TECHNICAL PAPER

1

Biodiversity Development Assessment Report

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Technical and Approvals Consultancy Services: Illabo to Stockinbingal

Technical Paper 1 – Biodiversity Development Assessment Report

August 2022

2-0001-220-EAP-00-RP-0008

Table of contents

Table of contents (continued)

Table of contents (continued)

Table of contents (continued)

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

Glossary

Accredited person or assessor	A person accredited under section 6.10 of the Biodiversity Conservation Act 2016 to prepare reports in accordance with Biodiversity Assessment Method.
Affected species	A species that is likely to be affected through by direct and/or indirect impacts as a result of the proposal.
Area of outstanding biodiversity value (AOBV)	Under the BC Act an AOBV is an area with irreplaceable biodiversity values that is of state, national or global importance. AOBVs identify the most valuable sites for biodiversity conservation in NSW outside of the national reserve system.
Assessment area	The area of land in a buffer zone around the subject land. For a linear development a buffer of 500m is applied.
Avoid	Measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity.
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: • Genetic diversity – the variety of genes (or units of heredity) in any population • Species diversity – the variety of species • Ecosystem diversity – the variety of communities or ecosystems.
Biodiversity Assessment Method	The Biodiversity Assessment Method 2020
Biodiversity Assessment Method Calculator	The online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site.
Biodiversity credits	Biodiversity credits are generated from management actions that improve biodiversity values and are used to offset the loss of biodiversity values on development sites. Biodiversity credits consist of ecosystem and species credits.
Biodiversity credit report	The report produced by the Biodiversity Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (Department of Planning Industry and Environment 2020).
Biodiversity offsets	Biodiversity offsets are the gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development.

Biodiversity value	Are the following values: • vegetation integrity--being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state • habitat suitability--being the degree to which the habitat needs of threatened species are present at a particular site • biodiversity values, or biodiversity-related values, prescribed by the regulations.
Candidate species	A species credit species that is likely to have suitable habitat on the subject land. Referred to as 'candidate species credit species' in the BAM-C and require further assessment in accordance with subsection 5.2.3 of the BAM.
Critical habitat	The whole or any part or parts of an area or areas of land comprising the habitat of an endangered species, an endangered population or an endangered ecological community that is critical to the survival of the species, population or ecological community. Critical habitat is listed under the EPBC Act.
Development footprint	The area of land that is directly impacted by a proposed development, including access roads and areas used to store construction materials. The term development footprint is also taken to include clearing footprint, except where the reference is to a small area development or a major project development.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017. This includes impacts from activities related to the construction or operational phase of the proposal. (Department of Planning Industry and Environment 2020).
Ecological community	An assemblage of species occupying a particular area.
Ecosystem credit	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site.
Ecosystem credit species	Ecosystem credit species are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.
Environment, Energy and Science (EES) Group	The NSW Department of Planning and Environment which holds the Environment, Energy and Science Group replaced the NSW Department of Planning and Environment which held the Office of Environment and Heritage (OEH) effective 1 July 2019. The EES Group brings together a range of functions including national park management, biodiversity and conservation, climate change, sustainability, resilience and adaptation, renewable energy and energy security, waste management and resource recovery, and environment protection and mine safety regulation. The work of the Group is supported by centres of excellence in: science; policy and strategy; and data analytics and insights.

Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.
Habitat	An area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community, including any biotic or abiotic components.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.
IBRA region	A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts.
Likely	Taken to be a real chance or possibility
Linear shaped development	Development that is generally narrow and extends across the landscape; for example, major roads, rail lines.
Locality	The area within 10km of the subject land.
Migratory species	Species protected as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999.* Listed migratory species are those listed in the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) and Republic of Korea – Australia Migratory Bird Agreement (RoKAMBA). Listed migratory species also include any native species identified in an international agreement approved by the Minister. Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.
Minimise	A process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of the proposal on biodiversity values.
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (Department of Planning industry and Environment 2018).
Mitigation	Action to reduce the severity of an impact (Department of Planning Industry and Environment 2020).

Native vegetation	Means any of the following types of plants native to New South Wales: • trees (including any sapling or shrub or any scrub) • understorey plants • groundcover (being any type of herbaceous vegetation) • plants occurring in a wetland.
Patch size	An area of intact native vegetation that: • occurs on the subject land or biodiversity stewardship site • includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the subject land or biodiversity stewardship site.
PCT classification system	The system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.
Plant community type	A NSW plant community type identified using the PCT classification system.
Population	A group of organisms, all of the same species, occupying a particular area.
Prescribed impact	Means the prescribed impacts identified in clause 6.1 of the BC Regulation. Prescribed impacts can be direct or indirect impacts.
Proposal	Proposal in this BDAR refers to the construction and operation of the Illabo to Stockinbingal section of Inland Rail. A proposal under the BAM includes any of the following: • development that requires consent under Part 4 of the EP&A Act • an activity that requires approval under Part 5, Division 5.1 (where the proponent has opted-in to the Biodiversity Offsets Scheme) of the EP&A Act • development that requires approval under Part 5, Division 5.2 of the EP&A Act • clearing that requires approval under Part 5A of the LLS Act; or a permit under the Vegetation SEPP • biodiversity certification of land and related development in the case of an application for biodiversity certification under the BC Act • a biodiversity stewardship site in the case of an application for a biodiversity stewardship agreement under the BC Act.
Proposal site	The area that would be used for the construction and operation of the proposal and includes the location of construction worksites and operational infrastructure. It includes all enhancement sites. Stage 2 (Impact Assessment) of the BAM has been applied to the proposal site for this report. This definition is consistent with the BAM definition of development footprint. It is also referred to as the 'construction footprint'.
Region	A bioregion defined in a national system of bioregionalisation. For this study, this is the Inland Slopes as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell, 1995).
Scattered trees	Scattered trees are defined in Appendix B, Section B.1 of BAM.

Significant	Important, weighty, or more than ordinary (as defined by the Department of Environment and Climate Change, 2007).
Species credit	The class of biodiversity credit created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.
Species credit species	Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, a species may be assumed present within a subject land.
Stage 1: Biodiversity Assessment	Stage 1 of the Biodiversity Assessment Method. It establishes a single consistent approach to assessing the biodiversity values on land subject to the proposal.
Stage 2: Impact Assessment	Stage 2 of the Biodiversity Assessment Method. It provides for an impact assessment on biodiversity values on land subject to the proposal.
Stewardship site	Stewardship site proposed for conservation in accordance with the BAM to compensate for residual impacts associated with the proposal.
Subject land	Is land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in a buffer zone around the subject land).
Threatened biodiversity	Threatened species, populations or ecological communities, or their habitats as listed under the *Biodiversity Conservation Act 2016, Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999*. Capitalisation of the terms 'Threatened' in this report refers to listing under the relevant State and/or Commonwealth legislation.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by EES and accessible from the BioNet website at www.bionet.nsw.gov.au
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, endangered or critically endangered (collectively referred to as Threatened) under the *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994* or the *Environment Protection and Biodiversity Conservation Act 1999*. Capitalisation of the terms 'threatened', 'vulnerable', 'endangered' or 'critically endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Vegetation class	A level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.
Vegetation formation	A broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.
Vegetation integrity	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

Vegetation integrity score	The quantitative measure of vegetation condition.
Vegetation type	A NSW plant community type (PCT)
Vegetation zone	A relatively homogenous area of native vegetation that is the same PCT and broad condition state.
Viability	The capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.
Weeds of National Significance	Weeds regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts. This includes 32 weeds listed under the National Weeds Strategy. A list of 20 was endorsed in 1999 and a further 12 were added in 2012.

Abbreviations

ARTC	Australian Rail Track Corporation
BAM	NSW Biodiversity Assessment Method 2020
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community: an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.
DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water, formerly the Department of Agriculture, Water and the Environment
DPE	NSW Department of Planning and Environment, formerly Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
Ha	Hectare
I2S	Illabo to Stockinbingal
IRDJV	Inland Rail Design Joint Venture (WSP | MM JV legal entity)
MNES	Matters of National Environmental Significance listed under the *Environment Protection and Biodiversity Conservation Act 1999*.
NP&W Act	NSW *National Parks and Wildlife Act 1974*
WSP | MM	WSP Australia | Mott MacDonald Joint Venture trading as IRDJV
TEC	Threatened Ecological Community
TSC Act	NSW *Threatened Species Conservation Act 1995* repealed and replaced by the NSW *Biodiversity Conservation Act 2016* as of the 25 August 2017.

Executive summary

The Australian Government has committed to delivering a new piece of national transport infrastructure by constructing an inland railway between Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland. The Inland Rail project ('Inland Rail') is a major national project that will enhance Australia's existing national rail network and serve the interstate freight market.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Illabo to Stockinbingal section of Inland Rail ('the proposal'), which is a new rail corridor and consists of a 39-kilometre (km) long single track standard gauge railway with one crossing loop to accommodate double stack freight trains up to 1,800 metres (m) long.

The Illabo to Stockinbingal proposal is a new rail corridor that will connect Illabo to Stockinbingal in New South Wales. The alignment branches out from the existing rail line north-east of Illabo and travel about 41km north to join the Stockinbingal to Parkes rail line west of Stockinbingal. The proposal passes through agricultural and rural properties in the Riverina region of NSW and generally follows the existing cadastral boundaries and roads between the towns of Illabo and Stockinbingal.

This Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the NSW Biodiversity Assessment Method 2020 (BAM) established under the *Biodiversity Conservation Act 2016* (BC Act) and provides an assessment of biodiversity values of the subject land for the Inland Rail – Illabo to Stockinbingal proposal (the proposal). The (then) Commonwealth Department of Agriculture, Water and the Environment (now the Department of Climate Change, Energy, the Environment and Water) (DCCEEW) confirmed that species and communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) can be assessed following the BAM methodology (Appendix B).

Comprehensive mapping and field surveys were supplemented by threatened species targeted surveys and scattered trees assessment. Surveys followed the BAM and relevant threatened species survey guidelines over seven survey periods between 2018 and 2021 (October 2018, November 2018, December 2018, May 2019, July 2019, September 2019, September-October 2020, January 2021 and October 2021.

This assessment identified the following plant community types:

- Plant Community Type (PCT) 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion.
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.

Of these, six PCTs correspond with the following Threatened Ecological Communities (TEC):

- PCT 266, PCT 276, PCT 277 & PCT 347 correspond with White Box Yellow Box Blakely's Red Gum Woodland listed as Critically Endangered under the BC Act and EPBC Act.
- PCT 76 & PCT 80 correspond with Inland Grey Box Woodland listed as Endangered under the BC Act and the EPBC Act.

A total of 58 Class 2 and Class 3 scattered trees were recorded, 42 of which were class 3 and contained hollows.

No threatened flora species have been recorded.

Eight threatened fauna species were recorded during field surveys:

- Brown Treecreeper (*Climacteris picumnus victoriae)* listed as Vulnerable under the BC Act
- White-fronted Chat (*Epthianura albifrons)* listed as Vulnerable under the BC Act
- Black Falcon (*Falco subniger*) listed as Vulnerable under the BC Act
- Flame Robin (*Petroica phoenicea*) listed as Vulnerable under the BC Act
- Superb Parrot (*Polytelis swainsonii)* listed as Vulnerable under both the BC Act and EPBC Act
- Grey-Crowned Babbler (*Pomatostomus temporalis temporalis)* listed as Vulnerable under the BC Act
- Diamond Firetail (*Stagonopleura guttata)* listed as Vulnerable under the BC Act
- Squirrel Glider (*Petaurus norfolcensis)* listed as Vulnerable under the BC Act.

Of these, the Superb Parrot and Squirrel Glider are considered as species credit species as potential breeding habitat will be impacted by the proposal.

A third species credit species, Southern Myotis, while not recorded, has been assumed as present based on presence of suitable habitat. A fourth species credit species, Key's Matchstick Grasshopper has been assumed as present based on presence of suitable habitat.

The other six recorded threatened fauna species and an additional 11 fauna species are considered as ecosystem credit species due to a moderate or higher likelihood of occurrence.

The proposal has been designed with the principles to avoid and minimise impact on native vegetation and habitat where possible in accordance with BAM. This route selection and design process has resulted in impact to only 72.93ha of native vegetation with over 85% (316.16ha) occurring in non-native vegetation. This process has also minimised impacts to scattered trees.

One Serious and Irreversible Impact (SAII) entity, White Box Yellow Box Blakely's Red Gum Woodland will be affected by the proposal. The impacts to this community have been reduced to 19.93ha.

The BAM Credit Calculator was used to provide a calculation of the number and class of biodiversity credits required to offset the biodiversity impacts associated with the proposal to ensure maintenance or improvement in biodiversity. The proposal will require a total of:

- 2,132 ecosystem credits (including scattered trees)
- 4,875 species credits.

Assessments of impact significance were conducted for biodiversity Matters of National Environmental Significance (MNES) including threatened species, populations and ecological communities considered likely to be affected by the proposal. Through these assessments, it was concluded that the proposal is likely to have a significant impact on two endangered ecological communities; Inland Grey Box Woodland and White Box Yellow Box Blakely's Red Gum Woodland.

Stage 1
Biodiversity assessment

1 Introduction

1.1 Overview

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. Inland Rail involves the design and construction of a new inland rail connection, about 1,700 kilometre long, between Melbourne and Brisbane. Inland Rail is a major national proposal that will enhance Australia's existing national rail network and serve the interstate freight market.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Illabo to Stockinbingal section of Inland Rail ('the proposal'), which has a total extent of about 42.5 kilometres, and consists of about 39 kilometres of new, greenfield single track standard gauge railway and associated infrastructure between Illabo and Stockinbingal.

The proposal requires approval from the NSW Minister for Planning under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Australian Government Minister for the Environment.

This report has been prepared by (Inland Rail Design Joint Venture (WSP/Mott Macdonald)) as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to accompany the application for approval of the proposal and addresses the Secretary's Environmental Assessment Requirements (SEARs) from the Secretary of the (then) NSW Department of Planning, Industry and Environment (now the Department of Planning and Environment (DPE)), issued on 30 April 2021.

1.2 The proposal

The proposal is located between Illabo and Stockinbingal within the Riverina region of NSW. The location of the proposal is shown in Figure 1.1.

1.2.1 Key features

The key features of the proposal (which would be confirmed during detailed design) include:

- a total extent of about 42.5 kilometres, including about 39 kilometres of new, greenfield single track standard gauge railway between Illabo and Stockinbingal, including:
  - a combination of track vertical alignments on existing ground level, on embankments and in cuttings
  - 8 new bridges at watercourses, two road overbridges and one grade separated (road over rail) at Burley Griffin Way
  - one crossing loop and associated maintenance siding
  - construction of new level crossings and alterations of existing level crossings (including public roads and private accesses)
  - stock underpasses and other vehicular crossings on private land to allow for the movement of livestock and vehicles across the rail line
  - installation and upgrade of about 88 new and existing cross drainage culverts below the rail formation and 27 longitudinal drainage culverts below level crossings
  - removal of redundant sections of track along the existing Stockinbingal to Parkes line and Lake Cargelligo line at Stockinbingal
- upgrades of about three kilometres of existing track for the tie-in works to the existing Main South rail line at Illabo, and tie ins to the Stockinbingal to Parkes rail line at Stockinbingal
- construction of about 1.7 kilometres of new track to maintain the existing connection of the Lake Cargelligo rail line either side of the proposal

- realignment of a 1.4 kilometre section of the Burley Griffin Way to provide a road over rail bridge at Stockinbingal
- realignment of Ironbong Road to allow for safe sight lines at the new active level crossing.

Associated infrastructure would include signalling and communications, signage, fencing and services and utilities. The construction of the proposal would also require the following works:

- construction access roads and access tracks
- watercourse crossings
- temporary changes to the road network
- construction compounds.

1.2.2 Timing and operation

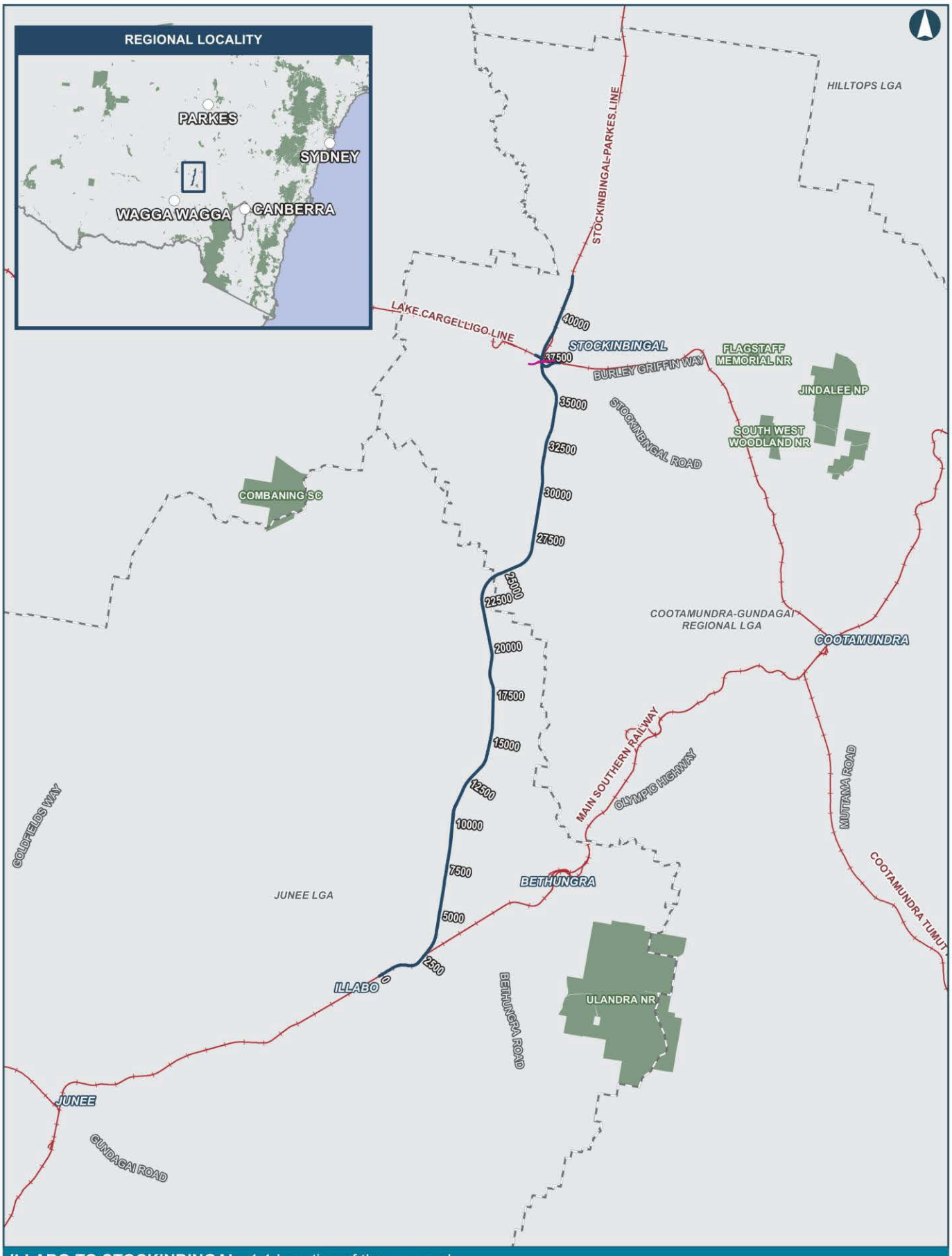
Subject to approval of the proposal, construction of the proposal is planned to start in mid-2024 and is expected to be completed mid-2026.

The proposal would form part of the rail network managed and maintained by ARTC. Train services would be provided by a variety of operators. It is estimated the Illabo to Stockinbingal section of Inland Rail would be trafficked by an average of 6 trains per day (both directions) from commencement of operations in late 2026, increasing to about 11 trains per day (both directions) in 2040.

The new rail line will be a faster, more efficient route that bypasses the Sydney rail network and will enable the use of double stacked trains (up to 6.5m high) along its entire length.

The trains would be diesel powered, and would be a mix of grain, intermodal (freight), and other general transport trains up to 1,800 metres in length.

The proposal is expected to be operational, as part of Inland Rail as a whole, once all 13 sections are complete, which is estimated to be in 2027. Prior to that, regional rail movements may occur on the Illabo to Stockinbingal section once complete.



ILLABO TO STOCKINBINGAL 1.1 Location of the proposal

0 2 4 6 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 7/23/2021 Paper: A3

Author: IRDJV Scale: 1:200,000

Data Sources: ARTC, NSWSS, ESRI

Key features of proposal

- Key features of proposal
- 40950 Chainage (distance in metres from southern limit of the proposal)
- Burley Griffin Way realignment

Existing features

- Local Government area boundary
- Existing rail
- Parks and reserves
- Sub-arterial road
- Arterial road

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\Overview\220_0115_EIS_1_1_LocationofProposal_r1v1.mxd

1.3 Scope and purpose of report

This report has been prepared to specifically address the SEARs issued by the (then) Department of Planning, Industry and Environment on 30 April 2021. The SEARs relevant to biodiversity, and references to sections where they have been addressed in the report are presented below in Table 1.1.

Specifically, this includes the preparation of a Biodiversity Development Assessment Report (BDAR) in accordance with section 6 of the *Biodiversity Conservation Act 2016* (BC Act) and the NSW Biodiversity Assessment Methodology (BAM 2020). Specifically, this BDAR addresses matters outlined in Stage 1 and Stage 2 of the BAM and has been prepared in accordance with the reporting requirements set out in Appendix K of the BAM.

Impacts to relevant Matters of National Environmental Significance (MNES) under the EPBC Act are addressed as part of the assessment.

Table 1.1 Secretary's Environmental Assessment Requirements relevant to Biodiversity Development Assessment

SEAR Number	Requirement	Where addressed in this report
6. Biodiversity The project design considers measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of project construction and operation.	**a)** Assess biodiversity impacts in accordance with s7.9 of the Biodiversity Conservation Act 2016 (BC Act), the Biodiversity Assessment Method (BAM), and be documented in a Biodiversity Development Assessment Report (BDAR).	This document is a BDAR and has been written in accordance with the BC Act and BAM.
	b) The BDAR must document the application of the avoid, minimise and offset framework in accordance with the BAM.	Chapter 9 and Chapter 13
	c) The BDAR must include information in the form detailed in s6.12 of the BC Act, cl6.8 of the Biodiversity Conservation Regulation 2017 and the BAM.	This report includes required information in the form detailed.
	d) The BDAR must be submitted with all digital spatial data associated with the survey and assessment as per Appendix 10 of the BAM.	Spatial data will be submitted as part of the EIS.
	e) The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the BC Act.	Section 1.6 and 1.7
	f) The BDAR must include details of the measures proposed to address offset obligations in accordance with the BAM.	Chapter 13
	g) The Proponent must assess any impacts on biodiversity values not covered by the BAM. This includes a threatened aquatic species assessment (Part 7A Fisheries Management Act 1994) to address whether there are likely to be any significant impact on listed threatened species, populations or ecological communities listed under the Fisheries Management Act 1994 (FM Act).	Refer to Technical Paper 2 – Aquatic biodiversity
	h) The Proponent must identify whether the project, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the BC Act, FM Act and the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).	Section 10.4 and Technical Paper 2 – Aquatic biodiversity

1.4 Structure of report

The structure of this report is outlined below:

Stage 1 – Biodiversity assessment

- **Chapter 1 – Introduction:** Outlines the background and need for the proposal, and the purpose of this report.
- **Chapter 2 – Legislation and policy context:** Provides an outline of the key legislative requirements and policy guidelines relating to the proposal.
- **Chapter 3 – Methodology.** Outlines the methodology employed for native vegetation and threatened species.
- **Chapter 4 – Landscape context:** Provides information on a range of landscape features that occur in the proposal site and broader locality.
- **Chapter 5 – Native vegetation:** Provides information on native vegetation including plant community type and vegetation zones.
- **Chapter 6 – Threatened species:** Provides information on threatened species listed under the BC Act.
- **Chapter 7 – Prescribed impacts:** Identifies potential prescribed biodiversity impacts on threatened entities listed under the BC Act.
- **Chapter 8 – Matters of national environmental significance:** Describes biodiversity matters relating to Commonwealth legislation under the EPBC Act.

Stage 2 – Impact assessment

- **Chapter 9 – Avoid and minimise:** Provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of the proposal.
- **Chapter 10 – Assessment of impact:** Describes the potential impacts associated with the proposal.
- **Chapter 11 – Mitigation and management of impacts:** Outlines the proposed mitigation measures for the proposal on biodiversity matters.
- **Chapter 12 – Impact summary – thresholds for assessment and offsetting impacts:** Outlines the impact thresholds and offset requirements for residual impacts to biodiversity values after the avoid, minimise and mitigate hierarchy has been applied.
- **Chapter 13 – Biodiversity credit report:** Applies the no net loss biodiversity standard as required under the BAM.
- **Chapter 14 – Conclusion:** Provides a conclusion of the potential impacts of the proposal on biodiversity.
- **Chapter 15 – Limitations:** Identifies the limitations and assumptions made when generating this report.
- **Chapter 16 – References:** Provides a list of resources referenced in this assessment.

1.5 Sources of information

The following information sources were used in preparation of this BDAR:

- aerial photographic imagery
- NSW Mitchell Landscapes 3.1 ((Department of Planning Industry and Environment 2021)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Department of the Environment and Energy 2018)
- Atlas of Groundwater Dependent Ecosystems (GDE) (Bureau of Meteorology 2021)
- Directory of Important Wetlands of Australia (Department of Agriculture Water and the Environment 2021)
- Register of Declared Areas of Outstanding Biodiversity Value – Critical habitat declarations in NSW (Department of Planning Industry and Environment 2021)
- BioNet Threatened Species Profile Database (Department of Planning industry and Environment 2021)
- Commonwealth Species Profiles and Threats Database (Department of Agriculture Water and the Environment 2021)
- State Vegetation Type Map: Central West/Lachlan Region Version 1.3. VIS_ID 4468 (Department of Planning Industry and Environment 2020)
- Central Southern NSW vegetation mapping (ADS40_E_3884) (NSW Government 2021).

1.6 Personnel

The contributors to the preparation of this paper, their qualifications and roles are listed in Table 1.2.

Table 1.2 Personnel

Name	Qualifications	Role	Years of experience
Alex Cockerill	Bachelor of Science (Hons), accredited BAM assessor BAAS17020	Principal Ecologist – technical review	22
Selga Harrington	Bachelor of Science (Hons), accredited BAM assessor BAAS17079	Principal Ecologist – ecology lead, technical input report preparation	23
Toby Lambert	Bachelor of Science (Hons), accredited BAM assessor BAAS17046	Principal Ecologist – technical input report preparation and review	25
Mark Stables	Bachelor of Science (Hons), accredited BAM assessor BAAS18097	Principal Ecologist – field surveys, report preparation	19
Tanya Bangel	Bachelor of Science (Hons), Diploma of Conservation and Land Management, accredited BAM assessor BAAS18076	Ecologist – field surveys and report preparation	12
Troy Jennings	Bachelor of Biodiversity and Conservation, Master of Wildlife Management, accredited BAM assessor BAAS18172	Ecologist – field surveys and report preparation	9
Nathan Cooper	Bachelor of Environmental Science, Graduate Diploma Ornithology, Diploma Applied Science, Environmental Technology,	Senior Ecologist – field surveys and assisted in report preparation	18
Allan Richardson	Bachelor of Environmental Science (Hons)	Senior Ecologist – field surveys and assisted in report preparation	16
Lauren Smith	Bachelor of Science (Resource and Environmental Management)	Ecologist – field surveys and assisted in report preparation	5

Name	Qualifications	Role	Years of experience
Alicia Palmer	Bachelor of Science (Resource and Environmental Management) (Hons)	Ecologist – assisted in report preparation	2
Andrea Tuckwell	Bachelor of Science (Information Technology); Postgrad Diploma in GIS	GIS Consultant – data management and map preparation	14
Isaac Augey	Bachelor of Environmental Science and Management	Graduate GIS Consultant – data management and map preparation	1
Paul Greenhalgh	Master of Science (Town and Country Planning); Bachelor of Science (Hons)	Environment Lead – report review	28

1.7 Certification

I, Mark Stables (BAM Accredited Assessor BAAS18097), certify that this BDAR has been prepared on the basis of the requirements of (and information provided under) the current BAM dated (12 August 2021 (within 14 days of report being submitted)) available from https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biodiversity-assessment-method.

2 Legislation and policy context

2.1 Commonwealth legislation

2.1.1 EPBC Act

The objective of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to protect and manage prescribed Matters of National Environmental Significance (MNES). Under the EPBC Act, proposed 'actions' that have the potential to significantly impact on MNES, the environment of Commonwealth land, or that are being carried out by an Federal Government agency, must be referred to the Federal Minister for the Environment for assessment.

As a result of the potential for impacts on protected matters, the proposal was referred to the (then) Australian Government Minister for the Environment in June 2018 (EPBC Referral No 2018/8233). On 6 August 2018, the (then) Australian Government Department of the Environment and Energy notified that the proposal is a controlled action, with the controlling provisions being 'listed threatened species and communities' (under section 18 & 18A of the EPBC Act).

Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. The nine MNES protected under the EPBC Act are:

- listed threatened species and ecological communities
- listed migratory species
- wetlands of international importance (listed under the Ramsar Convention)
- Commonwealth marine areas
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

Matters relating to biodiversity values under the EPBC Act has been considered in this assessment through:

- desktop review to determine the listed biodiversity matters that are predicted to occur within the locality of the proposal and hence could occur, subject to the habitats present
- targeted field surveys for listed threatened biota and migratory species
- assessment of potential impacts on threatened and migratory biota, including assessments of significance in accordance with the EPBC Act significant impact guidelines (Department of the Environment Water Heritage and the Arts 2013) where relevant
- identification of suitable impact mitigation and environmental management measures for threatened and migratory biota, where required.

2.1.1.1 Specific requirements issued for the proposal

As a result of the potential for impacts on protected matters, the proposal was referred to the (then) Australian Government Minister for the Environment in June 2018 (EPBC Referral No 2018/8233). On 6 August 2018, the (then) Australian Government Department of the Environment and Energy notified that the proposal is a controlled action, with the controlling provisions being 'listed threatened species and communities' (under section 18 & 18A of the EPBC Act).

Specific EPBC Act requirements were issued for Inland Rail – Illabo to Stockinbingal (EPBC 2018/8233, SSI 18_9406). Revised EPBC Act requirements were issued dated February 2021. A list of controlling provisions and Threatened entities likely to be affected by the proposal based on initial desktop assessment was issued by the Department and is provided at Attachment A in Appendix B.

The species and communities which the Department considered would likely be significantly impacted by the proposal included:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered
- Swift Parrot (*Lathamus discolor*) – Critically Endangered
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable.

The listed species and communities which the Department considered would possibly be significantly impacted included:

- Threatened flora:
  - *Ammobium craspedioides* (Yass Daisy) – Vulnerable
  - *Austrostipa wakoolica* (Spear Grass) – Endangered
  - *Prasophyllum petilum* (Tarengo Leek Orchid) – Endangered
  - *Caladenia concolor* (Crimson Spider-orchid) – Endangered.
- Threatened fauna:
  - Spot-tailed Quoll (south-eastern mainland population) (*Dasyurus maculatus maculatus*) – Endangered
  - Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable
  - Painted Honeyeater (*Grantiella picta*) – Vulnerable
  - Corben's Long-eared Bat, South-eastern Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable
  - Koala (*Phascolarctos cinereus*) – Endangered
  - Pink-tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable.

The provisions outline that for each EPBC Act-listed species affected by the proposed action the requirements outlined in Table 2.1 be applied. EPBC-listed species likely to be impacted by the proposed action were identified (Appendix C and Appendix D) and a detailed assessment was undertaken of each threatened entity with the results presented in this report.

Table 2.1 EPBC Act specific requirements issued for the proposal

Requirement	Section addressed
For each of the EPBC Act-listed species and ecological communities affected by the proposed action, the EIS must provide: **a)** survey results, including details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements **b)** a description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and **c)** maps displaying the above information (specific to EPBC matters) overlaid with the proposed action.	(a) Chapter 3, section 8.1 (b) Section 8.1 (c) Figure 8.1
The EIS must describe the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts on any relevant EPBC Act-listed species and communities. It must clearly identify the location and quantify the extent of all impact areas to each relevant EPBC Act-listed species or community.	Chapter 10 and 12

Requirement	Section addressed
For each of the EPBC Act-listed species and communities that are likely to be affected by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.	Chapter 9
The EIS must identify each EPBC Act-listed species and community likely to be significantly affected by the proposed action. Where a significant impact is likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit, how offsets will be secured, and timing of protection.	Chapter 8, 10 and 12 and Appendix E

2.1.1.2 EPBC environmental offset policy

Biodiversity offset obligations for significantly affected MNES listed under the EPBC Act have been calculated using the BAM credit calculator. This approach is consistent with the controlled action decision on the assessment approach, being that the proposal will be assessed by an accredited assessment under Part 5, Division 5.2 (SSI) of the EP&A Act.

Additionally, on 20 March 2020, the Commonwealth and the State of NSW entered into Amending Agreement No. 1 to the Assessment Bilateral Agreement under section 45 of the EPBC Act (Bilateral Amendment Agreement). The Bilateral Amendment Agreement, among other things, updated the NSW Bilateral Agreement to "accredit" the regime under the BC Act (including the BOS), which replaced the former biobanking regime under the repealed TSC Act.

The Bilateral Amendment Agreement also recognises that the (then) Department of Agriculture, Water and the Environment (now DCCEEW) has endorsed the BOS for both NSW and Commonwealth-listed threatened species. The endorsement is recorded in the EPBC Act Condition-Setting Policy Department of Agriculture, Water and the Environment, 2020. Broadly speaking, the NSW Bilateral Agreement accredits the assessment of environmental impacts of specified development under the NSW planning regime to avoid the duplication of assessment at the Commonwealth level. It allows the Australian Government Minister for the Environment to rely on specified NSW environmental impact assessment processes in assessing actions under the EPBC Act.

In determining biodiversity offsets for MNES under the EPBC Act, consideration has been given to Attachment A of the SEARs (Appendix B) and have been based on the results of detailed targeted surveys and assessment as outlined in Chapter 3 and Appendix F of this report.

2.2 NSW legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) establish a framework for the assessment and approval of developments in NSW. They also provide for the making of environmental planning instruments, including state environmental planning policies (SEPPs) and local environmental plans (LEPs), which determine the permissibility and approval pathway for development proposals and form a part of the environmental assessment process. In accordance with the provisions of the EP&A Act, the proposal is State Significant Infrastructure).

SSI may also be declared to be critical State significant infrastructure (CSSI) in accordance with section 5.13 of the EP&A Act, if it is of a category that, in the opinion of the NSW Minister for Planning, is essential for the State for economic, environmental or social reasons. The proposal was declared as CSSI in 2021.

Under section 5.14 of the EP&A Act, the approval of the NSW Minister for Planning is required for State significant infrastructure (including CSSI), and an EIS has been prepared under Division 5.2 of the EP&A Act.

2.2.2 BC Act

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on the 25 August 2017, repealing the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). The BOS creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (Office of Environment and Heritage, 2017).

The Biodiversity Assessment Method (BAM) was established as a standard method to implement the aims of the BOS and to address the loss of biodiversity and threatened species. The scheme creates a market framework for the conservation of biodiversity values and the offsetting of development impacts. It also provides the mechanisms to offset impacts of development, clearing or biodiversity certification such that there is no loss of biodiversity values.

It should be noted that BAM 2020 replaced BAM 2017 on the 22 October 2020 to allow key improvements for use in assessing biodiversity values under the BC Act. Transitional arrangements allow BDARs being prepared for existing State significant infrastructure proposals to use BAM 2017 for a period of up to 12 months from the BAM 2020 commencement date (see clause 6.31 (2) of the Biodiversity Conservation Regulation 2017). This report does not rely on these transitional arrangements and has been prepared in accordance with BAM 2020 as directed in the SEARs. A reference in this BDAR to 'the BAM' is a reference to the BAM 2020.

In accordance with section 6.8 (3) of the BC Act, the BAM is to exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013*), other than any impacts prescribed by the regulations under section 6.3.

This BDAR has been prepared in accordance with the BAM (2020) and includes prescribed biodiversity matters under the *Biodiversity Conservation Regulation 2017*.

2.2.3 Biosecurity Act 2015

The *Biosecurity Act 2015* provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

An assessment of biosecurity has been undertaken for the proposal (refer to Chapter 18 of the EIS). Priority weeds and Weeds of National Significance (WONS) recorded in the site are detailed in section 5.4.

2.2.4 Fisheries Management Act 1994

The key objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The Act provides for the listing of threatened species, populations and ecological communities, listing of ‘Key Threatening Processes’, and the requirements or otherwise for the preparation of a Species Impact Statement (SIS).

One of the objectives of the FM Act is to 'conserve key fish habitats ' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. To assist in the protection of key fish habitats, the Department of Primary Industries (DPI) has produced the Policy and guidelines for fish habitat conservation and management (DPI Fisheries 2013) and Fish Passage requirements for Waterway Crossings (Fairfull and Witheridge 2003). This policy applies to the following developments, works or activities, each of which can impact on key fish habitat:

- dredging or reclamation
- impeding fish passage
- damaging marine vegetation
- de-snagging.

A detailed aquatic biodiversity impact assessment has been undertaken for the proposal that will specifically address biodiversity values under the FM Act (see Technical Paper 2 – Aquatic biodiversity). This includes consideration of Aquatic Ecology in Environmental Impact Assessment – EIA guide (Smith 2003) and review of the Freshwater threatened species distribution maps.

2.2.5 Local Land Services Act 2013

The LLS Act was introduced to provide direction around programs and services associated with agricultural production, biosecurity, natural resource management and emergency management. It aims to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistent with the principles of ecologically sustainable development. One of the ways that it intends to achieve this is through the regulation of clearing of native vegetation.

Part 5A of the LLS Act sets out the ways in which the regulating of activities (in connection with land management) would occur and the areas of the State to which it would apply. Section 60A applies Part 5A to rural area including lands associated with the proposal site although Section 60O of the LLS Act deals excludes clearing that is authorised under other legislation. Furthermore, under the provisions of section 60O of the LLS Act the clearing of native vegetation is authorised if the clearing was authorised by a State significant infrastructure approval under Division 5.2 of the EP&A Act.

Under the BC Act, section 6.8(3) regulates that the BAM is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of LLS Act).

Category 1-exempt land is defined under the LLS Act (Part 5A Division 2 Section 60H) as:

- Land is to be designated as category 1-exempt land if the Environment Agency Head reasonably believes that:
  - the land was cleared of native vegetation as at 1 January 1990, or
  - the land was lawfully cleared of native vegetation between 1 January 1990 and the commencement of this Part.
- Land is to be designated as category 1-exempt land if the Environment Agency Head reasonably believes that:
  - the land contains low conservation value grasslands, or
  - the land contains native vegetation that was identified as regrowth in a property vegetation plan referred to in section 9 (2) (b) of the Native Vegetation Act 2003, or
  - the land is of a kind prescribed by the regulations as category 1-exempt land.

All other rural lands that do not meet category 1 definition form part of the assessment area subject to this BDAR.

The method for determining category 1 – exempt land for this proposal is outlined in section 3.2.2.

3 Methodology

3.1 Study area

The study area for survey was the proposal site. This includes the area that would be used for the construction and operation of the proposal and includes the location of construction worksites and operational infrastructure. It includes all enhancement sites. This is consistent with BAM definition of subject land.

3.2 Native vegetation methodology

3.2.1 Nomenclature

Names of vegetation communities used in this report are based on the PCT used in the NSW BioNet Vegetation Classification Database (NSW Government 2021).

These PCT names are cross-referenced for equivalency with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with previous vegetation mapping (Office of Environment & Heritage 2016) using dominant species and structure of the community.

3.2.2 Native vegetation regulatory mapping – category 1 'exempt lands'

In accordance with section 6.8 (3) of the BC Act, the BAM excludes the assessment of impacts on category 1-exempt land (within the meaning of Part 5A of the Local Land Services Act 2013), other than any impacts prescribed by the regulations under section 6.3.

The LLS Act defines 'category 1-exempt land' as areas of the State to which Part 5A of the LLS Act applies, which are designated as category 1-exempt land on the 'native vegetation regulatory map', prepared and published under the LLS Act.

A transitional 'native vegetation regulatory map' has been published in NSW. However, the transitional 'native vegetation regulatory map' is currently incomplete and no category 1-exempt land has been mapped within NSW. Consequently, category 1-exempt land has not been mapped at the proposal site.

Where an area has not been designated on a native vegetation map, section 60F of the LLS Act provides transitional requirements which, broadly speaking, require the relevant categorisation of land to be determined pursuant to section 60H of the LLS Act. Accredited assessors may determine the categorisation of land during this transitional period in accordance with section 60F. The method applied to determine the categorisation is provided below.

In determining the area of category 1–exempt land within the proposal site, a desktop land characterisation methodology was developed that builds on the Revised Land Categorisation Process (ARTC 2019), which has previously been agreed with BCD (including by letter from BCD to ARTC dated 15 August 2019), and with reference to the Native Vegetation Regulatory Map: method statement (OEH 2017).

In defining the area category 1 – exempt land, an initial analysis of the following spatial datasets has been undertaken:

- Land use: NSW Land Use 2017 v1.2, published June 2020. This dataset is used to classify areas as either cleared/highly disturbed, affected areas of native vegetation and undisturbed or protected areas of native vegetation.
- Woody vegetation: NSW Woody Vegetation Extent 2011, published 2015. This dataset is used to identify areas of extant remnant vegetation and cleared lands/non-woody vegetation.
- Transitional Native Vegetation Regulatory Map, version 3.0, published 26 March 2021.

- Sensitive regulated and vulnerable regulated lands on the Native Vegetation Regulatory Map portal. This dataset is used to identify areas mapped as category 1, 2 and excluded land.
- Zoning: EPI LEP LZN Land Zoning, current as at 23 April 2021.
- Travelling Stock Routes, LPI, supplied by ARTC 30 October 2020.
- State Vegetation Type Map.
- Aerial photos (to determine areas that were/are obviously under cultivation or improved pasture or otherwise disturbed).

Each of these datasets was used to determine whether native vegetation has been significantly disturbed or modified (and therefore cleared) in accordance with 60J of the LLS Act.

The steps in identifying category 1–exempt land included the following:

1. An initial inclusion of all land use classifications 3, 4 and most of 5 as mapped by the Land use: NSW Land Use 2017 v1.2, published June 2020 (consistent with figure 7 of the NVR method statement) (OEH 2017).
2. The land use classification was subsequently overlayed with the Transitional Native Vegetation Regulatory Map, version 3.0, published 26 March 2021, and any areas of the proposal site mapped as category 2 lands were excluded.
3. This was followed by the exclusion of areas of extant remnant vegetation as published within the Woody vegetation: NSW Woody Vegetation Extent 2011, (OEH, 2015) which were also included within the category 2 lands.
4. Additional analysis of historical aerial imagery as well as field verification during surveys was used to further classify areas as cleared/highly disturbed, resulting from significant disturbance associated with cultivation and/or improved pasture.

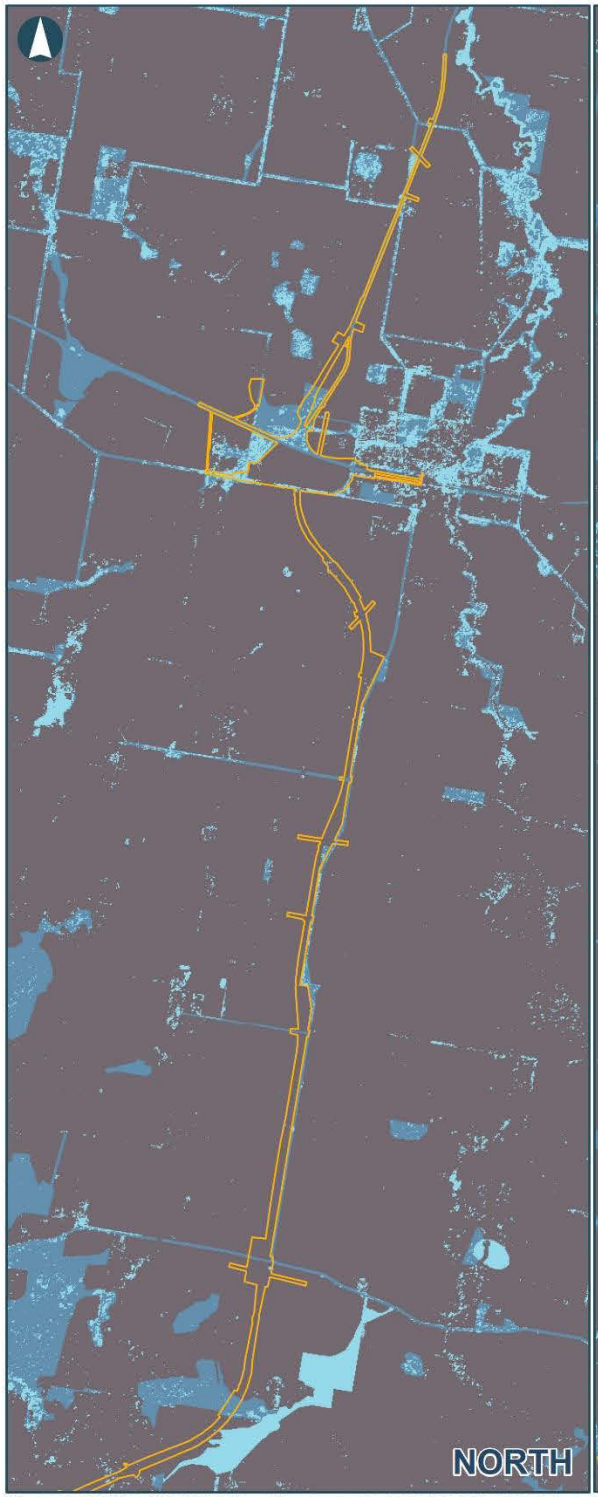
The approach is conservative and in accordance with the land categorisation method endorsed previously with BCD for Inland Rail.

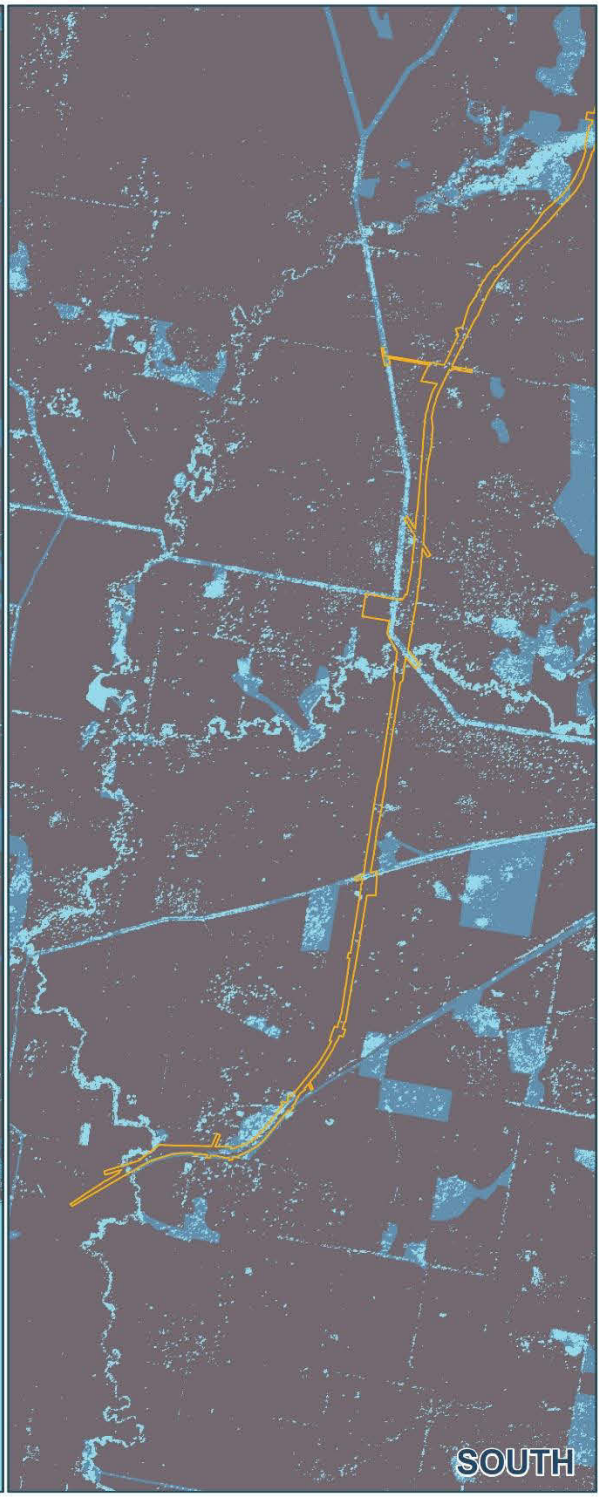
The outcome of native vegetation regulatory mapping category 1-exempt land is presented in Figure 3.1. It should be noted that these areas have been identified through a combination of desktop modelling and field survey (where possible).

The categories mapped are as follows:

- Category 2 – Remnant Vegetation/Undisturbed (BAM applies, approvals required)
- Potential Category 1, conservatively categorised as Category 2 (BAM applies, approvals required)
- Category 1 (BAM does not apply except for prescribed impacts).

All category 1 lands identified within the proposal site are exempt from BAM assessment and are not considered further in this BDAR, except for prescribed impacts (where relevant).





INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

ILLABO TO STOCKINBINGAL

Figure 3.1 Category 1 lands

- Proposal Site
- Category 2 – Remnant Vegetation / Undisturbed (BAM applies, approvals required)
- Potential Category 1, conservatively categorised as Category 2 (BAM applies, approvals required)
- Category 1 (BAM does not apply except for prescribed impacts)

0 0.5 1 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 2/3/2022
Author: IRDJV
Data Sources: IRDJV, ARTC, LPI

Paper: A3
Scale: 1:60,000

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_1Cat1Lands_r1v2.mxd

3.2.3 Stratification – desktop analysis of vegetation

Mapping of native vegetation extent within the proposal site is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM 2020 Operational Manual. Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the subject land. This provided an initial definition of vegetation Mapping of native vegetation zones.

3.2.4 Native vegetation survey methods

Native vegetation survey methods were undertaken were undertaken within the subject land during the following dates:

- 2–5 October 2018
- 19–23 November 2018
- 3–7 December 2018
- 13–15 May 2019
- 8–12 July 2019
- 2–4 September 2019
- 29 September–1 October 2020
- 31 January 2021.

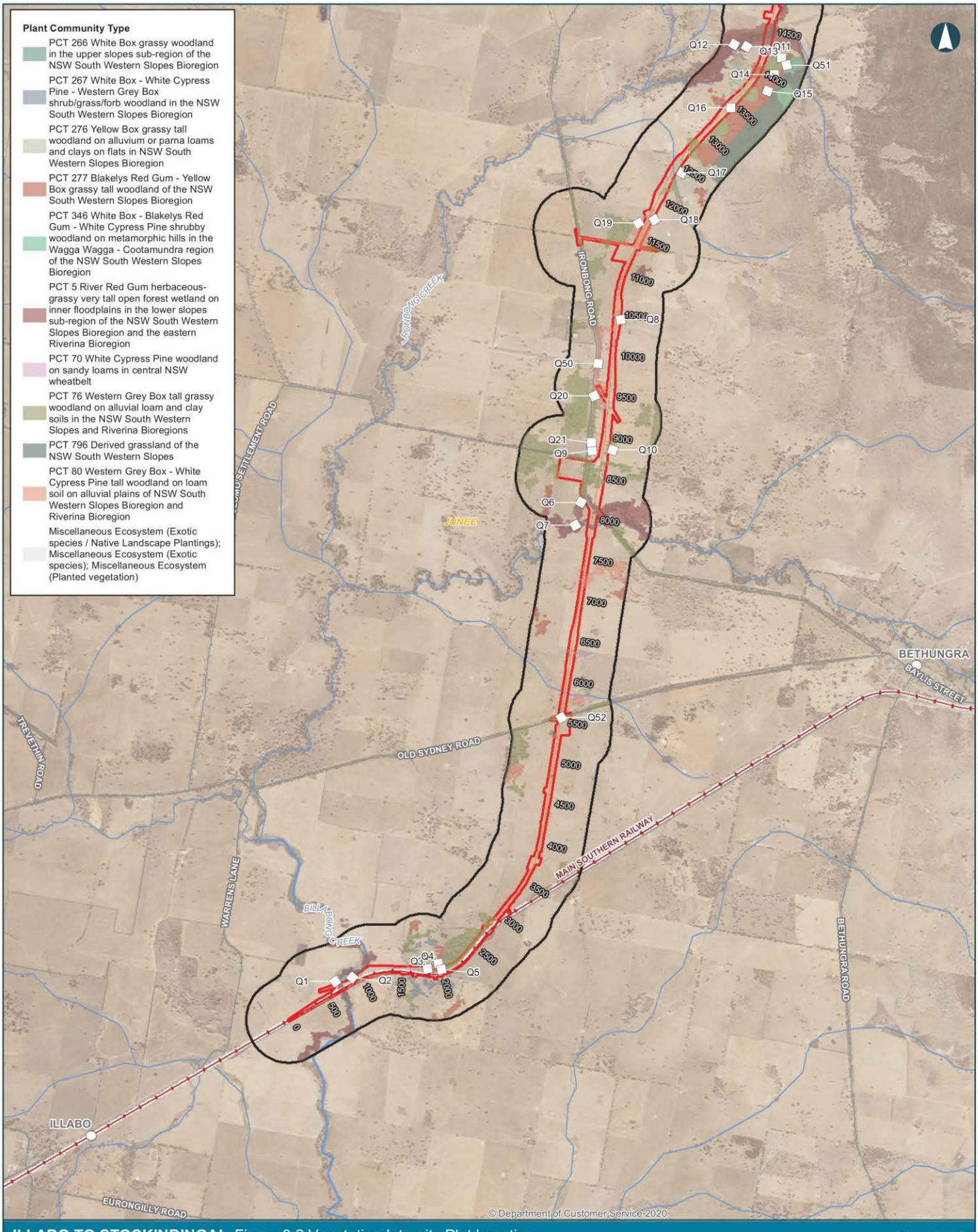
3.2.4.1 Field verification of vegetation mapping

Field validation (ground-truthing) of the existing vegetation classifications was completed based on random meander surveys and BAM vegetation integrity plots. Field verification was undertaken to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. Field data was compared and analysed against the regional vegetation mapping key diagnostic species to confirm each vegetation type. Field verification of the vegetation type, class and formation was used to identify vegetation zones and conditions in accordance with the BAM and NSW BioNet Vegetation Classification Database (NSW Government 2021). Vegetation (PCT) mapping including the location of vegetation integrity plots are shown in Figure 3.2.

In regards to the native vegetation mapping, ARTC met with the NSW Biodiversity and Conservation Division (BCD) on 1 December 2020, seeking clarification regarding mapping of derived grassland communities, specifically PCTs 250, 619 and 796. PCT 796 was considered for patches of derived grassland vegetation within the proposal site. BCD confirmed that assessors must not identify native vegetation as derived communities and must identify the parent PCT from which the grassland was derived from. This advice is consistent with section 4.2.3 of the BAM 2020.

3.2.4.2 Random meander survey

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper 1993), whereby the recorder walks in a random meander throughout the proposal site recording dominant and key plant species (e.g. threatened species, noxious weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness. This survey technique was used to verify vegetation boundaries and stratification from the desktop analysis.



ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 1 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

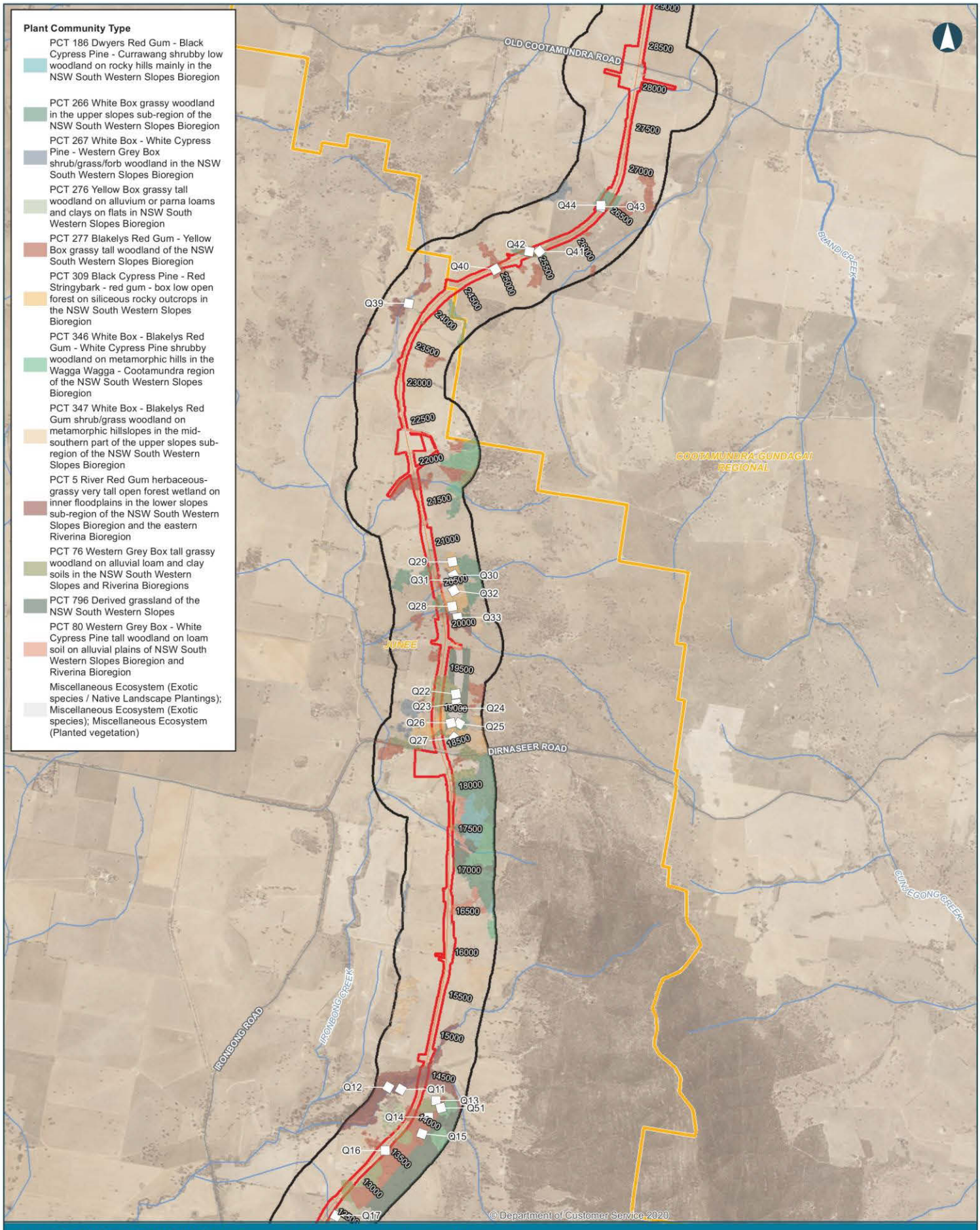
Date: 11/5/2021 Paper: A3
Author: IRDJV Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

New track/track upgrades
Proposal site
Assessment Area
Vegetation integrity plot locations
Local Government Area
Major Watercourse
Minor Watercourse
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_2SurveyMethods_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 2 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material. ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.

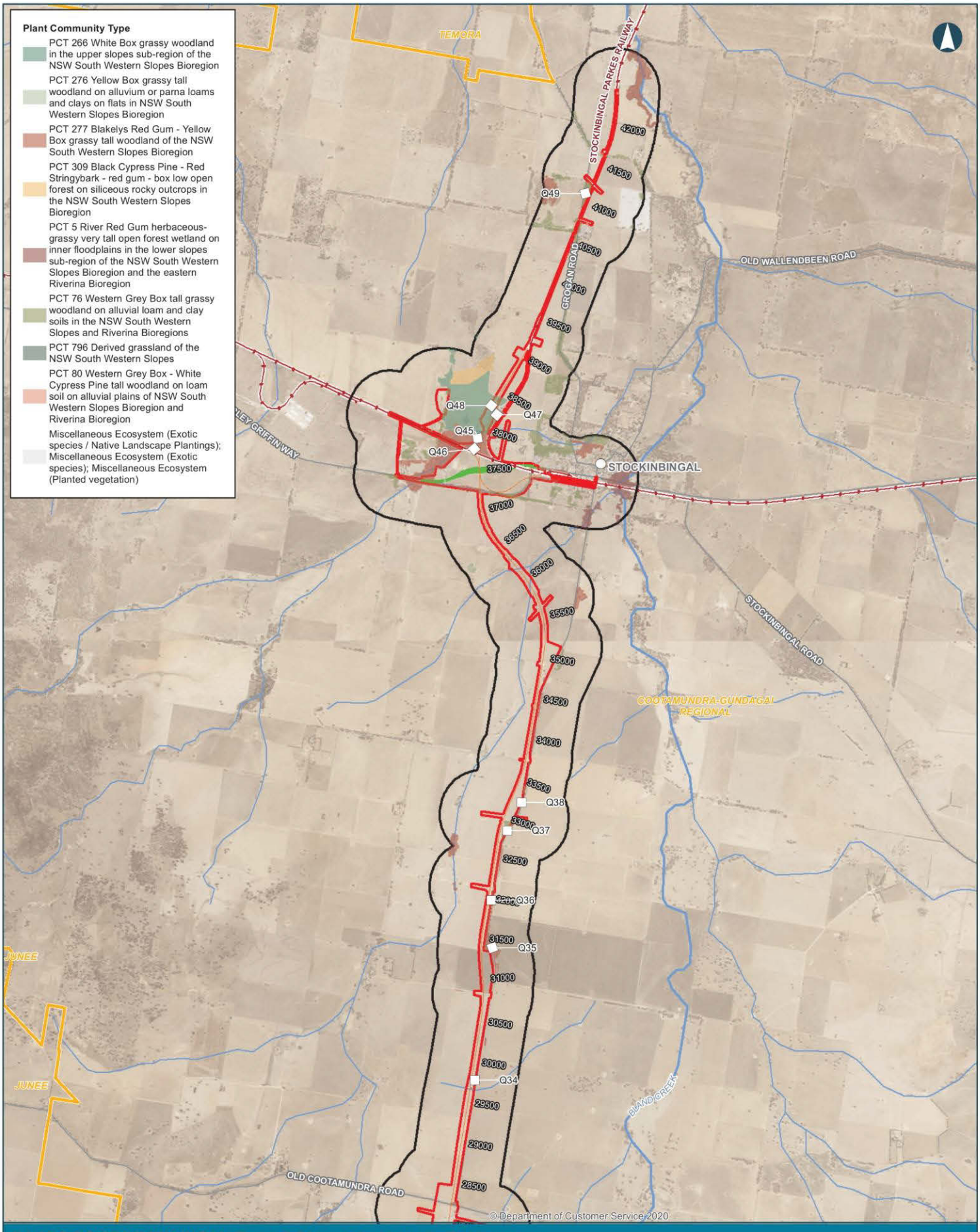
Date: 11/5/2021 Paper: A3
Author: IRDJV Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

New track/track upgrades
Proposal site
Assessment Area
Vegetation integrity plot locations
Local Government Area
Major Watercourse
Minor Watercourse

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_2SurveyMethods_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 3.2 Vegetation Integrity Plot Locations

MAP 3 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/5/2021
Author: IRDJV
Paper: A3
Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

New track/track upgrades
Proposal site
Assessment Area
Burley Griffin Way Road realignment
Vegetation integrity plot locations
Local Government Area
Major Watercourse
Minor Watercourse
Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_2SurveyMethods_r1v2.mxd

3.2.4.3 Vegetation integrity plots

Vegetation integrity plot – survey effort

Vegetation integrity plots were undertaken following section 4.3.3 of the Biodiversity Assessment Method (Department of Planning Industry and Environment, 2020) as and as described below and illustrated in Figure 3.3.

A total of 63 vegetation integrity plots were undertaken. Table 3.1 compares the areas of each vegetation zone and number of plots completed to the requirements of the BAM and Table 3.2 outlines the co-ordinates, orientations and field verified plant community type for each plot. The location of each vegetation integrity plot is shown in Figure 3.2. Full vegetation integrity plot data is presented in Appendix G.

Table 3.1 Minimum number of vegetation integrity plots required per vegetation zone

Zone ID	Vegetation type and zone	Extent within proposal site (ha)	Minimum plots required	Number plots completed
VZ1	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)		2	5 (Q1, Q11, Q12, Q31, Q33)
VZ2	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Poor condition)	0.7	1	3 (Q6, Q7, Q39)
VZ3	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	1.1	1	3 (Q5,Q49, Q52)
VZ4	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	18.7	3	3 (Q21, Q22, Q38)
VZ5	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)	5	2	2 (Q9, Q10)
VZ6	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Low – DNG)	2.3	1	1 (Q16)
VZ7	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)	1.4	1	2 (Q20, Q50)
VZ8	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	4.7	2	3 (Q18, Q19, Q59)
VZ9	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	4.5	2	4 (Q25, Q26, Q47, Q65)
VZ10	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	0.4	1	3 (Q27, Q43, Q66)
VZ11	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)	5.4	3	4 (Q41, Q42, Q44, Q48)

Zone ID	Vegetation type and zone	Extent within proposal site (ha)	Minimum plots required	Number plots completed
VZ12	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	2	1	2 (Q3, Q53)
VZ13	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition, canopy only)	0.6	1	3 (Q2, Q8, Q17)
VZ14	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	13.3	3	5 (Q4, Q13, Q45, Q46, Q51)
VZ15	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	2.2	1	5 (Q34, Q35, Q36, Q37, Q40)
VZ16	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low – DNG)	2.4	1	4 (Q14, Q15, Q54, Q55)
VZ17	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)	1.7	1	2 (Q28, Q29)
VZ18	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	0.13	1	2 (Q23, Q32)
VZ19	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	0.3	1	1 (Q60)

Table 3.2 Location and orientation of BAM vegetation integrity plots

Plot ID	Plant Community Type (Condition)	Easting	Northing	Orientation (degrees)
Q1	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)	571287	6149401	145
Q2	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)	571498	6149445	310
Q3	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	572410	6149556	170
Q4	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	572540	6149618	260
Q5	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	572579	6149547	350
Q6	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Poor condition)	574273	6155224	210

Plot ID	Plant Community Type (Condition)	Easting	Northing	Orientation (degrees)
Q7	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Poor condition)	574208	6154946	60
Q8	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)	574761	6157447	80
Q9	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)	574413	6155853	85
Q10	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	574661	6155862	20
Q11	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)	576289	6160764	210
Q12	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)	576137	6160789	210
Q13	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	576713	6160628	180
Q14	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	576623	6160426	270
Q15	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	576546	6160227	200
Q16	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Low – DNG)	576098	6160021	90
Q17	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	575500	6159232	30
Q18	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	575166	6158661	330
Q19	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	574975	6158622	60
Q20	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)	574437	6156519	335
Q21	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	574401	6155950	180
Q22	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	576955	6165561	260
Q23	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	576964	6165446	350
Q24	Unassigned	–	–	–
Q25	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	576999	6165202	210
Q26	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	576894	6165215	165

Plot ID	Plant Community Type (Condition)	Easting	Northing	Orientation (degrees)
Q27	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	576937	6165033	130
Q28	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)	576911	6166628	80
Q29	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)	576916	6167167	170
Q30	Unassigned	–	–	–
Q31	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)	576934	6166945	265
Q32	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	576929	6166817	240
Q33	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)	576975	6166491	260
Q34	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	579453	6174694	180
Q35	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	579664	6176300	160
Q36	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	579656	6176878	180
Q37	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	579847	6177724	180
Q38	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)	580020	6178064	0
Q39	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)	576384	6170305	10
Q40	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)	577435	6170718	240
Q41	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	577970	6170932	50
Q42	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	577846	6170932	100
Q43	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	578717	6171477	105
Q44	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	578716	6171496	90
Q45	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	579490	6182484	80
Q46	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	579444	6182353	50
Q47	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	579723	6182768	220

Plot ID	Plant Community Type (Condition)	Easting	Northing	Orientation (degrees)
Q48	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low – DNG)	579656	6182878	130
Q49	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	580796	6185450	345
Q50	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)	574483	6156914	95
Q51	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	576777	6160538	345
Q52	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)	574038	6152610	60
Q53	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)	574248	6158490	175
Q54	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	575727	6159424	65
Q55	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)	576185	6159853	350
Q56	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	576196	6160018	275
Q57	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	576542	6160131	217
Q58	PCT 277 Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)	576542	6160476	300
Q59	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)	574948	6158383	116
Q60	PCT 347 White Box – Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	576963	6166168	95
Q61	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Low-DNG)	579337	6183280	245
Q62	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Low-DNG)	579426	6183369	218
Q63	Miscellaneous Ecosystem	576975	6166034	320
Q64	Unassigned	–	–	–
Q65	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)	577050	6165278	330
Q66	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)	572185	6149778	230

Vegetation integrity plot – method

Vegetation integrity plots were completed in accordance with BAM. A schematic diagram illustrating the layout of each vegetation integrity plot is provided in Figure 3.3.

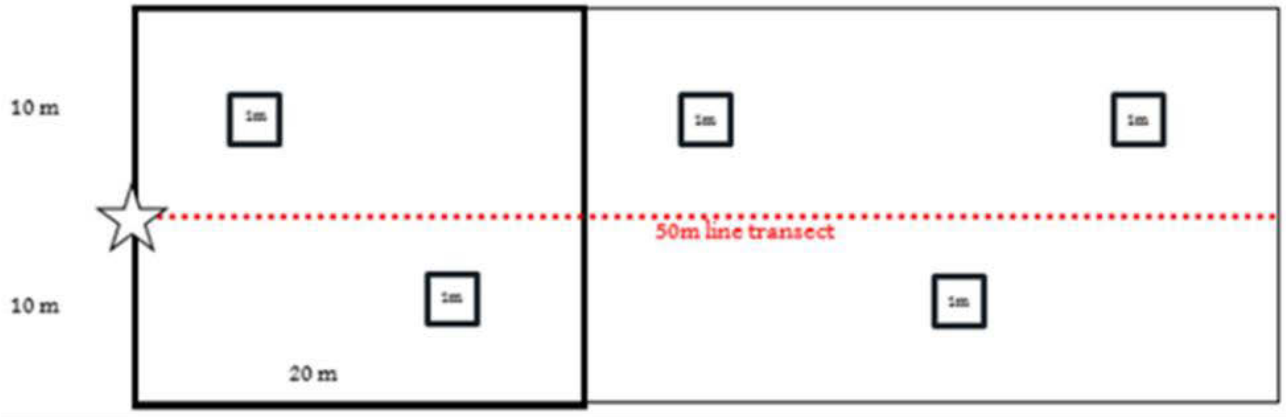


Figure 3.3 Schematic diagram illustrating the layout of the nested 20 x 50m, 20 x 20m and 1 x 1m sub-quadrants used for the assessment of condition attributes at each site

The following site attributes were recorded at each vegetation integrity plot location:

- **Location:** (easting – northing grid type MGA 94, Zone 56).
- **Vegetation structure and dominant species and vegetation condition:** Vegetation structure was recorded through estimates of percentage foliage cover, average height and height range for each vegetation layer.
- **Native and exotic species richness** (within a 400m squared quadrat): This consisted of recording all species by systematically walking through each 20m x 20m plot. The cover and abundance (percentage of area of quadrat covered) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded.
- **Number of trees with hollows** (1000 metre squared quadrat): This was the frequency of hollows within living and dead trees within each 50m x 20m plot. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least five centimetres across: (c) the hollow appeared to have depth: (d) the hollow was at least one metre above the ground and the (e) the centre of the tree was located within the sampled quadrat.
- **Number of large trees and stem size diversity** (1000m squared quadrat): tree stem size diversity was calculated by measuring the diameter at breast height (DBH) (i.e. 1.3 metre from the ground) of all living trees (greater than five centimetre DBH) within each 50m x 20m plot. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by comparing living tree stem DBH against the PCTs benchmarks.
- **Total length of fallen logs** (1000m squared quadrat): This was the cumulative total of logs within each 50m x 20m plot with a diameter of at least 10cm and a length of at least 0.5m.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter less than 10cm which is detached from a living plant) from within five 1m x 1m sub-plots spaced evenly either side of the 50m central transect.
- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e. saplings with a diameter at breast height less than or equal to 5cm).

Prior to establishing plot survey locations, vegetation stratification was undertaken to provide a representative vegetation zone for sampling. Stratification involved marking waypoints and bearings randomly to provide a representative assessment of the vegetation integrity of the vegetation zone in the study area and establishing the required number of plots at some of these waypoints.

3.2.4.4 Mapping of native vegetation zones

The vegetation within the proposal site was firstly assigned to a PCT and then aligned to a vegetation zone which is defined in the BAM as *'an area of native vegetation…. that is the same PCT and has a similar broad condition state'*. A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition.

The vegetation broad condition states which were applied to vegetation are summarised in Table 3.3. These factors were defined by using factors such as levels of disturbance, weed invasion and resilience.

Table 3.3 Vegetation broad condition categories

Condition category	Description
High	Vegetation still retains the species complement and structural characteristics. The vegetation displays resilience to weed invasion due to intact groundcover, shrub and canopy layers. Native species diversity is relatively high. Weeds may exist in this vegetation type but exhibit <5% foliage cover. Vegetation integrity scores ranged from 75–100.
Moderate	Vegetation has retained a native canopy, but the understorey and groundcover layers are generally co-dominated by exotic species that exhibit between 5–45% foliage cover. The mid and low stratums may have been structurally modified because of disturbances such as previous clearing or agricultural practices such as grazing of livestock.
Poor (canopy only)	Vegetation has retained a native canopy, or the canopy cover is showing signs of regeneration. The understorey and groundcover layers are generally dominated or co-dominated by exotic species that exhibit between 46–70% foliage cover. Native species diversity is generally relatively low, and the mid and low stratums have been structurally modified due to weed incursions, clearing, agricultural practises such as cropping or direct seeding.
Low (derived grassland)	Native vegetation generally lacking a native over-storey and mid stratum. For this proposal it includes PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Over-storey structural components of derived communities have either entirely been removed or are severely reduced (i.e. derived native grasslands with or without scatted paddock trees). Derived grassland was assigned to patches of vegetation where native perennial cover was greater than 50%.

Note: These categories have been used to define vegetation zones in Chapter 5.

3.2.4.5 Planted native vegetation mapping

Planted native vegetation was recorded throughout the study area as rows of native canopy species such as *Eucalyptus microcarpa* (Western Grey Box) and *Eucalyptus sideroxyln* (Mugga Ironbark). This vegetation was assigned to PCTs based on landscape position and nearest verified adjoining PCT (where possible) as advised by EES and assessed using the BAM. All planted native vegetation was assigned to Poor condition based on the low species diversity (particularly in the mid and low stratums) and absence of function attributes as described in the BAM (natural regeneration, large trees, litter cover, hollow bearing trees).

Planted vegetation was determined through visual inspection and included looking for evidence such as planting in rows, use of tree guards or stakes and through species selection (i.e. species either exotic or non-indigenous to the area).

Areas of planted native vegetation were assessed in accordance with the vegetation streamlined assessment module included in Appendix D of the BAM.

Planted native vegetation was assigned to best-fit PCTs based on landscape position and nearest verified adjoining PCT (where possible) as advised by EES and assessed using the BAM. However, in some cases this was not possible where the planted species does not align to any PCT, e.g. species that do not naturally occur.

Areas of planted native vegetation mapped within the proposal site:

- were not planted under an existing conservation obligation
- did not consist of planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat (as outlined in Appendix D of BAM)
- were assessed for threatened species habitat (Appendix D.2 of BAM) because planting was either:
  - undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation
  - planted for functional, aesthetic, horticultural or plantation forestry purposes (predominantly des windbreaks in agricultural landscapes and roadside plantings.

Areas of planted native vegetation were surveyed and assessed for the suitability for use by threatened species, as outlined in section 3.3. Measures to minimise impacts to threatened species that may utilise these areas are outlined in Chapter 11.

3.2.4.6 Scattered trees assessment

The definition for Scattered Trees is outlined in Appendix B of the BAM. Vegetation meets the definition of scattered trees if:

- species in tree growth from group have a percent foliage cover that is less than 25% of the benchmark for tree cover for the most likely plant community type and are on category 2-regulated land and surrounded by category 1-exempt land on the Native Vegetation Regulatory Map under the LLS Act, or
- have a DBH of greater than or equal to 5cm and are located more than 50m away from any living tree that is greater than or equal to 5cm DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground, or
- are three or fewer trees that have a DBH of greater than or equal to 5cm and are within a distance of 50m of each other, that in turn, are greater than 50m away from the nearest living tree that is greater than or equal to 5cm DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground.

During field surveys scattered trees were visually inspected and measured to collect the following data:

- the genus and species of each Scattered Tree
- DBH
- presence of hollows
- presence of mistletoes
- surrounding plant community types
- any sightings or evidence of threatened species using the scattered trees.

PCTs were assigned to each scattered tree based on the species and proximity to identified PCT zones in the proposal site or the dominant canopy species per the PCT description. The large tree benchmark from the assigned PCT was used to inform the Scattered tree class for each tree. Scattered tree classes are:

- **Class 1:** scattered trees that are ≤20cm DBH and are trees that meet the definition of trees with negligible biodiversity.
- **Class 2:** scattered trees that are ≥20cm DBH and less than the large tree benchmark for the most likely plant community type.
- **Class 3:** scattered trees that are greater than or equal to the large tree benchmark for the most likely plant community type.

The DBH of the tree was assessed and assigned a scattered tree class relevant to the large tree benchmark.

Due to restricted land access, not all scattered trees have been field validated. Where DBH was unable to be measured due to access restrictions a precautionary approach was adopted and scattered trees were assigned to Class 3. This approach was adopted for the presence of hollows whereby the presence of hollows was assumed for scattered trees unable to be accessed. In assigned PCTs, where individual tree species were not able to be determined due to restricted site access these trees have been assigned to PCTs associated with TEC and >90% cleared trading class.

Threatened species that would use the scattered trees are assumed to be the same threatened species that are returned by the BAM Calculator for the vegetation zones. Where targeted fauna surveys were required by the BAM Calculations, scattered trees were also included in the surveys.

3.3 Threatened species methodology

3.3.1 Nomenclature

Names of plants used in this document follow PlantNet (Royal Botanic Gardens and Domain Trust 2021). Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided. The names of introduced species are denoted with an asterisk (*).

For threatened species of plants, the names used in the EES Threatened Species Website are also provided in Appendix C where these differ from the names used in the PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory as maintained by the Department of Agriculture, Water and Environment (2021). Common names are used in the report for species of animal. Both common and scientific names are provided in the appendices.

For threatened species of animals, the names used in the BioNet Threatened Species Website and NSW Department Primary Industries are provided.

3.3.2 Assessing habitat suitability for threatened species

In the BAM, threatened species are assessed as either ecosystem credit species, species credit species or a combination of the two (referred to as ‘dual credit species’). The BAM defines these threatened species categories as follows:

- **ecosystem credit species (predicted)**: are those threatened species where the likelihood of occurrence and/or elements of its habitat can be confidently predicted by vegetation surrogates and landscape features
- **species credit species (candidate)**: are those threatened species that cannot be reliably predicted by habitat surrogates
- **dual credit species**: are those threatened species where part of the habitat is assessed as an ecosystem credit (e.g. foraging habitat) and part as a species credit (e.g. breeding habitat). In this report, dual credit species will be included in both ecosystem and species credit assessment.

The BAM sets out six steps for assessing habitat suitability for threatened species (ecosystem credit species and species credit species) in Section 5.2 of BAM. This includes identifying threatened species potentially occurring in the locality through desktop review, assessment of habitat and geographic constraints and likelihood of occurrence assessment to identify candidate species for targeted surveys. These methods are outlined in more detail in sections below.

3.3.2.1 Desktop review

The aim of the background research was to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed Migratory species or critical habitat recorded previously or predicted to occur in the locality.

This allowed for known habitat characteristics to be compared with those present within the proposal site to determine the likelihood of occurrence of each species or populations. These results informed the identification of appropriate field survey effort and the groups likely to occur.

Records of threatened species, populations and ecological communities known or predicted to occur in the locality of the proposal site were obtained from a range of databases as detailed in Table 3.4. These databases provide additional information on threatened biodiversity as required under section 6.1 of the BAM.

Table 3.4 Threatened species database searches

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	09/02/2021	30km x 30km centred on the proposal site	(NSW Government 2021)
PlantNet – NSW flora online	09/02/2021	Cootamundra LGA Junee LGA	(Royal Botanic Gardens and Domain Trust 2021)
Register of Declared Areas of Outstanding Biodiversity Value	09/02/2021	N/A	((then) Department of Planning Industry and Environment 2021 (now DPE))
Protected Matters Search Tool	09/02/2021	25km buffer around proposal site	((then) Department of Agriculture Water and the Environment 2021 (now DCCEEW))

Other relevant documents, existing broad-scale vegetation mapping, aerial photographs including historic aerial photos and maps reviewed as part of this study are referenced throughout the report where appropriate.

All species identified in the database searches (Appendix C and D) were assessed for potential inclusion as species and/or ecosystem credit species under the BC Act or assessment under EPBC Act. This included:

- exclusions of any species credit species identified in the BAM-C based on geographic limitations or habitat constraints as identified in BioNet threatened species database, microhabitats or vagrancy
- inclusion of species to BAM-C assessment that were identified from databases and recorded or considered to have potential habitat within the proposal site
- assessment of EPBC Act listed species and considered to have potential habitat and likely to occur within the proposal site.

Field surveys were then undertaken:

- to confirm habitat suitability for candidate species and map areas of potential habitat
- including targeted surveys for candidate (species credit) species.

Survey methods are detailed below in section 3.3.3 and 3.3.4.

3.3.3 Threatened flora surveys

Results of the threatened species database searches identified 44 threatened plant species listed under the BC Act as being known to occur or considered likely to occur within the subject land. A full list of species considered, their habitat/geographic restrictions, and potential habitat within proposal site is provided in Appendix C.

Targeted surveys were completed for these candidate flora species. Several candidate flora species have seasonal survey requirements due to difficulty of detection except at specific times of the year, during its flowering period.

Random meander surveys were undertaken throughout the subject land to map boundaries of vegetation zones and identify species occurring in each vegetation zone. In addition to random meander surveys, parallel transects were undertaken targeting threatened species of plant (Department of Planning Industry and Environment 2020). Where restricted land access has limited field survey, these areas have been assessed based on sampling of adjacent representative PCT and condition class vegetation. The BAM outlines survey requirements for threatened species including requirements for seasonal surveys to maximize the likelihood of recording a species if present. Surveys for threatened flora were undertaken over eight survey sessions totalling approximately 460 person hours as outlined in Table 3.5 and illustrated in Figure 3.4.

Table 3.5 Survey timing for threatened flora (species credit) species

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing
Acacia ausfeldii	Ausfeld's Wattle	V	–	Parallel transects in PCT 266; PCT 277 & PCT 276 (moderate condition) Vegetation integrity plots (Q3, Q4, Q13, Q17, Q25, Q26, Q45, Q46, Q47, Q51, Q53, Q56, Q57, Q58, Q65) Habitat assessment Random meanders	Any (flowering Aug-Oct)	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021
Ammobium craspedioides	Yass Daisy	V	V	Parallel transects in PCT 266; PCT 277 & PCT 276 (moderate condition) Vegetation integrity plots (Q3, Q4, Q13, Q17, Q25, Q26, Q45, Q46, Q47, Q51, Q53, Q56, Q57, Q58, Q65) Habitat assessment Random meanders	Sept – Jan	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021
Austrostipa wakoolica	A spear-grass	E	E	Parallel transects in PCT 76 & PCT 80 (good and moderate condition) Vegetation integrity plots (Q5, Q10, Q20, Q21, Q22, Q38, Q49, Q50, Q52) Habitat assessment Random meanders	September to December	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021
Caladenia arenaria	Sand-hill Spider Orchid	E SAII	E	Parallel transects in PCT 76 (good and moderate condition) Vegetation integrity plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	August – October	2-5 October 2018 29-30 September 2020 1 October 2020 25-28 October 2021
Caladenia concolor	Crimson Spider Orchid	E SAII	V	Parallel transects in PCT 347 (moderate condition) Vegetation integrity plots (Q23, Q32) Habitat assessment Random meanders	August – October	2-5 October 2018 29-30 September 2020 1 October 2020 25-28 October 2021

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing
Cullen parvum	Small Scurf-pea	E	–	Parallel transects in PCT 347, PCT 277 & PCT 5 (moderate condition) Vegetation integrity plots (Q1, Q4, Q11, Q12, Q13, Q23, Q31, Q32, Q33, Q39, Q45, Q46, Q51, Q56, Q57, Q58) Habitat assessment Random meanders	December to February	3-7 December 2018 31 January 2021
Diuris tricolor	Pine Donkey Orchid	V	–	Parallel transects in PCT 76, PCT 80 & PCT 347 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q20, Q21, Q22, Q23, Q32, Q38, Q49, Q50, Q52, Q60) Habitat assessment Random meanders	September – October	2-5 October 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021
Euphrasia arguta	–	CE SAII	CE	Parallel transects in PCT 266 & PCT 276 (moderate condition) Vegetation Integrity Plots (Q3, Q17, Q25, Q26, Q47, Q53, Q65) Habitat assessment Random meanders	None specified (flowering January to May)	2-5 October 2018, 3-7 December 2018 13-15 May 2019 31 January 2021 25-28 October 2021
Grevillea wilkinsonii	Tumut Grevillea	CE SAII	E	Parallel transects in PCT 266 Vegetation Integrity Plots (Q25, Q26, Q27, Q43, Q47, Q65, Q66) Habitat assessment Random meanders	October	2-5 October 2018, 25-28 October 2021 (a large spreading shrub- this species is not a cryptic and would also have been observable during other flora surveys, if present)
Indigofera efoliata	Leafless Indigo	E SAII	E	Parallel transects in PCT 76 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	All year	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021

Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing
Leucochrysum albicans var. tricolor	Hoary Sunray	–	E	Parallel transects in PCT 347 Vegetation Integrity Plots (Q23, Q32, Q60) Habitat assessment Random meanders	September to April	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021
Prasophyllum petilum[4]	Tarengo Leek Orchid	E	E	Parallel transects in PCT 347, PCT 277, PCT 276 (moderate condition) Vegetation Integrity Plots (Q3, Q4, Q13, Q17, Q23, Q32, Q45, Q46, Q51, Q53, Q56, Q57, Q58) Habitat assessment Random meanders	October to December	2-5 October 2018 3-7 December 2018 2-4 September 2019 1 October 2020 25-28 October 2021
Prasophyllum sp. *Wybong*[4]	Prasophyllum Wybong	– SAII	CE	Parallel transects in PCT 266, PCT 276 (moderate condition) Vegetation Integrity Plots (Q25, Q26, Q47, Q65, Q3, Q53) Habitat assessment Random meanders	September to October	2-5 October 2018 2-4 September 2019 1 October 2020 25-28 October 2021
Pultenaea humilis	Dwarf Bush-pea	V	–	Parallel transects in PCT 347 (moderate condition) Vegetation Integrity Plots (Q23, Q32) Habitat assessment Random meanders	October to December	2-5 October 2018 3-7 December 2018 2-4 September 2019 1 October 2020 25-28 October 2021
Senecio garlandii	Woolly Ragwort	V	–	Parallel transects in PCT 347 (moderate condition) Vegetation Integrity Plots (Q23, Q32) Habitat assessment Random meanders	All year	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021

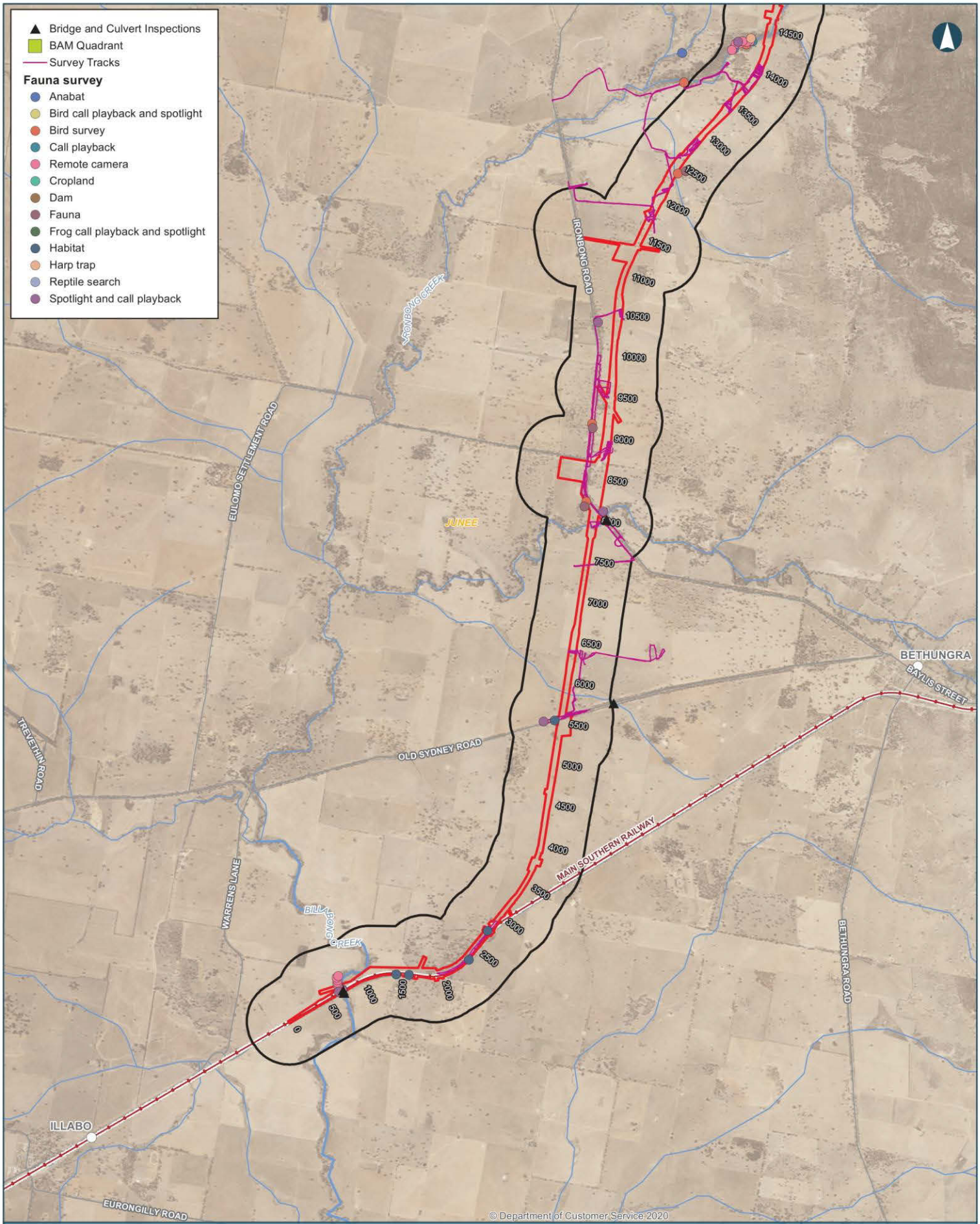
Scientific name	Common name	BC ACT[1]	EPBC ACT[2]	Survey technique	Seasonal survey requirements[3]	Survey timing
Swainsona murrayana	Slender Darling Pea	V	V	Parallel transects in PCT 76, PCT 80 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q20, Q21, Q22, Q38, Q49, Q50, Q52) Habitat assessment Random meanders	September	2-4 September 2019 29-30 September 2020
Swainsona recta	Small Purple Pea	E	E	Parallel transects in PCT 277, PCT 76; PCT 266; PCT 276 (good and moderate condition) Vegetation Integrity Plots (Q3, Q4, Q5, Q10, Q13, Q17, Q21, Q22, Q25, Q26, Q38, Q45, Q46, Q47, Q49, Q51, Q52, Q53, Q56, Q57, Q58, Q65) Habitat assessment Random meanders	September – November	2-5 October 2018 2-4 September 2019 29-30 September 2020 1 October 2020 25-28 October 2021
Swainsona sericea	Silky Swainson-pea	V	–	Parallel transects in PCT 76 (good and moderate condition) Vegetation Integrity Plots (Q5, Q10, Q21, Q22, Q38, Q49, Q52) Habitat assessment Random meanders	September – February	2-5 October 2018 3-7 December 2018 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021
Tylophora linearis	–	V	E	Parallel transects in PCT 347 (moderate condition) Vegetation Integrity Plots (Q23, Q32) Habitat assessment Random meanders	September – May	2-5 October 2018 3-7 December 2018 13-15 May 2019 2-4 September 2019 29-30 September 2020 1 October 2020 31 January 2021 25-28 October 2021

(1) Listed as E- Endangered; V – Vulnerable; CE – Critically Endangered, SAII – Serious and Irreversible Impact species under the BC Act, – not listed

(2) Listed as E- Endangered; V – Vulnerable; CE – Critically Endangered under the EPBC Act, – not listed

(3) Survey requirements based on BAM calculator survey requirements and cross-referenced with BioNet database

(4) The NSW Herbarium considers *Prasophyllum* sp. Wybong (C. Phelps ORG5269) and *Prasophyllum petilum* to be synonyms (i.e. the same species).



