat abatement plans are relevant to this species:

- Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia (DoE, 2015);
- Threat abatement plan for predation by the European red fox (DEWHA, 2008); and
- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*) (TSSC, 2013).

7.6.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLAN

Threats identified in the threat abatement plan for predation by feral cats include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for feral cats include:

- Effectively control cats in different landscapes;
- Improve effectiveness of existing control measures for feral cats;
- Develop and maintain alternative strategies for the recovery of threatened species; and
- Gain public support for feral cat management and promote responsible cat ownership.

Threats identified in the threat abatement plan for predation by the European red fox include:

- Predation on native species causing a critical decline in many species across animal groups; and
- Contributed to the extinction of many ground nesting bird species and the decline of small mammals.

Threat abatement actions for the European red fox include:

- Baiting;
- Biological control;
- Barriers;
- Habitat management; and
- Shooting and bounties.

Threats identified in the threat abatement plan for avifauna exclusion by over-abundant noisy miners include:

- Physical and numerical domination of other avifauna;
- Exacerbation of existing threats, such as habitat fragmentation, habitat structure, or grazing; and
- Broad scale canopy dieback.

Threat abatement actions for noisy miners include:

- Habitat revegetation; and
- Local culling.

7.6.7 REFERENCES

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7.7 WHITE-THROATED NEEDLETAIL (*HIRUNDAPUS CAUDACUTUS*)

7.7.1 STATUS

White-throated needletail (*Hirundapus caudacutus*) is listed as Vulnerable under the NC Act and Vulnerable (effective 04/07/2019) under the EPBC Act. This species is also listed as migratory and marine under the EPBC Act.

7.7.2 BIOLOGY AND ECOLOGY

7.7.2.1 CHARACTERISTIC

The white-throated needletail is a large bird at 19 - 21 cm long, with a wingspan of approximately 50 cm. They are a thickset bird with a cigar shaped body, long pointed wings and a short square tail that extends with needle-like shafts (TSSC, 2019; Pizzey and Knight, 2007). Both males and females have a dark-olive coloured head, face and neck with an iridescent crown, and a pale greyish mantle and back. The upperwings, uppertail and undertail are black with a greenish gloss, with a contrasting white patch at the base of the trailing edge of the wing feathers (TSSC, 2019). The body underparts of this species are generally dark-olive, with a U-shaped white band on the rear flanks, vent and undertail coverts (TSSC, 2019; Pizzey and Knight, 2007). The underwing is mostly black-brown with glossy grey-brown flight feathers. The face features a narrow, white band across the forehead and lores and a white patch on the chin and throat. The species' eyes are black-brown, the bill is black, and the legs and feet are dark grey to slightly pink (TSSC, 2019). The call is a high-pitched chitter and can usually be heard in high-speed chases (Pizzey and Knight, 2007).



PLATE 7-19: WHITE-THROATED NEEDLETAIL (*HIRUNDAPUS CAUDACUTUS*)

Source: Tranter (2016)

7.7.2.2 KNOWN DISTRIBUTION

The white-throated needletail breeds in Asia, from central and south-eastern Siberia and Mongolia, east to the Maritime Territories of Russia, Sakhalin and the Kuril Islands and south to northern Japan and north-eastern China (DoE, 2023). The species is a regular summer (non-breeding season) migrant to Australia.

Within Australia, the white-throated needletail occurs across the eastern coastal region, extending inland to the western slopes of the Great Dividing Range and occasionally onto the

inland plains adjacent. The species is widespread in Tasmania and Victoria, although they are less common in western regions outside of the Grampians and the south-west. Sightings have also been recorded in South-Australia where the range extends west to the Yorke Peninsula and the Mount Lofty Ranges. White-throated needleetails only occur as vagrants in the Northern Territory, Western Australia and to various outlying islands, including Norfolk, Lord Howe, Macquarie, Christmas and Cocos-Keeling Islands (DoE, 2023).

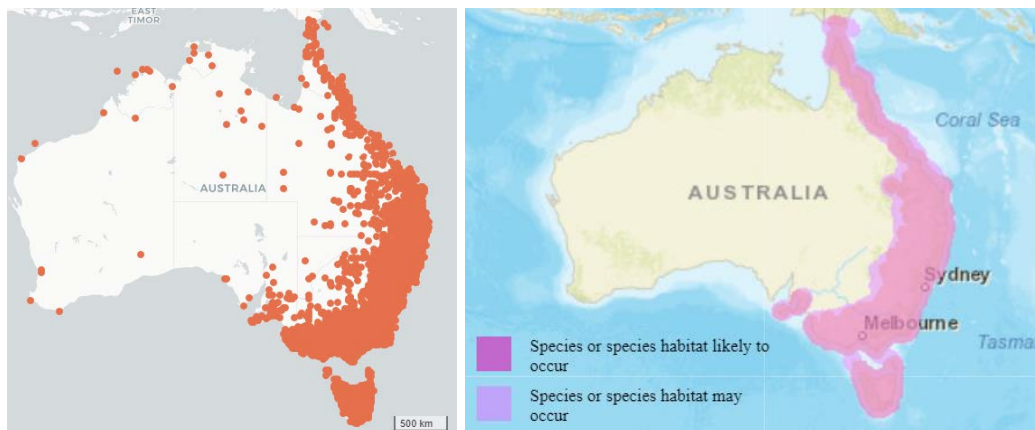


PLATE 7-20: DISTRIBUTION RANGE OF THE WHITE-THROATED NEEDLETAIL (*HIRUNDAPUS CAUDACUTUS*)

Source: ALA (2024), DoE (2023)

7.7.2.3 DISTRIBUTION IN RELATION TO PROJECT

The white-throated needletail is assessed as known to occur within the Project footprint as there are records within the footprint, habitat has been identified within the Study Area and the species was observed flying over woodland.

Database records (i.e. ALA and WildNet) show that the species has been identified within the Study Area (refer to Plate 7-21). There are 6 database records located in the Project footprint in Yelarbon and Bringalily State Forest which were recorded between 2006 and 2021. 609 records were identified outside of the Project footprint across the Study Area between 1927 and 2024. The nearest of these is a single record south of Whetstone State Forest, approximately 0.06 km from the alignment, recorded in 2016. The most recent records are located north of Pittsworth, approximately 2.3 km from the railway alignment. Records are clustered around Toowoomba, however, this is likely due to sampling bias as a result of greater population density.

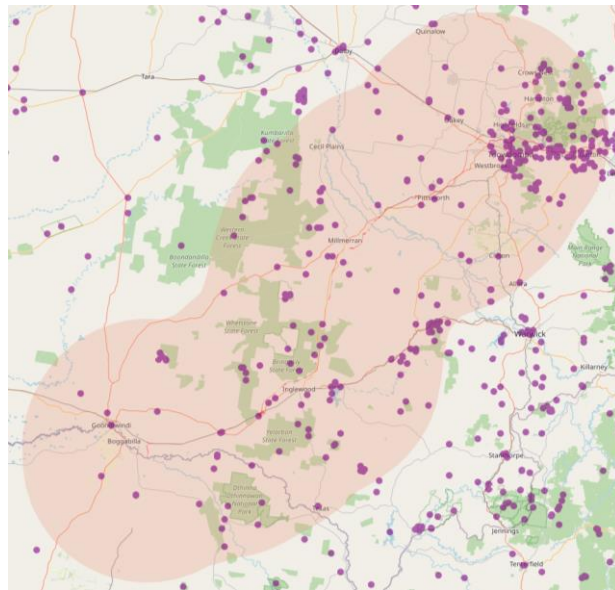


PLATE 7-21: DISTRIBUTION RANGE OF THE WHITE-THROATED NEEDLETAIL (*HIRUNDAPUS CAUDACUTUS*) IN RELATION TO THE PROJECT

Source: ALA (2024)

7.7.2.4 BIOLOGY AND REPRODUCTION

This species does not breed in Australia. After breeding in eastern Siberia, north-eastern China and Japan, the white-throated needletail leaves the breeding grounds between late August and October, flying singly or in scattered flocks. The species prefers to migrate east of Borneo and passes through eastern China and Japan between August and November and the Korean Peninsula between September and October. The southern passage is extremely rapid, and as such may be difficult to detect, particularly if flying individually and not as a flock (DoE, 2023; TSSC, 2019).

White-throated needletails mainly enter Australia via the Torres Strait, usually during September and October, and sometimes in early November. The species then travels south along both sides of the Great Divide in Queensland and NSW in October and November, usually arriving in southern parts of their range (Victoria and Tasmania) in November, with increasing numbers recorded from December and peaking in March, and some may remain until April (DoE, 2023; TSSC, 2019).

The white-throated needletail is nearly entirely aerial, from heights of 1 m up to more than 1,000 m high. While over the Australian Alps, they have been recorded at up to 2,000 m from an aircraft. Home ranges and territories are not maintained while the birds are in Australia. The species forages aerially, often in areas of updraughts, in the smoke of bushfires, occasionally in whirlwinds, and often along the edges of low-pressure systems (DoE, 2023; Pizzey and Knight, 2007). White-throated needletails have been recorded eating a wide variety of insects, including beetles, cicadas, flying ants, bees, wasps, flies, termites, moths, locusts and grasshoppers (TSSC, 2019). The species does not forage for individual insects but rather dives repeatedly through swarms, performing long curving rushes or raking glides. When foraging as a loose party or large flock, they fly in one direction or soar in rising air columns with wings spread and tails flared. They seldom alight on the ground or other substrates to catch insects (DoE, 2023; Pizzey and Knight, 2007).

While the white-throated needletail does not forage terrestrially, the species roosts in most habitats but are mostly recorded in wooded areas, between clearings, and heathlands. They appear to have traditional roost sites in tree hollows in tall trees, on ridge-tops, on bark or rock faces. They are a gregarious species, alighting in large flocks occasionally with other aerial insectivores (DoE, 2023).

Numbers recorded in NSW and Queensland apparently increase in February and March, as northward movements begin, as some birds leave Australia in February, but most leave between mid-March and April, with at least some, and probably most, birds flying north across Torres Strait. A few birds occasionally remain in Australia during the breeding season (DoE, 2023), it is unknown as to why these individuals do not migrate.

7.7.3 HABITAT DESCRIPTION AND DEFINITION

White-throated needletail are almost exclusively aerial in Australia, with a distribution from the northern-most point of Australia along the eastern coast and south to Kingston SE in south-western Victoria. The species can also occur in Adelaide (South Australia) and across the entirety of Tasmania. The railway alignment is located within the species modelled distribution of both habitat likely to occur and habitat may occur (as per the modelled habitat on the species SPRAT profile (DoE, 2023)).

White-throated needletail fly at heights of 1 m up to more than 1,000 m above the ground, over most habitat types including cleared areas, open forest and rainforest, woodlands, beaches or mudflats, coastal cliffs ridges and sand dunes, and occasionally out to sea (DoE, 2023). Although occurring over most habitat types, the species shows preference for flying over wooded areas including open forest and rainforest. As the species is majorly aerial, foraging habitat is considered similar to general habitat, with most foraging occurring over open habitats including farmland, heathland, mudflats and disturbed areas (i.e., burnt forests or slashed paddocks).

White-throated needletail are migratory species in Australia, arriving in Australia during September or October and departing back to the northern hemisphere in April (DoE, 2023).