ILLABO TO STOCKINBINGAL Figure 3.4 Target Species Surveys

MAP 1 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

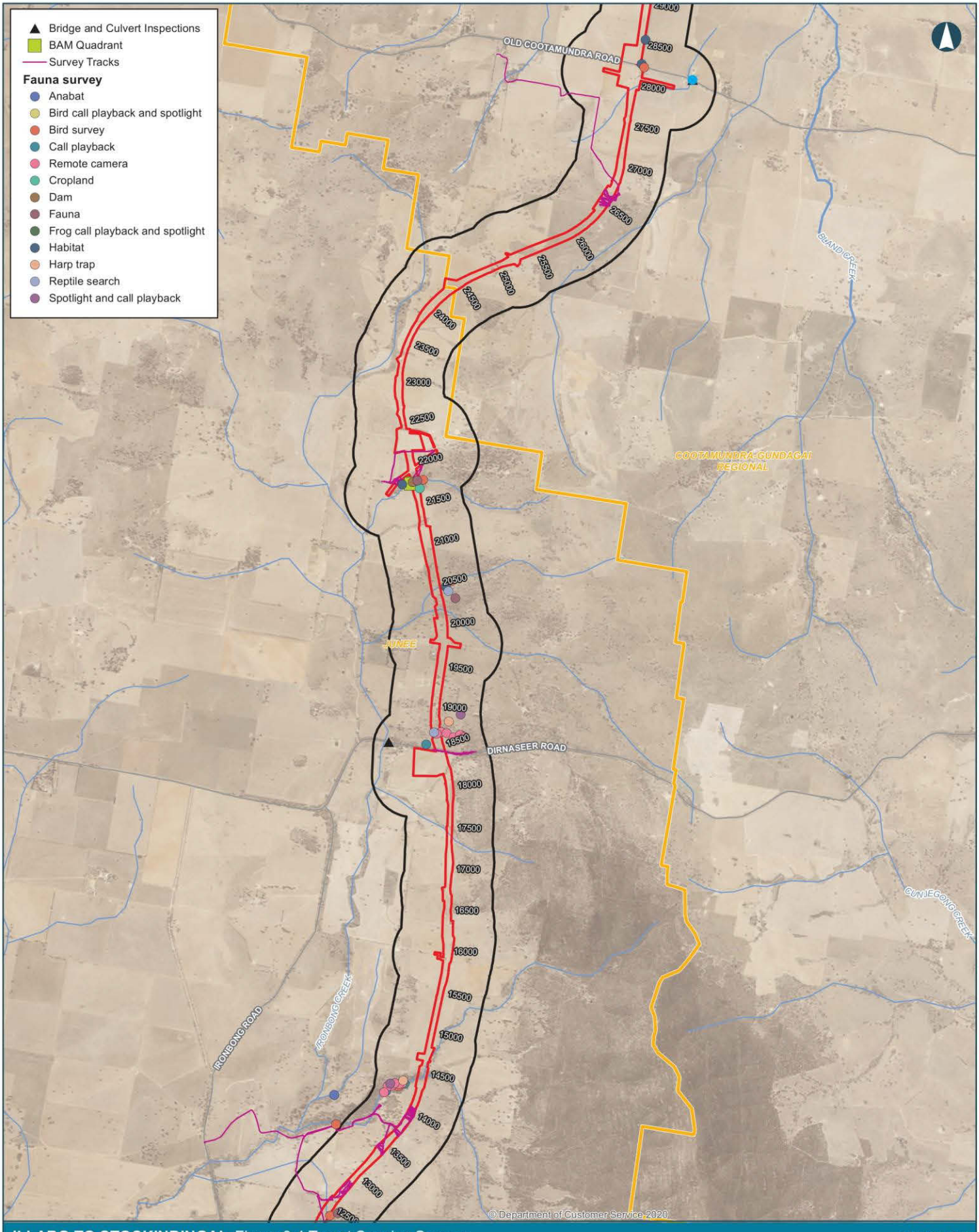
- New track/track upgrades
- Proposal site
- Assessment Area
- Local Government Area
- Major Watercourse
- Minor Watercourse
- Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_4_TargetSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 3.4 Target Species Surveys

MAP 2 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

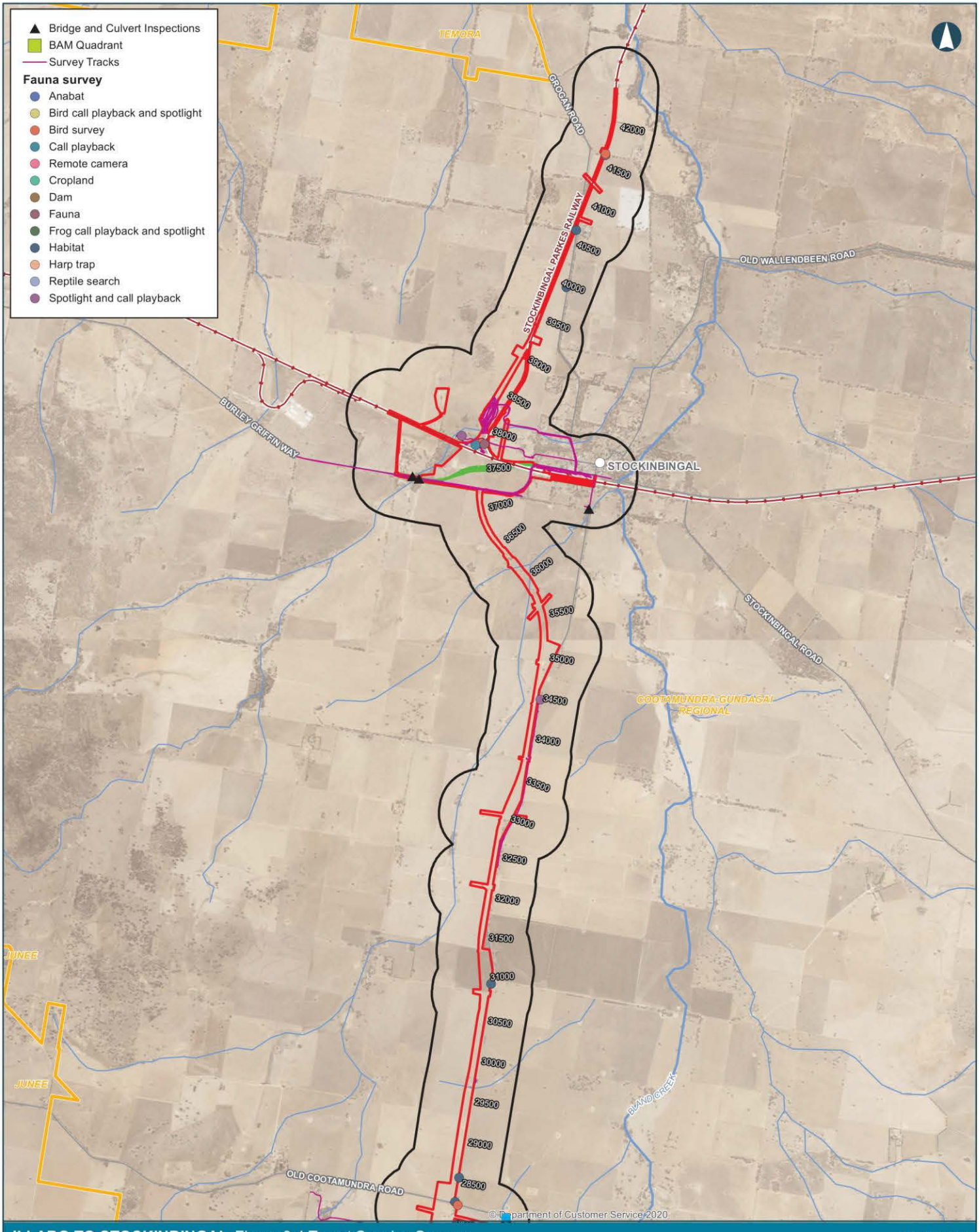
Key features of proposal

- New track/track upgrades
- Proposal site
- Assessment Area
- Local Government Area
- Major Watercourse
- Minor Watercourse

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_4_TargetSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 3.4 Target Species Surveys

MAP 3 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

Key features of proposal

- New track/track upgrades
- Proposal site
- Assessment Area
- Burley Griffin Way Road realignment

- Local Government Area
- Major Watercourse
- Minor Watercourse
- Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_4_TargetSpecies_r1v4.mxd

3.3.4 Threatened fauna surveys

3.3.4.1 Habitat assessments

Fauna habitat assessments were undertaken to assess the likelihood of threatened fauna (candidate species identified during desktop review) to occur within the subject land. Fauna habitat characteristics assessed included:

- structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians
- presence of waterways (ephemeral or permanent) and water bodies.

The following criteria were used to evaluate the condition of habitat values:

- **Good:** A full range of fauna habitat components are usually present (for example, old-growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
- **Moderate:** Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
- **Poor:** Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

3.3.4.2 Opportunistic sightings

Opportunistic sightings of animals were recorded including diurnal birds and reptiles. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows, food scraps etc., was also noted. This provided indirect information on animal presence and activity.

These habitat assessments informed seasonal surveys which targeted threatened fauna species. During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops
- habitat type boundaries.

3.3.4.3 Targeted seasonal surveys

Targeted seasonal surveys were completed for threatened fauna species, credit species and EPBC Act listed species within potential habitat within the subject land. Threatened fauna surveys completed within the subject land were carried out as described below and where applicable, considering the methodology detailed in the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation 2004), the *Survey Guidelines for Australia's Threatened Birds* (Department of the Environment Water Heritage and the Arts 2010), the *Threatened Species survey and assessment guidelines: field survey and methods for fauna-Amphibians* (Department of Environment and Climate Change 2009), *Survey guidelines for Australia's threatened frogs* (Department of the Environment Water Heritage and the Arts 2010) and *Survey guidelines for Australia's threatened reptiles* (Department of Sustainability Environment Water Population and Communities 2011). The optimum survey period and dates surveyed for candidate fauna species are summarised in Table 3.6.

Targeted fauna surveys for threatened species were undertaken during November and December 2018 and July 2019 during the optimal survey months as prescribed by the BAM Calculator. Survey methods are described below, and effort undertaken for each threatened species is summarised in Table 3.6. Locations of all targeted fauna surveys are illustrated in Figure 3.4 above. The weather conditions during surveys are discussed in section 3.4 below.

Diurnal bird surveys

Fourteen formal 20-minute diurnal bird searches were completed by two ecologists (totalling approximately 9.5 person hours). Bird surveys were completed by actively walking through the nominated site (approximately 1–2ha area) over a period of 20 minutes. All birds were identified to the species level, either through direct observation or identification of calls. Bird surveys were completed during different times of the day, but generally occurred during morning hours or evening. Birds were also recorded opportunistically during all other surveys.

Wherever threatened bird species were absent from the site, habitat assessments were conducted to determine the likelihood that subject land might support those species that are known to occur in the region.

Targeted seasonal surveys for endangered blossom nomads (i.e. Regent Honeyeater and Swift Parrot) was undertaken during August to identify presence for blossoming eucalypts and nectar resources, along with potential habitat utilisation by threatened blossom nomads. Where seasonal conditions for some species including flowering eucalypts were not suitable during the timing of onsite investigations, as was the case for endangered blossom nomads such as the Regent Honeyeater and Swift Parrot, likelihood of occurrence assessments were conducted by the presence/absence of suitable habitat and its condition.

Microchiropteran bat surveys

Culverts and bridges were inspected during surveys to identify if microchiropteran bat species were utilising these potential artificial rooting sites.

Ultrasonic Anabat bat detection (Titley Electronics) was used to record and identify the echolocation calls of microchiropterans foraging across a number of native vegetation communities. Passive monitoring of these survey sites in November 2018 was achieved by setting Anabat bat detectors to record continuously during nocturnal spotlighting, call playback and stag watches at potential artificial roosting sites within the subject land (approximately 1–2 hours recording at each survey site). In July 2019, passive monitoring at survey sites was achieved by setting Anabat bat detectors to record overnight at selected sites. Bat call analysis was completed by Nathan Cooper of WSP, with the presentation of data considering the guidelines of the Australasian Bat Society (Appendix H). Bat call of New South Wales Sydney Basin region (Pennay, Law et al. 2004) was used as a reference collection for bat call identification.

Although many microchiropteran bat species are detectable through use of Anabat call detection methodologies, the vocal differences between some species are too subtle to reliably differentiate between the various species occurring in a particular locality (i.e. *Nyctophilus corbeni*). Therefore, targeted harp trapping was completed for capture and release of microchiropteran bats. Site selection for the setting of harp traps included a number of rationales, such as, targeting of those habitat areas where hollow-bearing trees provide potential roosting sites and where suitable flyways were detected. Harp traps were set at each location over a three-consecutive night period, with captured bats identified to species level, sexed, measured and weighed. Bats were release immediately after processing during dark conditions or held in a cool, dark and quite location until release in the dark was possible. This included placing bats in sections of hollow trees out of the sun near the capture sites, so they could remain secure until their night activities resumed.

Table 3.6 Survey timing for threatened fauna (species credit and MNES) species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing
Invertebrates						
Key's Matchstick Grasshopper	*Keyacris scurra*	E	–	Target surveys	March to May August to December	Assumed present
Birds						
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Diurnal bird surveys	September to December	19-23 November 2018 29-30 September 2020 1 October 2020
Bush Stone-Curlew	*Burhinus grallarius*	E	–	Diurnal bird surveys Call playback	All year	19-23 November 2018 8-12 July 2019 29-30 September 2020 1 October 2020
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	E	Diurnal bird surveys	October to January	19-23 November 2018 1 October 2020
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	V	Diurnal bird surveys, searches for signs of feeding	March to August	13-15 May 2019 8-12 July 2019
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	–	Diurnal bird surveys	July to December	19-23 November 2018 8-12 July 2019
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	Diurnal bird surveys. Searches for stick nests	September to November	19-23 November 2018 2-4 September 2019 29-30 September 2020 1 October 2020
Little Eagle	*Hieraaetus morphnoides*	V	–	Diurnal bird surveys	August to October	2-4 September 2019 8-12 July 2019 29-30 September 2020 1 October 2020
Swift Parrot	*Lathamus discolor*	E	CE	Diurnal bird surveys	May to August	13-15 May 2019 8-12 July 2019

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	–	Diurnal bird surveys	September to December	19-23 November 2018 29-30 September 2020 1 October 2020
Square-tailed Kite	*Lophoictinia isura*	V		Diurnal bird surveys	September to December	19-23 November 2018 29-30 September 2020 1 October 2020
Barking Owl	*Ninox connivens*	V		Spotlighting and stag watches Call playback	May- December	19-23 November 2018 8-12 July 2019 29-30 September 2020 1 October 2020
Superb Parrot	*Polytelis swainsonii*	V	V	Diurnal bird surveys	September to November	19-23 November 2018 29-30 September 2020 1 October 2020
Masked Owl	*Tyto novaehollandiae*	V		Spotlighting and stag watches Call playback	May to August	8-12 July 2019
Powerful Owl	*Ninox strenua*	V		Spotlighting and stag watches Call playback	May to August	8-12 July 2019
White-throated Needletail	*Hirundapus caudacutus*		V	Diurnal bird surveys	October to March	19-23 November 2018 29-30 September 2020 1 October 2020
Frogs						
Sloane's Froglet	*Crinia sloanei*	V		Fauna habitat assessment Herpetofauna active searches Call playback	July to August	8-12 July 2019
Booroolong Frog	*Litoria booroolongensis*	E	V	Fauna habitat assessment Herpetofauna active searches	November to December	19-23 November 2018

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing
Southern Bell Frog	*Litoria raniformis*	E	V	Fauna habitat assessment Herpetofauna active searches	October to January	19-23 November 2018 1 October 2020
Reptiles						
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Fauna habitat assessment Herpetofauna active searches	September to November	19-23 November 2018
Striped Legless Lizard	*Delma impar*	V	V	Fauna habitat assessment Herpetofauna active searches	September to December	19-23 November 2018
Mammals						
Eastern Pygmy-possum	*Cercartetus nanus*	V		Remote camera Spotlighting	October to March	19-23 November 2018
Squirrel Glider	*Petaurus norfolcensis*	V		Remote camera Spotlighting and stag watching	All year	19-23 November 2018 8-12 July 2019
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Fauna habitat assessment If habitat identified, baited camera traps	All year	19-23 November 2018
Brush-tailed Phascogale	*Phascogale tapoatafa*	V		Remote camera Fauna habitat assessment Daytime searches for potential nesting sites Indirect evidence including scratches on trunks or scats Spotlighting and stag watching	All year	19-23 November 2018 8-12 July 2019
Koala	*Phascolarctos cinereus*	E	E	Fauna habitat assessment Direct observation Indirect observation including scratches	All year	19-23 November 2018

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Survey technique	Optimum survey months[3]	Survey timing
Bats						
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Microchiropteran bat surveys (anabats & harp trapping)	September to March	19-23 November 2018 8-12 July 2019 (Anabat only)
Large Bentwing-bat	*Miniopterus orianae oceanensis*	V		Microchiropteran bat surveys (anabats & harp trapping)	December to February	19-23 November 2018 8-12 July 2019 (Anabat only)
Southern Myotis	*Myotis macropus*	V		Microchiropteran bat surveys (harp traps & anabats) *harp traps were located near waterbodies	November to March	19-23 November 2018 8-12 July 2019 (Anabat only) Assumed habitat due to drought conditions
Corben's Long Eared Bat[4]	*Nyctophilus corbeni*	V	V	Microchiropteran bat surveys (anabats & harp trapping)	October to April	19-23 November 2018 8-12 July 2019 (Anabat only)
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Direct observation Spotlighting	October to December	19-23 November 2018

(1) Listed as E – Endangered; V – Vulnerable; CE – Critically Endangered, SAII – Serious and Irreversible Impact species under the BC Act, – not listed

(2) Listed as E – Endangered; V – Vulnerable; CE – Critically Endangered under the EPBC Act, – not listed

(3) Survey requirements based on BAM calculator survey requirements and cross-referenced with BioNet database

Spotlighting and stag watches

Spotlighting was used to target arboreal, flying and ground-dwelling mammals, as well as, nocturnal birds, reptiles and amphibians. Spotlighting was completed after dusk generally following the targeted nocturnal searches and were undertaken for at least 1 hour at each survey spot. Surveys were completed on foot using high-powered headlamps and hand torches. Sighted animals were identified to the species level.

Stag watches were to be undertaken at dusk in areas where hollow-bearing trees were identified within the subject land. The aim of dusk stag watches is to identify hollow dwelling fauna including owls, microbats and squirrel gliders are utilising any hollow-bearing trees within the subject land for breeding purposes. Following stag watches spotlighting transects were to be undertaken near known hollow-bearing trees.

Call playback

Call playback was undertaken to survey for nocturnal birds and frog species identified in Table 3.6 using standard methods (Kavanagh and Debus 1994, Debus 1995). Call playback was completed after dusk within a number of sites for approximately 1 hour at each survey site (Figure 6.1). These were targeted in areas of native vegetation, riparian areas and areas with important habitat features such as hollow bearing trees.

For each survey, an initial listening period of 10 to 15 minutes would be undertaken, followed by a spotlight search for 10 minutes on foot to detect any animals in the immediate vicinity. The calls of the target species would be then played intermittently for five minutes followed by a 10-minute listening period. After the calls are played, another 10 minutes of spotlighting was undertaken on foot in the vicinity to check for animals attracted by the calls, but not vocalising. Calls from Stewart and Pennay were broadcast using a portable media player and megaphone.

Remote camera

Remote motion sensing infra-red cameras were positioned to target Brush-tailed Phascogale, Eastern Pygmy-possum and Squirrel Glider in appropriate microhabitats for four consecutive nights (Figure 6.1). Remote camera traps were set in trees and large shrubs (at minimum heights of 1.5–2m) with a suitable food source containing raw chicken necks and sardines for Brush-tailed Phascogale and rolled oats and peanut butter with honey and vanilla essence to target Eastern Pygmy-possum and Squirrel Glider in the appropriate microhabitat. Cameras were also used to target other animals occurring within survey locations including introduced species.

Herpetofauna active searches

Herpetofauna active searches during the day and at night, were undertaken and involved looking for active specimens and eye shine, turning over suitable ground shelter, such as fallen timber, sheets of iron and exposed rocks, raking debris, and peeling decorticating bark. Specimens were either identified visually, by aural recognition of call (frogs only) or were collected and identified.

Herpetofauna surveys were completed by one or two persons over a 30-minute period over an approximate 1–2ha area with all ground shelter returned to their original position. Herpetofauna active searches were completed in conjunction with diurnal and nocturnal surveys. Frogs and reptiles were also being surveyed opportunistically during all other surveys. Reptiles were surveyed in reference to *Survey guidelines for Australia's threatened reptiles* (Department of Sustainability Environment Water Population and Communities 2011). Frogs were surveyed in *Threatened species survey and assessment guidelines: field survey methods for fauna (Amphibians)* (Department of Environment and Climate Change 2009).

3.4 Weather conditions

Field surveys were conducted over five survey periods: two survey periods in the spring of 2018 encompassing flora and fauna guilds, a summer survey session for flora in December 2018, a winter survey session for fauna in July 2019 and a further spring survey sessions for threatened flora and fauna in September 2019, September/October 2020 and January 2021.

During the survey periods conditions were mild to warm with a minimum temperature of -0.5°C and a maximum of 33°C. Low levels of rainfall was experienced during the survey period.

Weather conditions leading up and during the WSP survey period were dry in 2018 and 2019 with the Cootamundra regional area experiencing an abnormally low amount of rainfall and drought conditions. Weather conditions obtained from nearby Bureau of Meteorology Cootamundra Airport – station 073142 are summarised in Table 3.7.

Weather conditions during the July 2019 fauna survey period, extending between 8 July and 12 July 2019, were very cool with overcast conditions week and some precipitation experienced throughout the survey. The relatively low rainfall did not ease the generally dry conditions that preceded the survey.

Weather conditions leading up and during the WSP survey period in 2018 and 2019 were dry with the Cootamundra regional area experiencing an abnormally low amount of rainfall. Despite some rain prior to these surveys, flooding of temporary pools and wetlands preferred by some species was not present at time of surveys. However, additional targeted surveys were completed in September/October 2020 and January 2021. following above average winter and early spring rainfall. At the time of survey, exotic annual weed cover was high and reflected the long history of agricultural disturbance within the subject land. Given the high levels of exotic weed cover and lack of representative targeted surveys, threatened plant populations are considered unlikely to persist within this landscape.

In conducting vegetation integrity assessments, it is noted that drought conditions were experienced during surveys completed in the 2018/2019 period. During drought conditions, persistent native perennial cover was recorded with low to near non-existent exotic cover. Conversely, non-drought surveys conducted in spring 2020 observed extremely high exotic annual and perennial weed cover with low native cover. Given the highly disturbed nature of the vegetation due to a long history of cropping and grazing, vegetation integrity was identified to be reduced during non-drought conditions. This was particularly evident with patches assigned to derived grassland where during non-drought conditions native cover was mostly non-existent with exotic species exceeding in most patches >90% cover.

Table 3.7 Weather condition during survey period

Date	Temperature (°C)		Rain (mm)[1]	Wind (km/hr) (direction)[2]
	Minimum	Maximum		
02/10/2018	1.5	27.4	0	4 (SE)
03/10/2018	10.5	17.2	3.4	9 WNW
04/10/2018	11.9	16.5	9.8	24 SSE
05/10/2018	11.5	19.6	0.2	56 SSE
19/11/2018	12.9	28.1	0	24 ESE
20/11/2018	14.5	31.6	0	24 ESE
21/11/2018	18.4	22.3	10.4	24 WSW
22/11/2018	8.6	17.1	5.8	44 WNW
23/11/2018	8.3	18.0	7.4	44 WNW
03/12/2018	7.8	24.9	0	33 WSW
04/12/2018	12.6	27.9	0	17 SSW

Date	Temperature (°C)		Rain (mm)[1]	Wind (km/hr) (direction)[2]
	Minimum	Maximum		
05/12/2018	15.8	29.6	0	33 ESE
06/12/2018	15.1	31.3	0	33 ESE
07/12/2018	17.4	33.0	0	24 NNE
13/05/2019	0.3	17.5	0.2	9 SSW
14/05/2019	1.6	18	0	4 SSE
15/05/2019	-1.5	17.7	0	9 ESE
08/07/2019	8.6	13.9	4.0	Calm
09/07/2019	1.4	12.9	1.2	9 WSW
10/07/2019	4.5	12.4	0	17 NNW
11/07/2019	5.7	12.3	0.3	19 WNW
12/07/2019	5.0	13.5	0.3	24 NNE
02/09/2019	0.8	27.1	0.0	24 ENE
03/09/2019	3.9	30.5	0.0	9 SE
04/09/2019	5.5	27.6	0.0	19 WNW
29/09/2020	-0.5	19.4	0.0	9 ESE
30/09/2020	7.4	17	0.0	9 NNE
01/09/2020	10.5	17.1	0.8	24 WNW
31/01/2021	14.6	31.1	0	17 ESE

** Source: Climate data obtained from Bureau of Meteorology (2021), Cootamundra Airport – station 073142; 1) daily precipitation; 2) wind at 9am; N- north, E- East, S- South, W- West*

3.5 Field survey limitations

Access restrictions during the survey period prevented targeted threatened species surveys from being conducted throughout the survey area (i.e. limited targeted flora and fauna surveys). As such, survey was limited to areas where access was available (refer to Figure 3.5).

Where access was restricted or limited, but adjacent areas were accessible, vegetation community boundaries, condition and threatened flora and fauna habitat attributes were extrapolated from a distance with the aid of binoculars. Where the vegetation could not be viewed existing vegetation mapping of the area and aerial photo interpretation was used and a precautionary approach was adopted by assuming threatened biodiversity was present based on best available information.

No sampling technique can totally eliminate the possibility that a species is present. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present during surveys. The discovery of unknown populations of threatened species, even well outside their known range, is always possible. This applies particularly to cryptic species of plants and animals and plant species which can easily go undetected despite intensive survey.

The conclusions in this report are based upon data acquired during desktop review, field surveys and the known distribution and habitat preferences of species. The conclusions are, therefore, indicative of the likely biodiversity values, based on information available at the time of preparing the report, including the presence or otherwise of species.

ILLABO TO STOCKINBINGAL Figure 3.5 Areas not accessed

MAP 1 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/20/2022 Paper: A3
Author: IRDJV Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

New track/track upgrades
Land not accessed
Proposal site
Major Watercourse
Minor Watercourse
Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_5AreasNotSurveyed_r1v3.mxd

ILLABO TO STOCKINBINGAL Figure 3.5 Areas not accessed

MAP 2 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/20/2022
Author: IRDJV
Paper: A3
Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

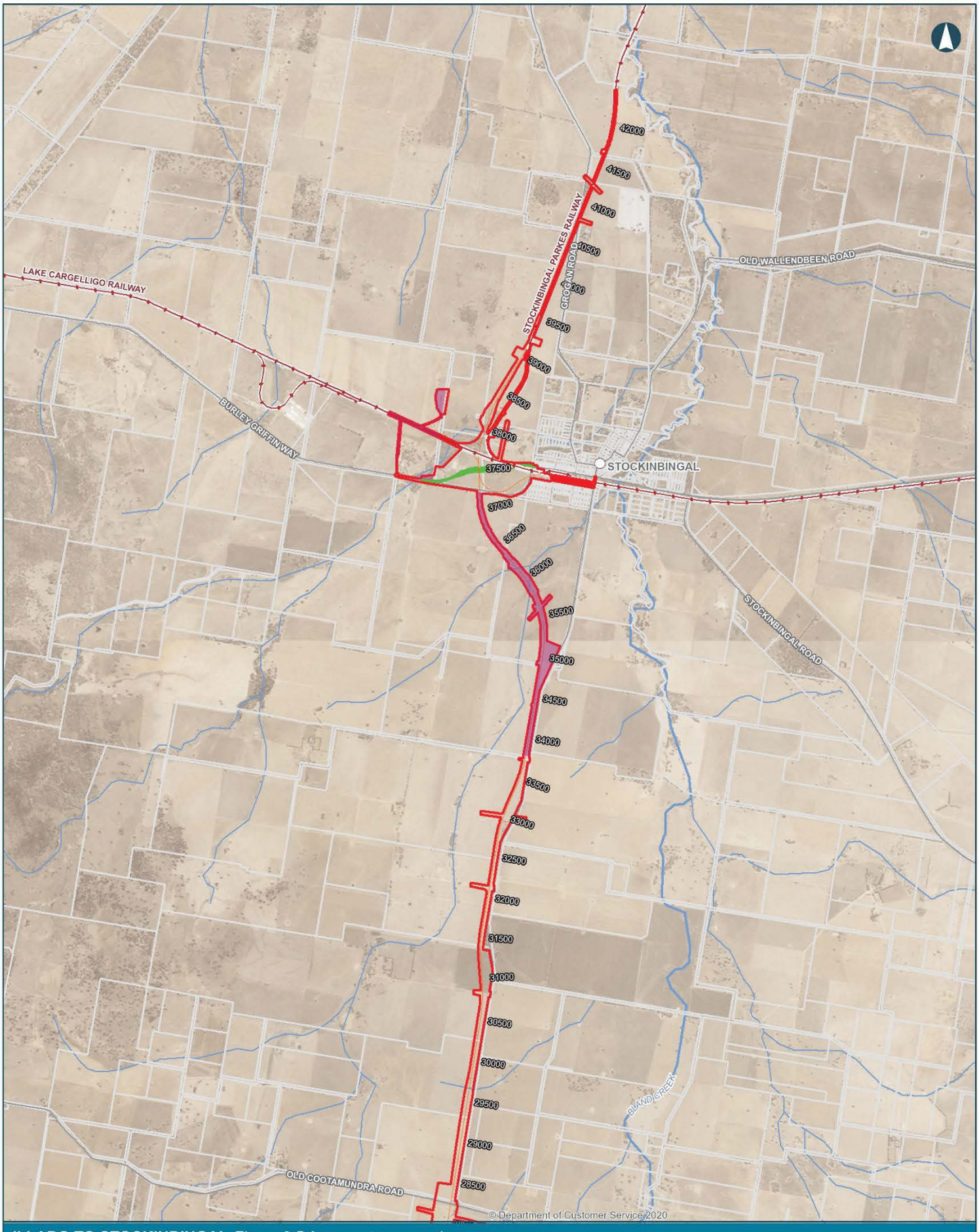
New track/track upgrades
Proposal site
Major Watercourse
Minor Watercourse
Land not accessed

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_5AreasNotSurveyed_r1v3.mxd



ILLABO TO STOCKINBINGAL Figure 3.5 Areas not accessed

MAP 3 OF 3

0 0.5 1 1.5 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/20/2022
Author: IRDJV
Paper: A3
Scale: 1:42,500
Data Sources: IRDJV, ARTC, LPI

- New track/track upgrades
- Proposal site
- Burley Griffin Way Road realignment
- Major Watercourse
- Minor Watercourse
- Existing Rail
- Land not accessed

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_3_5AreasNotSurveyed_r1v3.mxd

4 Landscape context

This chapter address landscape context in accordance with Chapter 3 of the BAM and has been prepared in accordance and has been prepared in accordance with Part 1 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020). It provides information on a range of landscape features that occur on the subject land and in surrounding areas. The landscape features outlined below are used to inform the habitat suitability of the subject land for threatened species and the potential movement of species across the landscape.

4.1 Landscape features

The proposal site is characterised by relatively flat land. The subject land lies within the eastern part of the Lachlan Fold Belt which consists of a complex series of north to north-westerly trending folded bodies of Cambrian to Early Carboniferous sedimentary and volcanic rocks. The northern and southern sections of the subject land pass through Quaternary alluvium and colluvial deposits consisting of gravel, sand, silt and clay. The central section of the proposal passes through the Frampton Volcanics which consist of, rhyolite, rhyodacite, dacite, quartz, sandstone, siltstone and conglomerate. The soils found within the subject land are a combination of Brown Chromosols, Red Kandosols and Brown Sodosols which generally have a moderate erodibility and erosion hazard. The proposal is located within the Murrumbidgee River and Lachlan River catchments, which are sub-catchments within the Murray Darling Basin. The catchment divide lies closer to Stockinbingal and therefore most of the subject land is within the Murrumbidgee catchment.

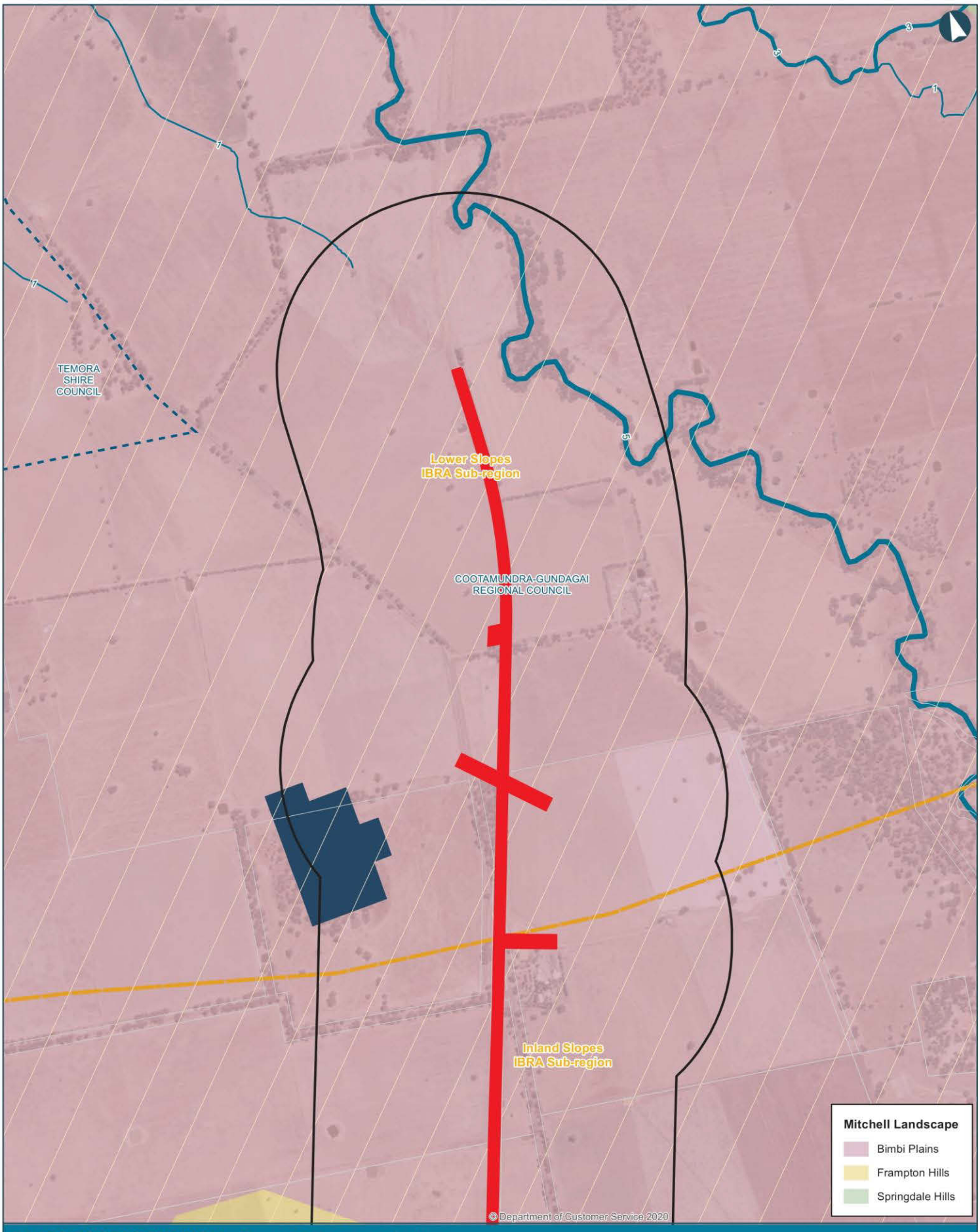
The proposal site crosses six named watercourses including Dudauman Creek, Ulandra Creek, Powder Horn Creek, Run Boundary Creek, Isobel Creek, Billabong Creek and numerous other crossings over small shallow ephemeral creeks and tributaries. All of these watercourses are at the top of the catchments for their respective valleys and are likely to only flow during rainfall events.

An overview of landscape features is presented in Table 4.1 and Figure 4.1.

Table 4.1 Summary of landscape features

Landscape feature	Occurrence in proposal site
IBRA bioregions and subregions	• NSW South Western Slopes • Inland Slopes IBRA subregion.
NSW landscape regions (Mitchell landscapes)	• Bimbi Plains • Frampton Hills (majority) • Murrumbidgee – Tarcutta Channels and Floodplains • Springdale Hills.
Local Government Area (LGA)	• Junee Shire Council (southern section) • Cootamundra-Gundagai Regional Council (northern section).
Rivers and streams	• Billabong Creek – 6th order stream • Ulandra Creek – 5th order stream • Run Boundary Creek – 3rd order stream • Isobel Creek – 3rd order stream • Powder Horn Creek – 3rd stream order • Dudauman Creek – 3rd order stream
Important and local wetlands	Bethungra Dam Reserve

Landscape feature	Occurrence in proposal site
Connectivity features	Overall the landscape has been heavily fragmented due to agricultural practices (i.e. cropping and clearing for livestock). The existing connectivity is limited but includes riparian corridors associated with watercourses (Billabong Creek, Ulandra Creek, Ironbong Creek, Run Boundary Creek) and road reserves of Old Sydney Road, Ironbong Road and Dirnaseer Road. These connectivity features link with the largest intact patch of remnant vegetation occurring to the east of the subject land in association with the nearby Bethungra and Ulandra Mountain range. Creeklines and associated riparian vegetation with the rivers and streams predominantly run from east to west and provide the remaining link to movement between Bethungra and Ulandra Mountain range to the east and areas to the west.
Areas of geological significance and soil hazard features	The subject land does not contain any areas of geological significance or soil hazard feature in relation to biodiversity.
Areas of outstanding biodiversity value	No declared areas of outstanding biodiversity value occur in or near the subject land.



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

IBRA Region (NSW South Western Slopes)
IBRA Sub-Region
Proposal Site
Wetlands
Local Government Areas
Assessment Area
Cadastre

Habitat Connectivity

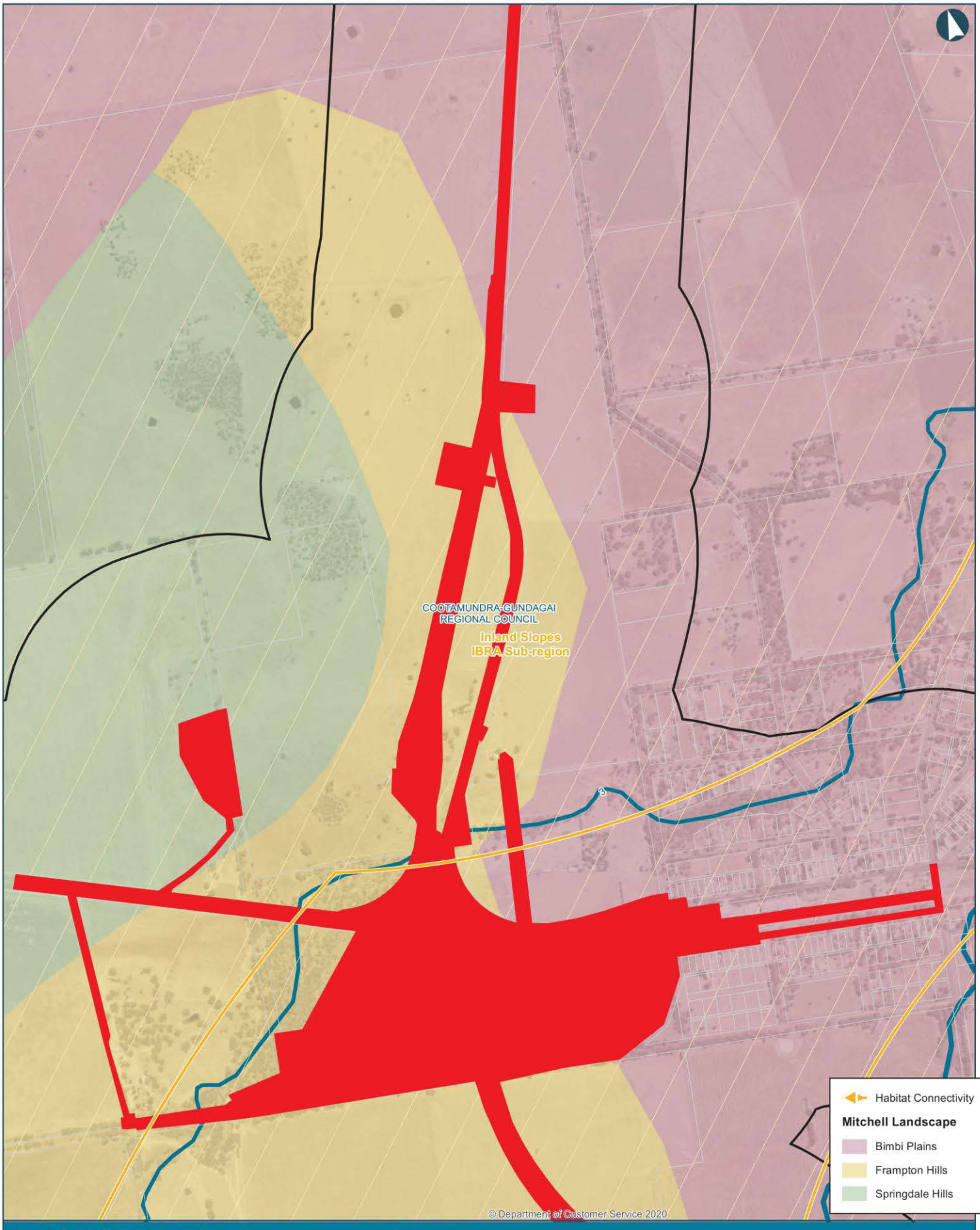
Strahler Stream Order

0
1
2
3
4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

Strahler Stream Order

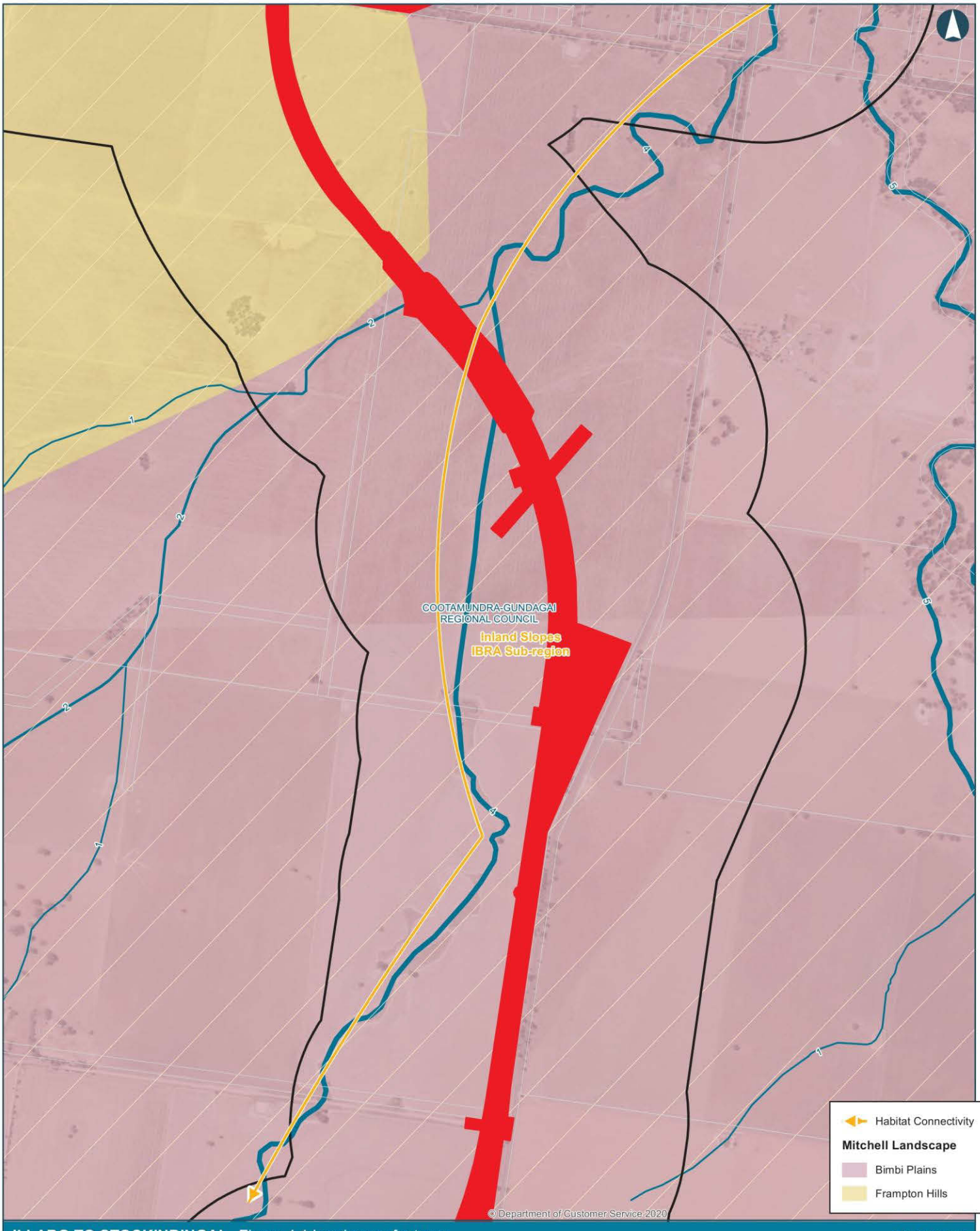
- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre
- Habitat Connectivity

Strahler Stream Order

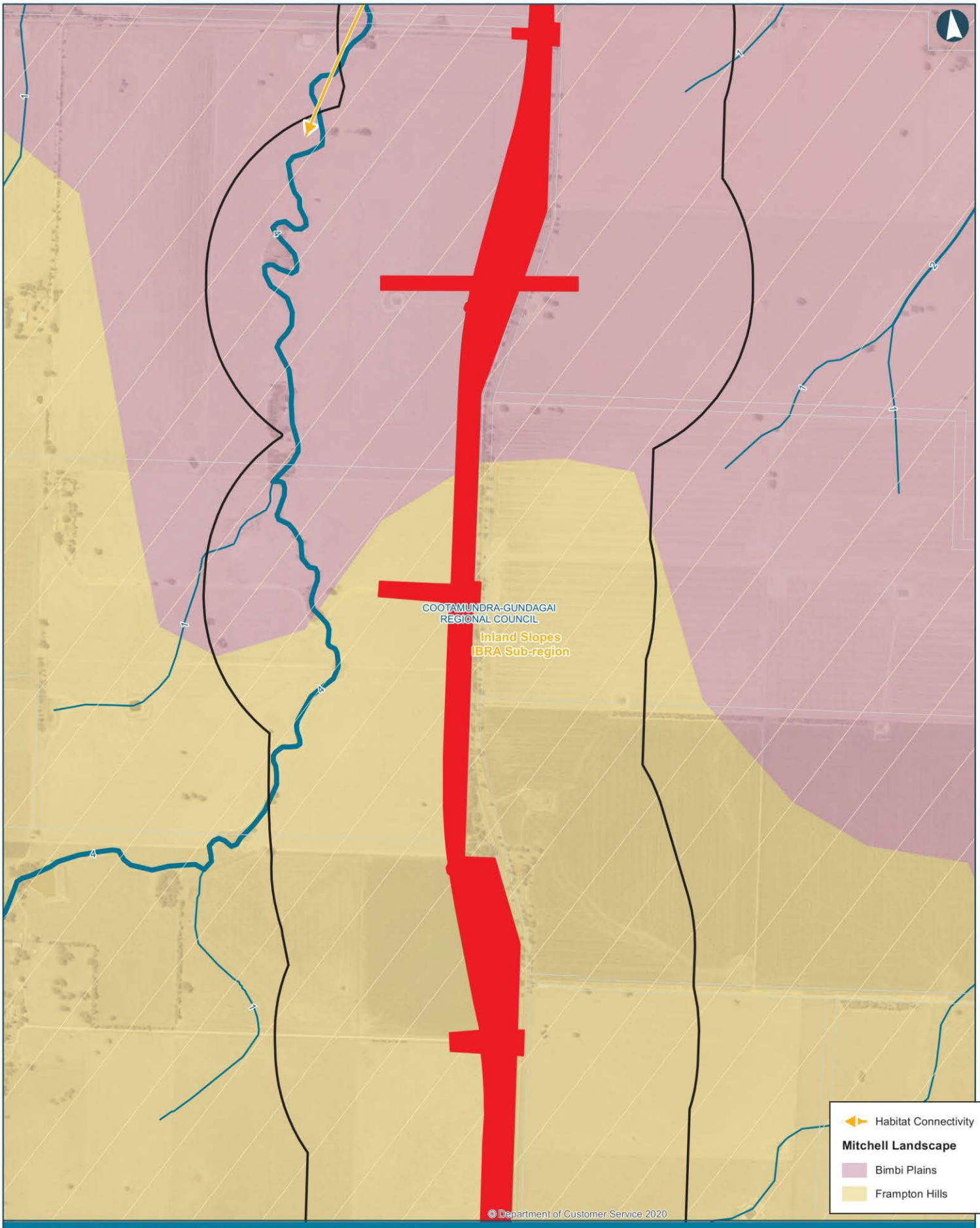
- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

IBRA Region (NSW South Western Slopes)
IBRA Sub-Region
Proposal Site
Wetlands
Local Government Areas
Assessment Area
Cadastre

Habitat Connectivity

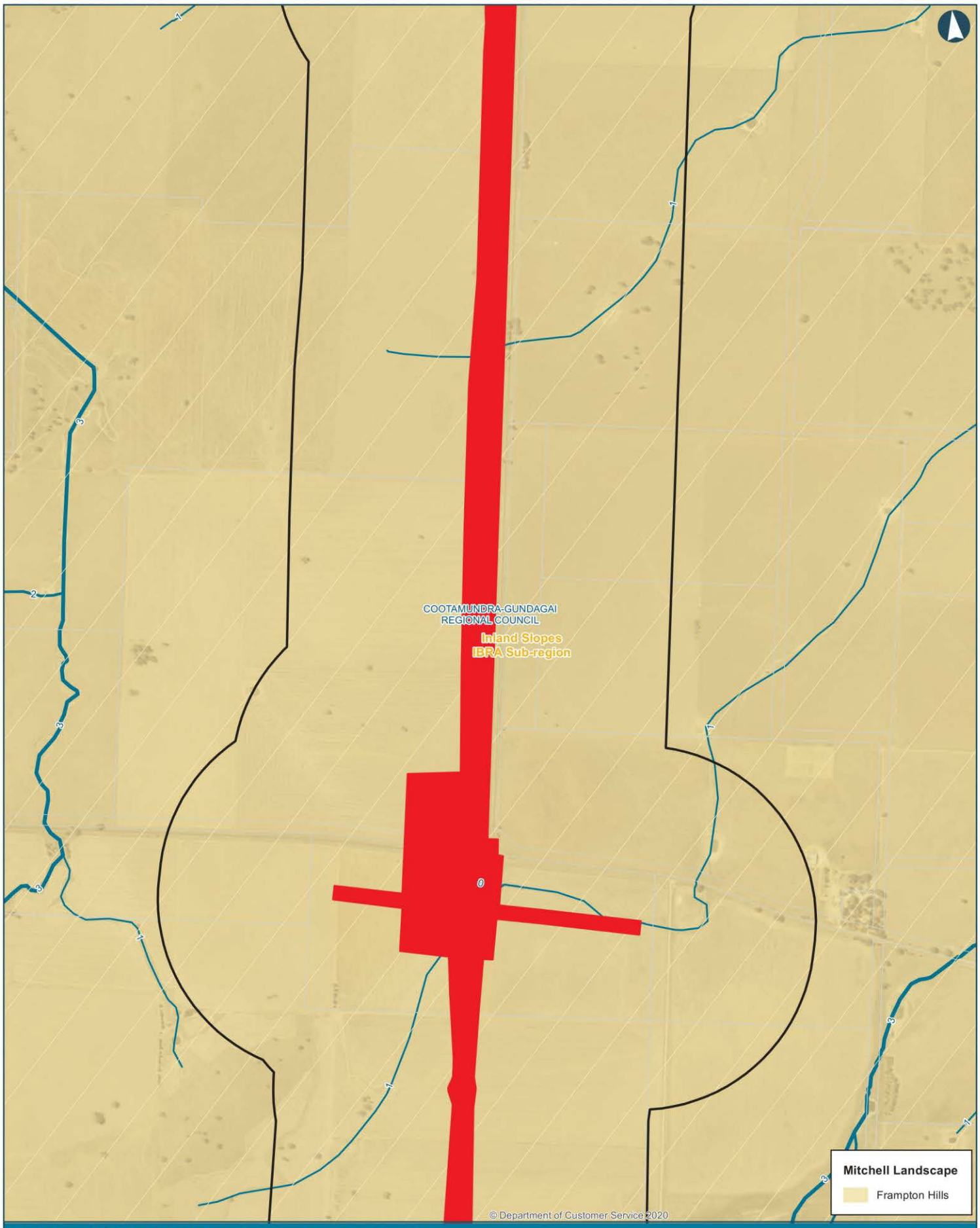
Strahler Stream Order

0
1
2
3
4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre
- Habitat Connectivity

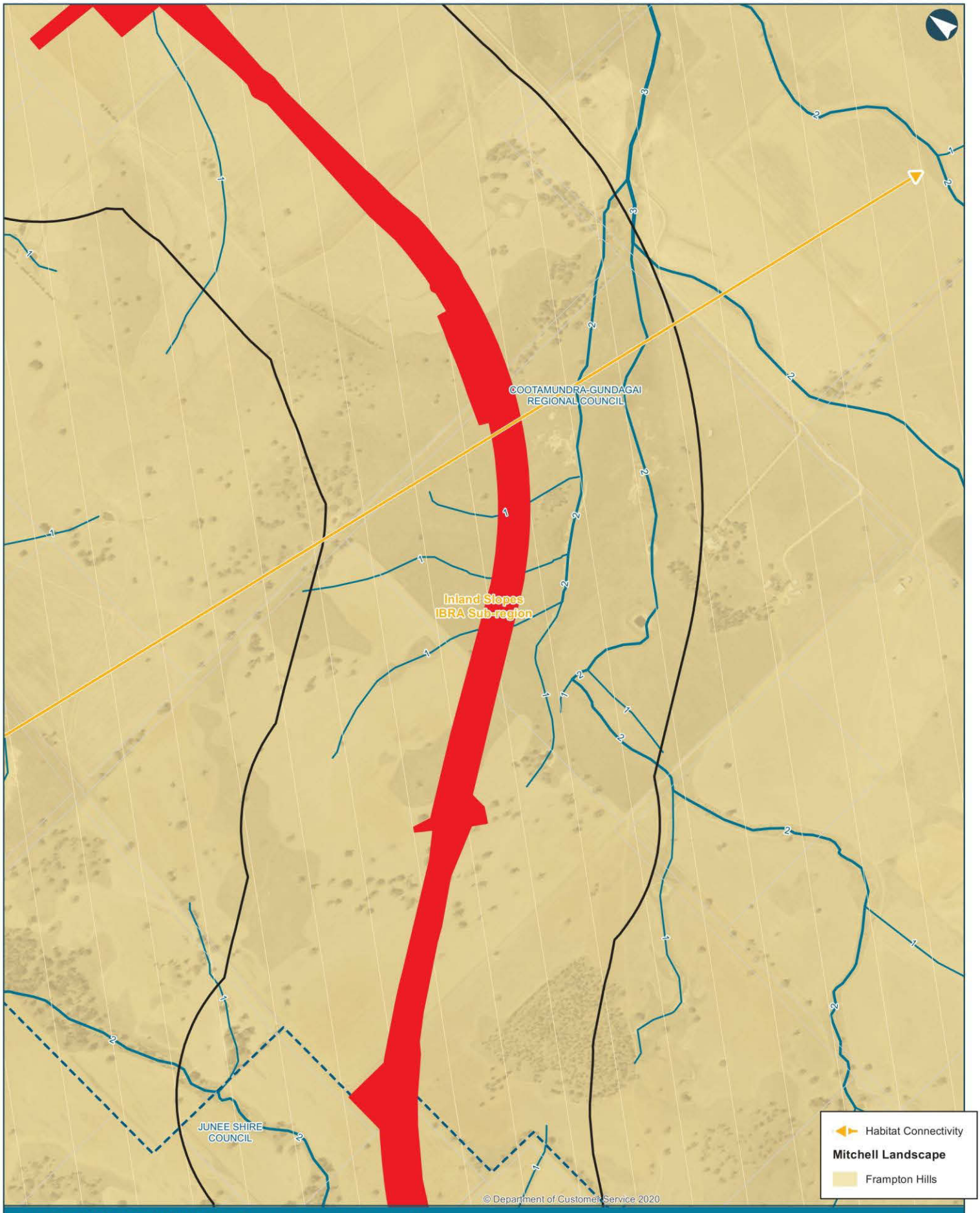
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

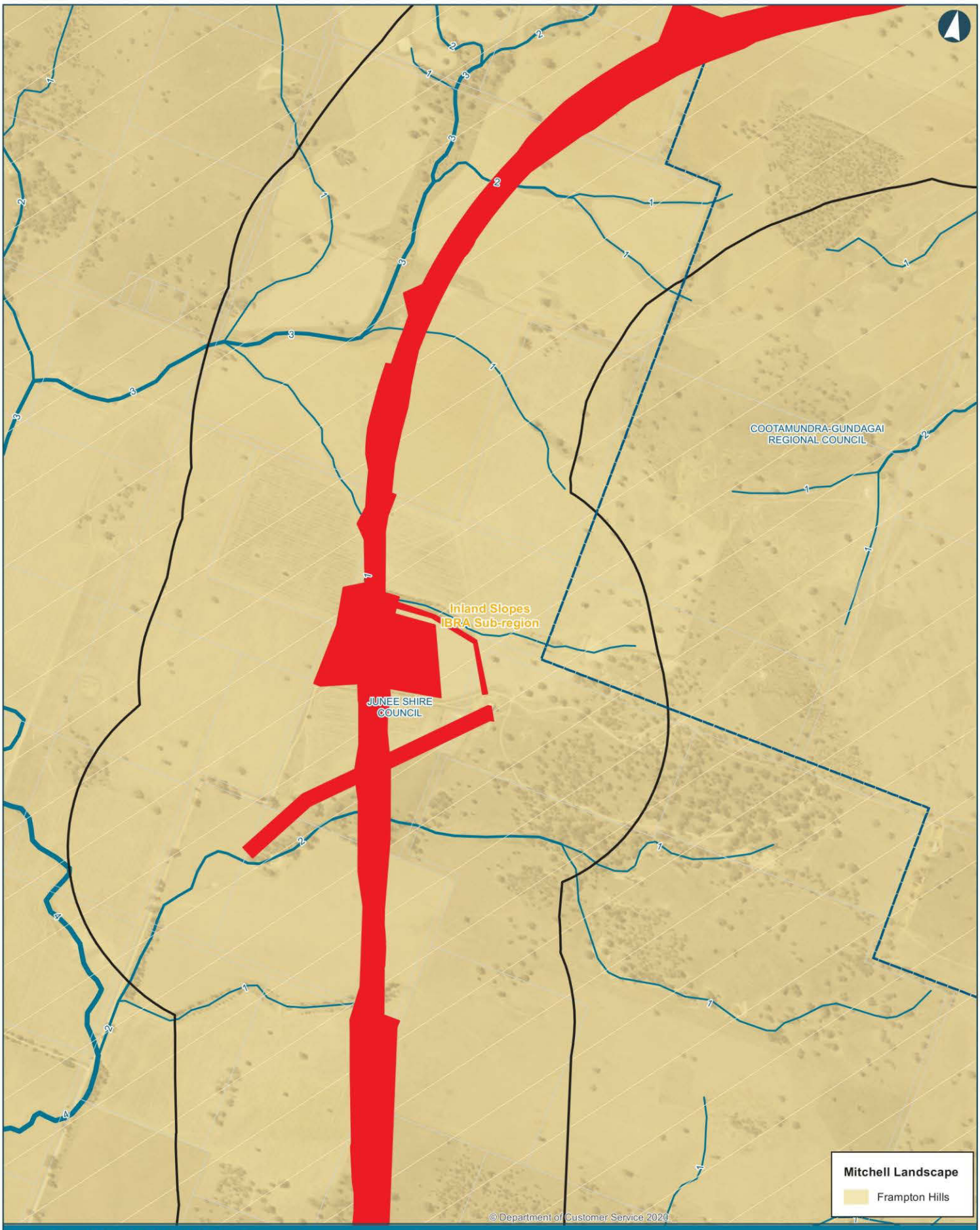
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

IBRA Region (NSW South Western Slopes)
IBRA Sub-Region
Proposal Site
Wetlands
Local Government Areas
Assessment Area
Cadastre

Habitat Connectivity

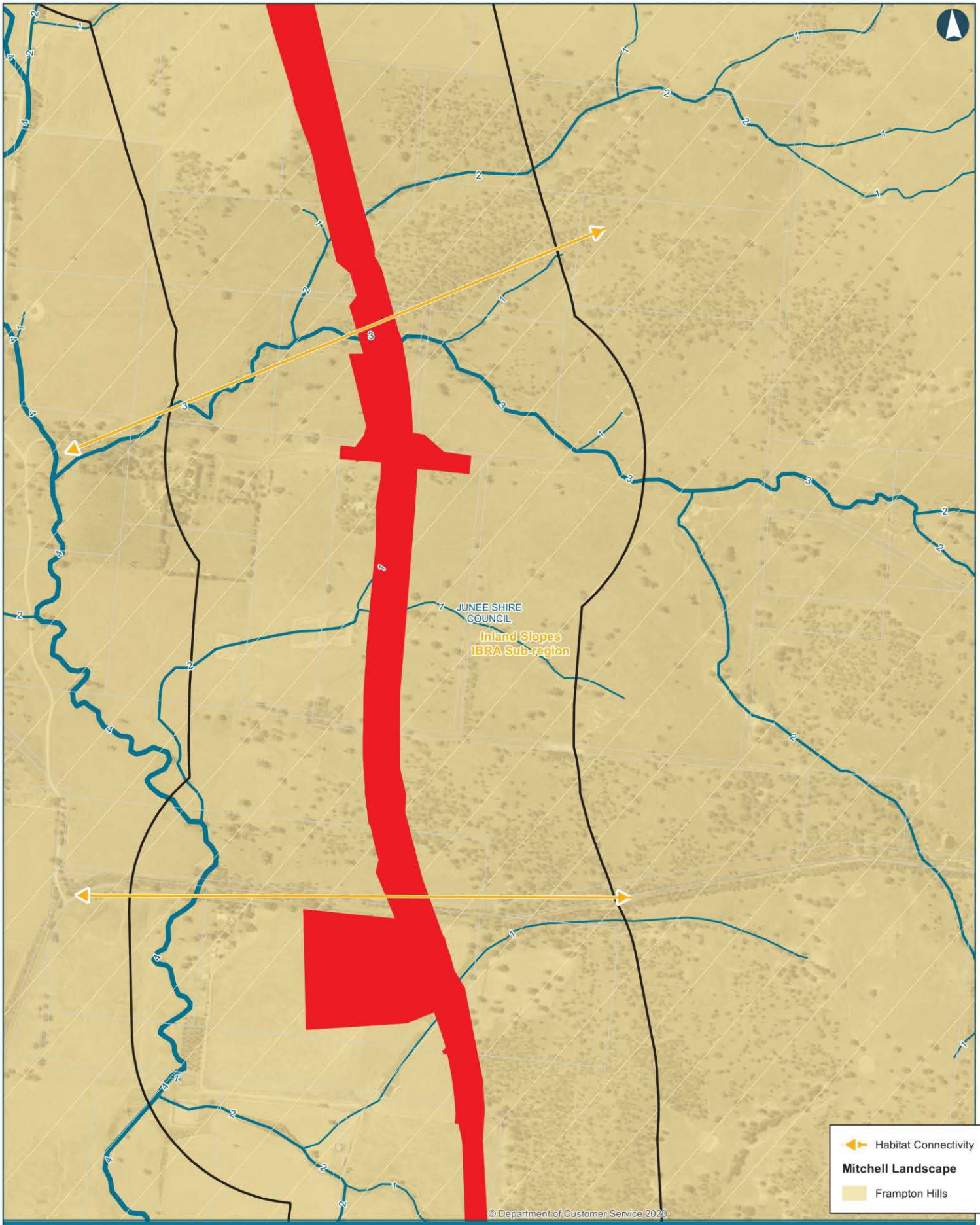
Strahler Stream Order

0
1
2
3
4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

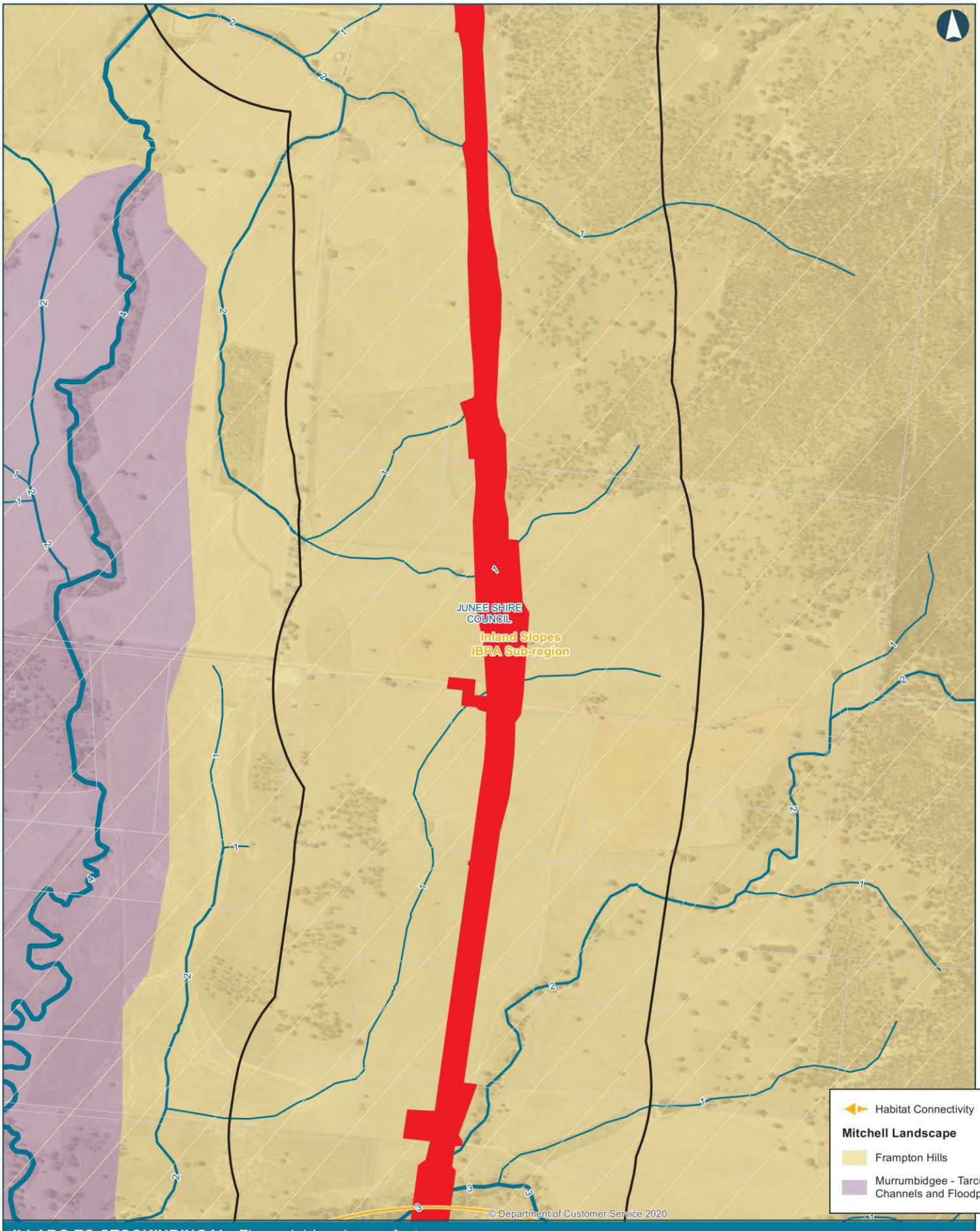
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre
- Habitat Connectivity

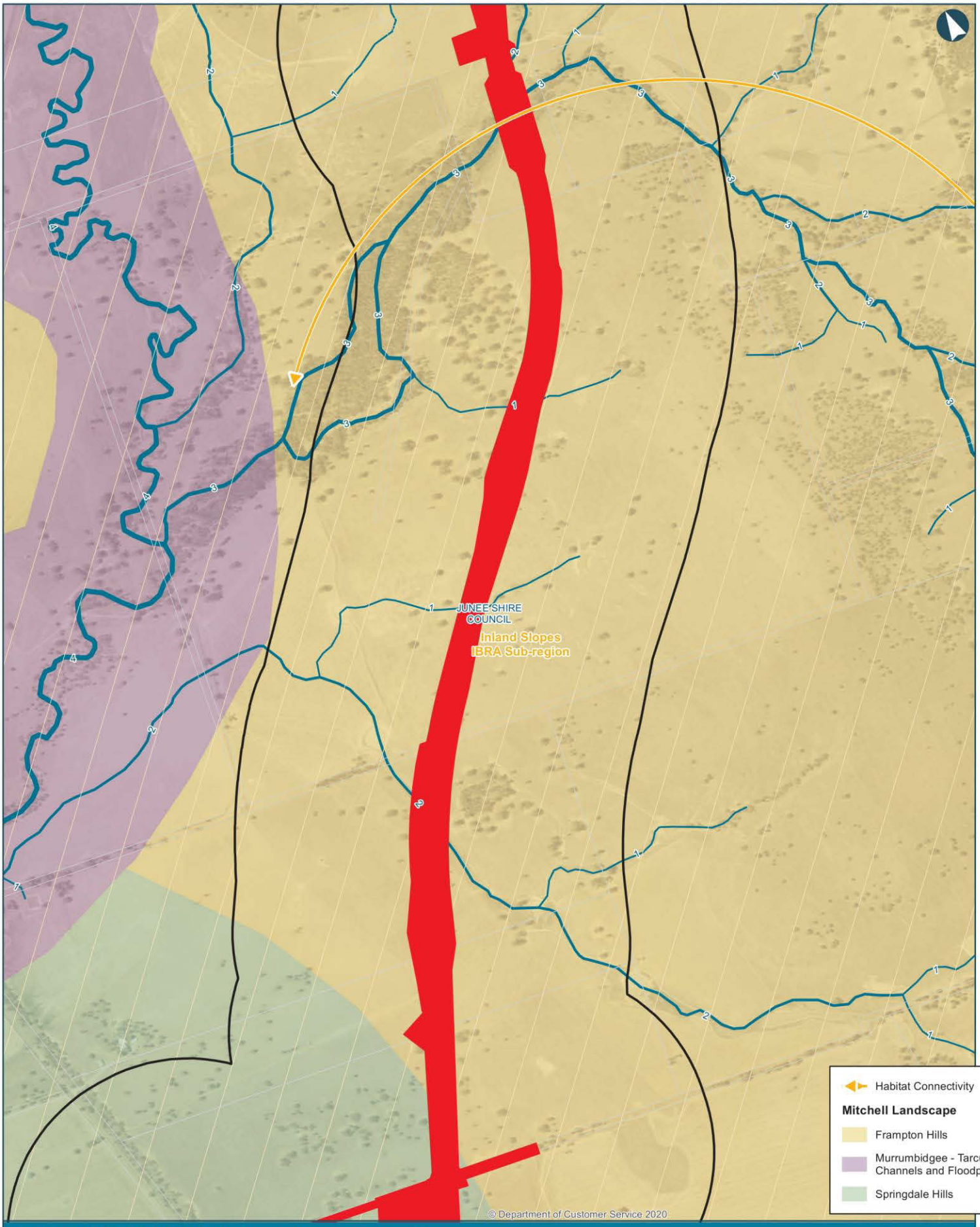
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

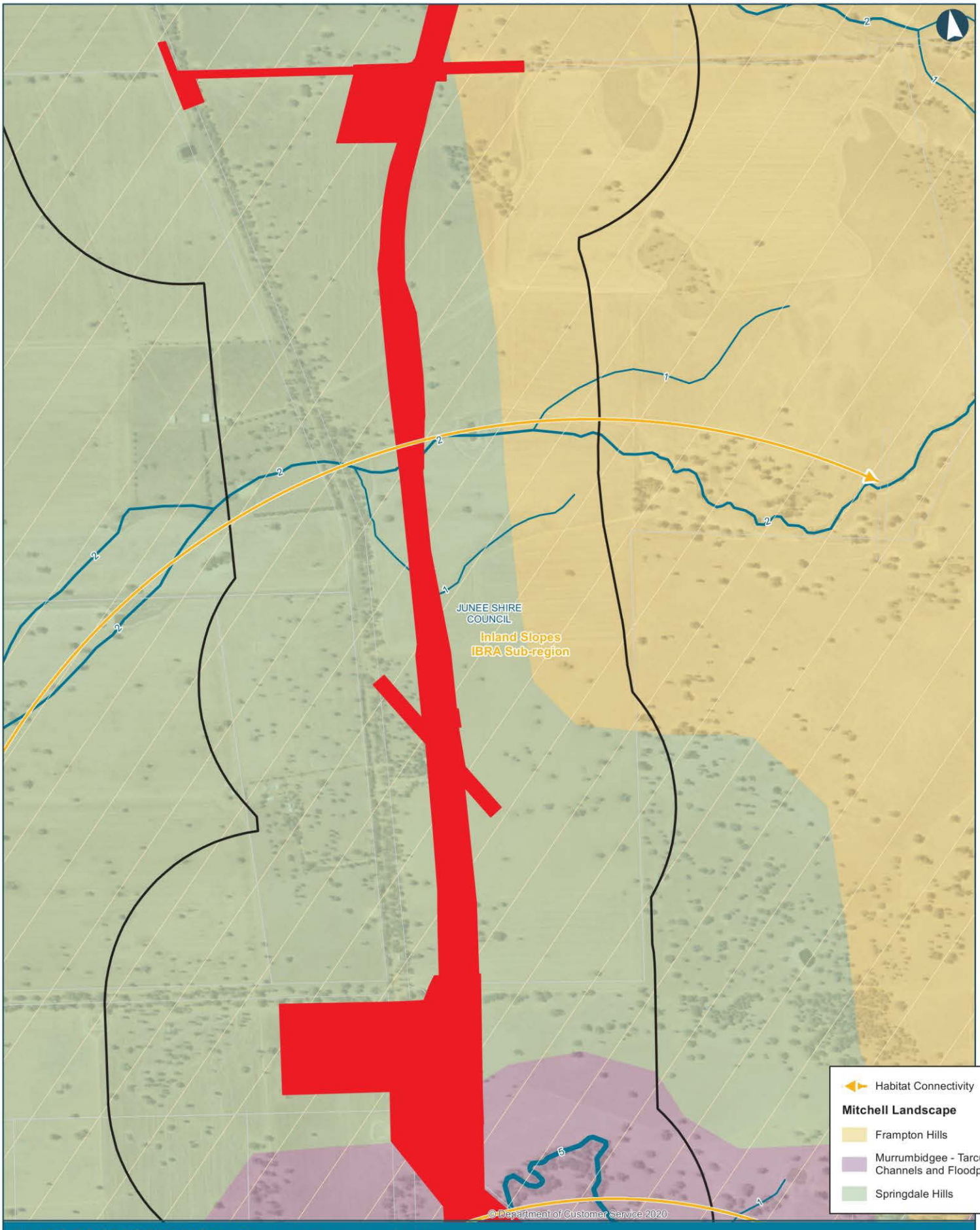
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

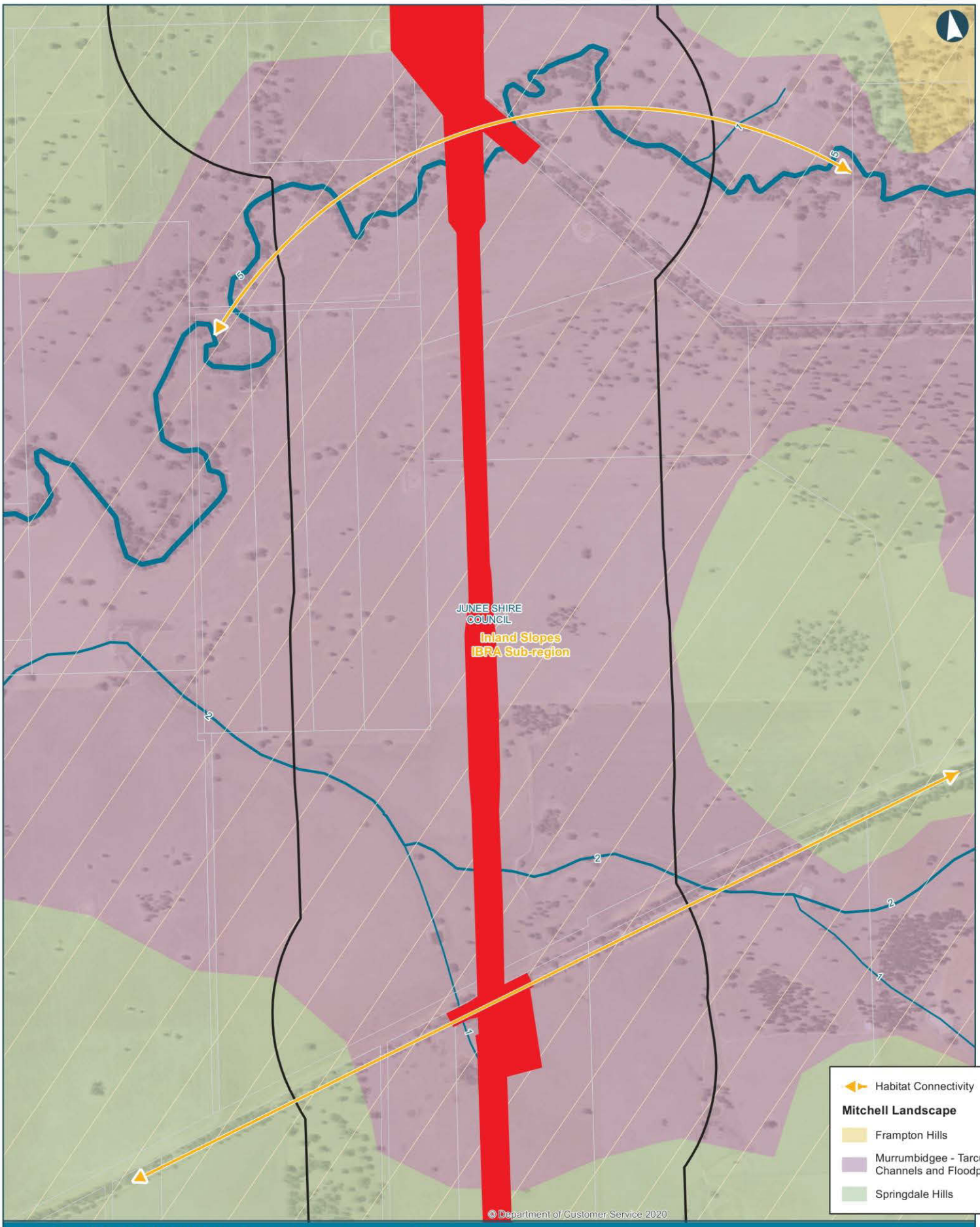
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

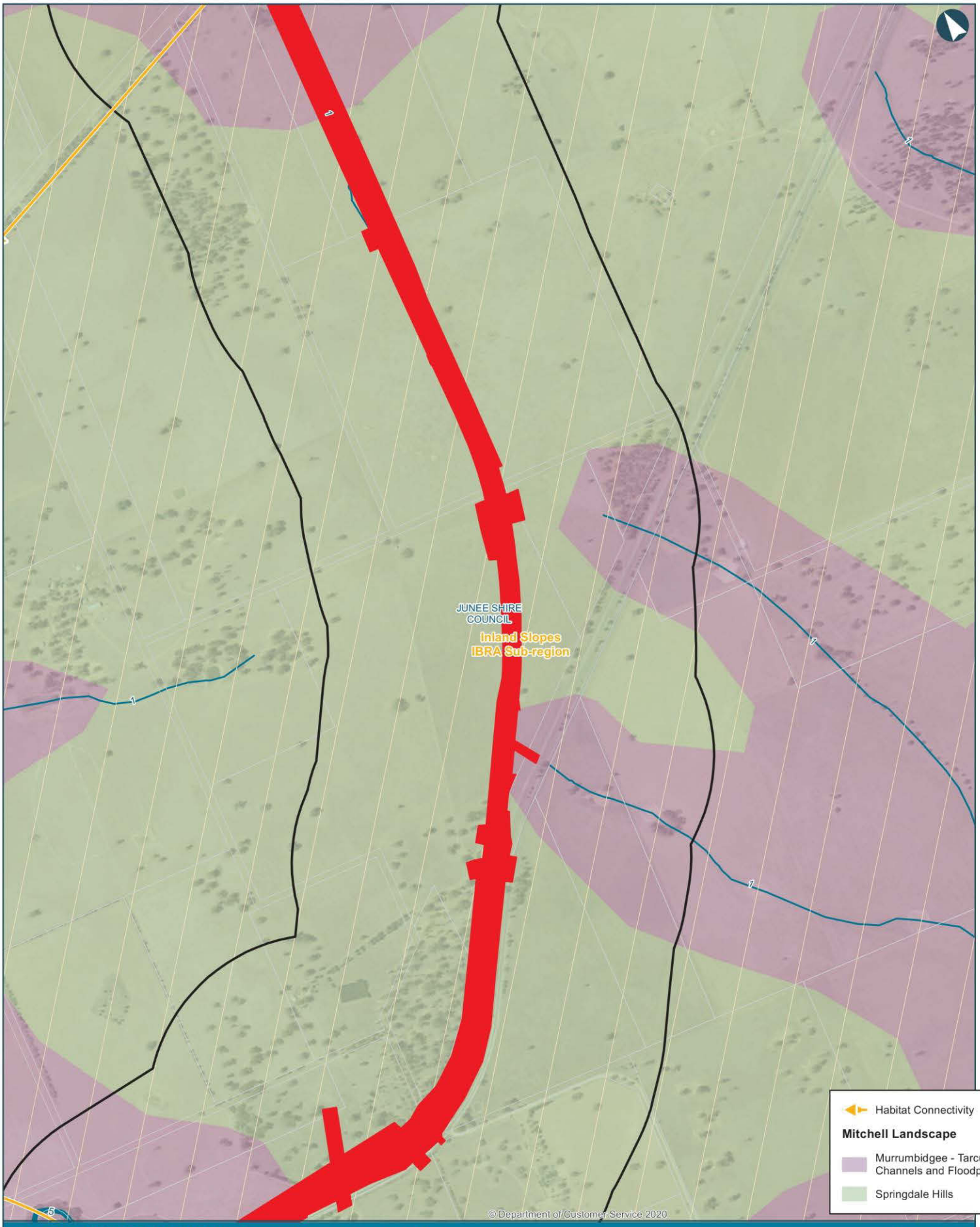
Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

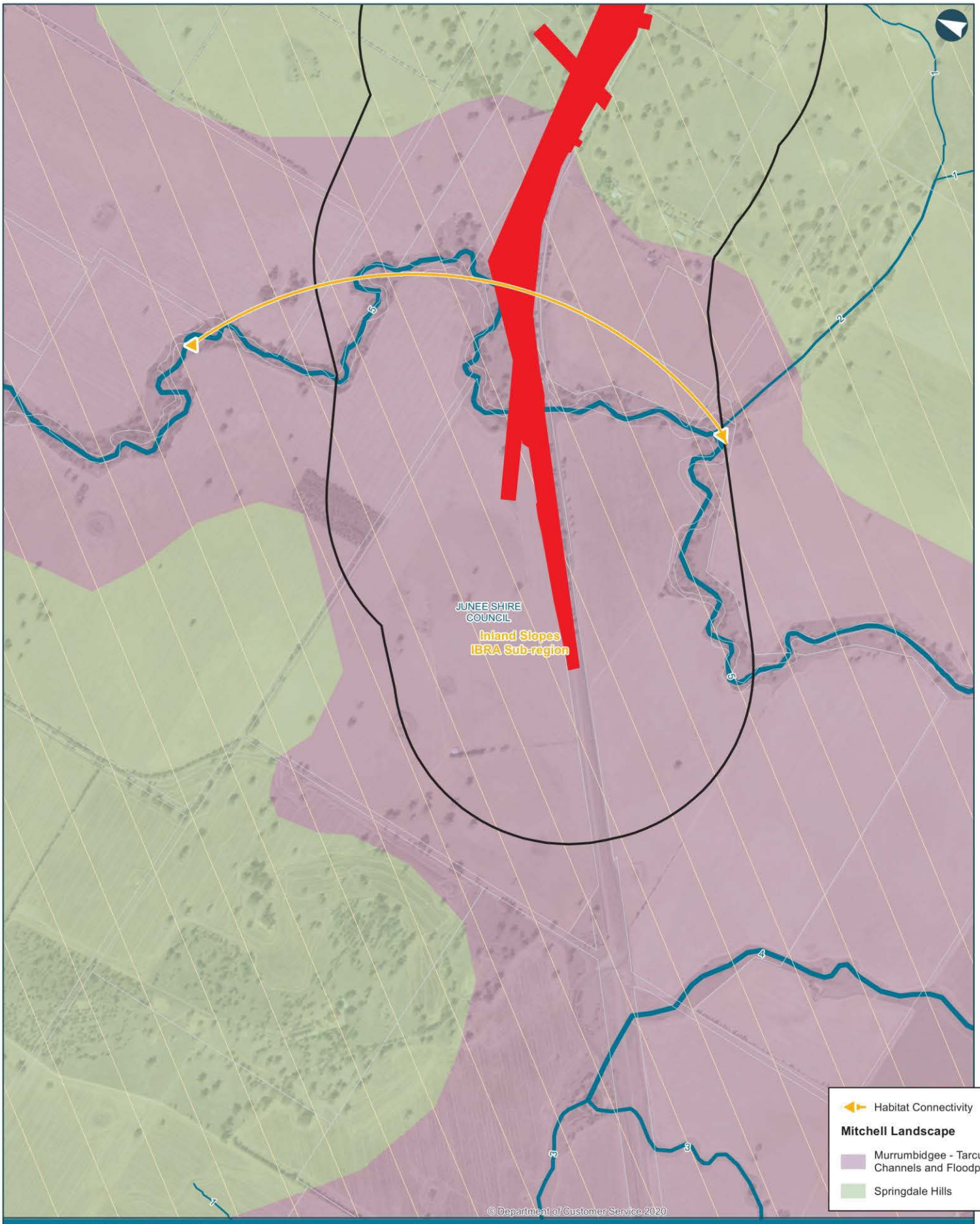
IBRA Region (NSW South Western Slopes)
IBRA Sub-Region
Proposal Site
Wetlands
Local Government Areas
Assessment Area
Cadastre

Habitat Connectivity
Strahler Stream Order
0
1
2
3
4 - 6

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd



© Department of Customer Service 2020

ILLABO TO STOCKINBINGAL Figure 4.1 Landscape features

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

- IBRA Region (NSW South Western Slopes)
- IBRA Sub-Region
- Proposal Site
- Wetlands
- Local Government Areas
- Assessment Area
- Cadastre

Habitat Connectivity

Strahler Stream Order

- 0
- 1
- 2
- 3
- 4 - 6

Habitat Connectivity

Mitchell Landscape

- Murrumbidgee - Tarcutta Channels and Floodplains
- Springdale Hills

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_4_1LandscapeFeatures_r1v2.mxd

5 Native vegetation

This chapter assesses native vegetation, threatened ecological communities and vegetation integrity within the subject land in accordance with Chapter 4 of the BAM and has been prepared in accordance with Part 2 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020).

Native vegetation survey and assessment methodology is outlined in section 3.3.

5.1 Assessing native vegetation cover

Native vegetation cover has been assessed in accordance with Section 3.2 of the BAM. Due the linear shape of the proposal, a 500m buffer following the centre line of the proposal has been applied for native vegetation cover calculations. Percent native vegetation cover refers to the amount of native vegetation (woody and non-woody) that is estimated to be present in the landscape of the assessment area.

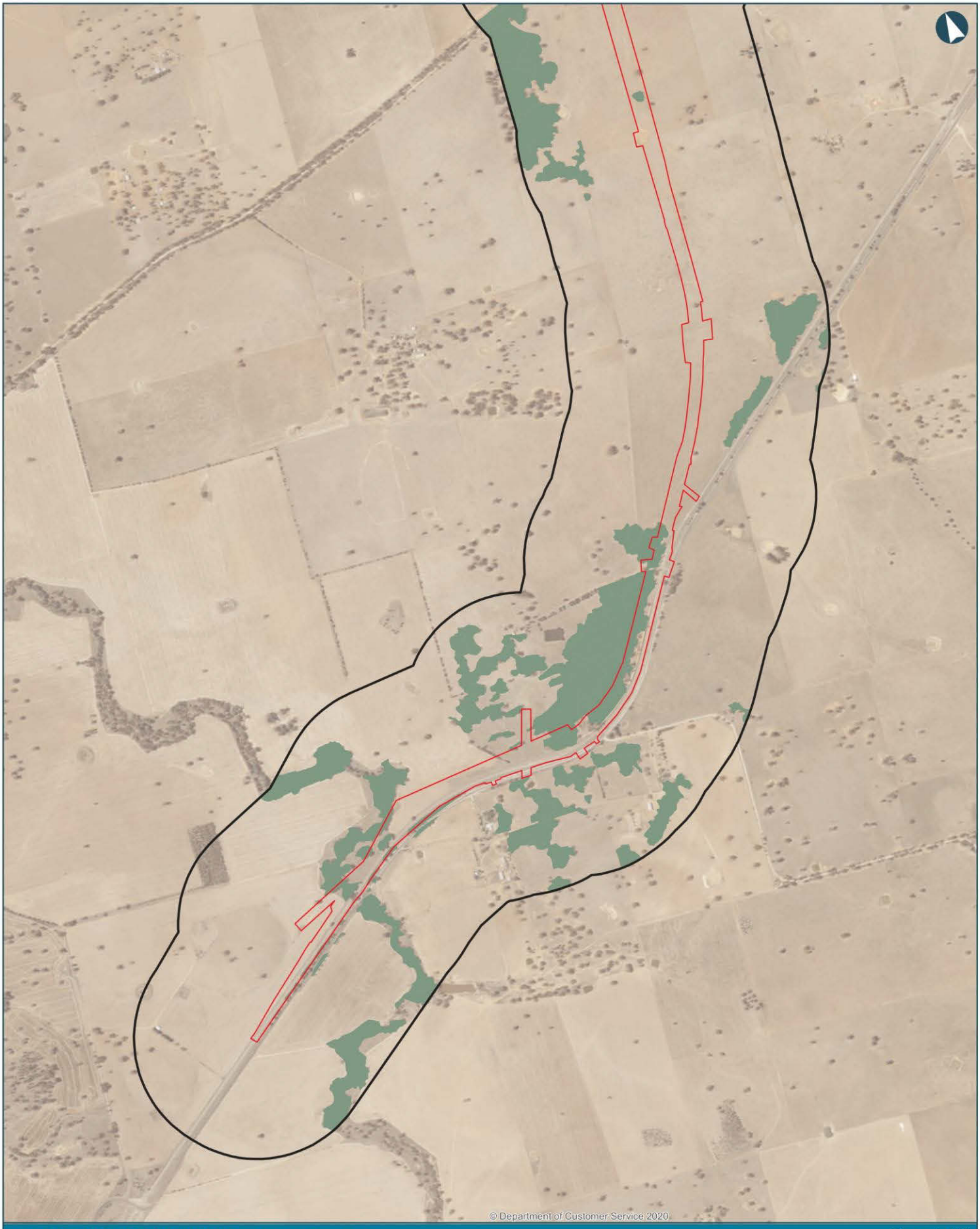
The percentage of native vegetation cover in the assessment area was assigned to one of the following classes:

5. 0–10 per cent
6. >10–30 per cent
7. >30–70 per cent
8. >70 per cent.

A summary of native vegetation cover is presented in Table 5.1 and Figure 5.1 illustrates the native vegetation cover. This area calculation includes remnant native vegetation as well as scattered native trees. Native vegetation was recorded to cover a total of 72.93ha (26 per cent) of the proposal site.

Table 5.1 Assessment of native vegetation cover

Total assessment area (ha)	Area of native vegetation cover (ha)	Native vegetation cover	Cover class
5,500	951	17%	> 10–30%



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/17/2021
Author: IRDJV
Paper: A3
Scale: 1:15,000

Data Sources: IRDJV, ARTC, LPI

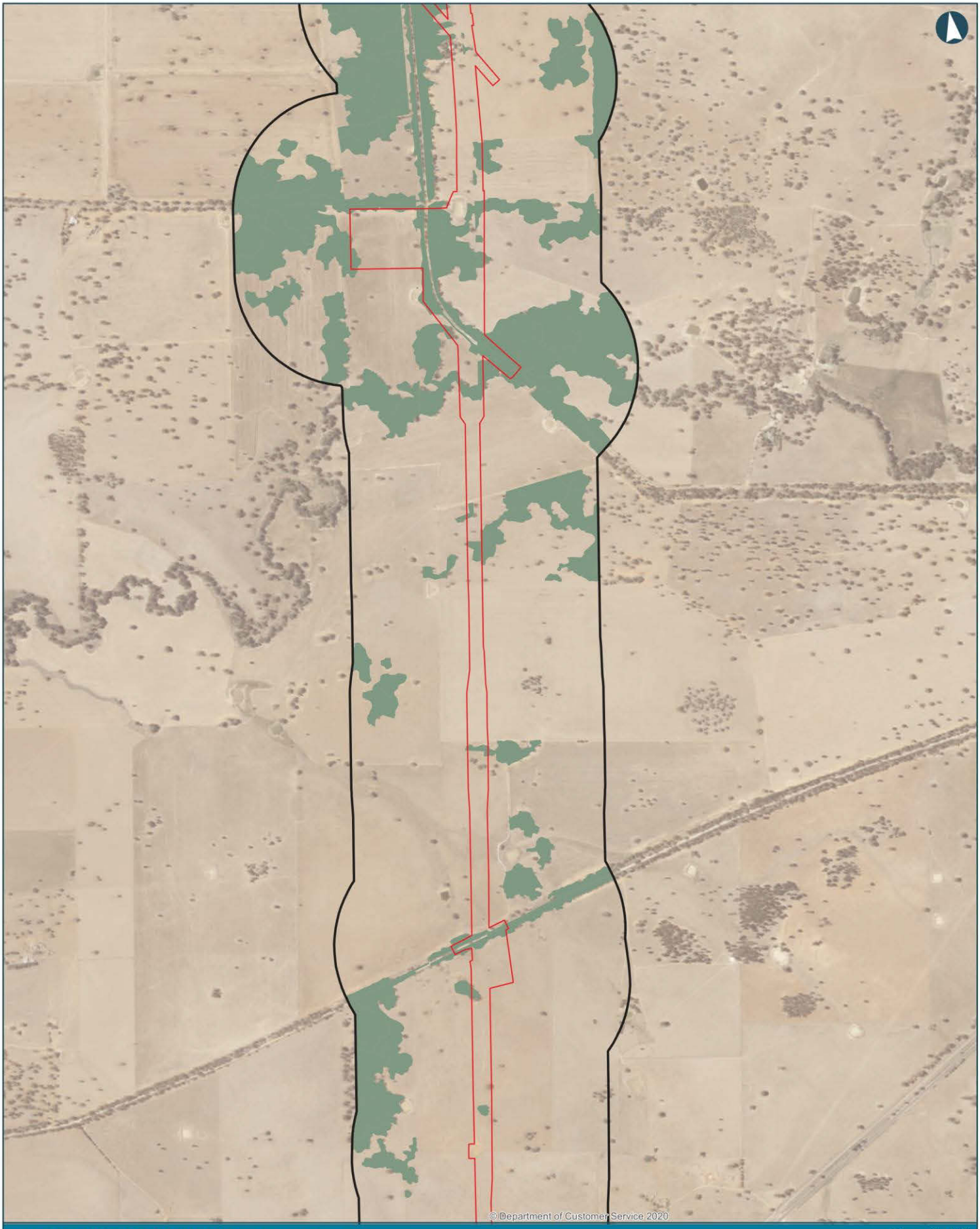
- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/17/2021
Author: IRDJV
Paper: A3
Scale: 1:15,000

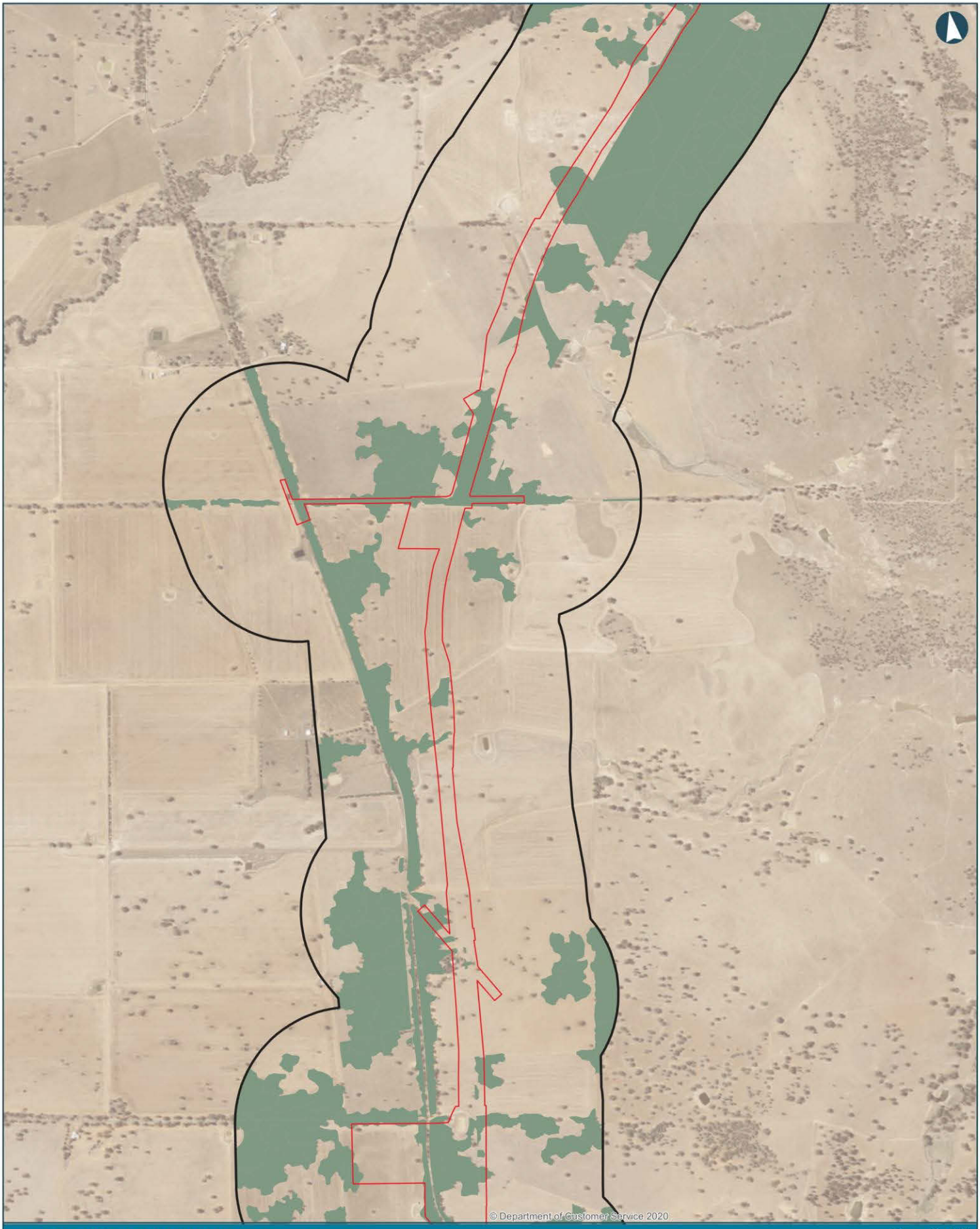
Data Sources: IRDJV, ARTC, LPI

- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/17/2021
Author: IRDJV
Paper: A3
Scale: 1:15,000

Data Sources: IRDJV, ARTC, LPI

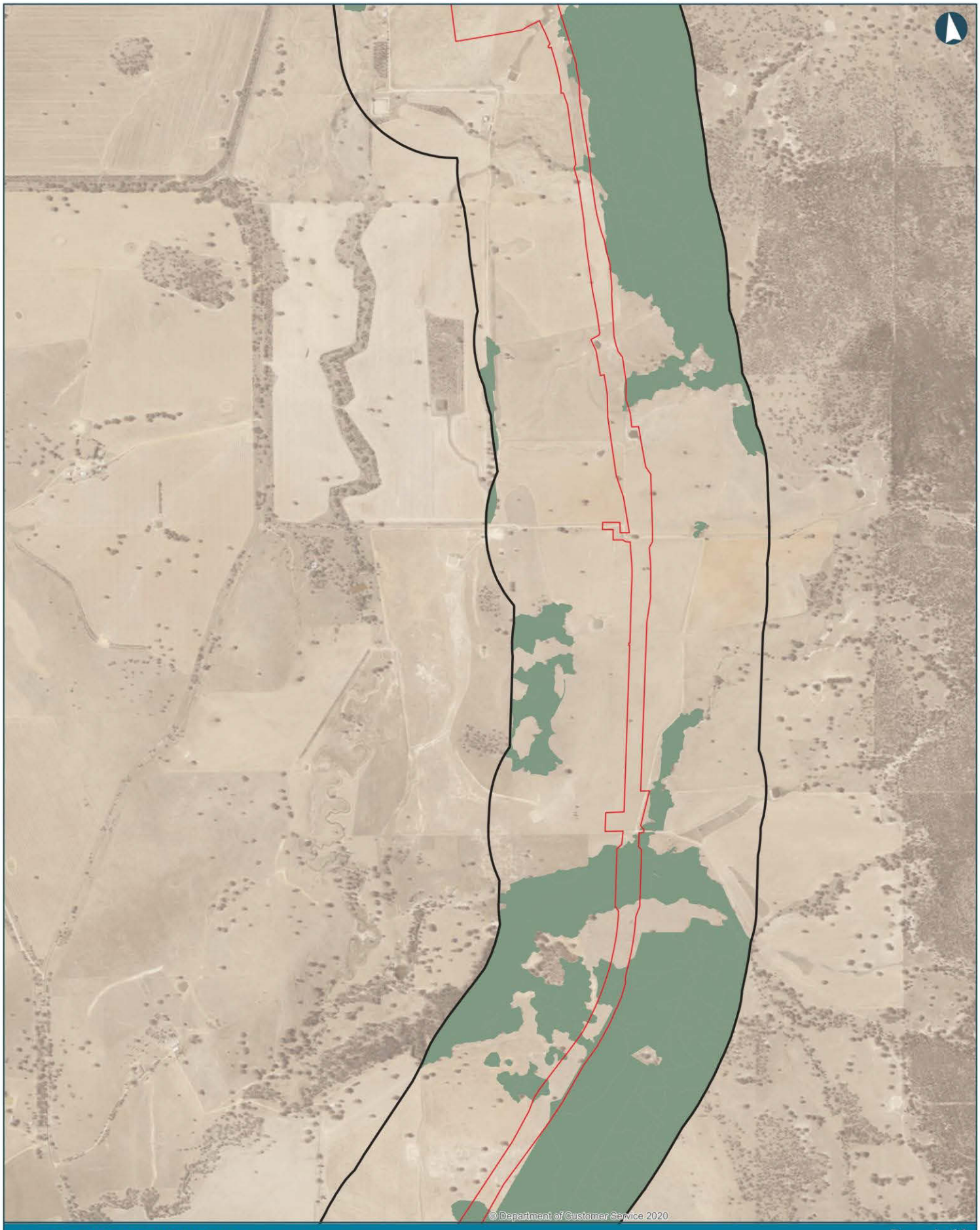
- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45
Kilometers

Coordinate System: GDA 1994 MGA Zone 55

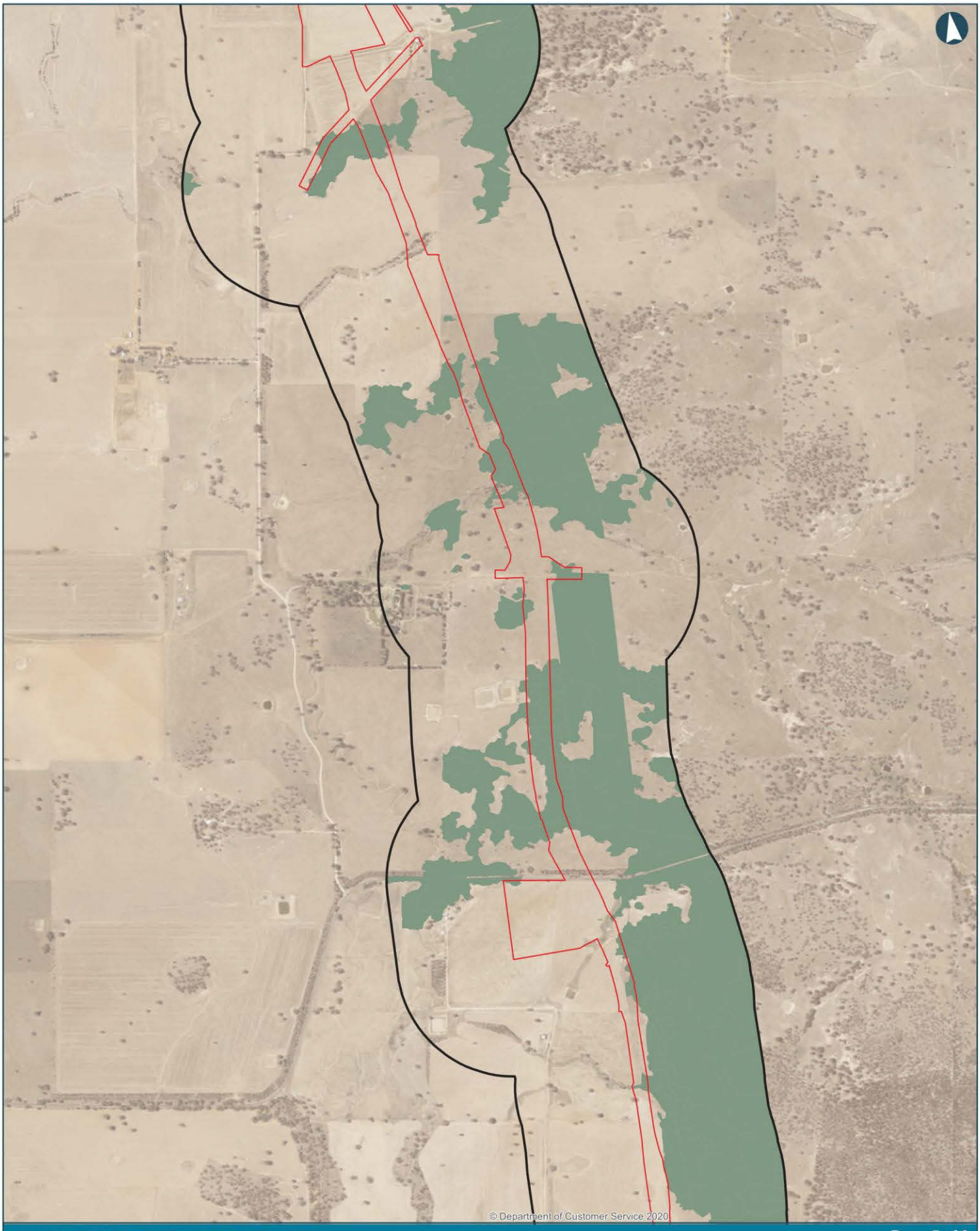
Date: 11/17/2021
Author: IRDJV
Paper: A3
Scale: 1:15,000
Data Sources: IRDJV, ARTC, LPI

Proposal Site
Assessment Area (500m Buffer)
Native Vegetation

INLAND RAIL
ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

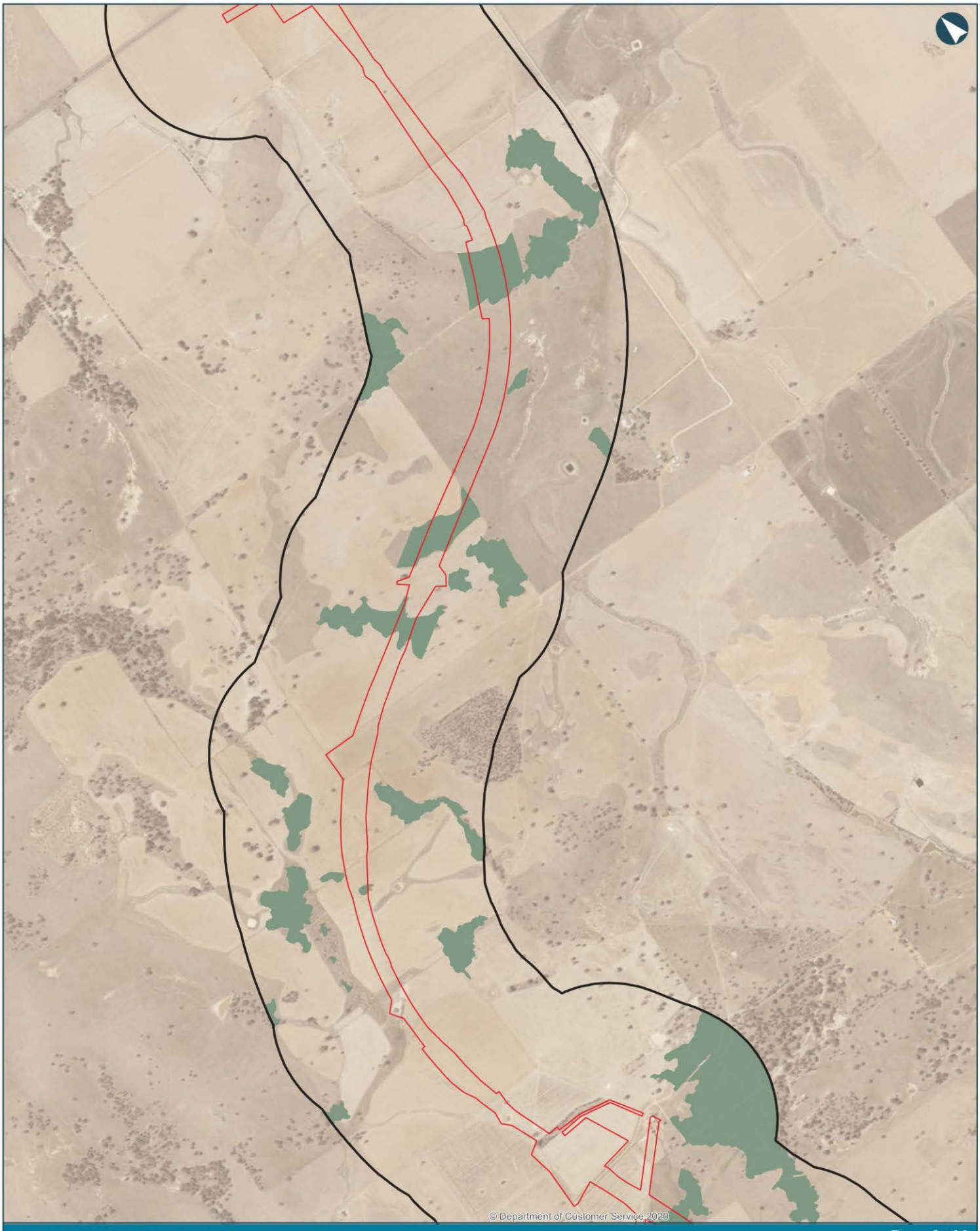
Date: 11/17/2021 Paper: A3
Author: IRDJV Scale: 1:15,000
Data Sources: IRDJV, ARTC, LPI

- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45
Kilometers

Coordinate System: GDA 1994 MGA Zone 55

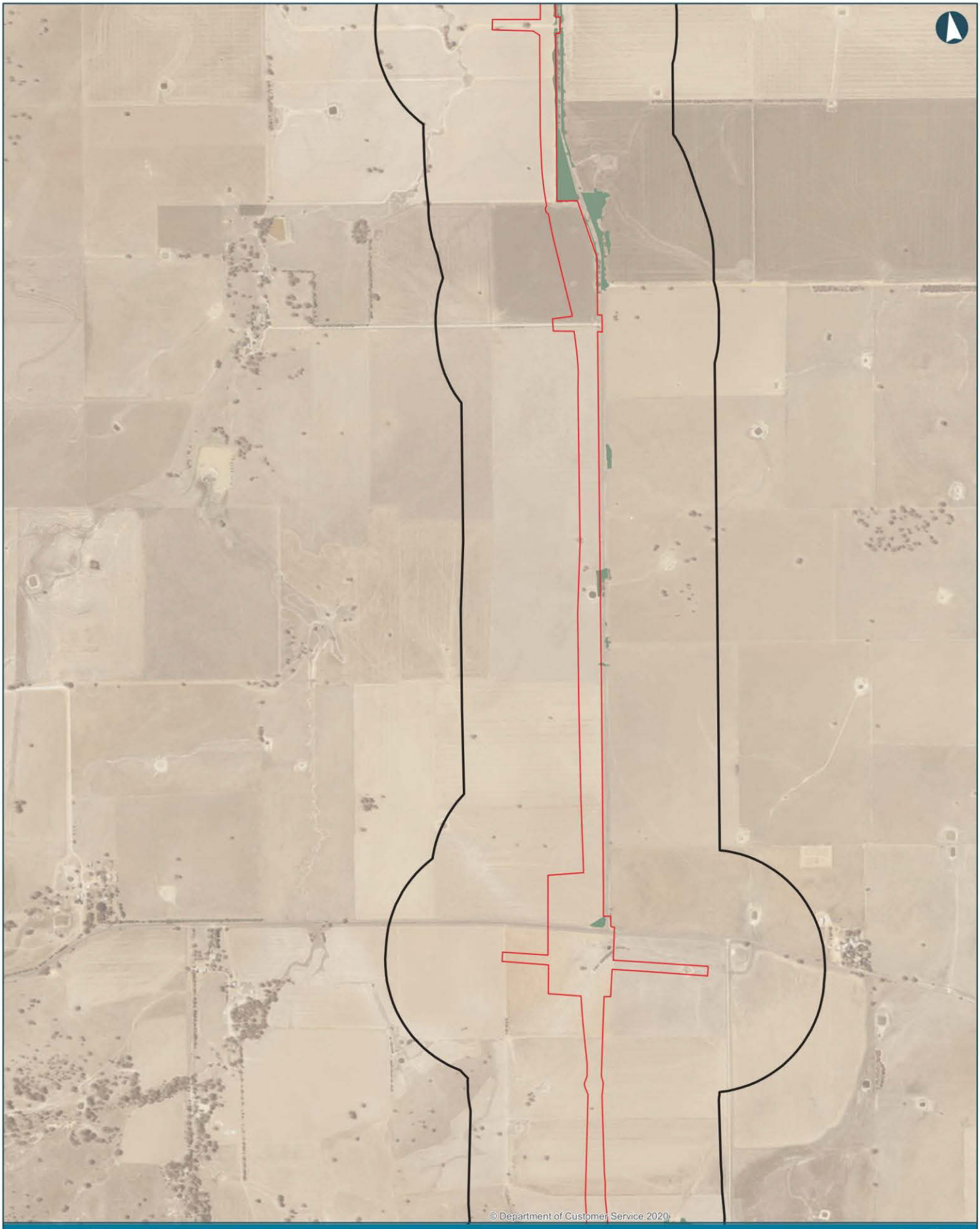
Date: 11/17/2021
Author: IRDJV
Paper: A3
Scale: 1:15,000
Data Sources: IRDJV, ARTC, LPI

- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/17/2021
Author: IRDJV
Paper: A3
Scale: 1:15,000

Data Sources: IRDJV, ARTC, LPI

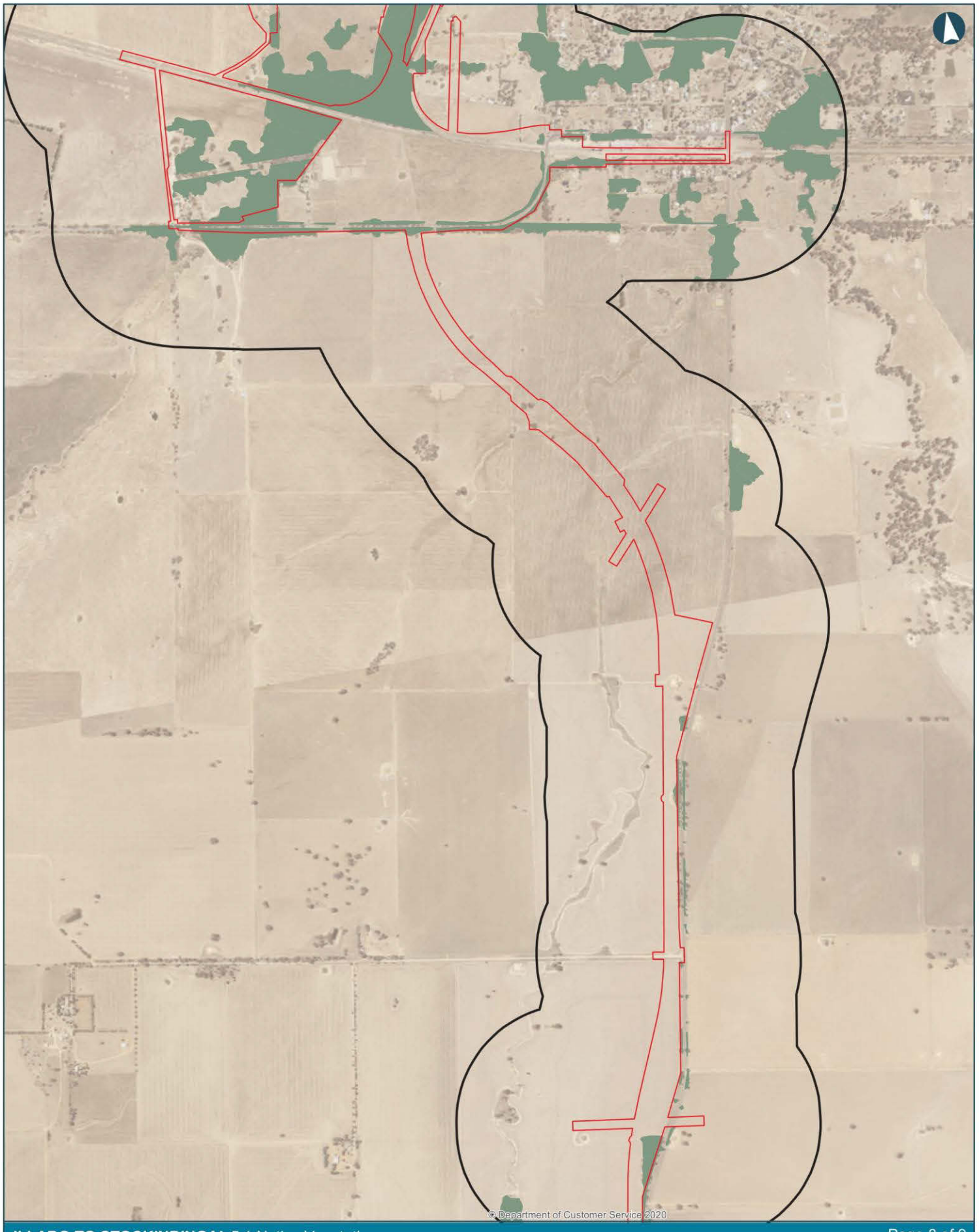
- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

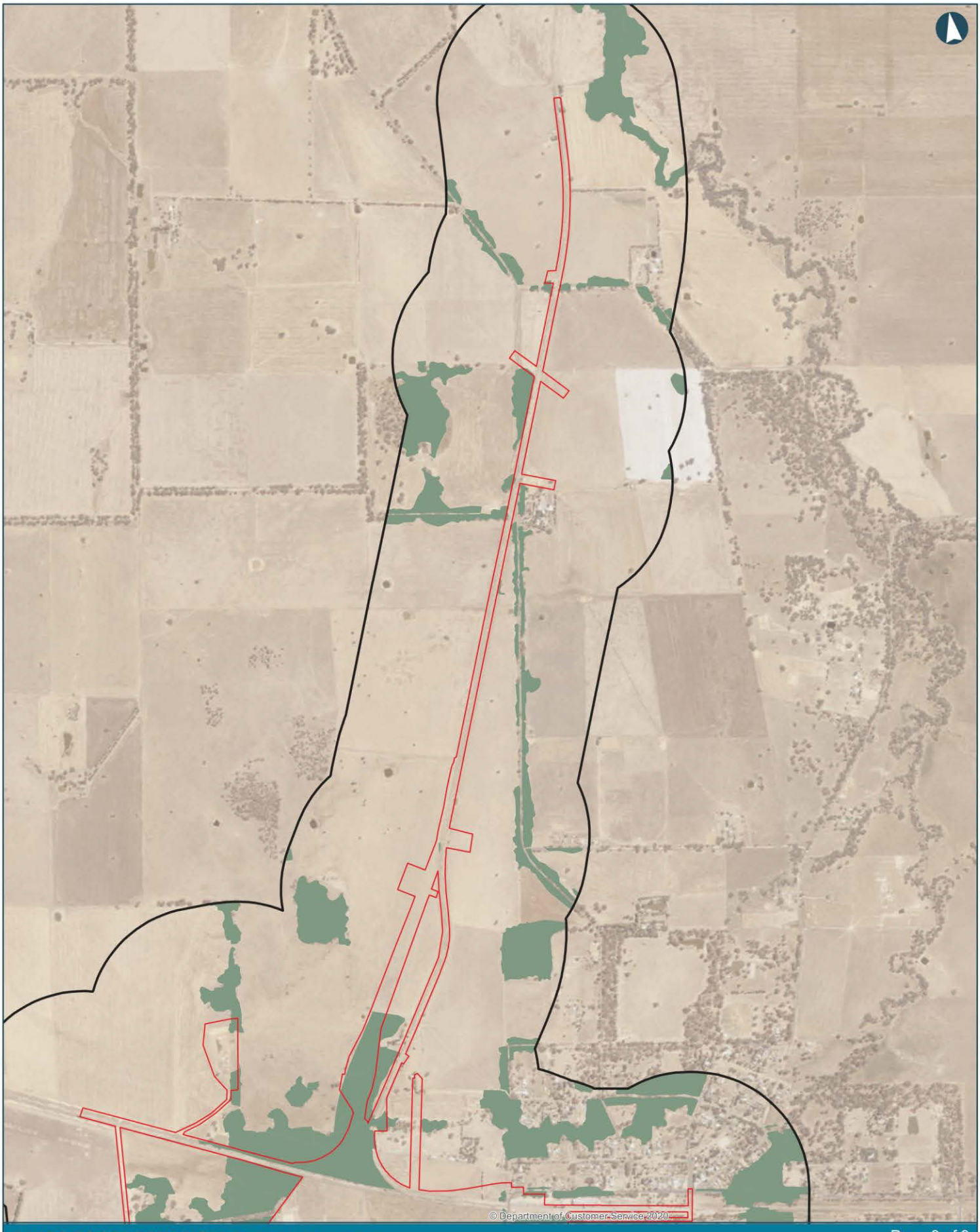
Date: 11/17/2021 Paper: A3
Author: IRDJV Scale: 1:15,000
Data Sources: IRDJV, ARTC, LPI

- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL 5.1 Native Vegetation

0 0.15 0.3 0.45 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

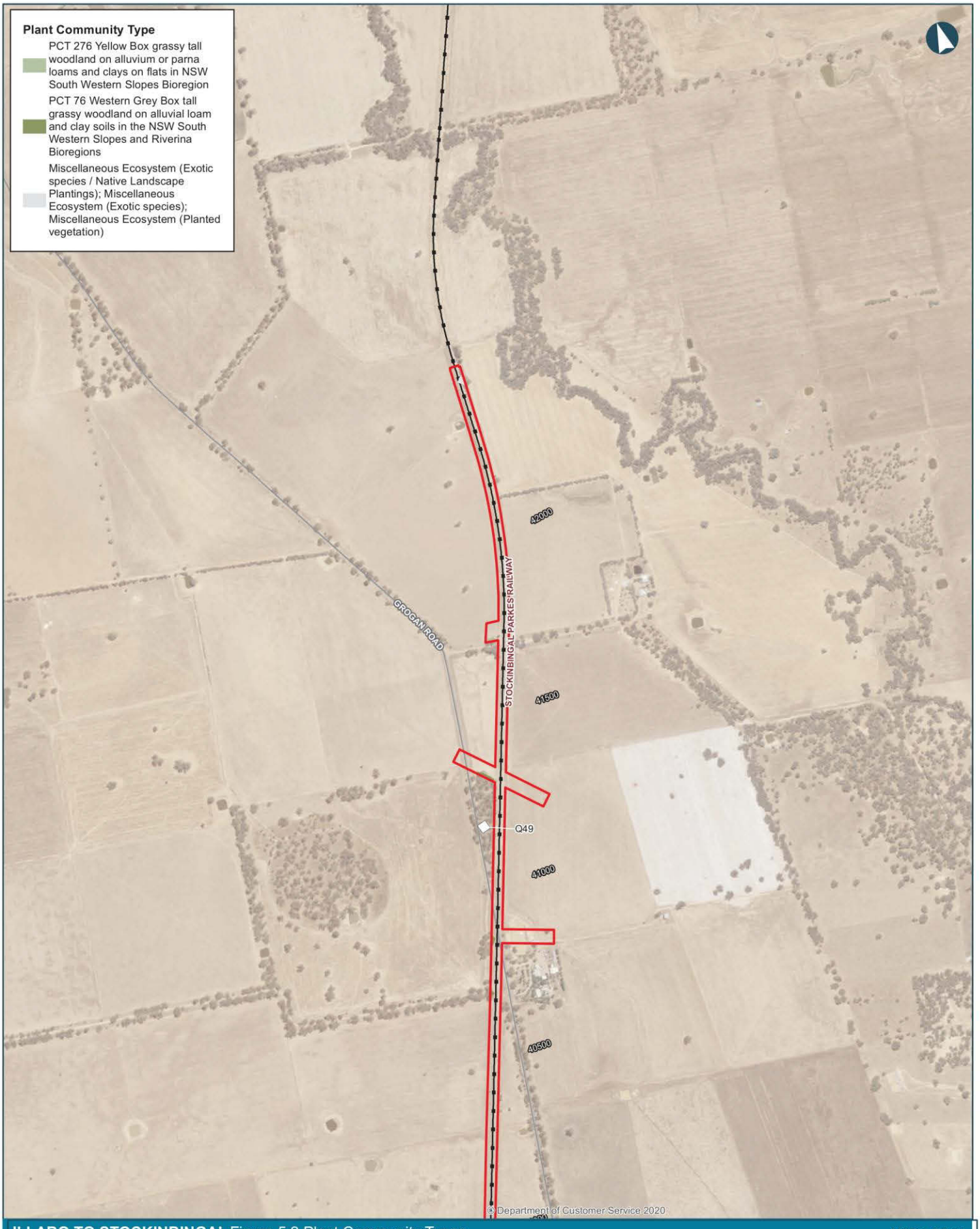
Date: 11/17/2021 Paper: A3
Author: IRDJV Scale: 1:15,000
Data Sources: IRDJV, ARTC, LPI

- Proposal Site
- Assessment Area (500m Buffer)
- Native Vegetation

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_1NativeVeg_r1v3.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

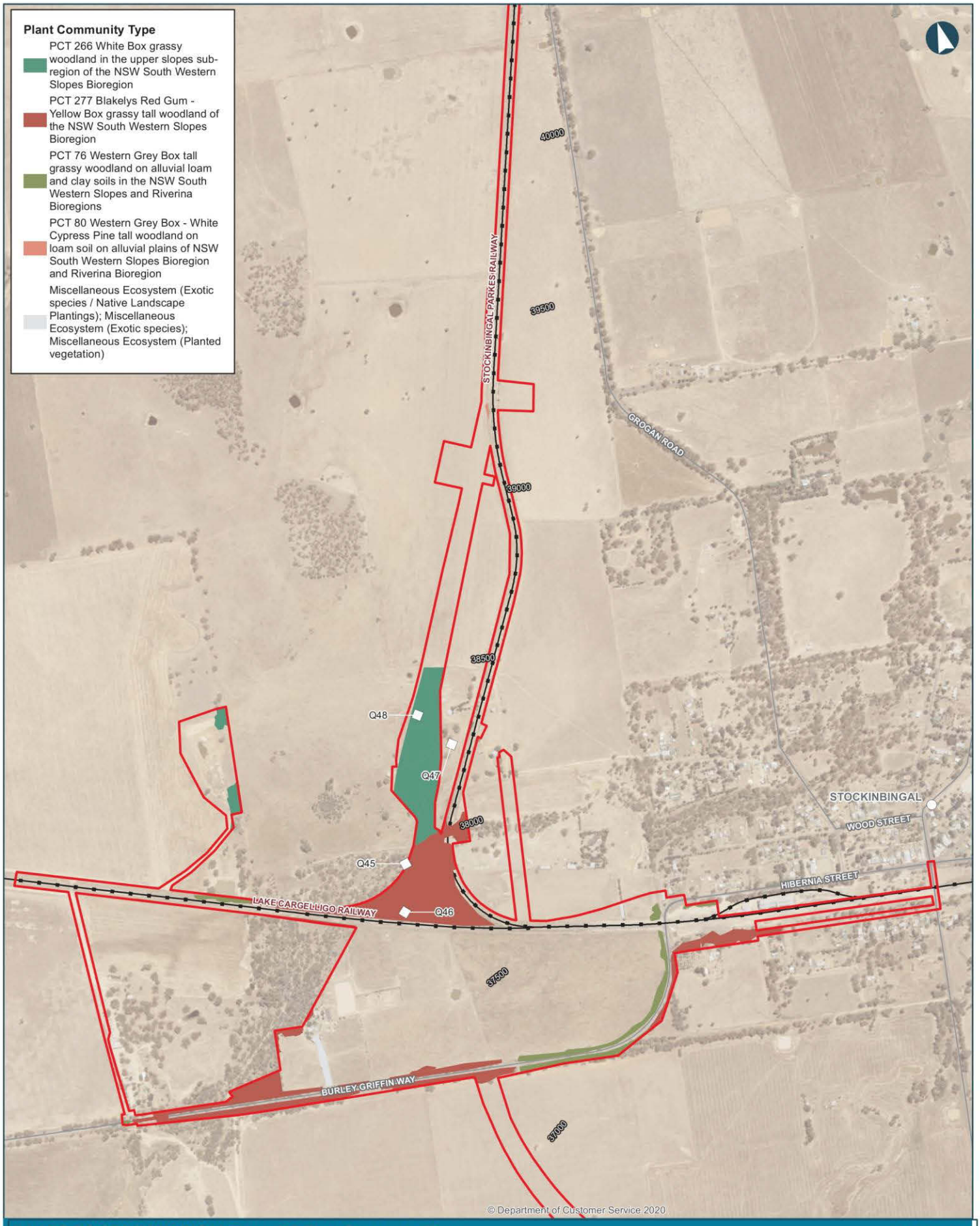
Proposal Site

Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

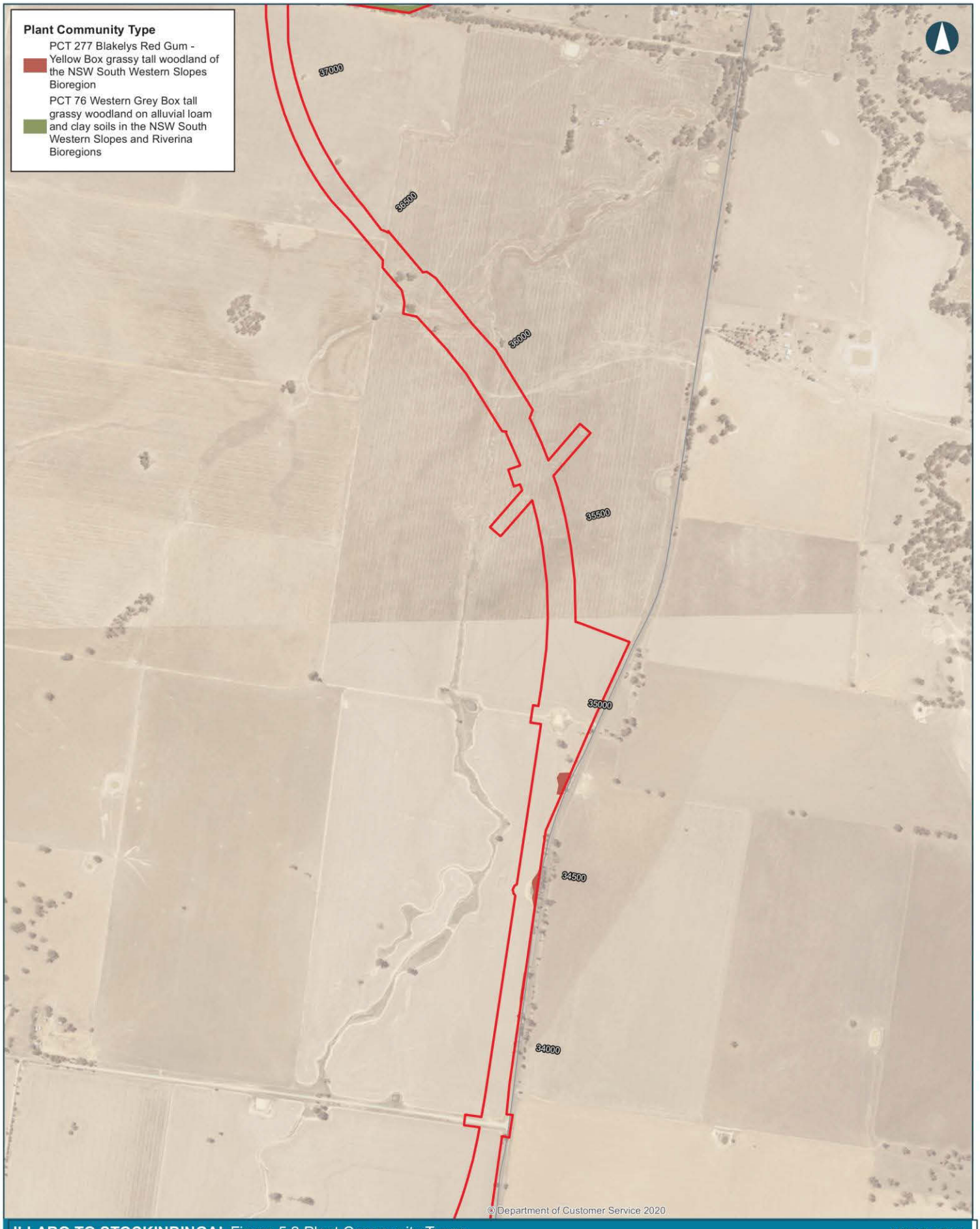
Proposal Site

Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_IZS\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

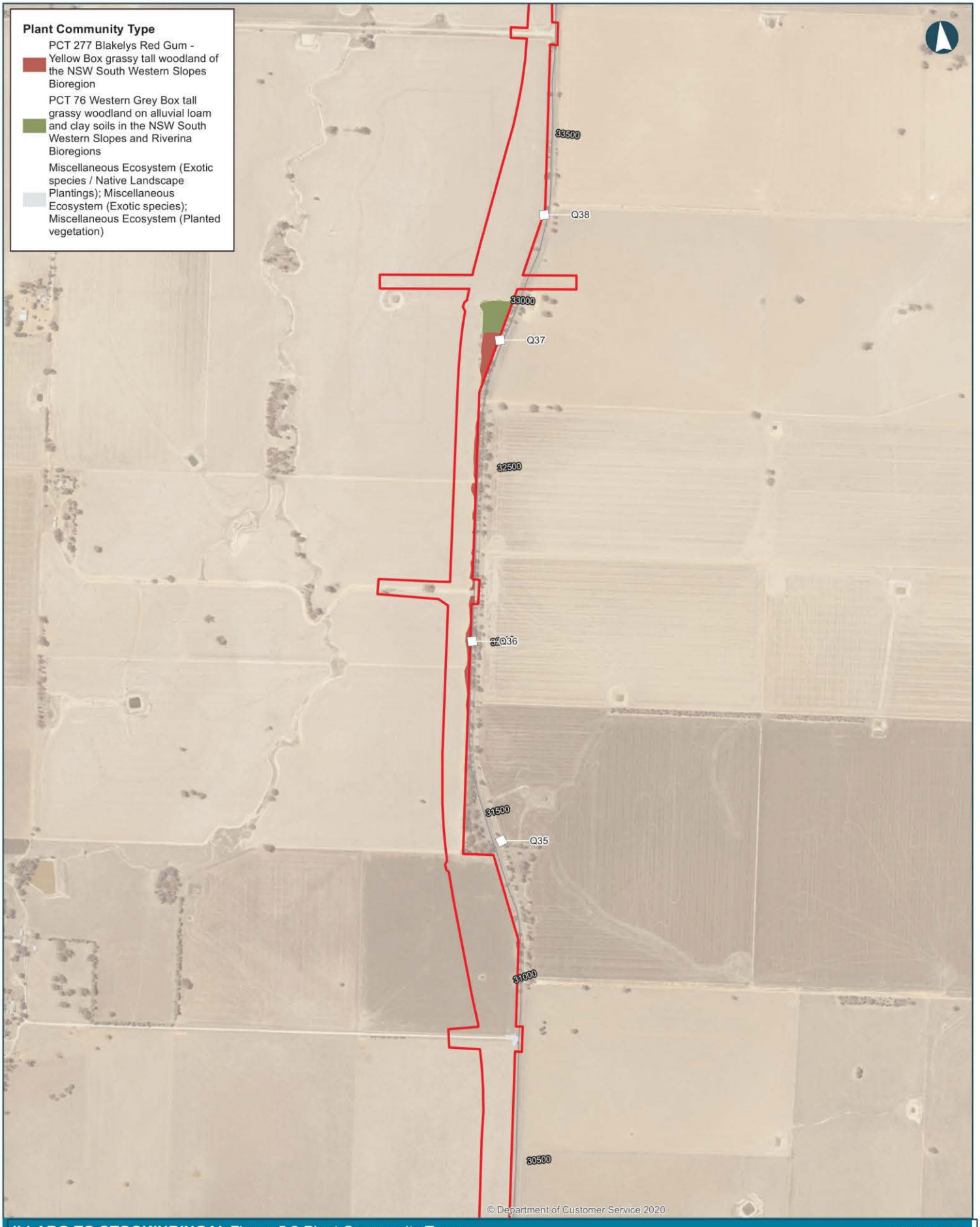
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

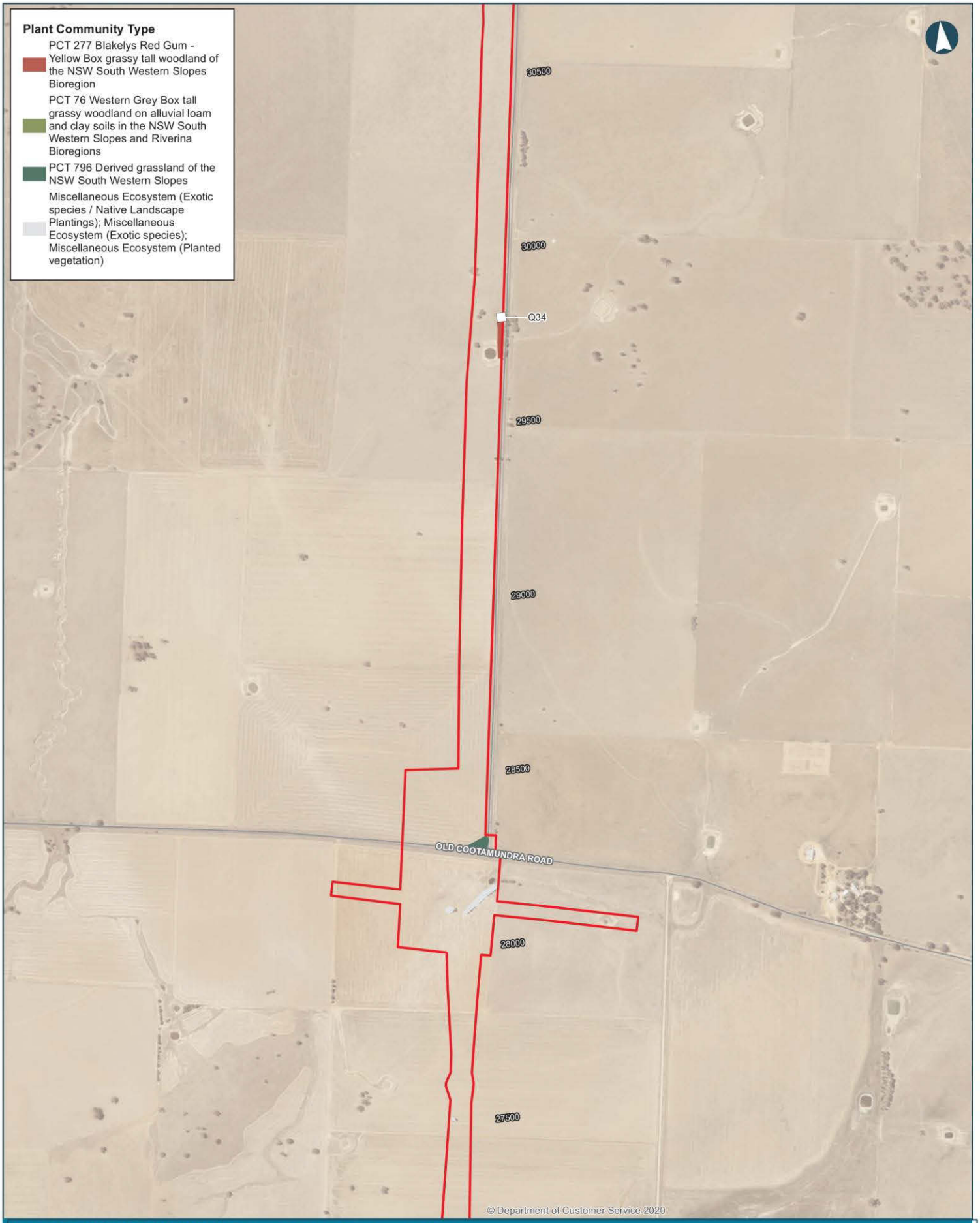
Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

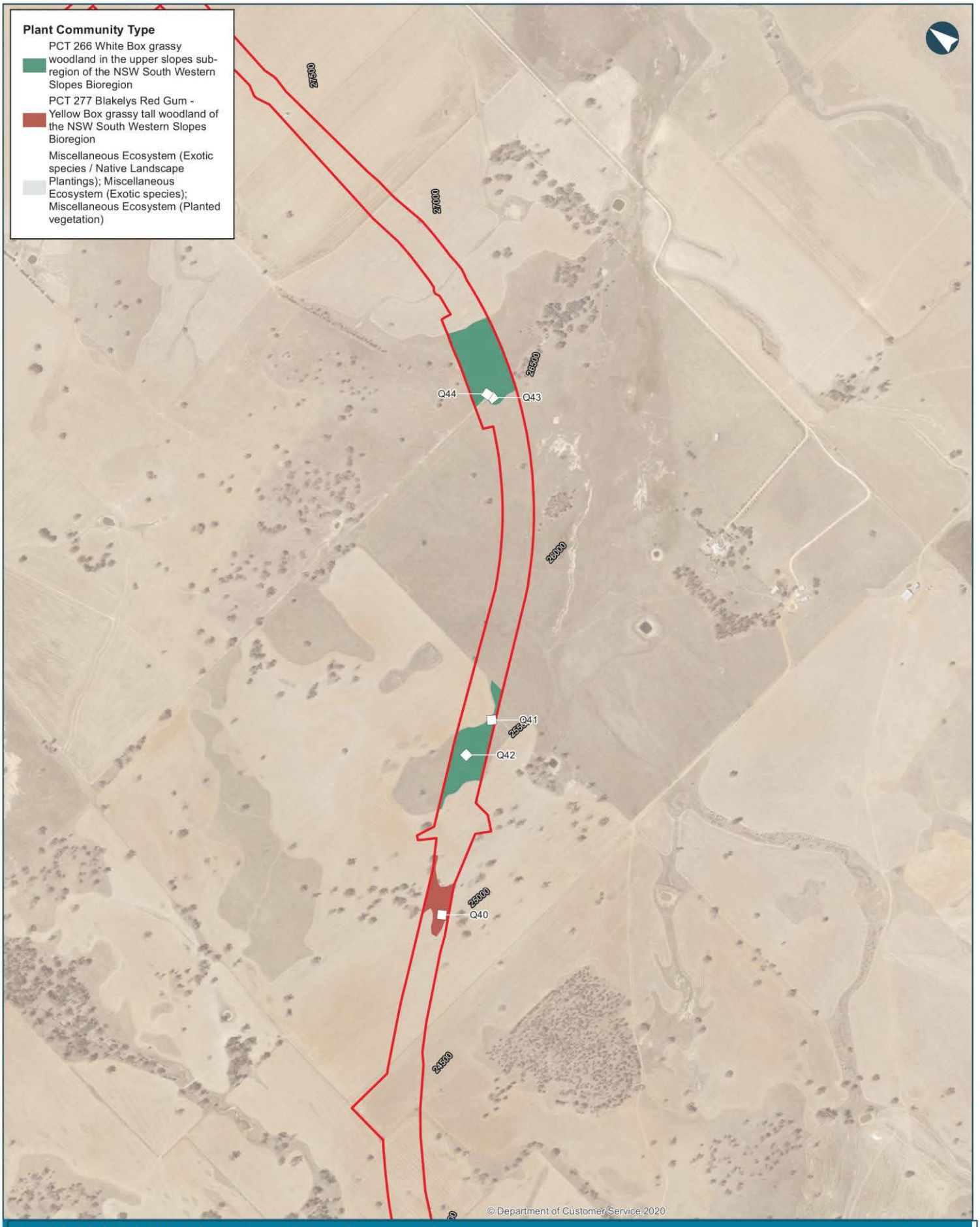
Proposal Site

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

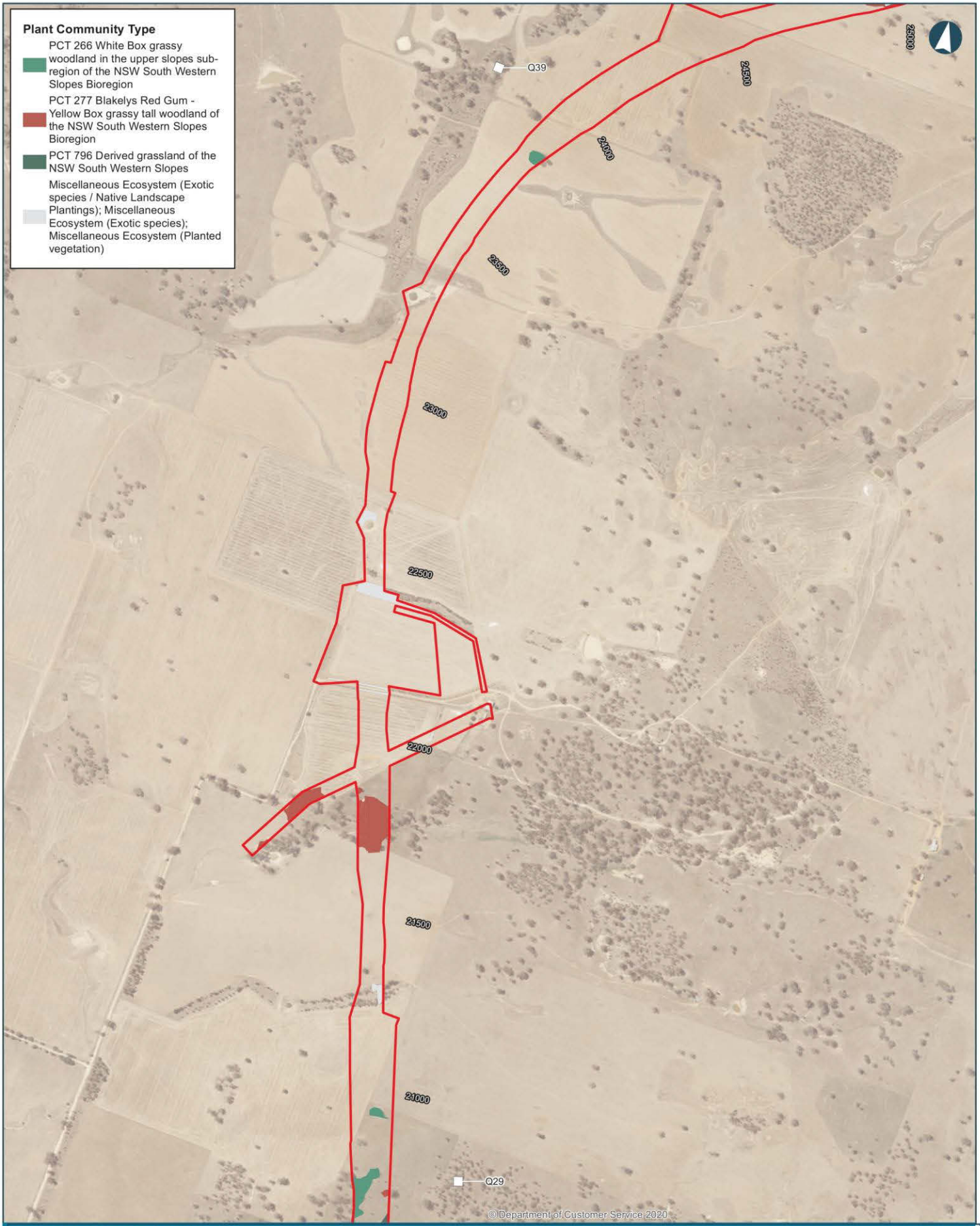
Proposal Site

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

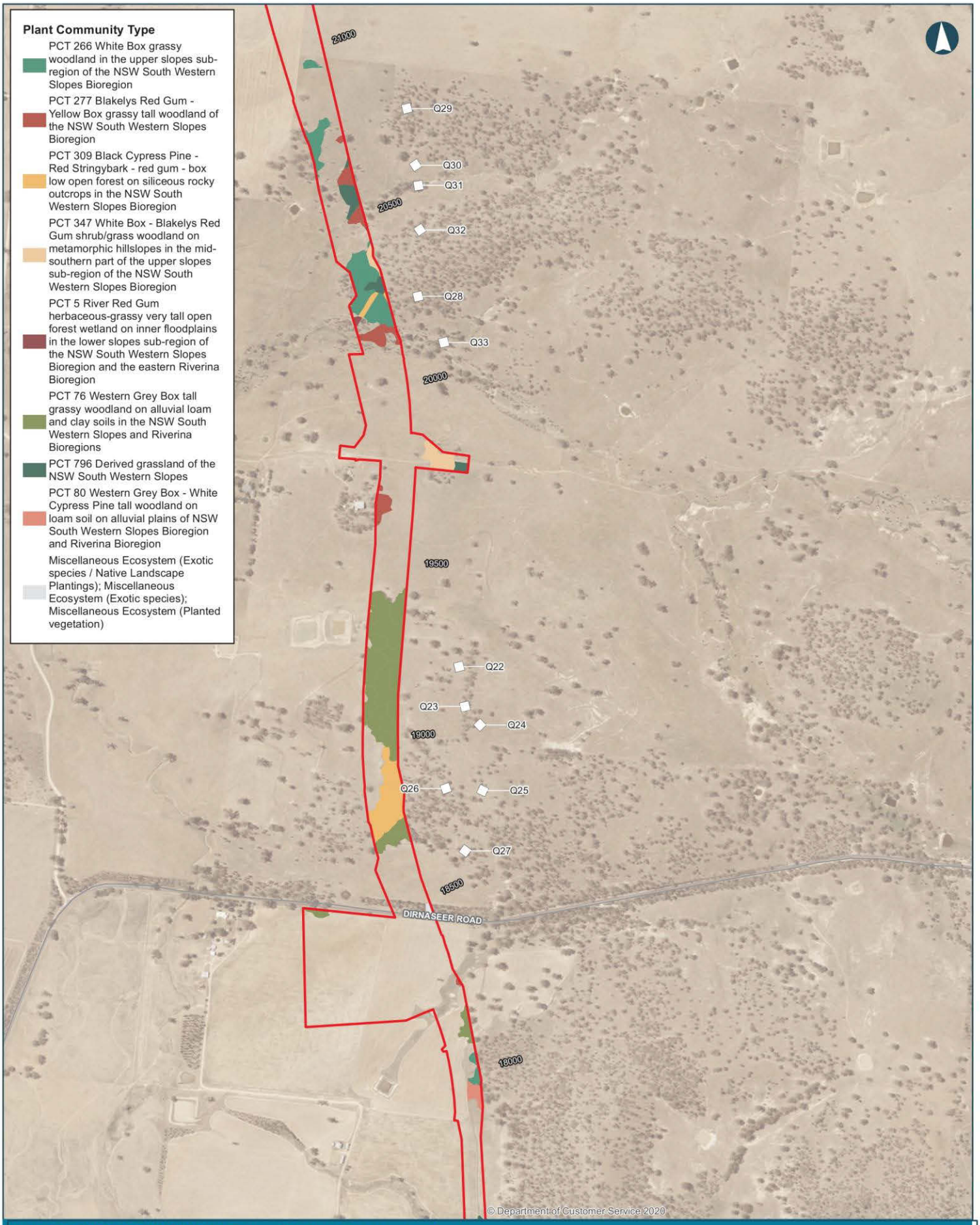
Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

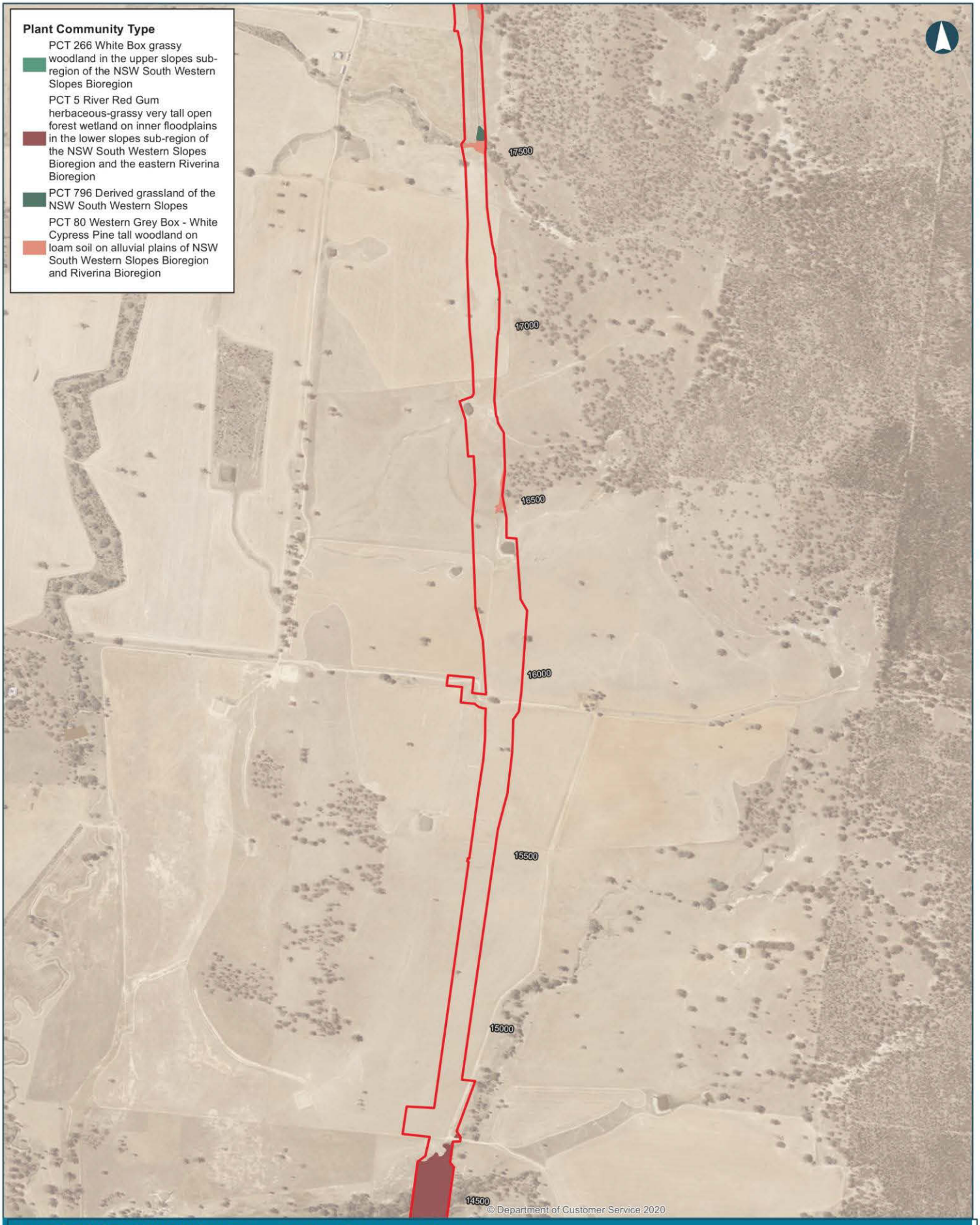
Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

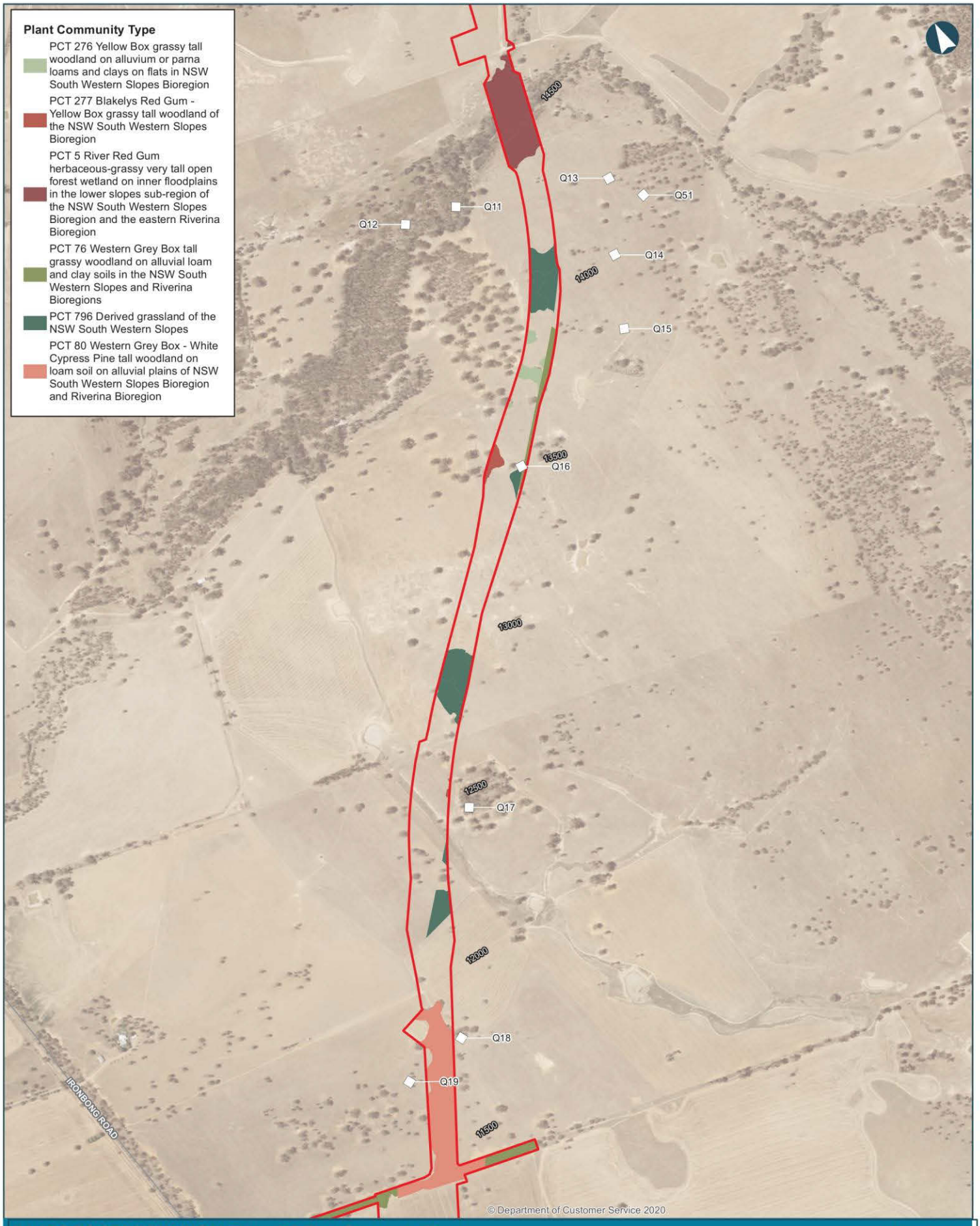
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

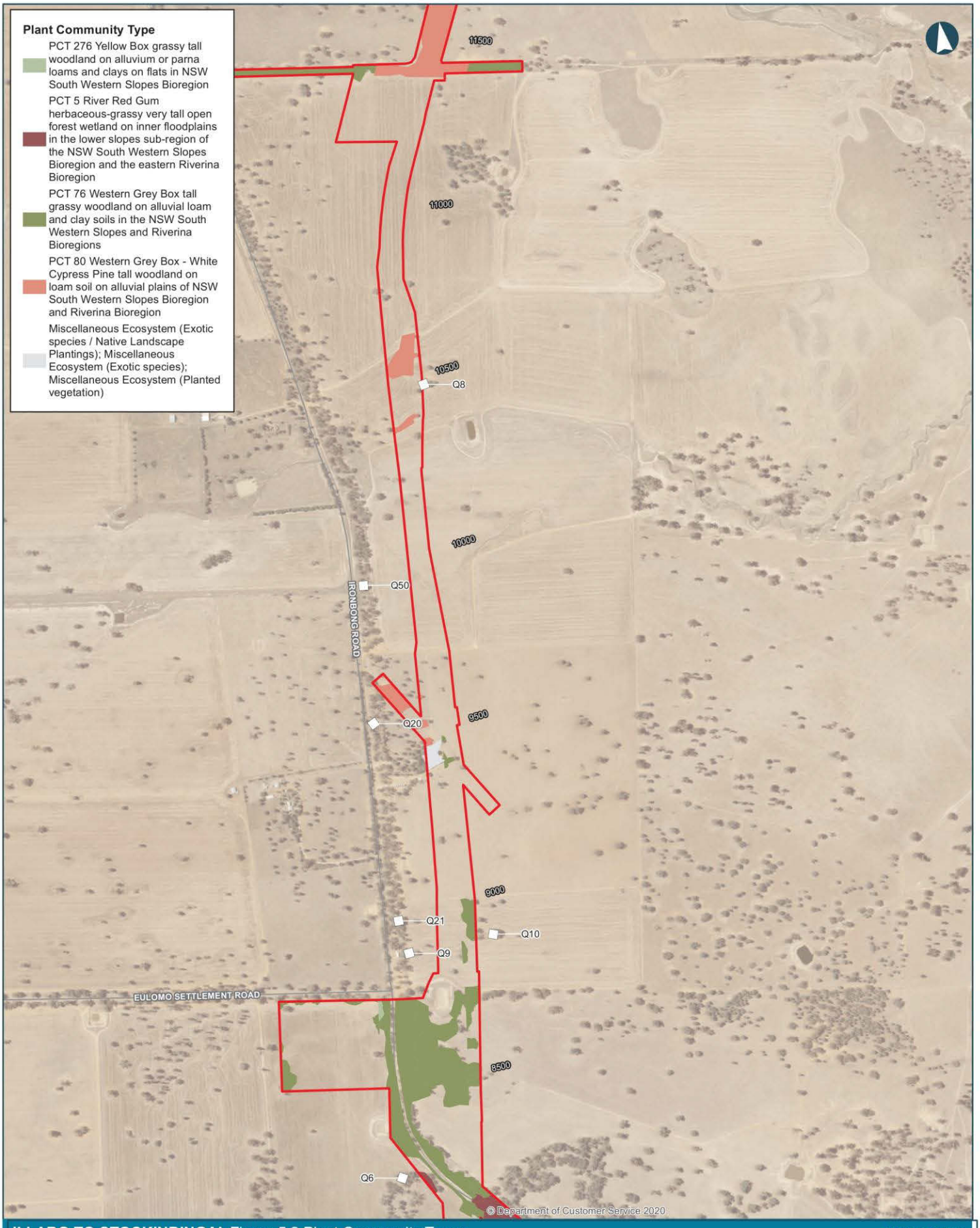
Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

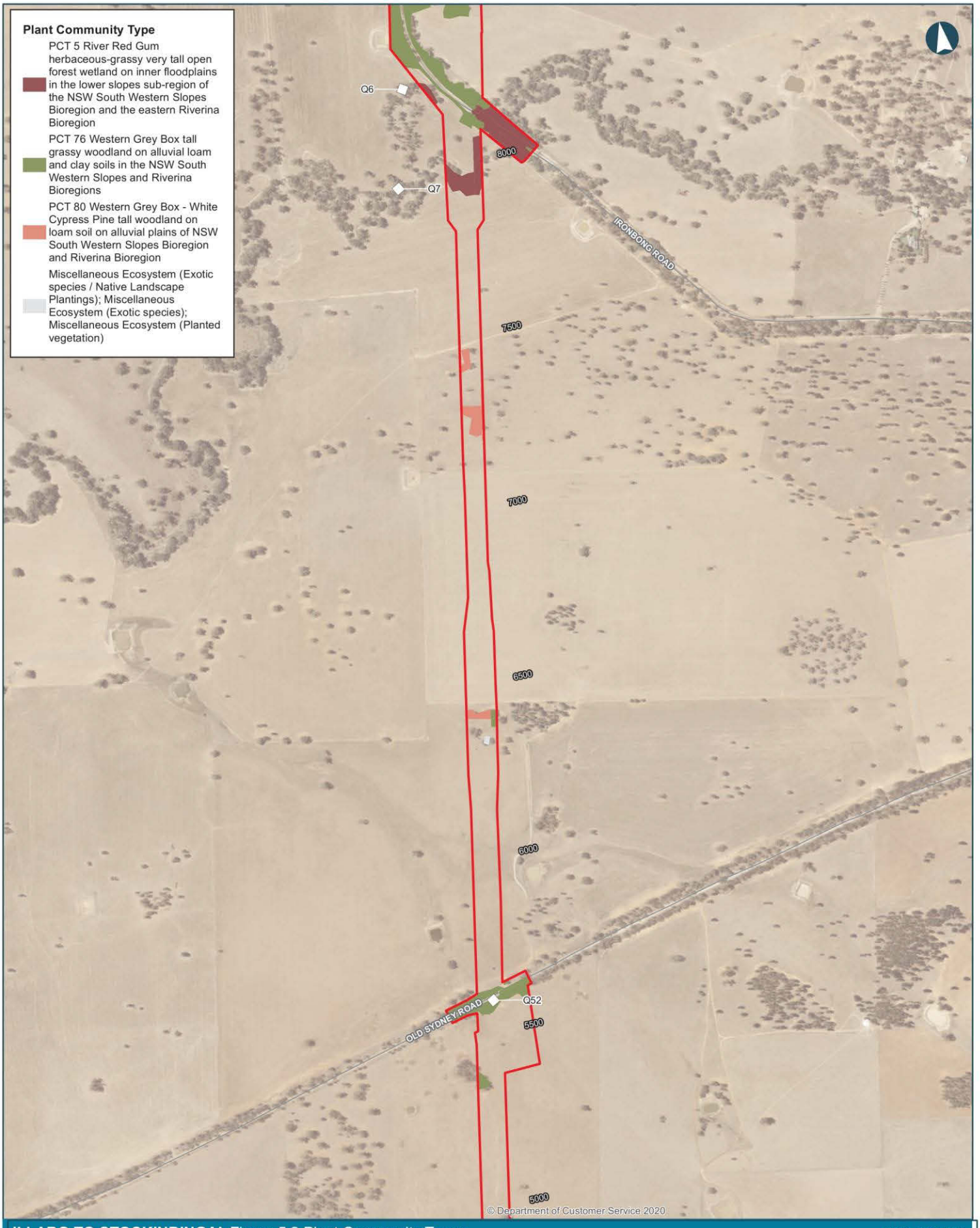
Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

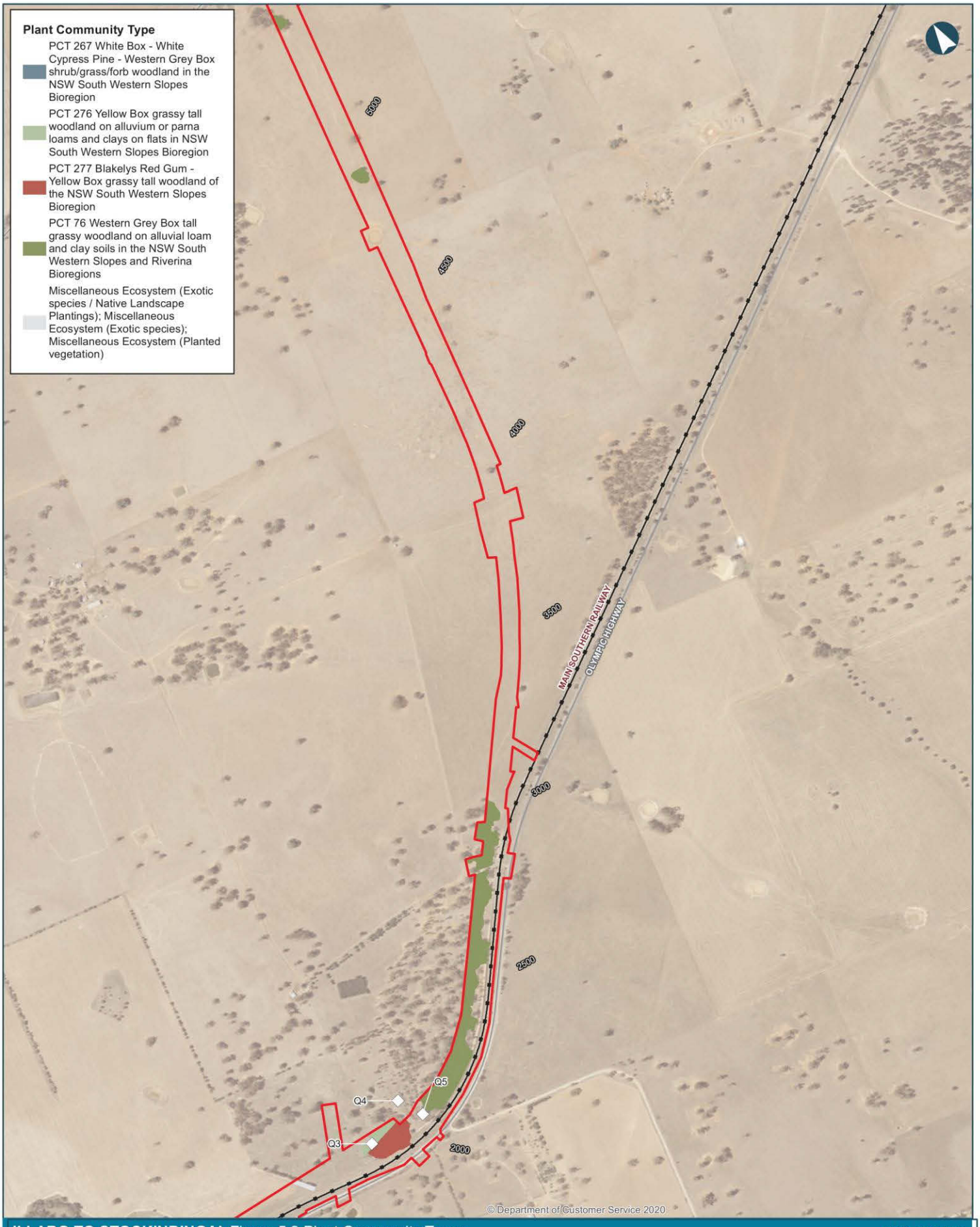
Vegetation integrity plot locations

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

Proposal Site

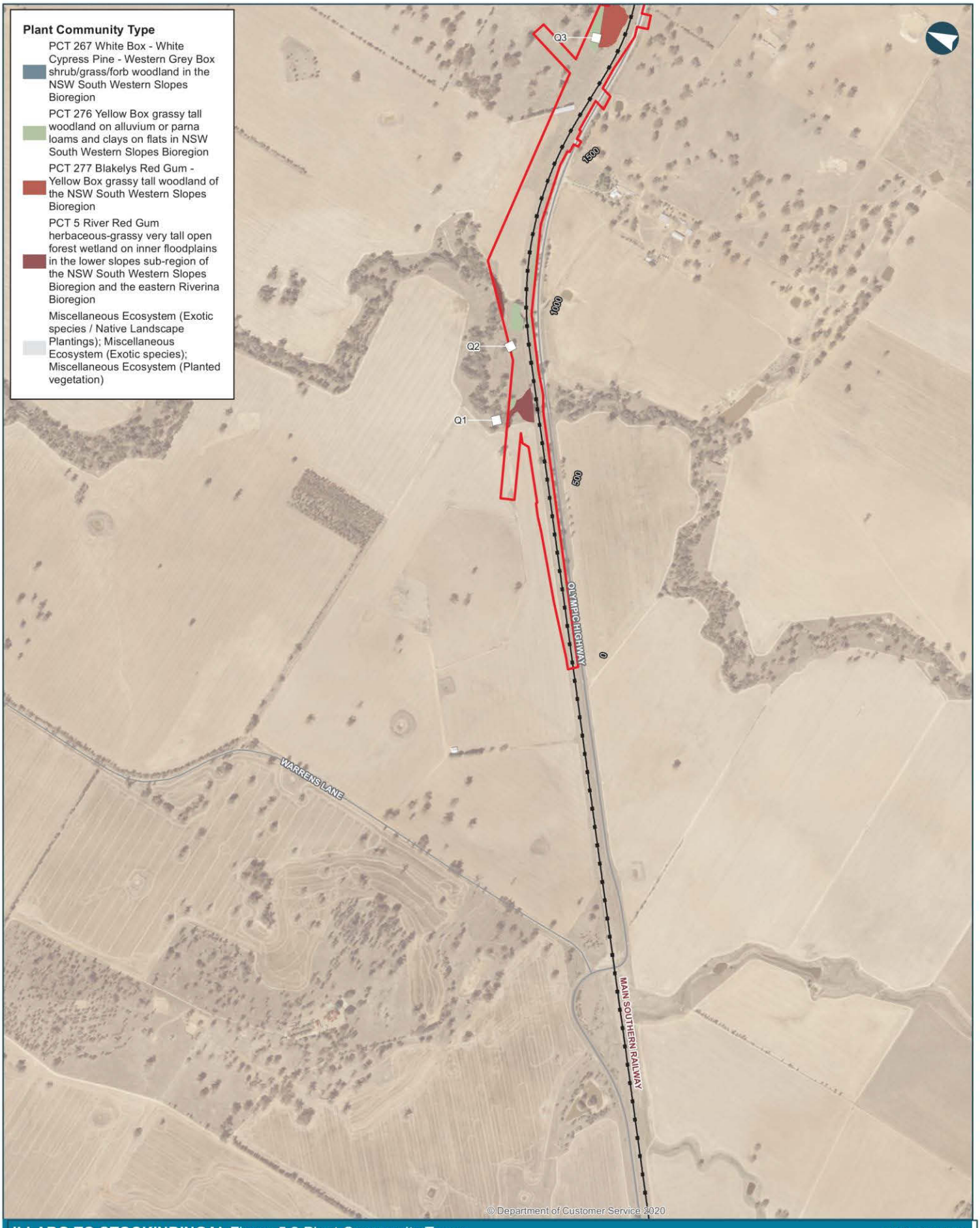
Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.2 Plant Community Types

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)

Vegetation integrity plot locations

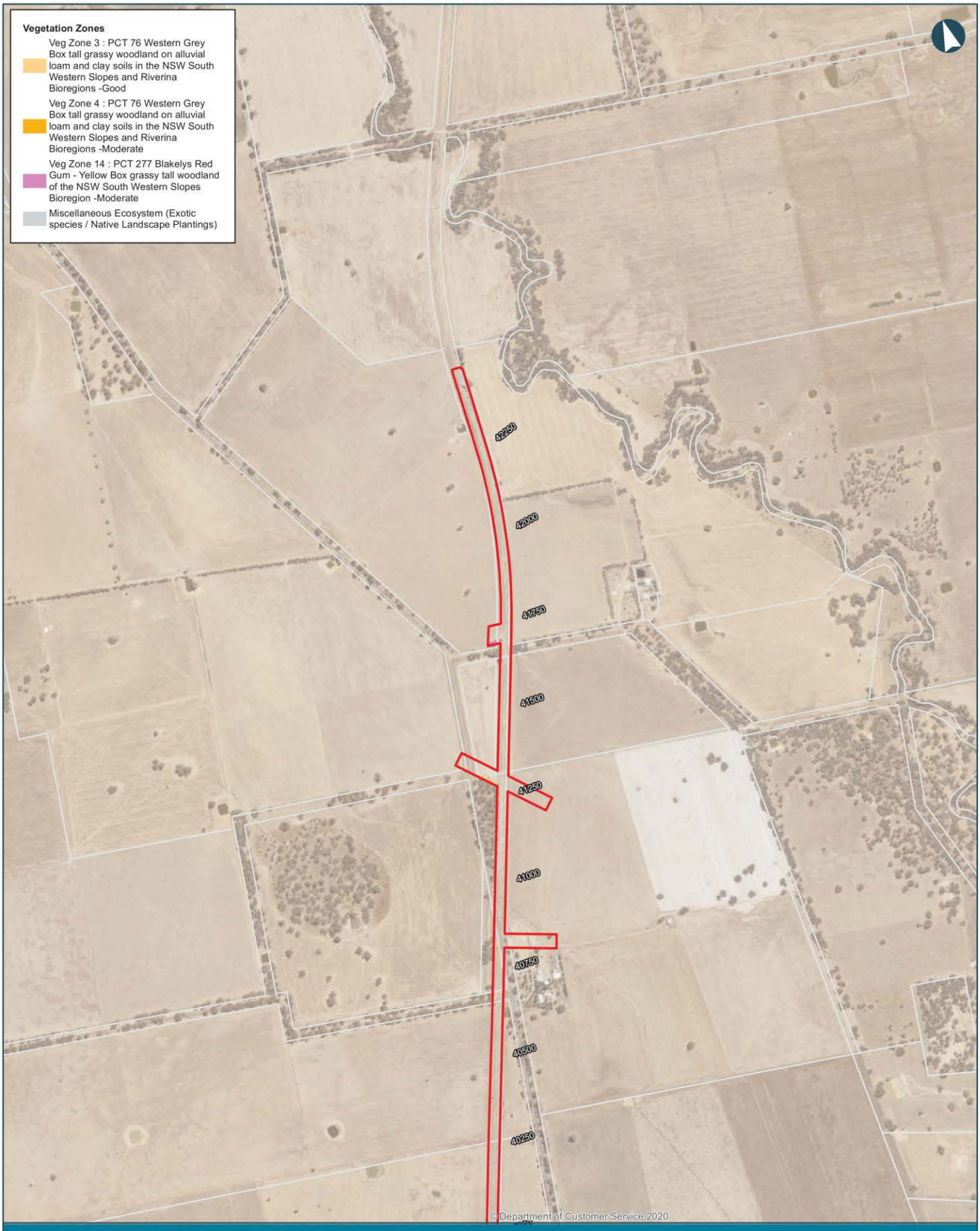
Proposal Site

Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_2PCTs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

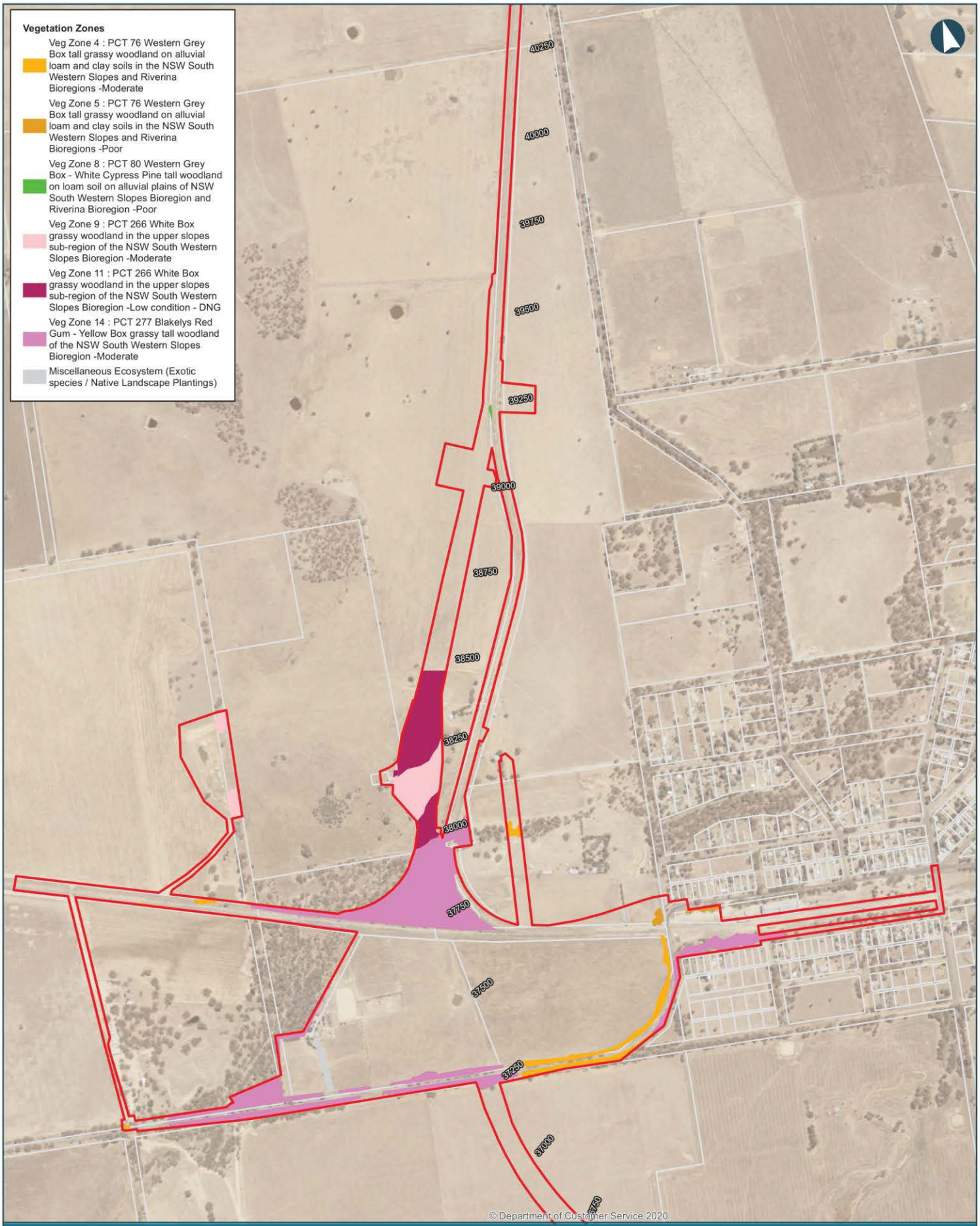
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd

ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

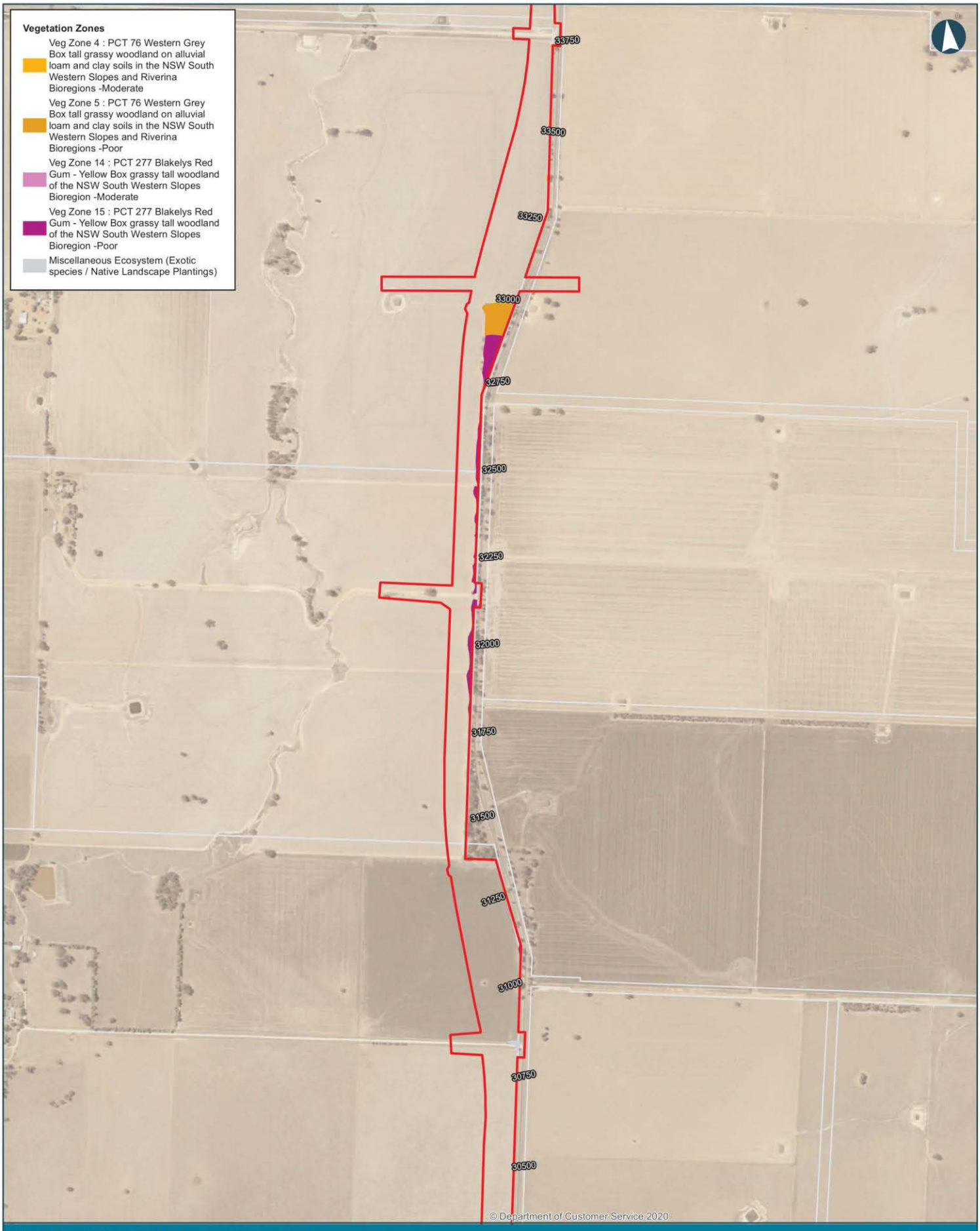
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

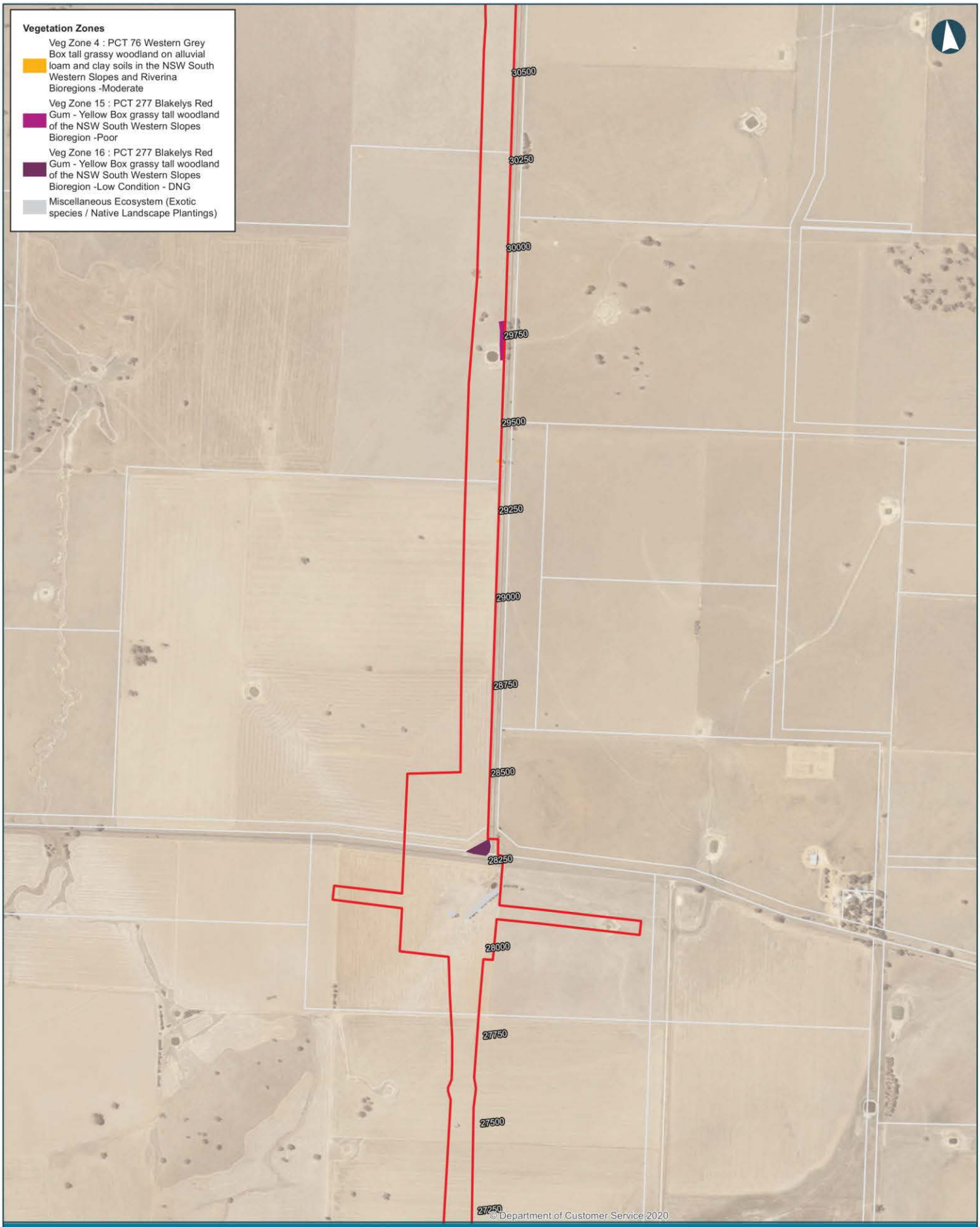
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

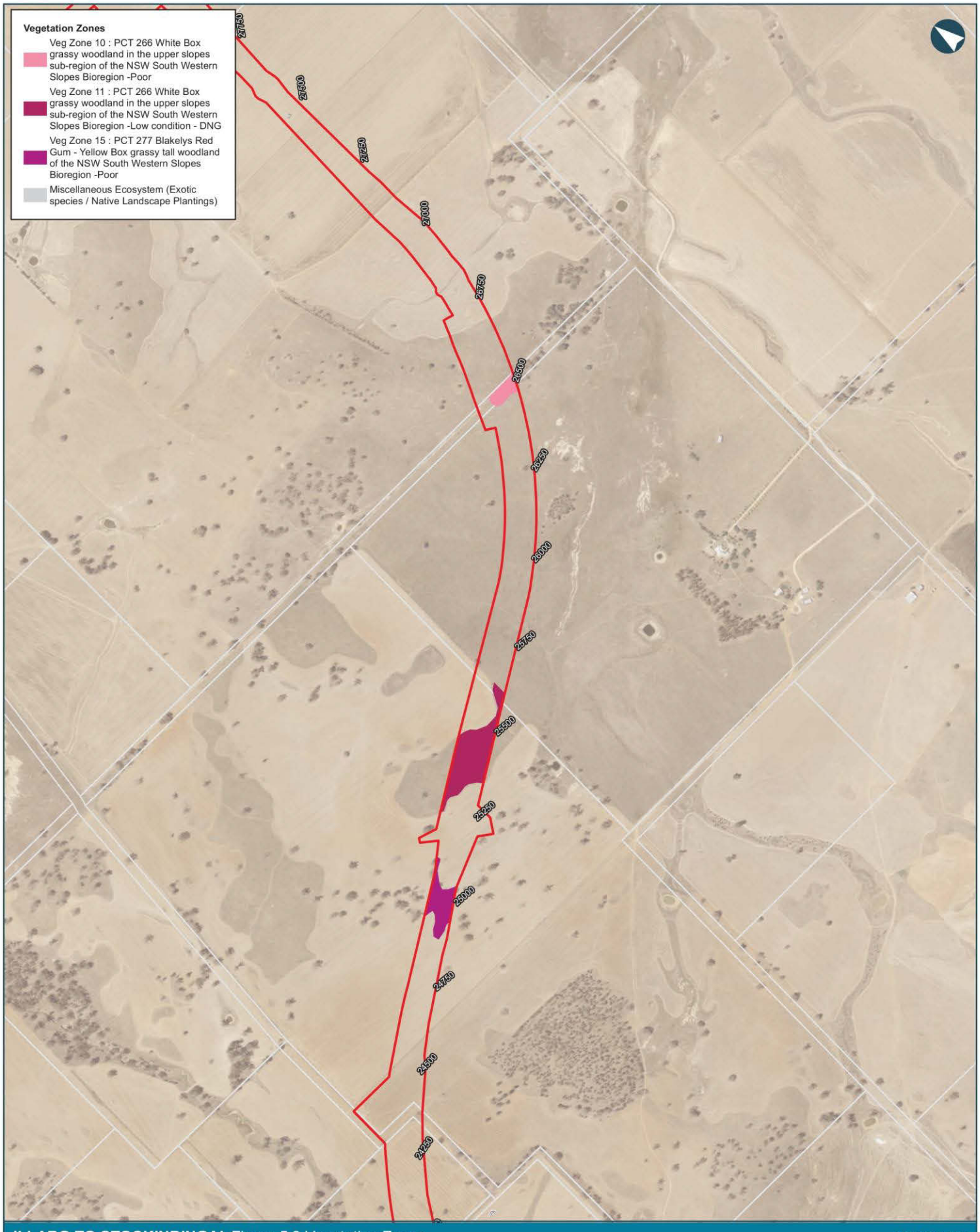
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