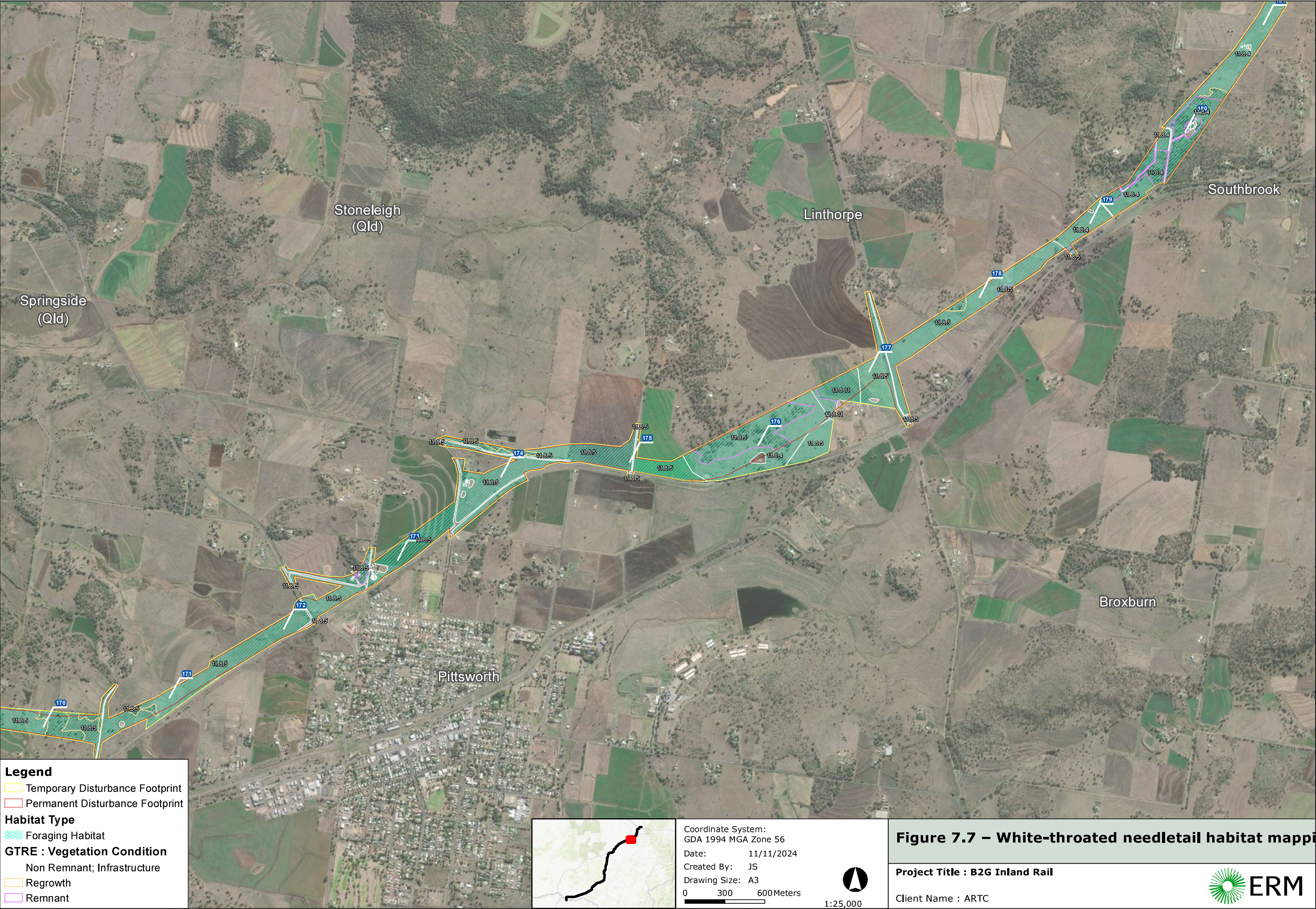
As white-throated needletail are migratory to Australia during the non-breeding season, and do not breed in Australia, breeding habitat has not been considered in Table 7-7, with only general habitat, roosting and foraging habitat and unsuitable habitat described.

TABLE 7-7 HABITAT CRITERIA FOR WHITE-THROATED NEEDLETAIL WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Roosting habitat	Roosting habitat consists of tall mature forests and woodlands amongst dense foliage and in hollows often associated with ridgelines and elevated areas. The species may also roost aerially.	11.3.1 11.3.2 11.3.14 11.3.17 11.3.18 11.3.21 11.3.24 11.3.25 11.3.27 11.3.27b 11.3.27i	Remnant mature forested and woodland areas along ridgelines and elevated distinct landscape features.

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
		11.3.4 11.4.3 11.4.10 11.5.1 11.51.a 11.5.4 11.5.14 11.5.20 11.7.4 11.7.5 11.7.7 11.8.3 11.8.4 11.8.5 11.8.11 11.9.5 11.9.7 11.9.9a 11.9.10	
Unsuitable habitat	N/A	N/A	Areas outside of the species modelled distribution.







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Foraging Habitat

GTRE : Vegetation Condition

Non Remnant; Infrastructure

Regrowth

Remnant



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

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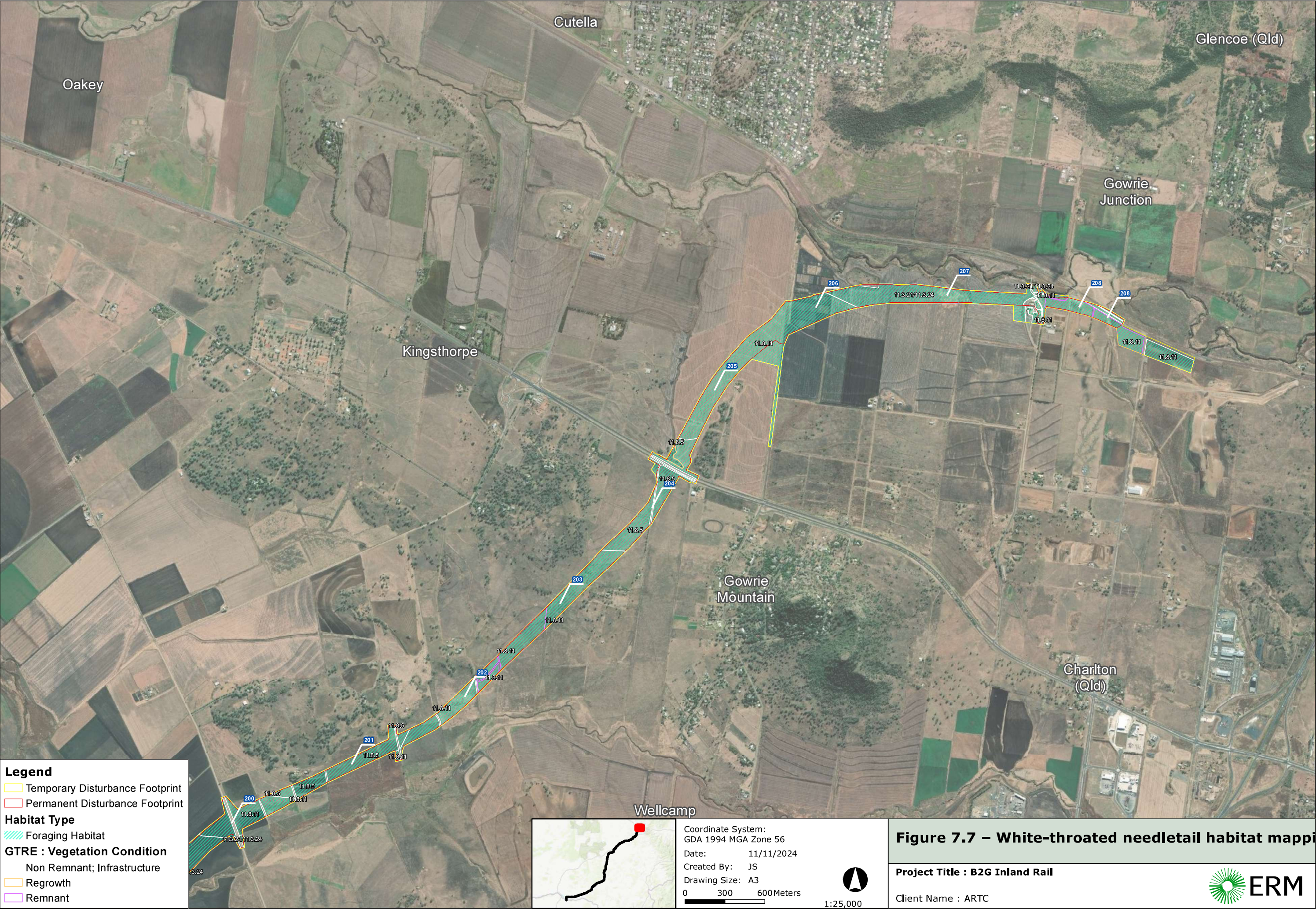
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Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

Client Name : ARTC













Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Foraging Habitat

GTRE : Vegetation Condition

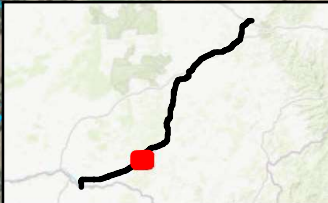
Non Remnant; Infrastructure

Regrowth

Remnant

Major Watercourse lines

Whetstone State Forest



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

0 300 600Meters

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Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

Client Name : ARTC

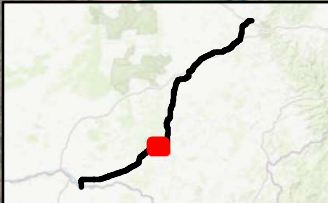
ERM





Legend

- Temporary Disturbance Footprint
- Permanent Disturbance Footprint
- Wildnet Records**
- ★ *Hirundapus caudacutus*
- Habitat Type**
- Foraging Habitat
- GTRE : Vegetation Condition**
- Non Remnant; Infrastructure
- Regrowth
- Remnant
- Major Watercourse lines
- Bringalily State Forest