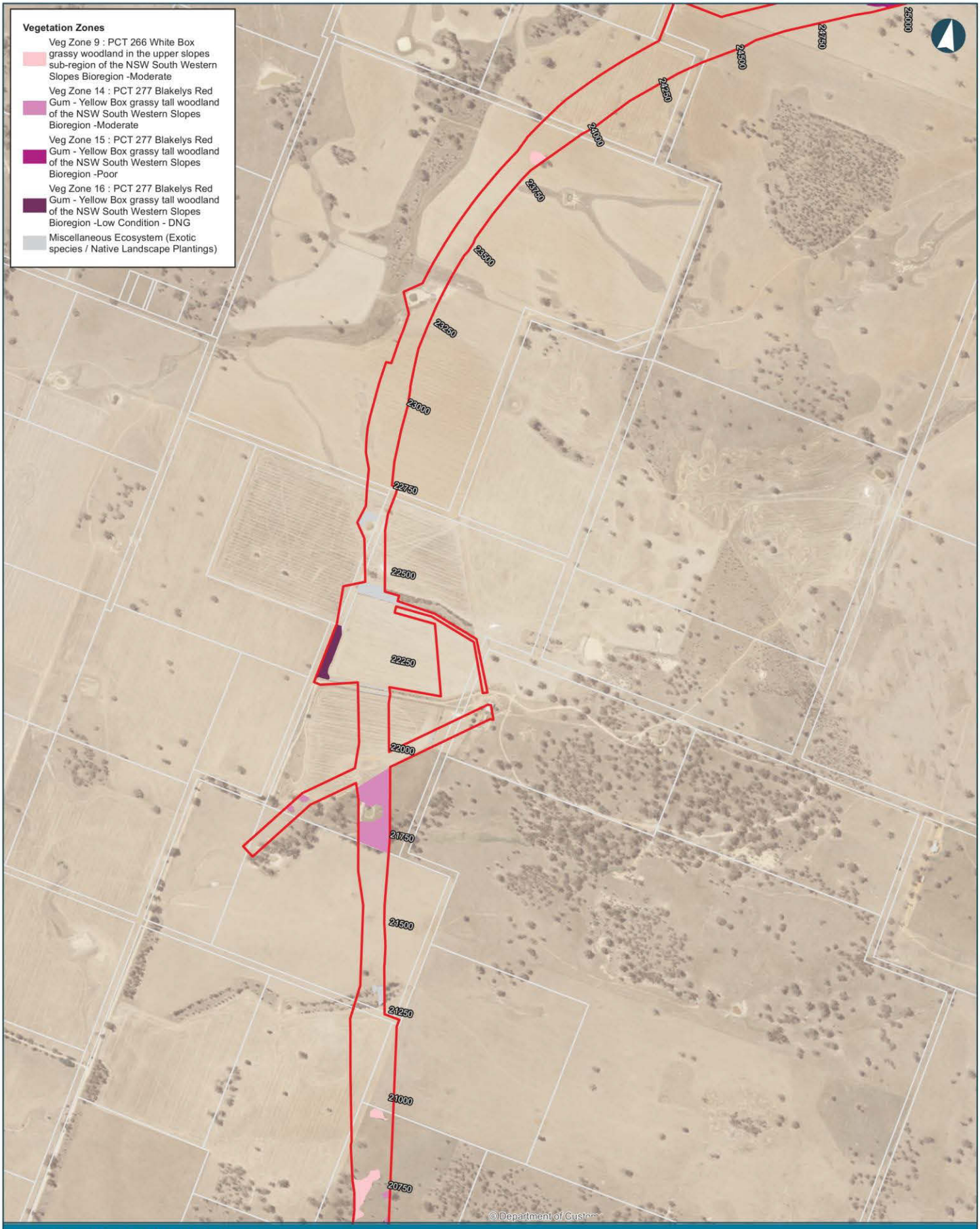
Cadastral Boundary

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

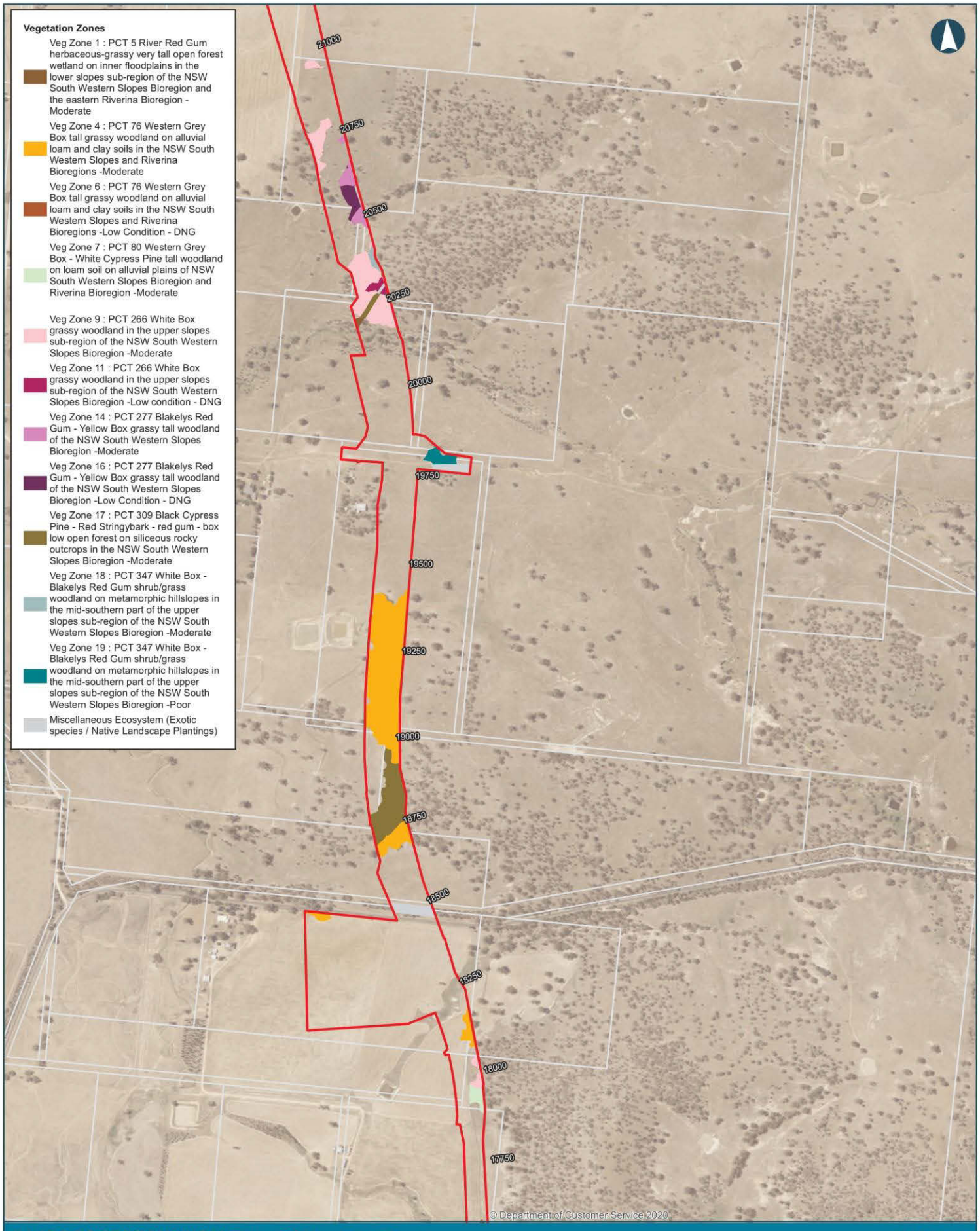
Cadastral Boundary

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

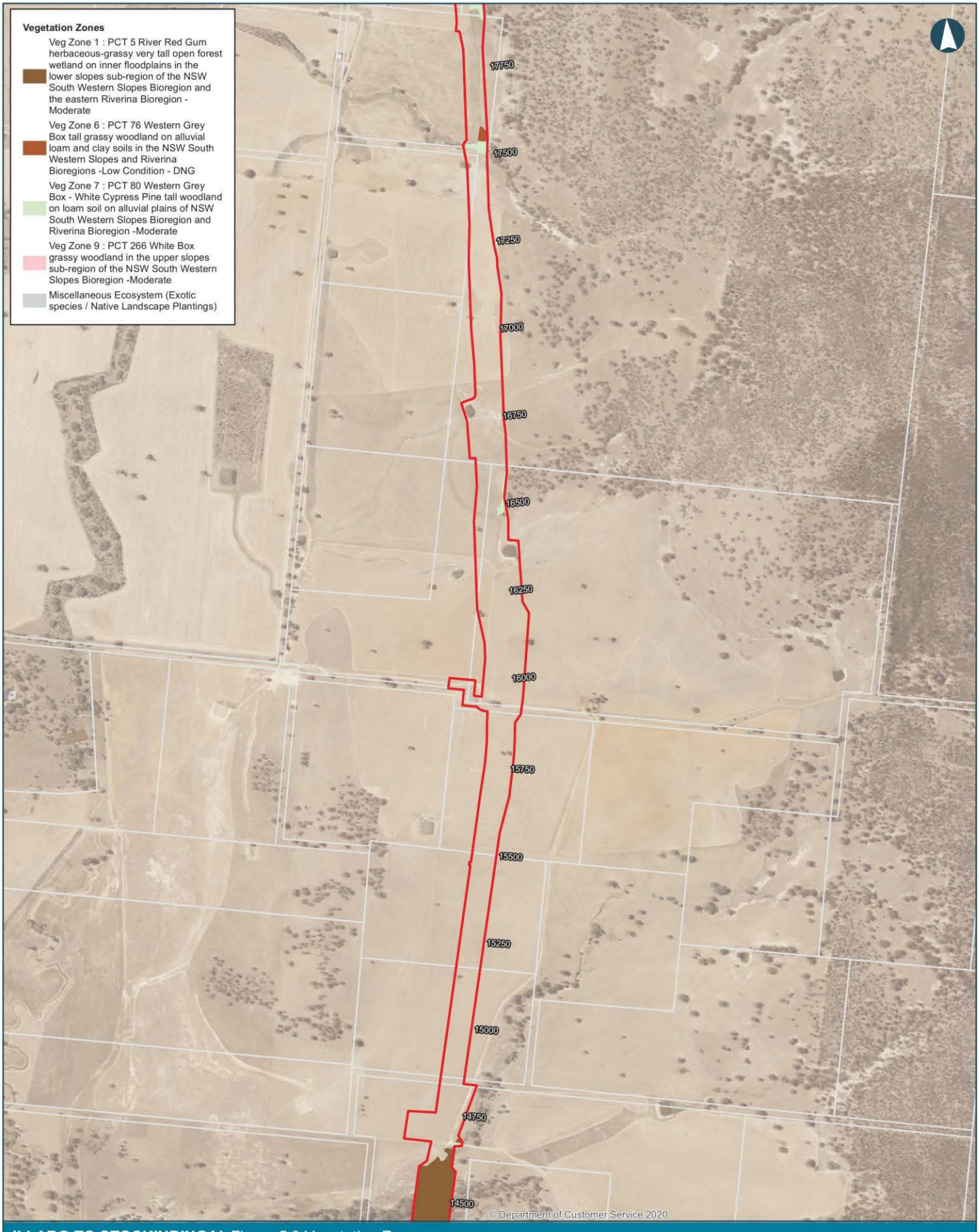
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

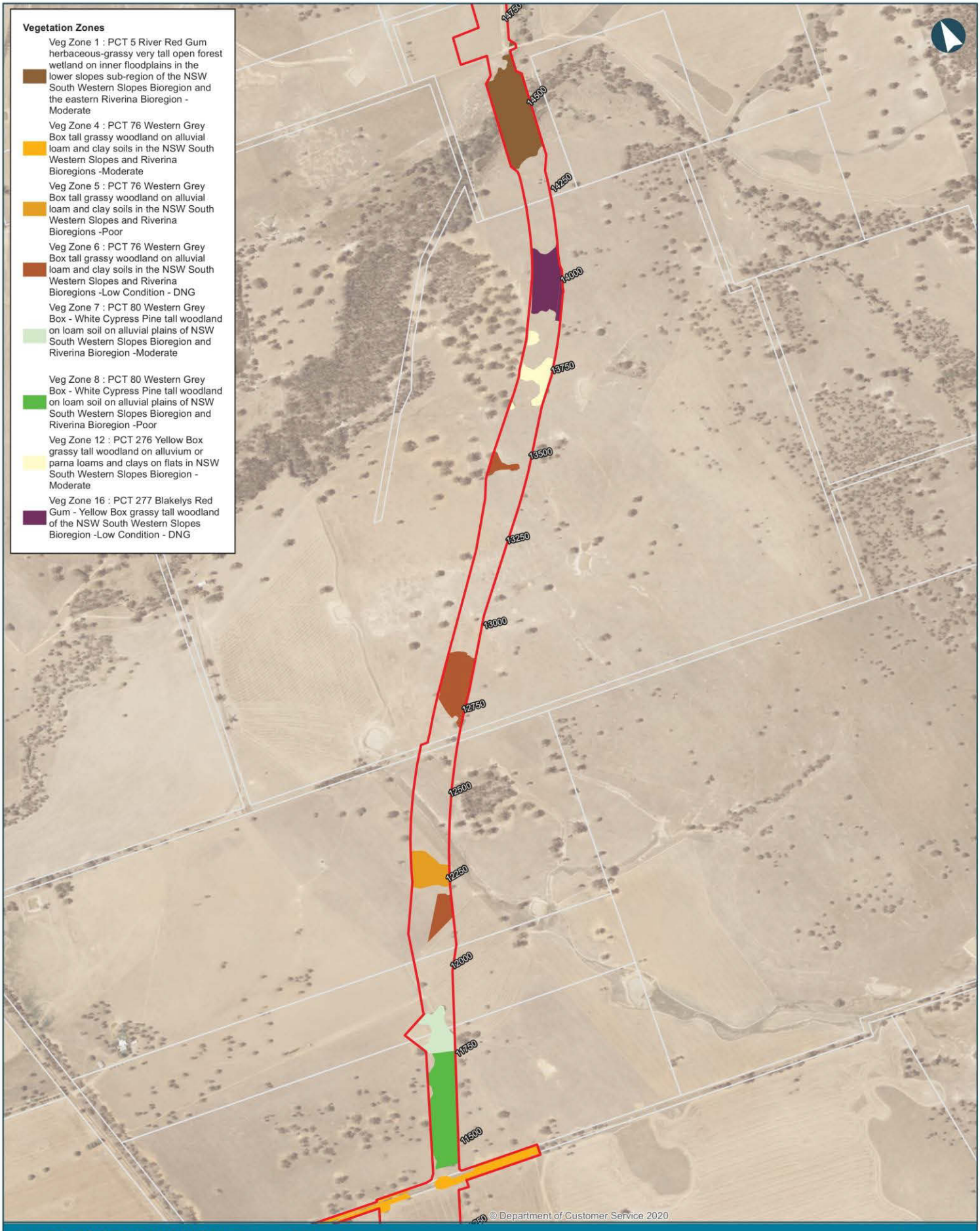
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

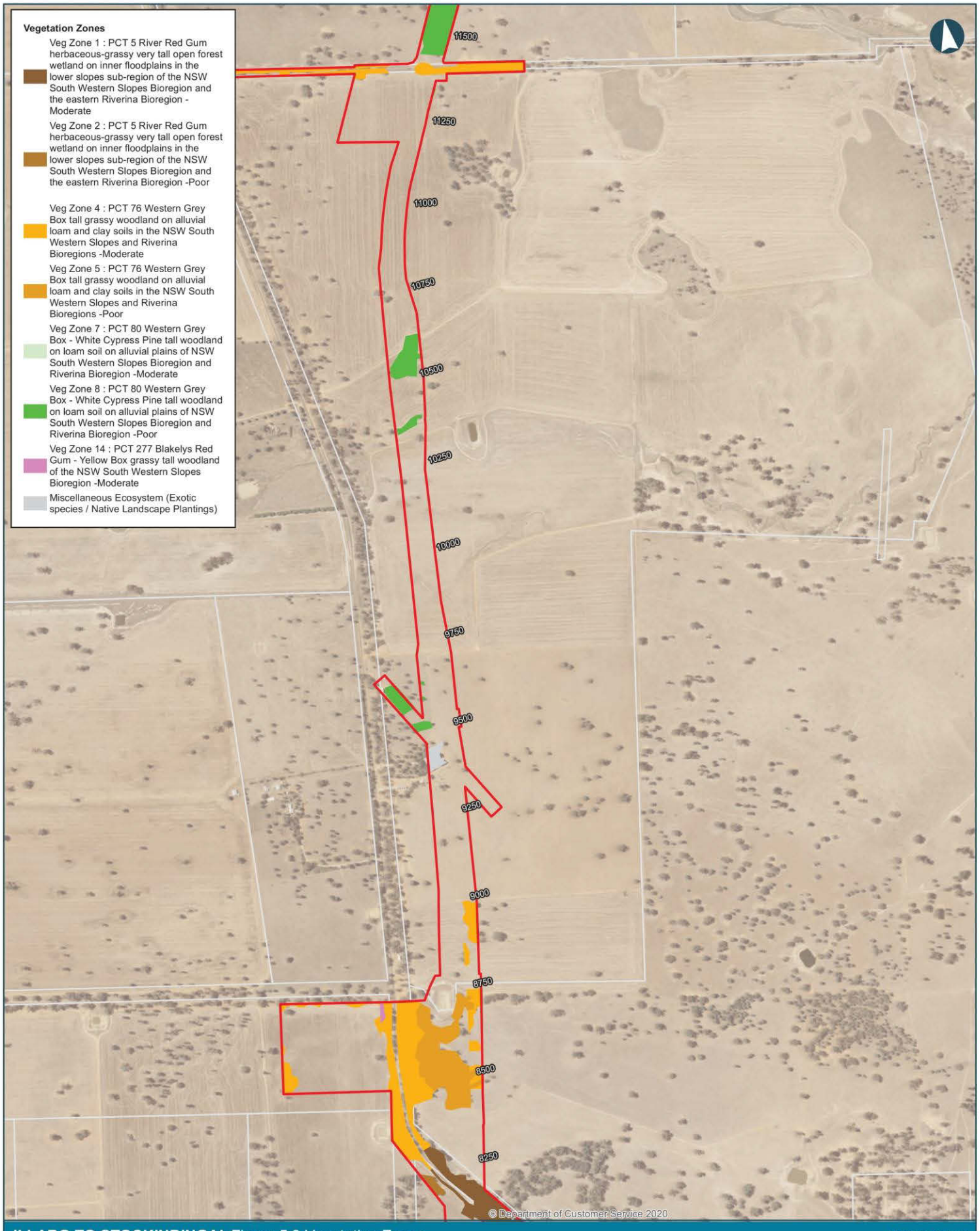
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

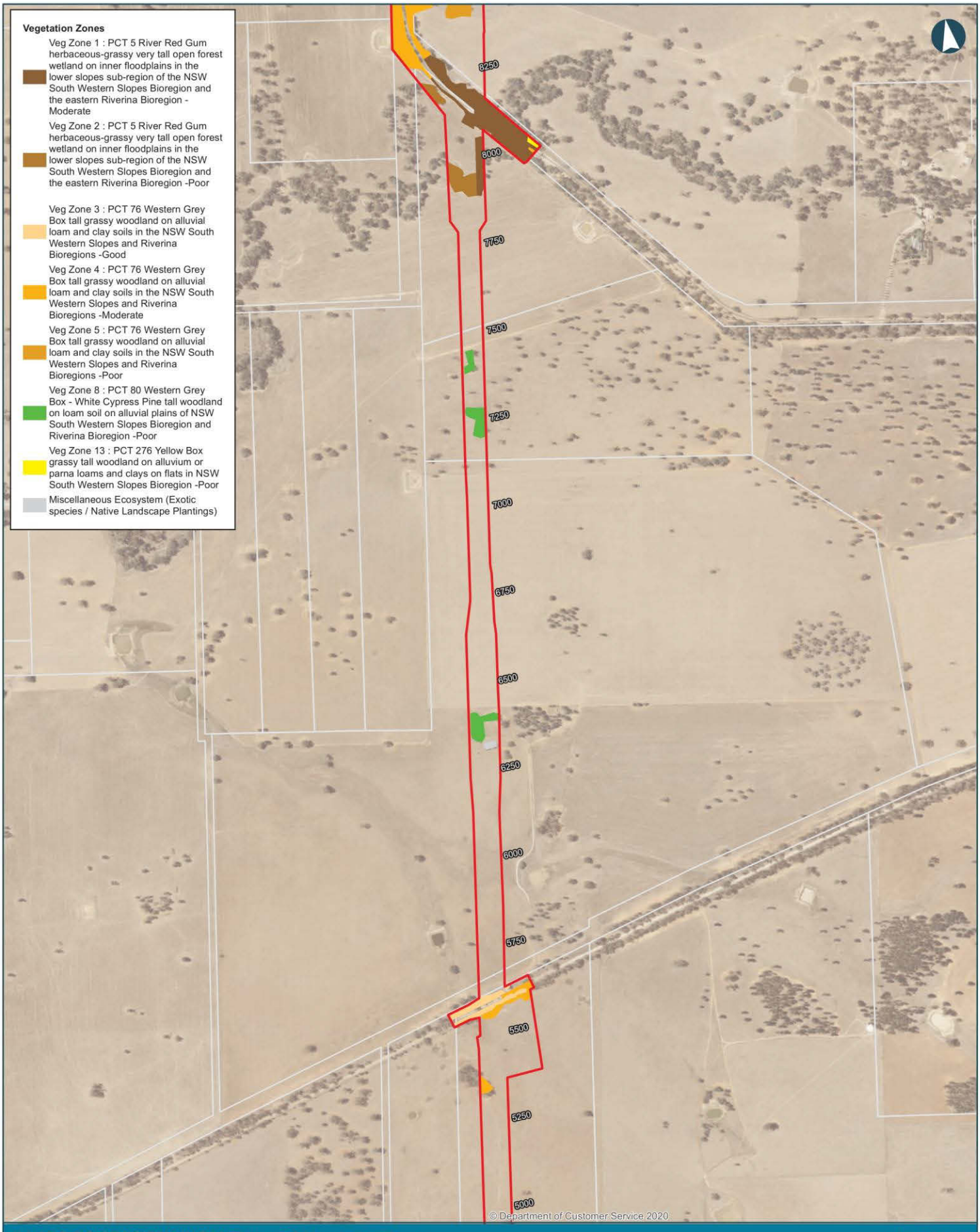
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

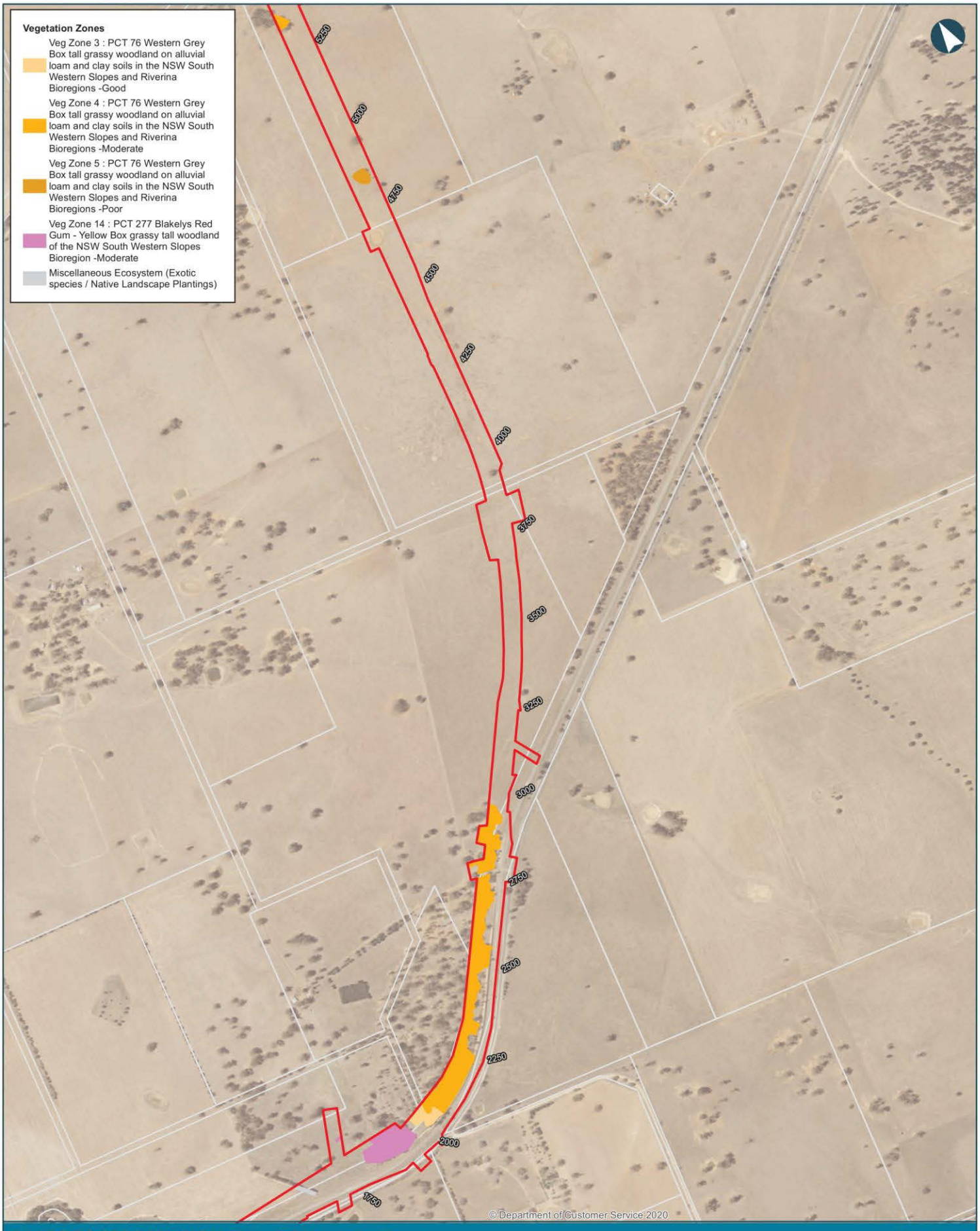
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

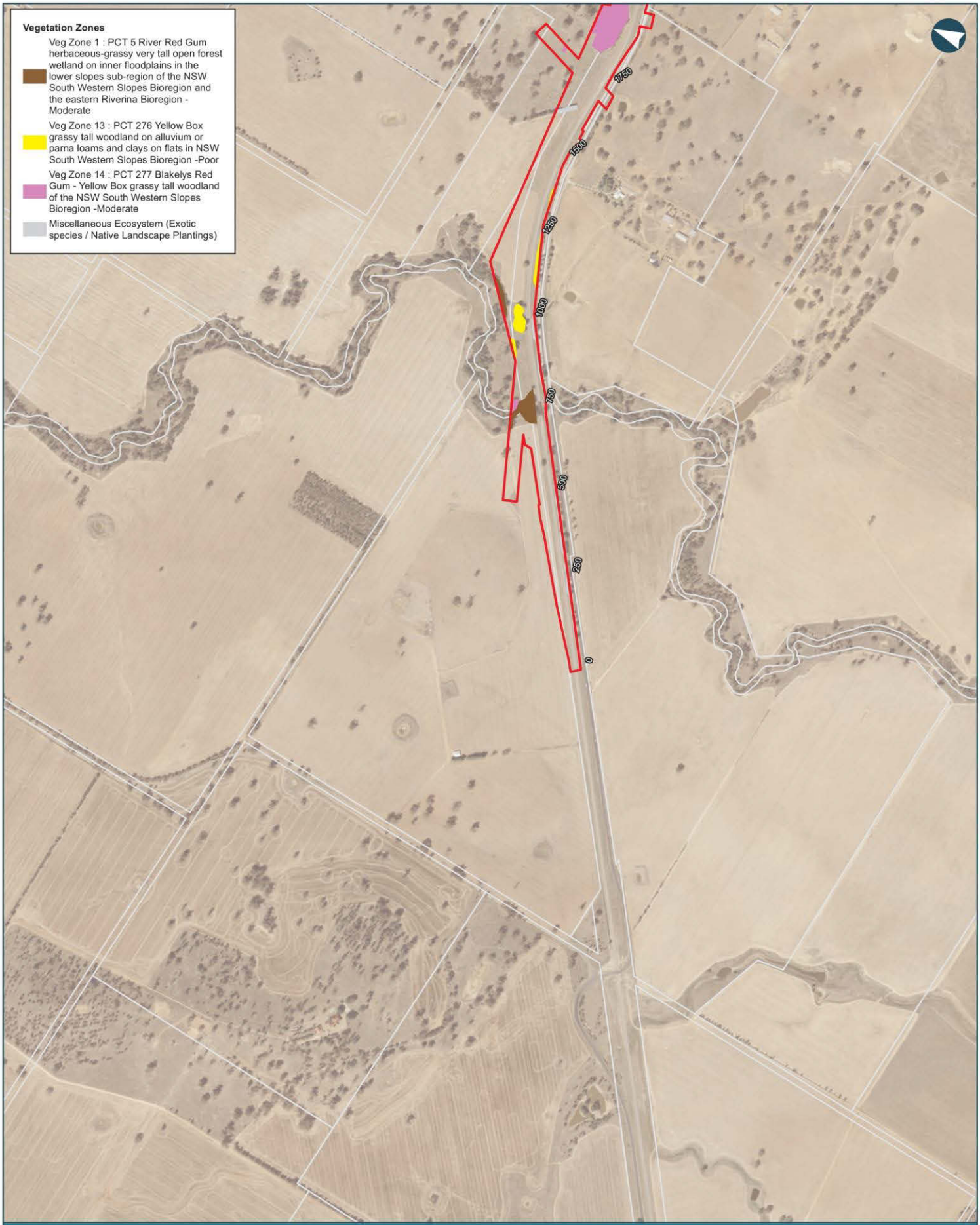
Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd



ILLABO TO STOCKINBINGAL Figure 5.3 Vegetation Zones

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 11/15/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_3VegetationZones_r1v5.mxd

Table 5.2 Overview of native vegetation types and zones identified within the subject land

Vegetation type	Threatened Ecological Community (BC Act)	Formation	Class	PCT % cleared	Zone	Patch size (ha)	Plots	Vegetation integrity score	Extent subject land (ha)
PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Not listed	Forested Wetlands	Inland Riverine Forests	40%	VZ1 – Moderate	25-100	Q1, Q11, Q12, Q31 Q33	78.5	6.1
	Not listed				VZ2 – Poor	5-24	Q6, Q7, Q39	28.9	0.7
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Grassy Woodlands	Floodplain Transition Woodlands	92%	VZ3 – Good	25-100	Q5, Q49, Q52	83.6	1.1
					VZ4 – Moderate	5-24	Q21, Q22, Q38	68	18.7
	Not listed				VZ5 – Poor	5-24	Q9, Q10	26.1	5
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions				VZ6 – Low (derived native grassland)	5-24	Q16	11.6	2.3
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion		Grassy Woodlands	Floodplain Transition Woodlands	83%	VZ7 – Moderate	25-100	Q20, Q50	54.6	1.4
	Not listed				VZ8 – Poor	5-24	Q18, Q19, Q59	33.5	4.7
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	94%	VZ9 – Moderate	25-100	Q25, Q26, Q47, Q65	68.3	4.5
	Not listed				VZ10 – Poor (derived native grassland)	25-100	Q27, Q43, Q66	27.8	0.4
	Not listed				VZ11 – Low	5-24	Q41, Q42, Q44, Q48	2	5.4

Vegetation type	Threatened Ecological Community (BC Act)	Formation	Class	PCT % cleared	Zone	Patch size (ha)	Plots	Vegetation integrity score	Extent subject land (ha)
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	90%	VZ12 – Moderate	5-24	Q3, Q53	69.5	2.0
	Not listed				VZ13 – Poor	5-24	Q2, Q8, Q17	27.7	0.6
PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	94%	VZ14 – Moderate	5-24	Q4, Q13, Q45, Q46, Q51, Q56, Q57, Q58	75.1	13.3
	Not listed				VZ15 – Poor	25-100	Q34, Q35, Q36, Q37, Q40	43.8	2.2
	Not listed				VZ16 – Low (derived native grassland)	25-100	Q14, Q15, Q54, Q55	2.7	2.4
PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Not listed	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	15%	VZ17 – Moderate	25-100	Q28, Q29	51.2	1.7
PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	Grassy Woodlands	Western Slopes Grassy Woodlands	63%	VZ18 – Moderate	25-100	Q23, Q32	46.9	0.13
	Not listed				VZ19 – Poor	25-100	Q60	31	0.3
TOTAL									**72.93**

5.2 PCT justification and description

This assessment identified the following plant community types:

- PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion.
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- The native vegetation PCTs were assigned to 19 vegetation zones based on broad condition state.

An overview of native vegetation types and zones identified is presented in Table 5.2. and the extent of each PCT is shown in Figure 5.2.

A total of 166 flora species were recorded within the subject land, of which 109 were native (66 per cent) and 57 (34 per cent) were exotic. Species recorded were predominantly from Poaceae, Fabaceae and Asteraceae families. No threatened flora were recorded in the subject land. BAM plot data is presented in Appendix G. Location of Vegetation Integrity (BAM) plots used to define each PCT is illustrated in Figure 5.2.

5.2.1 PCT 5 – River Gum Herbaceous-Grassy Very Tall Open Forest Wetland on Inner Floodplains in the Lower Slopes Sub-Region of the NSW South Western Slopes Bioregion and The Eastern Riverina Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.1 to Photo 5.4. A profile of PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion is provided in Table 5.3 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.4.

Table 5.3 Summary of PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion

PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	
PCT Justification	The vegetation type was assigned to PCT 5 based on the dominance of tall stands of *Eucalyptus camaldulensis* (River Red Gum) in the upper stratum, the herbaceous/grassy structure and composition of the ground stratum and biogeographical location. PCT 2 River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW was considered as a candidate for this vegetation type although was dismissed based on the lack of sedge diversity and dominance of herbaceous-grassy in the ground stratum.
Vegetation formation	Forested Wetlands
Vegetation class	Inland Riverine Forests
Conservation status	Not listed under BC Act or EPBC Act

PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	
SAII entity	No
Per cent cleared	40 per cent
Landscape position	This vegetation type was recorded along ephemeral drainage lines and creeks associated with tributaries of Ironbong and Bland Creek systems.
Species upper stratum	*Eucalyptus camaldulensis* (River Red Gum)
Species middle stratum	Mostly absent
Species ground stratum	*Carex appressa* (Tall sedge), *Cynodon dactylon* (Common Couch), *Microlaena stipoides* var. *stipoides* (Weeping Rice Grass), *Rumex brownii* (Swamp Dock), *Rytidosperma caespitosum* (Ringed Wallaby Grass)
Vegetation condition	Moderate condition (vegetation integrity score 78.5): areas were generally dominated by native species although subject to ongoing grazing pressure that has reduced the ground stratum native species richness and cover. Exotic weed cover was generally low at <5% although it is considered that seasonal occurrences of dense exotic annual weed cover would occur. Poor condition (vegetation integrity score 28.9): occurred generally as canopy only with low species richness and cover in the ground stratum. Evidence of heavy grazing and high exotic weed cover (50–75 per cent).

Photo 5.1 PCT 5 – Moderate condition (Plot Q11)

Photo 5.2 PCT 5 – Moderate condition (Plot Q1)

Photo 5.3 PCT 5 – Moderate condition (Plot Q33)

Photo 5.4 PCT 5 – Poor condition (Plot Q39)

Table 5.4 Comparison of PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**3**	**2**	**7**	**9**	**1**	**1**	**62**	**0**	**41**	**7**	**0**	**0**	**78**	**65**	**4(50)**	**–**	**–**
Q1	1	0	8	4	0	1	35	0	10.8	1.3	0	0.4	14	78	5	1	1
Q6	1	0	0	0	0	0	35	0	0	0	0	0	47	56	9	9	8
Q7	2	0	1	0	0	0	31	0	0.5	0	0	0	62	72	8	5	35
Q11	2	0	7	4	0	0	34	0	73.4	4.6	0	0	48	34	2	0	2.1
Q12	1	0	7	4	0	0	45	0	59.2	1	0	0	154	78	7	2	3.5
Q31	1	0	8	5	0	1	50	0	6.4	0.8	0	0.2	8	85	5	2	4.3
Q33	1	0	11	5	0	1	40	0	15.2	2.7	0	0.1	16	50	3	1	0.4
Q39	1	0	3	1	0	0	35	0	7.6	3	0	0	20	66	5	1	0.5

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type - PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion; Keith Formation: Forested Wetlands; Keith Class: Inland Riverine Forests; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.2 PCT 76 – Western Grey Box Tall Grassy Woodland on Alluvial Loam and Clay Soils in the NSW South Western Slopes and Riverina Bioregions

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.5 to Photo 5.8. A profile of PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions is provided in Table 5.5 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.6.

Table 5.5 Summary of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	
PCT Justification	PCT 76 was assigned to patches of native vegetation dominated by *Eucalyptus microcarpa* (Western Grey Box) that exhibited a sparse shrub middle stratum and predominately grassy ground stratum. This vegetation type was predominately associated with floodplain areas, alluvial foot slopes and undulating lower to mid slopes of local hills associated with clay loam soils. PCT 76 grades into PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion where mature *Callitris glaucophylla* (White Cypress Pine) become co-dominate in the upper stratum.
Vegetation formation	KF_CH3 Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Conservation status	Forms part of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered – BC Act/ EPBC Act)
SAII entity	No
Per cent cleared	92 per cent
Landscape position	Occurs on alluvial foot slopes and undulating lower to mid slopes of local hills associated with clay loam soils.
Species upper stratum	*Eucalyptus microcarpa* (Western Grey Box), *Eucalyptus conica* (Fuzzy Box), *Allocasuarina luehmannii* (Buloke) with scattered occurrences of *Alectryon oleifolius* (Western Rosewood).
Species middle stratum	*Maireana microphylla* (Small-leaved Bluebush), *Salsola australis* and *Sclerolaena muricata* (Black Rolypoly).
Species ground stratum	*Austrostipa scabra* subsp. *scabra* (Speargrass), *Bothriochloa macra* (Red Grass), *Carex inversa, Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Enteropogon acicularis* (Windmill Grass), *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush), *Maireana enchylaenoides* (Wingless Bluebush), *Panicum decompositum* (Native Millet), *Paspalidium constrictum* (Knottybutt Grass), *Sida corrugata* (Corrugated sida), *Solanum esuriale* (Quena), *Rytidosperma caespitosum* (Ringed Wallaby Grass).

PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	
Vegetation condition	Good condition: the vegetation integrity score for the condition state was relatively high at 83.6 with high treat weed cover recorded at <5 per cent. Most patches had low middle stratum richness and cover although exhibited a relatively diverse native grass and forb ground stratum. Historic and ongoing grazing was evident in most patches and exotic annual weed cover was low due to drought and seasonality. Moderate condition (vegetation integrity score 68): exhibits large trees, hollows, fallen timber and leaf litter which has resulted in a vegetation integrity score of 68. The middle stratum in generally absent. The ground stratum is mostly comprised of native grasses and is relatively low in native species richness and cover in forb, fern and other natives. Poor condition (vegetation integrity score 26.1): these patches generally occur as canopy only with little to no middle or ground stratum present. Most patches of this condition class occur as sheep camps within paddocks and have little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/spring these patches would be dominated annual weeds. Low condition (vegetation integrity score 11.6): this vegetation type occurs as derived native grasses and lacks any woodland structure with the upper and middle stratums historically removed. Due to historic and ongoing grazing the ground stratum is relatively low in native species richness and cover in forb, fern and other natives.

Photo 5.5 PCT 76 – Good condition (Plot Q5)

Photo 5.6 PCT 76 – Moderate condition (Plot Q21)

Photo 5.7 PCT 76 – Poor condition (Plot Q10)

Photo 5.8 PCT 76 – Low (DNG) condition (Plot Q16)

Table 5.6 Comparison of PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**3**	**5**	**8**	**11**	**1**	**1**	**32**	**3**	**27**	**5**	**0**	**0**	**45**	**65**	**3(50)**	**–**	**–**
Q5	1	4	9	7	1	0	30	24.2	64	11.1	0.2	0	3	48	0	1	1
Q9	2	0	0	0	0	0	27	0	0	0	0	0	0	1	2	1	0
Q10	2	0	0	3	0	0	31	0	0	0.3	0	0	9	30	5	2	0
Q16	0	0	5	5	1	0	0	0	41.6	1.1	0.1	0	0	11	0	0	0
Q21	3	1	5	5	0	0	10	2	41.7	15.4	0	0	12	78	8	5	2.2
Q22	2	0	8	1	0	0	25	0	7	0.1	0	0	13	27	1	1	0
Q38	1	0	11	4	0	1	30	0	20.1	0.9	0	0.2	2	75	1	0	6.4
Q49	2	5	9	11	0	1	31	13.4	39.9	4	0	0.1	47	83	4	4	0.7
Q52	1	2	7	4	0	0	40	10	12.7	2.4	0	0	7	85	2	2	0.2

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions; Keith Formation Grassy Woodlands; Keith Class: Floodplain Transition Woodlands; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.3 PCT 80 – Western Grey Box – White Cypress Pine Tall Woodland on Loam Soil on Alluvial Plains of NSW South Western Slopes Bioregion and Riverina Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.9 to Photo 5.12. A profile of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion is provided in Table 5.7 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.8.

Table 5.7 Summary of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	
PCT Justification	The vegetation type intergrades with PCT 76 and was differentiated by the presence of large mature specimens of *Callitris glaucophylla* (White Cypress Pine) in the upper stratum.
Vegetation formation	Grassy Woodlands
Vegetation class	Floodplain Transition Woodlands
Conservation status	Forms part of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered – BC Act/ EPBC Act)
SAII entity	No
Per cent cleared	83 per cent
Landscape position	Occurs on alluvial foot slopes and undulating lower to mid slopes of local hills associated with clay loam soils.
Species upper stratum	*Eucalyptus microcarpa* (Western Grey Box) and *Callitris glaucophylla* (White Cypress Pine) with scattered specimens of *Eucalyptus albens* (White Box).
Species middle stratum	Absent due to historic and ongoing sheep grazing.
Species ground stratum	*Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Dianella longifolia* var. *longifolia* (Blue Flax-Lily), *Dysphania pumilio* (Small Crumbweed), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Enteropogon acicularis* (Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Maireana enchylaenoides* (Wingless Bluebush), *Sida corrugata* (Corrugated sida), *Rytidosperma setaceum* (Smallflower Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 54.6): the vegetation integrity score for the condition state was 52.6 with high threat weed cover recorded at <10 per cent. Most patches had an absent middle stratum due to historic and ongoing grazing. Species richness and cover was generally recorded below benchmark although was mostly dominated by native species. The ground stratum is mostly comprised of native grasses and is relatively low in native species richness and cover in forb, fern and other natives. Poor condition (vegetation integrity score 33.5): these patches generally occur as canopy only with little to no middle or ground stratum present. Most patches of this condition class occur as heavily grazed paddocks and have little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/spring these patches would be dominated annual weeds.

Photo 5.9 PCT 80 – Moderate condition (Plot Q20)

Photo 5.10 PCT 80 – Moderate condition (Plot Q50)

Photo 5.11 PCT 80 – Poor condition (Plot Q18)

Photo 5.12 PCT 80 – Poor condition (Plot Q19)

Table 5.8 Comparison of PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**3**	**5**	**8**	**11**	**1**	**1**	**32**	**3**	**27**	**5**	**0**	**0**	**45**	**65**	**3(50)**	**–**	**–**
Q18	1	0	1	5	0	0	35	0	5	0.7	0	0	4	26	3	0	0
Q19	2	0	0	1	0	0	29	0	0	0.2	0	0	0	10	3	0	0
Q20	3	0	4	4	0	0	36	0	8.1	0.7	0	0	14	52	4	5	0
Q50	1	0	4	1	0	0	20	0	9.6	3	0	0	37	36	6	9	6
Q59	2	0	3	5	0	0	32	0	1.1	6.6	0	0	6	19.4	2	2	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial3 plains of NSW South Western Slopes Bioregion and Riverina Bioregion; Keith Formation: KF_CH3 Grassy Woodlands; Keith Class: Floodplain Transition Woodlands; source (NSW BioNet 5Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.4 PCT 266 – White Box Grassy Woodland in the Upper Slopes Sub-Region of the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.13 to Photo 5.16. A profile of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion is provided in Table 5.9 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.10.

Table 5.9 Summary of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
PCT Justification	PCT 266 was assigned to this vegetation type based on the dominance of *Eucalyptus albens* (White Box) in the upper stratum often occurring with *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 266 broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	94 per cent
Landscape position	Occurs on rocky slopes with shallow skeletal soils associated with the foothills of Bethungra Range.
Species upper stratum	*Eucalyptus albens* (White Box), *Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus melliodora* (Yellow Box), *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Aristida behriana* (Bunch Wiregrass), *Aristida jerichoensis* var. *jerichoensis* (Jericho Wiregrass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Enteropogon acicularis* (A Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Sida corrugata* (Corrugated sida), *Rytidosperma auriculatum* (Lobed Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 68.3): exhibited a sparse canopy dominated by *Eucalyptus albens* (White Box) with the middle stratum absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent. Poor condition (vegetation integrity score 27.8): This patch occurs as canopy only with little to no middle or ground stratum present. This patch was recorded in heavily grazed areas with little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/spring these patches would be dominated annual weeds. Low (DNG) condition (vegetation integrity score 2): occurs as derived native grassland with an absent upper and middle stratum. The ground stratum is mostly dominated by native species with exotic cover ranging from 5–25 per cent. This vegetation zone is subject to continued ongoing sheep grazing although no cropping or pasture improvements appear to have been undertaken.

Photo 5.13 PCT 266 – Moderate condition (Plot Q25)

Photo 5.14 PCT 266 – Poor condition (Plot Q43)

Photo 5.15 PCT 266 – Low (Plot Q41)

Photo 5.16 PCT 266 – Low (Plot Q44)

Table 5.10 Comparison of PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregions vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**34**	**35**	**2(50)**	**–**	**–**
Q25	1	0	8	10	0	1	15	0	10.3	2.7	0	0.2	6	10	0	0	0.5
Q26	2	0	9	6	0	1	35	0	12.7	1.8	0	0.1	71	30	2	0	0.6
Q27	1	0	2	0	0	0	35	0	1.1	0	0	0	14	16	3	0	4
Q41	0	0	10	6	0	1	0	0	36.9	0.9	0	0.1	0	0	0	0	1
Q42	0	0	9	4	0	1	0	0	25.7	0.8	0	0.1	0	2	0	0	1.6
Q43	1	0	2	2	0	0	4	0	2	0.6	0	0	14	36	6	5	6
Q44	0	0	6	3	0	0	0	0	28	0.5	0	0	0	2	0	0	0.1
Q47	1	0	6	8	0	0	30	0	4	6.6	0	0	16	42	3	2	0
Q48	0	0	5	2	0	0	0	0	14.3	0.4	0	0	0	0	0	0	0
Q65	1	0	6	3	1	0	15	0	30.2	0.4	0.4	0	48	22	0	3	25
Q66	2	0	0	4	0	0	17	0	0	15.5	0	0	26	23	0	2	1

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type - PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.5 PCT 276 – Yellow Box Grassy Tall Woodland on Alluvium or Parna Loams and Clays on Flats in NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.17 to Photo 5.20. A profile of PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion is provided in Table 5.11 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.12.

Table 5.11 Summary of PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	
PCT Justification	PCT 276 was assigned to this vegetation type based on the dominance of *Eucalyptus melliodora* (Yellow Box) in the upper stratum often occurring with *Eucalyptus microcarpa* (Western Grey Box).
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 276 is broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	90 per cent
Landscape position	Occurs on lower slopes and alluvial floodplain flats.
Species upper stratum	*Eucalyptus melliodora* (Yellow Box), *Eucalyptus microcarpa* (Western Grey Box)
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Aristida behriana* (Bunch Wiregrass), *Aristida jerichoensis* var. *jerichoensis* (Jericho Wiregrass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass) *Enteropogon acicularis* (A Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Sida corrugata* (Corrugated sida), *Rytidosperma auriculatum* (Lobed Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 69.5): exhibited a sparse canopy dominated by *Eucalyptus melliodora* (Yellow Box) with the middle stratum absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is modified due to grazing with exotic weed cover recorded to about 25 per cent. Poor condition (vegetation integrity score 27.7): occurred generally as canopy only with low species richness and cover in the ground stratum. Evidence of heavy grazing and high exotic weed cover (74 per cent).

Photo 5.17 PCT 276 – Poor condition (Plot Q2)

Photo 5.18 PCT 276 – Moderate condition (Plot Q3)

Photo 5.19 PCT 276 – Poor condition (Plot Q8)

Photo 5.20 PCT 276 – Poor condition (Plot Q17)

Table 5.12 Comparison of PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion vegetation integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**34**	**35**	**2(50)**	**–**	**–**
Q2	2	0	2	7	0	0	40	0	0.4	1.2	0	0	5	70	2	0	5
Q3	2	0	7	5	0	1	35	0	8.3	1	0	0.2	17	90	2	0	0
Q8	1	0	0	0	0	0	35	0	0	0	0	0	18	0	1	0	0
Q17	1	0	1	0	0	0	30	0	0.1	0	0	0	14	60	0	0	0
Q53	2	1	6	10	0	1	37	0.1	9.6	9	0	0.2	7	55	1	1	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type - PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.6 PCT 277 – Blakely's Red Gum – Yellow Box Grassy Tall Woodland of the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.21 to Photo 5.24. A profile of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion is provided in Table 5.13 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.14.

Table 5.13 Summary of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	
PCT Justification	PCT 277 was assigned to this vegetation type based on the dominance of *Eucalyptus blakelyi* (Blakely's Red Gum) in the upper stratum often occurring with *Eucalyptus melliodora* (Yellow Box) and scattered *Eucalyptus albens* (White Box).
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 277 broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	94 per cent
Landscape position	Occurs on lower slopes and gently undulating areas.
Species upper stratum	*Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus albens* (White Box), *Eucalyptus macrorhyncha* (Red Stringybark), *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Aristida behriana* (Bunch Wiregrass), *Aristida jerichoensis* var. *jerichoensis* (Jericho Wiregrass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass) *Enteropogon acicularis* (A Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Sida corrugata* (Corrugated sida), *Rytidosperma auriculatum* (Lobed Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 75.1): exhibited a sparse canopy dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) with the middle stratum absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent. Poor condition (vegetation integrity score 43.8): occurred generally as canopy only with low species richness and cover in the ground stratum. Evidence of heavy grazing and high exotic weed cover. Low condition (vegetation integrity score 2.7): this vegetation type occurs as derived native grasses and lacks any woodland structure with the upper and middle stratums historically removed. Due to historic and ongoing grazing the ground stratum is relatively low in native species richness and cover in forb, fern and other natives.

Photo 5.21 PCT 277 – Moderate (Plot Q4)

Photo 5.22 PCT 277 – Poor (Plot Q34)

Photo 5.23 PCT 277 – Low (Plot Q14)

Photo 5.24 PCT 277 – Moderate (Plot Q45)

Table 5.14 Comparison of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**34**	**35**	**2(50)**	**–**	**–**
Q4	2	2	8	5	1	2	18	11	36	2.8	0.2	1.2	1	50	0	0	10
Q13	1	0	10	4	0	0	0.3	0	43.4	0.7	0	0	0	2	0	0	0
Q14	0	0	9	7	0	0	0	0	38.7	1.7	0	0	0	2	0	0	0
Q15	0	0	8	7	1	0	0	0	8.9	12.1	0.3	0	0	0	0	0	0
Q34	2	0	3	1	0	0	42	0	2.7	0.2	0	0	4	86	4	2	3.3
Q35	2	0	1	3	0	0	11	0	0.1	0.5	0	0	0	77.2	2	0	17
Q36	1	1	4	2	0	1	35	12	8.6	0.6	0	0.2	2	68	3	1	6.3
Q37	1	0	11	3	0	1	19	0	15.6	1.1	0	0.2	0	68	0	0	13.3
Q40	1	0	1	2	0	0	40	0	2	0.5	0	0	29	54	5	4	18
Q45	5	2	10	6	1	2	40.5	2.2	12.5	2.5	0.1	0.2	19	89	3	4	3.3
Q46	3	0	6	6	0	0	21.1	0	9.9	1.3	0	0	2	88	2	2	2.1
Q51	1	0	7	4	0	0	25	0	21	0.5	0	0	0	20	1	0	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.7 PCT 309 – Black Cypress Pine – Red Stringybark – Red Gum – Box Low Open Forest on Siliceous Rocky Outcrops in the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.25 to Photo 5.26. A profile of PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion is provided in Table 5.15 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.16.

Table 5.15 Summary of PCT 309 Black Cypress Pine – Red Stringybark – Red Gum – Box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion

PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	
PCT Justification	PCT 309 was assigned to this vegetation type based on the dominance of *Eucalyptus macrorhyncha* (Red Stringybark) in the upper stratum often occurring with *Eucalyptus albens* (White Box).
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Conservation status	Not listed under BC Act or EPBC Act
SAII entity	No
Per cent cleared	15 per cent
Landscape position	Occurs on rocky hills with shallow skeletal soils associated with the Bethungra Range.
Species upper stratum	*Eucalyptus albens* (White Box), *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus melliodora* (Yellow Box), *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Austrostipa setacea* (Corkscrew Grass), *Chloris truncata* (Windmill Grass), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Panicum effusum* (Hairy Panicum), *Rytidosperma caespitosum* (Ringed Wallaby Grass), *Rytidosperma setaceum* (Smallflower Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 51): exhibited an upper stratum dominated by *Eucalyptus macrorhyncha* (Red Stringybark) with canopy dieback evident. The middle stratum was mostly absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent.

Photo 5.25 PCT 309 – Moderate condition (Plot Q28)

Photo 5.26 PCT 309 – Moderate condition (Plot Q29)

Table 5.16 Comparison of PCT 309 Black Cypress Pine – Red Stringybark – Red Gum – Box low open forest on siliceous rocky outcrops on the NSW South Western Slopes Bioregion integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**5**	**7**	**7**	**13**	**1**	**2**	**71**	**7**	**23**	**8**	**0**	**0**	**101**	**59**	**3(50)**	**–**	**–**
Q28	2	0	5	2	0	1	35	0	7.1	0.2	0	0.1	38	59	1	0	0
Q29	1	0	5	0	0	0	35	0	9.2	0	0	0	52	67	0	2	0

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion; Keith Formation: Dry Sclerophyll Forests (Shrubby sub-formation); Keith Class: Western Slopes Dry Sclerophyll Forests; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.2.8 PCT 347 – White Box – Blakely's Red Gum Shrub / Grass Woodland on Metamorphic Hillslopes in the Mid-Southern Part of the Upper Slopes Sub-Region of the NSW South Western Slopes Bioregion

The occurrence of this vegetation type within the subject land is illustrated in Figure 5.2 with photographic representation provided in Photo 5.27 to Photo 5.28. A profile PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion is provided in Table 5.17 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.18.

Table 5.17 Summary of PCT 347 White Box – Blakely's Red Gum shrub / grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	
PCT Justification	PCT 347 was assigned to this vegetation type based on the dominance of *Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) in the upper stratum occurring on hillslopes and undulating terrain.
Vegetation formation	Grassy Woodlands
Vegetation class	Western Slopes Grassy Woodlands
Conservation status	PCT 277 broadly consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Endangered under BC Act and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as Critically Endangered under the EPBC Act.
SAII entity	Yes
Per cent cleared	63 per cent
Landscape position	Occurs on hillslopes and undulating terrain associated with the foot slopes and outcropping rocky slopes of the Bethungra Range.
Species upper stratum	*Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) with scattered occurrences of *Eucalyptus macrorhyncha* (Red Stringybark) and *Brachychiton populneus* subsp. *populneus* (Kurrajong).
Species middle stratum	Absent
Species ground stratum	*Anthosachne scabra* (Wheat Grass), *Austrostipa scabra* subsp. *scabra* (Speargrass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Dichondra repens* (Kidney Weed), *Dysphania pumilio* (Small Crumbweed), *Einadia nutans* subsp. *nutans* (Climbing Saltbush), *Lomandra multiflora* subsp. *multiflora* (Many-flowered Mat-rush), *Oxalis perennans*, *Panicum effusum* (Hairy Panicum), *Rytidosperma caespitosum* (Ringed Wallaby Grass), *Rytidosperma racemosum*, *Rytidosperma setaceum* (Smallflower Wallaby Grass).
Vegetation condition	Moderate condition (vegetation integrity score 46.9): exhibited a relatively intact upper stratum dominated by *Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum). The middle stratum was mostly absent due to historic clearing for agriculture and continued ongoing sheep grazing. The ground stratum is predominately native with exotic cover <5 per cent. Poor condition (vegetation integrity score 31): This patch occurs as canopy only with little to no middle or ground stratum present. This patch was recorded in heavily grazed areas with little to no regeneration potential. Exotic annual weed cover was relatively low due to drought and seasonality although it is expected that following rain or during later winter/ spring these patches would be dominated annual weeds.

Photo 5.27 PCT 347 – Moderate condition (Plot Q23)

Photo 5.28 PCT 347 – Moderate condition (Plot Q32)

Table 5.18 Comparison of PCT 347 White Box – Blakely's Red Gum shrub / grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion integrity plot data against PCT condition benchmark data

Plot	Tree richness	Shrub richness	Grass richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass cover	Forb cover	Fern cover	Other cover	Length timber	Leaf litter	Large tree	HT[2]	HTW[3] cover
BM[1]	**4**	**3**	**8**	**9**	**1**	**1**	**18**	**1**	**30**	**6**	**0**	**0**	**49**	**56**	**2(50)**	**–**	**–**
Q23	2	0	7	4	0	0	45	0	3.1	0.6	0	0	34	30	0	1	0
Q32	4	0	6	4	0	1	26	0	9.7	0.5	0	0.1	57	59	0	0	0.1
Q60	1	0	2	5	0	0	10	0	0.5	10.6	0	0	55	5.4	0	0	8

(1) Benchmark data for equivalent community in NSW South Western Slopes IBRA Bioregion; Vegetation Type – PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion; Keith Formation: Grassy Woodlands; Keith Class: Western Slopes Grassy Woodlands; source (NSW BioNet Vegetation Classification database accessed February 2021 and cross referenced with BAM Credit Calculator)

(2) Hollow bearing tree

(3) High threat weed

5.3 Miscellaneous ecosystems

Vegetation identified within the subject land which was not able to be assigned to a recognised NSW Plant Community Type was assigned to a miscellaneous ecosystem (non-native vegetation) referred to as exotic species/native landscape plantings. This vegetation was predominately recorded has highly disturbed exotic grasslands with limited native vegetation and in some areas planted native vegetation. Dominant species identified in these areas included *Alternanthera pungens** (Khaki Weed), *Avena fatua** (Wild Oat), *Bromus spp*., *Trifolium spp.*, *Paspalum dilatatum** (Paspalum) and (*Cucumis myriocarpus* subsp. *leptodermis**) Paddy melon. Where planted native vegetation occurred, dominant species consisted of *Eucalyptus sideroxylon, Eucalyptus melliodora, Melia azedarach, Eucalyptus camaldulensis* and *Acacia* species.

Areas of planted native vegetation mapped within the proposal site:

- were not planted under an existing conservation obligation
- did not consist of planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat (as outlined in Appendix D of BAM).

No threatened species or evidence of usage by these were recorded within areas of planted native vegetation.

5.4 Patch size

Patch size is defined under the BAM as an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100m from the next area native vegetation (or less than or equal to 30m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the study area. Patch size area is assigned to each vegetation zone as a class, being less than 5 hectares, 5–24 hectares, 25–100 hectares or greater than or equal to 100 hectares. Patch size may extend onto adjoining land that is not part of the development site.

All vegetation zones within the subject land were recorded across several discontinuous patches which could be assigned to more than one patch size class (5–24ha, 25–100ha or ≥ 100ha). The largest patch size assessed was adopted and is outlined in Table 5.19 below. The location of each native vegetation zone within the subject land is illustrated in Figure 5.3. Patch sizes for each vegetation zone are illustrated in Figure 5.4.

Table 5.19 Patch sizes assigned to PCTs recorded

Vegetation type	Condition[1]	Patch size class (ha)
PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Moderate condition	25-100
	Poor condition	5-24
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good condition	25-100
	Moderate condition	5-24
	Poor condition	5-24
	Low condition – DNG	25-100
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate condition	5-24
	Poor condition	25-100

Vegetation type	Condition[1]	Patch size class (ha)
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	5-24
	Poor condition	5-24
	Low condition – DNG	5-24
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate condition	5-24
	Poor condition – canopy only	25-100
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	25-100
	Poor condition	5-24
	Low condition – DNG	5-24
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Moderate condition	5-24
PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	5-24
	Poor condition	25-100

5.5 Priority weeds and weeds of national significance

Of the introduced flora species recorded within the subject land, seven were listed as High Threat weeds under the BC Act. In addition, one recorded species, *Lycium ferocissimum*, was listed as Priority Weeds for the Riverina region under the *Biosecurity Act 2015* and listed as a Weed of National Significance (WoNS) (Department of Primary Industries 2021) as outlined below in Table 5.20. The biosecurity assessment provides further detailed assessment and all agricultural weeds (Chapter 18 of the EIS).

Table 5.20 Priority weeds identified within the subject land

Species name	Common name	BAM HTW[1]	Priority weeds	WONS
*Alternanthera pungens**	Khaki Weed	Yes	–	–
*Bromus diandrus**	Brome grass	Yes	–	–
*Hypericum perforatum**	St John's-wort	Yes	–	–
*Lycium ferocissimum**	African Boxthorn	–	Yes – Prohibition on dealings[2]	Yes
*Paspalum dilatatum**	Paspalum	Yes	–	–
*Romulea rosea var. australis**	Onion Grass	Yes	–	–
*Rosa rubiginosa**	sweet briar	Yes	–	–
*Xanthium spinosum**	Bathurst Burr	Yes	–	–

Note: (*) signify introduced species – non-native species

(1) High threat weed list (BAM-C list, last updated 22/10/20)

(2) Prohibition on dealings: Must not be imported into the State or sold

5.6 Scattered trees

A total of 58 Class 2 and Class 3 scattered trees were recorded during field surveys and desktop assessment. A breakdown of each scattered tree class and associated PCT is provided in Table 5.21. The scattered trees recorded are shown in Figure 5.4. Scattered trees with negligible biodiversity value are those trees identified as Class 1 scattered trees and these did not contain hollows.

Scattered Trees within the subject land were assigned to the following PCTs based on the dominant canopy tree species for each community as listed in the BAM credit calculator:

- PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.

The large tree benchmark for all PCTs assigned is >50cm DBH. This benchmark was used to determine the Class category for each scattered tree in accordance with Appendix B of the BAM. A description of each condition class is provided in section 5.2.

Table 5.21 Class 2 and Class 3 Scattered trees recorded

Class of scattered tree	Associated PCT	Number of scattered trees
Class 3 – with hollows	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	2
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	29
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	2
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	4
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 3 scattered trees with hollows		**42**

Class of scattered tree	Associated PCT	Number of scattered trees
Class 3 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	2
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1
Total Class 3 scattered trees with no hollows		**8**
Class 2 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 2 scattered trees with no hollows		**8**
Total Class 3 and Class 2 scattered trees		**58**

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4093 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

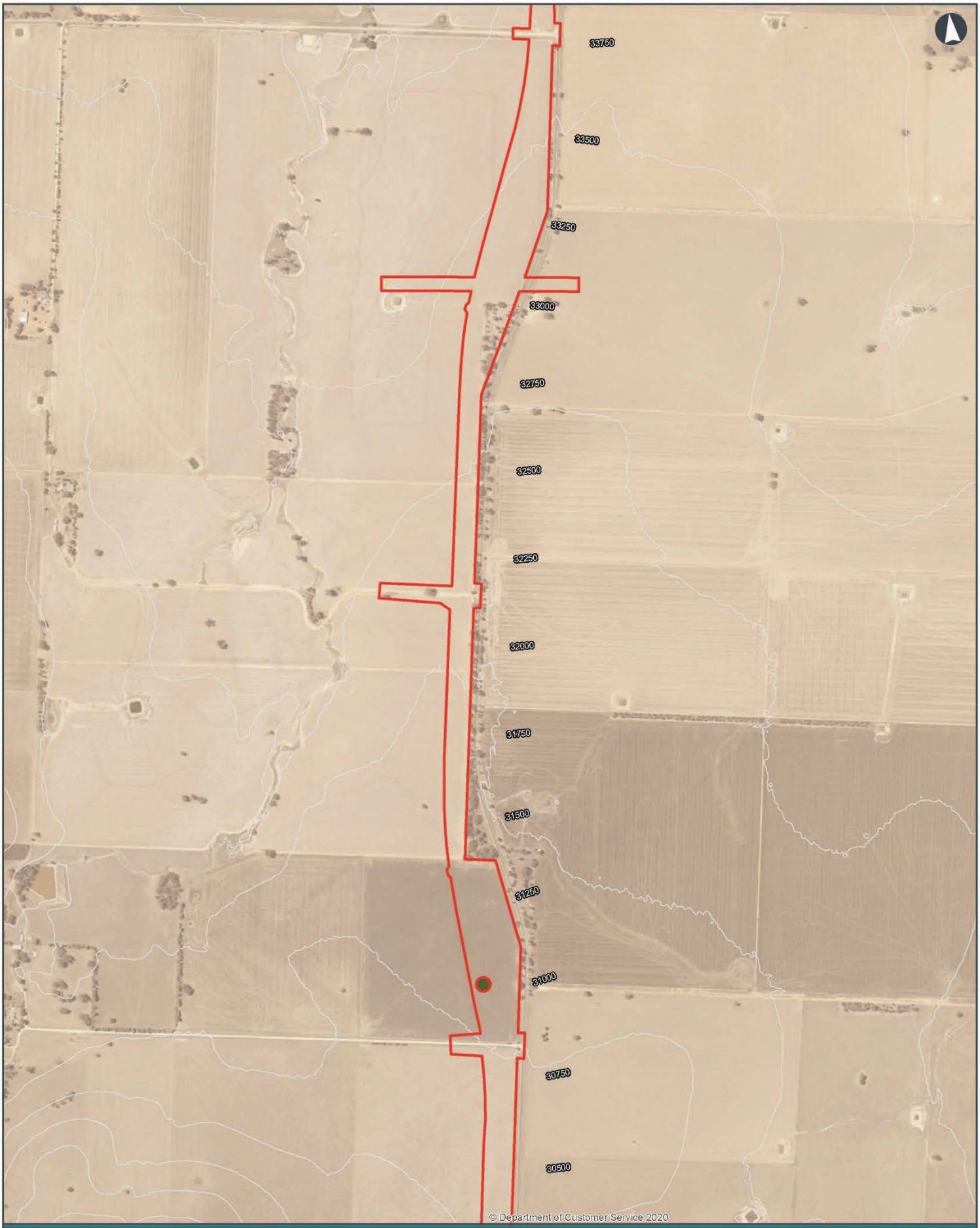
Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

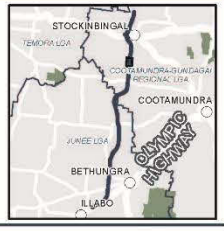
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

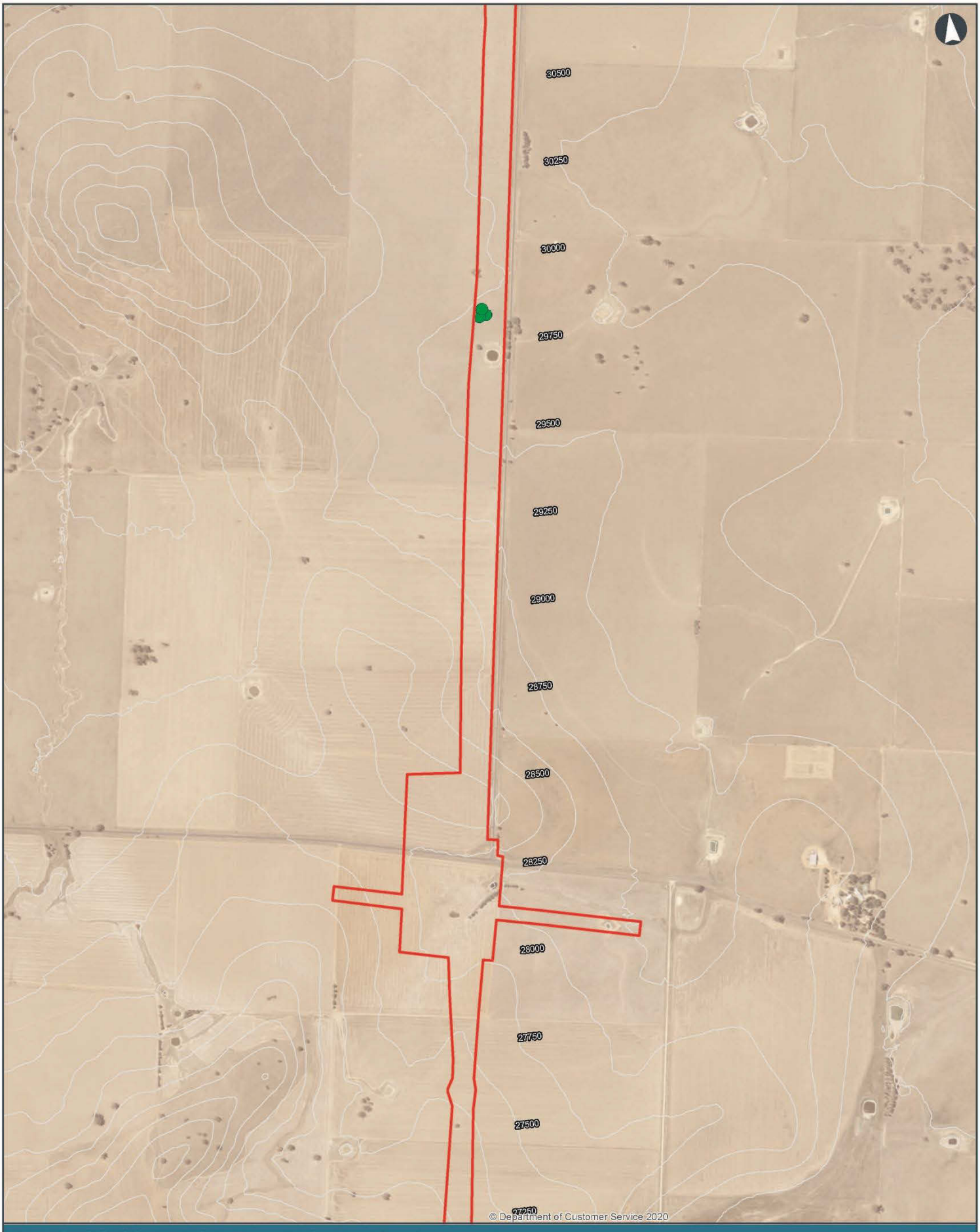
- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

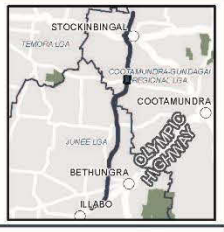
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

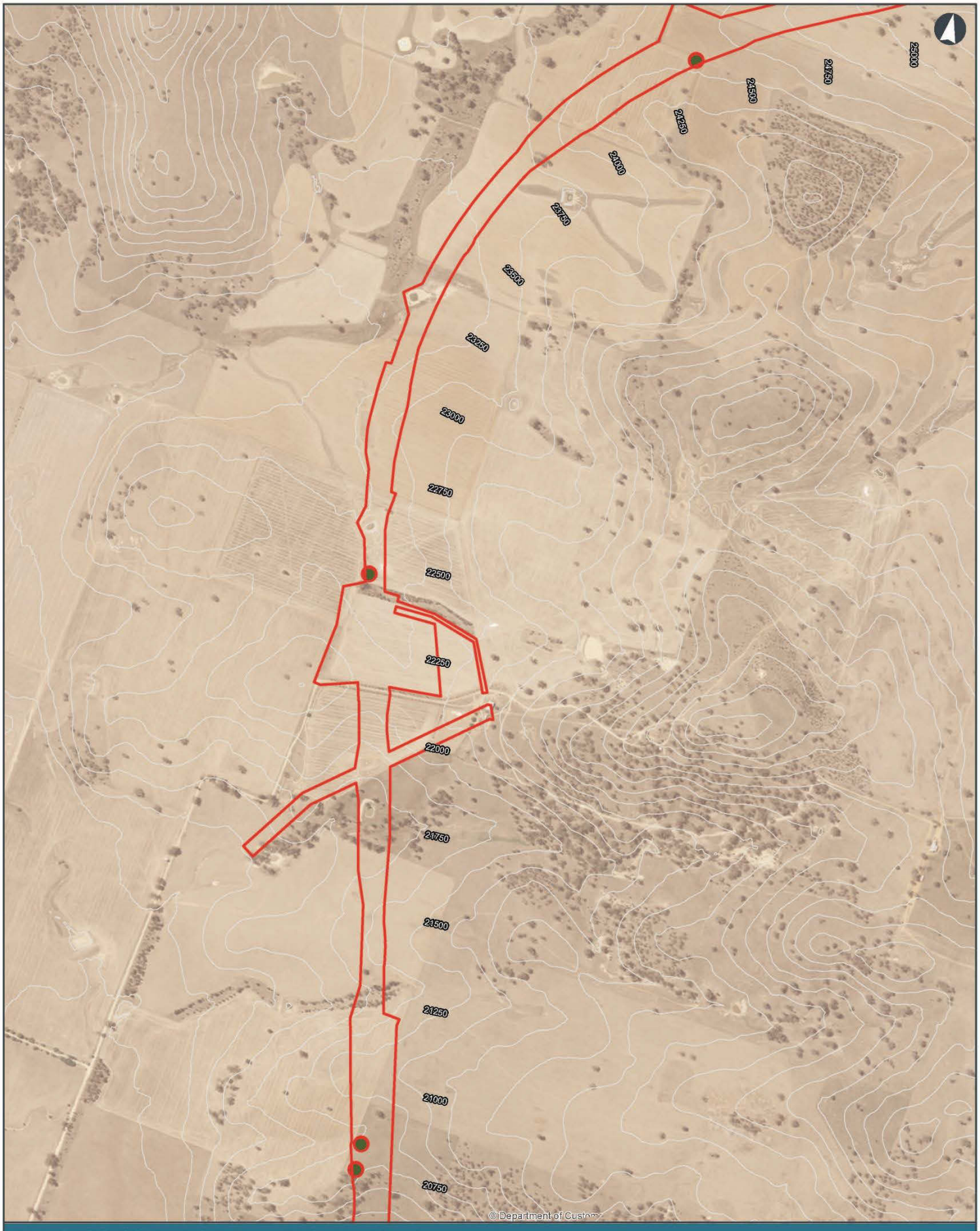
- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

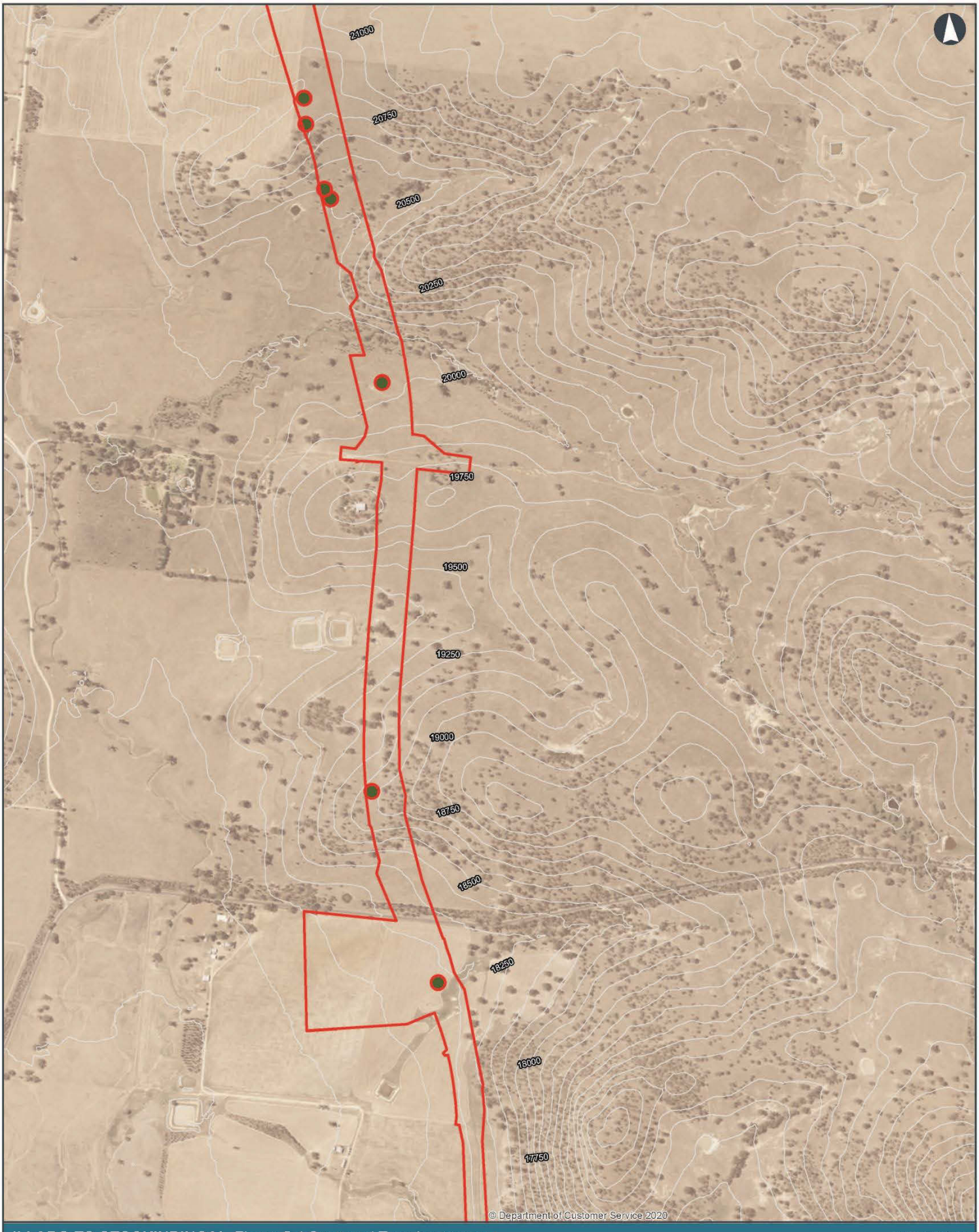
Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

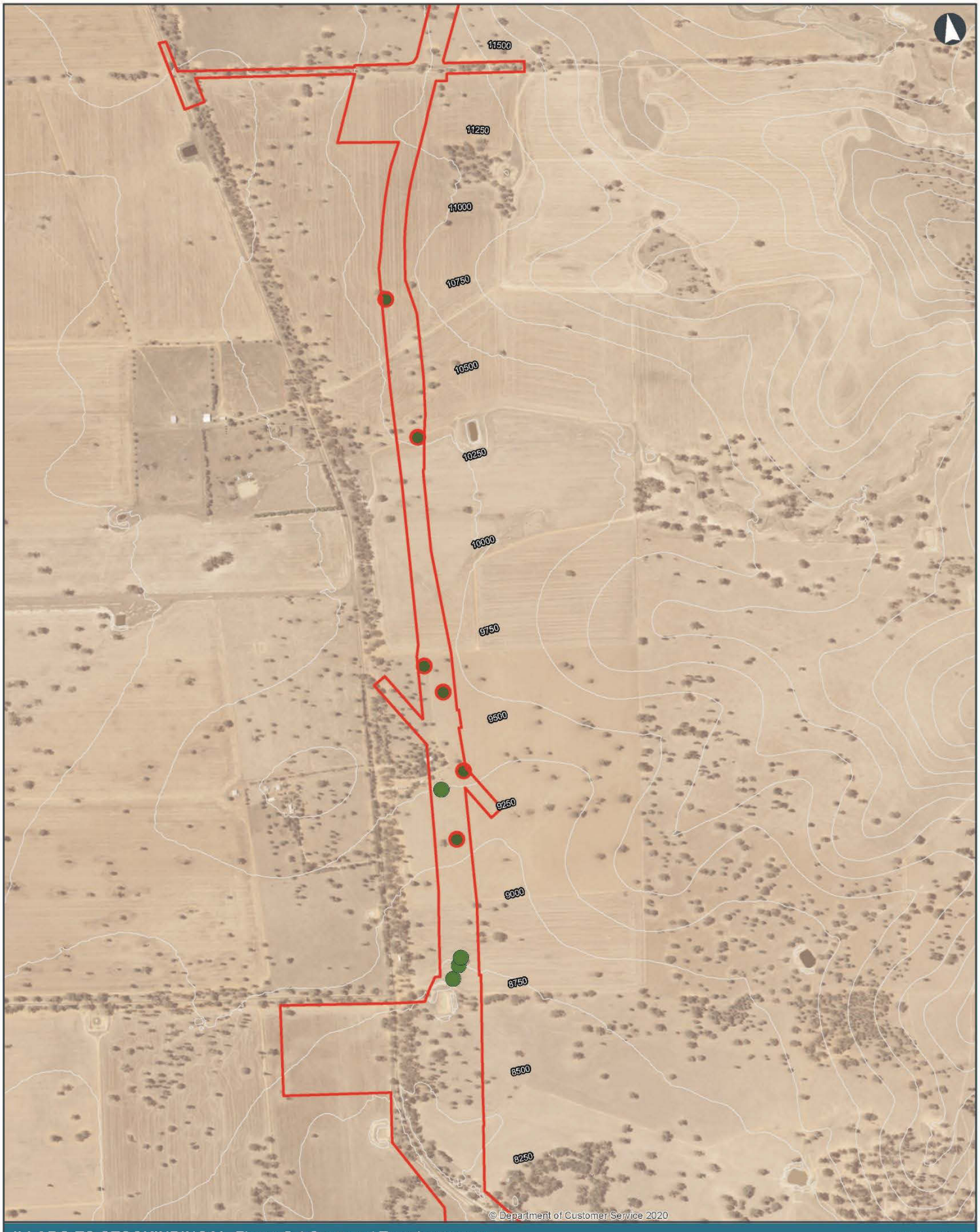
Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

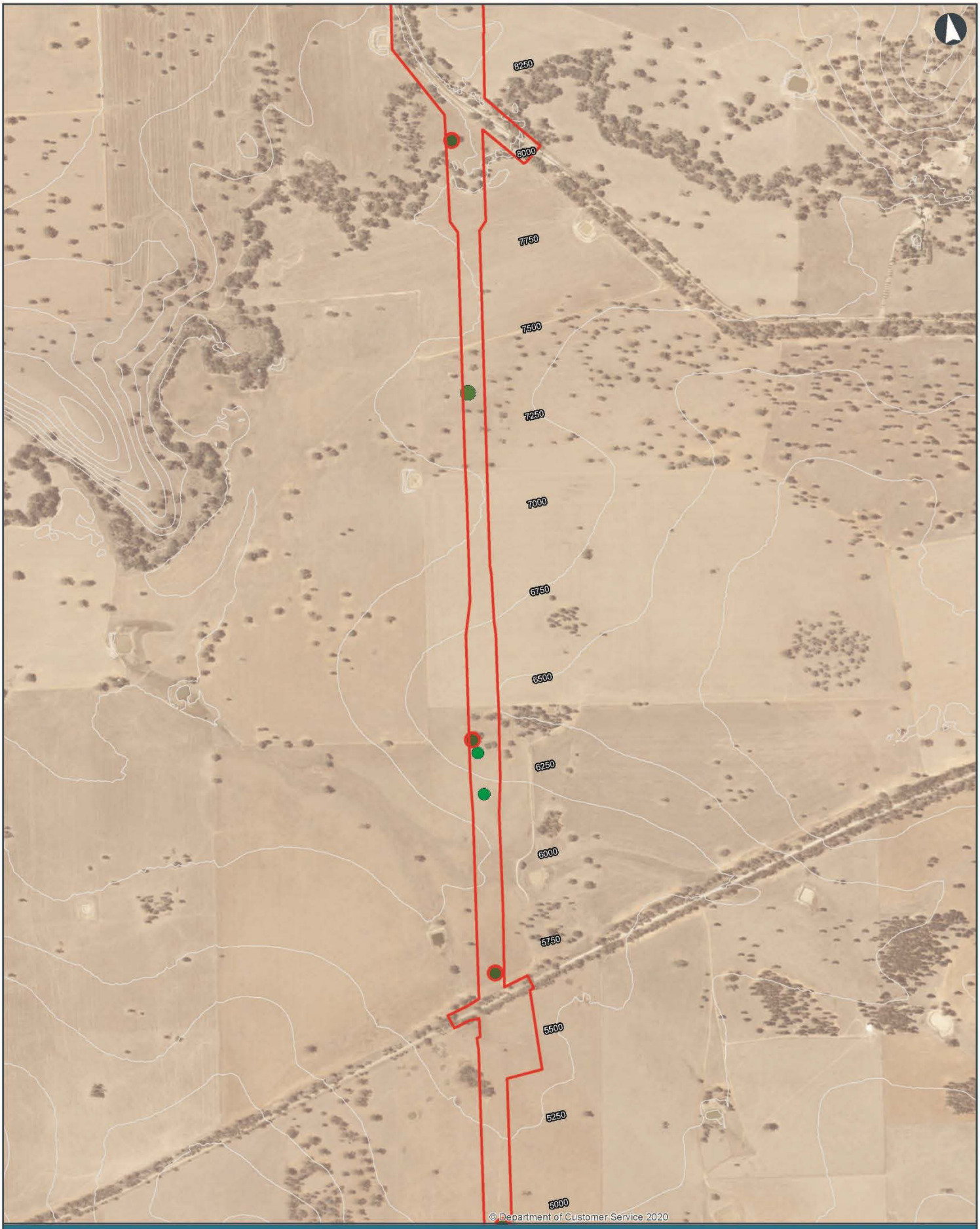
Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

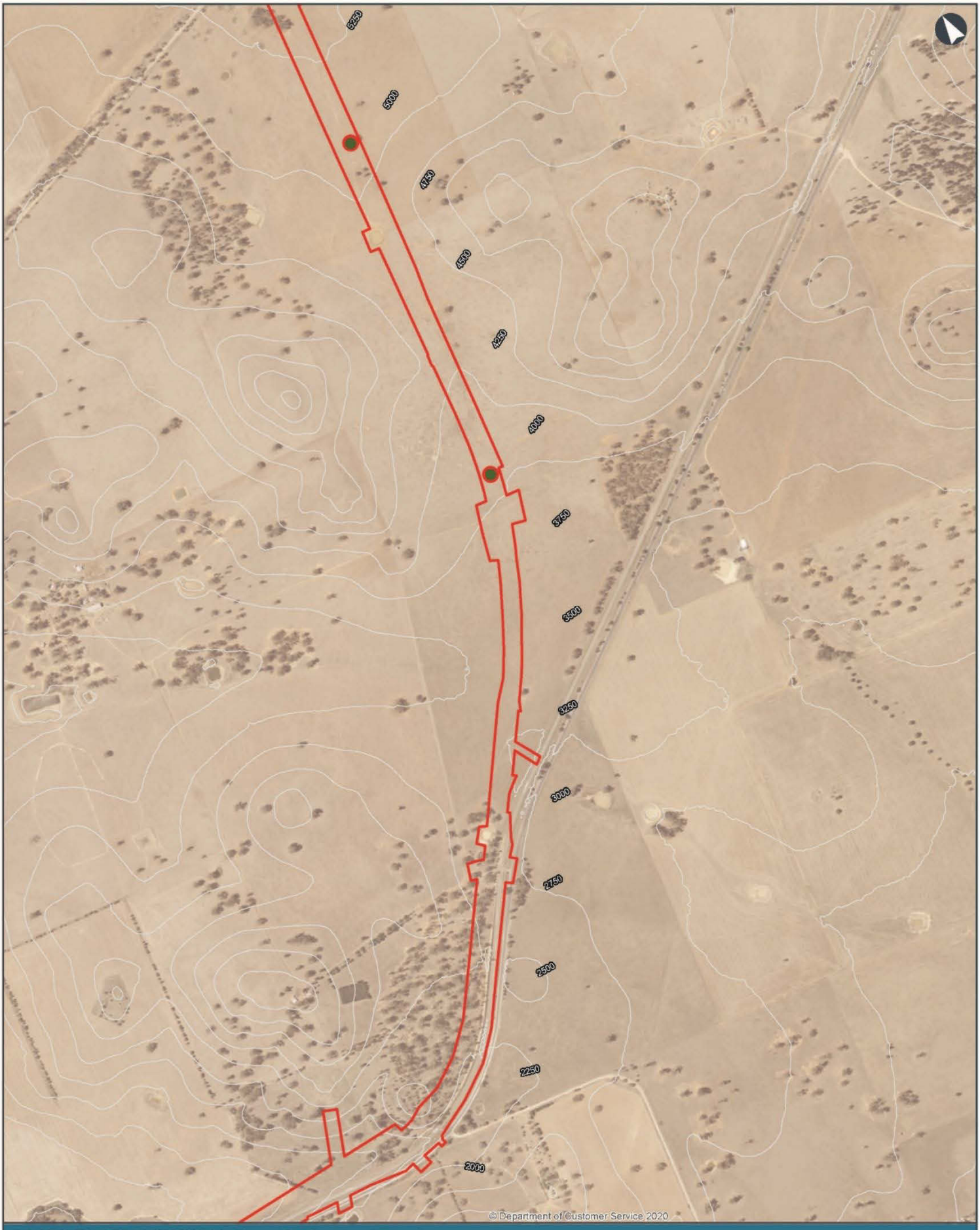
Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4998 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_02\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 5.4 Scattered Tree Assessment

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

5m Contours

Paddock Trees

- Class 1 - no hollows
- Class 2 - no hollows
- Class 2 - with hollows
- Class 3 - no hollows
- Class 3 - with hollows

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_4ScatteredTree_r1v2.mxd

5.7 Threatened ecological communities

Native vegetation recorded within the subject land is considered to meet the final determination of two threatened ecological communities listed under the BC Act. These are:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.
- White Box Yellow Box Blakely's Red Gum Woodland.

A comparison of the final determination for each threatened ecological community and candidate PCT is provided in Table 5.22 to Table 5.23. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for candidate PCTs to determine if vegetation recorded within the subject land is consistent with the criterion.

A summary of each threatened ecological community, associated PCT and extent within the subject land is summarised in Table 5.24. The location of each threatened ecological community within the subject land is mapped in Figure 5.5.