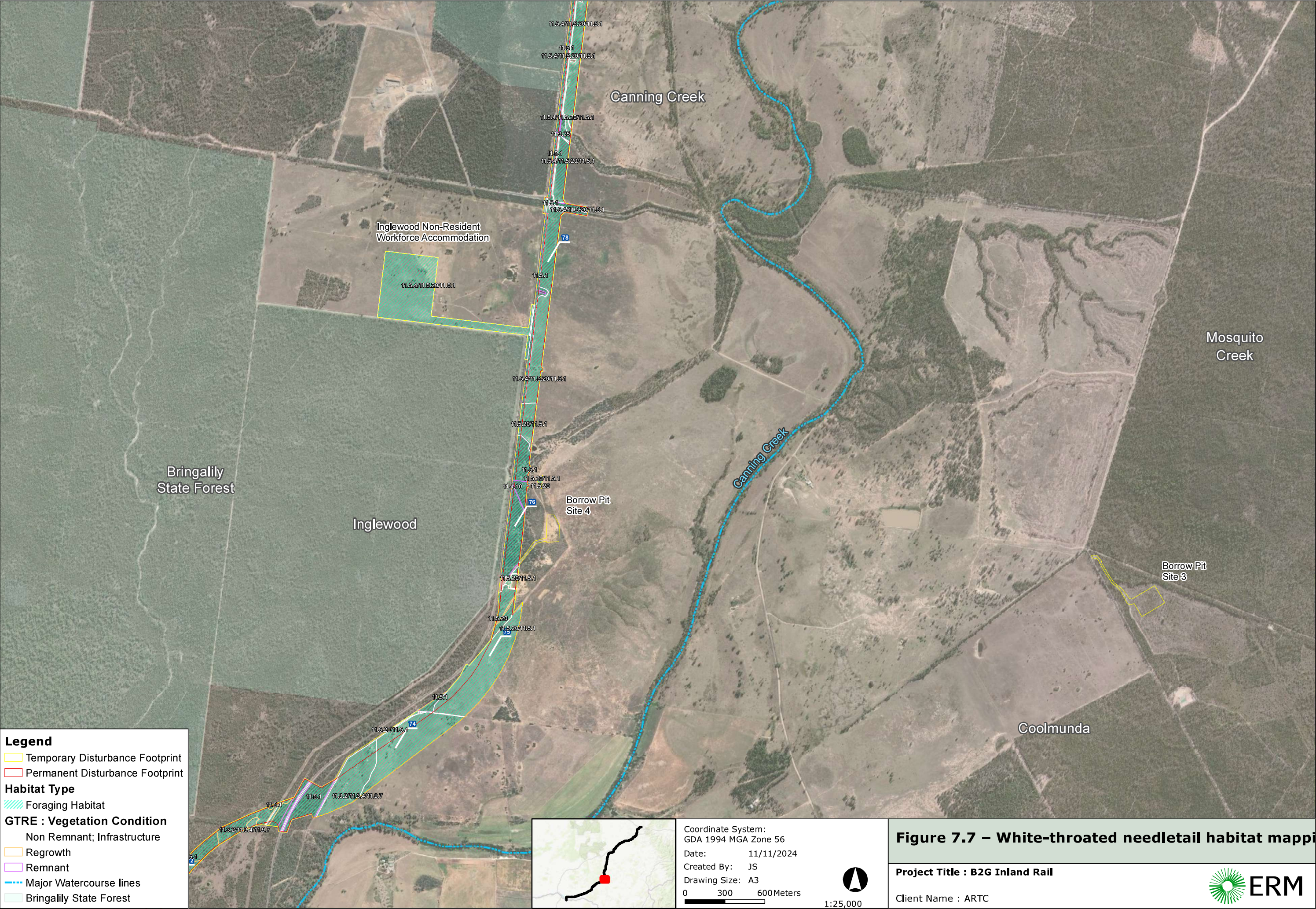
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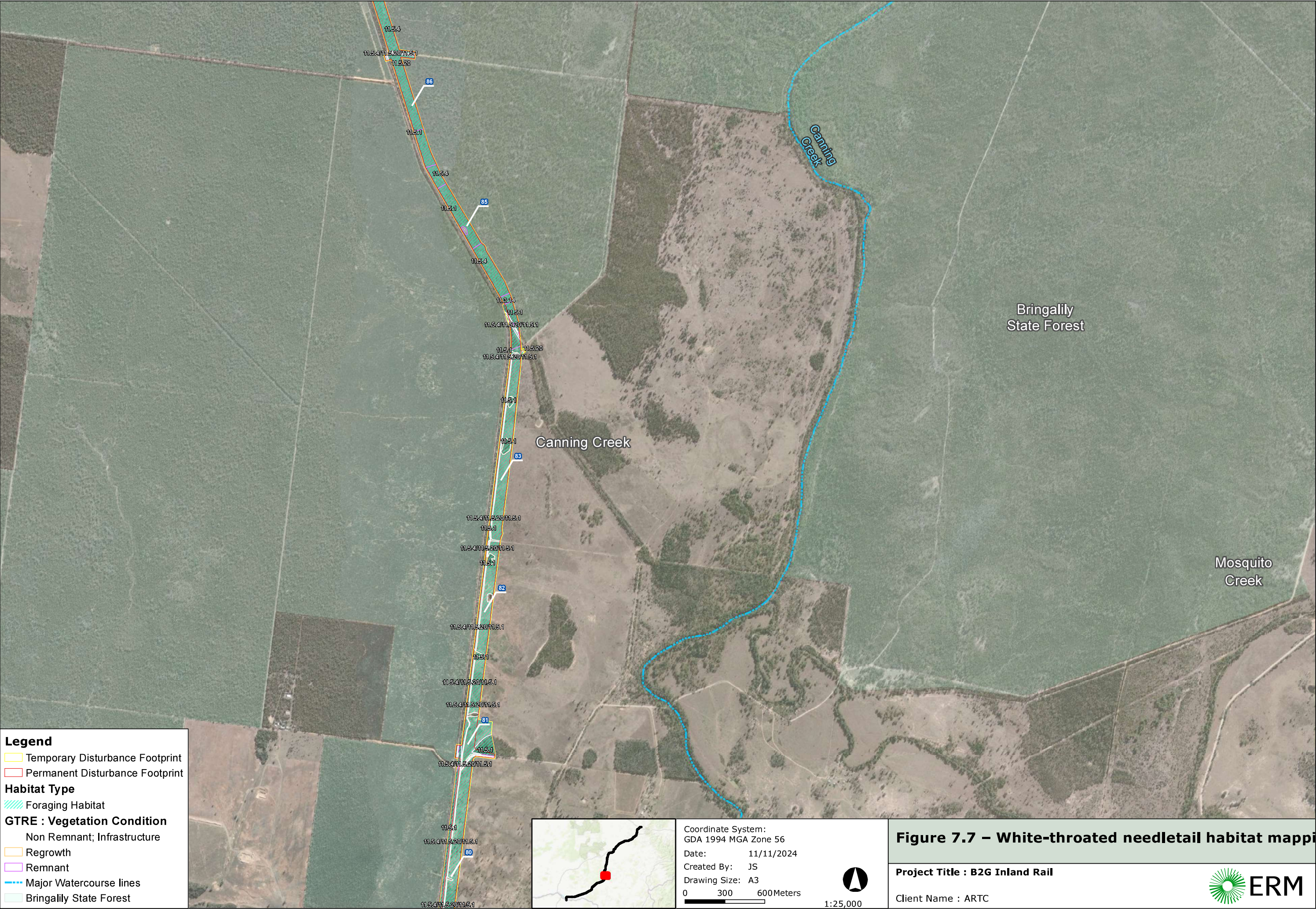
Figure 7.7 – White-throated needletail habitat mapping

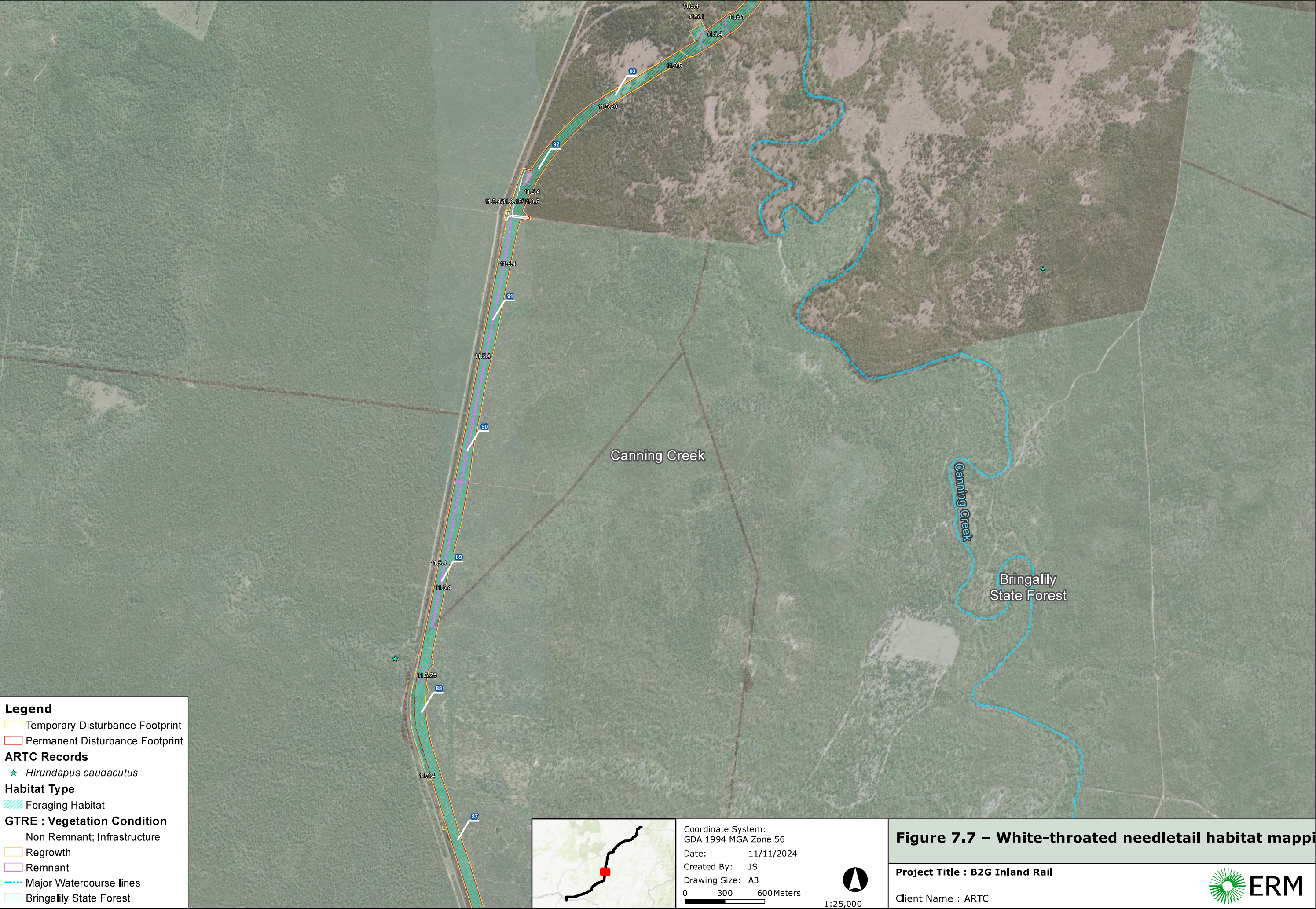
Project Title : B2G Inland Rail

Client Name : ARTC

ERM









Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Foraging Habitat

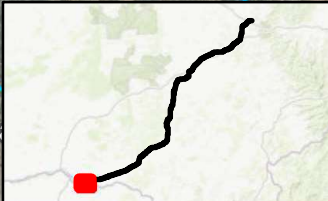
GTRE : Vegetation Condition

Non Remnant; Infrastructure

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

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Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

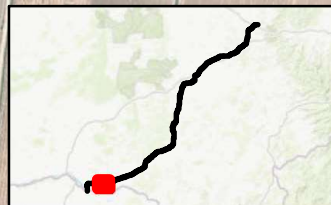
Client Name : ARTC

ERM



Legend

- Temporary Disturbance Footprint
- Permanent Disturbance Footprint
- Habitat Type**
- Foraging Habitat
- GTRE : Vegetation Condition**
- Non Remnant; Infrastructure
- Regrowth
- Remnant
- Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56
Date: 11/11/2024
Created By: JS
Drawing Size: A3
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Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

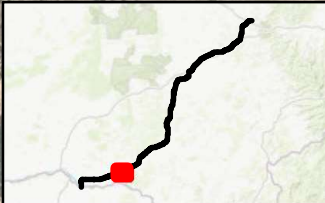
Client Name : ARTC

ERM



Legend

- Temporary Disturbance Footprint
- Permanent Disturbance Footprint
- ALA Records**
- ★ *Hirundapus caudacutus*
- Habitat Type**
- Foraging Habitat
- GTRE : Vegetation Condition**
- Non Remnant; Infrastructure
- Regrowth
- Remnant
- Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56
Date: 11/11/2024
Created By: JS
Drawing Size: A3
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Figure 7.7 – White-throated needletail habitat mapping