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

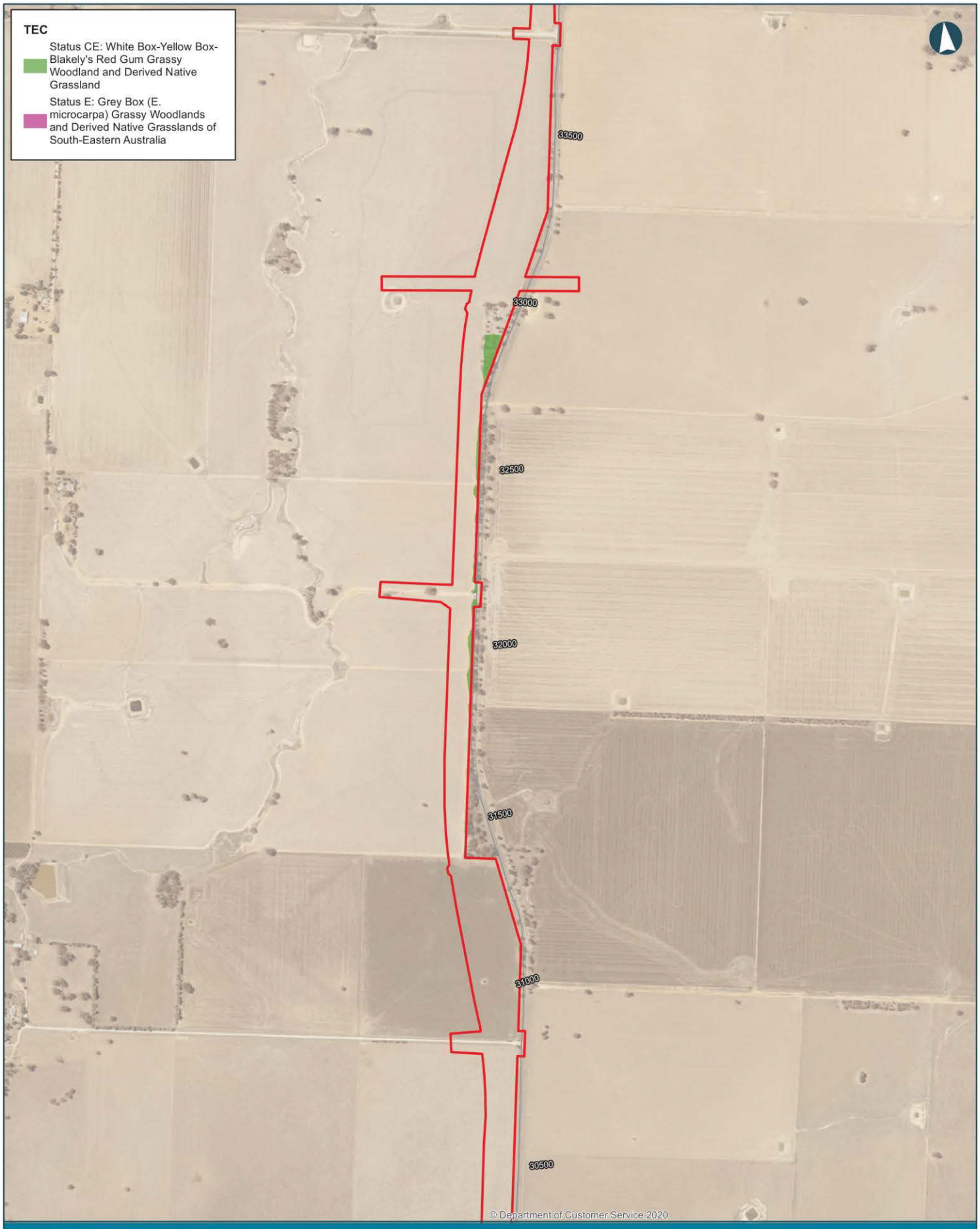
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

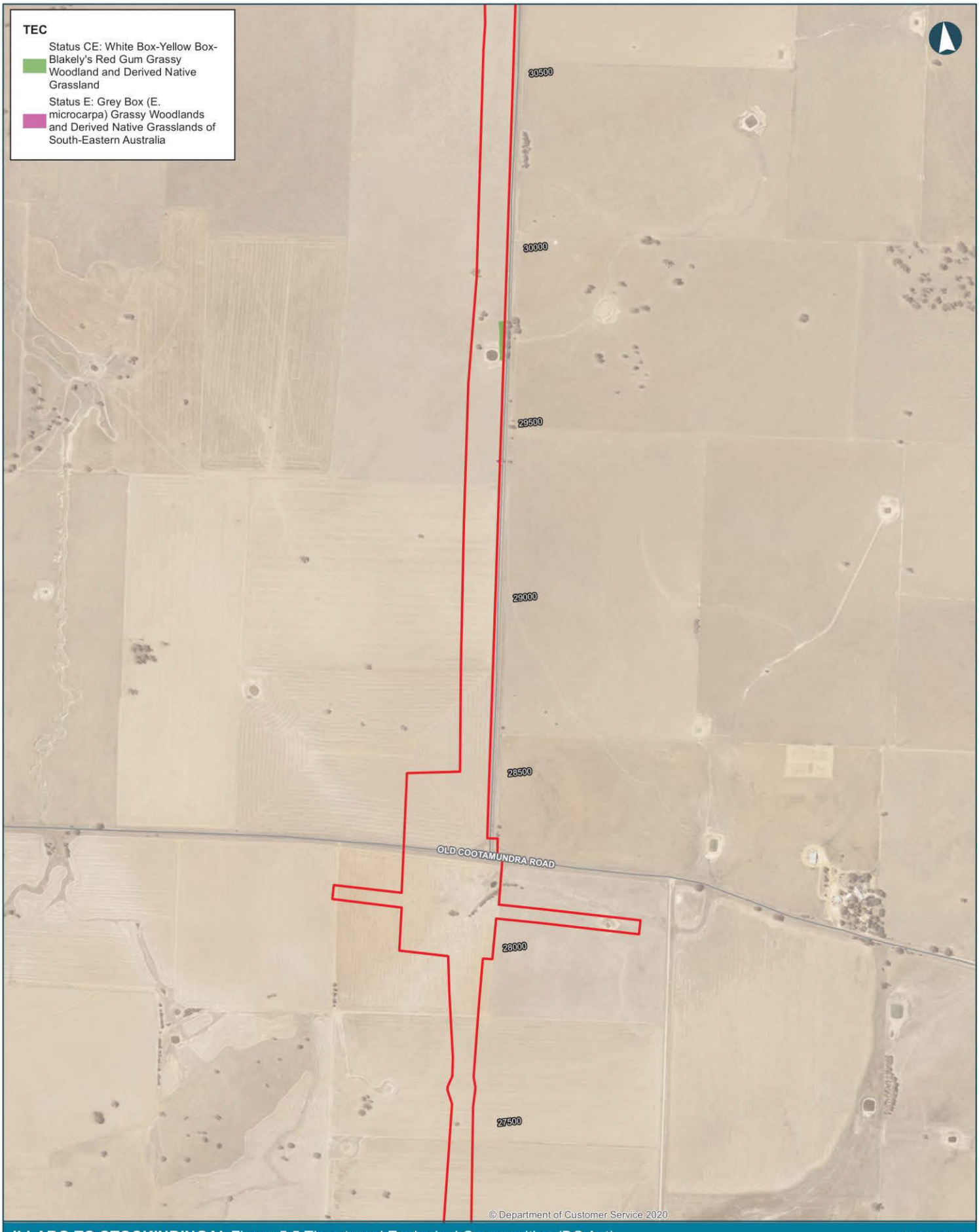
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

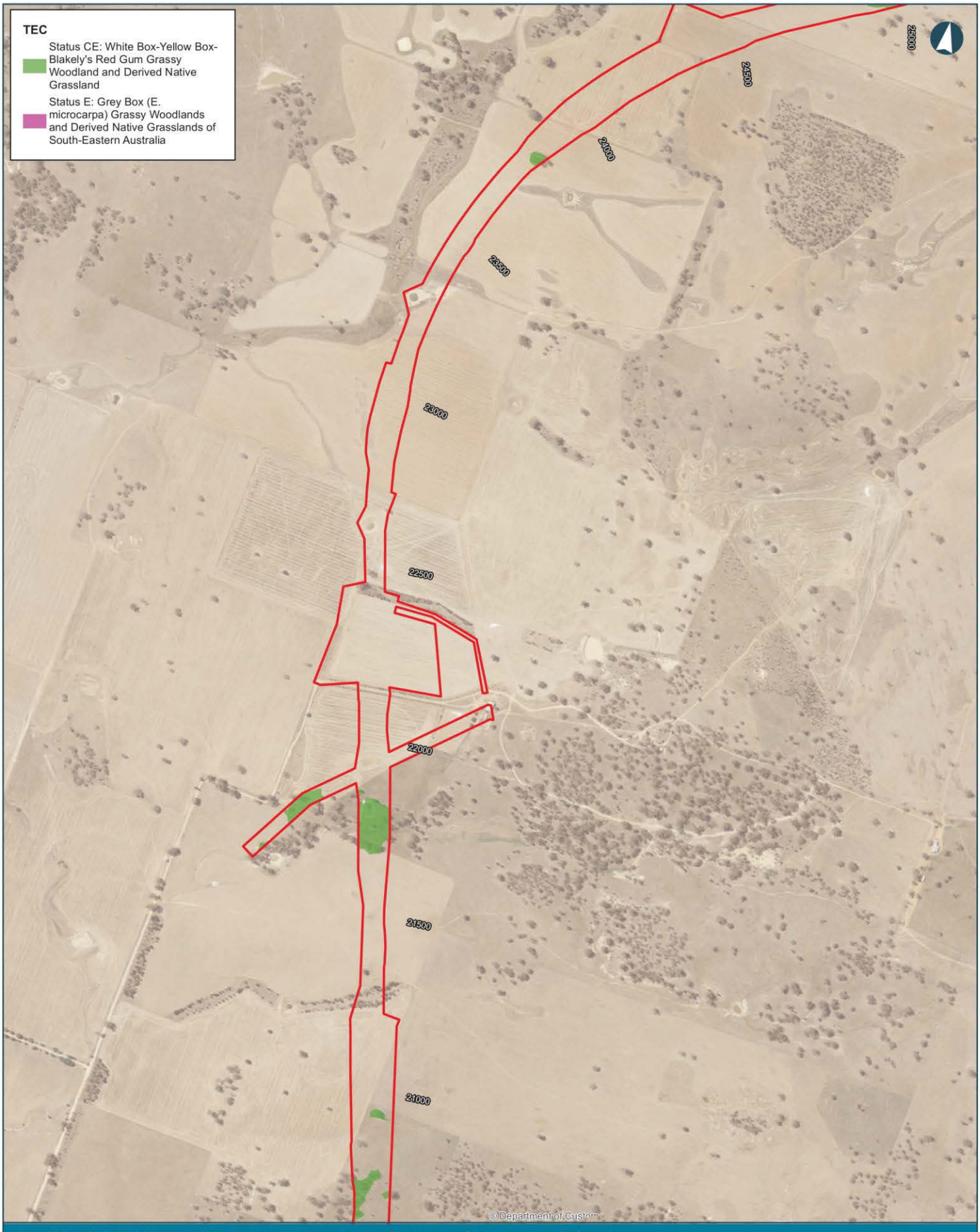
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

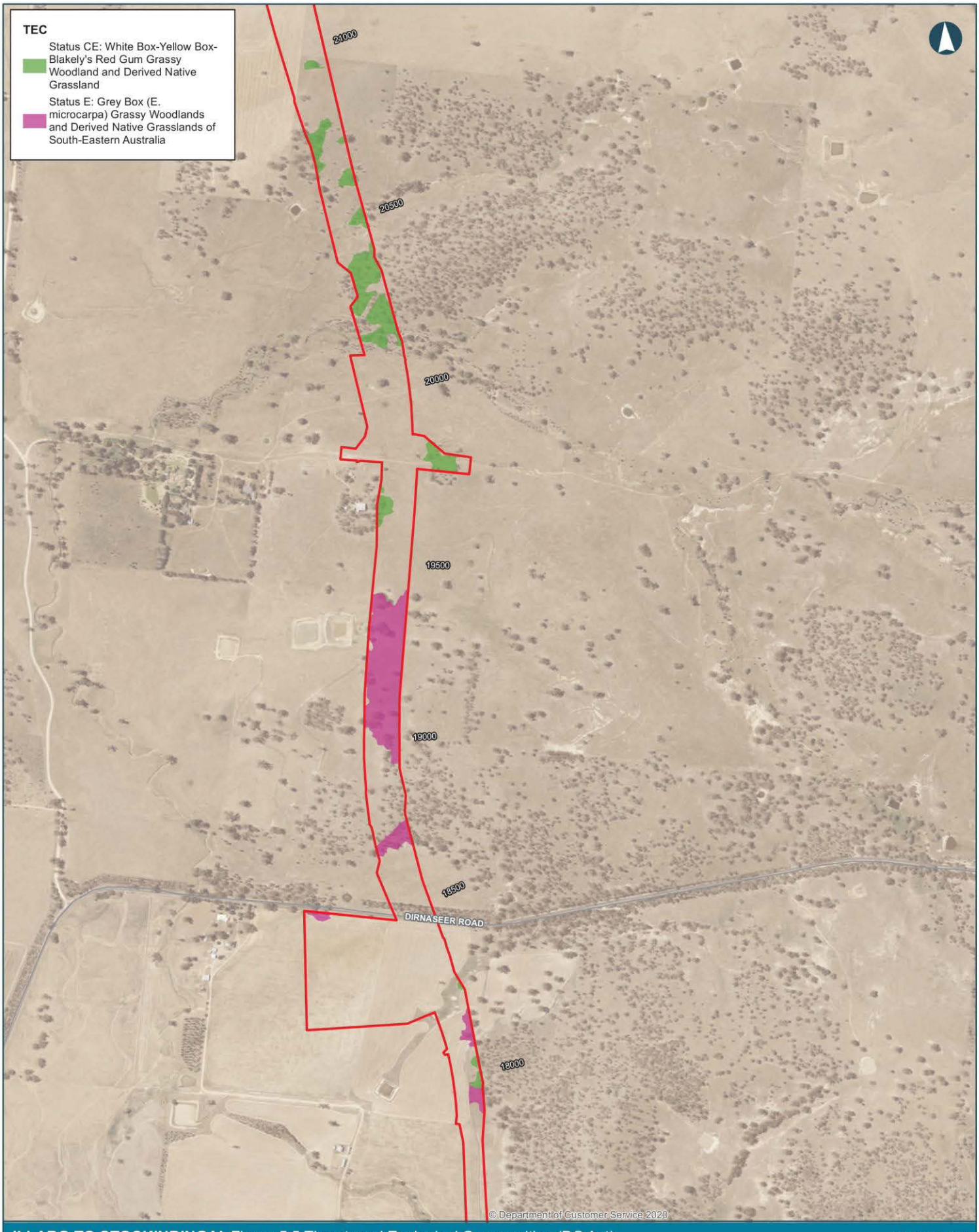
Proposal Site

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

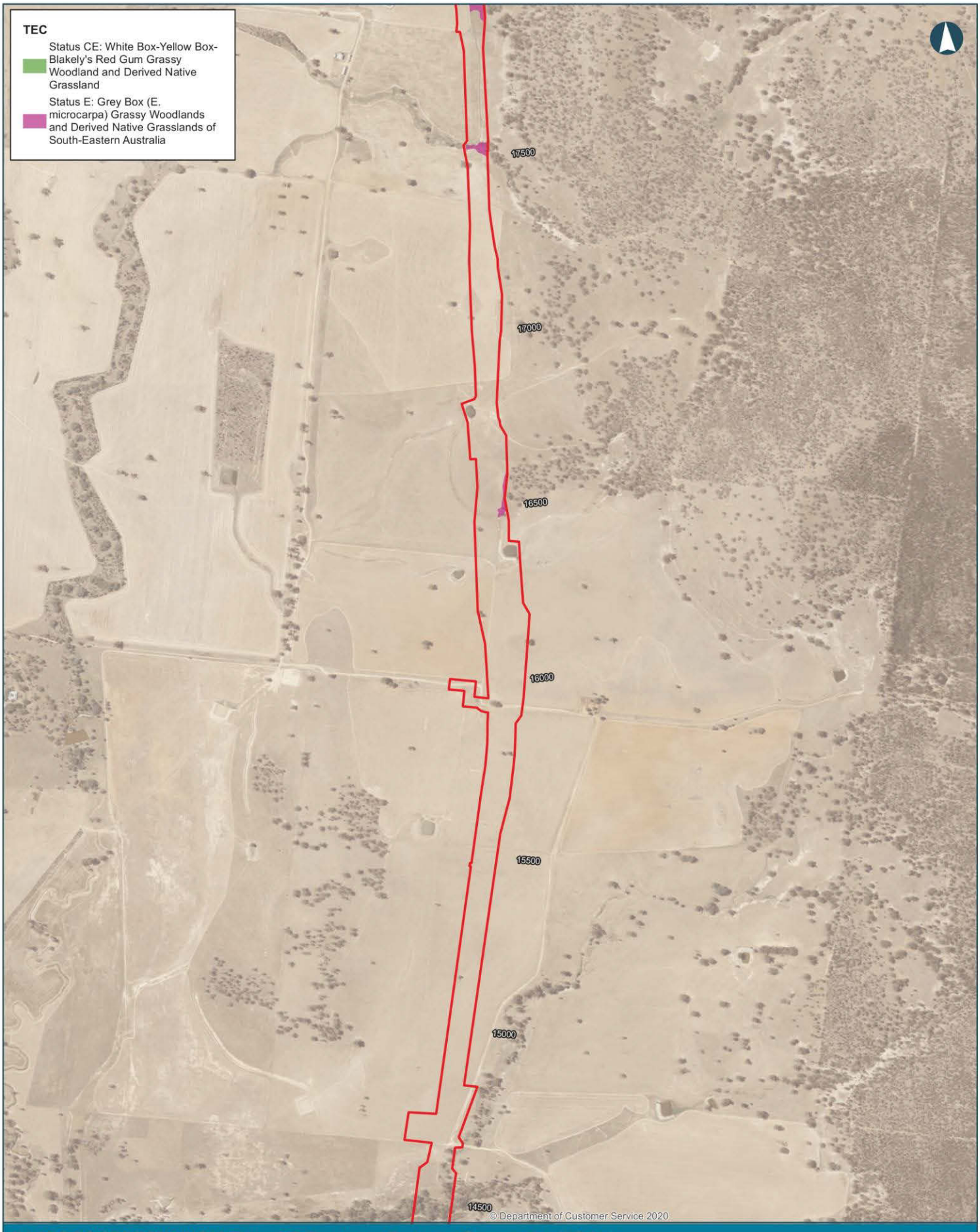
4038 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

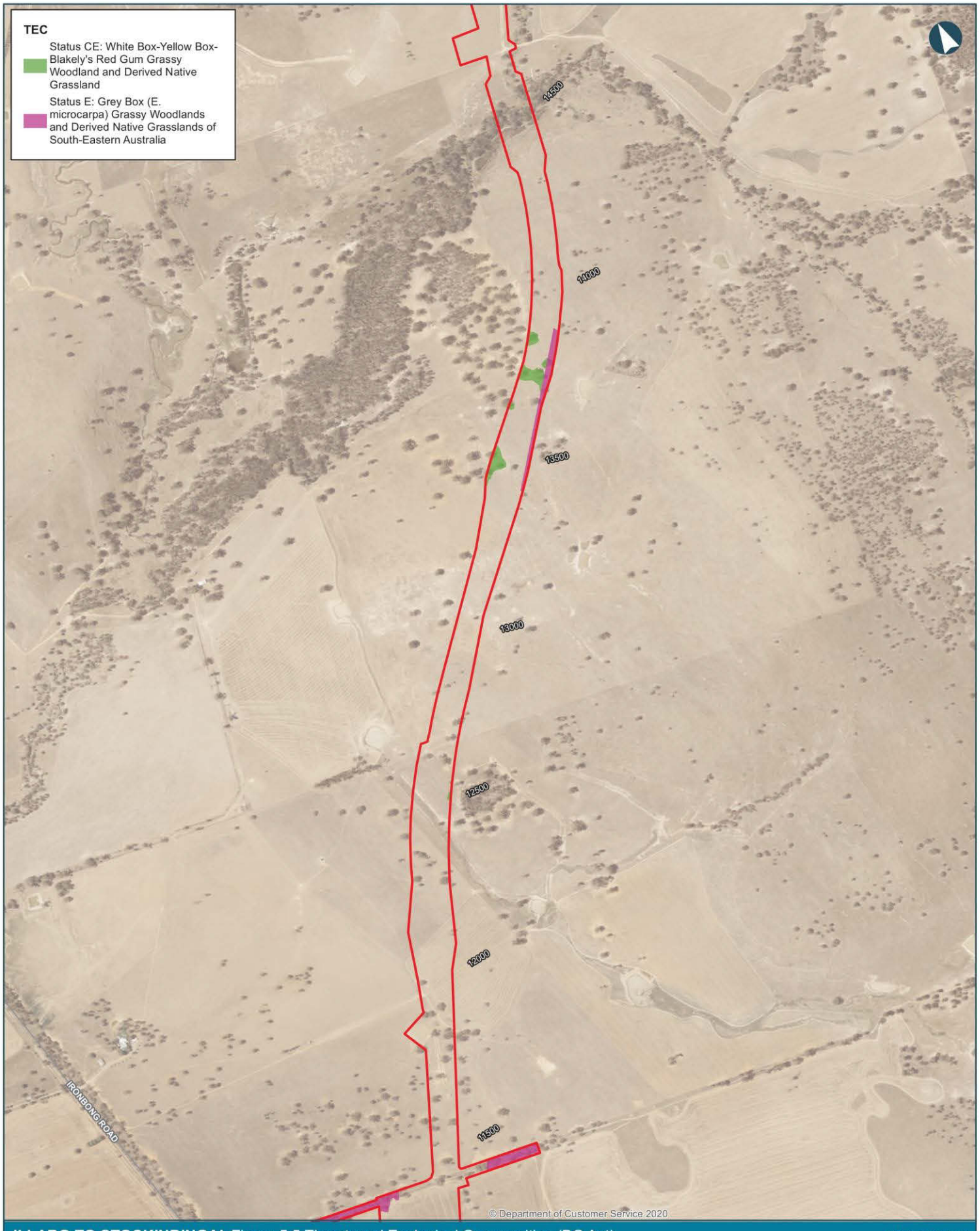
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

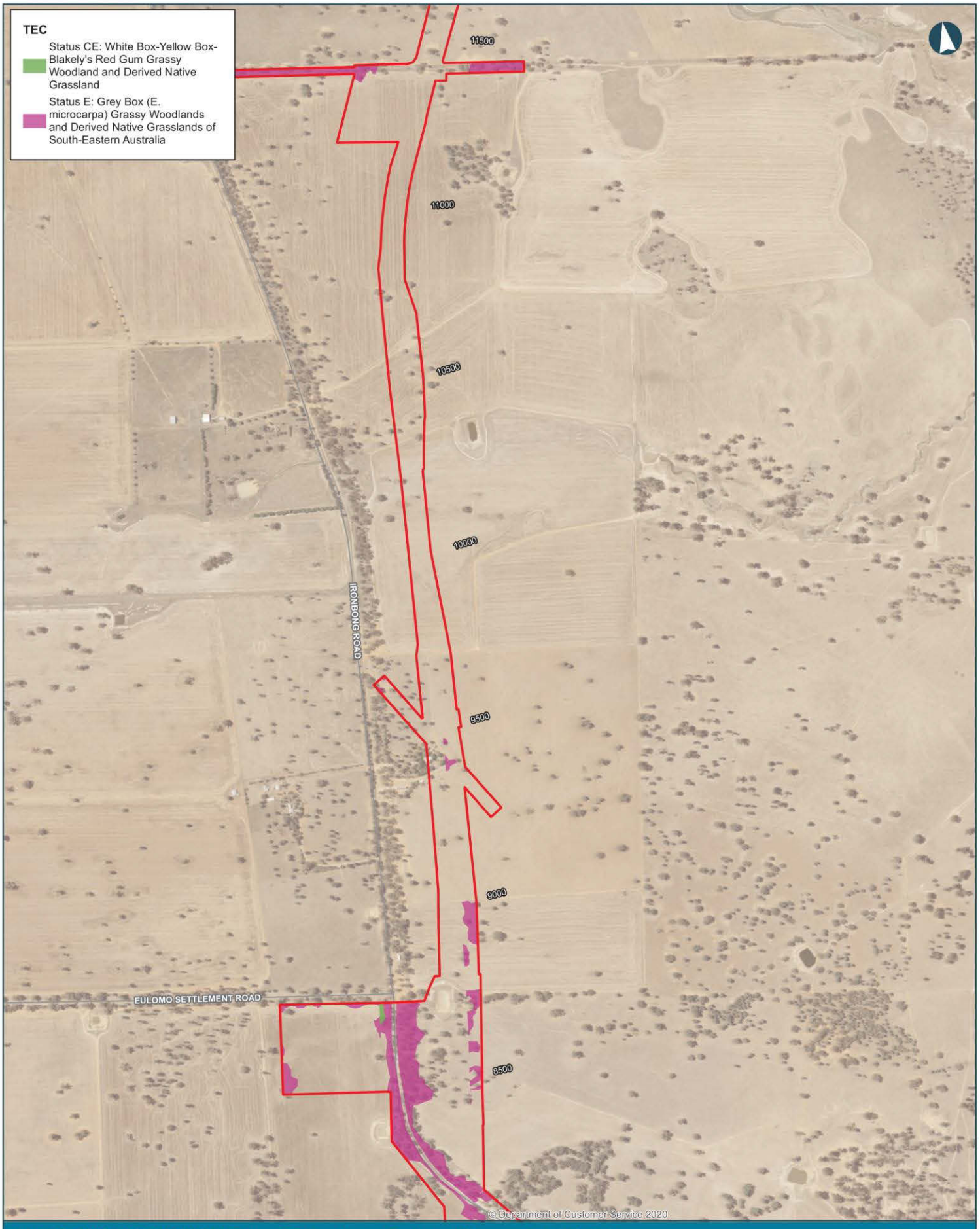
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

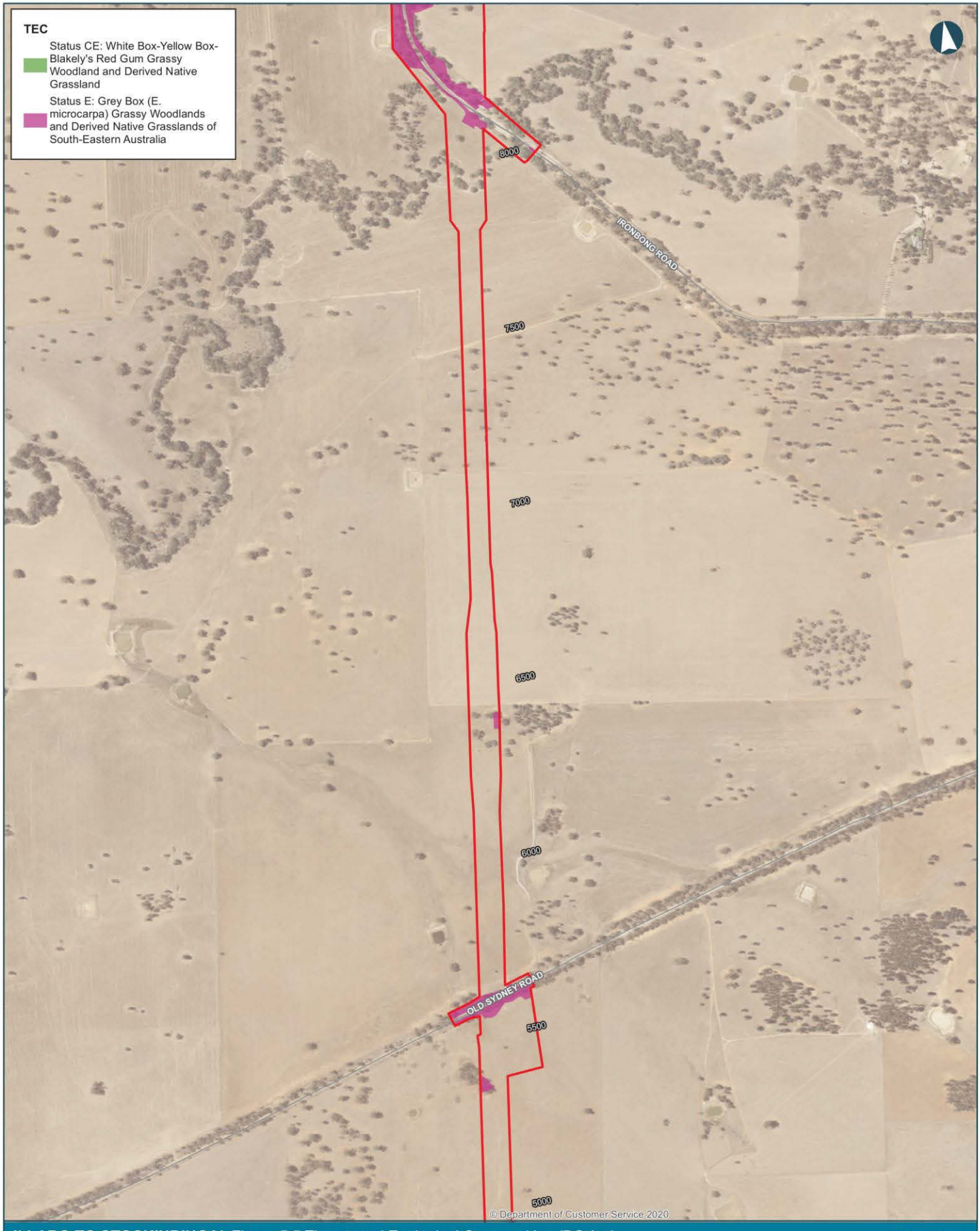
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

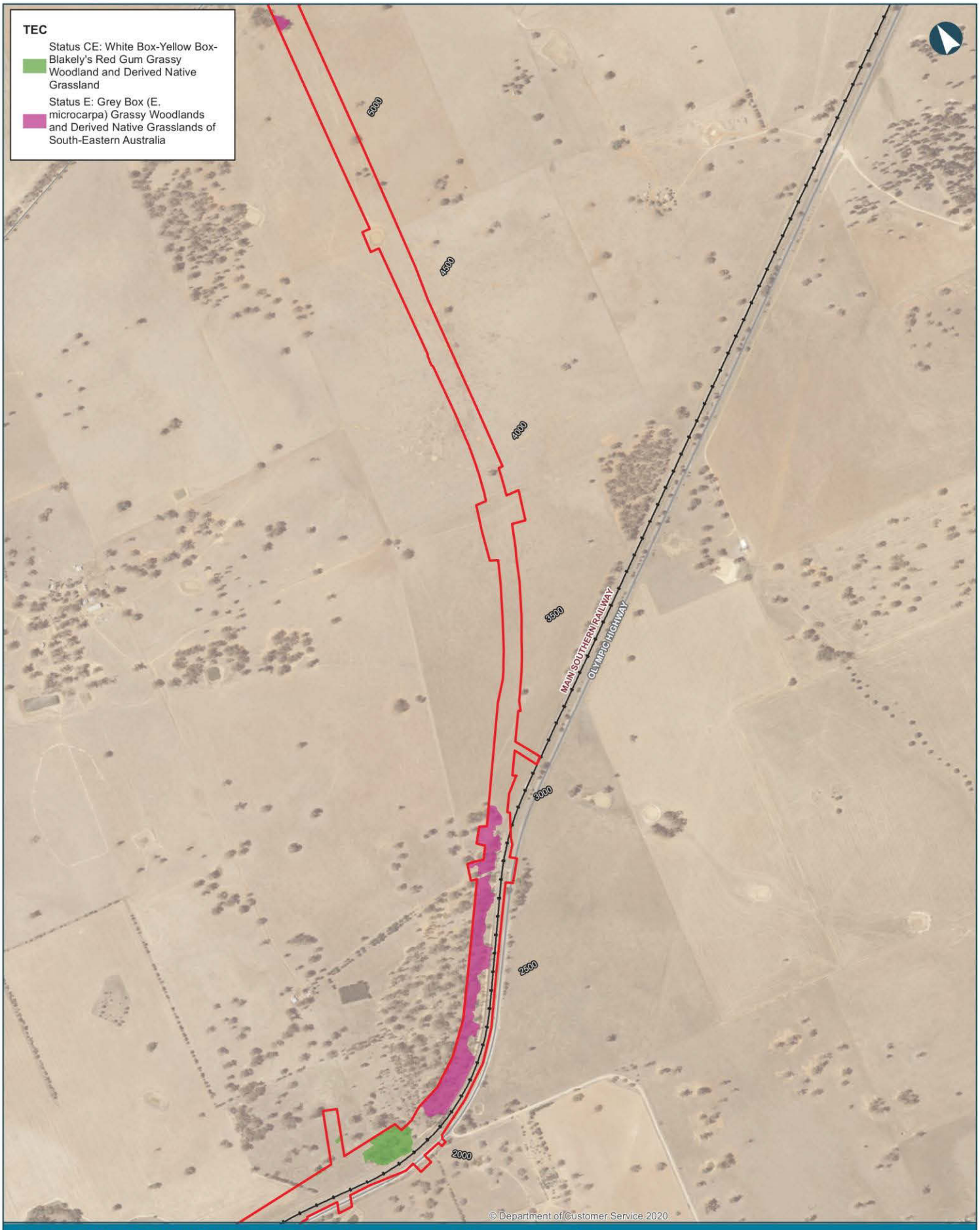
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd



ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd

ILLABO TO STOCKINBINGAL Figure 5.5 Threatened Ecological Communities (BC Act)

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Data Sources: IRDJV, ARTC, LPI

Paper: A3
Scale: 1:10,000

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_5_5TECs_r1v1.mxd

5.7.1 Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is listed as Endangered under BC Act.

The two following PCTs were considered candidates to form part of the BC Act listed Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.

To be considered consistent with the Endangered listing under the BC Act, the vegetation must be consistent with the final determination for Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (NSW Scientific Committee, 2007).

The assessment concluded that the following vegetation types and zones met the BC Act listing:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ3).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ4).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ6).
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ7).

A comparison of PCT 76 and PCT 80 within the subject land against the final determination for the threatened Inland Grey Box ecological community is provided in Table 5.22.

Table 5.22 Comparison of Inland Grey Box EEC final determination against associated PCT 76 and PCT 80 recorded within the subject land

Inland Grey Box Woodland EEC final determination[1]	PCT 76				PCT 80	
	Good	Moderate	Poor	Low	Moderate	Poor
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions is the name given to the ecological community found on relatively fertile soils of the western slopes and plains of NSW in which *Eucalyptus microcarpa* (Inland Grey Box) is the most characteristic species.	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species.			*Eucalyptus microcarpa* (Inland Grey Box) was absent	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species.	
In NSW the community principally occurs within the Riverina and South West Slopes Bioregions.	Recorded in the NSW South Western Slopes IBRA bioregion					
Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species - *Eucalyptus microcarpa* - is often found in association with *Eucalyptus populnea* subsp. *bimbil* (Bimbil Box), *Callitris glaucophylla* (White Cypress-pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Buloke) or *Eucalyptus melliodora* (Yellow Box), and sometimes with *Eucalyptus albens* (White Box).	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species with scattered occurrences of *Callitris glaucophylla* (White Cypress-pine).			Canopy was not recorded in this vegetation zone.	*Eucalyptus microcarpa* (Inland Grey Box) was the most dominant species with *Callitris glaucophylla* (White Cypress-pine) often recorded. Scattered occurrences of *Eucalyptus albens* (White Box) were also recorded.	
Characteristic species for this EEC.	Characteristic species were recorded in Q5, Q49, Q52,	Characteristic species were recorded in Q21, Q22, Q38	Characteristic species were recorded in Q9, Q10	Characteristic species were recorded in Q16	Characteristic species were recorded in Q20, Q50	Characteristic species were recorded in Q18, Q19, Q59
Inland Grey Box Woodland may be found in the local government areas of … Cootamundra, Junee…	Recorded in Cootamundra-Gundagai Regional Council and Junee Shire Council Local Government Areas.					
Inland Grey Box Woodland can, in some regions, be differentiated from *Eucalyptus albens-E. melliodora* communities by grass species. *Themeda triandra* and *Poa sieberiana* characterise the latter community whereas *Austrostipa scabra, Austrodanthonia spp.* and *Enteropogon spp.* are more typically associated with *Eucalyptus microcarpa*, although disturbance weakens this correlation (Prober and Thiele 2004).	*Austrostipa scabra* subsp. *scabra, Rytidosperma auriculatum*, *Rytidosperma caespitosum, Rytidosperma setaceum*, and *Enteropogon acicularis* were frequently recorded in these plant communities. It should be noted that during the time of survey, the Cootamundra and Junee regions were experiencing drought conditions and majority of the survey area with native grasslands had experienced heavy grazing.					

Inland Grey Box Woodland EEC final determination[1]	PCT 76				PCT 80	
	Good	Moderate	Poor	Low	Moderate	Poor
On a statewide scale, Benson et al. (2006) described six communities as fitting within the definition of Inland Grey Box Woodland (ID76, ID80, ID81, ID82, ID110 and ID237). The nominated community belongs to 'Floodplain Transition Woodlands' vegetation class of Keith (2004) which also includes the *Eucalyptus conica* (Fuzzy Box) and *E. pilligaensis* (Pilliga Box) woodland communities where *E. microcarpa* rarely occurs.	PCT 76 belongs to the Floodplain Transition Woodlands vegetation class and is known to align to this EEC.				PCT 80 belongs to the Floodplain Transition Woodlands vegetation class and is known to align to this EEC.	
Some remnants of the community survive with trees partly or wholly removed. Conversely, often the remnants of the community survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification.	Trees and ground layer partly intact	Trees and ground layer partly intact	Trees partly intact, ground soil seed bank not intact	Trees wholly removed, ground layer disturbed	Trees and ground layer partly intact	Trees partly intact, ground soil seed bank not intact
Disturbed remnants are considered to form part of the community including remnants where the understorey, overstorey or both would, under appropriate management, respond to assisted natural regeneration from the soil seed bank.	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Unlikely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration >90% native perennial understorey	Likely to respond to assisted natural regeneration	Unlikely to respond to assisted natural regeneration
Outcome	**Meets listing**	**Meets listing**	**Does not meet listing**	**Meets listing**	**Meets listing**	**Does not meet listing**

(1) NSW Scientific Committee (2007)

5.7.2 White Box Yellow Box Blakely's Red Gum Woodland

White Box – Yellow Box – Blakely's Red Gum grassy woodland is listed as Endangered under BC Act.

The four following PCTs were considered candidates to form part of the BC Act listed White Box – Yellow Box – Blakely's Red Gum grassy woodlands:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.

To be considered consistent with the Endangered listing under the BC Act, the vegetation must be consistent with the final determination for White Box – Yellow Box – Blakely's Red Gum grassy woodland (NSW Scientific Committee, 2004).

Vegetation recorded in Low and Poor condition was not considered in this assessment as it is considered unlikely the vegetation would respond to assisted natural regeneration (paragraph 8 of the final determination). It is assumed in these conditions that the natural soil seed bank is not intact and is therefore, not considered further in this assessment.

A comparison of PCT 266, PCT 276, PCT 277 and PCT 347 recorded against the final determination for the threatened White Box – Yellow Box – Blakely's Red Gum grassy woodland ecological community is provided in Table 5.23.

The assessment concluded that the following vegetation types and zones met the BC Act listing for White Box – Yellow Box – Blakely's Red Gum grassy woodland:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ9).
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ12).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ14).
- PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ18).

Table 5.23 Comparison of White Box Yellow Blakely's Red Gum Woodland EEC final determination and associated PCT 266, PCT 276, PCT 277 and PCT 347 recorded

White Box Yellow Box Blakey's Red Gum Woodland[1]	PCT 266		PCT 276	PCT 277		PCT 347
	Moderate	Low	Moderate	Moderate	Low	Moderate
Paragraph 1: White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland) is found on relatively fertile soils on the tablelands and western slopes of NSW. The community occurs within the South Eastern Highlands and NSW South Western Slopes Bioregions.	These vegetation types were recorded on fertile soils of the NSW South Western Slopes Bioregion.					
Paragraph 2: Box Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations – *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) or *Eucalyptus blakelyi* (Blakely's Red Gum). Grass and herbaceous species generally characterise the ground layer. In some locations, the tree overstorey may be absent as a result of past clearing or thinning and at these locations only an understorey may be present. Shrubs are generally sparse or absent, though they may be locally common.	*Eucalyptus albens* (White Box) was the dominant. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	The tree overstorey in this vegetation is absent due to historic and ongoing agricultural activities and at these locations only a native ground stratum is present.	*Eucalyptus melliodora* (Yellow Box) was the dominant overstorey species. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	*Eucalyptus blakelyi* (Blakely's Red Gum) and scattered *Eucalyptus albens* (White Box) were the dominant trees. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.	The tree overstorey in this vegetation is absent due to historic and ongoing agricultural activities and at these locations only a native ground stratum is present.	*Eucalyptus albens* (White Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) were the dominant trees. Shrubs are generally sparse or absent. Grass and herbaceous species generally characterise the ground stratum.
Paragraph 3: outlines the most characteristic species for this EEC.	Characteristic species were recorded in Q25, Q26, Q47, Q65	Characteristic species were recorded in Q41, Q42, Q44, Q48, Q66	Characteristic species were recorded in Q3, Q53	Characteristic species were recorded in Q4, Q13, Q45, Q46, Q51, Q56, Q57, Q58	Characteristic species were recorded in Q14, Q15, Q54, Q55	Characteristic species were recorded in Q23, Q32

White Box Yellow Box Blakey's Red Gum Woodland[1]	PCT 266		PCT 276	PCT 277		PCT 347
	Moderate	Low	Moderate	Moderate	Low	Moderate
Paragraph 4: Woodlands with *Eucalyptus albens* are most common on the undulating country of the slopes region while *Eucalyptus blakelyi* and *Eucalyptus melliodora* predominate in grassy woodlands on the tablelands. Drier woodland areas dominated by *Eucalyptus albens* often form mosaics with areas dominated by *Eucalyptus blakelyi* and *Eucalyptus melliodora* occurring in more moist situations, while areas subject to waterlogging may be treeless. *E microcarpa* is often found in association with *E. melliodora* and *E. albens* on the south western slopes.	PCT 266 was recorded in areas of higher elevation where surface rock was generally present and occurred as a grassy woodland.		PCT 276 was recorded in low-lying areas in the landscape subject to period flooding and occurred as a grassy woodland.	PCT 277 on low hills and undulations dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus albens* (White Box)	No overstorey species were recorded in this vegetation type.	PCT 347 occurs on mid slopes dominated by *Eucalyptus albens* (White Box)
Paragraph 8: Further remnants of the community are degraded as a consequence of their disturbance history. Some remnants of these communities survive with the trees partly of wholly removed by post European activities, and conversely, often remnants of these communities survive with these tree species largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification.	Trees and ground layer mostly intact	Trees wholly removed, ground layer disturbed	Trees and ground layer mostly intact	Trees and ground layer mostly intact	Trees wholly removed, ground layer disturbed	Trees and ground layer mostly intact
Paragraph 10: The condition of remnants ranges from relatively good to highly degraded, such as paddock remnants with weedy understories and only a few hardy natives left. Some remnants of the community may consist of only an intact overstorey or an intact understorey but may still have high conservation value due to the flora and fauna they support.	Vegetation integrity score 62.9 – hollow trees recoded	Vegetation integrity score 2 – low habitat value	Vegetation integrity score 41.4 – hollow trees recoded	Vegetation integrity score 77.8 – hollow trees recoded	Vegetation integrity score 2.7 – low habitat value	Vegetation integrity score 46.9 – hollow trees recorded
Paragraph 11: Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.	Likely to respond to assisted natural regeneration	Unlikely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration	Unlikely to respond to assisted natural regeneration	Likely to respond to assisted natural regeneration
Outcome	**Meets listing**	**Does not meet listing**	**Meets listing**	**Meets listing**	**Does not meet listing**	**Meets listing**

5.7.3 Summary of threatened ecological communities

Table 5.24 provides a summary of the threatened ecological communities listed under the BC Act recorded and the extent and condition within the subject land. These are mapped in Figure 5.5.

Table 5.24 BC Act listed Threatened Ecological Communities recorded

Threatened ecological community	BC Act	Associated PCT within the construction footprint	Condition	Extent with subject land (ha)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good	1.1
			Moderate	18.7
			Poor	Does not meet listing
			Low	2.3
		PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate	1.4
			Poor	Does not meet listing
Total area of Inland Grey Box Woodland				**23.5**
White Box Yellow Box Blakely's Red Gum Woodland	CE	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	4.5
			Poor	Does not meet listing
			Low	Does not meet listing
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate	0.8
			Poor	Does not meet listing
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate	14.5
			Poor	Does not meet listing
			Low	Does not meet listing
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	0.13
			Poor	Does not meet listing
Total area of White Box Yellow Box Blakely's Red Gum Woodland				**19.93**
Total area of all TECs listed under the BC Act				**43.43**

6 Threatened species

This chapter assesses the habitat suitability for threatened species in accordance with Chapter 5 of the BAM and has been prepared in accordance with the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020).

Methods for threatened species survey and assessment are outlined in section 3.3.

6.1 Habitat suitability for ecosystem credit species

Ecosystem credit species are those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. Ecosystem credit threatened species have been assessed in conjunction with information about site context (Section 1 of the BAM), PCTs and vegetation integrity attributes (Chapter 4 of the BAM), and data from the NSW Threatened Biodiversity Data Collection (TBDC) (Department of Planning Industry and Environment 2021).

Ecosystem credit threatened species were assessed using information about site context, PCTs and vegetation integrity attributes collected during the field surveys, and data from the Threatened Biodiversity Data Collection (EES, 2021) as required by subsections 5.2.1 and 5.2.2 of the BAM and Part 3 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020).

Initial desktop assessment to determine ecosystem (predicted) and species (candidate) credit species involved entering the identified vegetation types and zones into BAM-C. This allowed predicted and candidate species reports to be generated for the associated PCTs within the study area.

6.1.1 Predicted ecosystem credit species generated from BAM-C

A preliminary list of 41 predicted ecosystem credit species was generated from the BAM-C based on associated vegetation types. This predicted ecosystem credit species list is presented in Appendix J.

Seven of these predicted ecosystem credit species were recorded during the survey and are listed in Table 6.1.

Table 6.1 Threatened ecosystem species recorded

Scientific name	Common name	BC Act[1]	EPBC Act[2]	Credit type
Climacteris picumnus victoriae	Brown Treecreeper	V	–	Ecosystem credit species
Epthianura albifrons	White-fronted Chat	V	–	Ecosystem credit species
Falco subniger	Black Falcon	V	–	Ecosystem credit species
Petroica phoenicea	Flame Robin	V	–	Ecosystem credit species
Polytelis swainsonii	Superb Parrot	V	V	Species credit species (breeding)/Ecosystem
Pomatostomus temporalis temporalis	Grey-Crowned Babbler	V	–	Ecosystem credit species
Stagonopleura guttata	Diamond Firetail	V	–	Ecosystem credit species

6.1.2 Justification for inclusion of any additional predicted ecosystem credit species

In identifying an ecosystem credit species list for further assessment, two additional ecosystem credit species were recorded within the study area and has been included for assessment as outlined in Table 6.2.

Table 6.2 Justification for inclusion of any additional predicted ecosystem credit species

Scientific name	Common name	BC Act[1]	SAII	Justification for inclusion	Recorded
Epthianura albifrons	White-fronted Chat	V	No	Recorded within the proposal site.	Yes
Falco subniger	Black Falcon	V	No	Although likely to occur in relatively low numbers, this species occurs widely in open habitats including cropping lands where it preys upon open country birds. Trees within the study area may be used for perching, or rarely for breeding purposes.	Yes

(1) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered; SAII = Serious and Irreversible Impact entity

6.1.3 Justification of any exclusion of any predicted ecosystem credit species

In refining the candidate ecosystem species list for further assessment, one ecosystem credit species predicted by the BAM-C was excluded from the BAM-C candidate list Table 6.3.

Table 6.3 Justification for exclusion of any predicted ecosystem credit species

Common name	Species	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	Justification for exclusion
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species.	No Allocasuarina species observed on site upon which this species is dependent. Habitat requirements not met and exclusion of the species further supported by lack of records in locality and during surveys.

(1) V = Vulnerable, E = Endangered as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(3) Habitat requirements and geographic requirements were obtained from the BAM Credit Calculator (BCC)

6.2 Habitat suitability for species credit species

Species credit species are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits. Species credit species are those species for which the likelihood of occurrence, or elements of suitable habitat, cannot be confidently predicted by vegetation surrogates or landscape features (see section 3.3.2). Species credit species have been assessed in conjunction with information collected about the site context of the development site (Chapter 3 of the BAM), on PCTs and vegetation integrity attributes in (Chapter 4 of the BAM), and data obtained from the Threatened Biodiversity Data Collection (TBDC) (Department of Planning industry and Environment 2021).

In accordance with Part 3 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020), further assessment of candidate species credit species (Step 3) includes assessing microhabitats and targeted surveys to determine if a species is absent, or if present, whether a species and/or its habitats are degraded to the point that the species is unlikely to utilise the study area (or specific vegetation zones).

Details of threatened species surveys methods employed for this report are presented in Chapter 3. Results of targeted surveys are presented in section 6.2 and 6.3 below.

6.2.1 Threatened flora species

Results of the threatened species database searches identified 21 threatened plant species listed under the BC Act as being known to occur or considered likely to occur within the subject land. This included the list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1).

6.2.1.1 Candidate threatened flora species credit species generated from BAM-C

A preliminary list of candidate threatened flora species was generated from the BAM-C based on associated vegetation types for each IBRA subregion. This preliminary candidate threatened flora species list is presented in Table 6.4.

Table 6.4 List of preliminary BAM-C candidate threatened flora species credit species

Scientific name	Common name	BC Act[1]	EPBC Act[1]	Habitat features	Associated PCTs
Acacia ausfeldii	Ausfeld's Wattle	V	–	–	PCT 266; PCT 277 & PCT 276
Ammobium craspedioides	Yass Daisy	V	V		PCT 266; PCT 277; PCT 276
Austrostipa wakoolica	A spear-grass	E	E	south of Narranderra	PCT 76 and PCT 80
Caladenia arenaria	Sand-hill Spider Orchid	E SAII	E	west of Lockhart and north of Rand	PCT 76
Caladenia concolor	Crimson Spider Orchid	E SAII	V		PCT 347
Cullen parvum	Small Scurf-pea	E	–	–	PCT 347, PCT 277, PCT 5
Diuris tricolor	Pine Donkey Orchid	V	–	–	PCT 76, PCT 80, PCT 347
Euphrasia arguta	Euphrasia arguta	CE SAII	CE		PCT 266, PCT 276
Grevillea wilkinsonii	Tumut Grevillea	E SAII	E	Eastern part of sub-region from 10km west of the Hume Highway and north of the Snowy Mountains Highway	PCT 266
Indigofera efoliata	Leafless Indigo	E SAII	E		PCT 76
Leucochrysum albicans var. tricolor	Hoary Sunray	–	E	–	PCT 347

Scientific name	Common name	BC Act[1]	EPBC Act[1]	Habitat features	Associated PCTs
Prasophyllum petilum	Tarengo Leek Orchid	E	E		PCT 347, PCT 277, PCT 276
Prasophyllum sp. *Wybong*	Prasophyllum Wybong	– SAII	CE		PCT 266, PCT 276
Pultenaea humilis	Dwarf Bush-pea	V	–		PCT 347
Senecio garlandii	Woolly Ragwort	V	–		PCT 347 and PCT 185
Swainsona murrayana	Slender Darling Pea	V	V	Western half of sub-CMA	PCT 76, PCT 80
Swainsona recta	Small Purple-pea	E	E	–	PCT 277, PCT 76; PCT 266; PCT 276
Swainsona sericea	Silky Swainson-pea	V	V	–	PCT 76
Tylophora linearis	Tylophora linearis	V	E	–	PCT 347

(1) Threat status: V = Vulnerable, E = Endangered, CE = Critically Endangered.

6.2.1.2 Justification for inclusion of any additional threatened flora species credit species

No candidate threatened flora species were included in addition to the BAM-C preliminary candidate list.

6.2.1.3 Justification for exclusion of any additional threatened flora species credit species

No candidate threatened flora species were excluded from BAM-C preliminary candidate list.

6.2.2 Threatened fauna species

Results of the threatened species database searches identified 59 threatened fauna species listed under the BC Act as being known to occur or considered likely to occur within the subject land. This included the list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1). Threatened fauna species are presented in Figure 6.1.

6.2.2.1 Candidate threatened fauna species credit species generated from BAM-C

A preliminary list of candidate threatened fauna species was generated from the BAM-C based on associated vegetation types and is summarised in Table 6.5.

Table 6.5 List of preliminary BAM-C candidate threatened fauna species credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements/geographic restrictions[3]
Amphibians				
Sloane's Froglet	*Crinia sloanei*	V	–	Semi-permanent/ephemeral wet areas/containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area/within 500m of swamps/within 500m of waterbody
Booroolong Frog	*Litoria booroolongensis*	E	V	–
Southern Bell Frog	*Litoria raniformis*	E	V	N-

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements/geographic restrictions[3]
Birds				
Barking Owl	*Ninox connivens*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	–
Bush Stone-curlew	*Burhinus grallarius*	E1	–	Fallen/standing dead timber including logs
Common Sandpiper	*Actitis hypoleucos*	–	M	–
Curlew Sandpiper	*Calidris ferruginea*	E1	CE; M	–
Eastern Curlew	*Numenius madagascariensis*	–	CE; M;	–
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	E	Hollow bearing trees; Eucalypt tree species with hollows greater than 9cm diameter
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species
Little Eagle	*Hieraaetus morphnoides*	V	–	Nest trees – live (occasionally dead) large old trees within vegetation.
Major Mitchell's Cockatoo	*Callocephalon fimbriatum*	V	–	Hollow bearing trees; Living or dead tree with hollows greater than 10cm diameter
Masked Owl	*Tyto novaehollandiae*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.
Powerful Owl	*Ninox strenua*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	As per mapped areas
Square-tailed Kite	*Lophoictinia isura*	V	–	Nest trees: The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.
Superb Parrot	*Polytelis swainsonii*	V	V	Hollow bearing trees: Living or dead *E. blakelyi*, *E. melliodora*, *E. albens*, *E. camaldulensis*, *E. microcarpa*, *E. polyanthemos*, *E. mannifera*, *E. intertexta* with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.
Swift Parrot	*Lathamus discolor*	E1	CE	Hollow bearing trees
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	Ma	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements/geographic restrictions[3]
Mammals				
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	–	–
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V	–	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat with numbers of individuals >500
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	–
Grey-headed Flying-fox	*Pteropus poliocephalus*		V	Breeding camps
Koala	*Phascolarctos cinereus*	E	E	Areas identified via survey as important habitat -Important' habitat is defined by the density of koalas and quality of habitat determined by on-site survey.
Large-eared Pied Bat	*Chalinolobus dwyeri*	–	V	Cliffs within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels
Southern Myotis	*Myotis macropus*	V	–	Hollow bearing trees / Within 200m of riparian zone / Bridges, caves or artificial structures such as culverts within 200m of riparian zone
Squirrel Glider	*Petaurus norfolcensis*	V, EP	–	–
Reptiles				
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Rocky areas or within 50m of rocky areas
Striped Legless Lizard	*Delma impar*	–	V	–
Invertebrates				
Golden Sun Moth	*Synemon plana*	E	V	–
Key's Matchstick Grasshopper	*Keyacris scurra*	E	–	–

(1) V = Vulnerable, E = Endangered , EP=Endangered population as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(3) Habitat requirements and geographic requirements were obtained from the BAM Credit Calculator (BCC)

6.2.2.2 Justification for inclusion of any additional threatened fauna species credit species

No candidate threatened fauna species were included in addition to the BAM-C preliminary candidate list.

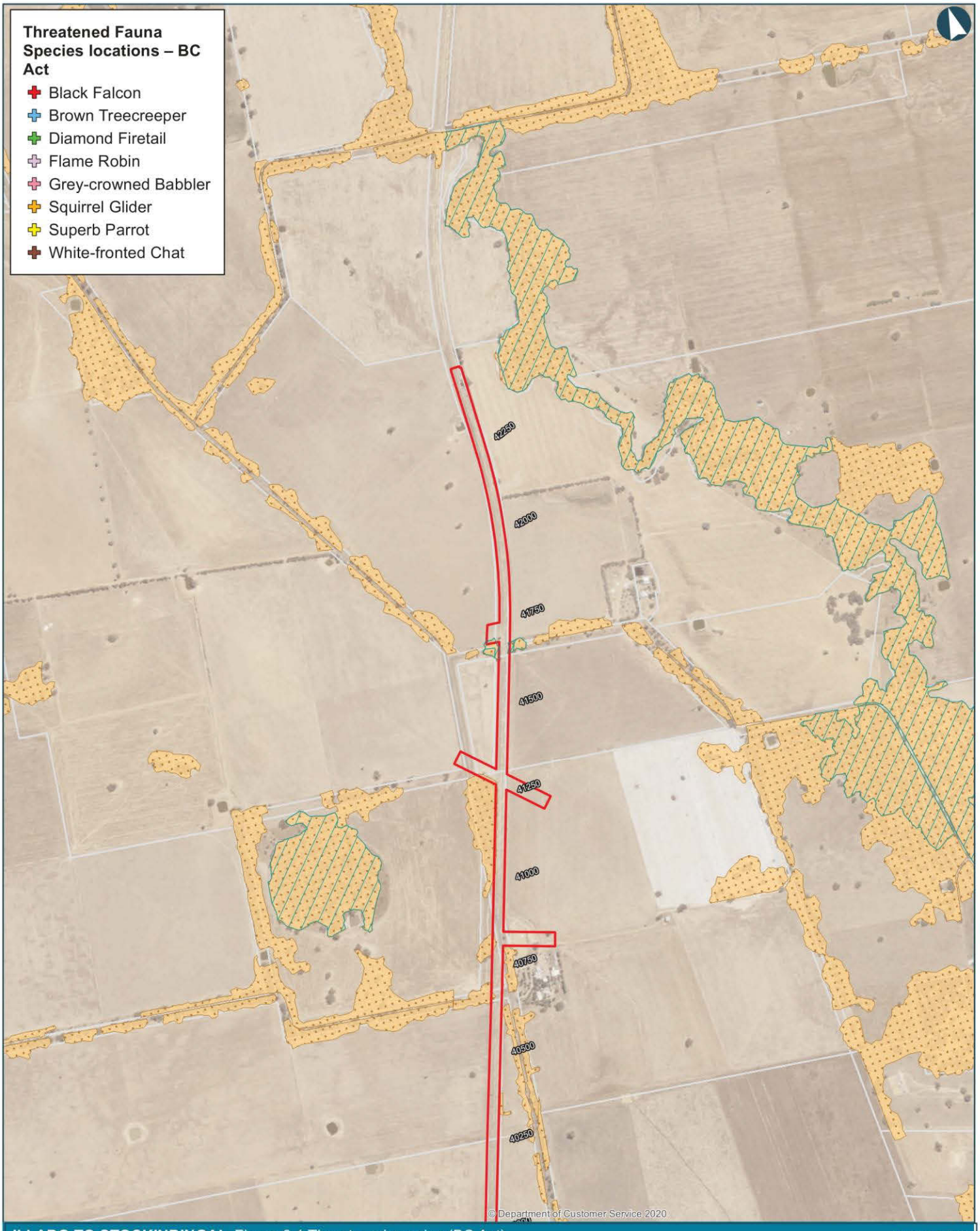
6.2.2.3 Justification for exclusion of any additional threatened fauna species credit species

Justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) and exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) is provided in Appendix C.

Two candidate threatened fauna species credit species was identified to be excluded to the BAM-C preliminary candidate species credit list (Table 6.6).

Table 6.6 Candidate threatened fauna species credit species excluded

Common name	Species	BC Act[1]	EPBC Act[2]	Habitat requirements/ geographic restrictions[3]	Justification for exclusion
Squirrel Glider	*Petaurus norfolcensis*	EP	–	Wagga LGA	Proposal site is outside the geographic range of the Wagga LGA endangered population. Although the Endangered Population is excluded from assessment, the Squirrel Glider is also listed as a Vulnerable species and is considered further under its Vulnerable species listing.
Golden Sun Moth	*Synemon plana*	E	V	Wallaby grass (Rytidosperma sp), Chilean needlegrass (Nassella nessiana) or Serrated Tussock (Nassella trichotoma)	There are no records of the species in the locality (Department of Planning 2020). Preferred habitat of native temperate grassland does not occur within the site (Department of Agriculture Water and the Environment 2021). Associated woodland and secondary grassland PCTs are thought to provide habitat as a result of the species spreading from occupied areas of natural temperate grassland into adjacent habitats after clearing (Department of Agriculture Water and the Environment 2021). Associated PCTs within the proposal site have very low cover of *Rytidosperma* (generally less than 3%). Areas with higher *Rytidosperma* cover (up to 20%) included either high cover of *Eucalyptus* spp. or tall grasses which is not preferred by the species. These areas were in poor or low condition and had been disturbed by agricultural activities including grazing by hooved animals and driving of vehicles and machinery resulting in excessive biomass removal, a threat to the species, as was observed during field surveys.



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Large-footed Myotis habitat

Squirrel Glider habitat

Superb Parrot habitat

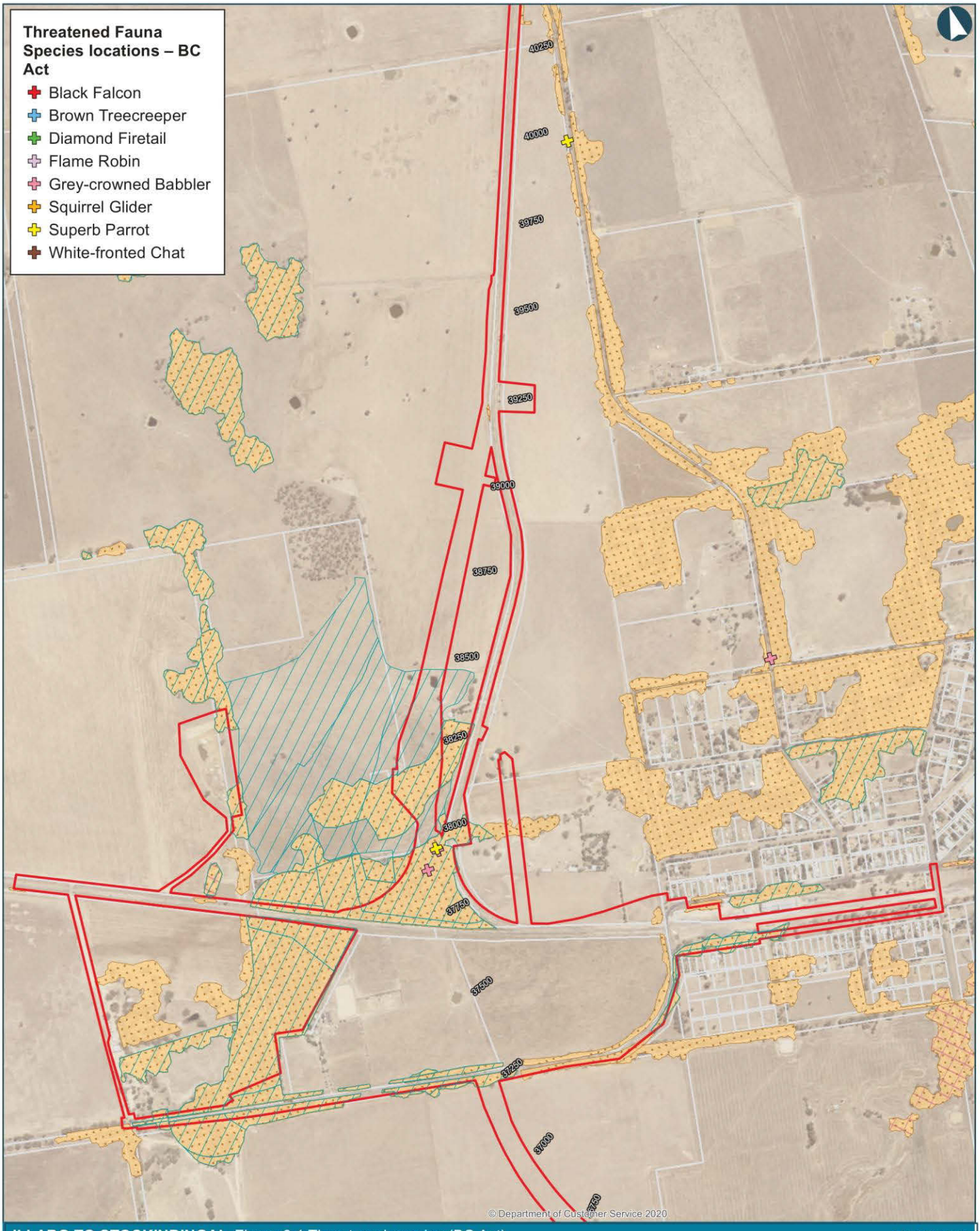
Key's Matchstick Grasshopper habitat

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

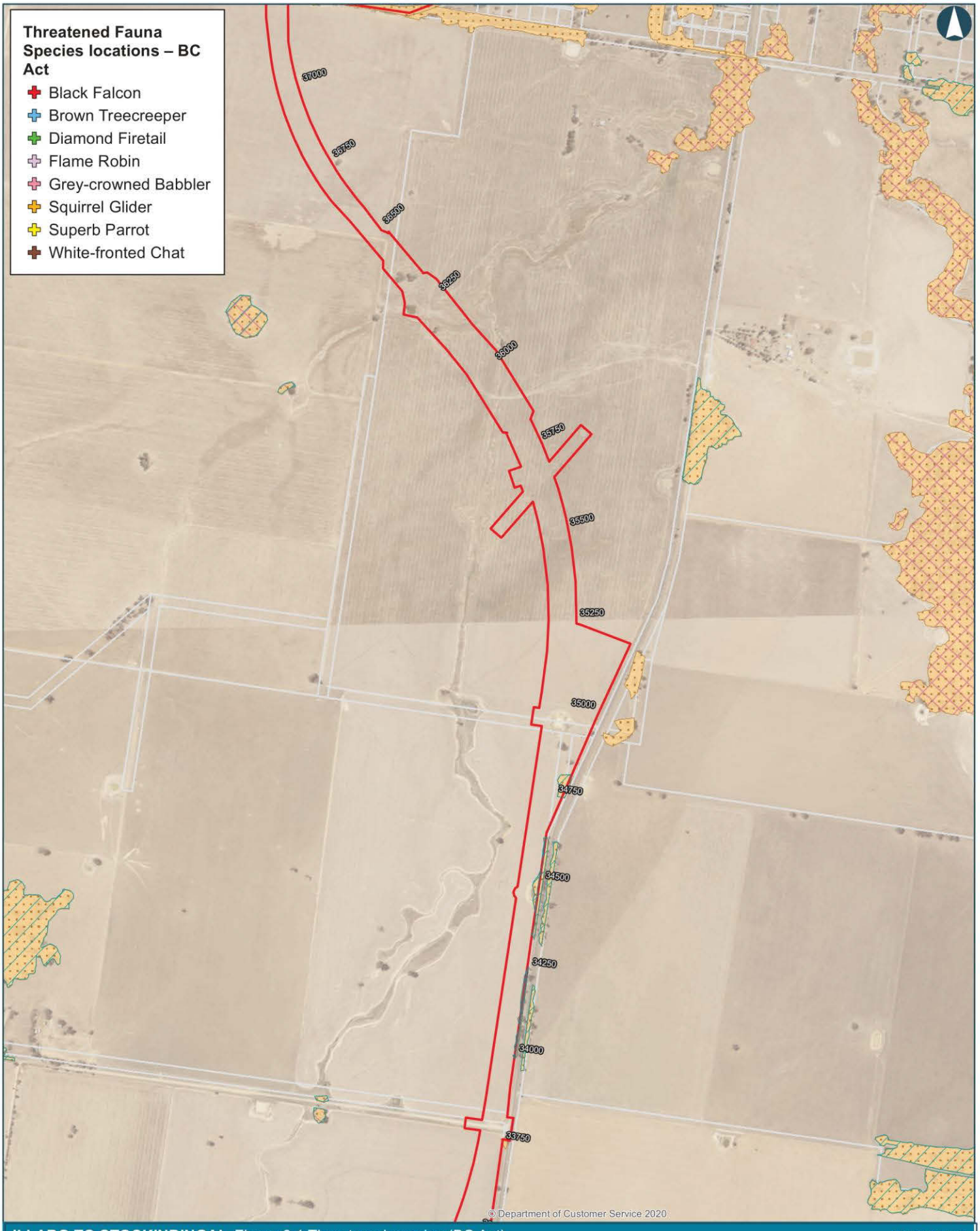
Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

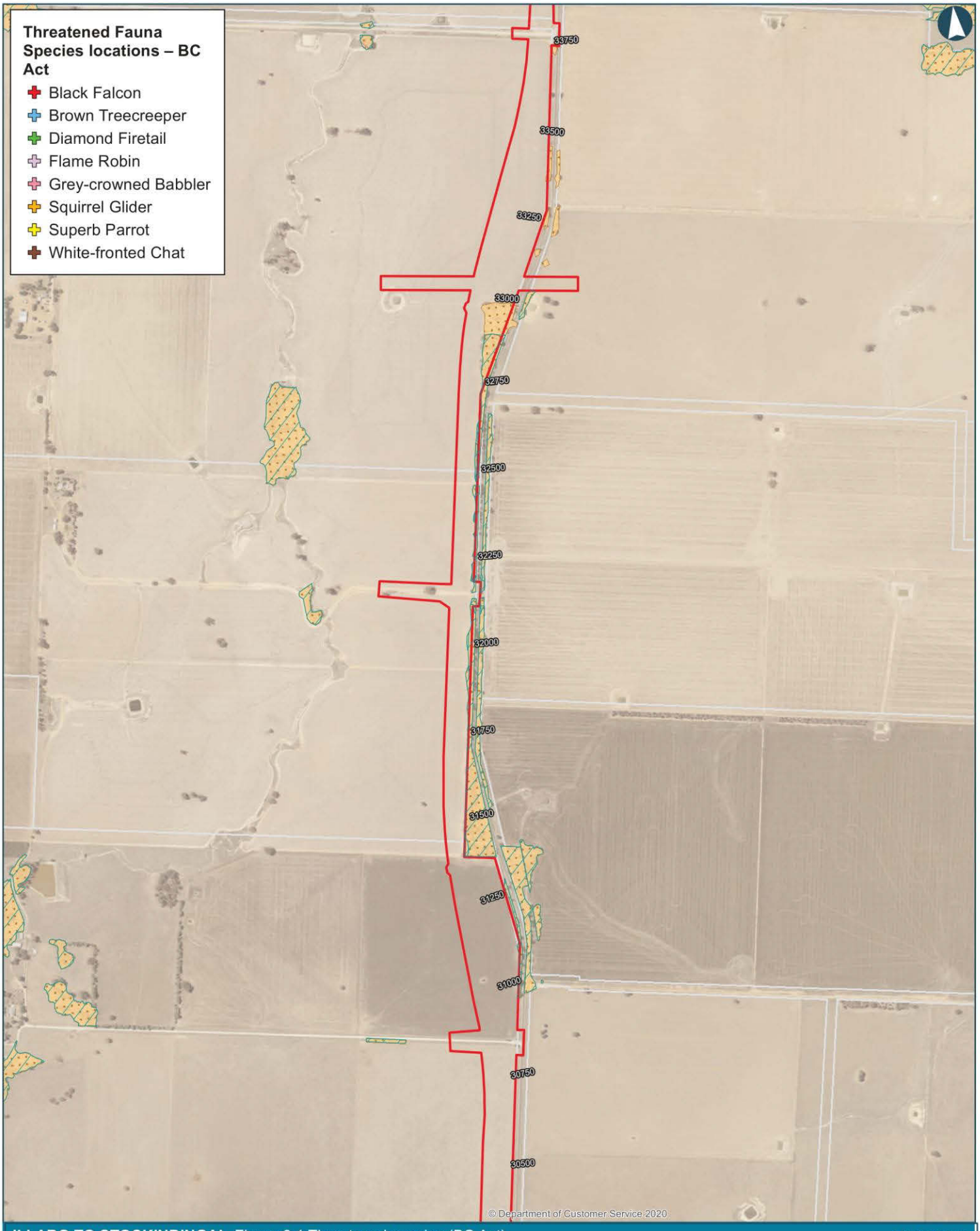
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

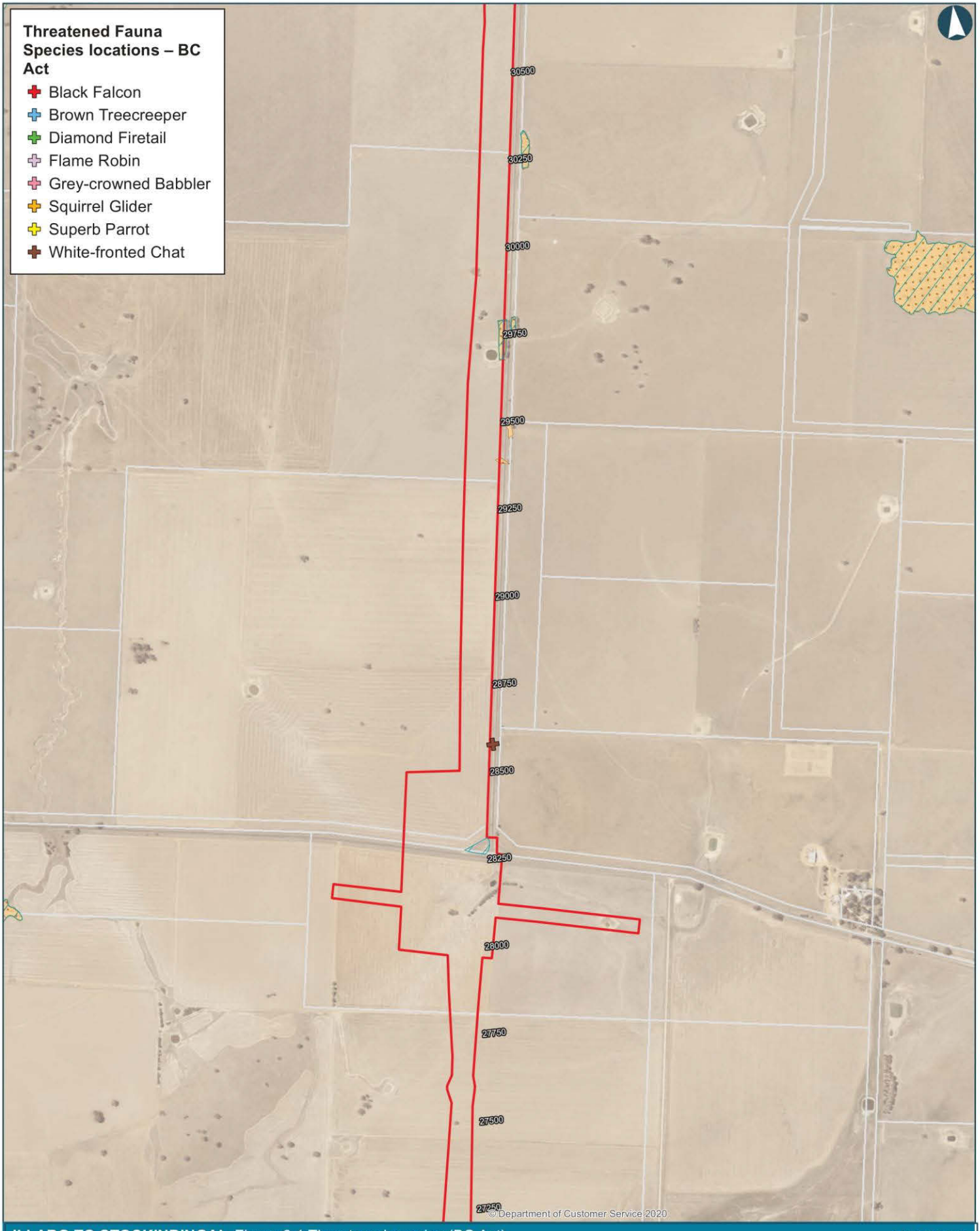
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

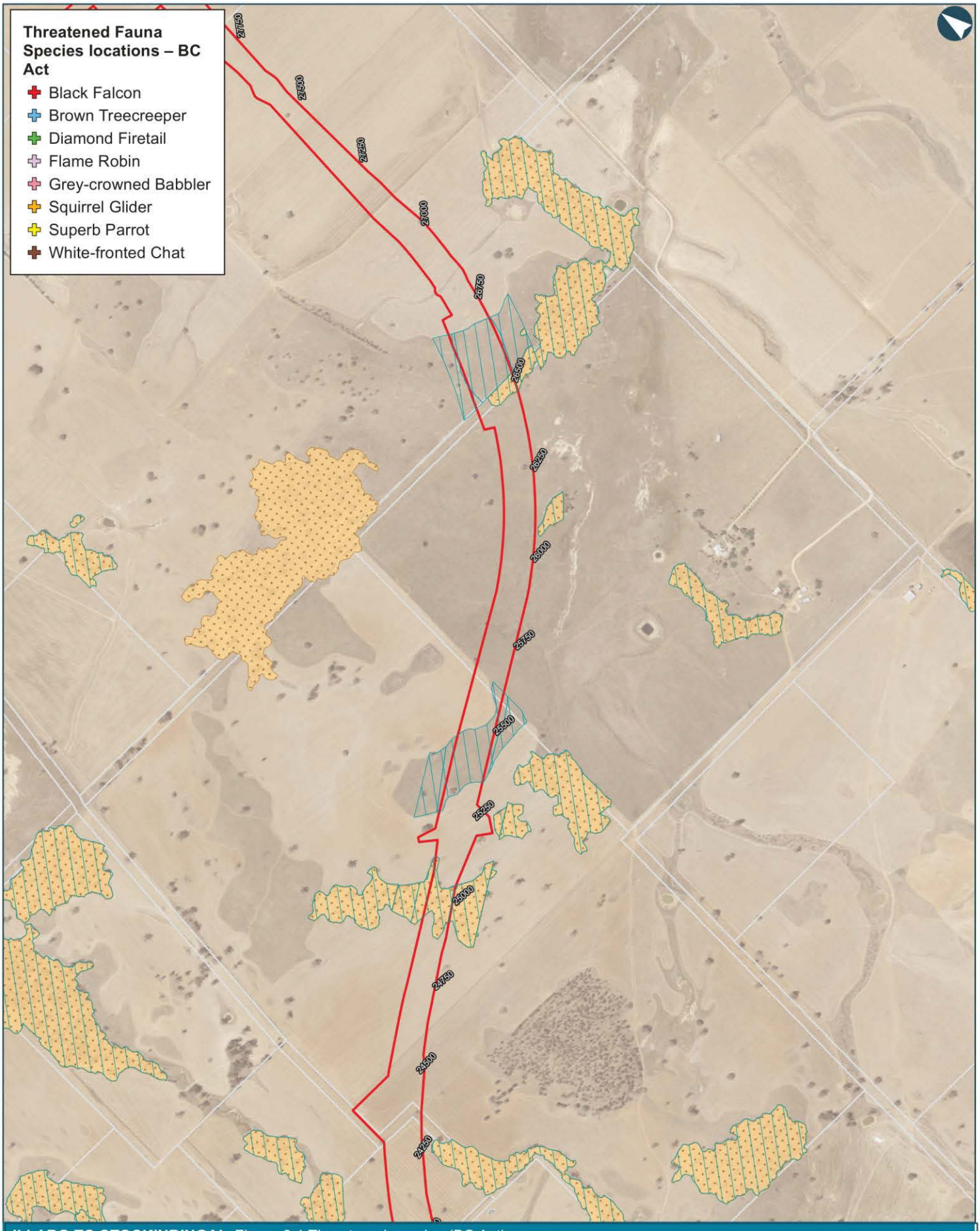
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

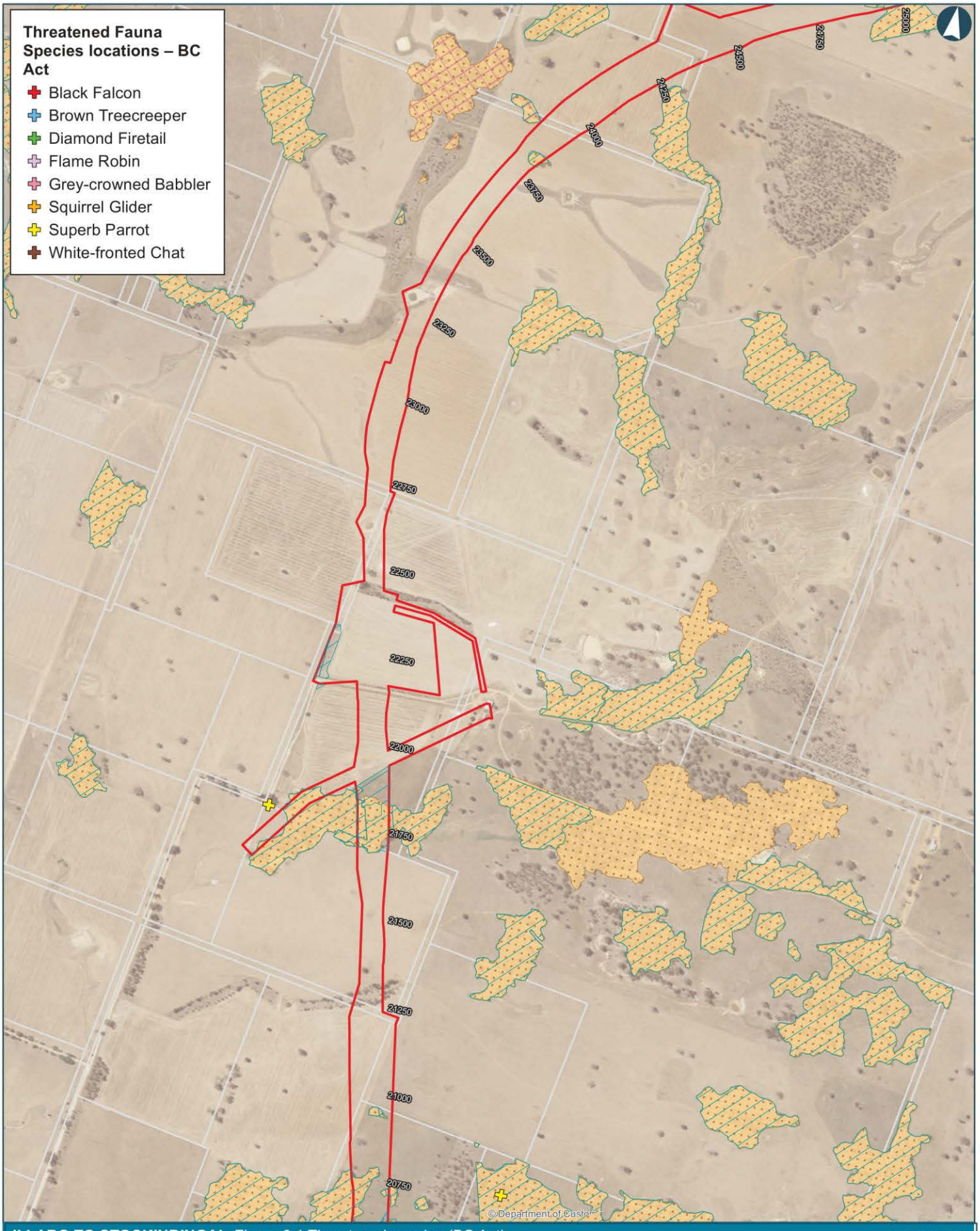
Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Large-footed Myotis habitat

Squirrel Glider habitat

Superb Parrot habitat

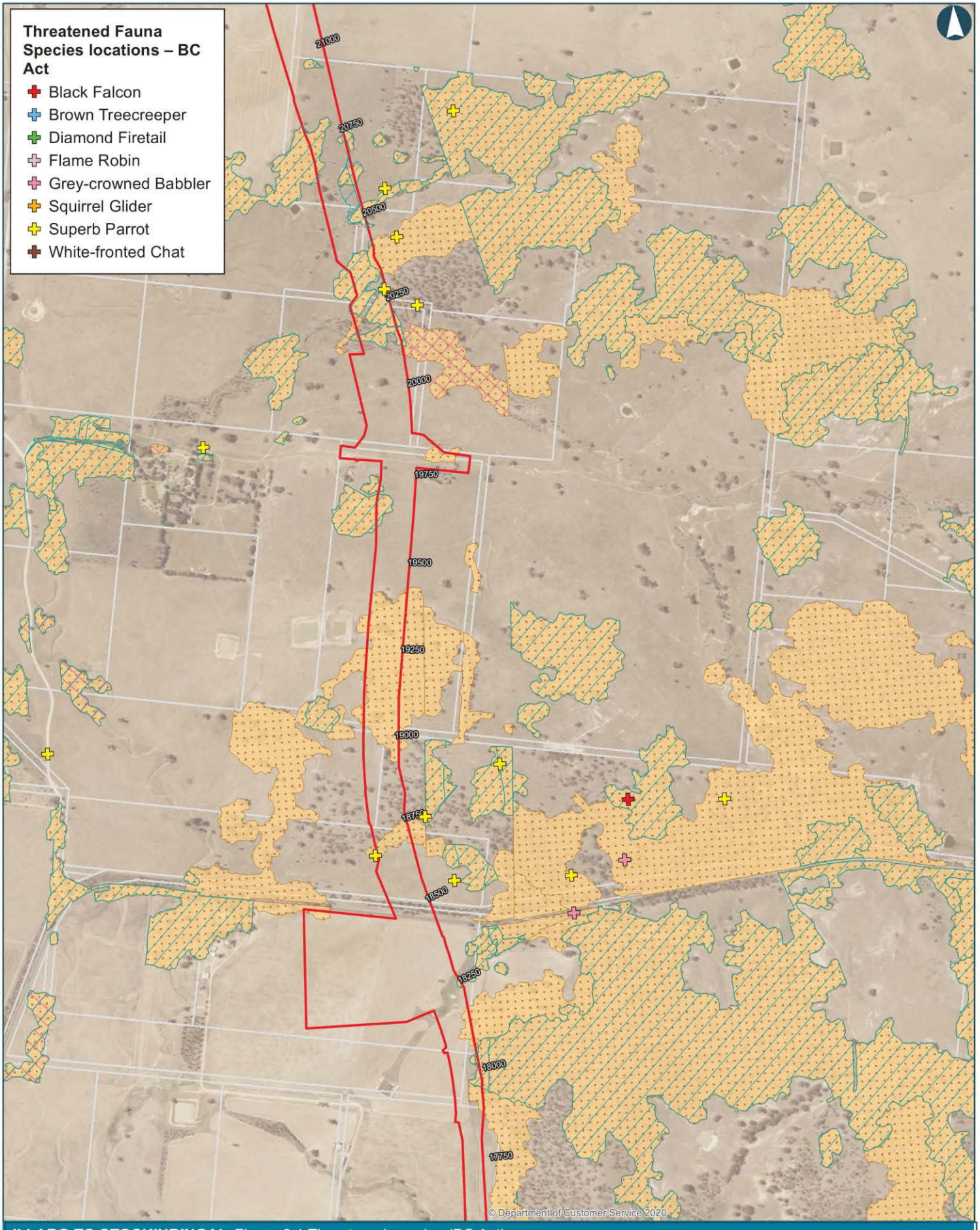
Key's Matchstick Grasshopper habitat

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

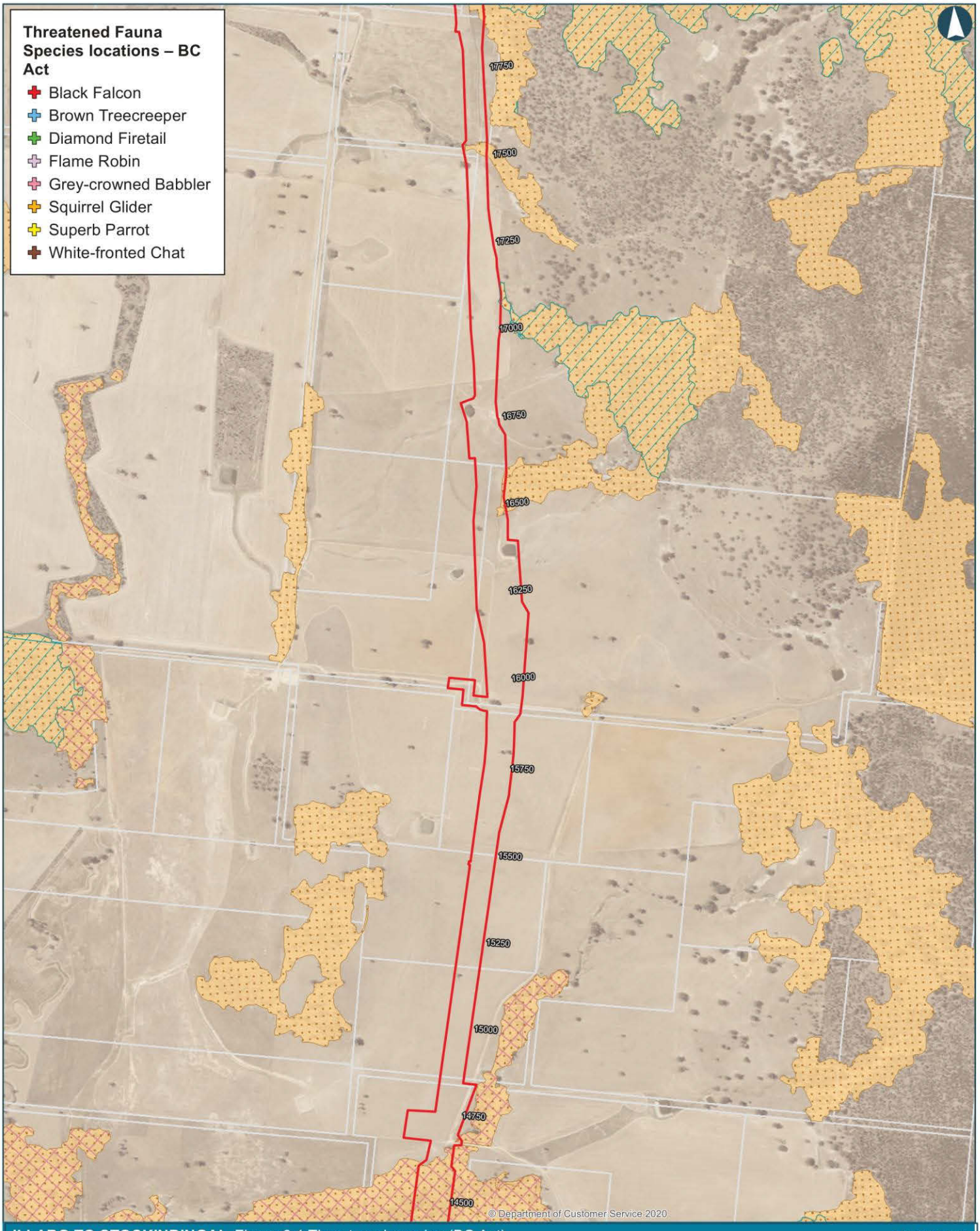
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

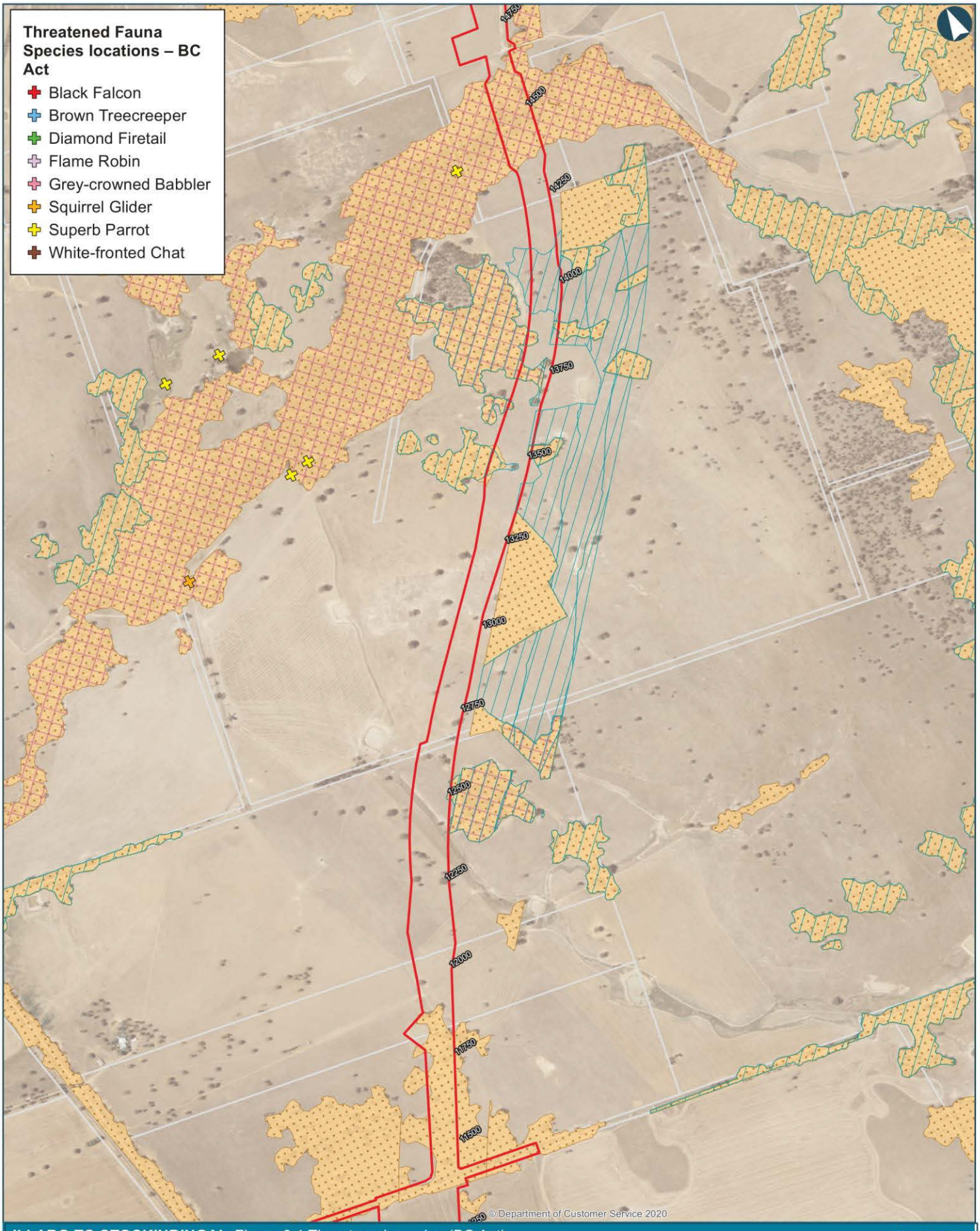
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Cadastral Boundary

Large-footed Myotis habitat

Squirrel Glider habitat

Superb Parrot habitat

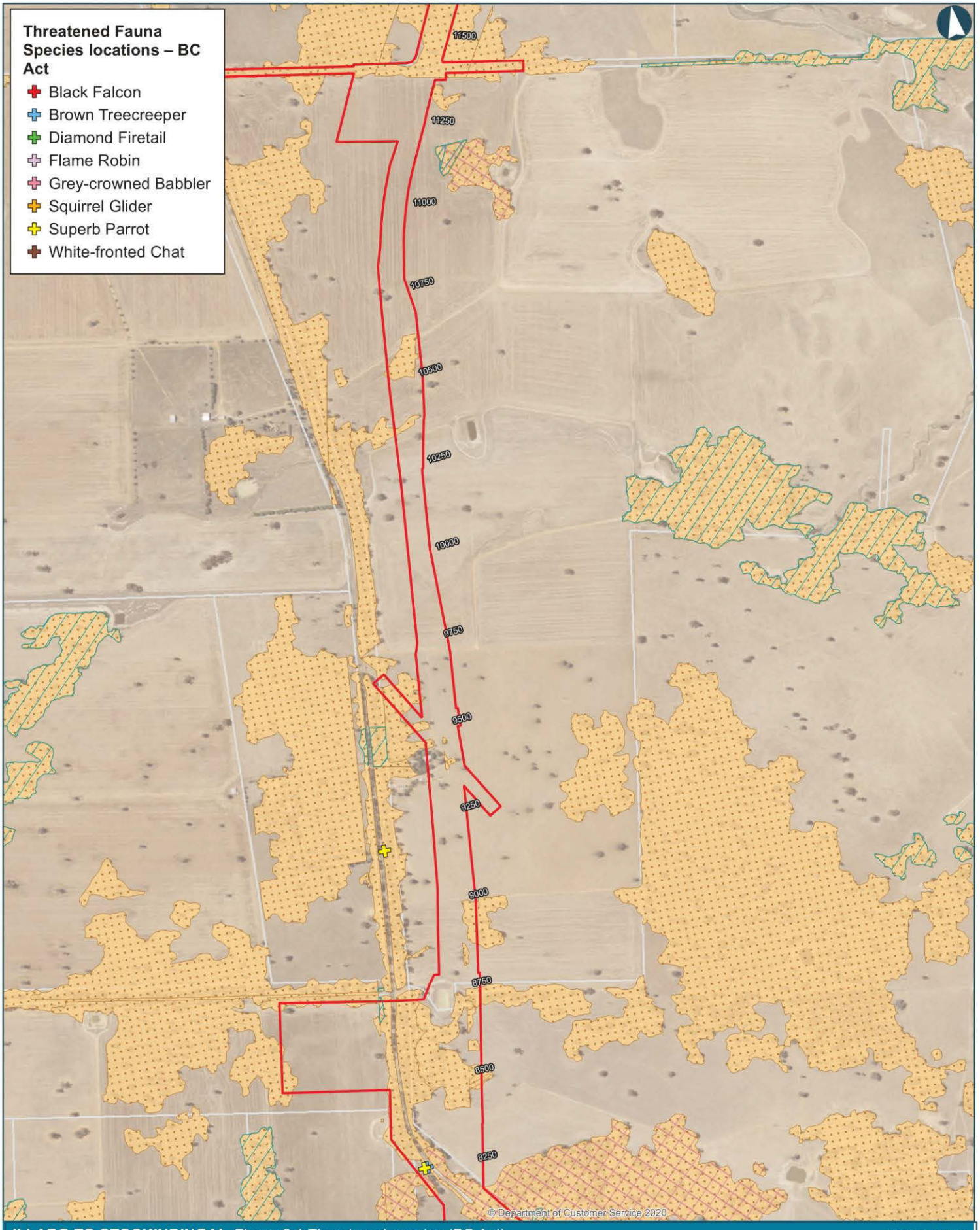
Key's Matchstick Grasshopper habitat

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

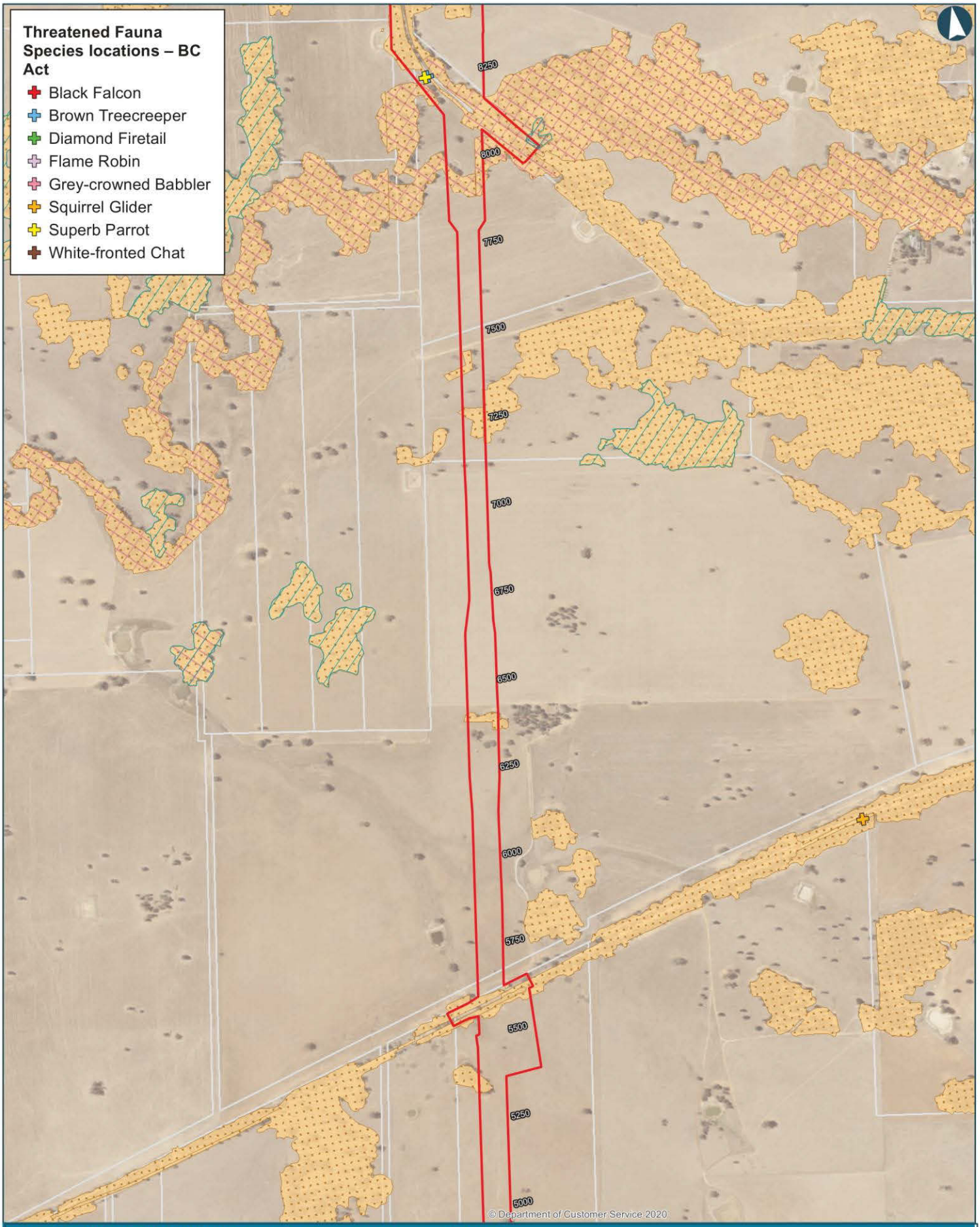
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

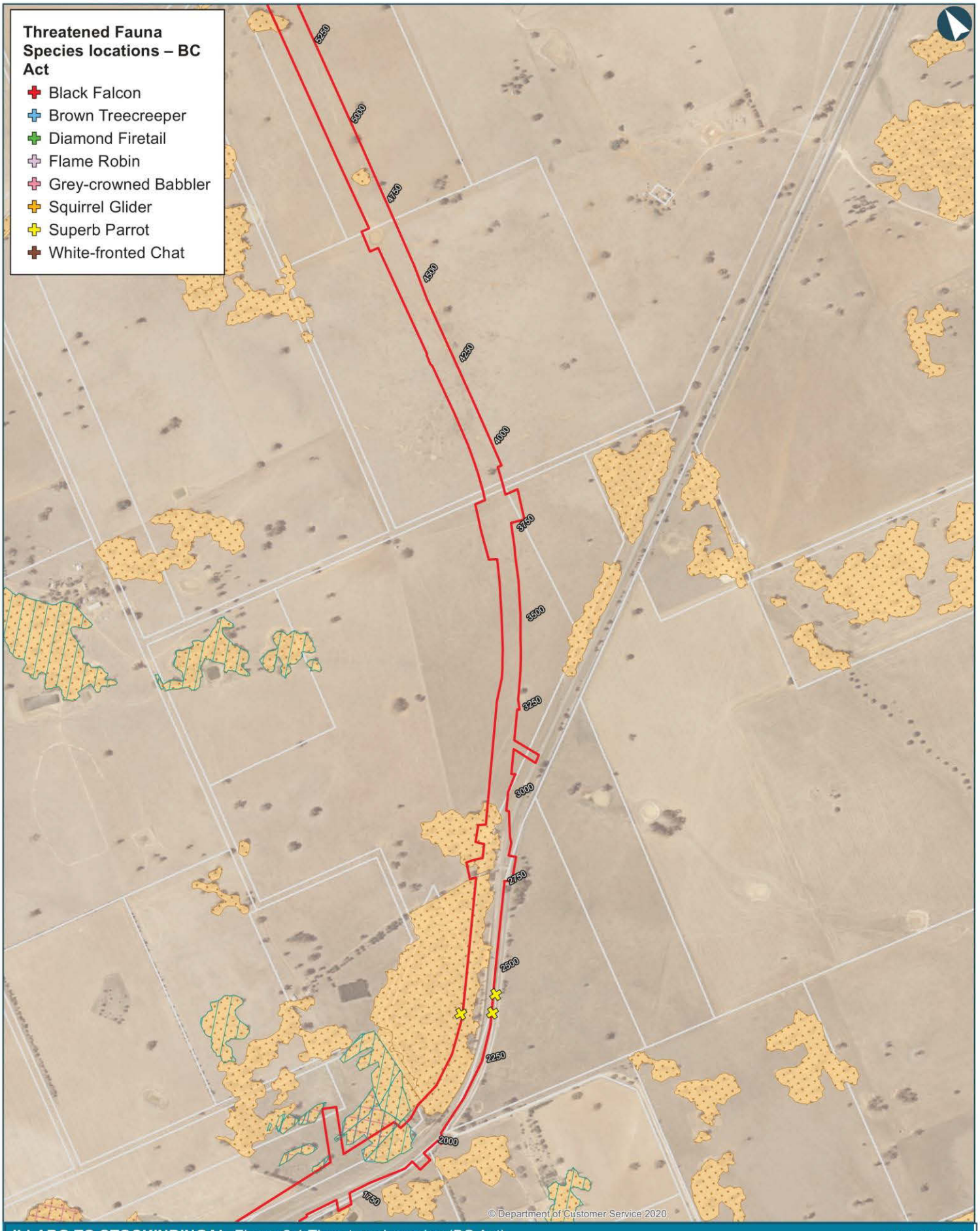
Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

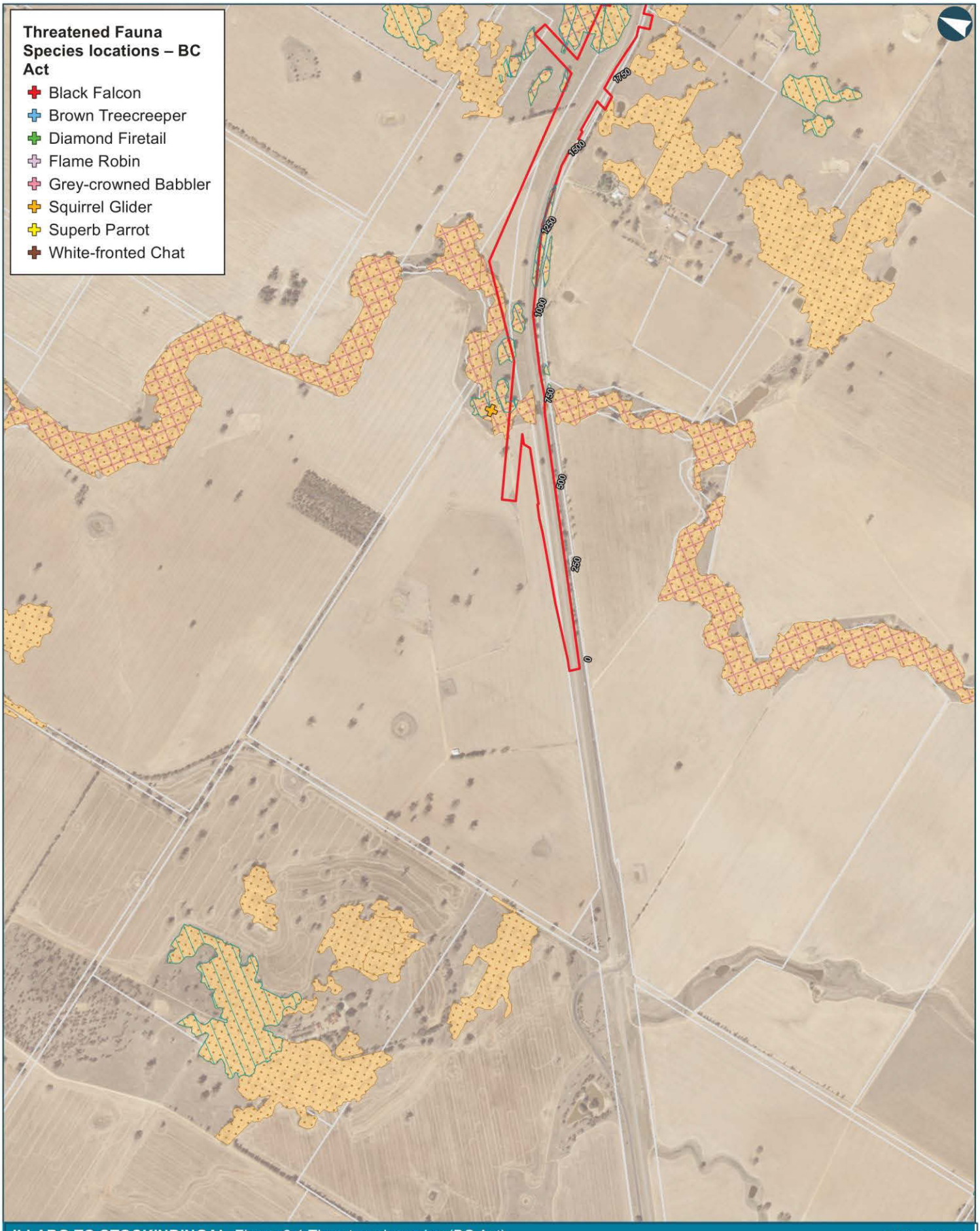
Date: 8/25/2022 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd



ILLABO TO STOCKINBINGAL Figure 6.1 Threatened species (BC Act)

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/25/2022
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Cadastral Boundary
Large-footed Myotis habitat
Squirrel Glider habitat
Superb Parrot habitat
Key's Matchstick Grasshopper habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Working\220822_IA_EIS_DataUpdates\220_0115_BDAR_6_1_ThreatSpecies_r1v4.mxd

6.3 Species credit species survey results

In accordance with Part 3 section 4.4.4 of the BAM 2020 Operational Manual – Stage 1 (EES 2020a), determine the presence of candidate species credit species (Step 4) includes the methods undertaken to determine if a species is absent, or if present, whether a species and/or its habitats are degraded to the point that the species is unlikely to utilise the proposal site (or specific vegetation zones).