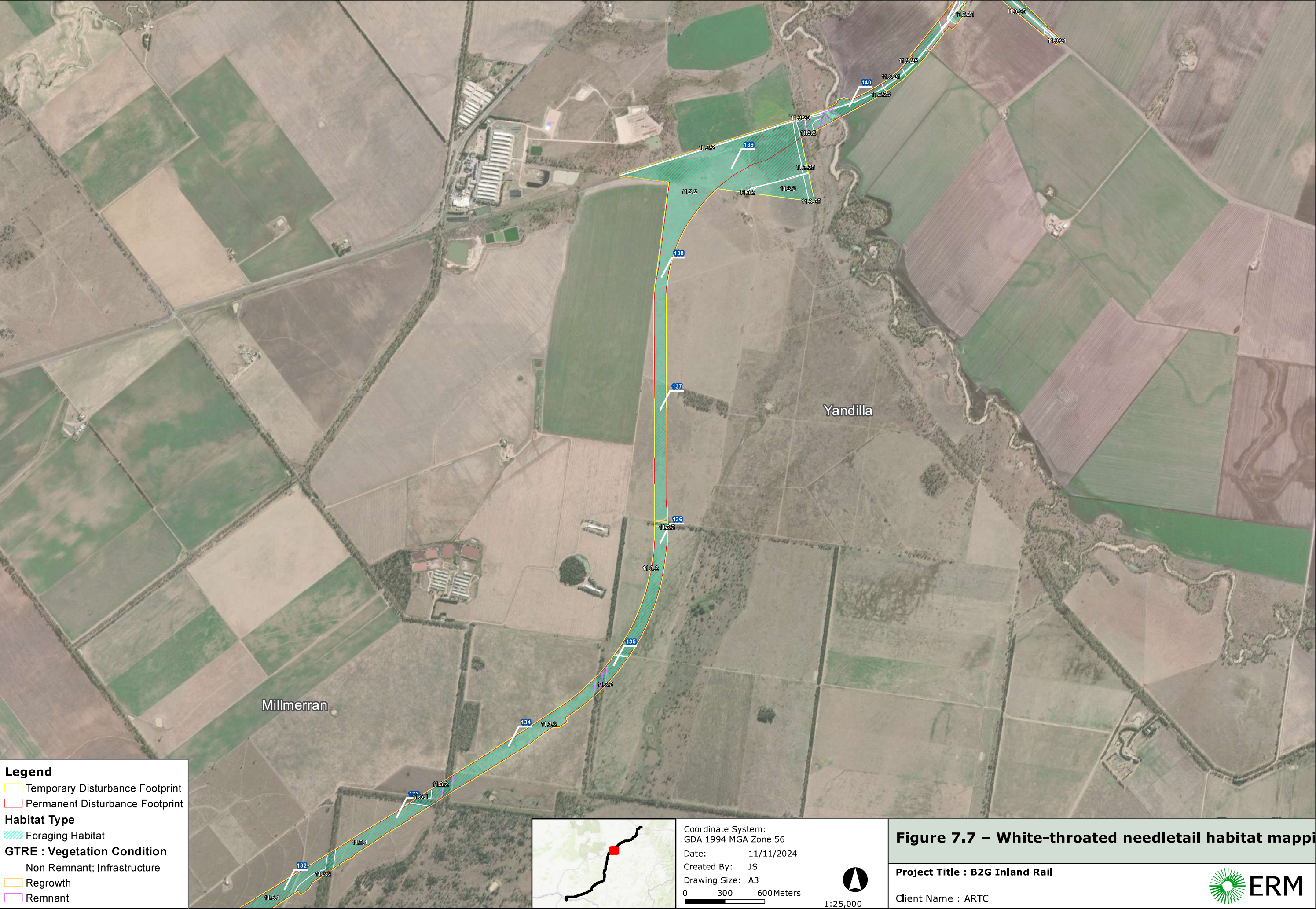
Project Title : B2G Inland Rail

Client Name : ARTC

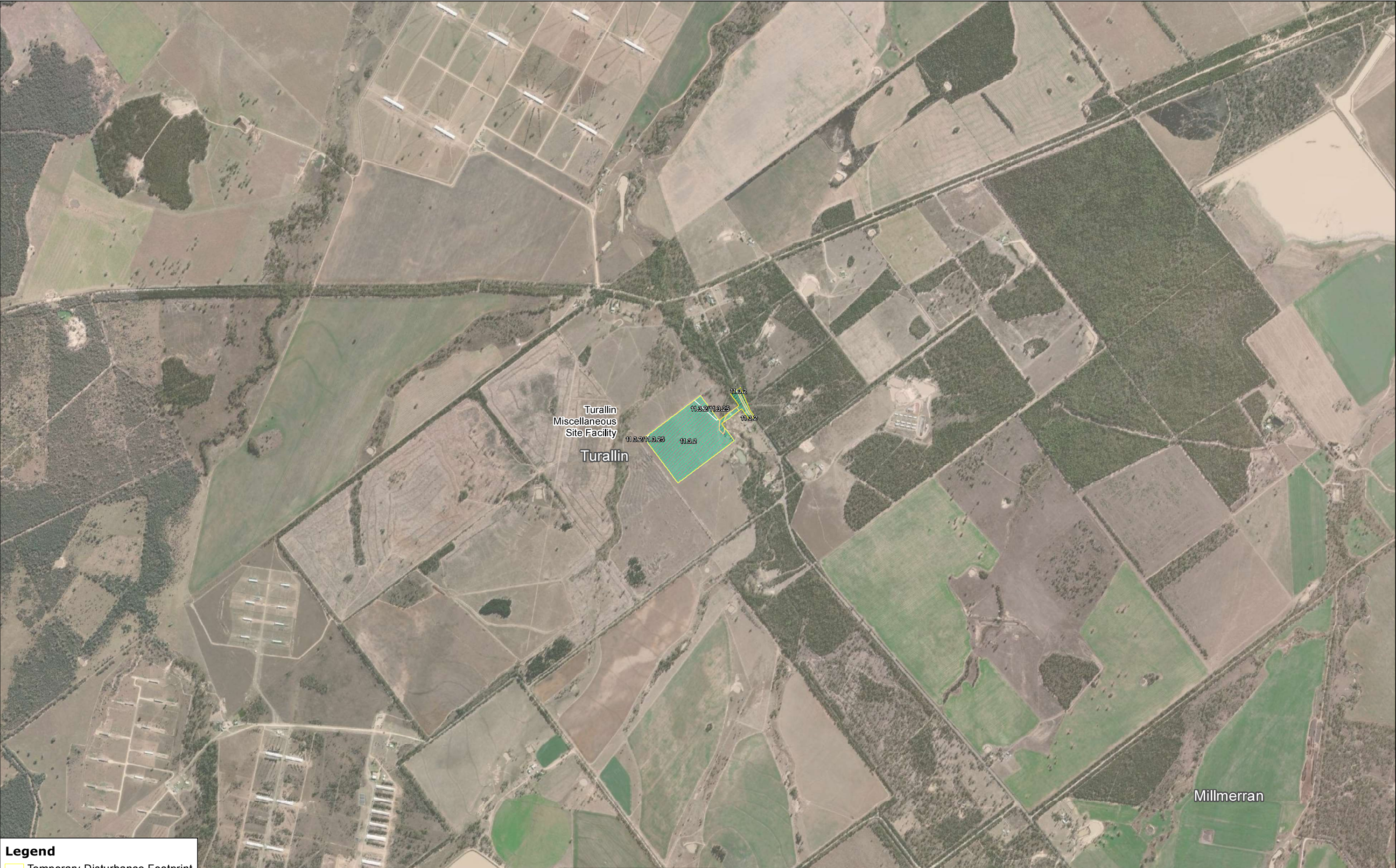












Legend

Temporary Disturbance Footprint

Habitat Type

Foraging Habitat

GTRE : Vegetation Condition

Non Remnant; Infrastructure

Regrowth



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

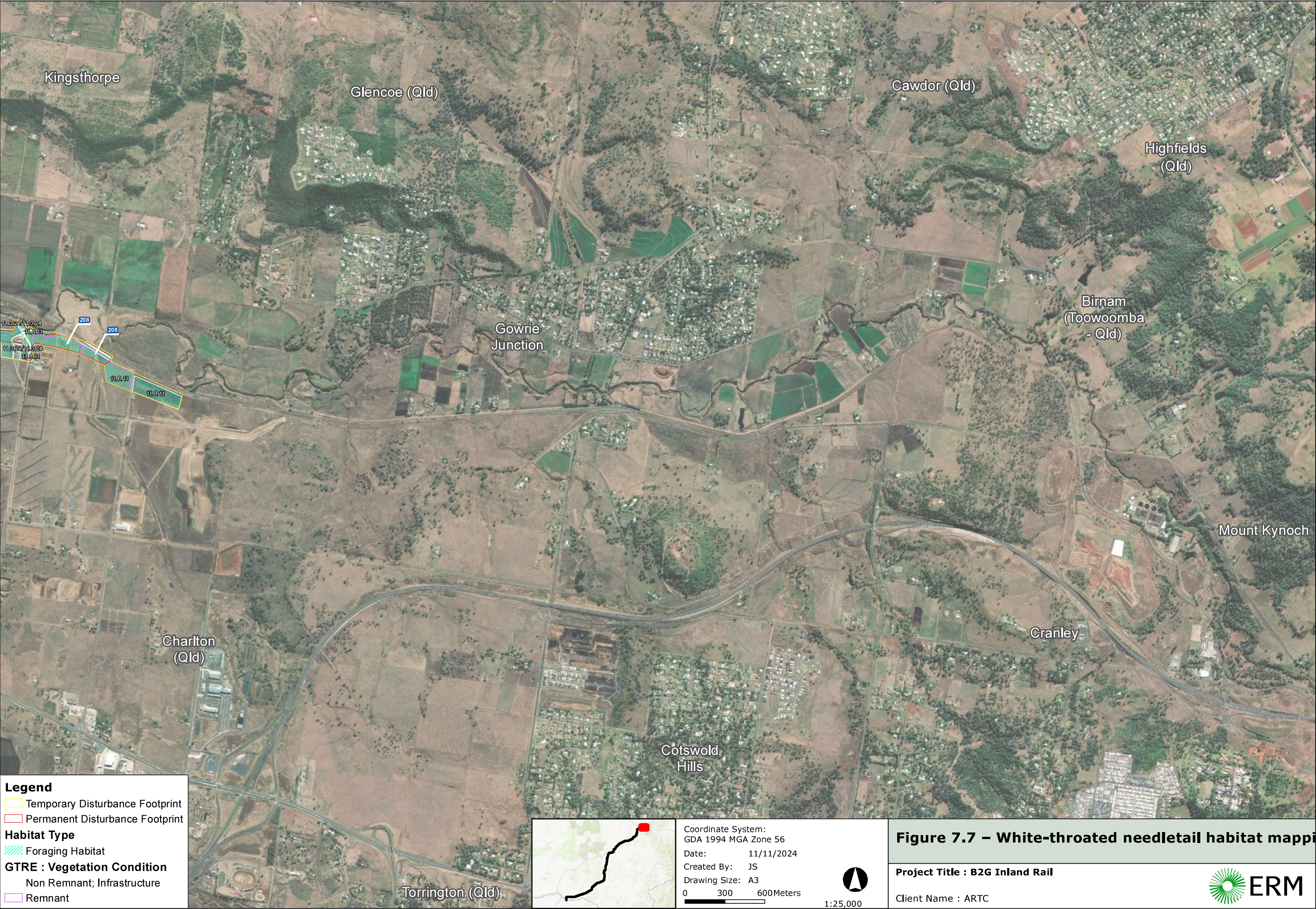
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Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

Client Name : ARTC



Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

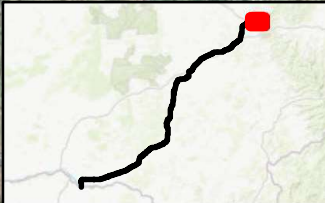
Habitat Type

Foraging Habitat

GTRE : Vegetation Condition

Non Remnant; Infrastructure

Remnant



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

0 300 600Meters



1:25,000

Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

Client Name : ARTC







Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Foraging Habitat

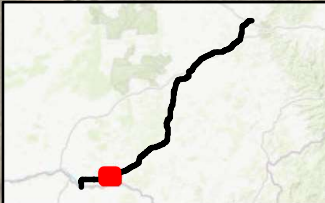
GTRE : Vegetation Condition

Non Remnant; Infrastructure

Regrowth

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 11/11/2024

Created By: JS

Drawing Size: A3

0 300 600Meters



1:25,000

Figure 7.7 – White-throated needletail habitat mapping

Project Title : B2G Inland Rail

Client Name : ARTC



7.7.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to white-throated needletail whilst the species is within Australia:

- Collision with overhead wires, windows, and lighthouses, however these threats only affect few individuals (DoE, 2023).

7.7.5 THREAT ABATEMENT/RECOVERY PLANS

No recovery plan has been established for this species, although it is expected that one will be developed following the recent EPBC listing. The following conservation and threat abatement plans are relevant to this species:

- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015);
- Wildlife Conservation Plan for Migratory Shorebirds (Commonwealth of Australia, 2015); and
- Marine bioregional plan for the North-west Marine Region (DSEWPC, 2012).

7.7.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

Objectives and actions outlined in the Draft referral guideline for 14 birds listed as migratory species under the EPBC Act include:

- To retain habitats and resources necessary for these species to successfully migrate and, where appropriate, breed throughout their natural range in Australia; and
- Ensure that breeding and non-breeding (including migratory passage) environments are conserved so they do not contribute to population declines.

Objectives and actions outlined in the Wildlife Conservation Plan for Migratory Shorebirds include:

- Protection of important habitat for migratory shorebirds that occurs throughout the East Asia-Australasian Flyway;
- Protect and conserve wetland habitats on which migratory shorebirds are dependent upon;
- Minimise or eliminate anthropogenic impacts to migratory shorebirds in Australia; and
- Identify and address knowledge gaps in migratory shorebird ecology to better inform decision makers, land managers and the public.

Objectives and actions outlined in the Marine bioregional plan for the North-west Marine Region include:

- Increase the support from research organisation;
- Establish and manage a Commonwealth marine reserve network to provide protection and conservation of biodiversity;
- Provide regional advice determining the significance of potential impacts;
- Develop targeted collaborative programs to coordinate species recovery and environmental protection efforts; and
- Improve monitoring, evaluation and reporting on ecosystem health.