6.3.1 Determining the presence of flora species credit species

Targeted surveys were undertaken for candidate threatened flora species as outlined in section 3.3.3. Results and outcome of targeted candidate threatened flora species surveys undertaken for this report are presented in Table 6.7.

Table 6.7 Candidate threatened flora species assessment and determination of affected species listed under the BC Act

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Acacia ausfeldii	Ausfeld's Wattle	V	Associated species include *Eucalyptus albens, E. blakelyi* and *Callitris spp.*, with an understorey dominated by *Cassinia spp.* and grasses. No habitat constraints identified Vegetation types: PCT 266, PCT 276 & PCT 277	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW is from the Mudgee / Gulgong region in the Central Tablelands. A small population of *Acacia verniciflua* (Varnish Wattle) was recorded in the southern portion of the proposal site. This was the only *Acacia* species to closely resemble Ausfeld's Wattle in both phyllode shape and viscosity of branchlets. Samples were collected and forwarded to the NSW National Herbarium although none were identified as *Acacia ausfeldii.* Given targeted surveys did not locate this species and that the proposal site is located to the west of any known population, *Acacia ausfeldii* (Ausfeld's Wattle) is unlikely to be affected by the proposal and as such this species is not considered further.
Ammobium craspedioides	Yass Daisy	V	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. No habitat constraints identified Vegetation types: PCT 266, PCT 277 & PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. There are no records of this species in the locality with the closest record being historic (1825) to the west of Gundagai adjacent to Nungas Road. Most records of this species occur east of a line from near Crookwell in the north to Gundagai in the south with an outlier population about 30km to the south of Wagga Wagga in Livingstone National Park. Given targeted surveys did not locate this species and that the proposal site is located to the west of any known population, *Ammobium craspedioides* (Yass Daisy) is unlikely to be affected by the proposal and as such this species is not considered further.
Austrostipa wakoolica	A spear-grass	E	Floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils. Habitat constraint: Alluvial plains and plains Vegetation types: PCT 76 & PCT 80	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends from the Central West where this species has a stronghold to scattered records in the Riverina region. The nearest known occurrence of *Austrostipa wakoolica* is from a single record (1992) near Ardlethan and is located approximately 90km to the west of the proposal site. This species is dispersed through wind, rain and flooding events. Given there is no local population, it is considered unlikely that this species would utilise potential habitat within the proposal site. Given targeted surveys did not locate this species and that the proposal site is located to the east of any known population, *Austrostipa wakoolica* (A spear grass) is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Caladenia arenaria	Sand-hill Spider Orchid	E	Woodland with sandy soil, especially that dominated by *Callitris glaucophylla* (White Cypress Pine). No habitat constraints identified Vegetation types; PCT 76 & PCT 80	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The surveys focused on vegetation patches with intact understorey (PCT 76 Good & Moderate and PCT 80 Moderate). The nearest known occurrence of this species is from a single record (1990) to the east of the Bethungra Range near Frampton. The proposal site is wholly located to the west of the Bethungra Range and given seed dispersal is wind dependent it is unlikely that this population could disperse to suitable habitat within the proposal site. Given targeted surveys did not locate this species and that the proposal site is located to the west of the only known record in the locality, *Caladenia arenaria* (Sand-hill Spider Orchid) is unlikely to be affected by the proposal and as such this species is not considered further.
Caladenia concolor	Crimson Spider Orchid	E	Known habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. No habitat constraints identified Vegetation type: PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the proposal site is to the east of the Bethrungra range in Ulandra Nature Reserve. The proposal site is wholly located to the west of the Bethungra Range. As Caladenia species rely on wind for their seed dispersal, it is considered unlikely that this population could disperse to suitable habitat within the proposal site. Given targeted surveys did not locate these species, the proposal site is located to the west of the closest known record and the absence of orchids within the proposal site, *Caladenia concolor* (Crimson Spider Orchid) is considered unlikely to be affected by the proposal. This species is not considered further.
Cullen parvum	Small Scurf-pea	E	Found in grassland, River Red Gum Woodland or Box-Gum Woodland, sometimes on grazed land and along watercourses. No habitat constraints identified Vegetation type: PCT 5, PCT 276, PCT 277 & PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The surveys focused on vegetation patches with intact understorey and/or grazed areas (PCT 5 Good & Moderate, PCT 276 Moderate, PCT 277 Moderate and PCT 347 Moderate). *Cullen parvum* (Small Scurf-pea) has a strong hold in suitable habitat to the north of Adelaide and Melbourne with scattered records between Albury and Young. The closest known records of this species are historic (1886) and located near Wagga Wagga with a more recent record (2011) being near Galgong 45km to the north-east. Though flooding has been suggested as a possible seed dispersal mechanism, this species relies largely on self-fertilisation. As there is no local population, it is considered unlikely that this species would disperse to suitable habitat within the proposal site. Given targeted surveys did not locate these species, *Cullen parvum* (Small Scurf-pea) is considered unlikely to be affected by the proposal. This species is not considered further.

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Diuris tricolor	Pine Donkey Orchid	V	Sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises. No habitat constraints identified Vegetation types: PCT 76, PCT 80 & PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The survey focused on associated vegetation in Good and Moderate condition. The closest known records of this species to the proposal site is 7km east of Stockinbingal (recorded in 2000) and a population near Coolamon (2011), 50km to the west of the proposal site. A reference population along Cootamundra-Stockinbingal Road was recorded in flower during the survey period. This confirmed that any local population of *Diuris tricolor* (Pine Donkey Orchid) within the proposal site is likely to be in flower. Given targeted surveys did not locate this species, *Diuris tricolor* (Pine Donkey Orchid) is unlikely to be affected by the proposal and as such this species is not considered further.
Euphrasia arguta	Euphrasia arguta	CE	Known to occur in eucalypt forest with a mixed grass and shrub understorey. No habitat constraints identified Vegetation type: PCT 266 & PCT 276	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the proposal site is historic (1887) and located 10km to the west near Cootamundra with a more recent record (2014) located 40km to the South of the proposal site near Tarcutta. *Euphrasia* species generally have poor seed dispersal capabilities usually within 20–30cm of the parent plant (Murphy & Downe, 2006). Given targeted surveys did not locate this species, the nearest record is located more than 40km from the nearest known record and this species poor seed dispersal abilities, *Euphrasia arguta* is unlikely to be affected by the proposal and as such this species is not considered further.
Grevillea wilkinsonii	Tumut Grevillea	E	Vegetation type: PCT 266	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The species is a large spreading shrub and is not cryptic. If present, it would have also been observable during other flora surveys outside the specified survey months. The Tumut Grevillea has a highly restricted distribution in the NSW South-west Slopes region. Its main occurrence is along a 6 km stretch of the Goobarragandra River approximately 20km east of Tumut where about 1,000 plants are known. The other occurrence is a small population that straddles the boundary of two private properties at Gundagai (Department of Agriculture Water and the Environment 2021; Department of Planning Industry and Environment 2021).

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Indigofera efoliata	Leafless Indigo	E	Known to grow on slight rises amongst ironstone formation in stony red-brown sandy loam. No habitat constraints identified Vegetation type: PCT 76	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the Central West and Central Tablelands region. The closest known record of this species to the proposal site is historic (1883) and is located approximately 200km to the north-east near Kerrs Creek. All other records are more than 250km from the proposal site. Given targeted surveys did not locate this species and that the proposal site is located more than 200km from the nearest known record, *Indigofera efoliata* is unlikely to be affected by the proposal and as such this species is not considered further.
Prasophyllum petilum	Tarengo Leek Orchid	E	Grows in open sites within Natural Temperate Grassland No habitat constraints identified Vegetation type: PCT 276 & PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the South-East, Central Tablelands and Hunter regions. The closest known records to the proposal site are located near Boorowa (1995–2016), approximately 75km to the east. Given targeted surveys did not locate this species and that the proposal site is located to the west of any known or likely habitat, *Prasophyllum petilum* (Tarengo Leek Orchid) is unlikely to be affected by the proposal and as such this species is not considered further.
Pultenaea humilis	Dwarf Bush-pea	V	Found in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes. No habitat constraints identified Vegetation type: PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution for this species is centred in Victoria with scattered records in NSW predominately to the south-east of Wagga-Wagga. The closest known record of this species to the proposal site is near Tumut (2002), approximately 70km to the south-east. Given targeted surveys did not locate this species and that the proposal site is located to the north-west of any known or likely habitat, *Pultenaea humilis* (Dwarf Bush-pea) is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Senecio garlandii	Woolly Ragwort	V	Known to occur on sheltered slopes of rocky outcrops. No habitat constraints identified Vegetation type: PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW is between Wagga Wagga and Albury. The closest known records of this species to the proposal site are historic with one record in Ulandra Nature Reserve (1999) which is approximately 15km to the east and several records near Temora (1975–1999), located 30km north-west of the proposal site. Senecio species rely on primarily on wind for seed dispersal. Given the proximity of known records to the proposal site, it is considered unlikely that *Senecio garlandii* (Woolly Ragwort) would disperse to suitable habitat within the proposal site. Given targeted surveys did not locate this species and that likelihood of seed dispersal from any known habitat, *Senecio garlandii* (Woolly Ragwort) is unlikely to be affected by the proposal and as such this species is not considered further.
Swainsona murrayana	Slender Darling Pea	V	Grows in a variety of vegetation types including grasslands or grassy woodlands that have been intermittently grazed or cultivated. Vegetation type: PCT 76 & PCT 80	No (surveyed)	**No –** targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the proposal site is historic (2001) and is located near Morangarell, approximately 40km to the north-west. During field surveys, a general lack on forb species was observed within the proposal site. No Swainsonia species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Given targeted surveys did not locate this species and that the proposal site is located about 40km from the nearest area of known or likely habitat, *Swainsona murrayana* (Slender Darling Pea) is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Swainsona recta	Small Purple Pea	E	Known to occur in the grassy understorey of woodlands and open-forests No habitat constraints identified Vegetation type: PCT 76, PCT 80, PCT 266, PCT 276 & PCT 277	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the proposal site is historic (1990) and is located near Wagga Wagga, approximately 50km to the south-west. A more recent record (2000) is located near Mandurama, approximately 130km to the north-east. During field surveys, a general lack on forb species was observed within the proposal site. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Given targeted surveys did not locate this species and that the proposal site is located at least 50km to from any known or likely habitat, *Swainsona recta* (Small Purple Pea) is unlikely to be affected by the proposal and as such this species is not considered further.
Swainsona sericea	Silky Swainson-pea	V	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. No habitat constraints identified Vegetation type: PCT 277 & PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West, Central West and Riverina regions. The closest known record of this species is historic (1990) and is located to the west of Gundagai, approximately 40km south-east of the proposal site. A more recent record (2005) is located near the Gundagai township. During field surveys, a general lack on forb species was observed within the proposal site. No Swainsonia species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Given targeted surveys did not locate this species and that the proposal site is located about 40km from the nearest area of known or likely habitat, *Swainsona sericea* (Silky Swainson-pea) is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	BC Act[1]	Habitat requirements[2]	Species presence	Affected candidate species affected by proposal?
Tylophora linearis	-	V	Grows in dry scrub and open forest No habitat constraints identified Vegetation type: PCT 347	No (surveyed)	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West and Central West regions. The closest known record of this species is historic (1915) and is located near Temora, approximately 30km west of the proposal site. A more recent record (2008) is located near the Bribbaree, approximately 45km to the north of the proposal site. Given targeted surveys did not locate this species and that the proposal site is located more than 30km from any known or likely habitat, *Tylophora linearis* is unlikely to be affected by the proposal and as such this species is not considered further.

(1) Listed under the BC Act - CE = Critically Endangered, E1= Endangered, E2= Endangered Population, V= Vulnerable

(2) Listed under the EPBC Act - CE = Critically Endangered, E= Endangered, V= Vulnerable

(3) Threat status under the BC Act: V = Vulnerable, E = Endangered, CE = Critically Endangered.

(4) The NSW Herbarium considers *Prasophyllum* sp. Wybong (C. Phelps ORG5269) and *Prasophyllum petilum* to be synonyms (i.e. the same species).

6.3.2 Determining the presence of fauna species credit species

Targeted surveys were undertaken for candidate threatened fauna species as outlined in section 3.3.4. Two fauna species credit species were recorded during the surveys (Superb Parrot and Squirrel Glider) and a third species (Southern Myotis) has been assumed as present despite targeted surveys not recording the species due to the presence of suitable habitat and drought conditions during surveys. Key's Matchstick Grasshopper has also been assumed to be present due to suitable habitat that was not subject to targeted surveys. The recorded species are listed in Table 6.8 described in sections below. Recorded threatened fauna and recorded and assumed candidate credit species polygons are illustrated in Figure 6.1.

Table 6.8 Species credit species recorded

Scientific name	Common name	BC Act[1]	EPBC Act[2]	Credit type
Polytelis swainsonii	Superb Parrot	V	V	Species credit species (breeding)/Ecosystem
Petaurus norfolcensis	Squirrel Glider	V	–	Species credit species

(1) Listed under the BC Act - CE = Critically Endangered, E1= Endangered, E2= Endangered Population, V= Vulnerable

(2) Listed under the EPBC Act – CE = Critically Endangered, E = Endangered, V = Vulnerable

Results and outcome of targeted candidate threatened fauna species surveys undertaken for this report are presented in Table 6.9.

Table 6.9 Candidate threatened fauna species credit species

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Invertebrates					
Keyacris scurra	Key's Matchstick Grasshopper	E	Species is generally reliant on an understorey of tussock grasses, typically *Themeda* for shelter and possibly food (unconfirmed), but may use similar grasses. Food sources include a range of dicotyledon species. Indicator species include the daisy *Chrysocephalum apiculatum*. Associated PCTs recorded: PCT 266, PCT 276, and PCT 277.	Yes (assumed present)	**Yes** – this species was identified in an update to the BAM-C. Therefore, the species is assumed to be present but will be subject to future targeted surveys.
Amphibians					
Crinia sloanei	Sloane's Froglet	V	Semi-permanent/ephemeral wet areas/containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area/within 500m of swamps/within 500m of waterbody. Associated PCTs recorded: PCT 5, PCT 76, PCT 80, and PCT 276.	No (surveyed)	No – not recorded during targeted surveys undertaken following rain and during BAM prescribed survey period.
Litoria booroolongensis	Booroolong Frog	E	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Associated habitat not recorded within the proposal site. Dams and ephemeral waterways are present within the proposal site, but would not be considered suitable for this species.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Litoria raniformis	Southern Bell Frog	E	Associated habitat not recorded within the proposal site. Dams and ephemeral waterways are present within the proposal site, but would not be considered suitable for this species.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	As per mapped areas.	No (surveyed)	No- proposal site is not identified as a breeding area for the species. A dual credit species, it is still considered as an ecosystem credit species. Potential to occur during seasonal movements and to forage on blossoming eucalypts.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Burhinus grallarius	Bush Stone-curlew	E	Fallen/standing dead timber including logs.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	Hollow bearing trees; Eucalypt tree species with hollows greater than 9cm diameter.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Hamirostra melanosternon	Black-breasted Buzzard	V	No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Hieraaetus morphnoides	Little Eagle	V	Nest trees – live (occasionally dead) large old trees within vegetation. Associated PCTs recorded: PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347.	No (surveyed)	No – the presence of a 'male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy', as described for the species in the Threatened Biodiversity Data Collection, were not recorded. Little Eagle nests are relatively large and persist beyond several breeding cycles, so the importance of the subject land for Little Eagle breeding would likely have been established by the existence of nests, which were not evident. A dual credit species, it is still considered as an ecosystem credit species.
Lathamus discolor	Swift Parrot	E1	Hollow bearing trees.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Lophochroa leadbeateri	Major Mitchell's Cockatoo	V	Hollow bearing trees; Living or dead tree with hollows greater than 10cm diameter.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Lophoictinia isura	Square-tailed Kite	V	Nest trees: The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Ninox connivens	Barking Owl	V	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Ninox strenua	Powerful Owl	V	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Polytelis swainsonii	Superb Parrot	V	Hollow bearing trees: Living or dead *E. blakelyi*, *E. melliodora*, *E. albens*, *E. camaldulensis*, *E. microcarpa*, *E. polyanthemos*, *E. mannifera*, *E. intertexta* with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm. Associated PCTs recorded in good, moderate and poor condition: PCT 5 (in poor and moderate condition), PCT 76 (in poor, moderate and good condition), PCT 80 (in poor and moderate condition), PCT 266 (in poor and moderate condition), PCT 276 (in poor and moderate condition), PCT 277 (in poor and moderate condition) and PCT 347 (in poor and moderate condition).	Yes (surveyed)	**Yes** – recorded. Potential breeding habitat identified. The subject land provides foraging and breeding habitat for the species.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Tyto novaehollandiae	Masked Owl	V	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Mammals					
Cercartetus nanus	Eastern Pygmy-possum	V	None. No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Chalinolobus dwyeri	Large-eared Pied Bat	V	Cliffs within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Chalinolobus picatus	Little Pied Bat	V	None. No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Miniopterus orianae oceanensis	Large Bentwing-bat	V	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat with numbers of individuals >500.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Myotis macropus	Southern Myotis	V	Associated PCTs (PCT 5 and PCT 276) with roosting habitat (hollow bearing trees, bridges, caves or artificial structures) within 200m of riparian zone or waterbodies.	Yes (assumed)	**Yes –** assumed present. Targeted surveys did not record this species, however, based on presence of suitable habitat this species has been included as a species credit species. Potential habitat mapped.
Petaurus norfolcensis	Squirrel Glider	V	Associated PCTs recorded: PCT 5 (in poor and moderate condition), PCT 76 (in poor, moderate and good condition), PCT 80 (in poor and moderate condition), PCT 266 (in poor and moderate condition), PCT 276 (in poor and moderate condition), PCT 277 (in poor and moderate condition), and PCT 347 (in poor and moderate condition).	Yes (surveyed)	**Yes** – Targeted surveys undertaken, species recorded within remnant vegetation foraging in canopy trees. Habitat mapped.

Scientific name	Common name	BC Act[1]	Habitat components	Species presence	Candidate species affected by proposal
Petrogale penicillata	Brush-tailed Rock-wallaby	E	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Phascogale tapoatafa	Brush-tailed Phascogale	V	None. No specific requirements or restrictions identified in BCC.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period.
Phascolarctos cinereus	Koala	E	Areas identified via survey as important habitat –Important' habitat is defined by the density of koalas and quality of habitat determined by on-site survey.	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.
Pteropus poliocephalus	Grey-headed Flying-fox	V	Breeding camps	No (surveyed)	No – not recorded during targeted surveys undertaken during BAM prescribed survey period. A dual credit species, it is still considered as an ecosystem credit species.

(1) Listed under the NSW Biodiversity Conservation Act 2016 – CE = Critically Endangered, E1 = Endangered, E2 = Endangered Population, V = Vulnerable

(2) Listed under the Commonwealth Environment Protection and Biodiversity Act 1999 - CE = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory

6.3.2.1 Key's Matchstick Grasshopper

Key's Matchstick Grasshopper (*Keyacris scurra*) is listed as Endangered under the BC Act and is not listed under the EPBC Act. Key's Matchstick Grasshopper was originally distributed from Victoria to Orange (NSW) across the wheat/sheep belt, typically recorded in native grasslands and grassy woodland. All Bionet records are located to the east of Kosciuszko National Park and Yass, with a single record located south-east of Batlow. While the predicted distribution of the species reaches Albury and Wagga, in reality the closest actual record (near Batlow, recorded in 2012) is over 100km to the south east of the proposal site.

Habitat is also described on the species profile as:

- in some reported locations there is an absence of *Themeda* and very few or no Asteraceae
- being flightless, this species does not disperse large distances (<10m) which suggests these observations are indicative of resident populations (rather than dispersing individuals)
- has been observed to feed on a range of species including *Aira caryophyllea* (Silver hairgrass), *Scirpus* sp. (sedges), *Wurmbea dioica* (Early Nancy), *Bulbine bulbosa* (Native Leek), *Calochilus paludosus* (Red Beard Orchid), *Rumex crispus* (Curled Dock), *Acetosella vulgaris*/*Rumex acetosella* (Sorrel), *Cerastium glomeratum* (Mouse-ear Chickweed), *Ranunculus lappaceus* (Common Buttercup), *Rosa rubiginosa* (Sweet Briar), *Acaena ovina* (Orchid), *Trifolium subterraneum* (Subterranean Clover), *Trifolium arvense* (Haresfoot Clover), *Poranthera microphylla*, *Stackhousia monogyna* (Creamy Candles), *Hibbertia sericea*, *Lavandula stoechas* (Lavender), *Salvia verbenaca* (Vervain), *Verbascum thapsus* (Great Mullein), *Sherardia arvensis* (Field Madder), *Galium tricornatum* (Rough Fruited Bedstraw), *Helichrysum apiculatum* (Common Everlasting), *Ozothamnus retusus* or *O. scaber* (*Helichrysum bilobum*), *Podolepis jaceoides (Podolepis acuminate*) (Showy Copper-wire Daisy) and *Craspedia uniflora*.

Targeted surveys for this species have not been undertaken, however, to enable the finalisation of this report, this species has conservatively been assumed to be present within potential habitats (including disturbed habitats) as described in Bionet, being:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (moderate, poor and low condition (derived native grassland))
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (moderate and poor condition)
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland (moderate, poor and low condition (derived native grassland)).

Key's Matchstick Grasshopper species polygon (assumed presence) therefore occurs in the proposal site where these PCTs and zones are mapped as occurring within the Inland Slopes IBRA subregion as identified in the BAM-C. Targeted surveys will be completed in the next relevant survey period to confirm presence.

6.3.2.2 Superb Parrot

Superb Parrot is found throughout inland NSW. On the south-western slopes the species core breeding area is approximately bounded by Grenfell, Cootamundra and Coolac in the west and Cowra and Yass in the east. Most of the birds breeding in this area migrate north in the winter and come back to breed between September and January. Here, the species is known to nest in open Box-Gum Woodland or isolated scattered trees.

During field surveys, Superb Parrots were observed in the subject land (refer to Figure 6.1) and broader investigation corridor. It is likely that the species occurs within the locality regularly throughout the breeding season and that hollows in large scattered trees or large trees in remnant stands of associated vegetation may represent breeding opportunities for individuals. Potential breeding habitat was identified within the subject land by the presence of 'habitat features and observed nest, or two or more birds seen on site' as described on the species Threatened Biodiversity Data Collection page.

It should be noted that no active breeding sites were observed, despite surveys occurring within the breeding period both within and surrounding the subject land. The assessment of impacts to "potential breeding habitat" is purely based on the observed presence of two or more birds and of potential hollow-bearing tree habitat (despite active breeding not being recorded). This is an inherently conservative approach.

Superb Parrots often occur in roadside vegetation and in agricultural land with little vegetative buffer (Christie 2004, Davey and Purchase 2004, Manning, Lindenmayer et al. 2004, Manning, Lindenmayer et al. 2007). The species is habituated to impacts associated with these roadside and agricultural areas including noise, dust and light. Key habitat attributes which have informed the species polygon include remnant patches of associated native vegetation which contain hollow-bearing trees or due to access issues are assumed to contain hollow bearing trees (including patches of PCTs 5, 76, 80, 266, 276, 277, and 347), it is currently estimated that approximately sixteen hollow-bearing trees would be affected by the proposal. In addition, while not utilised for the calculation of species credits, isolated hollow bearing scattered trees also provide potential breeding habitat for the species. Additionally, derived native grassland vegetation may also provide additional foraging habitat for the species which has been excluded from the species polygon.

6.3.2.3 Squirrel Glider

Squirrel Glider is distributed sparsely throughout eastern Australia, from northern Queensland to western Victoria. West of the Great Diving Range, the species is known to utilises mature or old growth Box but also utilises mix age forest/woodland. Most common vegetation is associated with, Box-Ironbark woodlands and River Red Gum forests. They have been observed to glide up to 100m with the assistance of a downhill slope and up to 50m over flatter terrain. Hollow-bearing scattered trees adjacent to preferred native vegetation can also provide potential habitat for the species in fragmented landscapes. They live primarily on insects (mainly caterpillars, beetles and stick insects) but also on pollen and nectar (mostly from eucalypts) (Australian Museum 2020). As a consequence of land clearing, remnant vegetation that support gliders often persist along linear patches associated with roadsides and watercourses where presence of hollow-bearing trees still persists.

Surveys undertaken in November 2018 recorded the species (refer to Figure 6.1) in the investigation corridor. Lack of records of the species during the July 2019 field surveys may be due to the reduced availability of resources for the species during the later survey period. The species polygon (Figure 6.1) has been developed to incorporate all associated vegetation within the subject land, which includes PCTs 5, 76, 80, 266, 276, 277, and 347 (excluding derived grasslands).

6.3.2.4 Southern Myotis

Southern Myotis is distributed across the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100km inland, except along major rivers. The species uses a range of roosting habitat including tree hollows, caves, mines, culverts, the underside of bridges and sometimes roofs or ceilings. Roosting habitat is often close to water. Typically, ten to fifteen bats, though sometimes up to 100 bats, roost together in a colony. Southern Myotis typically breeds between October and February. In NSW, females of the species typically breed once a year and produce one baby. Southern Myotis has disproportionately large feet (up to 8mm long) with long curved claws, which it uses for foraging. Southern Myotis forage over streams and pools, large lakes or reservoirs where they catch aquatic insects and small fish by raking their feet across the water surface (Australian Museum 2020, Department of Planning Industry and Environment 2020).

Movement of this species across the landscape is typically restricted to riparian corridors, due to the availability of roost sites (roosts for this species have only been located within 100m of waterbodies). Female dispersal distances are thought to be less than 30km with female-biased gene flow locally restricted. Gene flow between populations is dependent on males dispersing along riparian corridors. (Gorecki 2020). Targeted surveys did not record this species, however, based on presence of suitable habitat this species has been included as a species credit species. Associated PCTs (PCT 5 and PCT 276) within 200m of riparian zone or waterbodies have been mapped in the species polygon.

7 Prescribed impacts

This chapter identifies potential prescribed biodiversity impacts on threatened entities in accordance with Chapter 6 of the BAM and has been prepared in accordance with the BAM 2020 Operational Manual – Stage 1 (Department of Planning Industry and Environment 2020). Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the Biodiversity Offset Scheme, as per clause 6.1 of the BC Regulation. Prescribed biodiversity impacts are those which may be difficult to quantify, replace or offset, making avoiding and minimising these impacts critical to satisfy the requirements of Section 7 of the BAM (avoiding or minimising impact on biodiversity values).

Prescribed impacts (including direct and indirect impacts) are impacts:

- on the habitat of threatened entities including:
  - karst, caves, crevices, cliffs, rocks and other geological features of significance, or
  - human-made structures, or
  - non-native vegetation
- on areas connecting threatened species habitat, such as movement corridors
- that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)
- on threatened and protected animals from turbine strikes from a wind farm (not applicable so not addressed in this BDAR)
- on threatened species or fauna that are part of a TEC from vehicle strikes.

Table 7.1 identifies the prescribed impacts associated with the proposal and the threatened species which have the potential to utilise these features within the study area.

Table 7.1 Identified prescribed impacts

Feature	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependant on feature	Impact assessed
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No areas of geological significance are present. No karst, caves, cervices, cliffs, which may provide potential breeding habitat for threatened fauna (i.e. microchiropteran bats) were recorded. Some rock outcrops occur within and adjacent to the subject land, however no direct impacts of the proposal would impact fauna species that occur in association with rocky habitats.			Not considered further
Occurrences of human-made structures	No human made structures were identified in the development footprint that would provide suitable habitat for any threatened species.			Not considered further
Occurrences of non-native vegetation	Non-native vegetation occurs within and adjacent to the subject land. One non-native vegetation community was identified – 'Miscellaneous ecosystem' (non-native vegetation) referred to as exotic species/native landscape plantings (section 5.3). Some removal of non-native vegetation including, urban exotic/native landscape plantings may be impacted because of the proposal.		Although some threatened species may utilise non-vegetation for foraging purpose (for example raptors hunting prey), no threatened entity was identified to be dependent on non-native vegetation for part of their life cycle.	Not considered further
Corridors or other areas of connectivity linking habitat for threatened entities	Existing connectivity is limited to creeklines and road reserves. These connectivity features link with the largest intact patch of remnant vegetation occurring to the east of the subject land in association with the nearby Bethungra and Ulandra Mountain range. Creeklines and associated riparian vegetation with the rivers and streams mentioned in Table 4.1 above predominantly run from east to west and provide the remaining link to movement between Bethungra and Ulandra Mountain range to the east and areas to the west (Figure 1.1).	The proposal is likely to result in a reduction in vegetation patch sizes resulting in minor increases in localised fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. Due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale, this impact has the potential to be negative to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles.	The following threatened species have the potential to be impacted due to connectivity/fragmentation: Squirrel Glider	Impact further addressed in section 10.3

Feature	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependant on feature	Impact assessed
Water bodies or any hydrological processes that sustain threatened entities	**Partially** – Unmanaged construction activities in proximity to ephemeral watercourses or waterbodies could increase levels of turbidity and sediment deposition, decrease dissolved oxygen, and change pH levels in receiving environments. Other potential impacts on water quality could occur due to spills, leakages and disturbance of contaminated land.	The existing hydrological conditions of the subject land are already affected by altered landform because of surrounding land uses. The proposal may result in further alteration to the hydrology of the subject land due to changes in landform and the introduction of new infrastructure.	Although some threatened species may utilise waterbodies intermittently, no threatened entity was identified to be dependent on waterbodies for part of their life cycle.	Impact further addressed in section 10.3
Protected animals that may use the proposed wind farm development site as a flyway or migration route	Wind turbines do not occur within the study area and are not associated with the proposal.			Not considered further
Proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Vehicle strike has the potential to occur within the subject land in both construction and operation phases.	During construction the increase in construction vehicle movements, and increase in road use means potential vehicle strike to native fauna is likely to occur During operation, potential train strike to native fauna is likely to occur due to the increase in train movements and train height.	Potential train strike to native fauna may likely occur as a result of the proposal. Although no threatened entity was recognized to have a higher likelihood of vehicle strike as a result of the proposal and it is unlikely that the proposal would cause a significant increase in vehicle strike with the implementation of mitigation measures.	Impact further addressed in section 10.3

8 Matters of national environmental significance

This chapter describes Matters of National Environmental Significance (MNES) relating to Commonwealth legislation under the EPBC Act.

In addition to threatened entities listed under the BC Act, the BAM requires discussion of Threatened Ecological Communities and species listed under the EPBC Act. The SEARS also required that Matters of National Environmental Significance, listed under the EPBC Act, are considered.

A search of the EPBC Protected Matters Search Tool was completed for an area within 10km of the subject land. Results from database searches and field assessments are provided below.

8.1 Threatened species and ecological communities

8.1.1 Threatened ecological communities

Native vegetation recorded within the subject land was determined to align to two threatened ecological communities listed under the EPBC Act, including:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia – listed as Critically Endangered.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – listed as Critically Endangered

8.1.1.1 Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands of south-east Australia is listed as Endangered under EPBC Act.

The two following PCTs were considered candidates to form part of the EPBC Act listed Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived native grasslands of south-eastern Australia:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.

To be considered consistent with the Endangered listing under the EPBC Act, the vegetation must be consistent with the criteria outlined in the Commonwealth Listing Advice on Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Department of the Environment, 2010). These criteria include a required minimum 50 per cent perennial native cover, and assessment of the two PCTs against these criteria is provided in Appendix I.

The assessment concluded that the following vegetation types and zones met the EPBC Act listing for Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands:

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ3).
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ4).

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ6)
- PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ7).

The native understory of poor condition vegetation has been modified to an extent that it does not meet the required minimum 50 percent perennial native cover to meet the condition requirements of the Commonwealth listed community, as such it has not been included in the MNES assessment.

An overview of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia extent is provided in Table 8.1.

8.1.1.2 White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands is listed as Critically Endangered under EPBC Act.

The following four PCTs were considered candidates to form part of the EPBC Act listed White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion.
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion.

To be considered consistent with the Critically Endangered listing under the EPBC Act, the vegetation must be consistent with the criteria outlined in the EPBC Act policy statement 3.5 – White box – Yellow box – Blakely's red gum grassy woodlands and derived native grasslands (Department of the Environment and Heritage, 2006). An assessment of the four PCTs against these criteria is provided in Appendix I.

The assessment concluded that the following vegetation types and zones met the EPBC Act listing for White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland:

- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ9).
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ12).
- PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ14).
- PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ18).

As stated above, poor condition vegetation has not been considered in this MNES assessment as the native understory has been modified to an extent that it does not meet the required minimum 50 per cent perennial native cover.

An overview of the extent of White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands is provided in Table 8.1.

Table 8.1 Threatened ecological communities listed under the EPBC Act recorded

Threatened ecological community	Status[1]	Associated PCT within the construction footprint	Condition	Extent with subject land (ha)
Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia	E	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good	1.1
			Moderate	18.7
			Low – derived native grassland	2.3
		PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate	1.4
Total				**23.5**
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	4.5
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate	2
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate	13.3
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate	0.13
Total				**19.93**
Total area of all TECs listed under the EPBC Act:				**43.43**

(1) E = Endangered, CE = Critically Endangered as listed under the EPBC Act

8.1.2 Threatened flora species

A search of the EPBC Protected Matters Search Tool identified 18 flora species listed under the EPBC Act as being known to occur or considered likely to occur within the locality. Based on field surveys and assessment completed, a total of 11 are considered to have a moderate or higher likelihood of occurrence within or near the subject land and seven were considered unlikely to occur due to lack of suitable habitat and/or geographic range restrictions (Appendix C). These species became candidate species and subject to detailed targeted surveys and assessment. These candidate species were not recorded despite targeted surveys and as such, no threatened flora species or their habitat, listed under EPBC Act, are likely to be affected by the proposal and are not considered further. A summary of the EPBC Act listed flora species considered is provided in Table 8.2.

.

Table 8.2 Listed EPBC Act threatened flora considered for assessment

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Ammobium craspedioides	Yass Daisy	V	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. No habitat constraints identified Vegetation types: PCT 266, PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. There are no records of this species in the locality with the closest record being historic (1825) to the west of Gundagai adjacent to Nungas Road. Most records of this species occur east of a line from near Crookwell in the north to Gundagai in the south with an outlier population about 30km to the south of Wagga Wagga in Livingstone National Park. Given targeted surveys did not locate this species and that the subject land is located to the west of any known or likely habitat, Ammobium craspedioides (Yass Daisy) is unlikely to be affected by the proposal and as such this species is not considered further.
Austrostipa wakoolica	A spear-grass	E	Floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils. Habitat constraint: Alluvial plains and plains Vegetation types: PCT 76 &PCT 80	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends from the Central West where this species has a stronghold to scattered records in the Riverina region. The nearest known occurrence of Austrostipa wakoolica is from a single record (1992) near Ardlethan and is located approximately 90km to the west of the subject land. This species is dispersed through wind, rain and flooding events. Given there is no local population, it is considered unlikely that this species would utilise potential habitat within the subject land. Given targeted surveys did not locate this species and that the subject land is located to the east of any known or likely habitat, Austrostipa wakoolica (A spear grass) is unlikely to be affected by the proposal and as such this species is not considered further.
Caladenia arenaria	Sand-hill Spider Orchid	E	Woodland with sandy soil, especially that dominated by Callitris glaucophylla (White Cypress Pine). No habitat constraints identified Vegetation types; PCT 76 & PCT 80	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The surveys focused on vegetation patches with intact understorey (PCT 76 Good & Moderate and PCT 80 Moderate). The nearest known occurrence of this species is from a single record (1990) to the east of the Bethungra Range near Frampton. The subject land is wholly located to the west of the Bethungra Range and given seed dispersal is wind dependent it is unlikely that this population could disperse to suitable habitat within the subject land. Given targeted surveys did not locate this species and that the subject land is located to the west of the only known record in the locality, Caladenia arenaria (Sand-hill Spider Orchid) is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Caladenia concolor	Crimson Spider Orchid	E	Known habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the subject land is to the east of the Bethrungra range in Ulandra Nature Reserve. The subject land is wholly located to the west of the Bethungra Range. As Caladenia species rely on wind for their seed dispersal, it is considered unlikely that this population could disperse to suitable habitat within the subject land. Given targeted surveys did not locate these species, the subject land is located to the west of the closest known record and the absence of orchids within the subject land, *Caladenia concolor* (Crimson Spider Orchid) is considered unlikely to be affected by the proposal. This species is not considered further.
Euphrasia arguta	Euphrasia arguta	CE	Known to occur in eucalypt forest with a mixed grass and shrub understorey. No habitat constraints identified Vegetation type: PCT 266 & PCT 276	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known records of this species to the subject land is historic (1887) and located 10km to the west near Cootamundra with a more recent record (2014) located 40km to the South of the subject land near Tarcutta. *Euphrasia* species generally have poor seed dispersal capabilities usually within 20-30cm of the parent plant (Murphy & Downe, 2006). Given targeted surveys did not locate this species, the nearest record is located more than 40km from the nearest known record and this species poor seed dispersal abilities, *Euphrasia arguta* is unlikely to be affected by the proposal and as such this species is not considered further.
Indigofera efoliata	Leafless Indigo	E	Known to grow on slight rises amongst ironstone formation in stony red-brown sandy loam. No habitat constraints identified Vegetation type: PCT 76	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the Central West and Central Tablelands region. The closest known record of this species to the subject land is historic (1883) and is located approximately 200km to the north-east near Kerrs Creek. All other records are more than 250km from the subject land. Given targeted surveys did not locate this species and that the subject land is located more than 200km from the nearest known record, *Indigofera efoliata* is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Prasophyllum petilum	Tarengo Leek Orchid	E	Grows in open sites within Natural Temperate Grassland No habitat constraints identified Vegetation type: PCT 276 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The main distribution of this species in NSW extends between the South-East, Central Tablelands and Hunter regions. The closest known records to the subject land are located near Boorowa (1995-2016), approximately 75km to the east. Given targeted surveys did not locate this species and that the subject land is located to the west of any known or likely habitat, *Prasophyllum petilum* (Tarengo Leek Orchid) is unlikely to be affected by the proposal and as such this species is not considered further.
Swainsona murrayana	Slender Darling Pea	V	Grows in a variety of vegetation types including grasslands or grassy woodlands that have been intermittently grazed or cultivated. Vegetation type: PCT 76 & PCT 80	**No –** targeted surveys were conducted during appropriate season requirements and no specimens were recorded. The closest known record to the subject land is historic (2001) and is located near Morangarell, approximately 40km to the north-west. During field surveys, a general lack on forb species was observed within the subject land. No Swainsonia species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Given targeted surveys did not locate this species and that the subject land is located about 40km from the nearest area of known or likely habitat, *Swainsona murrayana* (Slender Darling Pea) is unlikely to be affected by the proposal and as such this species is not considered further.
Swainsona recta	Small Purple Pea	E	Known to occur in the grassy understorey of woodlands and open-forests No habitat constraints identified Vegetation type: PCT 76, PCT 80, PCT 266, PCT 276 & PCT 277	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. The closest known record to the subject land is historic (1990) and is located near Wagga Wagga, approximately 50km to the south-west. A more recent record (2000) is located near Mandurama, approximately 130km to the north-east. During field surveys, a general lack on forb species was observed within the subject land. No *Swainsona* species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Given targeted surveys did not locate this species and that the subject land is located at least 50km to from any known or likely habitat, *Swainsona recta* (Small Purple Pea) is unlikely to be affected by the proposal and as such this species is not considered further.

Scientific name	Common name	EPBC Act[1]	Habitat requirements[2]	Affected species?
Swainsona sericea	Silky Swainson-pea	V	Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. No habitat constraints identified Vegetation type: PCT 277 & PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West, Central West and Riverina regions. The closest known record of this species is historic (1990) and is located to the west of Gundagai, approximately 40km south-east of the subject land. A more recent record (2005) is located near the Gundagai township. During field surveys, a general lack on forb species was observed within the subject land. No Swainsonia species, which are typically common in the Box-Gum Woodland plant community types present, were recorded. This may suggest a generally unsuitable habitat. Given targeted surveys did not locate this species and that the subject land is located about 40km from the nearest area of known or likely habitat, *Swainsona sericea* (Silky Swainson-pea) is unlikely to be affected by the proposal and as such this species is not considered further.
Tylophora linearis	-	V	Grows in dry scrub and open forest No habitat constraints identified Vegetation type: PCT 347	**No** – targeted surveys were conducted during appropriate seasonal requirements and no specimens were recorded. This species has been recorded across NSW with the main distribution between the North West and Central West regions. The closest known record of this species is historic (1915) and is located near Temora, approximately 30km west of the subject land. A more recent record (2008) is located near the Bribbaree, approximately 45km to the north of the subject land. Given targeted surveys did not locate this species and that the subject land is located more than 30km from any known or likely habitat, *Tylophora linearis* is unlikely to be affected by the proposal and as such this species is not considered further.

(1) V – Vulnerable, E – Endangered, CE – Critically Endangered under the EPBC Act

8.1.3 Threatened fauna species

A search of the EPBC Protected Matters Search Tool identified 25 species listed under the EPBC Act as being known to occur or considered likely to occur within the locality.

Based on desktop and field assessment, a total of ten candidate species became the focus of targeted threatened fauna surveys and assessment. This included one recorded species Superb Parrot (*Polytelis swainsonii*), and 4 additional species that were considered to have a moderate likelihood of occurring within the subject land based on presence of suitable habitat (Table 8.3, Figure 8.1 and Appendix D). In addition, Appendix A of the SEARs identifies an additional five candidate species that were also assessed.

Threatened fauna surveys completed were carried out as described in Chapter 3 and Table 3.6. The outcome of these targeted surveys and assessments for the ten threatened candidate fauna species listed under the EPBC Act are presented in Table 8.3.

Table 8.3 Listed EPBC Act threatened fauna considered for assessment

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Regent Honeyeater	*Anthochaera phrygia*	CE	PCT 5, PCT 266, PCT 276, PCT 277, PCT 347	**Yes –** potential to occur during seasonal movements and to utilise blossoming eucalypts. subject land does not conform to high quality woodland habitats types that this species is dependent upon for foraging and breeding purposes. The subject land is not identified as a breeding area for the species. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The subject land would only provide marginal foraging habitat for the species during seasonal movements to utilise blossoming eucalypts. It is unlikely that the subject land is relied upon by the species to forage or breed. The proposal has been identified to impact on about 30.23ha of potential foraging habitat.
Swift Parrot	*Lathamus discolor*	CE	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Yes –** potential to occur during seasonal movements and to utilise blossoming eucalypts. Dependent on winter flowering resources of which *Eucalyptus microcarpa* occurs widely within subject land. Small amount of records locally and local resources are sparse, so occurrences are likely to be rare but cannot be discounted. subject land is outside of species known breeding habitat. subject land would form potential foraging habitat for the species during blossoming events. The proposal has been identified to impact on about 60.33ha of potential foraging habitat.
Superb Parrot	*Polytelis swainsonii*	V	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Yes –** recorded foraging on crop/agricultural land. Known widely within the locality and recorded within multiple locations within the subject land. No breeding activity was observed during targeted surveys, however, presence of breeding habitat (e.g. large hollow-bearing trees). Species likely to utilise the subject land for both foraging and breeding habitat. The proposal has been identified to impact on up to 72.93ha of potential foraging habitat, of which 60.33 is potential breeding habitat.
Spotted-tail Quoll	*Dasyurus maculatus maculatus*	E	PCT 5, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347	**No** – the subject land lacks the important microhabitat (i.e. understorey structure of fallen timber, rocky outcrops, shrub layer etc.) and connectivity to extensive vegetation patches for the species to persist and be reliant for breeding and foraging purposes. Spotted-tailed Quoll records are generally confined to within 200km of the coast and prefers mature wet forest habitat which include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves. Individuals also require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. It is more likely that the species relies more readily on remnant woodland patches to the east in association with Bethungra and Ulandra Mountain range. Based off habitat assessments, limited foraging habitat, and minimal records, it is considered that the species has a low likelihood of occurrence within the subject land.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	PCT 5, PCT 76, PCT 266, PCT 276, PCT 277	**Yes** – Not observed during nocturnal surveys but may visit the subject land when blossom resources are scarce in other regions. Records within the locality are scarce and no camps occur within the subject land nor are there any recorded on interactive Flying-fox web viewer within the locality. The species is distributed within 200km of the eastern coast of Australia and known to disperse and nomadically move based on seasonal resource abundances (i.e. blossom and fruiting events). Differencing patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years based of resource availability. Within inland areas the species is known to be uncommon, with occurrences based off abundance/availability of foraging resources. Within the subject land, the species would only intermittently occur when blossom resources are plentiful, however these would be irregular. No breeding camps occur within the subject land or were recorded during surveys. It is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 54.6ha of potential foraging habitat.
Painted Honeyeater	*Grantiella picta*	V	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347	**No** – Marginal foraging habitat within remnant vegetation. A specialist feeder on mistletoes (*Amyema* spp.) which did not occur in high densities. The species is a specialist feeder of mistletoes growing on woodland eucalypts and acacias and occurs in Boree/Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. Throughout its range it occurs in low densities. The habitat within the subject land is marginal, often lacking the high densities of mistletoes within larger patches of intact Box-Ironbark Forests. It is more likely that the species relies more readily on remnant woodland patches to the east in association with Bethungra and Ulandra Mountain range. It is unlikely that the subject land supports a residential population or that the species is highly reliant on the subject land for foraging and breeding habitat. The subject land likely acts as a small part of foraging habitat within the larger home range of the species, and it is likely that the species may occur irregularly during nomadic movements. Targeted surveys including diurnal bird surveys did not identified any individuals nor large occurrences of mistletoes. Based off habitat assessments, limited foraging habitat, and minimal records, it is considered that the species has a low likelihood of occurrence within the subject land.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	PCT 80, PCT 266	**Yes –** Associated habitat in the form of box dominated woodlands, tree hollows and loose bark were recorded within the subject land. No previous records within the locality, however, presence of foraging habitat (i.e. box eucalypt dominated communities) and breeding habitat (hollow-bearing trees) identified. Targeted surveys including Anabat recordings and harp trapping did not capture any individuals, however, based on habitat assessments, identified microhabitats and known distribution it is considered that the species has a moderate – high likelihood of occurrence within the subject land. The subject land contains 11ha of potential habitat.
Koala	*Phascolarctos cinereus*	E	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 309, PCT 347	**No** – A lack of continuity between woodland patches, patch size and sufficient foraging resources suggest that this species does not form a residential population in the subject land. May occur randomly due to roaming movements. The subject land does not occur within known core koala population areas, the south-western slopes population is considered to occur in low densities. Due to the low number of records (two), low connectivity between large patches of good quality remnant habitat and the degraded nature of habitat within the subject land, it is unlikely a residential population occurs within subject land. Targeted surveys including, habitat assessments, SATs, spotlighting and opportunistic daytime surveys did not record individuals within the subject land.
Pink-tailed Worm-lizard	*Aprasia parapulchella*	V	PCT 266, PCT 276, PCT 277, PCT 347	**No** – Marginal habitat (rocky outcrops, scattered rocks) were recorded within the subject land. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality. The species has a patchy distribution along south western slopes, with the closest records north-east of Tarcutta. Prefers habitat with dominant groundcover of native grasses (i.e. *Themeda* sp.); sparse or no tree cover and scattered small rocks embedded in the soil surface. These important habitat features were limited within the subject land, despite targeted searches (active searches) no individuals were recorded. It is unlikely that the subject land provides good quality habitat for the species, as majority of the subject land has been heavily disturbed due to agricultural practices.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Affected species?
White-throated Needletail	*Hirundapus caudacutus*	V	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Yes –** Almost exclusively aerial. Occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings. May irregularly occur foraging over subject land. The habitats within the subject land are unlikely to constitute important habitat for this species. The habitat present is unlikely to support significant proportions of the population nor are the habitats critical to any life stage of the species. The species is likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this and this mobile nature, and the marginal habitat it is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 60.33ha of vegetation communities associated with aerial foraging habitat.

(1) Listed under the EPBC Act – CE = Critically Endangered, E = Endangered, V = Vulnerable

8.2 Migratory species

Migratory species are protected under international agreements, to which Australia is a signatory, including JAMBA, CAMBA, RoKAMBA and the Bonn Convention on the Conservation of Migratory species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

Migratory species are protected under international agreements to which Australia are a signatory, including Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (RoKAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

Based on desktop review 11 migratory fauna species were identified to potentially occur. No listed Migratory species were recorded within the subject land during surveys. However, based on habitat assessments a total of two migratory species have a moderate to high likelihood to occur within the subject land (Table 8.4, Appendix D). These species have been considered with reference to the *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment 2015).

Table 8.4 Migratory species recorded or have a moderate potential to occur

Scientific name	Common name	EPBC Act[1]	Likelihood of occurrence
Apus pacificus	Fork-tailed Swift	M; Ma	**Moderate.** Almost exclusively aerial. Commonly recorded over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. Most observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas. Forages aerially for insects, sometimes in mixed feeding flocks with other aerial foragers. Believed to roost on the wing (Department of the Environment 2015). May irregularly occur foraging over subject land.
Hirundapus caudacutus	White-throated Needletail	V; M	**Moderate**. Almost exclusively aerial though does roost in tree hollows and the foliage canopy. Occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings. Forages for insects on the wing, flying anywhere between “cloud level” and “ground level” and readily forms mixed feeding flocks with other aerial insectivores (Department of the Environment 2015). May irregularly occur foraging over subject land.

(1) Listed under the EPBC Actp – M = Migratory, Ma = Marine

These species (Table 8.4) have the potential to utilise a wide variety of habitats, including native vegetation communities found within the subject land.

While migratory species of bird may use the subject land and have records in the locality, the subject land is not considered to be of sufficient extent or quality to be critical for these species. The subject land would not be considered ‘important habitat’ for migratory birds as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines, in that the subject land does not contain:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- habitat utilised by a migratory species which is at the limit of the species range
- habitat within an area where the species is declining.

The habitats within the subject land are unlikely to constitute important habitat for any of the mentioned species. The habitat present is unlikely to support significant proportions of the population of any migratory species nor are the habitats critical to any life stage of these species (neither identified species breed in Australia). These species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this and their mobile nature, these species are not considered to be significantly affected by the proposal and are not considered further in this report.

8.3 World and national heritage

No world or national heritage places were identified within the locality of the subject land.

8.4 Wetlands of national and international importance

Wetlands are important habitat for a diverse range of animals including waterbirds, amphibians, invertebrates and fish species as well as aquatic and water loving plants such as sedges and rushes. Tree species such as River Red Gum also rely on these environments. Wetlands are important provide strategic refuge during drought and frequently support threatened species. Most of the migratory bird species listed under international convention agreements with Australia may be found in these wetlands.

8.4.1 Nationally important wetlands

One wetland of national importance was identified within the locality– Bethungra Dam Reserve. Bethungra Dam Reserve occurs to the east of the subject land. It occurs upstream (approximately 12km) from the subject land and is wetland habitat created by the damming of Wandalybringle Creek. The wetland provides large stands of common reeds and cumbungi, it acts as important refuge habitat during drought conditions and provides habitat for a variety of birds and animals. The Bethungra Dam Reserve does not occur within the subject land and the proposal would not impact this nationally important wetland.

8.4.2 Wetlands of international importance (Ramsar wetlands)

Four international wetlands of importance (Ramsar) were identified in desktop searches, these are:

- Banrock Station wetland complex
- Hattah-kulkyne Lakes
- Riverland
- the Coorong, and Lakes Alexandrina and Albert wetland.

All these international wetlands of importance occur >400km from the subject land and are will not be affected by the proposal.

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

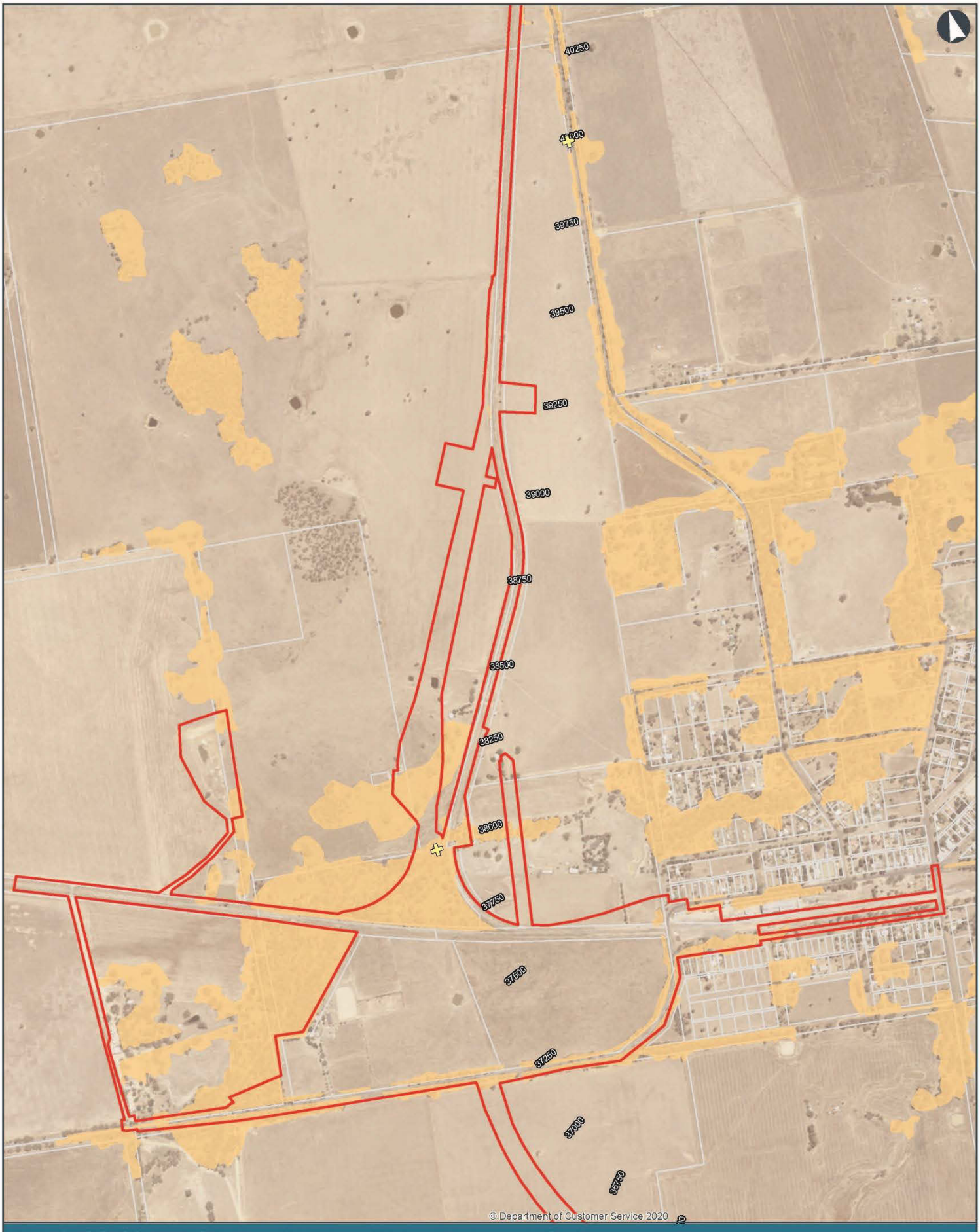
Species locations - MNES

Superb Parrot species record

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

Superb Parrot species record

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

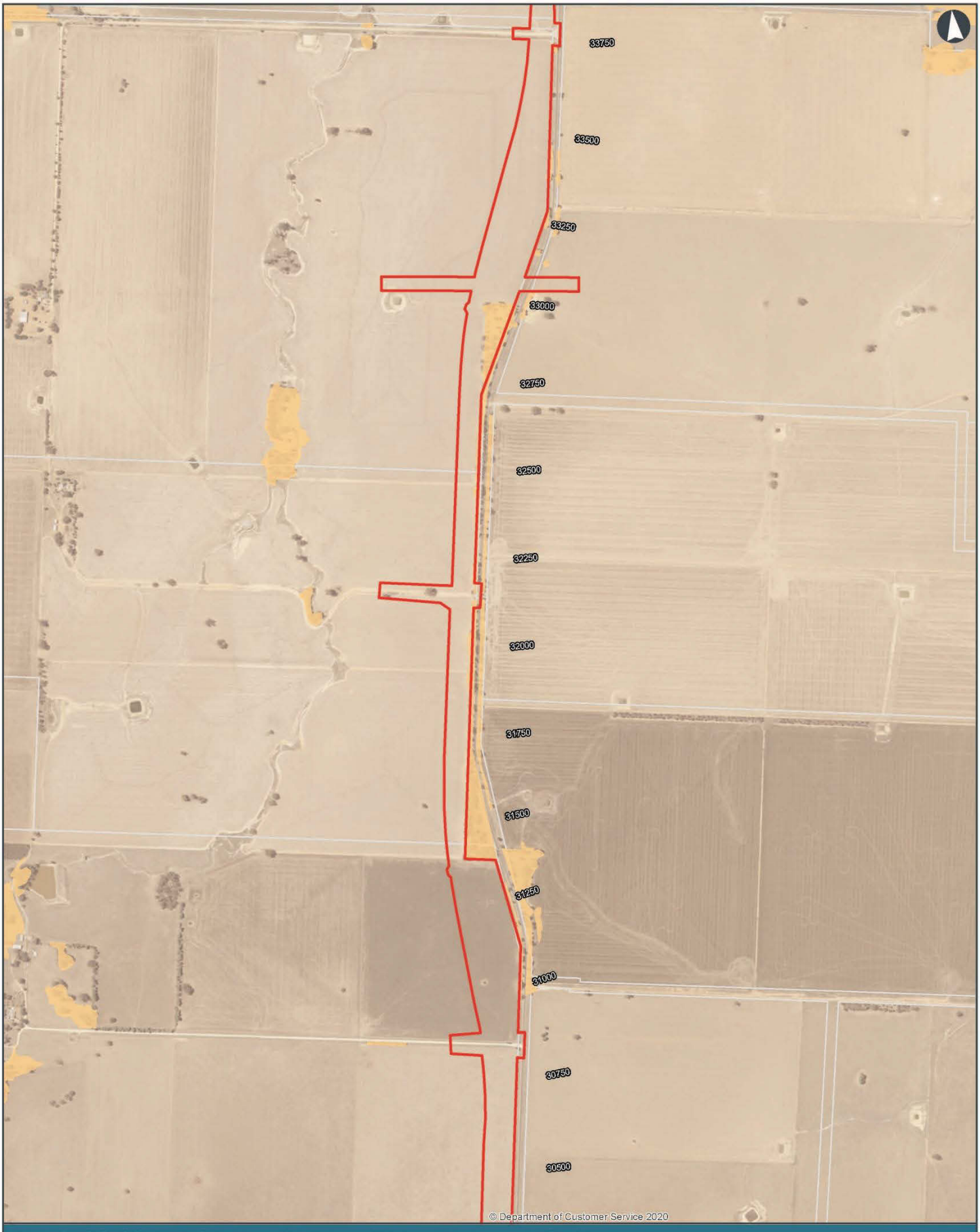
Cadastral Boundary

Superb Parrot habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Data Sources: IRDJV, ARTC, LPI

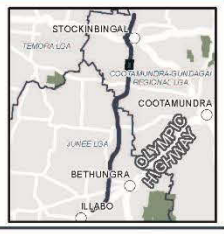
Paper: A3
Scale: 1:10,000

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

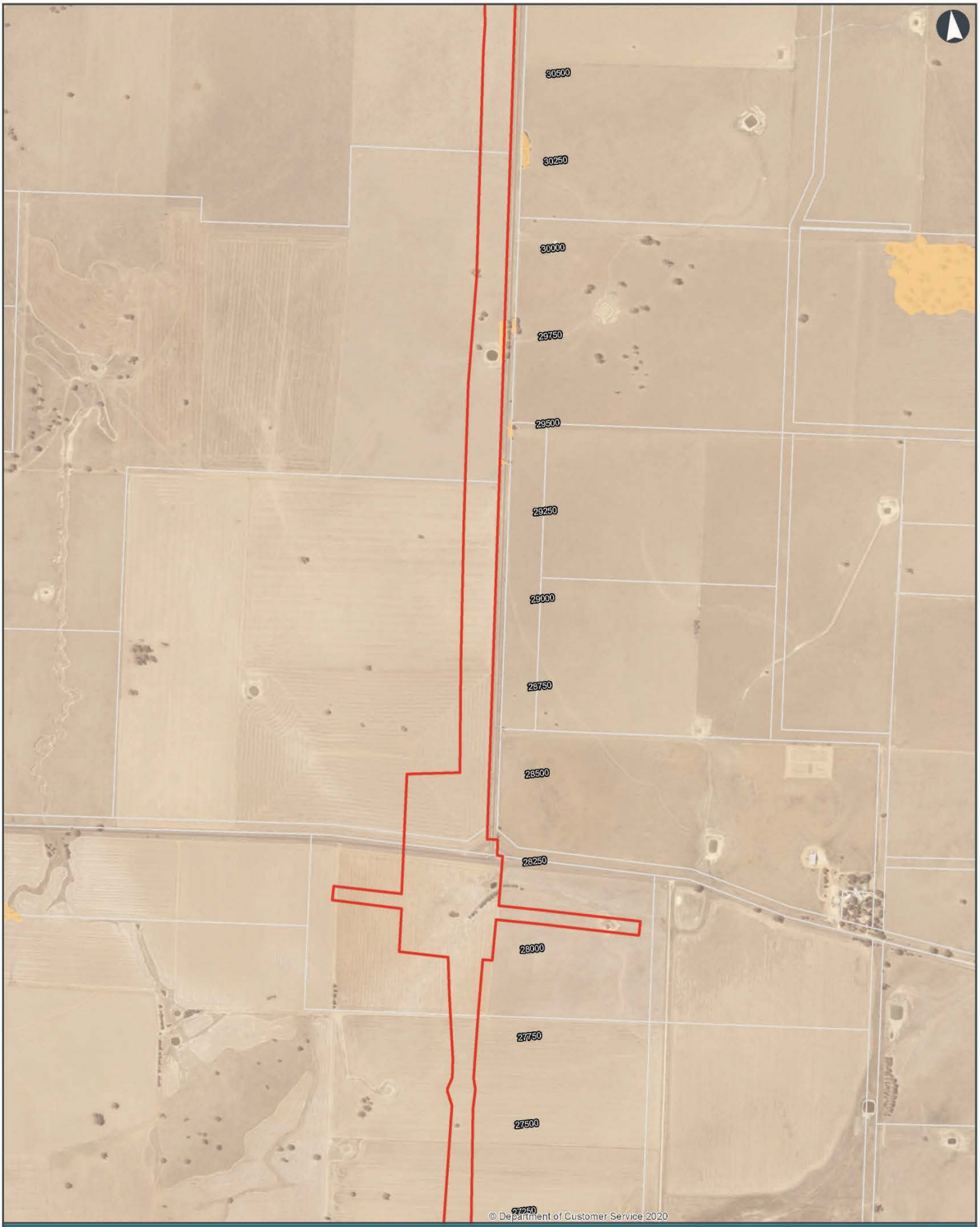


INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

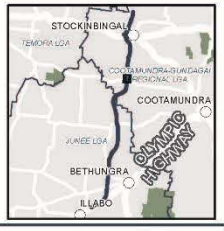
Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

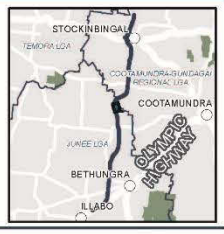
Proposal site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

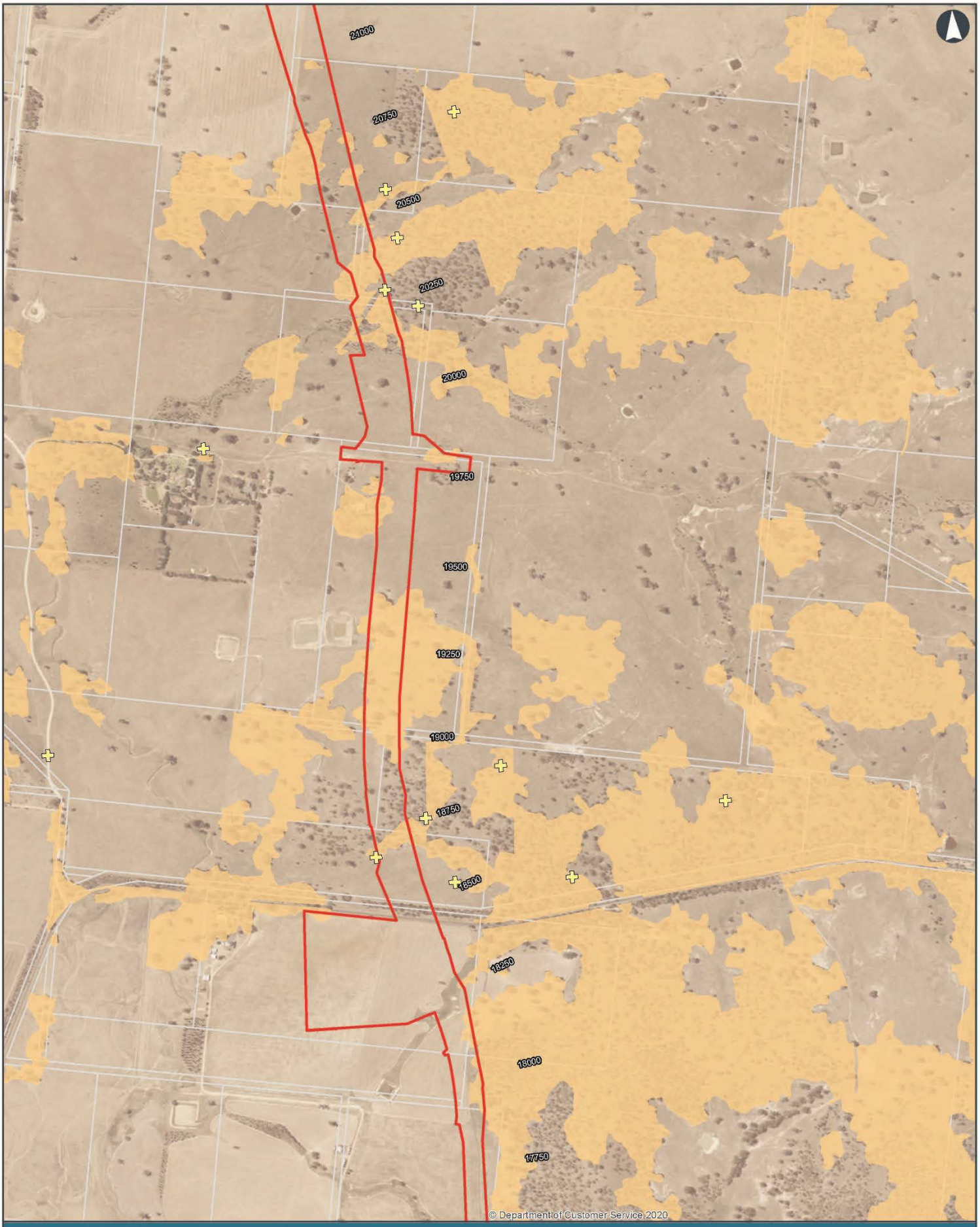
Superb Parrot species record



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

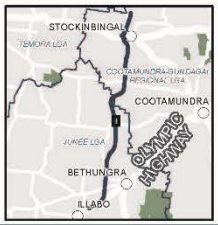
Proposal site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

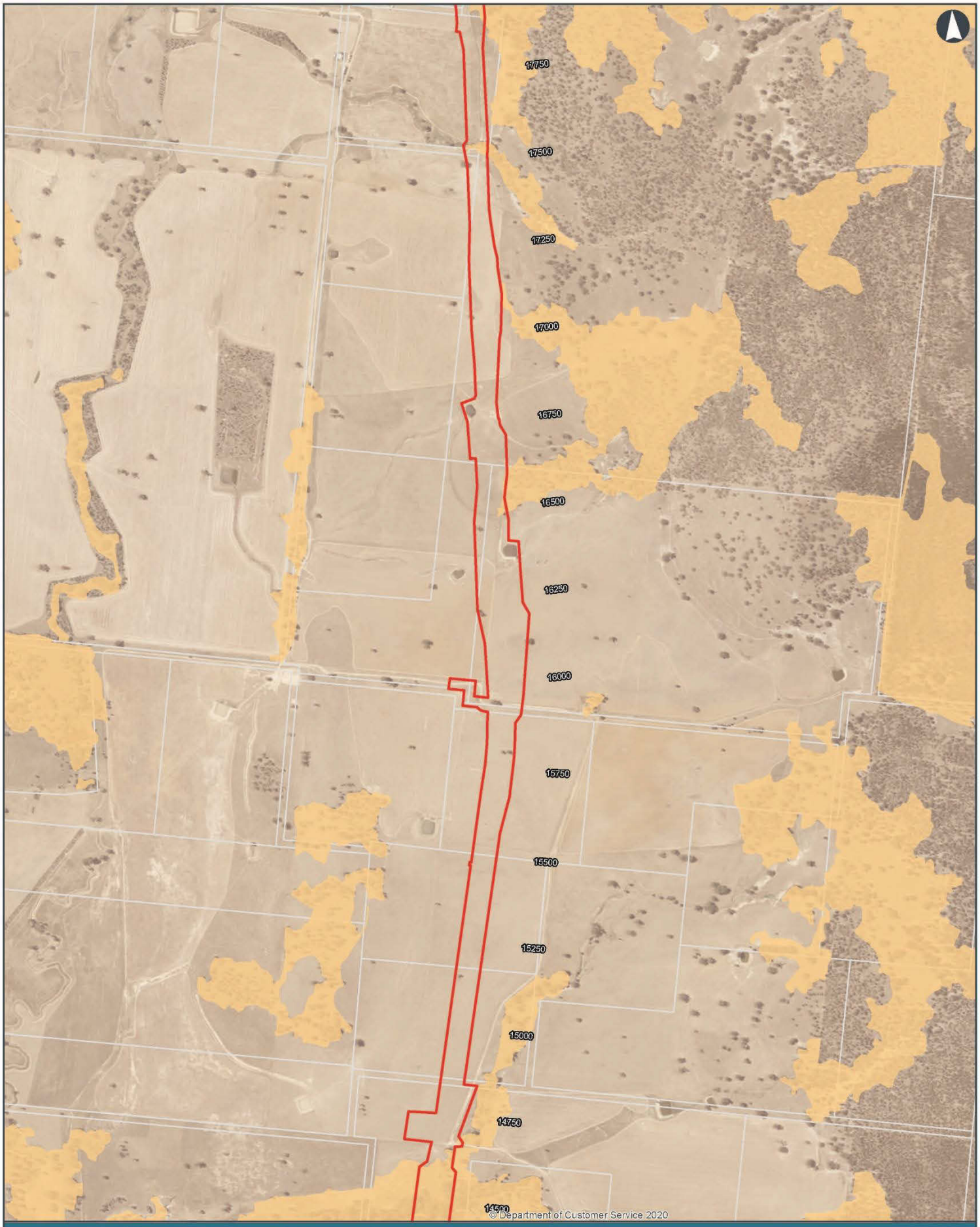
Superb Parrot species record



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS10B286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd

ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

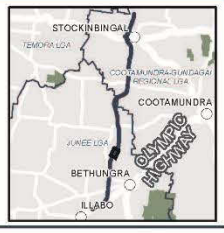
Proposal site

Cadastral Boundary

Superb Parrot habitat

Species locations - MNES

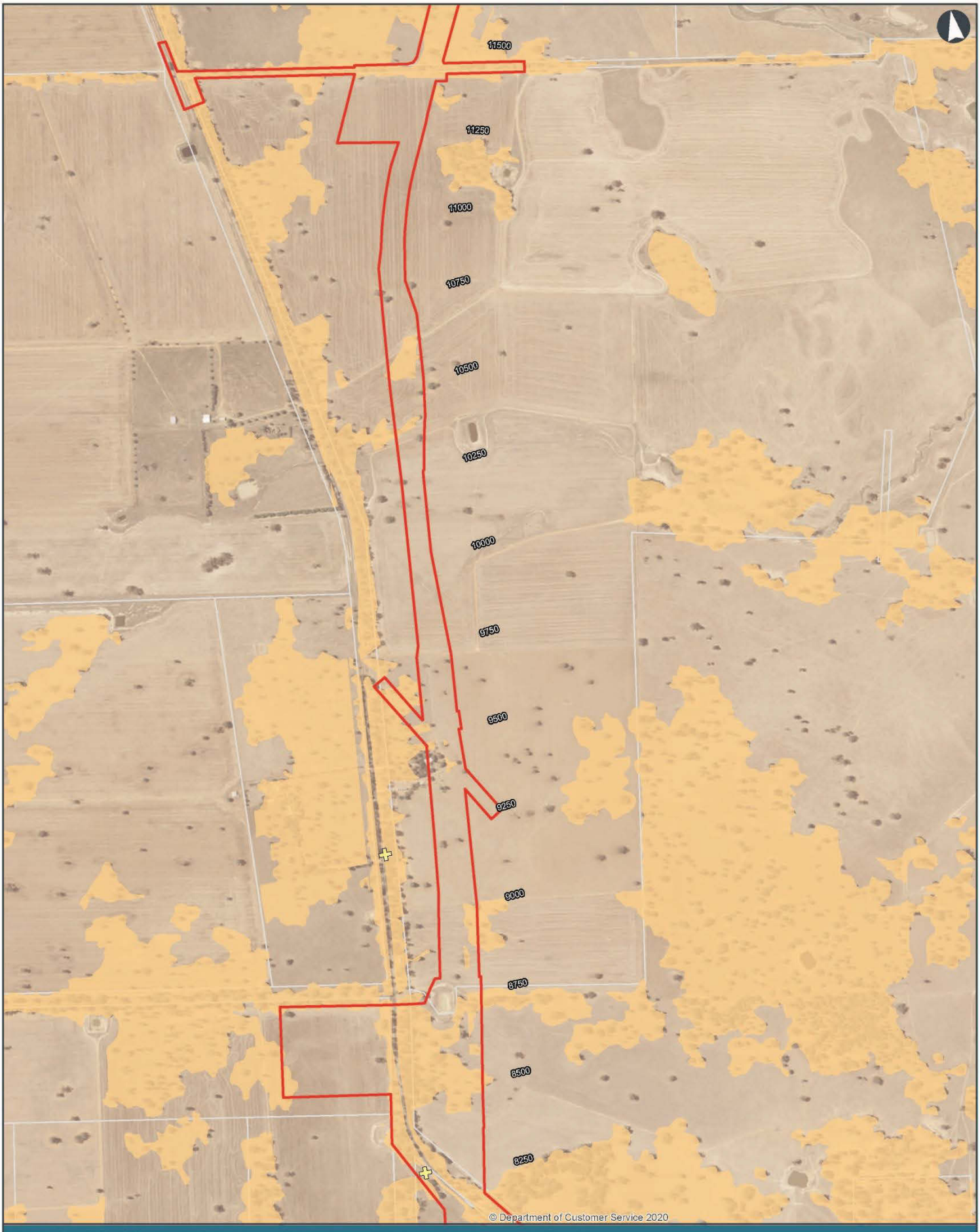
Superb Parrot species record



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

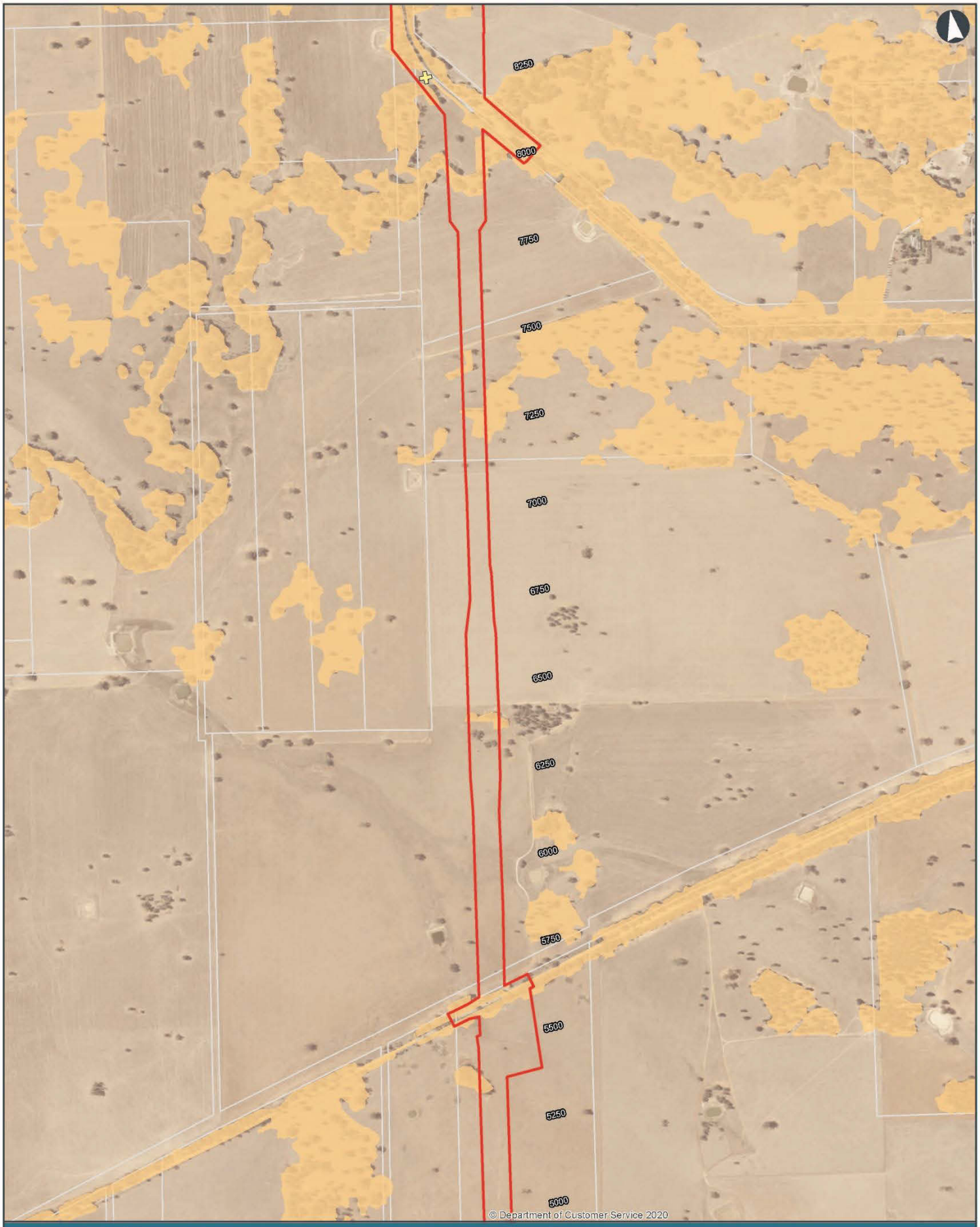
Species locations - MNES

Superb Parrot species record

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

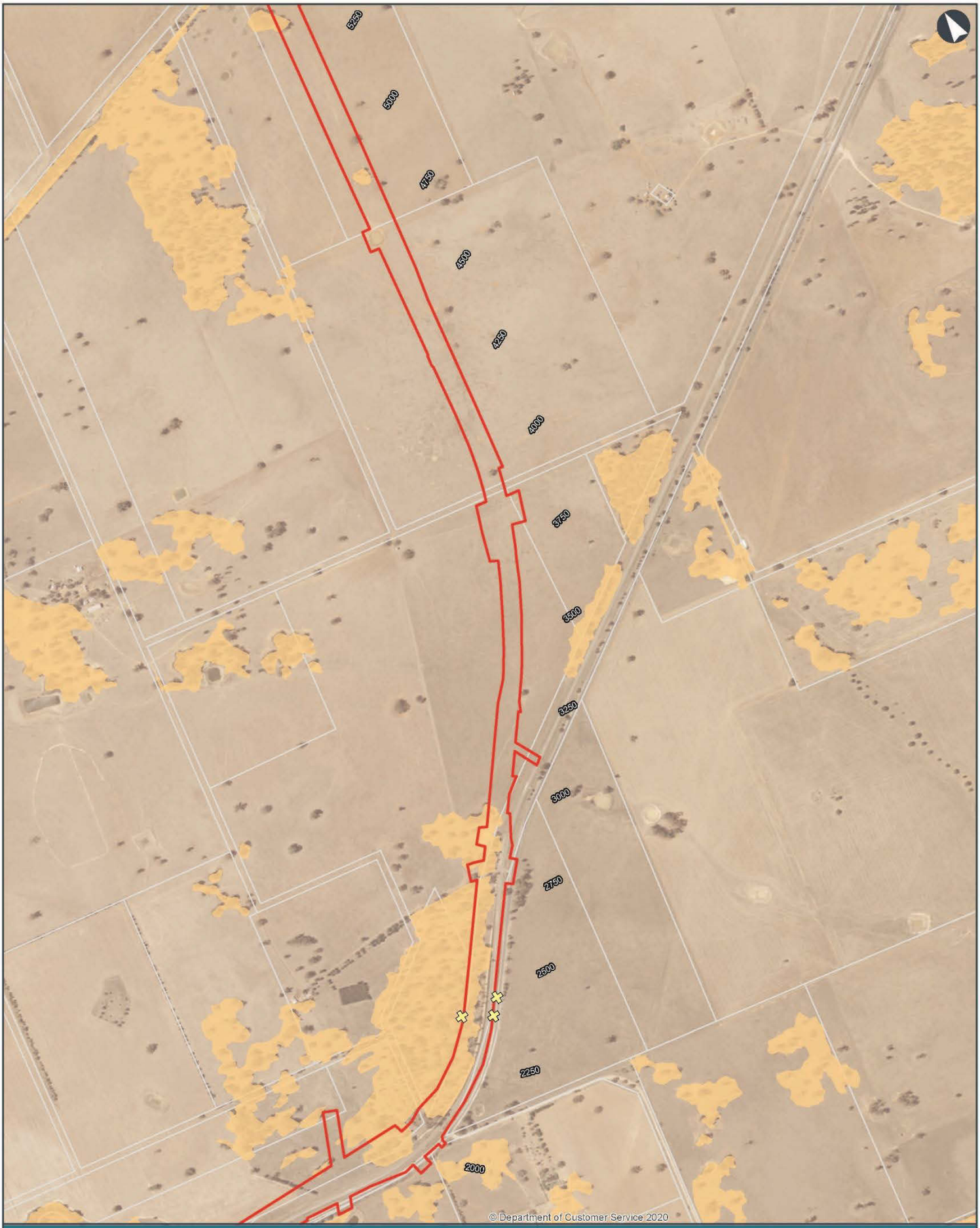
Species locations - MNES

Superb Parrot species record

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

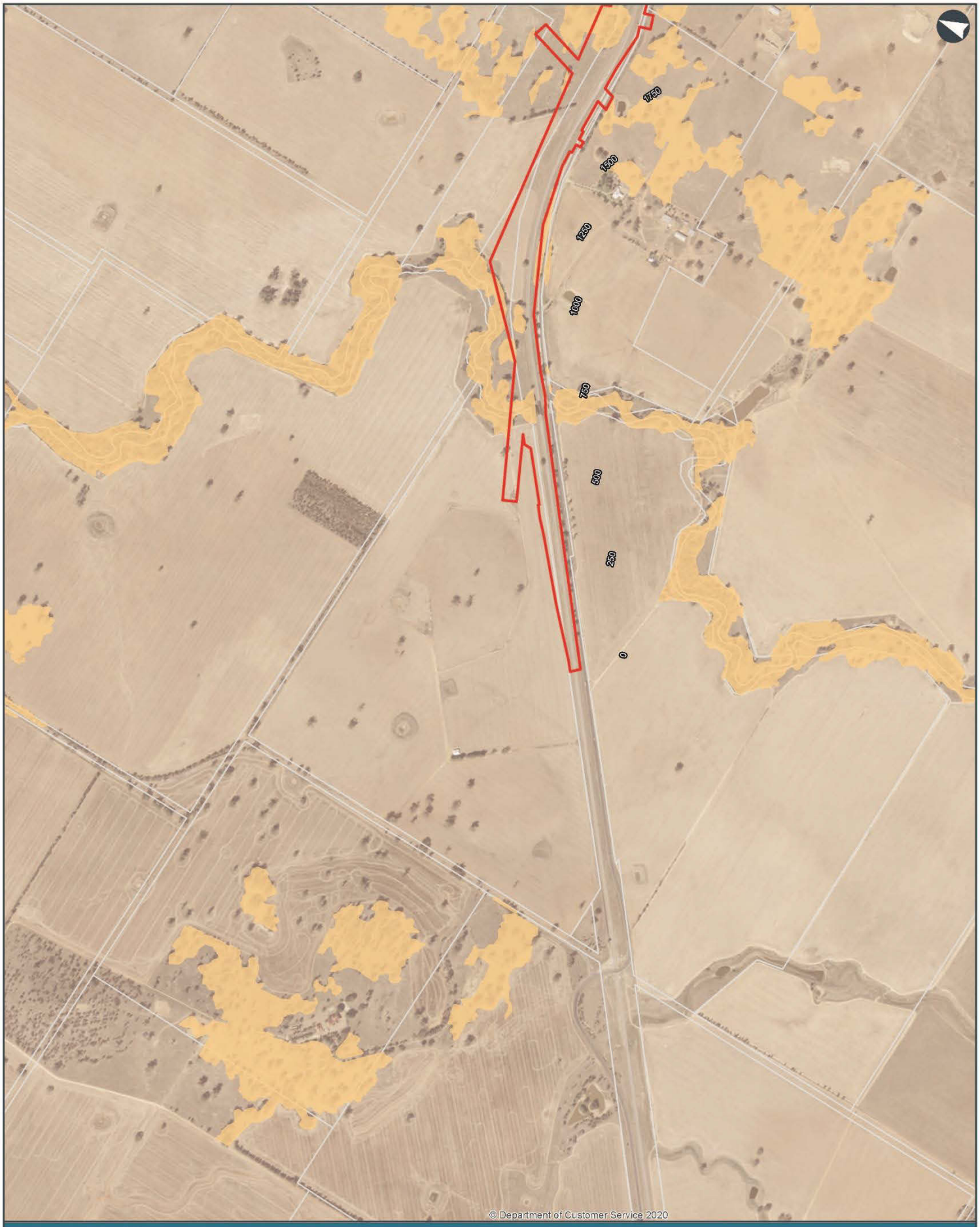
Species locations - MNES

Superb Parrot species record

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 8.1 Matters of National Environmental Significance

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal site

Cadastral Boundary

Superb Parrot habitat

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_8_1MNES_EPBC_r1v2.mxd

Stage 2
Impact assessment

9 Avoiding or minimising impacts on biodiversity values

The following provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of the proposal. This information is provided to directly address Chapter 7 of the BAM.

9.1 Avoid and minimise impacts on native vegetation and associated habitat

The principles in section 7.1 of the Biodiversity Assessment Method have been considered to avoid and minimise impacts on native vegetation and habitat, where possible, through the project development process. Chapter 6 of the EIS provides a detailed discussion of the alternative and options assessment which included:

- strategic alternatives – alternative freight transport solutions
- do nothing alternatives
- alternative route options
- options assessment process and development of preferred alignment
- siting of construction compounds and batch plants.

The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the proposal. The proposal consistency with principles of the BAM to avoid and minimise impacts to biodiversity values as described in Table 9.1. This includes consideration of alternative options to avoid and minimise impacts on biodiversity values.

In order to effectively avoid and/or minimise the potential for impacts during all key phases of the proposal, significant constraints, risks and opportunities that the alignment should seek to avoid through design were identified. The specific design responses to avoid and minimise adverse impacts to terrestrial and aquatic biodiversity are identified in Chapter 6 of the EIS.

Table 9.1 Efforts to avoid and minimise impacts on native vegetation and habitat during proposal design

Principles	Proposal consistency
Locating the proposal to avoid and minimise impacts on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.1.1.3 of BAM)	
Locating the proposal in areas where there are no biodiversity values	Areas of biodiversity value could not be entirely avoided. Where practicable avoidance has been undertaken and the design with the lowest feasible biodiversity impact (i.e. lowest vegetation condition) has been undertaken Alternatives and options considered and how biodiversity was considered is outlined in Chapter 6 of the EIS.
Locating the proposal in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	The proposed alignment has utilised areas of existing disturbance (i.e. within agricultural lands or cropping areas) and areas of lower vegetation condition.

Principles	Proposal consistency
Locating the proposal in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.	A multi criteria assessment was undertaken as part of the route selection process. A 250m corridor was assessed to inform the presence and condition of threatened ecological communities. This has resulted in a decrease in the direct impact to Inland Grey Box Woodland TEC and Box Gum Woodland TEC recorded. Avoidance of Inland Grey Box Woodland TEC along Ironbong Road and both Inland Grey Box Woodland and Box Gum Woodland TECs along Dudauman Road has significantly reduced the overall impact to TECs (see in Chapter 6 of the EIS (alternatives and proposal options).
Locating the Project outside of the buffer area around breeding habitat features such as nest trees or caves.	The proposal design has avoided areas which provide connectivity as far as practicable. Where the alignment cannot avoid impact to areas of connectivity such as along Old Sydney Road, the implementation of connectivity mitigation measures will be considered (i.e. rope bridges, culverts etc.).
Consideration of alternatives (section 7.1.1.4 of the BAM)	
An analysis of alternative modes or technologies that would avoid or minimise impacts on biodiversity values	Design and construction works will, so far as practicable, avoid direct impacts to local creek lines and tributaries through appropriate bridge or culvert design (see Chapter 6 of EIS).
An analysis of alternative routes that would avoid or minimise impacts on biodiversity values *An analysis of alternative locations that would avoid or minimise impacts on biodiversity values* *An analysis of alternative sites within a property on which the proposal is proposed that would avoid or minimise impacts on biodiversity values*	Chapter 6 of the EIS provides a detailed discussion of the alternative and options assessment which included: • strategic alternatives – alternative freight transport solutions • do nothing alternatives • alternative route options • options assessment process and development of preferred alignment • siting of construction compounds and batch plants. The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the proposal. The multi-criteria analysis undertaken during the option selection included consideration of environmental impacts. To further refine the preferred alignment, an environmental constraints workshop was held in January 2019 to identify significant constraints, risks and opportunities that the alignment should seek to avoid through design responses. The workshop provided an overview of the biodiversity (terrestrial and aquatic), heritage and agricultural constraints and suggested design responses. Multiple design options were analysed, and the provided design has minimised impacts to high biodiversity values (i.e. areas with highest vegetation integrity score, threatened ecological communities, Class 3 Scattered Trees and areas of potential habitat for threatened fauna). A summary of the specific design responses to avoid and minimise adverse impacts to biodiversity are identified in Chapter 6 of the EIS (alternatives and proposal options).