7.7.7 REFERENCES

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8. FAUNA SPECIES – THREATENED INVERTEBRATES

8.1 BULLOAK JEWEL BUTTERFLY (*HYPOCHRYSOPS PICEATUS*)

8.1.1 STATUS

EPBC Act – Critically Endangered, effective 7 September 2023

NC Act - Critically Endangered

8.1.2 BIOLOGY AND ECOLOGY

8.1.2.1 CHARACTERISTICS

The bulloak jewel butterfly has differing characteristics between male and female sexes. The mature male has a fore wing with the upperside a dull purple base to the sub-termin, costa almost straight, termen broadly brown-black, costa and veins overlain with orange scales. The hind wing costa and termen broadly brown-black, veins faintly overlain with orange scales, basal half of inner marginal fold pale grey, cilia dark grey, darker and produced at tornus. The underside of both wings are a brown-grey color with orange spots and orange-red bands edged with black lines or spots. The female fore wings upper side are a pale bluish-purple base to dorsum, costa and termen broadly brown-grey area distal to discal cell paler with prominent brown bars; hind wing broadly bluish-purple extending to dorsum, costa and termen broadly brown-black, veins dark grey, basal half of inner margin fold pale grey. Underside ground colour pale cream-grey, with markings similar to male (Borsboom, 2019).



PLATE 8-1: BULLOAK JEWEL BUTTERFLY

8.1.2.2 KNOWN DISTRIBUTION

The bulloak jewel butterfly has a current distribution restricted to south-eastern Queensland from near Leyburn west to the Bendidee National Park/State Forest area (refer to Plate 8-2). The species has a distribution within the IBRA Brigalow Belt South Region. There only four known records of the species, those records being within the Brendidee National park and State Forest, over 40 km from the Project footprint (ALA, 2024). The next nearest records are within and adjacent to the Leyburn State Forest, approximately 20 km from the Project footprint. The last record is located approximately 25 km south of the township of Warrick and approximately 30 km form the Project footprint (ALA, 2024).

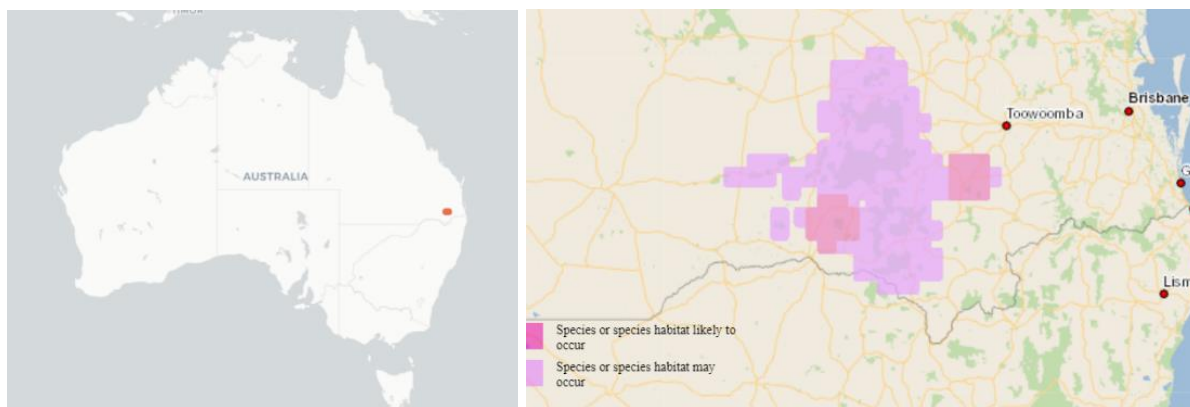


PLATE 8-2: DISTRIBUTION RANGE OF THE BULLOAK JEWEL BUTTERFLY

Source: ALA (2024), DCCEEWa (2023)

8.1.2.3 DISTRIBUTION IN RELATION TO THE PROJECT

The bulloak jewel butterfly is assessed as potential to occur within the Project footprint. This assessment was based off that only four records of the species exist within its extremely limited distribution range but outside of the locality of the Project footprint. There are currently only two known extent subpopulations, one near Leyburn the other in the Bendidee National Park/Bendidee State Forest area (refer to Plate 8-3). The bulloak jewel butterfly numbers have never been high for these two subpopulations. There are unconfirmed records from ~26 km southwest of Millmerran and in New South Wales ~9 km southwest of Texas (D.P.A. Sands unpublished data), but photographic evidence or specimens are required for confirmation, as this butterfly can be confused with similar-looking *Hypochrysops* species. The Project footprint is within the species mapped distribution and does contain preferred habitat features, however only two subpopulations are known to exist, in which both are excess of 20 km from the Project footprint.

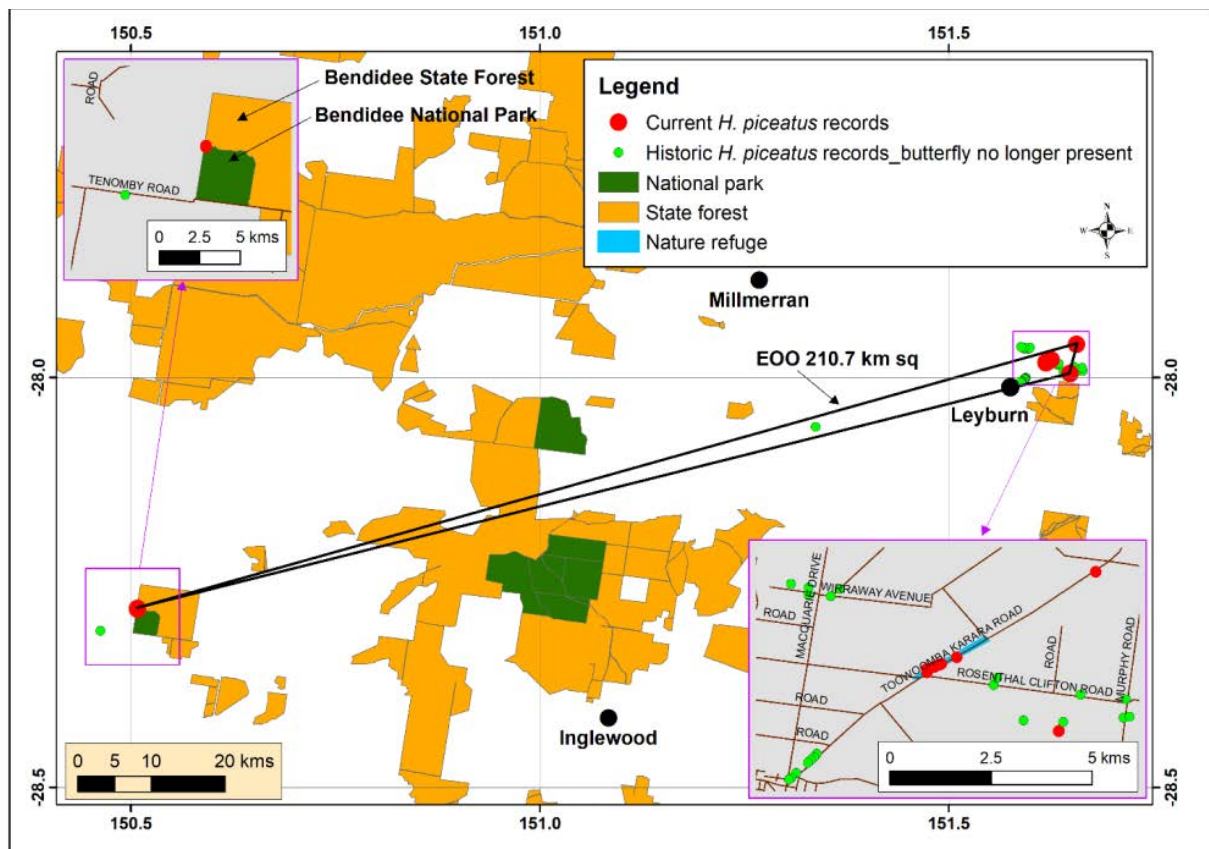


PLATE 8-3: LOCATIONS OF THE TWO SUBPOPULATIONS OF THE BULLOAK JEWEL BUTTERFLY

Source: DCCEEWb (2023)

8.1.2.4 BIOLOGY AND REPRODUCTION

The bulloak jewel butterfly has several developmental stages (egg, larva, pupa, butterfly), with larvae commonly going through five instar stages (Braby, 2010a). The species has two generations annually, with butterflies present from late August to early May, with a main emergence of butterflies in spring followed by a second emergency in summer early autumn. The butterfly's dispersal range is not completely understood within literature, however over 40-years of field observations point to the species only dispersing 1-3 km within its home range. Additionally, the bulloak jewel butterfly only has a life span of 10-25 days in duration (Sands & Braby, 2019). The butterfly species incurs an array of predators and natural threats including the egg parasitoids *Ooencyrtus* sp. and *Trichogramma* sp. (Hymenoptera) and an unidentified larval parasitoid (Braconidae, Hymenoptera) (D.P.A. Sands, unpublished data), birds such as the mistletoe bird (*Dicaeum hirundinaceum*) and honeyeaters species. The butterflies have been recorded feeding at flowers, including those of *Angophora leiocarpa*, *Eucalyptus tereticornis*, *Jacksonia scoparia*, *Kunzea opposita* var. *opposita* and several mistletoes, including *Amyema* spp. (Sands 2018; Sands & Braby 2019).

Male butterflies patrol and settle 8-10 m above the ground at the edge or tops of mature bulloaks (*A. luehmannii*) and *Angophora leiocarpa* trees, being active between 10 am and 5 pm during sunny periods when temperatures are above 22°C (Sands & Braby 2019). Females fly less rapidly and settle lower down when ovipositing (Sands & Braby 2019). Females deposit clusters of 3-7 eggs near hollows or cracks in upper branches or twigs of mature bulloaks,

occasionally at the base of mistletoes on bulloaks, but always in trees where the ant *Anonychomyrma inclinata* is present (Dunn & Kitching 1994; Eastwood & Fraser 1999; Braby 2000b; Sands & Braby 2019; Lewis & Sands 2021). This ant attends and feeds on secretions from special glands on *H. piceatus* larvae, and in turn provides the larvae with protection from predators (Sands 2018, 2019, Lewis & Sands 2021). The ant has been observed carrying the larvae to shelters on host trees, then carrying or guiding them at dusk to the soft terminal foliage of the tree (D.P.A. Sands unpublished data in Lewis & Sands 2021). This is referred to as an obligate relationship (Pierce et al. 2002). *Anonychomyrma inclinata* nests arboreally in hollows of living mature *A. luehmannii*, *Angophora leiocarpa*, *Eucalyptus crebra* and *E. tereticornis* (Sands 2018; Sands & Braby 2019; Lewis & Sands 2021). It was also reported by Sands (2018) to nest in logs 15 cm in diameter, but prefers to use these and other fallen timber to move between trees (Lewis & Sands 2021). Large, mature *Angophora leiocarpa* trees used as nesting sites by the ant have been dated up to 400 years old (P. Sparshott, pers. comm. in Sands & Braby 2019).