Principles	Proposal consistency
Designing a proposal to avoid and minimise impact on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.1.2.1 of BAM)	
Reducing the proposal's clearing footprint by minimising the number and type of facilities	Detailed design may provide further opportunities for minimising the final development footprint as far as practical. Ancillary facilities and temporary construction sites will be located within areas of low biodiversity values (i.e. cleared land) and avoid direct impacts to vegetation in high threat status or areas of high biodiversity value as far as practical. The current optimized design has further reduced native vegetation clearing including impacts to TECs This reduction has been achieved through reducing the overall proposal length and footprint as well as relocation to areas of non-native woody vegetation (cropping and pasture areas). Preliminary surveys to identify areas of lower biodiversity value have been undertaken to inform detailed design of ancillary facilities (i.e. areas dominated by exotic species, cropped areas).
Locating ancillary facilities in areas where there are no biodiversity values	
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC or is an entity at risk of a serious and irreversible impact (SAII)	
Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.	Fauna passage opportunities will be investigated. This will include investigation of crossing structures (i.e. glider poles, culverts etc.) within the detailed design phase to enable the continuation of movement and genetic material across the landscape. Mitigation measures have been developed to address the direct and indirect impacts of the proposal including restoration and rehabilitation and are outlined in Chapter 11.

9.2 Avoid and minimise impacts on prescribed biodiversity

This section addresses prescribed biodiversity impacts that may be difficult to quantify, replace or offset, making avoiding and minimising impacts critical in accordance with Section 7.2.1 & 7.2.2 of the BAM. Prescribed biodiversity impacts relevant to the proposed have been identified in Table 9.2.

Table 9.2 Efforts to avoid and minimise impacts on prescribed biodiversity during proposal planning

Prescribed biodiversity impacts	Proposal planning
Designing a project location to avoid and minimise impact on prescribed biodiversity (section 7.2.1 of BAM)	
a) *locating the envelope of surface works to avoid direct impacts on the habitat features identified in Chapter 6*	Areas of habitat features could not be entirely avoided; however, the proposal has been designed to avoid impact to intact vegetation as much as practicable and where habitat features (i.e. culverts) are to be impacted, these features may be retained. Mitigation measures have been developed to address the direct and indirect impacts of the proposal to prescribed impacts.

Prescribed biodiversity impacts	Proposal planning
b) *locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features, e.g. locating longwall panels away from geological features of significance or water dependent plant communities and their supporting aquifers*	The proposal has not been located in an area where subsurface works would impact geological features of significance. Detailed assessment of impacts to aquifers, hydrology, water quality and groundwater dependent ecosystems is provided in: • Technical Paper 4 – Hydrology and flooding • Technical Paper 5 – Water quality • Technical Paper 6 – Groundwater. Given that the majority of watercourses that cross the subject land are ephemeral, impacts to surface water hydrology and flow regimes as a result of construction would be limited in extent. The design of the proposal has been developed to avoid impacts to hydrology and flooding through design criteria. The proposed drainage scenario is designed to mimic existing waterway catchments, flows and flow paths and thus avoiding water quality impacts as a result of changes to flow regimes where practical. The flow paths of watercourses intersected by the proposal would not be altered and drainage infrastructure has been designed to maintain natural processes. The location of proposed culverts has been selected at topographical low points to match existing flow patterns. Ecosystems have been identified within the Study area that rely on the subsurface presence of groundwater. This includes the following high potential ground water dependent ecosystems (GDEs): • three high potential aquatic (river) GDEs were identified intersecting the proposal site, Billabong Creek, Dudauman Creek and Ulandra Creek • four high potential terrestrial (vegetation) GDEs were identified, Blakelys Red Gum, Yellow Box, Western Grey Box and White Cypress Pine. The impact of the Proposal on the underlying groundwater sources was assessed to contain a negligible to low risk to the groundwater environment during both construction and operation. This is principally due to the Proposals cut depths not anticipated to intersect the regional groundwater table for the Lachlan alluvial or Fracture rock groundwater sources. In addition, groundwater is currently not a preferred option to be used to support water supply for construction. The potential groundwater impacts were assessed against the minimal impact considerations of the NSW Aquifer Interference Policy, with the predicted impacts anticipated to be less than level 1 impact considerations. Any residual risk to the groundwater environment would be reduced by the implementation of appropriate groundwater mitigation and management measures.

Prescribed biodiversity impacts	Proposal planning
c) *locating the proposal to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or local movement pathways*	The proposal is located within rural area, and heavily disturbed agricultural settings. Wildlife corridors and landscape connectivity is limited, although some drainage lines associated with the subject land provide local connectivity for more mobile species of animal. The proposal will result in increased fragmentation and loss of connectivity for the movement of species between areas. The proposal design has avoided and minimised impacts to areas which provide connectivity as far as practicable. Where the alignment cannot avoid impact to areas of connectivity such as along Old Sydney Road, the implementation of connectivity mitigation measures will be considered (i.e. rope bridges, culverts etc.). Detailed design is considering wildlife crossing structures (e.g. glider poles, canopy plantings, multi-use culverts) that may enhance wildlife connectivity in association with the proposal and assist species movement between habitat patches. Areas where the proposal crosses 3rd order streams and above have been considered during design development to minimise impact on aquatic habitat. Creek crossings which require consideration of fish passage requirements comprise: • Dudauman Creek • Powder Horn Creek • Isobel Creek • Ulandra Creek; and • Billabong Creek. In response to this, bridges have been proposed to allow water from a watercourse to pass under the railway. To ensure that fish passage is maintained, watercourse crossing structures would be designed in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management Update 2013* (DPI Fisheries 2013). This is discussed in detail in Technical Paper 2 – Aquatic biodiversity.
d) *optimising proposal layout to minimise interactions with threatened entities*	The proposal has been designed to minimise impact to areas of TECs. A multi criteria assessment was undertaken as part of the route selection process. A large survey area was assessed to inform the presence and condition of threatened ecological communities. This has resulted in a decrease in the direct impact to Inland Grey Box Woodland TEC and Box Gum Woodland TEC recorded. Avoidance of Inland Grey Box Woodland TEC along Ironbong Road and both Inland Grey Box Woodland and Box Gum Woodland TECs along Dudauman Road has significantly reduced the overall impact to TECs. In addition, the layout was designed to minimise impacts to threatened species including Superb Parrot and Squirrel Glider which were recorded within the study area. This included shifting alignment to avoid high quality habitat areas and minimising impacts to connectivity along old Sydney Road and Billabong Creek, Bethungra and Boundary Creek. large river red gums and hollow bearing trees at Ironbong Road and Ulandra Creek. This enabled the proposal layout to minimise interactions with threatened entities. A summary of the specific design responses to avoid and minimise adverse impacts to biodiversity are identified in Chapter 6 of the EIS (alternatives and proposal options) and shown in Figure 6.11 of the EIS.

Prescribed biodiversity impacts	Proposal planning
e) *locating the proposal to avoid direct impacts on water bodies or hydrological processes.*	The proposal will directly impact some mapped water bodies which occur within the existing rail corridor. The proposed drainage scenario is designed to mimic existing waterway catchments, flows and flow paths and thus avoiding water quality impacts as a result of changes to flow regimes where practical. There are no changes to flood afflux, velocity, or duration at the proposals sites and all subject lands achieve the required drainage immunity. As such there would be no changes to the local and regional flow regime that would cause impacts to the water quality to the surrounding environment. Detailed assessment of impacts to aquifers, hydrology, water quality and groundwater dependent ecosystems is provided in: • Technical Paper 4 – Hydrology and flooding • Technical Paper 5 – Water quality • Technical Paper 6 – Groundwater. Mitigation measures incorporating sedimentation and hydrology controls are outlined in Chapter 11.
Designing a project location to avoid and minimise impact on prescribed biodiversity (section 7.2.2 of BAM)	
a) *an analysis of alternative modes or technologies that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed mode or technology*	Chapter 6 of the EIS (alternatives and proposal options) provides a detailed discussion of the alternative and options assessment which included: • strategic alternatives – alternative freight transport solutions • do nothing alternatives • alternative route options • options assessment process and development of preferred alignment • siting of construction compounds and batch plants. The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the proposal. The multi-criteria analysis undertaken during the option selection included consideration of environmental impacts. To further refine the preferred alignment, an environmental constraints workshop was held in January 2019 to identify significant constraints, risks and opportunities that the alignment should seek to avoid through design responses. The workshop provided an overview of the biodiversity (terrestrial and aquatic), heritage and agricultural constraints and suggested design responses. Multiple design options were analysed, and the provided design has minimised impacts to high biodiversity values (i.e. areas with highest vegetation integrity score, threatened ecological communities, Class 3 Scattered Trees and areas of potential habitat for threatened fauna). A summary of the specific design responses to avoid and minimise adverse impacts, including impacts to biodiversity, are identified in Table 6.7 and shown in Figure 6.11 of the EIS. Detailed design may provide further opportunities for minimising the final development footprint as far as practical. Ancillary facilities and temporary construction sites will be located within areas of low biodiversity values (i.e. cleared land) and avoid direct impacts to vegetation in high threat status or areas of high biodiversity value as far as practical. Reduction to vegetation clearing has been achieved through reducing the footprint as well as relocation to areas of non-native woody vegetation (cropping and pasture areas). Ancillary facilities (i.e. areas dominated by exotic species, cropped areas). Mitigation measures have been developed to address the direct and indirect impacts of the proposal to prescribed impacts.
b) *an analysis of alternative routes that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed route*	
c) *an analysis of alternative locations that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed location*	
d) *an analysis of alternative sites within a property on which the proposal is proposed that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed site.*	

10 Assessment of impact

The following section describes a summary the potential impacts associated with the proposal in accordance with Chapter 8 of the BAM. This includes impacts during construction and operational phases of the project (Table 10.1).

Table 10.1 Summary of potential impacts to biodiversity

Impact	Construction phase	Operation phase
Native vegetation clearing	✓	
Clearing of threatened ecological communities	✓	
Direct impact on threatened flora	✓	
Direct impact on threatened fauna and their habitat	✓	
Clearing of scattered trees	✓	
Fauna injury and mortality	✓	✓
Edge effects	✓	✓
Weed invasion	✓	✓
Introduction of pathogens	✓	
Increased noise, dust and light	✓	✓
Loss of hollow-bearing tree breeding habitats	✓	
Loss of connectivity and/or increase in habitat fragmentation	✓	✓
Changes in hydrology	✓	✓

10.1 Assessment of direct impacts unable to be avoided

Assessment of direct impacts unable to be avoided is prepared in accordance with Section 8.1 of the BAM.

10.1.1 Impacts on native vegetation

The proposal will impact on a total of 72.93ha of native vegetation. The area of each PCT to be affected is shown in Table 10.2. Discussion of relevant key threatening processes related to direct impacts on vegetation is provided in section 10.4.

A total of 62.83ha of woodland habitat would be cleared for the proposal as well as 10.1ha of native grassland habitat.

Table 10.2 Direct impacts to native vegetation

Zone ID	PCT	Condition	Habitat type	Current vegetation integrity	Change in vegetation integrity	Future vegetation integrity	Direct impact (ha)
1	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Moderate condition	Woodland	78.5	-78.5	0	6.1
2		Poor condition	Woodland	28.9	-28.9	0	0.7
3	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good condition	Woodland	83.6	-83.6	0	1.1
4		Moderate condition	Woodland	68	-68	0	18.7
5		Poor condition	Woodland	26.1	-26.1	0	5
6		Low condition (Derived Native Grassland)	Grassland	11.6	-11.6	0	2.3
7	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate condition	Woodland	54.6	-54.6	0	1.4
8		Poor condition	Woodland	33.5	-33.5	0	4.7
9	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Woodland	68.3	-68.3	0	4.5
10		Poor condition	Woodland	27.8	-27.8	0	0.4
11		Low condition (Derived Native Grassland)	Grassland	2	-2	0	5.4
12	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate condition	Woodland	69.5	-69.5	0	2.0
13		Poor condition	Woodland	27.7	-27.7	0	0.6
14	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	Woodland	75.1	-75.1	0	13.3
15		Poor condition	Woodland	43.8	-43.8	0	2.2
16		Low condition (Derived Native Grassland)	Grassland	2.7	-2.7	0	2.4

Zone ID	PCT	Condition	Habitat type	Current vegetation integrity	Change in vegetation integrity	Future vegetation integrity	Direct impact (ha)
17	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Moderate condition	Woodland	51.2	-51.2	0	1.7
18	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Woodland	46.9	-46.9	0	0.13
19		Poor condition	Woodland	31	-31	0	0.3
Native vegetation directly impacted by the proposal (ha)							**72.93**

10.1.2 Impacts on threatened ecological communities

A total of 43.43ha of the native vegetation is consistent with a threatened ecological community listed under the BC Act. The proposal will have a direct impact on the following two threatened ecological communities:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions, listed as Endangered under the BC Act.
- White Box Yellow Box Blakely's Red Gum Woodland, listed as Critically Endangered under the BC Act.

A summary of direct impacts on each threatened ecological community, associated PCT and VZ and extent within the subject land is summarised in Table 10.3.

Table 10.3 Direct impact on threatened ecological communities listed under the BC Act

Threatened ecological community	BC Act	Equivalent vegetation type (and vegetation zone)	Extent within subject land (ha)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ3)	1.1
		PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ4)	18.7
		PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ6)	2.3
		PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ7)	1.4
Total			**23.5**
White Box Yellow Box Blakely's Red Gum Woodland	Critically Endangered	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ9)	4.5
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ12)	2
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ14)	13.3
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ18)	0.13
Total			**19.93**
Total direct impact on TECs listed under the BC Act			**43.43**

10.1.3 Impacts on candidate threatened species credit species

10.1.3.1 Impacts on threatened flora species

No threatened flora species were recorded within the development footprint or are considered likely to be impacted by the proposal.

10.1.3.2 Impacts on threatened fauna species

Two candidate threatened fauna species credit species were recorded within the study area and identified as affected by the project and two more were assumed to be present. Direct impacts to candidate threatened fauna species and their habitat are outlined in Table 10.4 below.

Table 10.4 Direct impact on threatened fauna species listed under the BC Act

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
Key's Matchstick Grasshopper	*Keyacris scurra*	E	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ9	Moderate condition	4.5
				VZ10	Poor condition	0.4
				VZ11	Low condition (Derived Native Grassland)	5.4
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	2
				VZ13	Poor condition	0.6
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ14	Moderate condition	13.3
				VZ15	Poor condition	2.2
				VZ16	Low condition (Derived Native Grassland)	2.4
Total area affected						**30.80**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
Superb Parrot	*Polytelis swainsonii*	V	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	VZ1	Moderate condition	6.1
				VZ2	Poor condition	0.6
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ3	Good condition	0.8
				VZ4	Moderate condition	19
				VZ5	Poor condition	5
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ7	Moderate condition	1.4
				VZ8	Poor condition	4.7
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ9	Moderate condition	4.5
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	2
				VZ13	Poor condition	0.6
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ14	Moderate condition	13.3
				VZ15	Poor condition	2.2
			PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ18	Moderate condition	0.13
Total area affected						**60.33**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
Squirrel Glider	*Petaurus norfolcensis*	V	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	VZ1	Moderate condition	6.1
				VZ2	Poor condition	0.6
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ3	Good condition	0.8
				VZ4	Moderate condition	19
				VZ5	Poor condition	5
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ7	Moderate condition	1.4
				VZ8	Poor condition	4.7
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ9	Moderate condition	4.5
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	2
				VZ13	Poor condition	0.6
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ14	Moderate condition	13.3
				VZ15	Poor condition	2.2
			PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ1888	Moderate condition	0.13
Total area affected						**60.33**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat to be affected (ha)
Southern Myotis	*Myotis macropus*	V	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	VZ1	Moderate condition	6.1
				VZ2	Poor condition	0.6
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	1
				VZ13	Poor condition	0.6
Total area affected						**8.25**

10.1.3.3 Loss of hollow-bearing tree breeding habitats

The proposal will include the loss of hollow-bearing trees and has the potential to affect native animals such as:

- hollow-dependent bats
- hollow-nesting and canopy-nesting birds (including Superb Parrot, a candidate species)
- arboreal mammals (including Squirrel Glider, a candidate species)
- reptiles.

A total of 41 hollow-bearing trees have been recorded within the proposal site as shown in Figure 5.4. The total number of hollow-bearing trees will be confirmed and quantified further during detailed design and pre-clearing surveys.

10.1.4 Clearing of scattered trees

A total of 58 Class 2 and Class 3 scattered trees were recorded within the subject land. A breakdown of each scattered tree class and associated PCT is provided in Table 10.5.

Table 10.5 Direct impacts on Class 2 & Class 3 scattered trees and associated PCT

Class of scattered tree	Associated PCT	Number of scattered trees
Class 3 – with hollows	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	1
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	29
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	2
	PCT 276 - Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	4
	PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 3 scattered trees with hollows		**41**
Class 3 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1
Total Class 3 scattered trees with no hollows		**9**

Class of scattered tree	Associated PCT	Number of scattered trees
Class 2 – with no hollows	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2
	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2
Total Class 2 scattered trees with no hollows		**8**
Total Class 3 and Class 2 scattered trees		**58**

10.1.5 Injury and mortality

Injury and mortality of fauna could occur during construction activities and during operation and are discussed in this section.

Injury and mortality may occur:

- prior to construction when vegetation and habitat is being cleared
- during construction when machinery and plant is moved to, from and on site
- during operation, as a result of train strike.

All roads and rail have potential to result in the mortality of native animals. Loss in connectivity and/or increase in habitat fragmentation as a result of the project may impact the Squirrel Glider, this species is limited by gliding distances between areas of habitat and the project is likely to result in an increased risk of train strike in particular due to the use of double-stacked containers (up to 6.5m high). In addition, entrapment of fauna in temporary excavations may also occur during construction.

The risk is higher where roads and rail:

- traverse areas of substantial animal habitat
- are located near natural or artificial water bodies
- contain food sources (e.g. Mown grass verges, nectar-producing shrubs) which attract animals to the road edge
- have high speed limits
- provide poor visibility of wildlife (e.g. due to bends, crests and poor lighting).

While it is not possible to eliminate the risk of roadkill and train strike occurring, it is possible to minimise this through consideration of the above factors in the design of roads/access routes, landscaping, fauna connectivity structures and infrastructure and the implementation of road signs and speed limits.

Minimising road-kill will be delivered in the concept and detailed design processes of the roads and rail infrastructure including fauna crossings and landscaping plans.

It is unlikely that the proposal would contribute significantly to vehicle strike to native fauna, and the consequences of impacts to species are likely to be negligible.

10.2 Assessment of indirect impacts unable to be avoided

The assessment of indirect impacts has been prepared in accordance with Section 8.2 of the BAM. Indirect impacts have been considered in terms of the nature, extent and duration of impacts on native vegetation, threatened ecological communities and threatened species habitats likely to be affected. The assessment of indirect impacts is presented in Table 10.6.

The indirect impacts to potential breeding habitat for threatened Superb Parrot is likely to be negligible. Although potential breeding hollows are present, no breeding sites were identified in the survey of a broader corridor. Furthermore, the species often occurs in roadside vegetation and in agricultural land as well as urban areas with little vegetative buffer (Christie 2004, Davey and Purchase 2004, Manning, Lindenmayer et al. 2004, Manning, Lindenmayer et al. 2007). The species is habituated to living in roadside and agricultural areas including associated noise, dust and light. Mitigation measure to minimise the potential Indirect impacts to breeding habitat would be outlined in the CEMP and could include timing of proposed works to avoid the breeding season within 100m of potential or confirmed nest trees. Based on this, the indirect impacts to potential breeding habitat is considered likely to be negligible and as such additional credit calculation for indirect impacts has not been undertaken.

Table 10.6 Assessment of indirect impacts

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Inadvertent impacts on adjacent habitat or vegetation	Construction	All PCTs Threatened species Threatened ecological communities Aquatic habitat	All PCTs Aquatic habitats associated with creeks and rivers	Short term	**Moderate**. Inadvertent impacts on adjacent vegetation can include a range of indirect impacts including soil disturbance, introduction of weeds, erosion, sedimentation, enriched run-off and water quality. Construction of the proposal has the potential to result in sedimentation and erosion and mobilisation of contaminants within the subject land and into adjoining native vegetation and ephemeral drainage lines, through soil disturbance and construction activities. Sediment laden runoff and spills affect water quality and adversely affect aquatic life particularly during construction near creek lines. The proposal will be designed (where practicable) to minimise impact to these sensitive environmental receivers. The mobilisation of sediments would be contained within the disturbance area as sediment containment measures would be implemented as part of mitigation measures.
Connectivity and habitat fragmentation	Construction/ operational	Native vegetation Threatened species All fauna	All PCTs	Long term	**Moderate**: The removal of native vegetation and splitting of habitat patches can result in habitat fragmentation which is 'physical dividing up of once continuous habitats into separate smaller 'fragments'. The proposal is considered unlikely to result in a large increase to landscape scale fragmentation and to further limit connectivity and movement corridors than what already exists in the subject land, as it occurs within an already highly fragmented landscape with limited large patches of remnant vegetation. The impacts from the proposal would largely involve small areas of disturbance of vegetation patches, which would not result in significant habitat fragmentation. Overall the habitat present within the landscape has been heavily fragmented due to agricultural practices (i.e. cropping and livestock use). Existing connectivity is limited to creeklines and road reserves. These connectivity features link with the largest intact patch of remnant vegetation occurring to the east of the subject land in association with Bethungra and Ulandra Mountain range. Creeklines and associated riparian vegetation, including Billabong Creek, Ulandra Creek, Ironbong Creek and Run Boundary Creek generally run from east to west and provide the remaining link to movement between Bethungra and Ulandra Mountain range to the east and areas to the west. Road reserve vegetation in association with Old Sydney Road, Ironbong Road and Dirnaseer Road are also considered to provide connectivity between remnant patches of woodland to the east and west of the subject land. Linear habitat patches associated with riparian areas and road reserves also create links to smaller isolated patches of habitat and scattered trees within the landscape.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
					The proposal is likely to result in a reduction in vegetation patch sizes resulting in minor increases in localised fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. Due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale, this impact has the potential to be negative to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles. Loss in connectivity and/or increase in habitat fragmentation as a result of the proposal may impact the movement of Squirrel Glider, which is limited by gliding distances between areas of habitat. Fragmentation and increases in mortality may reduce gene flow and gene pool and lead to inbreeding depression in remnant populations of Squirrel Glider with greater risk of loss due to mortality and catastrophes (such as wildfires). For long-term viability of populations fragments must be functionally linked to large remnants or multiple smaller habitat patches. Habitat for the Squirrel Glider becomes fragmented once tree spacing becomes beyond their gliding capacity. Squirrel Gliders primarily move through their home range by gliding from tree to tree with an average glide length of 30–40m (van der Ree 2002). General locations for fauna connectivity have been identified and advice on design of fauna crossing structures provided which takes into consideration the height of remaining trees, gap between trees and the gliding angle of Squirrel Gliders. Implementation of connectivity structures and mitigation measures would provide beneficial links to existing wildlife movement corridors and limited the effects of habitat fragmentation. The predicted level of fragmentation from the proposal is not expected to be enough to prevent the breeding and dispersal of plant pollinators or the dispersal of plant propagules (i.e. seed or other vegetative reproductive material) between habitat patches. The existing functional connectivity for many species would remain in the subject land and be alleviated with connectivity mitigation measures.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Reduced viability of adjacent habitat due to edge effects	Construction/ operational	Native vegetation	All PCTs	Long term	**Minor:** Edge effects create vulnerable areas subject to degradation by the establishment and spread of weeds, enriched run-off from road pavement and dumping of rubbish and have the potential to reduce the viability of adjacent habitat long-term. It is listed as a Key Threatening Processes under BC Act. Currently, edge effects from existing agricultural activities (i.e. cropping and livestock) impact native vegetation particularly through weed invasion. However, as the proposal involves clearing into good condition native vegetation this impact is likely to exacerbated and introduce this impact into additional areas of native vegetation and habitat. The vegetation recorded within the subject land mostly occurred within a rural agricultural setting with some degree of weed invasion. Vegetation recorded in good and moderate condition and/or with connectivity to larger patches of vegetation is most vulnerable to edge effects.
Reduced viability of adjacent habitat due to noise, dust or light spill	Construction/ operational	Native vegetation Threatened species Threatened ecological communities	All PCTs	Short term	**Minor:** Noise, dust, light and contaminant pollution are indirect impacts that are likely to result from activities associated with the proposal. These impacts are likely to have cumulative effects. Noise, dust, light and contaminant pollution are likely to occur from all proposal activities, although will be greatest where activities take place near vegetated areas and during construction. During construction of the proposal, increased noise and vibration levels in the subject land and immediate surrounds are likely due to vegetation clearing, ground disturbance, machinery and vehicle movements, and general human presence. The noise and vibration from activities associated with the proposal would potentially disturb fauna and may disrupt foraging, reproductive, or movement behaviours. The impacts from noise emissions are likely to be temporary in nature and localised to the construction areas. They are not considered likely to have a significant, long-term impact on wildlife populations outside the area of impact. Assessment of noise and vibration impacts is provided in Technical papers 8, 9 and 10). Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the subject land activities. This has the potential to reduce photosynthesis and transpiration and cause abrasion and heating of leaves resulting in reduced growth rates and decreases in overall health of the vegetation. Dust pollution is likely to be greatest during periods of substantial earthworks, vegetation clearing, vehicle movements for construction and decommissioning activities and during adverse weather conditions. However, deposition of dust on foliage is likely to be highly localised, intermittent, and temporary and is therefore not considered likely to be a major impact of the proposal. Assessment of air quality vibration impacts is provided in Technical paper 15 – Air quality).

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
					Ecological light pollution is the descriptive term for light pollution that includes direct glare, chronic or periodic increased illumination, and temporary unexpected fluctuations in lighting (including lights from a passing trains), that can have potentially adverse effects on wildlife. Night works may be required during the construction phase of the proposal and will increase light pollution. The changes to light conditions associated with the construction phase of the proposal are temporary and would therefore be unlikely to have a significant impact on local fauna populations. Landscape and Visual Impact Assessment is provided in Technical Paper 13. During the construction phase localised release of contaminants (i.e. hydraulic fluids, oils, fluids, etc.) into the surrounding environment (including drainage lines) could accidentally occur. The most likely result of contaminant discharge would be the localised contamination of soil and potential direct physical trauma to flora and fauna that come into contact with contaminants. Any accidental release of contaminants is likely to be localised and would be unlikely to have a significant effect on the environments of the subject land, particularly due to the implementation of mitigation measures to immediately address any spills.
Transport of weeds from the site to adjacent vegetation	Construction/ operational	Native vegetation Threatened ecological communities	All PCTs	Long term	**Minor:** The clearing of native vegetation for the proposal, including earthworks would increase the potential for weed invasion into adjacent patches of native vegetation. Management measures would be required to minimise the risk of introduction and spread of weeds. A biosecurity assessment undertaken for the project provides further detailed assessment (Chapter 18 of the EIS).

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Transport of pathogens from the site to adjacent vegetation	Construction	Native vegetation Threatened ecological communities	All PCTs	Short term	**Minor:** The proposal has the potential to increase the spread of pathogens that threaten native biodiversity values, such as the soil-borne pathogen *Phytophthora cinnamomi* (Phytophthora) and *Austropuccinia psidii* (Myrtle rust). Phytophthora infects root systems whereas Myrtle Rust deforms leaves and leads to heavy defoliation. Both pathogens are associated with damage and death to native plants and may be dispersed over large distances. Phytophthora can be spread through flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Propagules of Phytophthora may also be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers and movement of soil. Myrtle rust spores can be spread easily via contaminated clothing, hair, skin and personal items, infected plant material, equipment as well as by insect/animal movement and wind dispersal. The proposal construction activities are likely to lead to an increased risk of dispersal of Phytophthora and/or Myrtle Rust through works involving soil disturbance. This indirect impact corresponds to several Key Threatening Processes listed under BC Act: • infection of native plants by *Phytophthora cinnamomi* introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae. The construction and operation of the proposed modification may increase the risk of these KTPs however, this will be minimised through mitigation measures (see section 10.5 and Chapter 11).
Increased risk of starvation, exposure and loss of shade or shelter	Construction	All fauna species	All PCTs	Short term	**Minor.** Displacement of resident fauna species during native vegetation clearing is considered relatively low due to the extensive vegetation adjacent to the subject land. Given the clearing associated with the proposal would be small narrow areas across a 42km linear development and the relative mobile nature of most potential resident fauna species, the increased risk of starvation, exposure and loss of shade or shelter due to the proposal is likely to be low.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Loss of breeding habitats	Construction	All fauna species	All PCTs	Long term	**Moderate.** The loss of breeding habitat such as hollow-bearing trees and fallen timber has the potential to affect native animals such as: • hollow-dependent mammals • hollow-nesting and canopy-nesting birds • arboreal mammals • reptiles. The loss of breeding habitats is unlikely to extend beyond the development footprint. Impacts beyond this area would be avoided through mitigation and management measures.
Increase in predatory species populations	Construction/ operation	All fauna species	All PCTs	Long term	**Minor.** Predation by feral cats and the Fox are listed as key threatening processes under the BC Act and have potential to impact local fauna populations in adjacent habitat. It is unlikely that the proposal would further exacerbate the impact predator species populations than what currently exists within the locality.
Reduction in water quality	Construction/ operational	Hydrology	All PCTs Aquatic habitats associated with creeks and rivers	Long term	**Minor.** Unmanaged construction activities (such as earthworks, relocation of utilities and removal of vegetation) could result in: soil erosion, siltation and off-site movement of eroded sediments by stormwater, contributing to increased levels of turbidity and sediment deposition, decreased dissolved oxygen, and change pH levels in surrounding waterways. In addition, accidental fuel and chemical stills and contaminated runoff from construction vehicles, plant, equipment or chemical storage areas have the potential to reach waterbodies and streams within and adjacent to the subject land. Other possible sources of reduction in water quality would be disturbance of any contaminated land. An increase in impervious surfaces, although minor, may result in an increased volume of runoff, which would lead to increased scouring, erosion and sedimentation. Run-off may carry increased sediment loads and nutrients (such as nitrogen and phosphorus), surrounding waterbodies and streams within and adjacent to the subject land. Water quality is assessed in Technical Paper 5.

Indirect impact	Construction/ operational	Nature	Extent	Duration	Consequence[1]
Changes to geomorphology of watercourse	Construction/ operational	Hydrology	All PCTs Aquatic habitats associated with creeks and rivers	Long term	**Minor.** Small sections of mapped water bodies or streams will be crossed because of the proposal, these areas are small in extent and considered negligible, given the implementation of environmental safeguards. Loss of habitat would occur as a result of construction activities (such as earthworks and removal of vegetation). Works within the riparian zone would be minimised as far as practicable. All areas of retained native vegetation will be subject to vegetation management to enhance biodiversity values of adjacent stream and creeks. Temporary changes in creek flows and velocities downstream of waterbodies and creeks within the subject land may occur as a result of construction activities (such as earthworks, relocation of utilities and removal of vegetation). Implementation of water controls and runoff will be implemented to ensure any indirect impacts to creek flows and velocities are not significantly changed and to avoid any erosion and bed and bank stability impacts. Mobilised sediment could build up in the waterways in and downstream of the subject land. Impermeable surfaces created by the proposal are considered minor although may lead to increases in the volume and rate of runoff, which could cause erosion within the instream channel. Changes to the geomorphology of watercourses from surface water runoff during operation of the proposal is considered negligible, given the implementation of stormwater controls and environmental safeguards. Drainage works would be designed to prevent scouring of creeks and drainage lines. Hydrology and flooding Impact Assessment is provided in Technical Paper 4.

(1) Consequences follow risk criteria outlined in Appendix G of the EIS: Major – Considerable environmental damage – requiring remediation; Moderate – Localised/clustered environmental damage – requiring remediation; Minor – Isolated environmental damage – minimal remediation required

10.3 Assessment of prescribed biodiversity impacts

Assessment of prescribed impacts is prepared in accordance with Section 8.3 of the BAM and outlined in Table 10.7.

Table 10.7 Prescribed biodiversity impacts

Prescribed biodiversity impact (Biodiversity Assessment Method)	Relevance to current proposal
Impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance	None – no karst, caves, crevices, cliffs or other features of geological significance will be affected by the proposal.
Impacts of development on the habitat of threatened species or ecological communities associated with rocks	**Partially** – rock outcrops occur within and adjacent to the subject land, however no direct impacts of the proposal would impact fauna species that occur in association with rocky habitats. Indirect impacts will be mitigated and unlikely to lead to significant impact to associated species.
Impacts of development on the habitat of threatened species or ecological communities associated with human made structures	None – no human made structures (i.e. culverts) occur within the subject land nor will any be affected due to the proposal.
Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation	**Partially** – non-native vegetation occurs within and adjacent to the subject land. One non-native vegetation community was identified. Some removal of non-native vegetation including, urban exotic/native landscape plantings may result because of the proposal. It is unlikely that the removal of a small number of non-native vegetation patches will have a significant impact on native threatened fauna. Trees and shrubs associated with non-native vegetation offers foraging, nesting and sheltering habitat to locally occurring threatened birds. The removal of non-native vegetation will result in negligible direct and indirect impacts on these threatened species.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	**Partially** – The proposal will result in new fragmentation of habitat patches within the locality. The loss of habitat and native vegetation may partially affect the movement patterns of several terrestrial fauna species however it is unlikely to significantly affect the movement or life-cycle of species in which already occurs within the subject land.
Impacts of the development on movement of threatened species that maintains their life cycle	
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	**Partially** – Unmanaged construction activities in proximity to watercourses or waterbodies could increase levels of turbidity and sediment deposition, decrease dissolved oxygen, and change pH levels in receiving environments. Other potential impacts on water quality could occur due to spills, leakages and disturbance of contaminated land. Mitigation measures would be implemented to reduce the impact to these areas due to the proposal.
Impacts of wind turbine strikes on protected animals	No – no wind turbines are proposed as part of this proposal.

Prescribed biodiversity impact (Biodiversity Assessment Method)	Relevance to current proposal
Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	**Yes** – this will occur in both construction and operation phases. During construction the increase in construction vehicle movements and increase in road use means potential vehicle strike to native fauna is likely to occur. While it is not possible to eliminate the risk of roadkill occurring, it is possible to minimise this through roads/access routes, and the implementation of road signs and speed limits. However, due to the subject land being within a construction area it is likely that low speed limit zones will be established. Thus, it is unlikely that the subject land would result in significant levels of roadkill mortality of threatened species. Minimising vehicle strike will be delivered in the concept and detailed design processes of the roads. During operation, potential train strike to native fauna is likely to occur due to the increase in train movements and train height. While it is not possible to eliminate the risk of train strike, minimising vehicle strike during operation will be delivered in the concept and detailed design processes of the rail infrastructure including fauna crossings and landscaping plans.

10.4 Assessment of impacts on Matters of National Environmental Significance

10.4.1 Threatened ecological communities

Two threatened ecological communities listed under the EPBC Act would be impacted:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

10.4.1.1 Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia

An assessment of significance has been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F. The outcome of this assessment is that the proposal is likely to have a significant impact on Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands of south-east Australia for the following reasons:

- The proposal would clear 23.5ha of the community, equivalent to approximately 0.003% of the remaining extent of the community.
- The proposal will fragment eight patches of the community and is likely to exacerbate fragmentation at a regional scale that is likely to be significant to the community given its already fragmented state.

10.4.1.2 White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

An assessment of significance has been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F. The outcome of this assessment is that the proposal is likely to have a significant impact on White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands for the following reasons:

- The proposal would clear 19.93ha of the community in moderate to good condition.
- The proposal will create fragmentation in large patches and roadside remnants of Box-Gum Woodlands and increase fragmentation between smaller patches.
- Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria should be considered critical to the survival of this ecological community. As such all occurrences of EPBC-listed Box-Gum Grassy Woodland within the subject land are considered habitat critical to the survival of this community.

10.4.2 Threatened species

No threatened flora species were recorded despite targeted surveys and are therefore unlikely to be impacted by the proposal.

One EPBC listed fauna species was recorded, Superb Parrot (*Polytelis swainsonii*), and five additional fauna species are considered to have a moderate likelihood of occurring within the subject land.

An assessment of significance has been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F for threatened species listed under the EPBC Act with moderate or higher likelihood of occurrence. The assessments determined that the proposal is unlikely to lead to a significant impact on threatened fauna species or their habitat, listed under EPBC Act (Appendix F).

Table 10.8 Summary of assessment of impacts to EPBC Act listed fauna

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Likely impacts
Regent Honeyeater	*Anthochaera phrygia*	CE	PCT 5, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** The subject land would only provide marginal foraging habitat for the species during seasonal movements to utilise blossoming eucalypts. It is unlikely that the subject land is relied upon by the species to forage or breed. The proposal has been identified to impact on about 30.23ha of potential foraging habitat.
Swift Parrot	*Lathamus discolor*	CE	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** Occurrences are likely to be rare but cannot be discounted. Subject land is outside of species known breeding habitat. Subject land would form potential foraging habitat for the species during blossoming events. The proposal has been identified to impact on about 60.33ha of potential foraging habitat.
Superb Parrot	*Polytelis swainsonii*	V	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** Species likely to utilise the subject land for both foraging and breeding habitat. The proposal has been identified to impact on up to 72.93ha of potential foraging habitat, of which 60.33ha is potential breeding habitat.

Common name	Scientific name	EPBC Act[1]	Habitat components – PCT	Likely impacts
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	PCT 5, PCT 76, PCT 266, PCT 276, PCT 277	**Not significant** Records within the locality are scarce and no camps occur within the subject land. It is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 54.6ha of potential foraging habitat.
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	PCT 80, PCT 266	**Not significant** Targeted surveys including Anabat recordings and harp trapping did not capture any individuals, however, based on habitat assessments, identified microhabitats and known distribution it is considered that the species has a moderate – high likelihood of occurrence within the subject land. The subject land contains 11ha of potential habitat.
White-throated Needletail	*Hirundapus caudacutus*	V	PCT 5, PCT 76, PCT 80, PCT 266, PCT 276, PCT 277, PCT 347	**Not significant** **Yes –** Almost exclusively aerial. May irregularly occur foraging over subject land. The habitats within the subject land are unlikely to constitute important habitat for this species. The habitat present is unlikely to support significant proportions of the population nor are the habitats critical to any life stage of the species. The species is likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this and this mobile nature, and the marginal habitat it is unlikely that the species relies on the subject land for foraging or breeding purposes. As a precautionary an EPBC assessment of significance was undertaken for the species. The proposal has been identified to impact on about 60.33ha of vegetation communities associated with aerial foraging habitat.

Assessments of significance have been completed in accordance with the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment Water Heritage and the Arts 2013), and is provided in Appendix F for threatened species listed under the EPBC Act with moderate or higher likelihood of occurrence. The assessments determined that the proposal is unlikely to lead to a significant impact on threatened fauna species or their habitat, listed under EPBC Act (Appendix F).

10.5 Key threatening processes

This section identified whether the proposed action of any component of the proposal would be classified as a Key Threatening Process (KTP) listed under the BC Act, EPBC Act or FM Act as required by the SEARS.

Any process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community is considered a KTP. KTPs listed in Schedule 4 of the BC Act and section 183 of the EPBC Act were individually assessed against the proposal to determine their relevance.

Two KTPs listed under the FM Act, 10 KTPs listed under the BC Act and five listed under the EPBC Act were considered relevant to the proposal and have been detailed in Table 10.9 below. Mitigation measures have been developed to minimise these Key Threatening Processes.

Table 10.9 Key threatening processes relevant to proposal

Key threatening process	Relevant legislation	Relevance to proposed action
Degradation of native riparian vegetation	FM Act	A total of 4.94ha of native riparian vegetation would be impacted (Technical Paper 2 – Aquatic biodiversity).
Removal of large woody debris (snags)	FM Act	A total of six streams would be impacted and may require removal of large woody debris (Technical Paper 2 – Aquatic biodiversity).
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	BC Act	A total of six streams were identified within the subject land, three of which are 3rd order. The proposal will impact on these waterways.
Bushrock removal	BC Act	Bushrock will be removed during the construction phase of the proposal.
Clearing of native vegetation/Land Clearance	BC Act / EPBC Act	Clearing of native vegetation is known to occur within the NSW South Western Slopes and is defined as the destruction of a sufficient proportion of one or more strata (layers) of vegetation within a stand or stands of native vegetation. The proposal will involve the clearing all strata layers of 72.93ha of native vegetation.
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	BC Act / EPBC Act	Psittacine Circoviral (beak and feather) Disease (PCD) affects parrots and associated species (psittacines birds), and is often fatal. It is caused by a virus that infects and kills the cells of the feather and beak, as well as cells of the immune system, leaving birds vulnerable to bacterial and other infections. Threatened species considered to have a high potential for being adversely impacted by PCD recorded within the proposal is the Swift Parrot. The construction and operation of the proposal is not considered likely to further increase risk of this key threatening process in the locality.
Infection of native plants by *Phytophthora cinnamomi*	BC Act / EPBC Act	Any activity that moves soil, water or plant material can spread or introduce *Phytophthora cinnamomi*. The construction and operation of the proposed modification may increase the risk of introducing or spreading *Phytophthora cinnamomi* as it will require the movement of soil, water and plant material (DP&E, 2015)
Infection of amphibians with chytrid fungus resulting in chytridiomycosis	EPBC Act	Chytridiomycosis is potentially fatal to all native species of amphibian. Fifty species of Australian frogs have been found infected with the chytrid fungus. In NSW, 22 species, more than one quarter of the total NSW amphibian fauna, have been diagnosed with the disease. The construction and operation of the proposed modification may increase the risk of introducing and/or spreading this pathogen as it will require the movement of soil, water and plant material.

Key threatening process	Relevant legislation	Relevance to proposed action
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	BC Act	Exotic Rust Fungi is not currently known from the NSW South Western Slopes bioregion. Within the subject land, Myrtaceous species formed a dominant flora family. Spores of *Uredo rangelii* (Myrtle rust) are dispersed by wind, water, on plant material including seed, on equipment and clothing. The construction and operation of the proposal may increase the risk of introducing or spreading Exotic rust fungi through the movement of soil and water as well as the presence and movement of equipment.
Invasion and establishment of exotic vines and scramblers	BC Act	The invasion and establishment of exotic vines and scramblers, exotic perennial grasses and African Olive (*Olea europea**) is a potential indirect impact of the construction and operation of the proposal. The spread and establishment of African Olive (*Olea europea*),* exotic perennial grasses (i.e. *Paspalum dilatatum*)* and exotic vines and scramblers from surrounding areas may be facilitated through the movement of soils and machinery.
Invasion of native plant communities by exotic perennial grasses	BC Act	
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.	BC Act	
Novel biota and their impact on biodiversity	EPBC Act	This process includes the competition, predation or herbivory and habitat degradation of vertebrate and invertebrate pests, terrestrial weeds, aquatic weeds and marine pests as well as the mortality, habitat loss and degradation caused by pathogens. This corresponds to the introduction of exotic vines and scramblers and exotic perennial grasses, introduction of Exotic Rust Fungi, *Phytophora cinnamomi,* and Chytrid fungus all of which are detailed individually in this table.
Loss of hollow-bearing trees	BC Act	Hollow-bearing trees were recorded during the vegetation integrity plot surveys and scattered tree assessments. A register of hollow-bearing tree loss will be recorded during the construction phase of the proposal. Biodiversity offsets will be included hollow-bearing trees.
Removal of dead wood and dead trees	BC Act	Dead wood and dead trees (stags) within the impact area will be removed during the construction phase of the proposal.

11 Mitigation and management of impacts

This section has been prepared in accordance with Chapter 8 of the BAM to address the potential impacts of the proposal on biodiversity as discussed in Chapter 10. This section identifies measures to mitigate or manage impacts in accordance with the recommendations in BAM Chapter 8.4 and 8.5 including:

- techniques, timing, frequency and responsibility
- identifying measures for which there is risk of failure
- evaluating the risk and consequence of any residual impacts
- documenting an adaptive management strategy.

11.1 Approach to mitigation

Environmental management for the proposal would be carried out in accordance with the approach detailed in Chapter 27 (Approach to environmental management and mitigation) of the EIS.

This would include a biodiversity sub-plan, prepared as part of the Construction Environmental Management Plan (CEMP) and an operational environmental management framework (EMF).

11.2 Mitigation measures

The proposed mitigation measures are detailed below in Table 11.1.

Table 11.1 Proposed mitigation measures

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact
BD-1	Impacts on fish passage	Watercourse crossing structures, both temporary and permanent in nature, would meet Inland Rail design standards and be designed in accordance with *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull, S. and Witheridge, G., 2003) and *Policy and Guidelines for fish habitat conservation and management* (DPI, 2013) as far as practicable.	Detailed design/ Pre-construction	ARTC Design contractor	High, known to be effective	Minor. Impacts to aquatic biodiversity reported in Technical Paper 2.
BD-2	Fauna connectivity	A fauna connectivity strategy would be prepared to guide detailed design. It would include investigation and design of: • locations for fauna crossing structures, particularly for Squirrel Glider, including consideration of height of remaining trees, gap between trees and the gliding angle of Squirrel Gliders • the provision of localised fencing to direct fauna to crossing structures in accordance with relevant guidelines • fauna furniture to be included in the design of bridges and culverts where appropriate to encourage crossings by native fauna. The connectivity strategy would include monitoring and reporting requirements in relation to the operational performance of the final measures.	Detailed design/ Pre-construction	ARTC Design contractor	High, known to be effective	Moderate. Impacts to connectivity avoided and minimised as far as practicable, however, connectivity likely to be reduced with potential for higher predation. Impacts to connectivity discussed in Chapter 10.

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact
BD-3	Managing the potential for biodiversity impacts during construction	Pre-clearing surveys would be undertaken prior to construction by a suitably qualified ecologist in accordance with the biodiversity management plan. Specific surveys would include: • surveys for roosting microbats and birds in structures, including telegraph poles and buildings that are proposed to be removed • searches for nest trees • identification of hollow-bearing trees and logs requiring fauna management during removal • aquatic fauna salvage in watercourses or residual pools within 50 metres of the construction footprint, and in areas that would be enclosed by silt curtains (e.g. piling locations).	Detailed design/ Pre-construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Mortality of animals low as a result of implementation of mitigation measure.
BD-4	Managing the potential for biodiversity impacts during construction	Clearing extents/site boundary/limit of works would be consistent with project extents defined in a condition of approval.	Detailed design/ Pre-construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Clearing of native vegetation and habitats avoided as far as practicable. Impact to native vegetation and habitats as reported in section 10.1.
BD-5	Managing the potential for biodiversity impacts during construction	The clearing extents/site boundary/limit of works would be clearly defined with flagging or marking tape, signage or other suitable means to delineate no go areas. This delineation and marking process would align with the project flagging/marking tape process and specifications.	Detailed design/ Pre-construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Clearing of native vegetation and habitats avoided as far as practicable. Impact to native vegetation and habitats as reported in section 10.1.

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact
BD-6	Managing the potential for biodiversity (aquatic) impacts during construction	Direct impacts on in-stream vegetation and native vegetation on the banks of watercourses would be avoided as far as practicable by establishing appropriate setback distances.	Detailed design/ Pre-construction	ARTC Construction contractor	High, known to be effective	Minor. Impacts to fish passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.
BD-7	Managing the potential for biodiversity impacts during construction	A biodiversity management plan would be prepared prior to construction and implemented as part of the CEMP. The plan would include measures to manage biodiversity and minimise the potential for impacts during construction. The plan would be prepared in accordance with relevant legislation, guidelines and standards. The plan would include, but not be limited to: • locations and requirements for pre-clearing surveys, including terrestrial and aquatic habitats • establishing protocols for the staged clearing of vegetation and safe tree felling and log removal to reduce the risk of fauna mortality • measures to avoid and minimise clearing of hollow-bearing trees and paddock trees where practicable • measures relating to the provision and management of nest boxes, including reuse of hollows and monitoring protocols • animal handling protocols, including relocation and emergency care • an unexpected finds protocol • measures to manage biosecurity risks in accordance with the *Biosecurity Act 2015 (Cth)* • measures to reduce the risk of terrestrial and aquatic fauna mortality/injury • measures relating to the stripping, stockpiling and management of topsoil where it contains seedbank or weed material.	Construction	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Mortality of animals low as a result of implementation of mitigation measure. Impacts to important habitat features avoided or minimised.

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact
BD-8	Rehabilitation of vegetation subject to temporary disturbance	A rehabilitation strategy would be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas once construction is complete. The strategy would include clear objectives for rehabilitation of native vegetation in temporary disturbances areas and in riparian areas.	Construction	ARTC Construction contractor	High. Known to be effective.	Moderate. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Outcome should be long term restoration, rehabilitation of native vegetation and habitat to similar condition or better.
BD-9	Managing the potential for biodiversity (aquatic) impacts during construction	Scheduling of construction activities to minimise time of works in or adjacent to drainage lines and waterfront land (watercourse bed and land within 40m of the highest bank of the watercourse (DPI, 2012), particularly during periods of flow	Construction	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to fish habitat and passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.
BD-10	Managing the potential for biodiversity (aquatic) impacts during construction	Where it is not practicable to work in the dry, a sediment or silt curtain attached to the same sides of the bank and around the works area would be installed for erosion and sediment control and to maintain fish passage.	Construction	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to fish passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact
BD-11	Weed management	Weed management protocols for the operational rail corridor and other ARTC facilities would be in accordance with the requirements of the *Biosecurity Act 2015* (Cth) and incorporated into the operational environmental management framework. These protocols would include: • site hygiene and waste-management procedures to deter pest animals • weed surveillance and treatment during operation and maintenance activities • requirements in relation to pesticide and herbicide use, including any limitations on use. Restrictions may apply in proximity to watercourses, known areas of Matters of National Environmental Significance, or *Biodiversity Conservation Act 2016* (NSW) listed receptors, habitat or land uses sensitive to spray-drift from the application of pesticides and herbicides • erosion and sediment control risks associated with broad-scale weed removal or treatment.	Operation	ARTC Construction contractor	High. Known to be effective.	Minor. Impacts to biodiversity avoided as far as practicable. Impacts to native vegetation and habitats as reported in section 10.1. Outcome should control weeds and their spread to ensure native vegetation and habitat is maintained in similar condition or better.
BD-12	Fauna connectivity	The operational performance of fauna connectivity measures (including impacts on fauna as a result of train operations) would be monitored in accordance with the fauna connectivity strategy. This would include recording of wildlife collisions with trains, and monitoring of use of crossing structures by target species (including the Squirrel Glider) and feral predators. The need for additional measures or modifications to existing measures would be identified to respond to any issues identified.	Operation	ARTC	Moderate. Known to maintain connectivity, however, increased risk of predation and mortality.	Moderate. Connectivity would be reduced from current connectivity. Residual risk includes mortality as a result of train collision and increased predation. Monitoring and adaptive management would be implemented to respond to issues identified.

Reference	Aspect	Mitigation measure (action)	Phase	Responsibility	Likelihood of success	Consequence of residual impact
BD-13	Aquatic ecology	Culverts that provide for the flow of watercourses would be inspected and maintained in accordance with ARTC's standard operating procedures to address any issues that may contribute to the blockage of fish passage.	Operation	ARTC	High. Known to be effective.	Minor. Impacts to fish passage avoided and minimised as far as practicable. Impacts to aquatic biodiversity reported in Technical Paper 2.

Notes: Consequences follow risk criteria outlined in Appendix G of the EIS: Major – Considerable environmental damage – requiring remediation; Moderate – Localised/clustered environmental damage – requiring remediation; Minor – Isolated environmental damage – minimal remediation required

12 Impact summary – Thresholds for assessment and offsetting impacts

This chapter sets out the impact thresholds for residual impacts to biodiversity values after avoid, minimise and mitigate measures have been applied. Thresholds for assessment and offsetting impacts are outlined in Chapter 9 of the BAM and include:

- impacts on biodiversity values at risk of a serious and irreversible impact
- impacts that require offsetting
- impacts which do not require offsetting
- impacts that do not require further assessment.

12.1 Serious and irreversible impacts

This section identifies every potential serious and irreversible impact (SAII) entity that are listed in the Guidance to assist a decision-maker to determine a serious and irreversible impact that would be impacted on by the subject land.

Impact assessment of potential entities of SAII impacts on biodiversity values are outlined under Chapter 9 of the BAM and addressed below.

12.1.1 Threatened ecological communities

To assist the determining authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact, the BDAR must contain details of the assessment of SAII, in accordance with the assessment criteria set out in the Biodiversity Assessment Method.

The following two threatened ecological communities are likely to be affected by the proposal.

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.
- White Box Yellow Box Blakely's Red Gum Woodland.

One of these communities, White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland is identified as a candidate SAII entity in Appendix 3 of Guidance to assist a decision-maker to determine a serious and irreversible impact (Department of Planning Industry and Environment 2019).

An assessment of White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland was assessed against the serious and irreversible impacts on biodiversity values in accordance with section 9.1.1 of the BAM and is provided in Table 12.1. The distribution of this community throughout the subject land is illustrated in Figure 12.1.

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

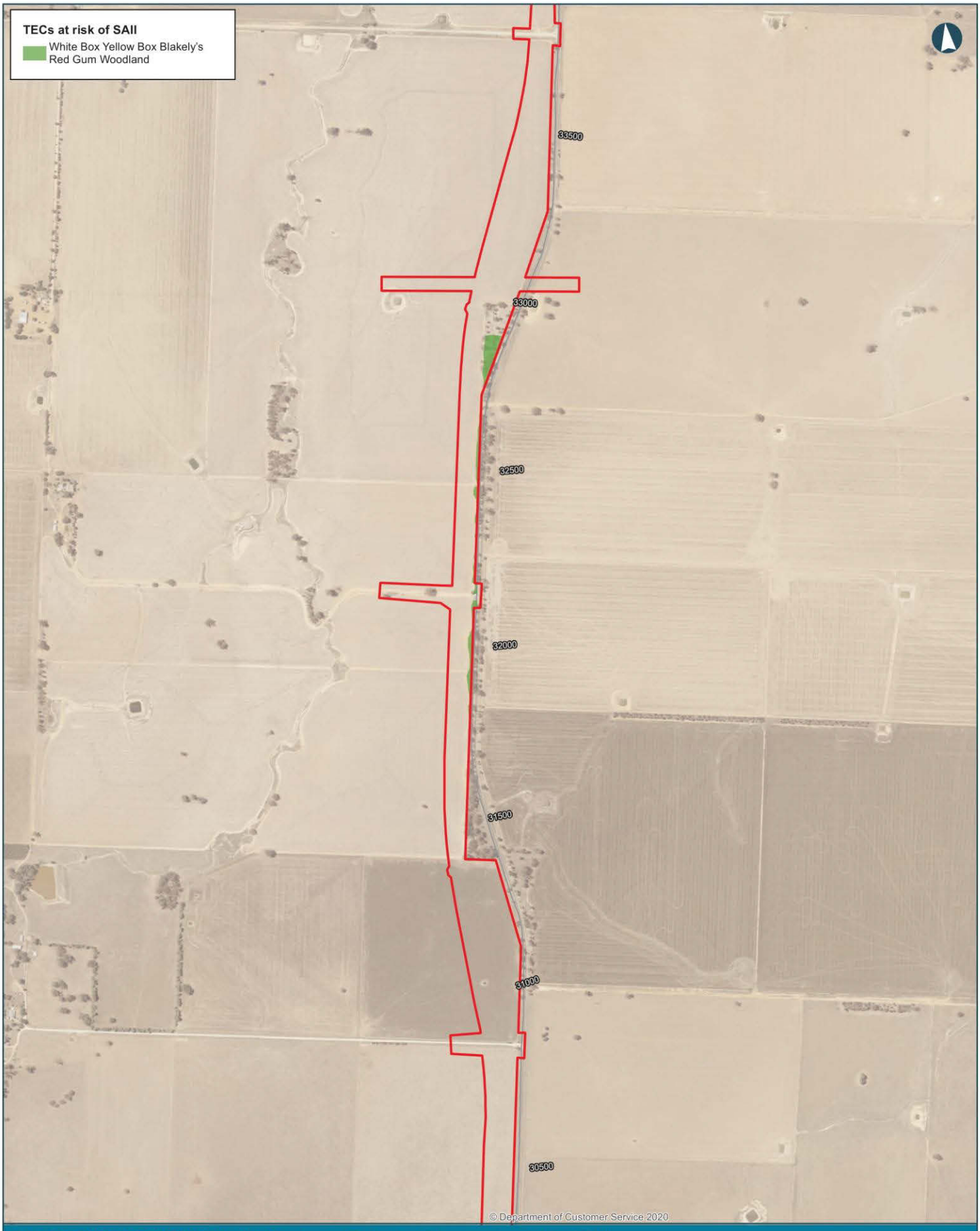
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

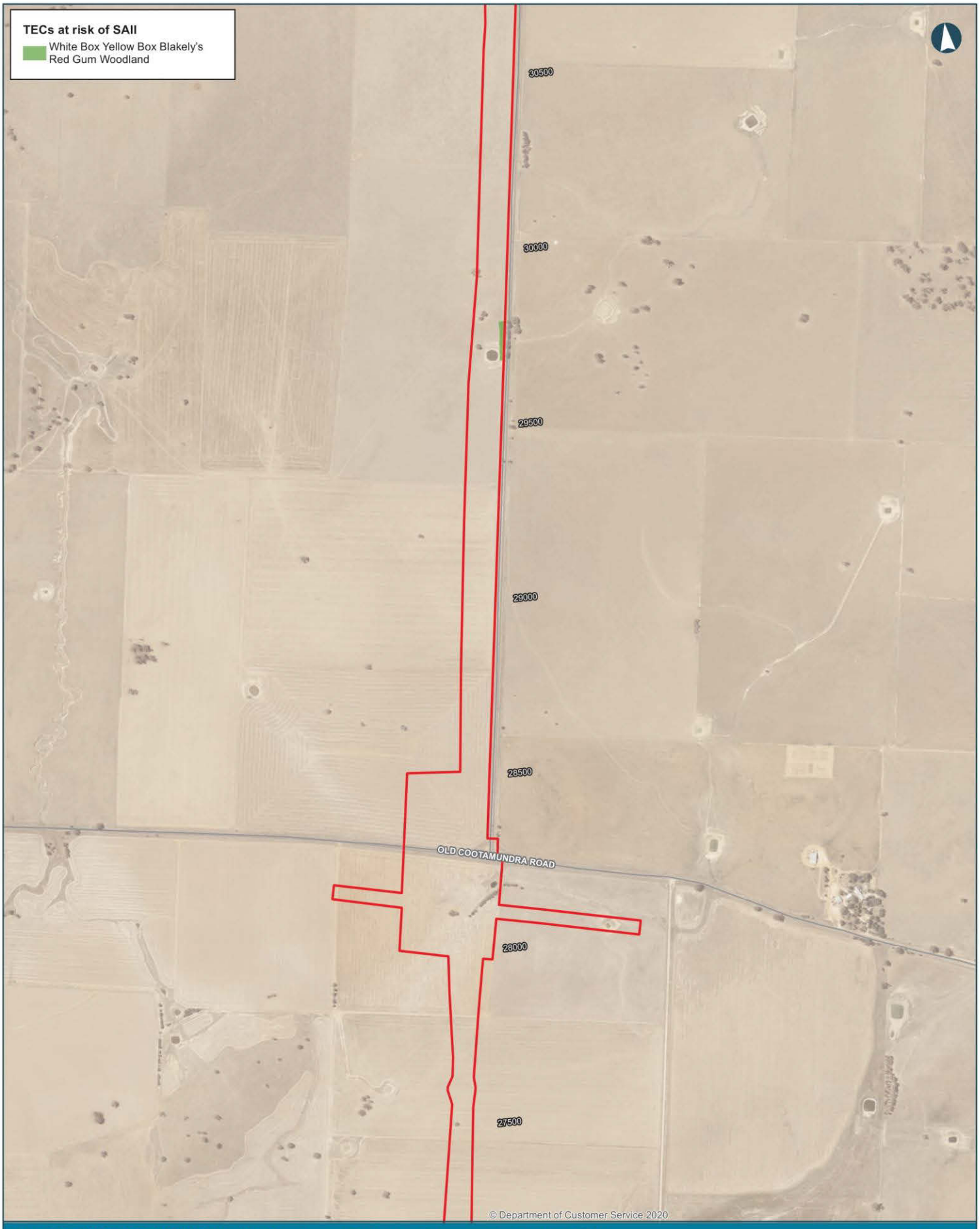
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

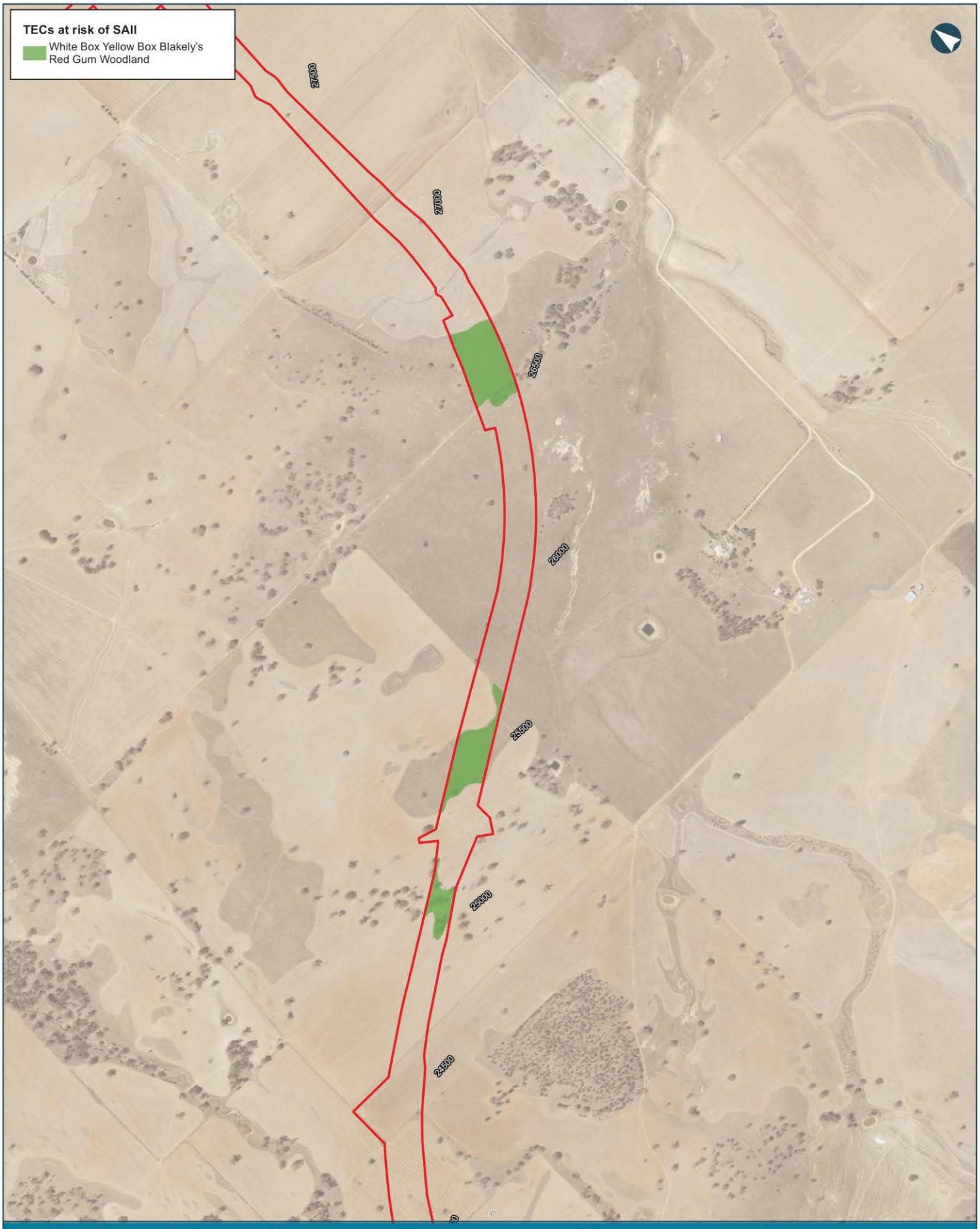
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

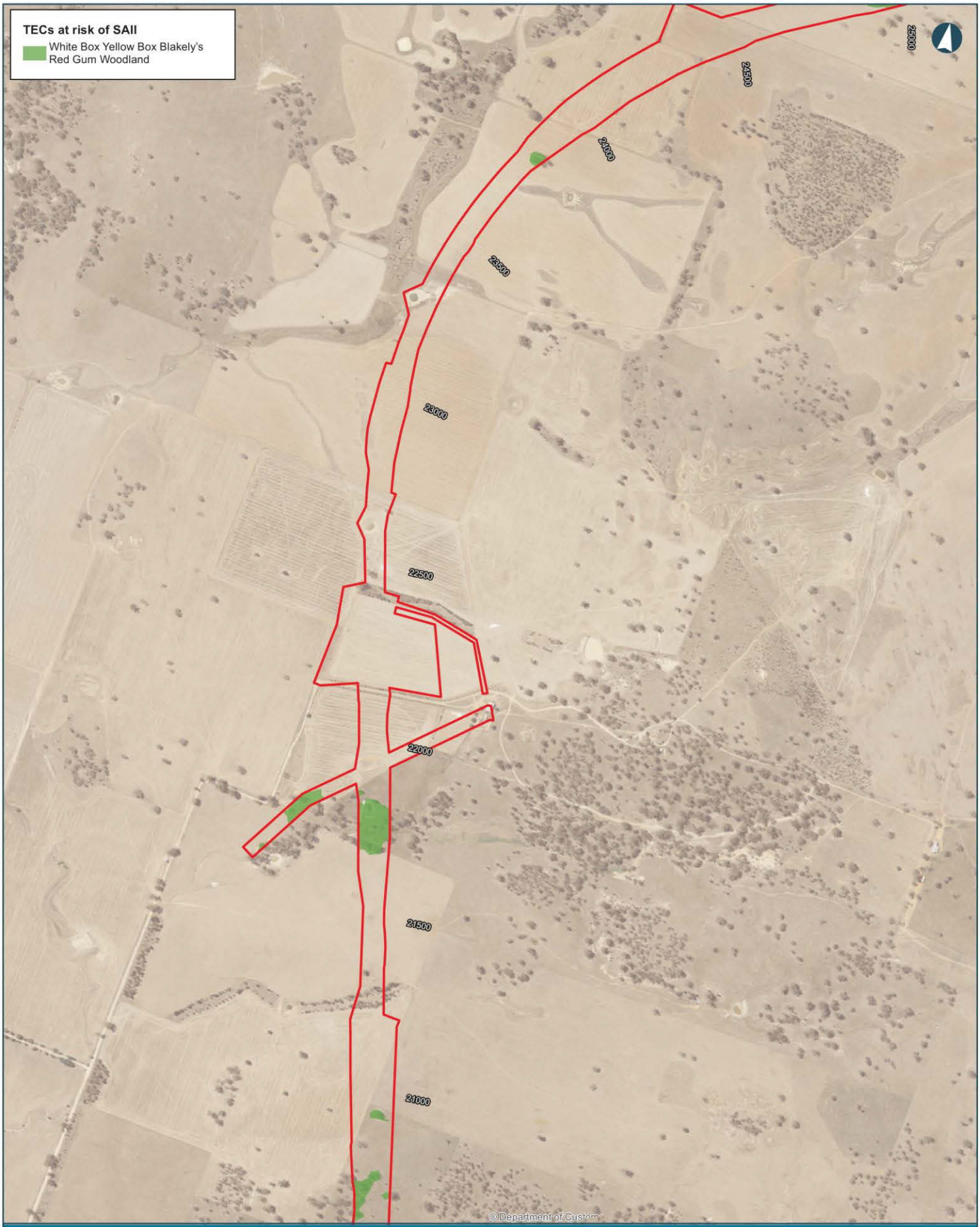
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

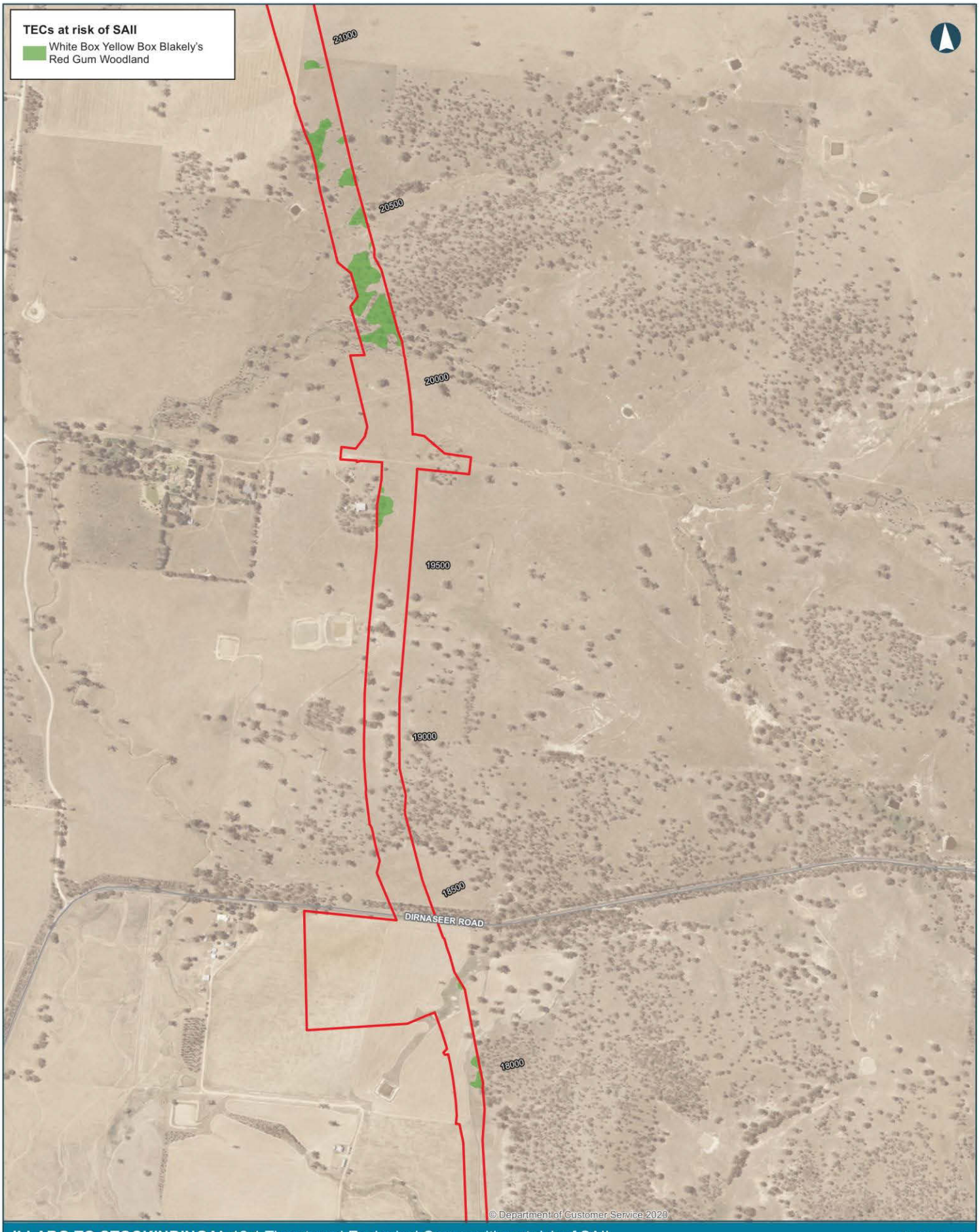
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000

Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

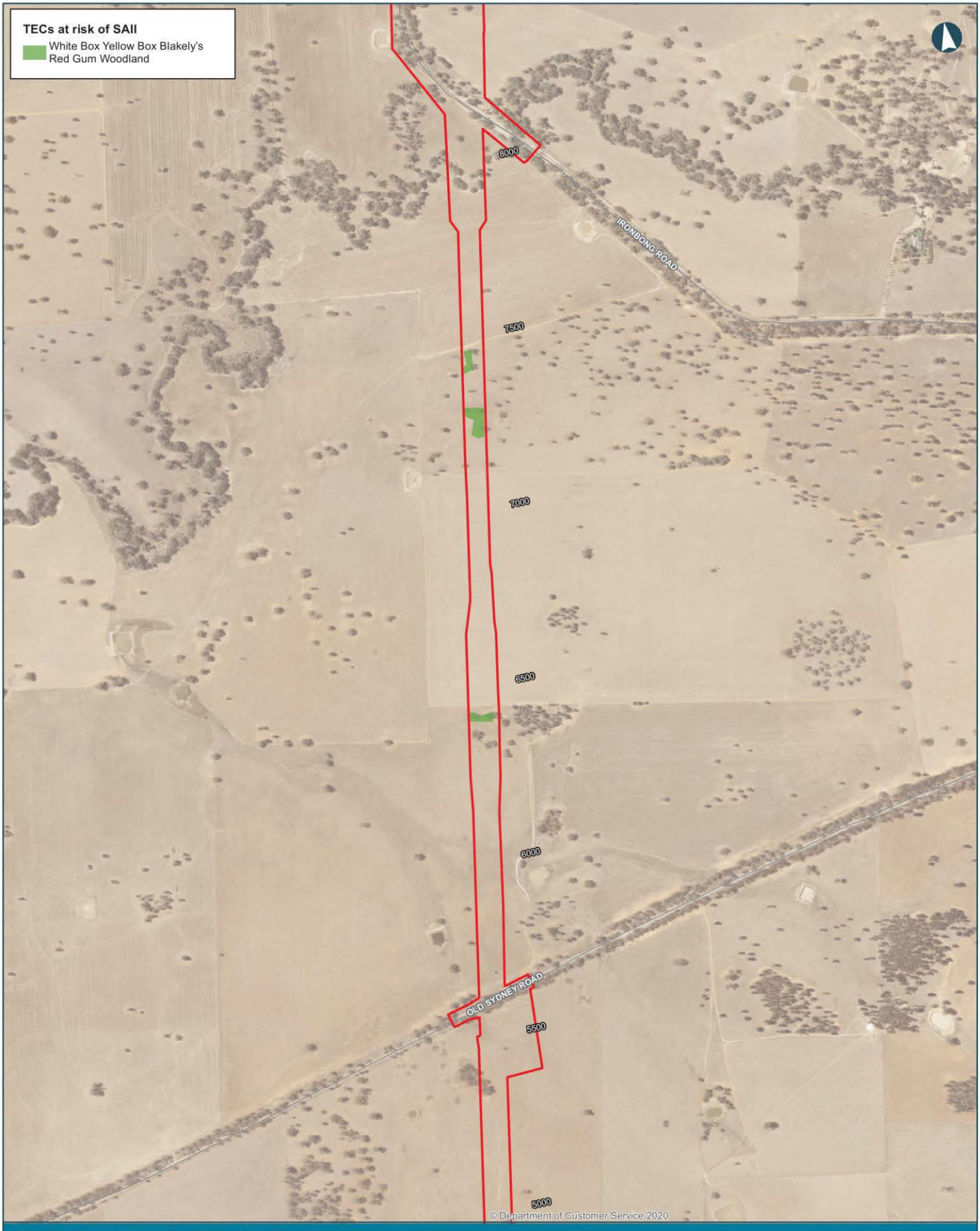
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

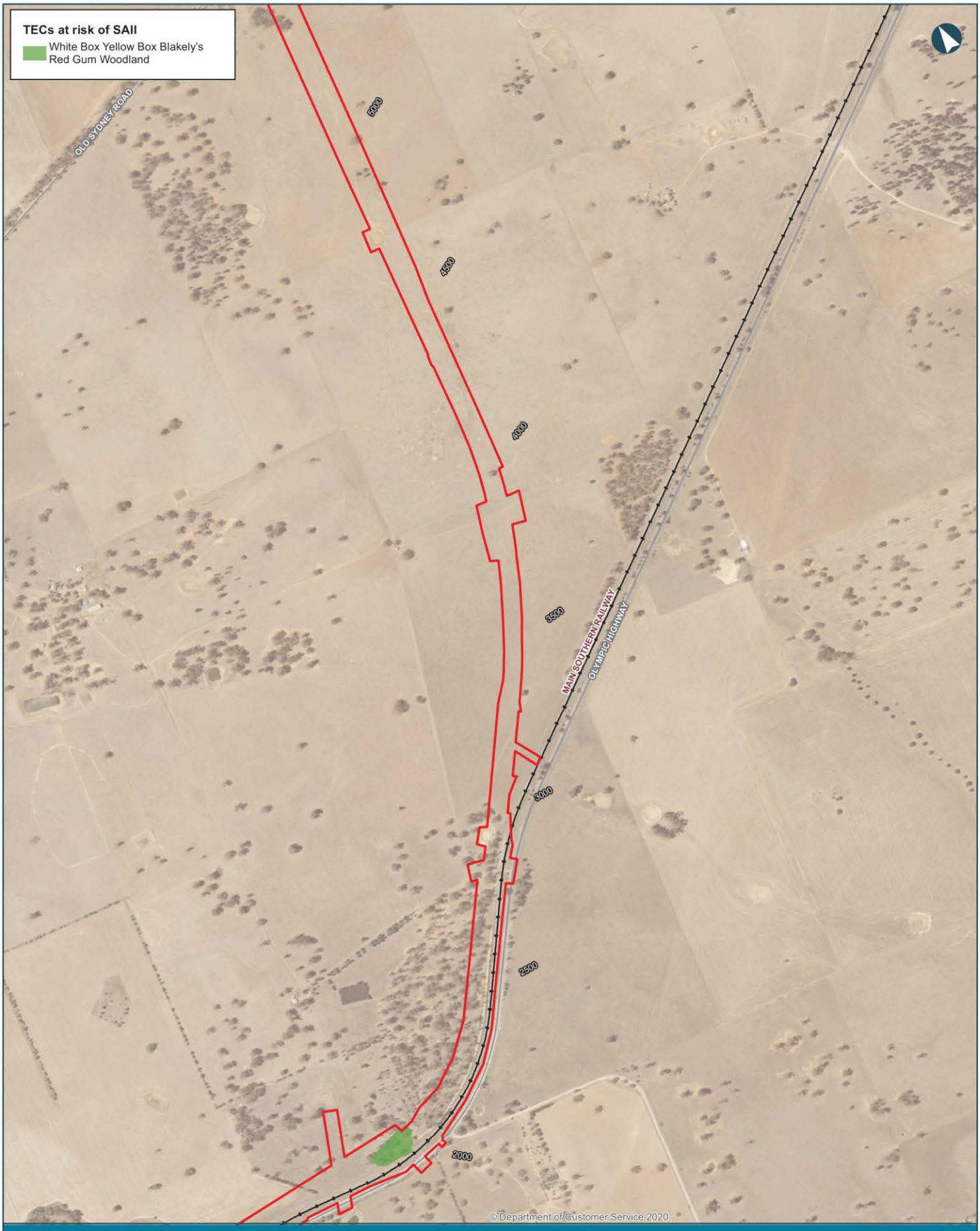
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd



ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021
Author: IRDJV
Paper: A3
Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

ILLABO TO STOCKINBINGAL 12.1 Threatened Ecological Communities at risk of SAII

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_1TECRiskSAII_r1v2.mxd

Table 12.1 Extent of the SAII threatened ecological community White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland within the subject land

Threatened ecological community	BC Act	Equivalent vegetation type (and vegetation zone)	Extent within subject land (ha)
White Box Yellow Box Blakely's Red Gum Woodland	Critically Endangered SAII	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ9)	4.5
		PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ12)	2
		PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ14)	13.3
		PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ18)	0.13
			19.93

Table 12.2 SAII assessment for threatened ecological communities

Assessment requirements	White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII	1 The direct impacts on White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland) have been avoided where possible through design refinement. This proposal has explored three alignment options, with the final design avoiding as many areas of ecological constraint (including Box Gum Woodland) as practical. Direct impact can be further avoided through detailed design A total of 93.83ha of Box Gum Woodland was recorded in the 250m corridor applied to the subject land, of which 19.93ha (<30%) will be directly affected. Indirect impacts will be managed through mitigation measures which are outlined in Chapter 11.
2. The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: a. evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal) b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: i. change in community structure ii. change in species composition iii. disruption of ecological processes iv. invasion and establishment of exotic species v. degradation of habitat, and vi. fragmentation of habitat.	2.a. the scientific determination for Box Gum Woodland lists the community as Critically Endangered with an estimated reduction in geographic distribution to less than 10% of its original distribution. The estimated reduction in geographic extent of the TEC since 1970 is unknown although the scientific determination for Box Gum Woodland estimates that the annual rate of loss for the TEC between the period 2009-2018 for the NSW South Western Slopes was 746ha. 2.b. The Box Gum Woodland recorded within the subject land occurs in Moderate condition. Vegetation which occurred as derived native grasslands and in poor condition (PCT 266, PCT 276, PCT 277, PCT 347) are not considered part of Box Gum Woodland TEC as they do not meet the condition threshold (refer to section 5.7.2). The patches of Box Gum Woodland recorded within the subject land are subject to agricultural practices particularly the grazing of livestock. This has reduced the SAII entities overall biodiversity value and limits the successful pollination and regeneration of some flora species therein.

Assessment requirements	White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland
	The proposal is unlikely to result in substantial alteration of surface water flows or groundwater levels, fire or flooding regimes. The proposal would not include use of fertilisers or other pollutants which would inhibit or impact the community. Within the subject land, this community currently occurs in moderate condition. The proposal will impact on isolated patches and patches with limited connectivity subject to grazing and high edge effects from cropping. It is not considered to be habitat that would be important for the long-term survival of Box Gum Woodland. The proposal is unlikely to significantly increase fragmentation of the community within the region. Mitigation measures have been provided (Chapter 11) to minimise any potential indirect impacts to remaining areas of the community.
3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR.	3. Box Gum Woodland is not listed in the TBDC as a data deficient entity
4.a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: i. in hectares, and ii. as a percentage of the current geographic extent of the TEC in NSW. 4.b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by: i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by: • distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and • estimated maximum dispersal distance for native flora species characteristic of the TEC, and • other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s)	4.a.i. The direct impacts to this SAII entity is: • total direct impact of 19.93ha of Box Gum Woodland. Indirect impact will be managed through mitigation measures outlined in Chapter 11. 4.a.ii. in NSW the best estimate of the area of occupancy is 151,100km^2. The loss of 19.93ha as a result of the proposal would constitute a loss of less than 0.0002% of extent of the TEC in NSW. The removal of 19.93ha equates to a 0.2% reduction of this community within the locality (10km radius from Subject land). 4.b. Within the Subject land the TEC occurs a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. There is an estimated 439ha of the community within 500m buffer of the subject land which would be retained. The proposed action will involve the removal of vegetation along a linear development. As such, the proposal will fragment large patches and roadside remnants of *Box-Gum Woodlands* in the locality and increase fragmentation between smaller patches. Proposal would involve clearing of moderate condition vegetation consisting of: • PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ9) with a vegetation integrity score of 68.3 will be 4.5ha • PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ12) with a vegetation integrity score of 69.5 will be 1.04ha • PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ14), with a vegetation integrity score of 75.18 will be 13.3ha; and

Assessment requirements	White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland
	• PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ18) with a vegetation integrity score of 46.9 will be 0.13ha. The proposal will impact on isolated patches and patches with limited connectivity subject to grazing and high edge effects from cropping. It is not considered to be habitat that would be important for the long-term survival of Box Gum Woodland. The proposal is unlikely to significantly increase fragmentation of the community within the region.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	5. This BDAR does not provide any new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.

12.1.2 Threatened flora candidate SAII entities

No threatened flora listed under the BC Act are considered likely to occur within the subject land affected, as such no threatened flora SAII entity will be affected by the proposal.

12.1.3 Threatened fauna candidate SAII entities

Two threatened fauna candidate species listed under the BC Act were recorded within the subject land; Superb Parrot and Squirrel Glider. These species are not classified as SAII entities and as such no SAII entities will be affected by the proposal.

12.2 Determining an offset requirement for impacts

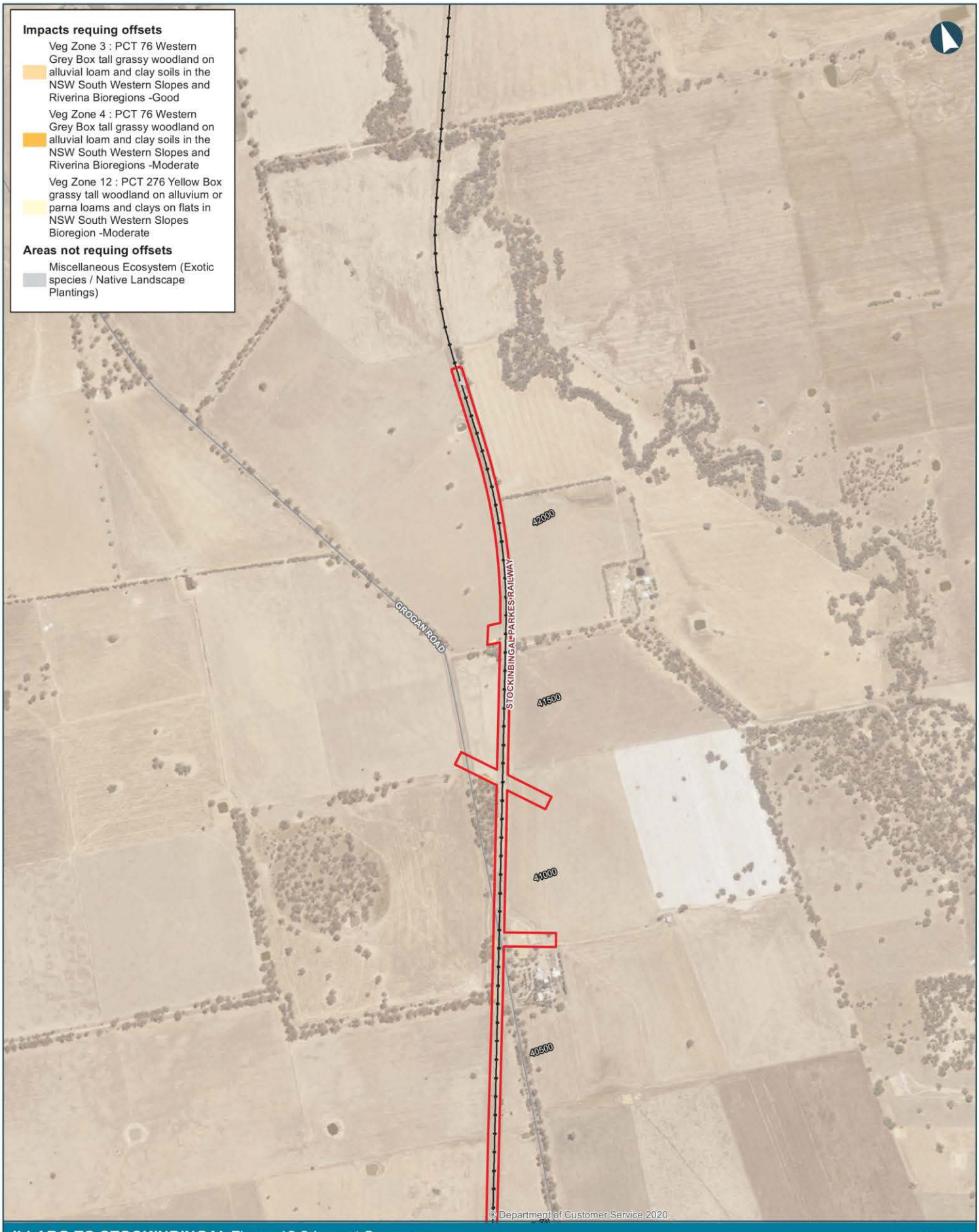
Biodiversity offsetting for residual impacts on biodiversity values listed under the BC Act is mandatory for SSI developments being assessed under Part 7 of the BC Act and subject to a BDAR. Biodiversity offset obligations have been determined using the BAM credit calculator for impacts on native vegetation and threatened species (Appendix K) and impacts associated with scattered tree clearing (Appendix E). The required ecosystem and species credit offset obligations are outlined below.

12.2.1 Impacts on native vegetation and TECs (ecosystem credits)

In accordance with section 9.2.1 of the BAM, an offset is required for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥15, where the PCT is representative of an EEC or a CEEC
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

The areas of the subject land that are subject to a biodiversity offset are illustrated in Figure 12.2. The required ecosystem and species credit obligations are outlined below.