8.1.3 HABITAT DESCRIPTION AND DEFINITION

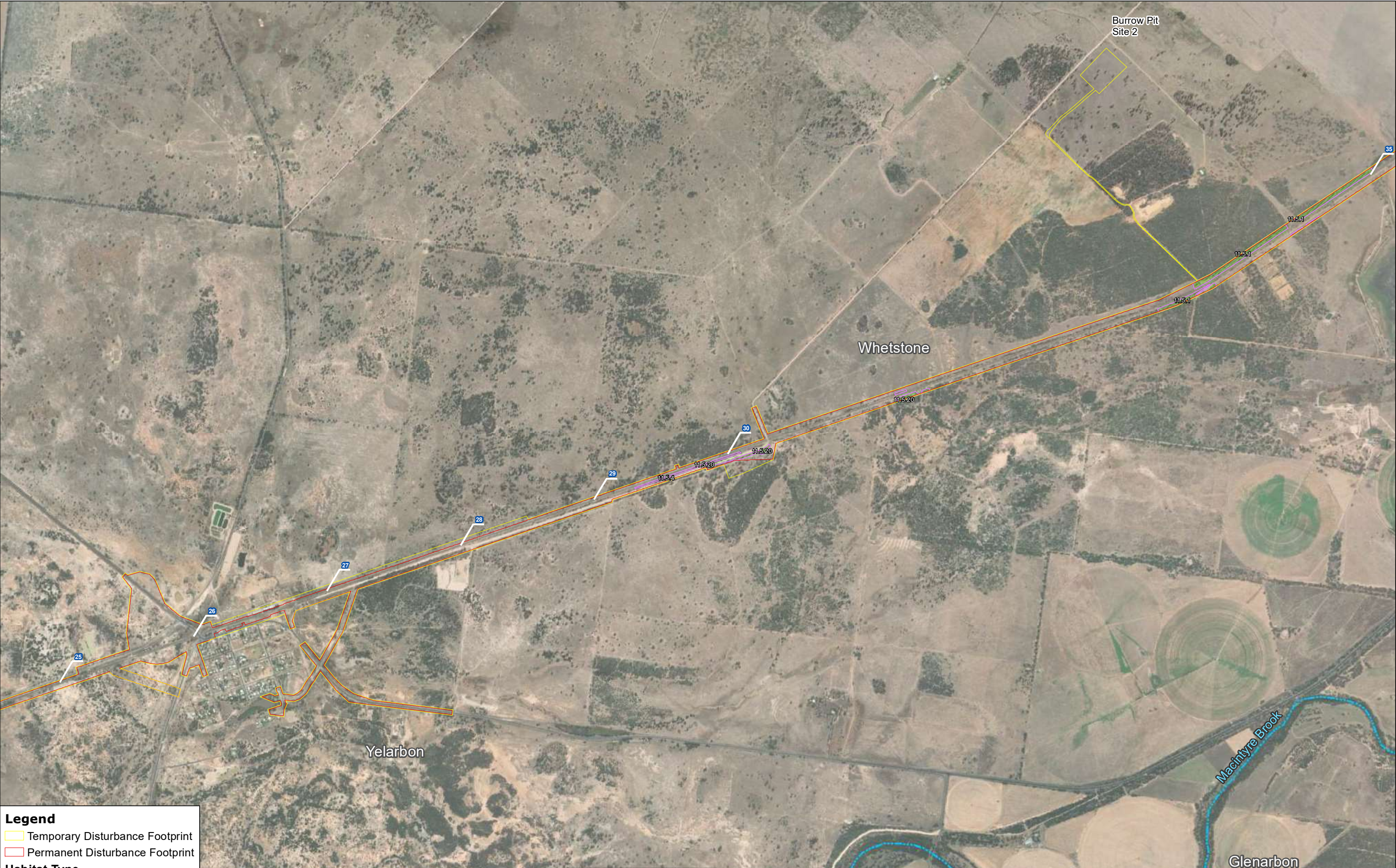
The bulloak jewel butterfly has a very limited distribution, being limited to a small area in south-east Queensland from Goondiwindi south to Smithfield, then North to Dalby and in areas south of Pittsworth. The butterfly species is only known to be present in two locations in differing sub-populations, one near Leyburn the other in the Bendidee National Park/Bendidee State Forest area. The bulloak jewel butterfly commonly occurs in bulloak woodlands. The vegetation communities that are commonly associated with the butterfly species include *Allocasuarina luehmanni*, *A. leiocarpa*, *Eucalyptus tetricornis* and *Acacia neriifolia*, with an understory comprising of *Jacksonia scoparia*, *Cassinia leavis*, *Acacia spp.* and *Callitris columellaris var campestris* (Dunn & Kitching, 1994). The ground cover consists of various small herbs, grasses, mat rushes and leaf litter. Mistletoe has also been associated with presence of the species in a habitat area, in which commonly mistletoe is found on *Allocasuarina*, *Eucalyptus*, *Angophora* and *Acacia spp* trees. The only tree in which the bulloak jewel butterfly dwells within is any *Allocasuarina luehmanni* species tree. The habitat requirements of the bulloak jewel butterfly are complicated, in that the species needs the *Allocasuarina luehmanni* species, but additionally needs the *Anonychomyrma inclinata* ant present within the tree.

Allocasuarina luehmanni tree species (or Bulloak trees) utilized by the bulloak jewel butterfly are typically greater than 75 years in age with a breast height (DBH) of 18-40 cm, and are often senescent with dead limbs, hollow branches and twigs or fissures in the trunks (Sands & Braby, 2019). In 2002 at the Bendidee State Forest/National Park site for the bulloak jewel, a sample of 20 bulloak trees used by the butterfly ranged in DBH from 19.0-42.6 cm, with a mean DBH of 27.7 cm, a height range of 10.6-15.0 m and a mean height of 13.0 m (A. Borsboom & D.P.A. Sands unpublished data). A November 1999 sample of 25 bulloaks where the butterfly occurs at Leyburn, and which had the butterfly's attendant ant present on them, ranged in DBH from 16-28 cm with a mean DBH of 20.5 cm (D.P.S. Sands unpublished data). Based on regional ecosystems (RE) mapping and descriptions at both extant and historic sites for the butterfly (Queensland Herbarium 2019a, 2019b), REs associated with the butterfly in which bulloaks can occur include 11.3.14, 11.5.1, 11.5.4, 11.5.20, 11.7.7 and 11.9.9a.

Habitat critical to the survival of the species is not defined in the Conservation Advice (DAWE, 2021), however, important habitat would be areas consisting of mature *Allocasuarina luehmanni* that present attributes alike a breast height (DBH) of 18-40 cm, and are often senescent with dead limbs, hollow branches and twigs or fissures in the trunks. Additionally, the *Anonychomyrma inclinata* ant must be occupying the same tree that the butterfly species is within. habitat mapping for this species within the Project footprint has been mapped using the criteria in Table 8-1 and is presented in Figure 8-1. The DCCEEW standard break down for habitat (i.e. breeding, foraging, dispersal) is not used due to the niche ecology of the species described above.

TABLE 8-1 HABITAT CRITERIA FOR BULLOAK JEWEL BUTTERFLY WITHIN THE STUDY AREA

Habitat function	General habitat	Regional Ecosystems	Habitat mapping rules
Suitable habitat	Patches of woodland that feature <i>Allocasuarina luehmanni</i> are used as dwelling habitat. Additionally other vegetation communities that are commonly associated are <i>A. leiocarpa</i> , <i>Eucalyptus tetricornis</i> and <i>Acacia neriifolia</i> , with an understory comprising of <i>Jacksonia scoparia</i> , <i>Cassinia leavis</i> , <i>Acacia spp.</i> and <i>Callitris columellaris var campestris</i> . The <i>Anonychomyrma inclinata</i> ant must be occupying the same tree that the butterfly species is within. Also, habitat that features mistletoe.	11.3.14 11.5.1 11.5.4 11.5.20 11.7.7 11.9.9a	Areas of remnant <i>Allocasuarina luehmanni</i> woodland and associate REs where <i>Allocasuarina luehmanni</i> is present.
Not suitable habitat	<i>Eucalyptus tetricornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines. <i>Dichanthium sericeum</i> and/or <i>Astrebla spp.</i> grassland on alluvial plains. Cracking clay soils	11.3.25 11.3.21	Areas not mapped as habitat. Grassland, shrubland, forest and woodland without mature <i>Allocasuarina luehmanni</i> . Areas outside the species modelled distribution.



Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

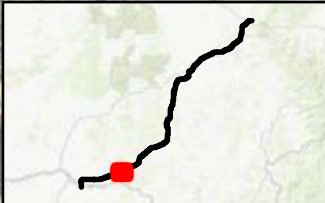
Suitable Habitat

GTRE : Vegetation Condition

Non Remnant

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters



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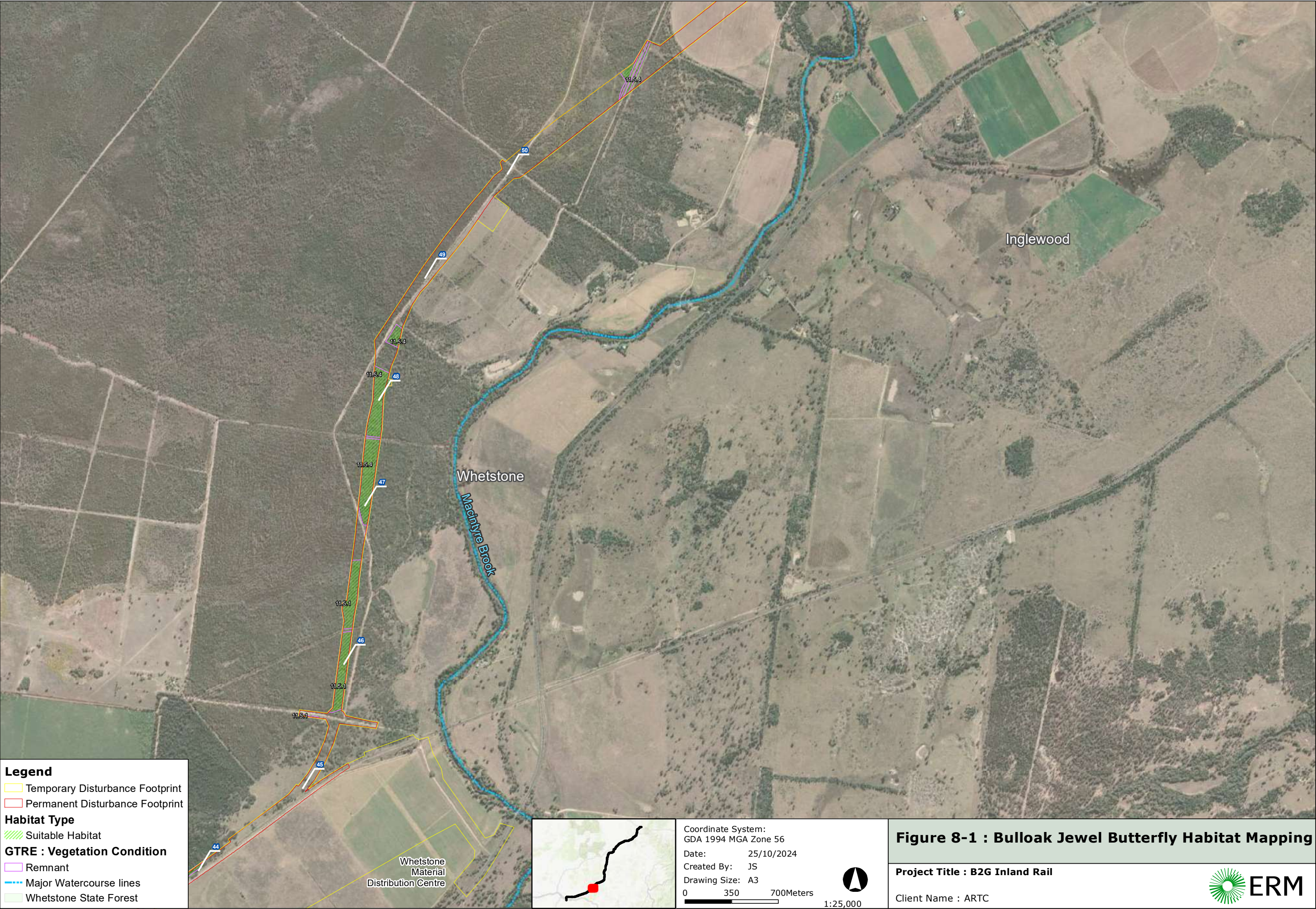
Figure 8-1 : Bulloak Jewel Butterfly Habitat Mapping

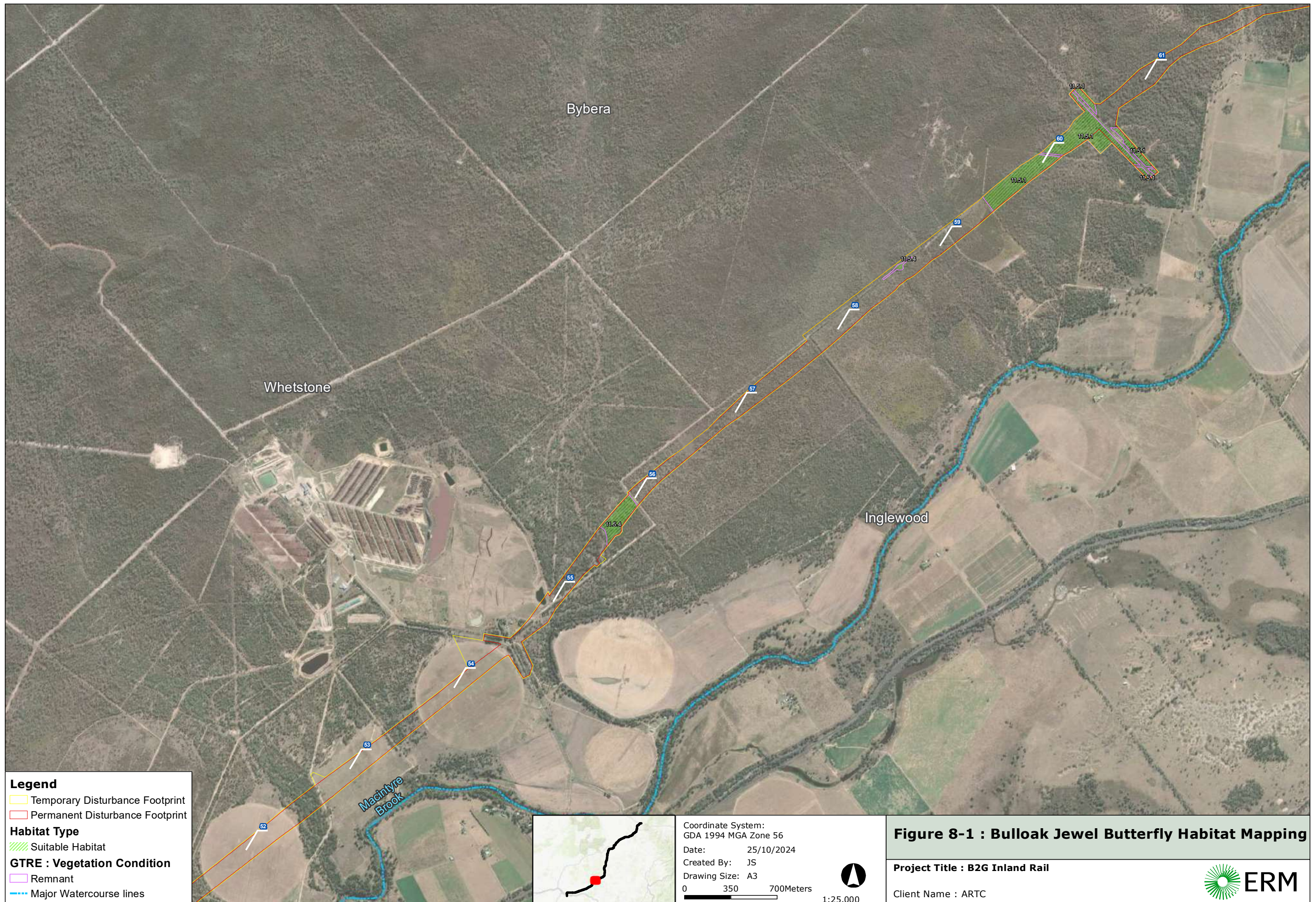
Project Title : B2G Inland Rail

Client Name : ARTC









Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Remnant

Major Watercourse lines



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters

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Figure 8-1 : Bulloak Jewel Butterfly Habitat Mapping

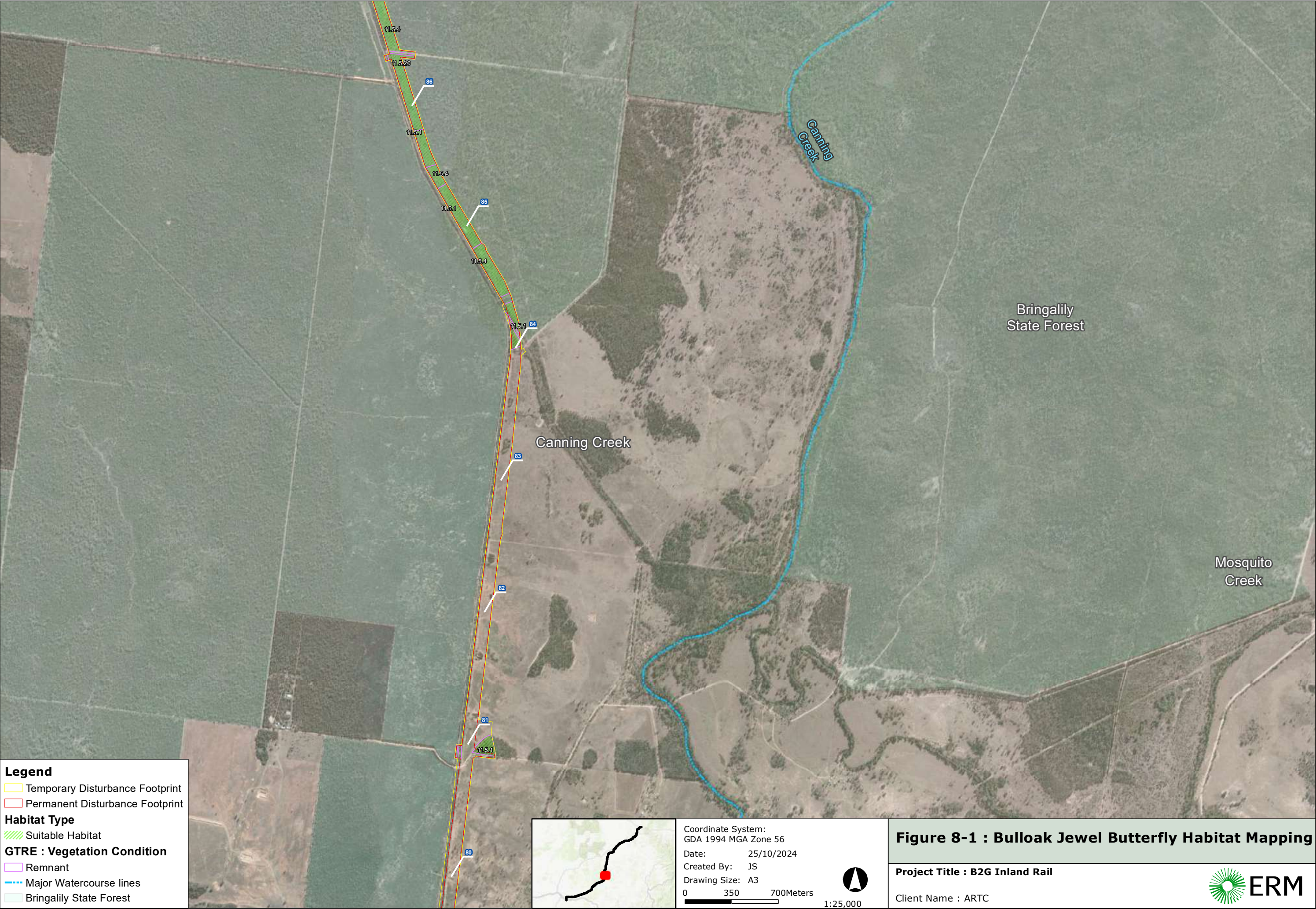
Project Title : B2G Inland Rail

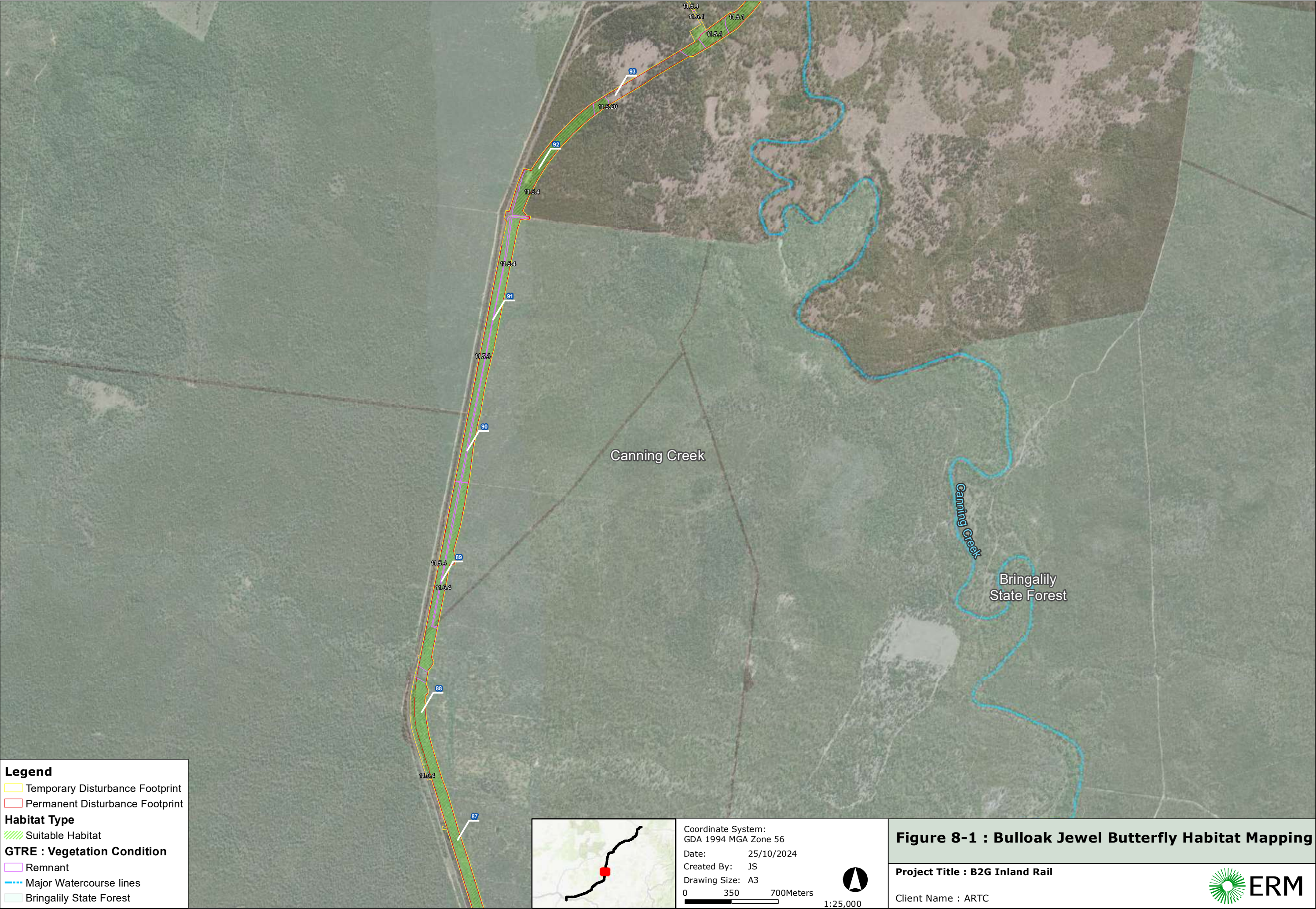
Client Name : ARTC

ERM













Legend

Temporary Disturbance Footprint

Permanent Disturbance Footprint

Habitat Type

Suitable Habitat

GTRE : Vegetation Condition

Remnant



Coordinate System:
GDA 1994 MGA Zone 56

Date: 25/10/2024

Created By: JS

Drawing Size: A3

0 350 700Meters

1:25,000

Figure 8-1 : Bulloak Jewel Butterfly Habitat Mapping

Project Title : B2G Inland Rail

Client Name : ARTC

ERM

8.1.4 THREATENING PROCESSES

The following have been identified as potentially threatening processes to the bulloak jewel butterfly:

- Land clearance (illegal removal of mature living and dead bulloaks for either woodturning, firewood or fence posts),
- Climate change,
- Grazing by domestic stock (Cattle trampling of soil crusts and cattle browsing on bulloak recruitment trees),
- Rubbish dumping,
- Rabbits (threat to recruitment of the butterfly's host trees),
- Invasive weeds (buffel grass),
- Fire,
- Inbreeding depressions,
- Illegal collecting (Borsboom, 2019).

8.1.5 THREAT ABATEMENT/RECOVERY PLANS

Various threat abatement and mitigating actions are underway to improve management, assist with rehabilitation, and possibly extend boundaries of the roadside Ellangowan Nature Refuge in which the butterfly occurs.

- Planning is now well advanced for the Clifton Landcare group to erect a cattle exclusion fence around the refuge,
 - Protective measures the fencing will provide include minimising illegal clearing including the removal of butterfly host trees for woodturning, fencing and firewood,
 - Protective measures the fencing will provide include exclusion of stock,
- Protection of the butterfly's bulloak host trees from damage or loss associated with timber harvesting operations, maintaining appropriate fire regimes and retention of logs on the ground for the attendant ant,
- Buffel grass (*Cenchrus ciliaris*) control has been undertaken in Bendidee State Forest,
- Adult bulloak jewels were netted at the nearby Southern Downs Regional Council managed site for the butterfly and released in the nature refuge (Borsboom, 2019).

8.1.6 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS

To improve management, assist with rehabilitation, and possibly extend boundaries of the roadside Ellangowan Nature Refuge in which the butterfly occurs.

- Cattle exclusion fence around the refuge,
 - Minimising illegal clearing including the removal of butterfly host trees for woodturning, fencing and firewood,
 - Exclusion of stock,
- Protect host trees from damage or loss associated with timber harvesting operations,

- Buffel grass control,
- Reduction of inbreeding depression.

8.1.7 REFERENCES

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9. FAUNA SPECIES – SPECIAL LEAST CONCERN MIGRATORY BIRDS

TABLE 9-1: MIGRATORY BIRDS

Species Name	Status	Distribution in relation to Project	Habitat	Threats	Conservation advice, recovery plan and threat abatement plans	Recovery objectives / actions
Common greenshank (<i>Tringa nebularia</i>)	EPBC Act: E (listed 5/1/ 2024, after controlled action date), Ma, Mi (Bonn, CAMBA, JAMBA, ROKAMBA) NC Act: SLC	There are no records within the Project footprint, however there are records within the Study Area around permanent waterbodies. The Project footprint is located outside of the species modelled distribution of species or species habitat likely to occur and may occur (DoE, 2023).	The species inhabits natural and artificial wetlands and sheltered coastal habitats including harbors, river estuaries, deltas, lagoons, tidal pools, rock flats/platforms, swamps, lakes, dams, rivers, billabongs, waterholes, inundated floodplains, claypans, salt flats, sewage farms, inundated rice crops and bores (Higgins and Davies, 1996).	(DCCEEW, 2024): • Loss/modification of habitat (i.e., residential, farming, industrial and aquaculture/fishing activities). • Downstream effects of large dams. • Increased silt in the water, pollution and weed or pest invasion of habitats • Disturbance at feedings and roosting sites (i.e., fishing, power boating, four-wheel driving, walking dogs, noise and night lighting).	No threat abatement plan has been identified for this species. The following have been identified as relevant: • Wildlife Conservation Plan for Migratory Shorebirds. (DoE, 2015) • Marine bioregional plan for the North-west Marine Region (DSEWPac, 2012).	Refer to Section 9.1.1 for the objectives of the recovery plans.
Fork-tailed swift (<i>Apus pacificus</i>)	EPBC Act: Ma, Mi (CAMBA, JAMBA, ROKAMBA)	Confirmed as present within the Project footprint and within the Study Area. In Queensland, the species is	The fork-tailed swift is almost exclusively aerial and forages over a wide range of remnant and non-remnant habitats. The species predominantly occur over inland	There are no significant threats to the Fork-tailed swift in Australia, but potential threats include habitat destruction and predation by feral	The following threat abatement plan has been identified as being relevant for this species: • Threat abatement plan for predation by	Threat abatement actions for feral cats include: • Effectively control cats in different landscapes • Improve effectiveness of

Species Name	Status	Distribution in relation to Project	Habitat	Threats	Conservation advice, recovery plan and threat abatement plans	Recovery objectives / actions
	NC Act: SLC	widespread along the western regions of the Great Dividing Range from Chinchilla to Hughenden. East of the Great Dividing Range the species is widespread yet scattered. The footprint is located within the species modelled habitat distribution of species or species habitat likely to occur (DoE, 2024).	plains, but occasionally over coastal areas or foothills. The species are more inclined to hunt at lower altitudes above open areas or over water. The species forage along the edges of low-pressure systems and thus, are considered a precursor to unsettled weather (DoE, 2024).	animals (Birdlife International, 2009).	feral cats. (DoE, 2015). The following have been identified as relevant: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).	existing control measures for feral cats - Develop and maintain alternative strategies for the recovery of threatened species - Gain public support for feral cat management and promote responsible cat ownership.
Glossy ibis (<i>Plegadis falcinellus</i>)	EPBC Act: Ma, Mi (Bonn) NC Act: SLC	There is no official distribution for this species, however in Australia the species is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia, which would overlap with the Project alignment (DoE, 2024).	The species preferred habitat for foraging and breeding are freshwater marshes at the edges of lakes and rivers, lagoons, floodplains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is also occasionally found in coastal locations such as estuaries, deltas, saltmarshes, and coastal lagoons (del	(DoE, 2024): - Wetland destruction or degradation as a result of pesticide use, groundwater extraction, water diversion, drainage, increased salinity, irrigation, and hydroelectric power production. - Habitat loss and fragmentation as a result of clearing, grazing, and burning.	No threat abatement plan has been identified for this species. The following have been identified as relevant: - Wildlife Conservation Plan for Migratory Shorebirds. (DoE, 2015) - Marine bioregional plan for the North-west Marine Region (DSEWPaC, 2012).	Refer to Section 9.1.1 for the objectives of the recovery plans.

Species Name	Status	Distribution in relation to Project	Habitat	Threats	Conservation advice, recovery plan and threat abatement plans	Recovery objectives / actions
			Hoyo et al. 1992; Hancock et al. 1992; Marchant and Higgins 1990). The species may retreat to permanent wetlands or coastal areas during drought periods (Marchant and Higgins, 1990).	- Human disturbance - Invasion by exotic plants and fish species.		
Latham's snipe <i>(Gallinago hardwickii)</i>	EPBC Act: V (listed 5/1/2024, after controlled action date); Ma, Mi (Bonn, JAMBA, ROKAMBA) at the time of referral. NC Act: SLC	Confirmed as present within the Project footprint and within the Study Area. Latham's snipe is a passage migrate through northern Australia, with the species recorded to occur from Cape York Peninsula to south-eastern South Australia. The species occurs inland over the eastern tablelands and west of the Great Dividing Range (DoE, 2024).	The species usually inhabit open, freshwater wetlands with low, dense vegetation. However, they can also occur in habitat with saline or brackish water, in modified or artificial wetlands, and in areas located close to humans or human activity. Smaller numbers inhabit drier habitat, including open woodlands and high-altitude grasslands or herblands, usually those being in proximity to surface water (DCCEE, 2024).	(DoE, 2024): - Loss of habitat caused by the drainage, modification of wetlands, agriculture and development of land. - Easily disturbed by the intrusion of humans or cattle into their habitats. - Pollution of wetlands.	No threat abatement plan has been identified for this species. The following have been identified as relevant: - Wildlife Conservation Plan for Migratory Shorebirds. (DoE, 2015) - Threat abatement plan for predation by European red fox. (DEWHA, 2008).	Refer to Section 9.1.1 for the objectives of the Wildlife Conservation Plan for Migratory Shorebirds. Threat abatement actions for the European red fox include: - Baiting; - Biological control; - Barriers; - Habitat management; and - Shooting and bounties.

Species Name	Status	Distribution in relation to Project	Habitat	Threats	Conservation advice, recovery plan and threat abatement plans	Recovery objectives / actions
Oriental cuckoo <i>(Cuculus optatus)</i>	EPBC Act: Mi (CAMBA, JAMBA, ROKAMBA) NC Act: SLC	The northern portion of the Project footprint is located within the species modelled distribution habitat of species or species habitat may occur, whilst the southern portion is located outside of the modelled distribution (DoE, 2024).	Oriental cuckoos inhabit monsoon forests, wet sclerophyll forests, paperbark swamps, dense open forests, scrubby gullies, and mangroves and is also known to use rainforest edges, leafy trees in paddocks, river flats and roadsides. This species prefers dense vegetation with a closed canopy (Pizzey and Knight 2007; Schodde and Tidemann 2010).	No threats have been identified for this species.	No threat abatement plan has been identified for this species, as there are no threats listed. The following have been identified as relevant: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).	-
Rufous fantail <i>(Rhipidura rufifrons)</i>	EPBC Act: Mi (Bonn) NC Act: SLC	The Project footprint is located within the species modelled distribution of species or species habitat likely to occur and may occur (DoE, 2024).	Rufous fantails mainly inhabit wet sclerophyll forests, often in gullies dominated by eucalypts, but can also occur in subtropical and temperate rainforests. The species occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests (DoE, 2024).	No threats have been identified for this species.	No threat abatement plan has been identified for this species, as there are no threats listed. The following have been identified as relevant: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).	-

Species Name	Status	Distribution in relation to Project	Habitat	Threats	Conservation advice, recovery plan and threat abatement plans	Recovery objectives / actions
Satin flycatcher <i>(Myiagra cyanoleuca)</i>	EPBC Act: Mi (Bonn) NC Act: SLC	The Project footprint is located within the species modeled distribution of the species, the mapping of the species illustrates the species habitat is likely to occur (DoE, 2024).	The satin flycatcher inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests (DoE, 2024).	The main threats to the satin flycatcher populations is clearing and logging of forests in south-eastern Australia, mainly the loss of mature forest and woodlands. Sating flycatchers are not normally identified in regrowth forests (DoE, 2024)	There is no threat abatement plan that has been identified as being relevant for the species. The following have been identified as relevant: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015).	There is no recovery or developed Recovery Plan for the satin flycatcher species.
Sharp-tailed sandpiper <i>(Calidris acuminata)</i>	EPBC Act: V (listed 5/1/24, after controlled action date), Mi (Bonn, CAMBA, JAMBA, ROKAMBA at the time of referral) NC Act: SLC	The Project footprint is located within the species modeled distribution of the species, the mapping of the species illustrates the species habitat is may to occur (DoE, 2024).	The sharp-tailed sandpiper prefers muddy edges of shallow fresh or brackish wetlands with inundated or emergent sedges, grass, saltmarsh or other low vegetation. The species additionally occur in flooded paddocks, sedge lands and other ephemeral wetlands, however, leave when dry (DoE, 2024).	The main threats include (DoE, 2024): - Habitat loss (Clearing of vegetation and habitat) - Reduction in water quality and quantity - Disturbance from residential and recreational activities	No threat abatement plan has been identified for this species. An approved conservation advice has been developed for the species, <i>Conservation Advice for Calidris acuminata (sharp-tailed sandpiper)</i> (DoE, 2024).	There is no recovery or developed Recovery Plan for the species.

Species Name	Status	Distribution in relation to Project	Habitat	Threats	Conservation advice, recovery plan and threat abatement plans	Recovery objectives / actions
				- Changing of climate; and - Hunting.		

9.1 THREAT ABATEMENT/RECOVERY PLANS RELEVANT TO MIGRATORY SPECIES

The following Referral Guideline, Wildlife Conservation Plan and Marine Bioregional Plan have been identified as being relevant for this species:

- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE, 2015);
- Wildlife Conservation Plan for Migratory Shorebirds (Commonwealth of Australia, 2015); and
- Marine bioregional plan for the North-west Marine Region (DSEWPC, 2012).

9.1.1 SUMMARY OF THREAT ABATEMENT/RECOVERY PLANS RELEVANT TO MIGRATORY SPECIES

Objectives and actions outlined in the Draft referral guideline for 14 birds listed as migratory species under the EPBC Act include:

- To retain habitats and resources necessary for these species to successfully migrate and, where appropriate, breed throughout their natural range in Australia; and
- Ensure that breeding and non-breeding (including migratory passage) environments are conserved so they do not contribute to population declines.

Objectives and actions outlined in the Wildlife Conservation Plan for Migratory Shorebirds include:

- Protection of important habitat for migratory shorebirds that occurs throughout the East Asia-Australasian Flyway;
- Protect and conserve wetland habitats on which migratory shorebirds are dependent upon;
- Minimise or eliminate anthropogenic impacts to migratory shorebirds in Australia; and
- Identify and address knowledge gaps in migratory shorebird ecology to better inform decision makers, land managers and the public.

Objectives and actions outlined in the Marine bioregional plan for the North-west Marine Region include:

- Increase the support from research organization;
- Establish and manage a Commonwealth marine reserve network to provide protection and conservation of biodiversity;
- Provide regional advice determining the significance of potential impacts;
- Develop targeted collaborative programs to coordinate species recovery and environmental protection efforts; and
- Improve monitoring, evaluation and reporting on ecosystem health.

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