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 1 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

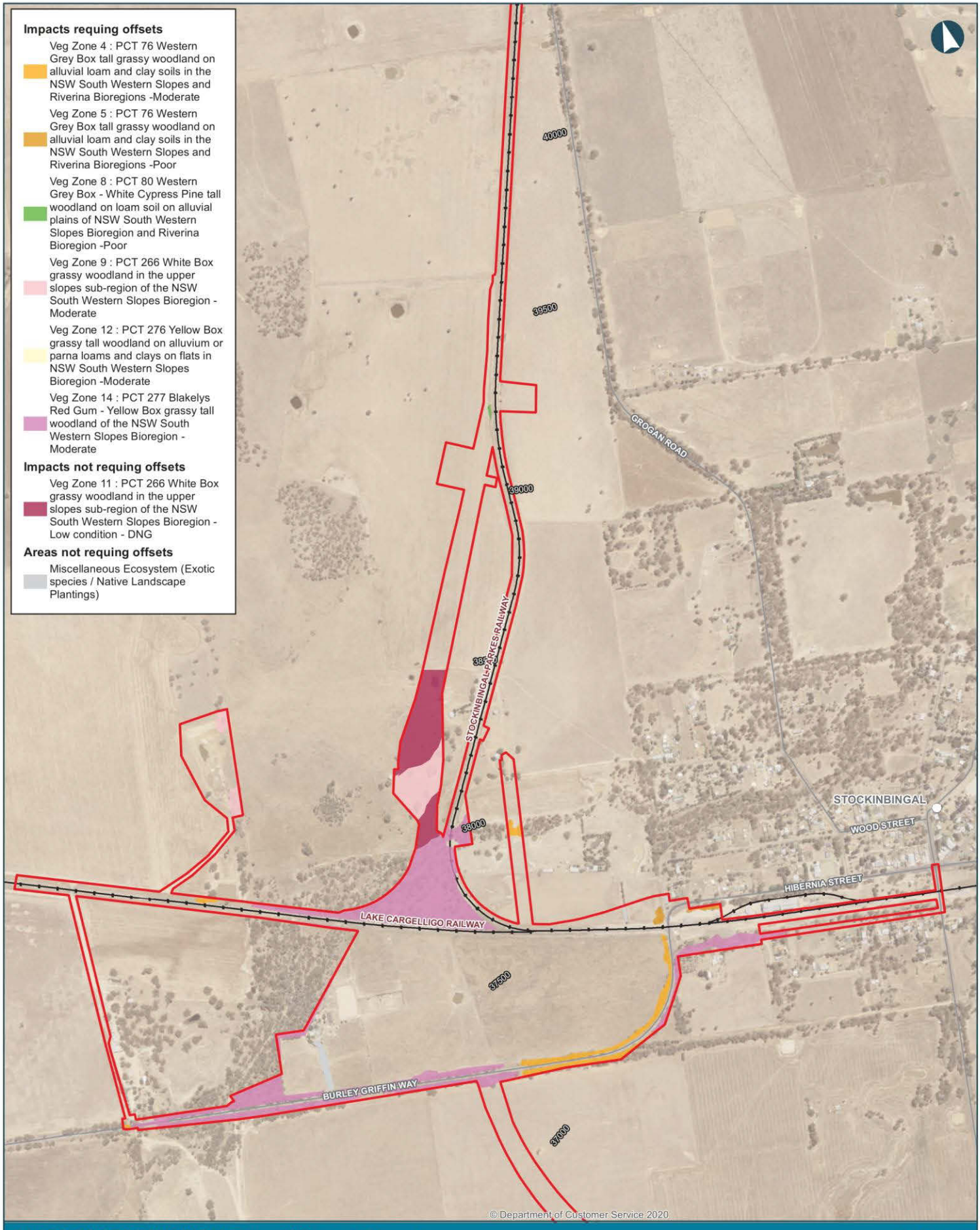
Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 2 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

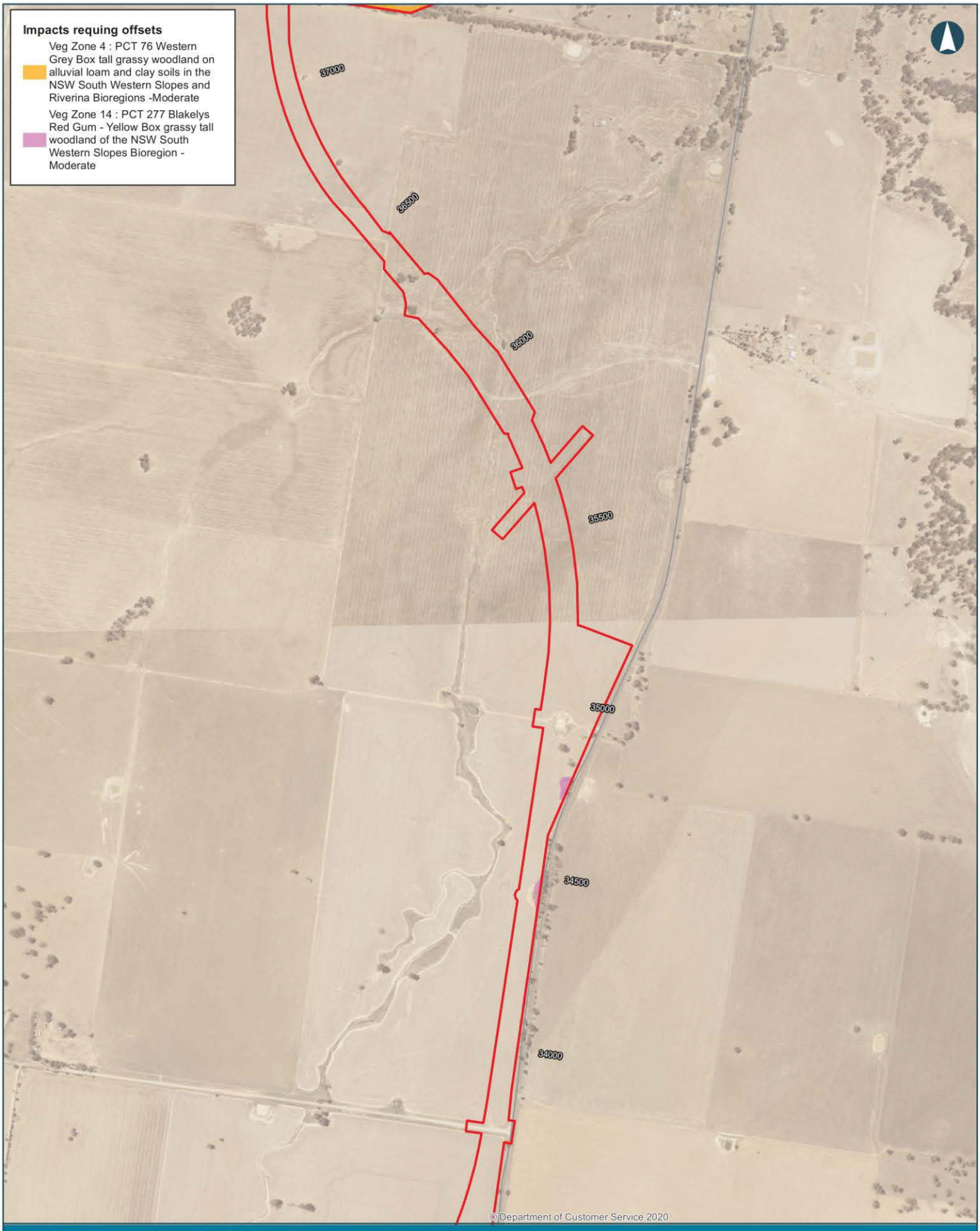
Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 3 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

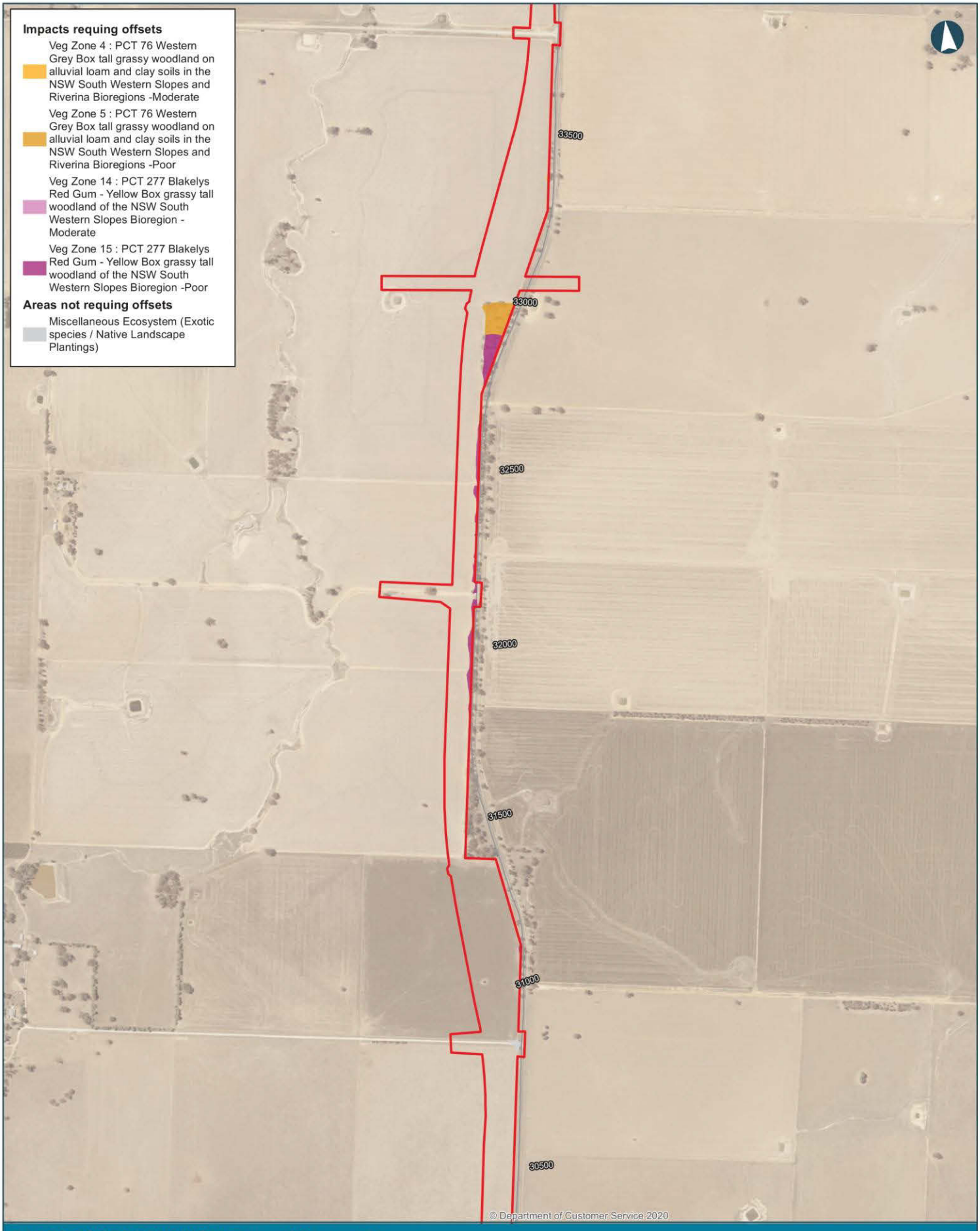
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 4 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

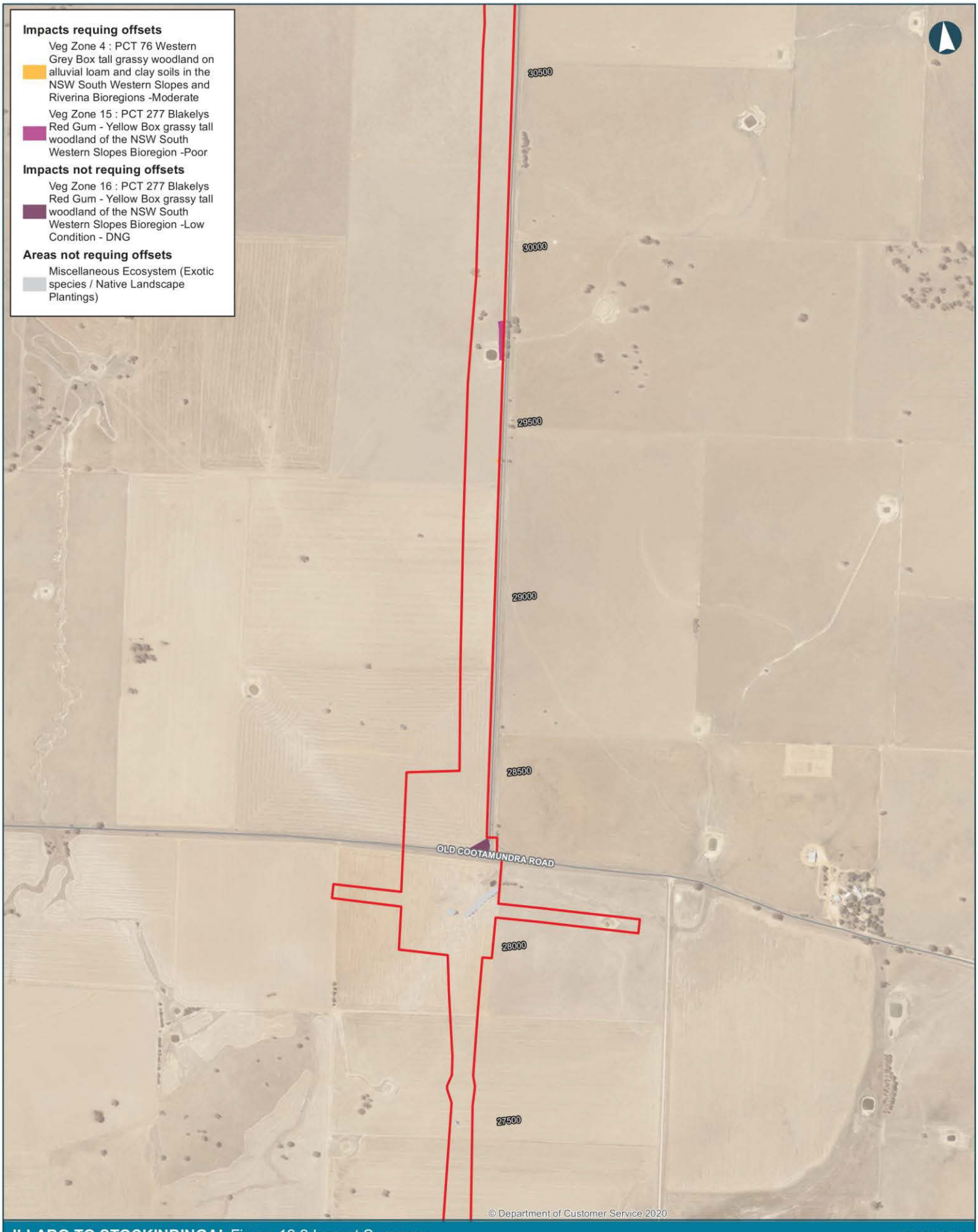
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 5 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

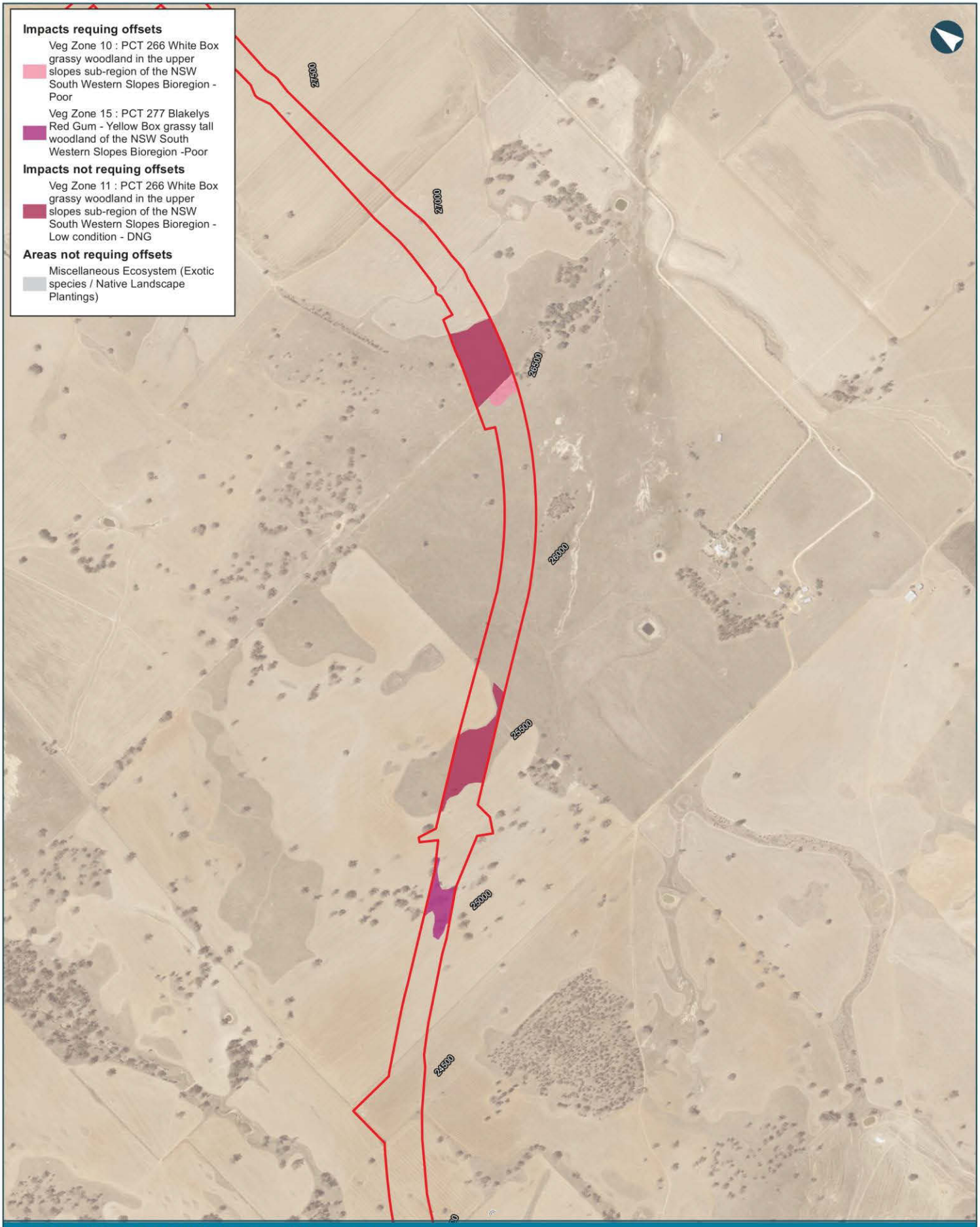
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 6 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

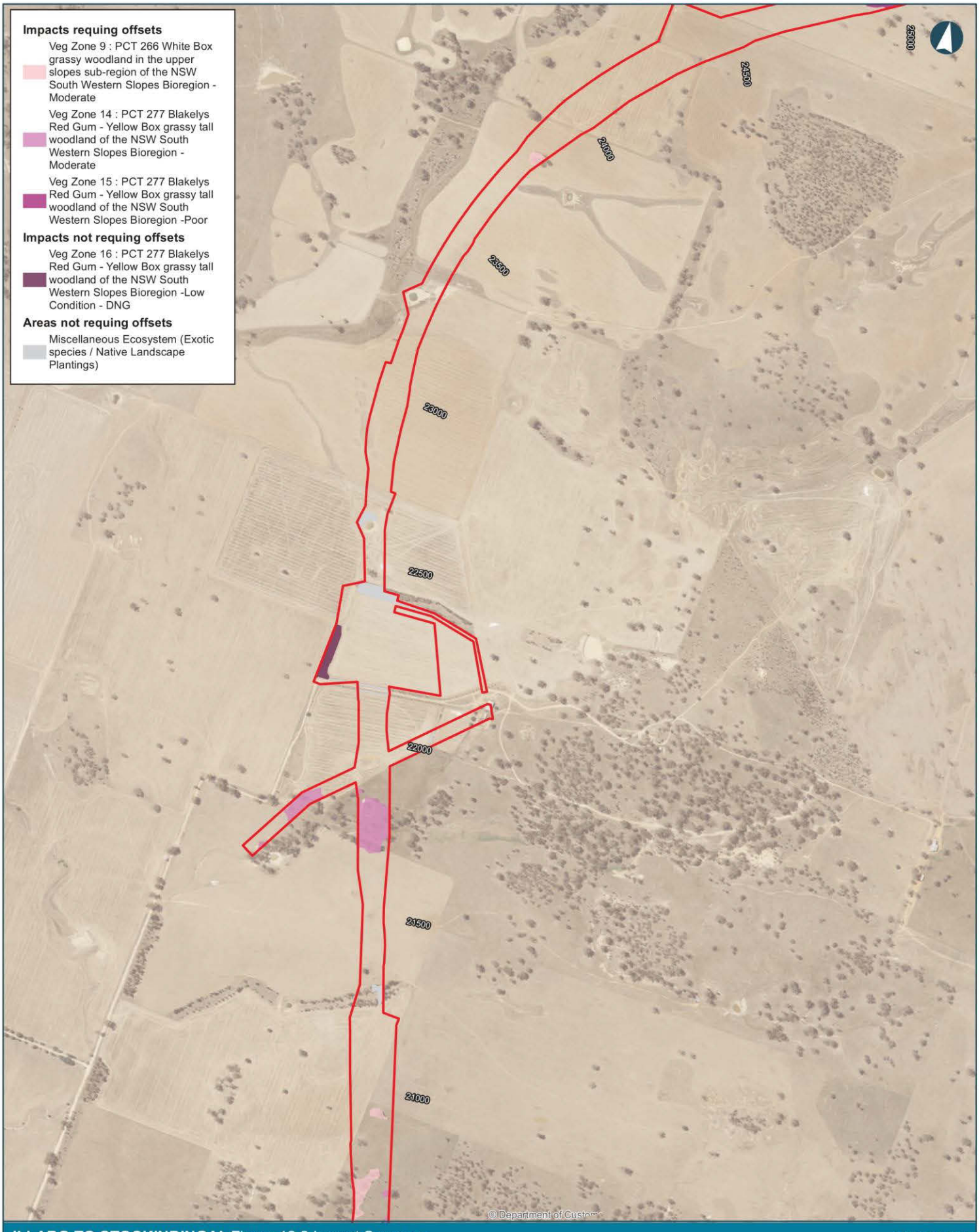
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 7 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

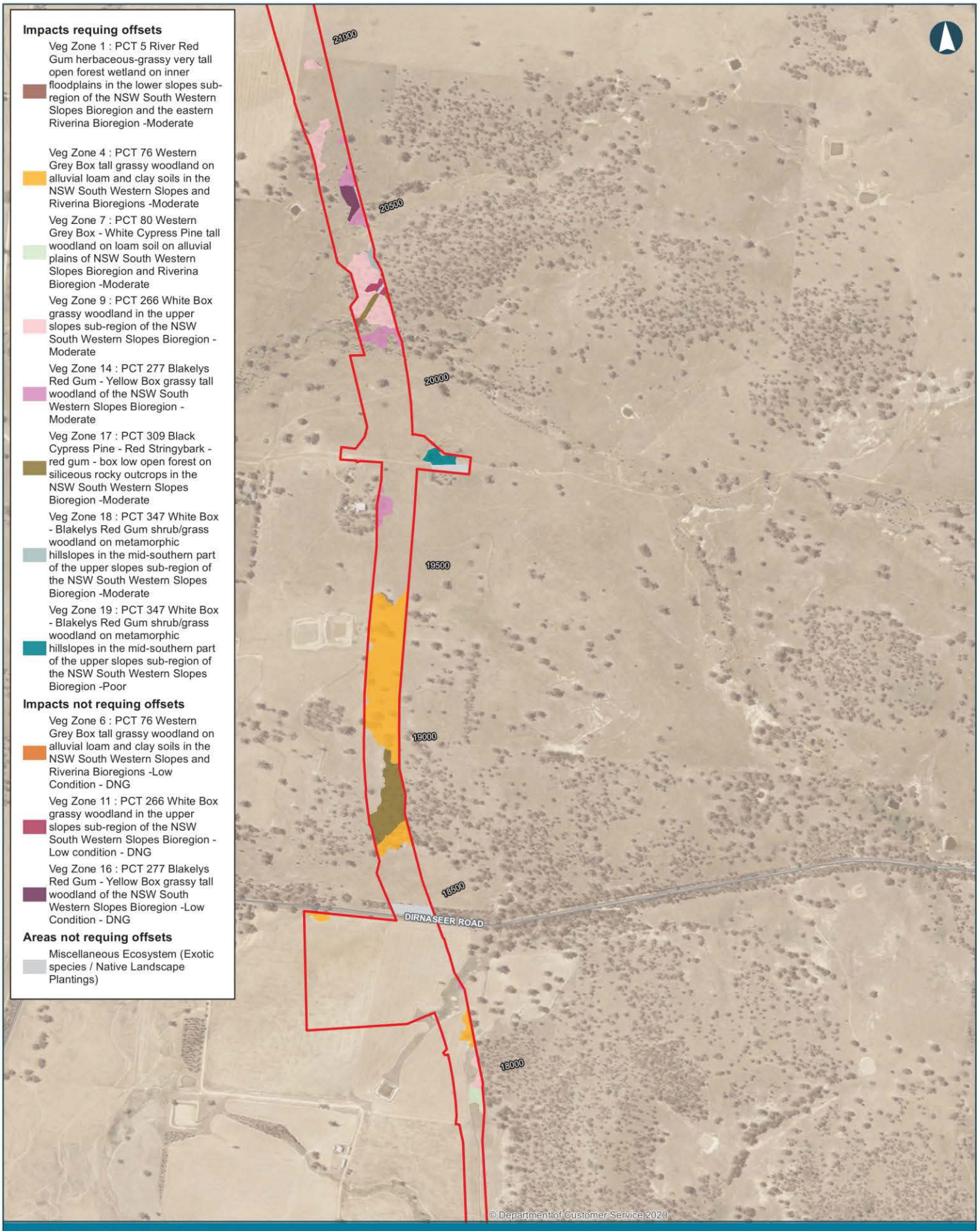
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



Impacts requing offsets

- Veg Zone 1 : PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion -Moderate
- Veg Zone 4 : PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions -Moderate
- Veg Zone 7 : PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion -Moderate
- Veg Zone 9 : PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 14 : PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion - Moderate
- Veg Zone 17 : PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion -Moderate
- Veg Zone 18 : PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion -Moderate
- Veg Zone 19 : PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion -Poor

Impacts not requing offsets

- Veg Zone 6 : PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions -Low Condition - DNG
- Veg Zone 11 : PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion - Low condition - DNG
- Veg Zone 16 : PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion -Low Condition - DNG

Areas not requing offsets

- Miscellaneous Ecosystem (Exotic species / Native Landscape Plantings)

ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 8 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

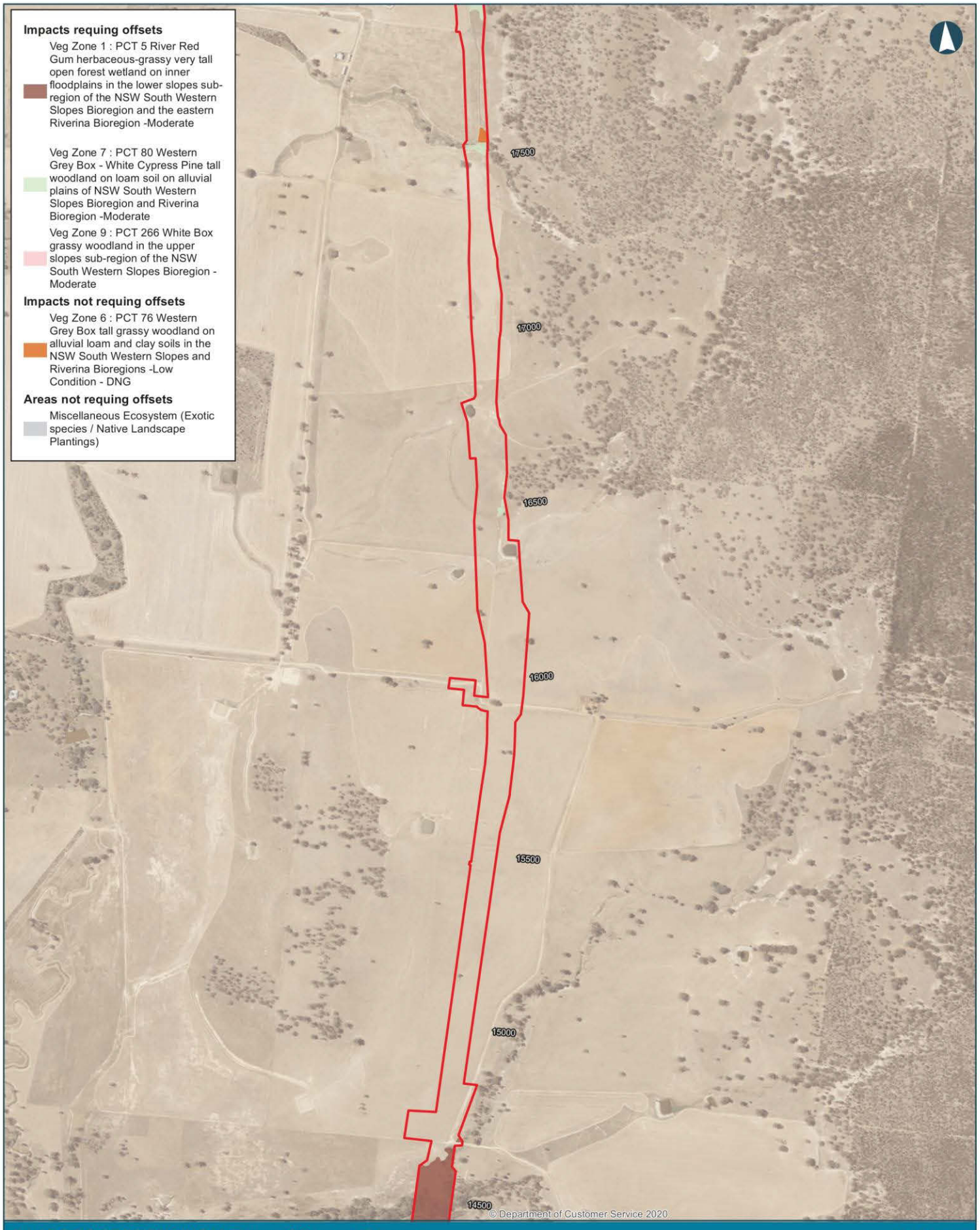
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 9 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

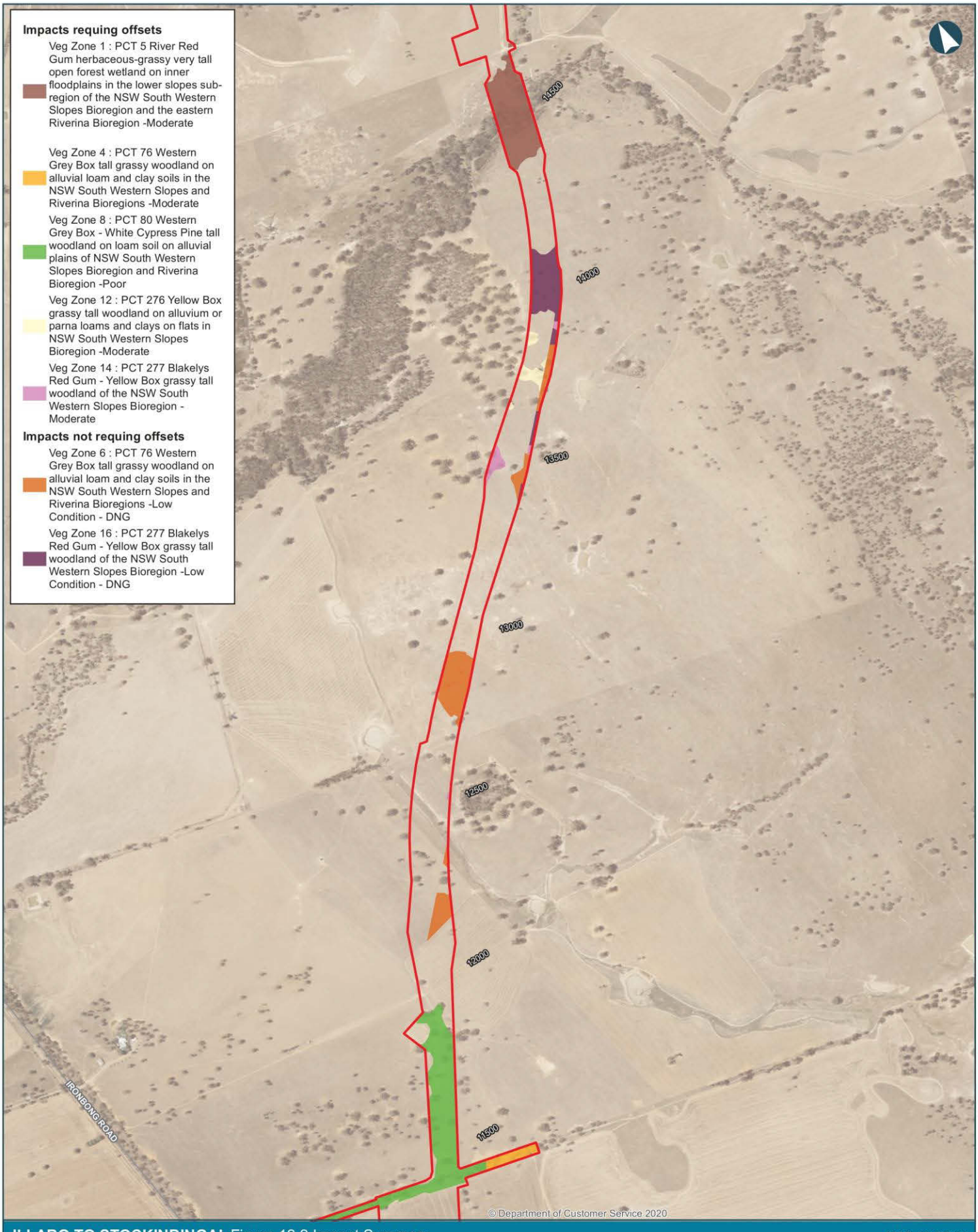
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 10 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

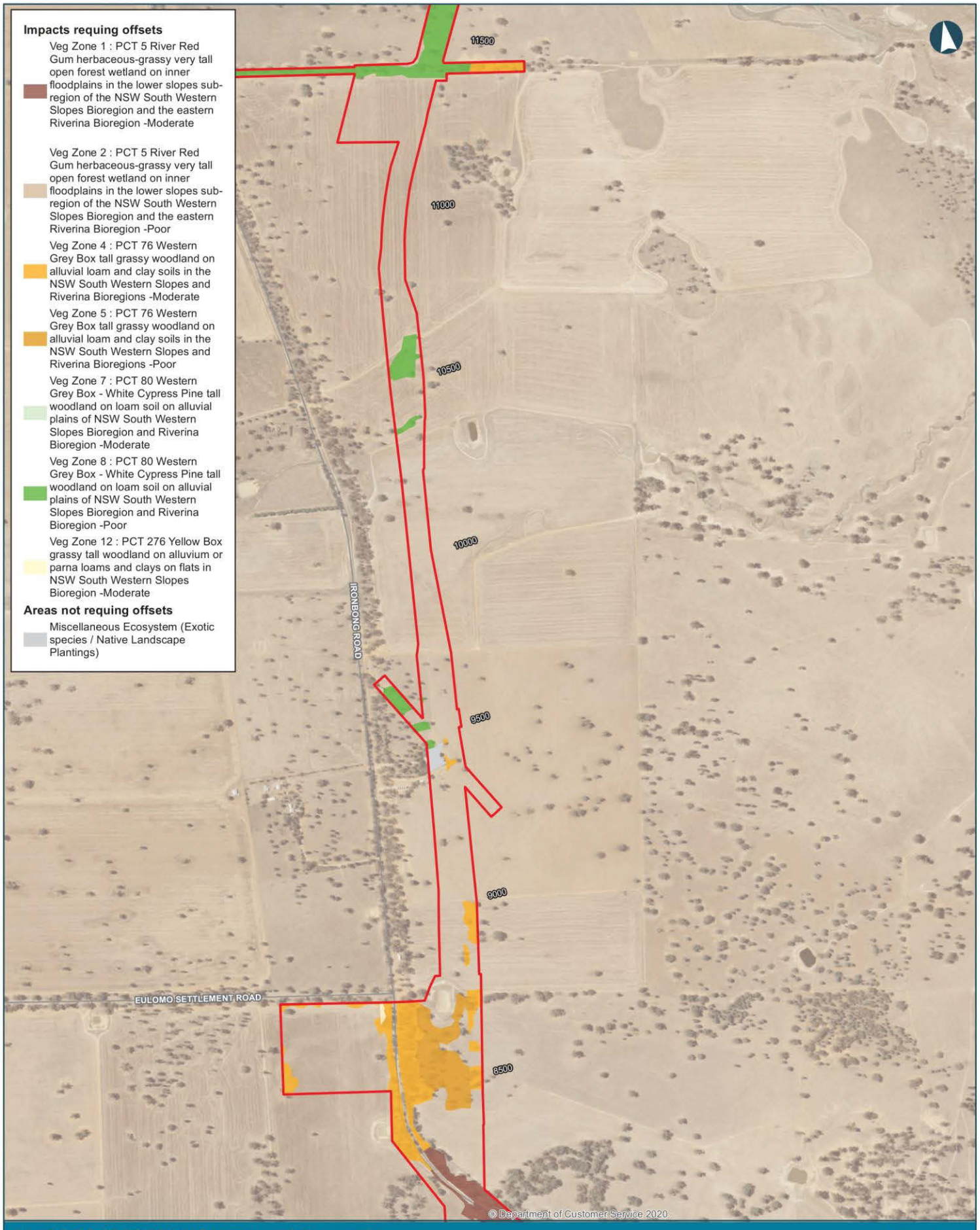
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 11 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

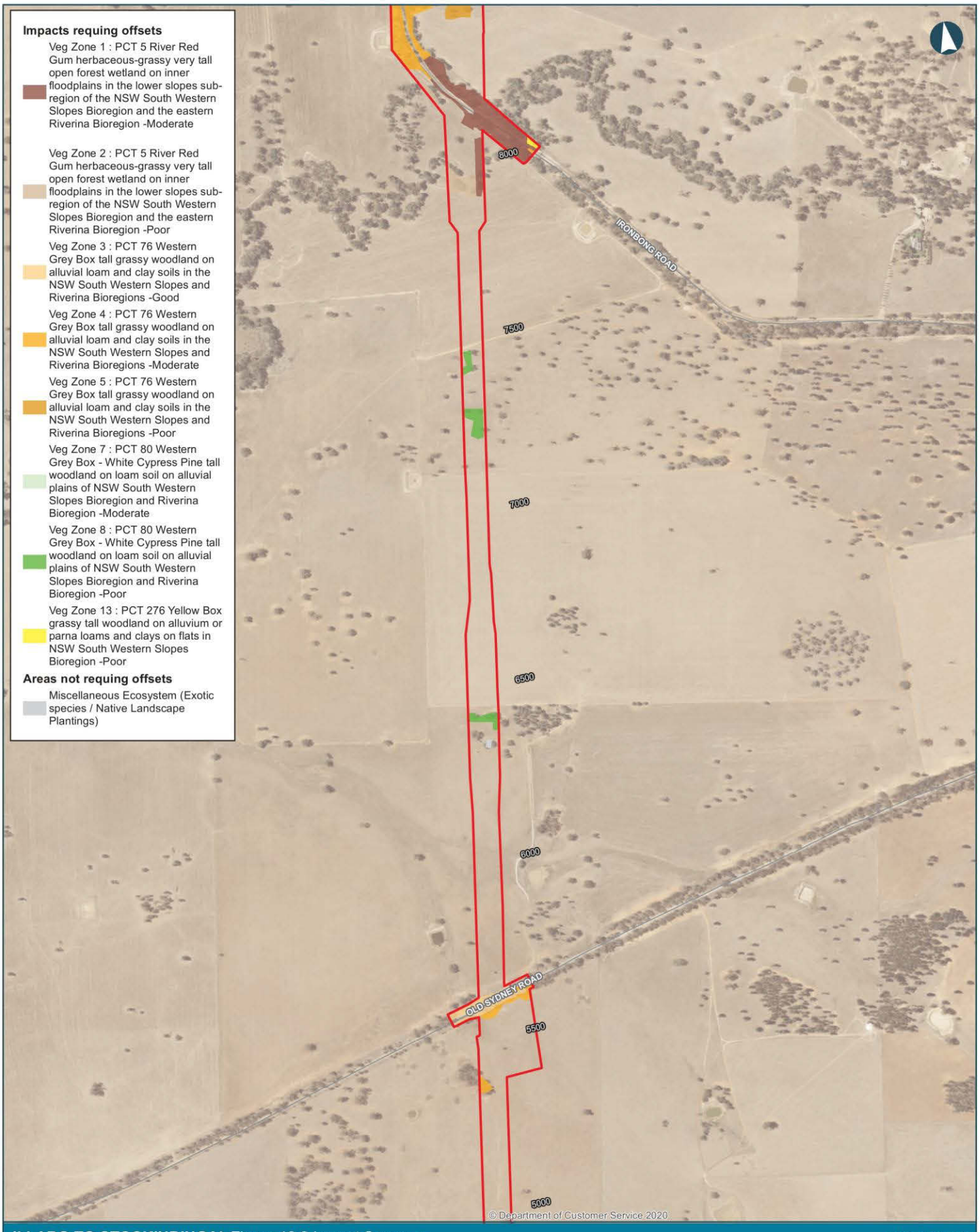
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_IZS\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 12 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

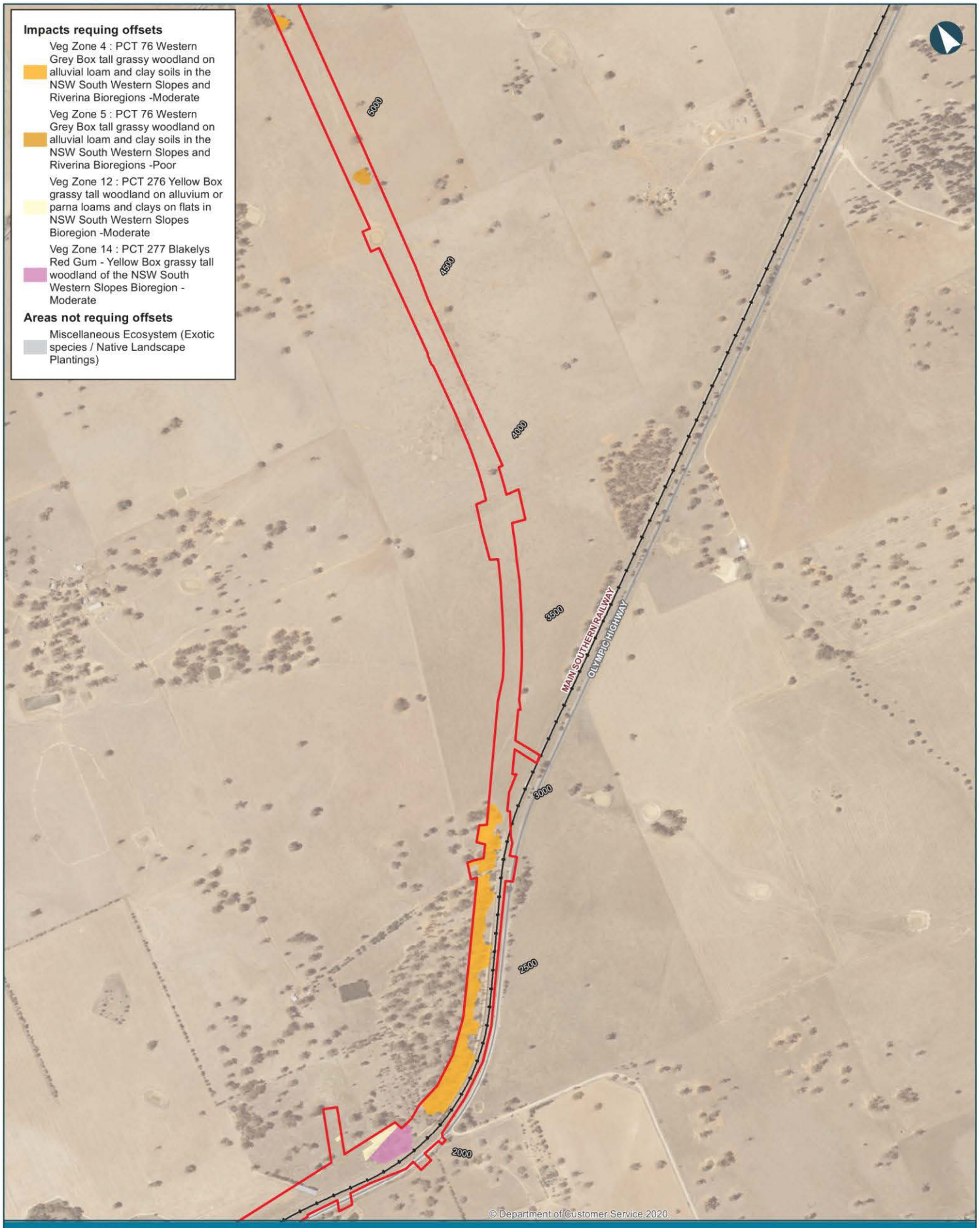
4098 Chainage (distance in metres from southern limit of the proposal)

Proposal Site

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 13 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

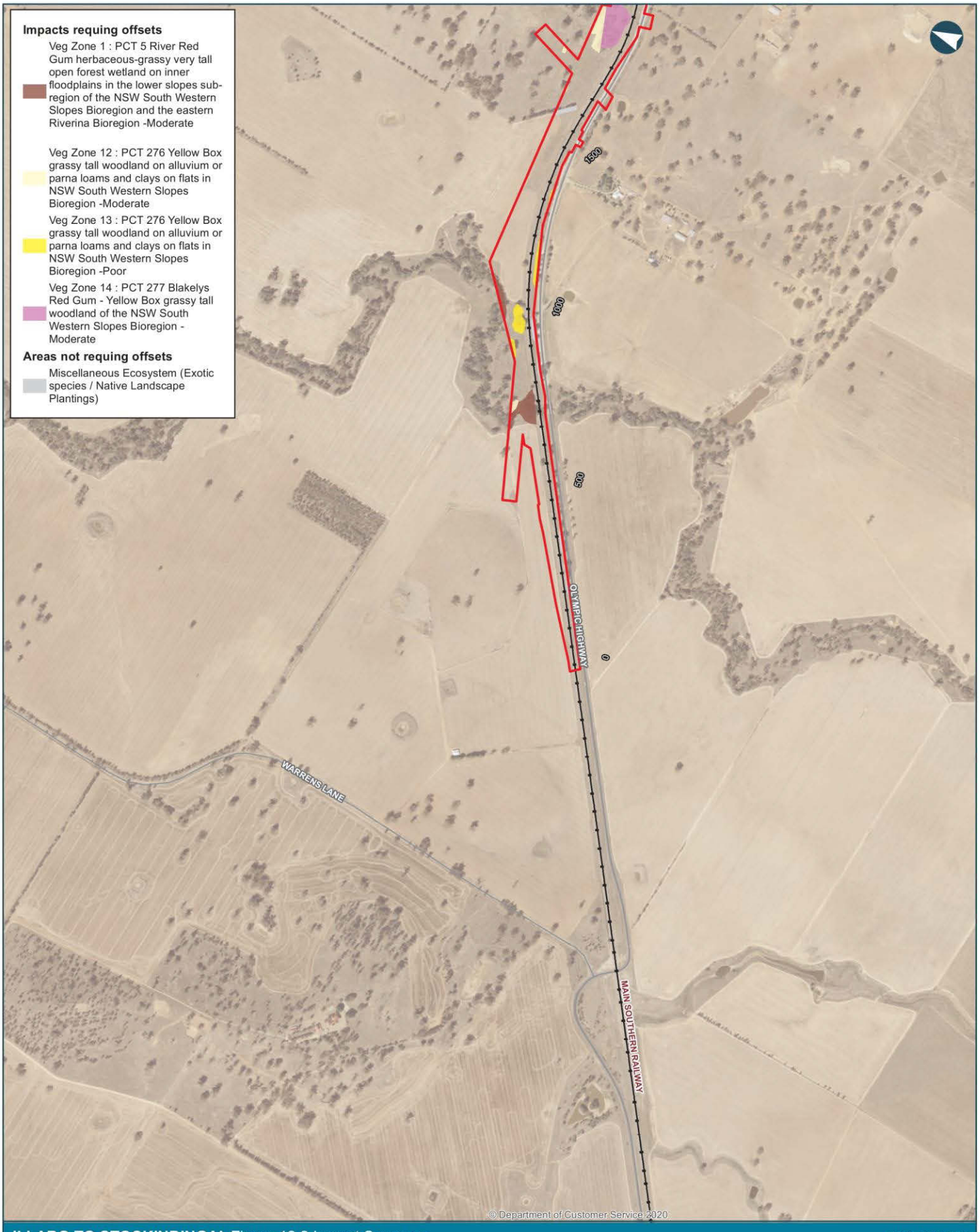
Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4098 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd



ILLABO TO STOCKINBINGAL Figure 12.2 Impact Summary

MAP 14 OF 14

0 0.1 0.2 0.3 Kilometers

Coordinate System: GDA 1994 MGA Zone 55

Date: 8/19/2021 Paper: A3
Author: IRDJV Scale: 1:10,000
Data Sources: IRDJV, ARTC, LPI

4038 Chainage (distance in metres from southern limit of the proposal)
Proposal Site
Existing Rail

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\Projects\PS108286_I2S\Tasks\220_0115_ENV_EISReport100Percent\Documents\Specialists\BDAR\220_0115_BDAR_12_2ImpactSummary_r1v2.mxd

12.2.2 Impacts requiring biodiversity offsets (ecosystem credits)

Impacts requiring biodiversity offset ecosystem credits are detailed in Table 12.3.

Table 12.3 Impacts requiring biodiversity offset ecosystem credits

Zone ID	PCT	Condition	TEC	SAII	Current Vegetation Integrity	Offset required
1	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Moderate condition	No	No	78.5	Yes
2		Poor condition	No	No	28.9	Yes
3	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Good condition	Yes	No	83.6	Yes
4		Moderate condition	Yes	No	68	Yes
5		Poor condition	No	No	26.1	Yes
6		Low condition (Derived Native Grassland)	No	No	11.6	No
7	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate condition	Yes	No	54.6	Yes
8		Poor condition	Yes	No	33.5	Yes
9	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	68.3	Yes
10		Poor condition	No	No	27.8	Yes
11		Low condition (Derived Native Grassland)	No	No	2	No
12	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	69.5	Yes
13		Poor condition	No	No	27.7	Yes
14	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate condition	Yes	Yes	75.1	Yes
15		Poor condition	No	No	43.8	Yes
16		Low condition (Derived Native Grassland)	No	No	2.7	No
17	PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Moderate condition	No	No	51.2	Yes
18	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	Moderate condition	No	No	46.9	Yes
19		Poor condition	No	No	31	Yes

12.2.3 Impacts on threatened species and their habitat (species credits)

In accordance with section 9.2.2 of the BAM, an offset is required for all impacts on threatened species and their habitat where offsets are determined for the impacts of the proposal on threatened species that require species credits, identified in accordance with Chapter 5 of the BAM and as outlined in section 10.1.3 of this report.

12.2.4 Impacts requiring biodiversity offsets (species credits)

Impacts requiring biodiversity offset species credits are detailed in Table 12.4.

Table 12.4 Impacts requiring biodiversity offset species credits

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Key's Matchstick Grasshopper	*Keyacris scurra*	E	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ9	Moderate condition	68.3	4.5
				VZ10	Poor condition	27.8	0.4
				VZ11	Low condition (Derived Native Grassland)	2	5.4
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	69.5	2
				VZ13	Poor condition	27.7	0.6
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ14	Moderate condition	75.1	13.3
				VZ15	Poor condition	43.8	2.2
				VZ16	Low condition (Derived Native Grassland)	2.7	2.4
Total Key's Matchstick Grasshopper assumed habitat area affected							**30.80**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Superb Parrot	*Polytelis swainsonii*	V	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	VZ1	Moderate condition	78.5	6.1
				VZ2	Poor condition	28.9	0.6
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ3	Good condition	83.6	1.1
				VZ4	Moderate condition	68	18.7
				VZ5	Poor condition	26.1	5
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ7	Moderate condition	54.6	1.4
				VZ8	Poor condition	33.5	4.7
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ9	Moderate condition	68.3	4.5
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	69.5	2
				VZ13	Poor condition	27.7	0.6
			PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ14	Moderate condition	75.1	13.3
				VZ15	Poor condition	43.8	2.2
			PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ18	Moderate condition	46.9	0.13
Total Superb Parrot habitat area affected							**60.33**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Squirrel Glider	*Petaurus norfolcensis*	V	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	VZ1	Moderate condition	78.5	6.1
				VZ2	Poor condition	28.9	0.6
			PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	VZ3	Good condition	83.6	1.1
				VZ4	Moderate condition	68	18.7
				VZ5	Poor condition	26.1	5
			PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	VZ7	Moderate condition	54.6	1.4
				VZ8	Poor condition	33.5	4.7
			PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ9	Moderate condition	68.3	4.5
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	69.5	2
				VZ13	Poor condition	27.7	0.6
			PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	VZ14	Moderate condition	75.1	13.3
				VZ15	Poor condition	43.8	2.2
			PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	VZ18	Moderate condition	46.9	0.13
Total Squirrel Glider habitat area affected							**60.33**

Common name	Scientific name	BC Act[1]	Habitat or PCT	Vegetation zone	Condition	Habitat condition (vegetation integrity) loss	Area/count
Southern Myotis	*Myotis macropus*	V	PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	VZ1	Moderate condition	78.5	6.1
				VZ2	Poor condition	28.9	0.6
			PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	VZ12	Moderate condition	69.5	1
				VZ13	Poor condition	27.7	0.6
Total Southern Myotis habitat area affected (PCT 5 and PCT 276 within 200m of water)							**8.25**

12.2.5 Impacts that do not need further assessment

In accordance with Section 9.3 of the BAM the following impacts to non-native vegetation do not need further assessment and do not require a biodiversity offset:

- The impact of 3.2ha of miscellaneous ecosystem consisting of exotic/native landscape plantings.

13 Biodiversity credit report

No net loss in biodiversity value is the standard that underpins the BAM. The standard is attained through ensuring that the amount of biodiversity offset credit required from an impact is proportional to the amount of credit generated through improvements in the condition of native vegetation or threatened species habitat at a biodiversity stewardship site. The application of no net loss standard is set out in Chapter 10 of the BAM.

13.1 Applying the no net loss standard

No net loss in biodiversity is achieved where:

- the impacts on biodiversity values from a proposal are avoided, minimised or mitigated through reasonable measures (refer Chapters 9 and 11)
- all residual direct impacts on biodiversity values from clearing native vegetation and habitat loss are offset by:
  - retiring the required number of biodiversity credits determined in Section 10.1 of the BAM, with a class of credit identified in Section 10.2 of the BAM that meets the 'like-for-like' or 'variation. rules required in clauses 6.3 and 6.4 of the BC Regulation 2017 respectively.

All residual impacts on biodiversity resulting from the proposal, after applying the avoid, minimise and mitigate hierarchy, have been outlined in Chapter 10 of this report. The ecosystem and species credit offset requirements calculated for these residual impacts are presented below.

All residual impacts on biodiversity resulting from the proposal, after applying the avoid, minimise and mitigate hierarchy, have been outlined in section 12.2 of this report. The ecosystem and species credit offset requirements calculated for these residual impacts are presented below.

13.2 Ecosystem credit offset requirement

The required ecosystem credit obligation, as determined using the BAM credit calculator, for impacts on native vegetation are provided in Table 13.1. The ecosystem credit species predicted to utilise these PCTs are listed in the BAM credit report in Appendix K.

Table 13.1 Ecosystem credits

Plant community type	Threatened ecological community	Area affected (ha)	Ecosystem credit
PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Not listed	6.8	188
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	27.1	751
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion		6.1	117

Plant community type	Threatened ecological community	Area affected (ha)	Ecosystem credit
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	10.3	199
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion		2.6	97
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion		17.9	684
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Not listed	1.7	33
PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	0.43	10
Total		**72.93**	**2079**

The like for like ecosystem credit class options for each biodiversity offset credit obligation is summarised in Table 13.2.

Table 13.2 Like for like trading ecosystem credit classes

Credit class PCT	Any PCT with the below TEC	Contains hollow bearing trees	In the below IBRA subregions
PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Inland Riverine Forests. This includes PCTs: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362 AND Inland Riverine Forests – < 50% cleared group (including Tier 7 or higher).	Yes	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
PCT 309 Black Cypress Pine – Red Stringybark – red gum – box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion	Western Slopes Dry Sclerophyll Forests (including PCTs 54, 110, 179, 217, 243, 255, 270, 273, 287, 291, 309, 321, 322, 323, 324, 325, 327, 330, 331, 333, 341, 343, 346, 348, 354, 358, 379, 387, 396, 398, 399, 401, 402, 403, 404, 405, 406, 407, 408, 409, 414, 415, 417, 419, 420, 423, 425, 430, 431, 440, 443, 449, 455, 456, 457, 459, 462, 463, 467, 468, 469, 470, 471, 472, 473, 476, 477, 478, 479, 480, 482, 515, 531, 532, 576, 577, 581, 592, 610, 617, 671, 673, 676, 712, 713, 714, 746, 863, 889, 940, 956, 1133, 1176, 1277, 1278, 1279, 1307, 1313, 1314, 1316, 1381, 1398, 1610, 1629, 1654, 1655, 1656, 1657, 1660, 1661, 1663, 1668, 1669, 1671, 1672, 1674, 1676, 1677, 1678, 1679, 1680, 1709, 1711, 1770, 1771) AND Western Slopes Dry Sclerophyll Forests – < 50% cleared group (including Tier 7 or higher).	Yes	

13.3 Species credit offset requirement

The required species credit obligation, as determined using the BAM credit calculator, for impacts on threatened species habitats are provided in Table 13.3.

In relation to like for like species credit trading options, the offset must be like for like species credits that can be sourced from anywhere in NSW.

Table 13.3 Species credits

Scientific name	Common name	BC Act	Area (hectares)	Species credits
Keyacris scurra	Key's Matchstick Grasshopper	E	**30.8**	**792**
Myotis macropus	Southern Myotis	V	**8.25**	**291**
Petaurus norfolcensis	Squirrel Glider	V	**60.33**	**1896**
Polytelis swainsonii	Superb Parrot	V	**60.33**	**1896**

13.4 Ecosystem credit requirements for scattered tree clearing

The required ecosystem credit obligation, as determined using the BAM credit calculator, for scattered tree clearing are provided in Table 13.4.

Table 13.4 Ecosystem credits for scattered tree clearing

Plant community type	Threatened ecological community	Number of scattered trees	Ecosystem credits
PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Not listed	1	1
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	33	32
PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	6	5
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	3	3
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	10	8
PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	5	4
Total		**58**	**53**

The like for like scattered tree clearing ecosystem credit class options for each biodiversity offset credit obligation is summarised in Table 13.5.

Table 13.5 Like for like trading for scattered tree clearing ecosystem credit classes

Credit class PCT	Any PCT with the below TEC / class	Containing HBT	In the below IBRA subregions
PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion	Inland Riverine Forests AND Inland Riverine Forests – < 50% cleared trading group	Yes	Inland Slopes ,Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. OR Any IBRA subregion that is within 100km of the outer edge of the affected site.

Source: Like for like trading credit classes as per the BAM credit report (Appendix K)

13.5 EPBC Act offset requirements for significantly affected MNES

Biodiversity offset obligations for significantly affected MNES listed under the EPBC Act have been calculated using the BAM credit calculator. This approach is consistent with the controlled action decision on the assessment approach, being that the proposal will be assessed by an accredited assessment under Part 5, Division 5.2 (SSI) of the EP&A Act. It is also consistent with the (then) Department of Agriculture, Water and the Environment's (now DCCEEW) endorsement in March 2020 of the BOS for both NSW and Commonwealth-listed threatened species, as stated in the EPBC Act Condition-Setting Policy (Department of Agriculture Water and the Environment 2020). In determining biodiversity offsets for MNES under the EPBC Act, consideration has been given to Attachment A of the SEARs (Appendix B) and have been based on the results of detailed targeted surveys and assessment as outlined in Chapter 8 and Appendix F of this report. The significantly affected MNES listed under the EPBC Act that are to be offset for this proposal are:

- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Section 7.14 (4) of the BC Act outlines that 'a condition to retire biodiversity credits is required to be complied with before any development is carried out that would impact on biodiversity values'. This approach is in line with the EPBC environmental offsets policy (2012) which outlines in section 7.7 that an offset should be implemented either before, or at the same point in time as, the impact arising from the action. The required ecosystem credit offset obligation, as determined using the BAM credit calculator, for impacts on significantly affected biodiversity values listed under the EPBC Act and associated native vegetation types and zones are provided in Table 13.6.

Table 13.6 EPBC Act offsets for significantly affected biodiversity values

Threatened ecological community	Equivalent vegetation type and zone	Extent within subject land (ha)	Ecosystem credits
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Good condition (VZ3)	1.1	46
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Moderate condition (VZ4)	18.7	636
	PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – Low condition (VZ6)	2.3	0

Threatened ecological community	Equivalent vegetation type and zone	Extent within subject land (ha)	Ecosystem credits
	PCT 80 Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion – Moderate condition (VZ7)	1.4	38
Total		**23.5**	**720**
White Box Yellow Box Blakely's Red Gum Woodland	PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ9)	4.5	192
	PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion – Moderate condition (VZ12)	2	87
	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion – Moderate condition (VZ14)	13.3	624
	PCT 347 White Box – Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion – Moderate condition (VZ18)	0.13	4
Total		**19.93**	**907**
Total direct impact on TECs listed under the EPBC Act		**43.43**	**1627**

Note: Ecosystem credits for EPBC Act TECs are not additional offset requirements but form part of the overall ecosystem credit offset obligation for impacts on native vegetation (PCTs).

13.6 Biodiversity offset approach

The biodiversity offset approach for this project would ensure that the credit requirements are met and would be secured in accordance with BC Regulation 2017 trading rules. This strategy includes the following:

- Offsets will primarily consist of land-based offsets that are strategically located within the impact and adjacent sub-regions to the Inland Rail corridor. Priority will be given to sites that maximise the co-location of ecosystem and species offset requirements across multiple NSW projects, and contain large enough areas to meet the predicted NSW requirements.
- Offset sites will be located and landholders assisted in the development of offset sites as Biodiversity Stewardship Sites, so that ARTC can purchase relevant credits created at those sites.
- ARTC may consider developing an offset site on residual lands acquired for the project (either by itself or as part of the transfer of the site to a third party).
- Where credits under the like-for-like rules cannot be reasonably sourced, ARTC will enact the Variation Rules (if the criteria can be met). Variation rules would not apply to any Matters of National Environmental Significance (MNES).
- Payments directly to the Biodiversity Conservation Fund may also be made to retire project approval credit obligations.
- Biodiversity offsets will be finalised prior to project construction impacts, or as required in the Planning Approval.

14 Conclusion

This BAM assessment concluded that the proposal will have a residual impact on 72.93ha of native vegetation comprised of ten native plant community types. This includes two threatened ecological communities listed under the BC Act and EPBC Act within the subject land:

- Inland Grey Box Woodland listed as Endangered under the BC Act and the EPBC Act (PCT 76 and PCT 80).
- White Box Yellow Box Blakely's Red Gum Woodland (PCT 266, PCT 276, PCT 277 and PCT 347) listed as Endangered under the BC Act and Critically Endangered under the EPBC Act. This community is also listed as an SAII entity affected.

No threatened flora species have been recorded or are considered affected by the proposal.

Eight threatened fauna species and one migratory species were recorded during field surveys. Of these, the Superb Parrot and Squirrel Glider are candidate species and will be affected by the proposal.

A third species credit species, Southern Myotis, while not recorded, has been assumed as present based on presence of suitable habitat. A fourth species credit species, Key's Matchstick Grasshopper, while not recorded, has been assumed as present based on presence of suitable habitat. It had not been subject to targeted surveys.

The other six recorded threatened fauna species and an additional 11 fauna species are considered as ecosystem credit species due to a moderate or higher likelihood of occurrence.

The proposal has been designed with the principles of avoid and minimise impact on native vegetation and habitat where possible in accordance with BAM. This process has resulted in the assessment of 279.06ha with a 250m corridor applied to the subject land and impact to 105.76ha of native vegetation under the previous design phase to only 72.93ha at the current optimised design phase.

The BAM Credit Calculator was used to provide a calculation of the number and class of biodiversity credits required to offset the biodiversity impacts associated with the proposal to ensure maintenance or improvement in biodiversity. The proposal will require a total of:

- 2,079 ecosystem credits
- 4,875 species credits.

The BAM credit calculator was also used to provide a calculation of the number and class of biodiversity credits required to offset scattered tree loss. A total of 58 scattered trees were recorded or assumed, 42 of which were class 3 and contained hollows. The proposal will require a total of 53 of ecosystem credits for scattered trees.

Assessments of impact significance were conducted for all Matters of National Environmental Significance (MNES) threatened species, populations and ecological communities considered likely to be affected by the proposal. Through these assessments, it was concluded that the proposal is likely to have a significant impact on two endangered ecological communities; Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived grasslands of south-east Australia and White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands.

15 Limitations

This Report is provided by WSP Australia Pty Limited (*WSP*) for Australian Rail Track Corporation Ltd (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal and agreement with the Client (*Agreement*).

15.1 Permitted purpose

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

15.2 Qualifications and assumptions

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information*), those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

15.3 Use and reliance

This Report should be read in its entirety and must not be copied, distributed or referred to in part only. The Report must not be reproduced without the written approval of WSP. WSP will not be responsible for interpretations or conclusions drawn by the reader. This Report (or sections of the Report) should not be used as part of a specification for a project or for incorporation into any other document without the prior agreement of WSP.

WSP is not (and will not be) obliged to provide an update of this Report to include any event, circumstance, revised Information or any matter coming to WSP's attention after the date of this Report. Data reported and Conclusions drawn are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

This Report can only be relied upon for the Permitted Purpose and may not be relied upon for any other purpose. The Report does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise. It is the responsibility of the Client to accept (if the Client so chooses) any Conclusions contained within the Report and implement them in an appropriate, suitable and timely manner.

In the absence of express written consent of WSP, no responsibility is accepted by WSP for the use of the Report in whole or in part by any party other than the Client for any purpose whatsoever. Without the express written consent of WSP, any use which a third party makes of this Report or any reliance on (or decisions to be made) based on this Report is at the sole risk of those third parties without recourse to WSP. Third parties should make their own enquiries and obtain independent advice in relation to any matter dealt with or Conclusions expressed in the Report.

15.4 Disclaimer

No warranty, undertaking or guarantee whether expressed or implied, is made with respect to the data reported or the conclusions drawn. To the fullest extent permitted at law, WSP, its related bodies corporate and its officers, employees and agents assumes no responsibility and will not be liable to any third party for, or in relation to any losses, damages or expenses (including any indirect, consequential or punitive losses or damages or any amounts for loss of profit, loss of revenue, loss of opportunity to earn profit, loss of production, loss of contract, increased operational costs, loss of business opportunity, site depredation costs, business interruption or economic loss) of any kind whatsoever, suffered on incurred by a third party.

16 References

Australian Museum (2020). "Southern Myotis." from https://australian.museum/learn/animals/bats/southern-myotis/.

ARTC (2019). Inland Rail to Narrabi - Revised Methodology for Categorisation of Land. Department of Planning Industry and Environment.

Australian Museum (2020). "Squirrel Glider." from https://australian.museum/learn/animals/mammals/squirrel-glider/.

Baker-Gabb, D. (2011). National Recovery Plan for the Superb Parrot Polytelis swainsonii. Melbourne, VIC, Department of Sustainability and Environment, .

Bureau of Meteorology (2021). "Groundwater Dependent Ecosystems Atlas." from http://www.bom.gov.au/water/groundwater/gde/.

Christie, P. (2004). "Extension of the known breeding range of the Superb Parrot." Corella **28**: 75-78.

Churchill, S. (1998). Australian Bats. Sydney, Reed New Holland.

Cropper, S. C. (1993). Management of Endangered Plants. Melbourne, CSIRO Australia.

Davey, C. and D. Purchase (2004). "A survey of the superb parrot *Polytelis swainsonii* and potential nesting tree hollows along roads of the South Western Slopes New South Wales." Journal of the Australian Bird Study Association **28**(1).

Debus, S. J. S. (1995). "Surveys of large forest owls in Northern New South Wales: methodology, calling behaviour and owls responses." Corella **19**(2): 38-50.

Department of Agriculture Water and the Environment (2020). Environment Protection and Biodiversity Conservation Act 1999 – Condition-setting Policy.

Department of Agriculture Water and the Environment (2021). "Australian Faunal Directory." from https://biodiversity.org.au/afd/home.

Department of Agriculture Water and the Environment (2021). Conservation Advice for *Synemon plana* (Golden Sun Moth).

Department of Agriculture Water and the Environment (2021). "Directory of Important Wetlands in Australia." from https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands.

Department of Agriculture Water and the Environment (2021). "Species Profile and Threats Database." from https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

Department of Agriculture Water and the Environment (2022). "Protected Matters Search Tool." from http://environment.gov.au/epbc/protected-matters-search-tool.

Department of Environment (2013). Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. D. o. Environment. Canberra, ACT, Commonwealth of Australia.

Department of Environment and Climate Change (2006). Recommendation for the Identification of Critical habitat for the Eastern Suburbs Banksia Scrub Endangered Ecological Community: Draft for Public Comment Hurstville, Department of Environment and Climate Change.

Department of Environment and Climate Change (2009). Threatened species survey and assessment guidelines: field survey methods for fauna. Amphibians. Hurstville, Department of Environment Climate Change.

Department of Environment and Conservation (2004). Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft). Hurstville, Department of Environment and Conservation.

Department of Environment and Conservation (2006). "Threatened species, populations and ecological communities." 2006, from http://www.threatenedspecies.environment.nsw.gov.au/index.aspx.

Department of Environment and Energy (2017). "Register of Critical Habitat." from http://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl.

Department of Environment and Heritage (2006). White Box-Yellow Box-Blakelys red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List, unpublished.

Department of Environment Climate Change and Water (2011). National Recovery Plan White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Sydney.

Department of Planning, I. a. E. (2020). "Tarengo Leek Orchid - profile." 2021, from https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10666.

Department of Planning industry and Environment (2018). "Glossary of Biobanking terms." from https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biobanking/glossary-of-biobanking-terms.

Department of Planning Industry and Environment (2019). Guidance to assist a decision-maker to determine a serious and irreversible impact. Sydney, NSW.

Department of Planning Industry and Environment (2020). Biodiversity Assessment Method. Parramatta, NSW.

Department of Planning Industry and Environment (2020). Biodiversity Assessment Method 2020 Operational Manual – Stage 1.

Department of Planning Industry and Environment (2020). "State Vegetation Type Map: Central West / Lachlan Region Version 1.4. VIS_ID 4468." from https://data.nsw.gov.au/data/dataset/central-west-lachlan-regional-native-vegetation-pct-map-version-1-0-vis_id-4358182f4.

Department of Planning Industry and Environment (2020). Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method. Parramatta NSW.

Department of Planning Industry and Environment (2021). "Area of Outstanding Biodiversity Value register." from https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-of-outstanding-biodiversity-value/area-of-outstanding-biodiversity-value-register.

Department of Planning Industry and Environment (2021). "BioNet threatened species database." from https://www.environment.nsw.gov.au/AtlasApp/Default.aspx.

Department of Planning Industry and Environment (2021). "NSW (Mitchell) Landscapes - version 3.1." from https://data.nsw.gov.au/data/dataset/nsw-mitchell-landscapes-version-3-1.

Department of Planning industry and Environment (2021). "Threatened biodiversity profile search." from https://www.environment.nsw.gov.au/threatenedspeciesapp/.

Department of Planning Industry and Environment (2021). "Tumut Grevillea - profile.". from https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10381.

Department of Planning Industry and Environment (2022). BioNet Atlas of NSW Wildlife.

Department of Primary Industries (2021). "African boxthorn (*Lycium ferocissimum*)." from https://weeds.dpi.nsw.gov.au/Weeds/AfricanBoxthorn.

Department of Sustainability Environment Water Population and Communities (2011). Survey guidelines for Australia's threatened reptiles.

Department of Sustainability Environment Water Population and Communities (2012). Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia: A guide to the identification, assessment and management of a nationally threatened ecological community.

Department of the Environment (2010). Approved Conservation Advice for the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-east Australia, . Department of the Environment. Canberra, Australian Government, .

Department of the Environment (2013). Matters of National Environmental Significance - Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999. Canberra, ACT.

Department of the Environment (2013). Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. D. o. Environment. Canberra, ACT, Commonwealth of Australia.

Department of the Environment (2015). "Draft referral guideline for 14 birds listed as migratory species under the EPBC Act." from https://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds.

Department of the Environment (2015). Referral guideline for 14 birds listed as migratory species under the EPBC Act. Department of the Environment.

Department of the Environment (2016). "Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia." Biodiversity - Species Profile and Threats Database. Retrieved 3 June 2016, from http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=86.

Department of the Environment (2016). National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*). D. o. t. Environment. Canberra.

Department of the Environment and Energy (2017). "Superb Parrot (*Polytelis swainsonii*) in Species Profile and Threats Database." Species Profile and Threats Database. from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=738.

Department of the Environment and Energy (2018). "Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) ". from https://data.gov.au/dataset/ds-nsw-188ae132-d7b4-4a1a-8785-21786bcbe0bf/details#:~:text=gov.au%20%2D%20beta-,Interim%20Biogeographic%20Regionalisation%20for%20Australia,)%2C%20Version%207%20(Subregions)&text=Interim%20Biogeographic%20Regionalisation%20for%20Australia%20(IBRA)%20version%207.0%20represents%20a,and%20419%20sub%20regions%20...

Department of the Environment and Energy (2019). "*Anthochaera phrygia* in Species Profile and Threats Database." from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=82338.

Department of the Environment Water Heritage and the Arts (2010). Survey guidelines for Australia's threatened birds.

Department of the Environment Water Heritage and the Arts (2010). Survey guidelines for Australia's threatened frogs.

Dominelli, S. (2000). Distribution, roost requirements and foraging behaviour of the Greater Long-eared Bat (*Nyctophilus timoriensis*) and the Little Pied Bat (*Chalinolobus picatus*) in the Bookmark Biosphere Reserve, An Unpublished Report prepared for Bookmark Biosphere Trust, South Australia.

DPI Fisheries (2013). Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 upate). NSW.

Duncan, A., et al. (1999). The Action Plan for Australian Bats. E. Australia. Canberra.

Ellis, M., et al. (1999). Eastern Long-eared Bat Nyctophilus timoriensis. The Action Plan for Australian Bats. A. Duncan, G. Baker and M. N. Canberra, Environment Australia**:** 42-43.

Fairfull, S. and G. Witheridge (2003). Why do fish need to cross the road? Fish passage requirements for waterway crossings. Cronulla, NSW Fisheries.

Garnett, S. T. and G. M. Crowley (2000). The Action Plan for Australian Birds. Canberra, Environment Australia.

Higgins, P. J., et al., Eds. (2001). Handbook of Australian, New Zealand and Antarctic Birds Volume 5: Tyrant-flycatchers to Chats. Melbourne, Oxford University Press.

Kavanagh, R. P. and S. J. S. Debus (1994). "The Powerful Owl *Ninox strenua* in New South Wales." Australian Birds **28, supplement 21-38**.

Keith, D. (2004). Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT Hurstville, Department of Environment and Conservation.

Manning, A. D., et al. (2004). "The conservation implications of bird reproduction in the agricultural “matrix”: a case study of the vulnerable superb parrot of south-eastern Australia." Biological Conservation **120**(3): 363-374.

Manning, A. D., et al. (2007). "Large-scale spatial and temporal dynamics of the vulnerable and highly mobile superb parrot." Journal of Biogeography **34**(2): 289-304.

NSW Government (2021). "BioNet Vegetation Classification." from https://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx.

NSW Government (2021). "Vegetation Central Southern NSW ADS40 E 3884 (dataset)." from https://data.nsw.gov.au/data/dataset/vegetation-map-by-3d-digital-image-interpretation-vegetation-of-central-southern-nsw-vis-id-51b16/resource/2a2515d1-8df7-4471-a9a0-677321900137.

Office of Environment & Heritage (2016). "State Vegetation Type Map: Central West / Lachlan Region Version 1.4. VIS_ID 4468." from https://data.nsw.gov.au/data/dataset/central-west-lachlan-regional-native-vegetation-pct-map-version-1-0-vis_id-4358182f4.

Office of Environment & Heritage (2017). "Blue-billed Duck - profile.".

Office of Environment & Heritage (2017). "Eastern Bentwing-bat - profile." Retrieved 18 September, 2018, from https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10534.

Office of Environment & Heritage (2017). "Regent Honeyeater - profile." from https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10841.

Office of Environment & Heritage (2017). "Rosenberg's Goanna - profile." Retrieved 18 September 2018, from https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10826.

Parnaby, H. E. (1995). Greater Long-eared Bat Nyctophilus timoriensis. Chatswood, NSW, Reed Books.

Pennay, M., et al. (2004). Bat calls of NSW. Region based guide to the echolocation calls of microchiropteran bats. Sydney, New South Wales Department of Environment and Conservation and State Forests of New South Wales.

Royal Botanic Gardens and Domain Trust (2021). "PlantNet - The Plant Information Network System of Botanic Gardens Trust (version 2.0)." from http://plantnet.rbgsyd.nsw.gov.au/.

Saunders, D. A., Tzaros, C., (2011). National Recovery Plan for the Swift Parrot Lathamus discolor. Melbourne, Birds Australia.

Smith, M. L. (2003). Aquatic Ecology in Environmental Impact Assessment - EIA Guideline Series. Brookvale NSW.

Strahan, R. (1995). The Mammals of Australia. Sydney, Reed New Holland.

Threatened Species Scientific Committee (2010). Commonwealth Listing Advice on Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia. D. o. t. E. W. H. a. t. Arts. Department of the Environment, Water, Heritage and the Arts, Canberra, ACT.

Threatened Species Scientific Committee (2015). Conservation Advice *Nyctophilus corbeni* (south-eastern long-eared bat). D. o. t. Environment.

Turbill, C. and M. Ellis (2006). "Distribution and abundance of the south eastern form of the Greater Long-eared Bat Nyctophilus timoriensis." Australian Mammalogy **28**: 1-7.

van der Ree, R. (2002). "The population ecology of the Squirrel Glider (*Petaurus norfolcensis*) within a network of remnant linear habitats." Wildlife Research **29**(4): 329 - 340.

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix A BAM requirements for a Biodiversity Development Assessment Report

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Table A.1 Minimum information requirements for a BDAR (Table 24 and Table 25 of the BAM)

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Introduction	Introduction to the biodiversity assessment including: • brief description of the proposal • identification of subject land1 boundary, including: – operational footprint (if BDAR) – construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR) – land proposed for biodiversity certification (if BCAR) • general description of the subject land • sources of information used in the assessment, including reports and spatial data.	Chapter 1 Section 1.2 Section 1.5	• Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR).	Chapter 1 Figure 1.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Landscape features	Identification of site context components and landscape features, including: • general description of subject land topographic and hydrological setting, geology and soils • percent native vegetation cover in the assessment area (as described in BAM Section 3.2) • IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.)) • rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E) • wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.)) • connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6)) • karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.) • areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) • any additional landscape features identified in any SEARs for the proposal.	Chapter 4	• Site Map – Boundary of subject land – Cadastre of subject land – Landscape features identified in BAM Subsection 3.1.3 • Location Map – Digital aerial photography at 1:1,000 scale or finer – Boundary of subject land – Assessment area, (i.e. the subject land and either 1500m buffer area or 500m buffer for linear development – Landscape features identified in BAM Subsection 3.1.3 – Additional detail (e.g. local government area boundaries) relevant at this scale • Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: – IBRA bioregions and subregions – rivers, streams and estuaries – wetlands and important wetlands – connectivity of different areas of habitat – karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features – areas of outstanding biodiversity value occurring on the subject land and assessment area – any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs.	Chapter 4 Figure 1.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Native vegetation	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3) and Subsection 4.1.1) • provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2) • review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1) • describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2 • where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A). For each PCT within the subject land, describe: • vegetation class • extent (ha) within subject land • evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)) • plant species relied upon for identification of the PCT and relative abundance of each species • if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)) • estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.)) Describe the vegetation integrity assessment of the subject land, including: • identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1) • assessment of patch size (as described in BAM Subsection 4.3.2) • survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) • use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	Section 3.1 Chapter 5	• Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2) • Map of PCTs within the subject land (as described in BAM Section 4.2(1.)) • Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1) • Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries • Map of TEC distribution on the subject land and table of TEC listing, status and area (ha) • Patch size areas (as described in BAM Subsection 4.3.2) • Table of current vegetation integrity scores for each vegetation zone within the site and including: – composition condition score – structure condition score – function condition score • Presence of hollow bearing trees.	Section 3.1 and Chapter 5 Figure 5.1 Figure 5.2 Figure 5.3 Figure 5.5 Table 5.19 Table 5.2 Table 5.21 Figure 5.4

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Threatened species	Identify ecosystem credit species likely to occur on the subject land, including: • list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or • vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list. From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.)). Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3).	Section 1.6 Section 3.3 Chapter 6 Appendix C Appendix D Appendix H	• Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: – the ecosystem credit species removed from the list – the sensitivity to gain class of each species • Table detailing species credit species in accordance with BAM section 5.2 and identifying: – the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present – the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map • Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4) • Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5).	Section 1.6 Section 3.3 Chapter 6 Appendix C Appendix D Appendix H Table 6.1 Table 6.2 Table 6.3 Table 6.4 Table 6.5 Table 6.6 Table 6.7 Table 6.8 Table 6.9 Figure 6.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
	Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published • timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: • justification of the use of an expert report • identify the expert, provide evidence of their expert credentials and Departmental approval of expert status • all requirements of Box 3 have been addressed in the expert report. Where use of local data is proposed (BAM Subsection 1.4.2): • identify relevant species • identify data to be amended • identify source of information for local data, e.g. published literature, additional survey data, etc. • justify use of local data in preference to VIS Classification or TBDC data • provide written confirmation from the decision-maker that they support the use of local data			

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: • the unit of measure for each species is documented • for species assessed by area: – the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5) – a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied • for species assessed by counts of individuals: – the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) – the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken – the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land. Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4).			

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Prescribed impacts	• Identify potential prescribed biodiversity impacts on threatened entities, including: – karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) – occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) – corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) – water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4) – protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) – where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6) • Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts • Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3).	Chapter 7	• Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Chapter 7

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Avoid and Minimise Impacts	• Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: – modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting – the proposed mode or technology – routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route – alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location – alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site • Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2) • Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Section 7.2.1(3.)).	Chapter 9	• Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility • Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation • Maps demonstrating indirect impact zones where applicable.	Chapter 9 Table 9.1 Table 9.2

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Assessment of Impacts	• Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1) • Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): – description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal – documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications – reporting any limitations or assumptions, etc. made during the assessment – identification of the threatened entities and their habitat likely to be affected • Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: – karst, caves, crevices, cliffs, rocks and other features of geological significance – human-made structures – non-native vegetation – connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range – movement of threatened species that maintains their life cycle – water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities • Assessment of the impacts of wind turbine strikes on protected animals • Assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	Chapter 10	• Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts.	Chapter 10 Table 10.2

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Mitigation and Management of Impacts	• Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including: – techniques, timing, frequency and responsibility – identify measures for which there is risk of failure – evaluate the risk and consequence of any residual impacts – document any adaptive management strategy proposed • Identification of measures for mitigating impacts related to: – displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) – indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) – mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2) • Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5).	Chapter 11	• Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Chapter 11 Table 11.1

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Impact Summary	• Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: – addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land – addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land – documenting assumptions made and/or limitations to information – documenting all sources of data, information, references used or consulted – clearly justifying why any criteria could not be addressed • Identification of impacts requiring offset in accordance with BAM Section 9.2 • Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.) • Identification of areas not requiring assessment in accordance with BAM Section 9.3. Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including: • future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) • change in vegetation integrity score (BAM Subsection 8.1.1) • number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 9) • number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3).	Chapter 12	• Map showing the extent of TECs at risk of an SAII within the subject land • Map showing location of threatened species at risk of an SAII within the subject land • Map showing location of: – impacts requiring offset – impacts not requiring offset – areas not requiring assessment • Table of PCTs requiring offset and the number of ecosystem credits required • Table of threatened species requiring offset and the number of species credits required.	Figure 12.1 Figure 12.2 Table 12.3 Table 12.4

Report section	Information	Section in BDAR	Maps and data	Section in BDAR
Biodiversity Credit Report	• Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2).	Chapter 13	• Table of credit class and matching credit profile.	Chapter 13 Table 13.1 Table 13.2 Table 13.3 Table 13.4 Table 13.5 Table 13.6

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix B Secretary's Environmental Assessment Requirements

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Planning Secretary's Environmental Assessment Requirements

Section 5.16 of the *Environmental Planning and Assessment Act 1979*

Application Number	SSI-9406
Proposal	Inland Rail – Illabo to Stockinbingal
Location	Land generally in a new north-south corridor, from the Main South rail line north-east of Illabo to the Parkes to Stockinbingal rail line to the west of Stockinbingal
Proponent	Australian Rail Track Corporation
Date of Issue	30 April 2021

1. General SEARs

Desired Performance Outcome	Requirement	Current Guidelines
1. Environmental Impact Assessment Process The process for assessment of the project is transparent, balanced, well focussed and legal.	1. The Environmental Impact Statement must be prepared in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation). 2. The project will impact matters of national environmental significance (MNES) protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed under an Accredited Assessment. The Proponent must assess impacts to MNES protected under the EPBC Act. The assessment must be in accordance with the requirements listed in Attachment A. 3. Where the project requires approval under the EPBC Act and is being assessed under the Bilateral Agreement (pursuant to Amending Agreement No.1) the EIS must address: (a) consideration of any Protected Matters that may be impacted by the development where the Commonwealth Minister has determined that the project is a Controlled Action; (b) identification and assessment of those Protected Matters that are likely to be significantly impacted; (c) details of how significant impacts to Protected Matters have been avoided, mitigated and, if necessary, offset; and (d) consideration of, and reference to, any relevant conservation advices, recovery plans and threat abatement plans. 4. The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	EPBC Act Environment Assessment Process (SEWPAC, 2010)
2. Environmental Impact Statement The project is described in sufficient detail to enable clear understanding that the project has been developed through an iterative process of impact identification and assessment and project refinement to avoid, minimise or offset impacts so that the project, on balance, has the least adverse environmental, social and economic	1. The EIS must include, but not necessarily be limited to, the following: (a) executive summary; (b) a description of the project, including key components and activities (including ancillary components and activities) required to construct and operate it including: - project overview; - site and route locations (including use of plans); - scope of works to construct the project, including key activities, description of	

impact, including its cumulative impacts.	methodologies, working hours, indicative plant and equipment to be used; - timing of key construction activities; - acquisition of privately owned, council and crown land; and - connections to adjacent Inland Rail sections; (c) a statement of the objective(s) of the project; (d) a summary of the strategic need for the project with regard to its critical State significance and relevant State Government policy; (e) an analysis of any feasible alternatives to the project; (f) a description of feasible options within the project; (g) a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative / option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to and options(s) within the project were selected; (h) a general description of different construction methods that were analysed and preferred methods; (i) a concise description of the general biophysical, social and economic environment that is likely to be impacted by the project (including offsite impacts). Elements of the environment that are not likely to be affected by the project do not need to be described; (j) a description of the trains that will operate under the project; (k) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts; (l) the identification and assessment of key issues as provided in the 'Assessment of Key Issues' performance outcome;		

(m)a statement of the outcomes the Proponent will achieve for each key issue;

(n) measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact;

(o) consideration of the interactions between measures proposed to avoid or minimise impact(s), between impacts themselves and between measures and impacts;

(p) an assessment of the relevant cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed;

(q) statutory context of the project as a whole, including:

- how the project meets the provisions of the EP&A Act and EP&A Regulation; and
- a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out;

(r) a chapter that synthesises the environmental impact assessment and provides:

- a succinct but full description of the project for which approval is sought;
- a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project;
- a compilation of the impacts of the project that have not been avoided;
- a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts;
- a compilation of the outcome(s) and criteria the proponent will achieve and how these will be monitored; and
- the reasons justifying carrying out the project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable

	development and cumulative impacts; and (s) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software. 2. The EIS must only include data and analysis that is reasonably needed to make a decision on the project. Relevant information must be succinctly summarised in the EIS and included in full in appendices. Irrelevant, conflicting or duplicated information must be avoided.	
3. Assessment of Key Issues* Key issue impacts are assessed objectively and thoroughly to provide confidence that the project will be constructed and operated within acceptable levels of impact. * Key issues are nominated by the Proponent in the CSSI project application and by the Department in the SEARs. Key issues need to be reviewed throughout the preparation of the EIS to ensure any new key issues that emerge are captured. The key issues identified in this document are not exhaustive but are key issues common to most CSSI projects.	1. The level of assessment of likely impacts must be proportionate to the significance of, or degree of impact on, the issue, within the context of the project location and the surrounding environment. The level of assessment must be commensurate to the degree of impact and sufficient to ensure that the Department and other government agencies are able to understand and assess impacts. 2. For each key issue the Proponent must: (a) assess the issue (including modelling as relevant), and address and undertake the requirements specified in section 2; (b) describe the biophysical, social and economic environment, as far as it is relevant to that issue, including substantiated baseline data that is reflective of current guidelines where relevant; (c) describe the legislative and policy context, as far as it is relevant to the issue; (d) identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), the impacts of concurrent activities within the project and cumulative impacts (parallel and sequential) with other projects; (e) demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies); (f) identify clear and quantifiable actions, outcomes and, where possible, performance criteria; (g) detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant); (h) detail how residual impacts will be managed or offset, and the approach and effectiveness of these measures; and (i) measures to monitor the avoidance, minimisation and offsetting of impacts to ensure quantified outcomes and criteria are met. 3. Where multiple options to avoid or minimise impacts are available, they must be identified and considered, and the proposed measure justified taking into account the public interest.	
4.	1. The project must be informed by consultation, including with relevant local, State and	

Consultation The project is developed with meaningful and effective engagement during project design and delivery.	Commonwealth government agencies, infrastructure and service providers, special interest groups, local Aboriginal community groups, affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines. 2. The Proponent must document the consultation process and demonstrate how the project has responded to the inputs received. 3. The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution. 4. Where the Proponent establishes a Community Consultative Committee (CCC) for the project, the establishment and operation of the CCC must be in accordance with the Department's *Community Consultative Guidelines State Significant Projects (2019)*. The CCC must not be the only or primary method of engagement with the community on the project.	

2. Key Issue SEARs

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
1. Biodiversity The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. he Offsets and/or supplementary measures are assured which are equivalent to any residual impacts of project construction and operation.	1. Biodiversity impacts in accordance with s7.9 of the *Biodiversity Conservation Act 2016* (BC Act), the Biodiversity Assessment Method (BAM), and be documented in a Biodiversity Development Assessment Report (BDAR). 2. The BDAR must document the application of the avoid, minimise and offset framework in accordance with the BAM. 3. The BDAR must include information in the form detailed in s6.12 of the BC Act, cl6.8 of the *Biodiversity Conservation Regulation 2017* and the BAM. 4. The BDAR must be submitted with all digital spatial data associated with the survey and assessment as per Appendix K of the BAM. 5. The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2020 under s6.10 of the BC Act. 6. The BDAR must include details of the measures proposed to address offset obligations in accordance with the BAM and the EPBC Act, as follows: a) The total number and classes of biodiversity credits required to be retired for the development/project; b) The number of classes of like-for-like biodiversity credits proposed to be retired; c) The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; d) Any proposal to fund a biodiversity conservation action; e) Any proposal to make a payment to the Biodiversity Conservation Fund.	Biodiversity Assessment Method (DPIE 2020) BAM Accredited Assessor Resources (includes all current BAM survey guidelines) Biodiversity Assessment Method 2020 Operational Manual Stage 1 (DPIE 2020) Biodiversity Assessment Method Operational Manual Stage 2 (OEH, 2019) Significant Impact Guidelines 1.1 Matters of National Environmental Significance (DEWHA, 2013) Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013 (DPI, 2013) Threatened Species Survey and Assessment Guidelines Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Aquatic Ecology in Environmental Impact Assessment – EIA Guideline (Marcus Lincoln Smith 2003) Freshwater threatened species distribution maps ()

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	7. Impacts on biodiversity values not covered by the BAM. This includes a threatened aquatic species assessment (Part 7A *Fisheries Management Act 1994*) to address whether there are likely to be any significant impact on listed threatened species, populations or ecological communities listed under the *Fisheries Management Act 1994* (FM Act). 8. Identify whether the project, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the BC Act, FM Act and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).	
2. Protected and Sensitive Lands The project is designed, constructed and operated to avoid or minimise impacts on protected and sensitive lands. The project is designed, constructed and operated to avoid or minimise future exposure to coastal hazards and processes.	1. Assess the impacts of the project on environmentally sensitive land and processes (and the impact of processes on the project) including, but not limited to: (a) protected areas (including land and water) managed by DPIE BCD and/or DPI Fisheries under the *National Parks and Wildlife Act 1974* and the *Marine Estate Management Act 2014*; (b) Key Fish Habitat as mapped and defined in accordance with the FM Act; (c) waterfront land as defined in the *Water Management Act 2000;* (d) land or waters identified as Critical Habitat under the BC Act, FM Act or EPBC Act; and (e) biobank sites, private conservation lands and other lands identified as offsets.	Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010) Revocation, Re-categorisation and Road Adjustment Policy (OEH, 2012) Guidelines for controlled activities on waterfront land (DPI 2012) Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013 (DPI, 2013) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003)
3. Transport and Traffic Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained.	1. Construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to: (a) the likely construction access routes (including haul routes) and the scheduling of construction vehicle movements; (b) the indicative number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements and track machines); (c) construction worker parking; (d) the nature of existing traffic (types and number of movements) on	Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2007) Guide to Traffic Generating Developments Version 2.2 (RTA, 2002) Cycling Aspects of Austroads Guides (Austroads, 2014) NSW Bicycle Guidelines v 1.2 (RTA, 2005) Planning Guidelines for Walking and Cycling

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.	construction access routes (including consideration of peak traffic times, movement of livestock, agricultural machinery, farm vehicles and other farm infrastructure) and assessment of traffic impacts on these routes including identifying traffic management measures to mitigate any issues; (e) provisions proposed to ensure safe access and egress to/from the classified road network; (f) the nature of any train paths (types and number of movements) and potential impact to these train paths due to additional track possession requirements; and (g) the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project and the duration of these changes. 2. Operational transport impacts of the project for both road and rail, including: (a) forecast travel demand and traffic volumes for the project (road and rail); (b) travel time analysis; (c) performance of key intersections and level crossings by undertaking a level of service analysis at key locations; (d) wider transport interactions (local and regional roads, cycling, movement of livestock or farm vehicles, intermodal hubs. public and freight transport and the broader NSW rail network); and (e) identification of traffic and transport measures to mitigate any impacts. The assessment must include the modelling of the operational impact of the project. 3. Assess the feasibility of level crossings (existing and proposed) and justify the safety and operational impacts and/or benefits of the proposed crossing type, taking into account the NSW Government's Construction of New Level Crossings Policy. 4. In the assessment of level crossings, the EIS must: (a) provide a safety assessment for each level crossing. The safety	(DIPNR, 2004) Construction of New Level Crossing Policy (TfNSW, 201) Future Transport Strategy 2056 (TfNSW, 2018) NSW Draft Freight and Ports Plan (TfNSW, 2018-2023) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Australian Level Crossing Assessment Model (ALCAM, 2016) Railway Crossing Safety Series 2011, Plan: Establishing a Railway Crossing Safety Management Plan (RTA, 2011) Austroads (2016). Safe System Assessment Framework

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	assessment is to be consistent with ALCAM, and any Interface Agreements and related Safety Management Plans; (b) demonstrate how the risks identified in the So Far As Is Reasonably Practical (SFAIRP) process will be reduced in consultation with the relevant road authority and TfNSW. (c) assess potential short-stacking impacts; (d) confirm road approaches to level crossings are fit for purpose, safe and designed and constructed in accordance with Austroads Guide to Road Design; and account any rationalisation of private and public level crossings in line with the NSW Government's *Level Crossing Closure Policy*.	
4. Flooding, Hydrology and Geomorphology The project minimises changes to the existing flood regime's impacts on property, public safety and the environment resulting from alteration of the water flow characteristics of watercourses and overland flowpaths. Where feasible, the project includes remedial measures to mitigate any adverse water flow impacts or flood safety risks caused by the existing rail infrastructure within the project area. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding,	1. Description of topographic and hydrological conditions of the site and surrounding area, including: (a) Assessment of the existing hydrology and flooding characteristics of all watercourses within and adjacent to the project area. This includes locating and assessing flowpaths emanating from existing culverts, pipes and bridges under the rail formation, or from overtopping of the existing formation in flood events. (b) Description of the existing and proposed topography in all areas that could be potentially affected by floodwaters. This includes the spatial location, and the horizontal and vertical dimensions of all spoil mounds. (c) Carrying out of investigations to assess the propensity for scour, erosion and geomorphological changes to occur within any watercourses or overland flowpaths affected by the project. 2. Design parameters and features, including: (a) Description and justification of quantitative flood management objectives for flooding, hydrological and geomorphological changes resulting from the project. These objectives are to consider land use and include afflux, velocity, extent, duration, hazard and scour potential.	NSW Government's Floodplain Development Manual (Department of Natural Resources, 2005) PS 07-003 New guideline and changes to section 117 direction and EP&A Regulation on flood prone land Practical Consideration of Climate Change - Flood risk management guideline (DECC, 2007) Floodplain Management Plans: https://www.industry.nsw.gov.au/water/plans-programs/healthyfloodplains-project/plans Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation Australian Disaster Resilience Handbook 7 – Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia. (AIDR, 2017)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
flooding hazards, or flooding induced by infrastructure failure.	(b) Description and justification of the proposed flood planning level (FPL) for the project including the annual exceedance probabilities (AEPs) of the floods which will overtop the formation and rail. When establishing the appropriate FPL, consider any impacts on adjacent infrastructure and any alteration works required to improve flood immunity of affected infrastructure. (c) Description of the location and size of all existing and proposed pipes, culverts and bridges, and the locations and AEPs of floods that overtop the existing formation and rail. (d) Preliminary engineering designs of the velocity dispersal velocity attenuation and other velocity mitigation works that are proposed to avoid adverse scouring on the land downstream of the project area, adjacent to locations where pipes, culverts or bridges are proposed or where the rail formation may be overtopped. (e) At locations along the rail route, identification of the width of land between the toe of the formation and the downstream boundary of the project area, that is available for the construction of these mitigation works. Where there is insufficient width of project land available for these works, clear identification of the extent of additional land beyond the project boundary area that may be required, including the locations where easements over land or acquisition of land may be required. 3. Operational phase impacts of the project on flood behaviour for a full range of flood events up to and including the PMF (including consideration of the impacts of climate change and differing storm durations), including: (a) utilisation of 2D hydrologic and hydraulic models that are consistent with ARR and current best practice and utilise topographic and infrastructure data that is of sufficient spatial coverage and accuracy to ensure the resultant models can accurately assess existing and proposed water flow characteristics; (b) Identification of allowance for blockage of all cross-drainage structures to be made in accordance with ARR; (c) having these models independently peer-reviewed with the review findings published in the EIS;	*Australian Rainfall and Runoff* (Commonwealth of Australia, Geoscience Australia, 2019) (ARR) *Floodplain Risk Management Guide - Incorporating [2016] Australian Rainfall and Runoff in studies* (OEH, 2019) AS/NZS 3100:2018 Risk Management – Principles and Guidelines

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	(d) assessing any changes to the potential flood affectation, scouring or geomorphological changes to other properties, assets and infrastructure, over a full range of flood durations and flood frequencies against the proposed quantitative flood management objectives; (e) assessing changes in upstream and downstream flowpaths (location, discharges and velocities, including overland flow); (f) where the existing rail infrastructure has an adverse flood impact on property or people, the flood assessment must consider the extent to which the project alleviates or exacerbates these existing impacts; (g) assessing impacts of extreme floods up to the probable maximum flood (PMF) including consideration of flood risks to people and property resulting from failure of the formation or washouts of ballast. (h) assessing the consistency (or inconsistency) with the applicable Council or DPIE Water floodplain management plans. The requirements of these plans must be discussed with DPIE Water and the relevant Council; (i) assessing whether each component of the project is compatible with the flood hazard of the land and the hydraulic functions of flow conveyance, floodway and flood storage; (j) assessing impacts on farm dams, agricultural infrastructure, crops and activities associated with altered hydrology including volumetric changes in water flows; (k) assessing any impacts that the project may have upon existing community emergency management arrangements for flooding. These matters must be discussed with the State Emergency Service and applicable Council; and (l) evaluating any social and economic impacts that the project may have on the community as a consequence of changes to flooding and hydrology including dividing or fragmentation of property and changes to property management which could lead to the loss of viability. 4. Construction impacts of the project including:	

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	(a) typical construction methodology and programming that may affect flood impacts; (b) structures and plant located on the floodplain during construction; (c) land uses and infrastructure in the vicinity of the project susceptible to flood impacts that may arise during the construction phase; (d) acceptable impacts having regard to the nature and duration of various construction activities within the floodplain, and the probabilities of a range of flood events occurring over the duration of the construction period; and (e) measures to mitigate risks of construction impacts occurring. 5. In the event that operational impacts do not comply with the nominated quantitative flood management objectives, provide measures to ensure the project's detailed design complies with the quantitative objectives. Alternatively: (a) demonstrate that design changes to meet objectives at a given project location are not practicable; and (b) describe how broad flooding objectives will still be met at a given location; and (c) detail procedures to ensure that the flood performance is acceptable to affected parties.	
5. Water – Hydrology Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where	1. Describe (and map) the existing hydrological regime for any surface and groundwater resource (including reliance by users and for ecological purposes) likely to be impacted by the project, including stream orders, as per the BAM. 2. Prepare a conceptual water balance for ground and surface water including the proposed intake and discharge locations, volume, frequency and duration, sources, security and licensing requirements. 3. Surface and groundwater hydrology impacts of the construction and operation of the project and any ancillary facilities (both built elements and discharges) on surface and groundwater hydrology in	Biodiversity Assessment Method (DPIE, 2020) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008) NSW Aquifer Interference Policy (DPI, 2012) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Risk assessment Guidelines for Groundwater Dependent Ecosystems (Office of Water, 2012)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.	accordance with the current guidelines, including: (a) natural processes within rivers, wetlands, estuaries, marine waters and floodplains that affect the health of the fluvial, riparian, estuarine or marine system and landscape health (such as modified discharge volumes, durations and velocities), aquatic connectivity and access to habitat for spawning and refuge; (b) impacts from any permanent and temporary interruption of groundwater flow, including the extent of drawdown, barriers to flows, implications for groundwater dependent surface flows, ecosystems and species, groundwater users and the potential for settlement; (c) changes to environmental water availability and flows, both regulated/licensed and unregulated/rules-based sources; (d) direct or indirect increases in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses; (e) minimising the effects of proposed stormwater and wastewater management during construction and operation on natural hydrological attributes (such as volumes, flow rates, management methods and re-use options) and on the conveyance capacity of existing stormwater systems where discharges are proposed through such systems; and (f) water take (direct or passive) from all surface and groundwater sources with estimates of annual volumes during construction and operation, including an assessment of the availability of water where water entitlement is required to be purchased. 4. Identification of any requirements for baseline monitoring of hydrological attributes.	Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018) Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (OEH and EPA, 2017) Relevant water sharing plans at https://www.mdba.gov.au/publications/all-publications
6. Water – Quality The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards	1. Water quality impacts, including: (a) stating the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values; (b) identifying and estimating the quality and quantity of pollutants	NSW Water Quality and River Flow Objectives at http://www.environment.nsw.gov.au/ieo/ Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006) Australian and New Zealand Guidelines for Fresh and

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable).	that may be introduced into the water cycle by source and discharge point and describe the nature and degree of impact that any discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment; (c) identifying the rainfall event that the water quality protection measures will be designed to cope with; (d) the significance of any identified impacts including consideration of the relevant ambient water quality outcomes; (e) demonstrating how construction and operation of the project will, to the extent that the project can influence, ensure that: - where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and - where the NSW WQOs are not currently being met, activities will work toward their achievement over time; (f) justifying, if required, why the WQOs cannot be maintained or achieved over time; (g) demonstrating that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented; (h) identifying sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments; and (i) identifying proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality.	Marine Water Quality (ANZG, 2018) Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DECC, 2008) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008) Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018)
7. Soils The environmental values of land, including soils, subsoils and landforms, are protected. Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.	1. Assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, the Proponent must document how the assessment and/or remediation would be undertaken in accordance with current guidelines. 2. Assess whether salinity is likely to be an issue and if so, determine the presence, extent and severity of soil salinity within the project area.	Managing Land Contamination: Planning Guidelines SEPP 55 –Remediation of Land, (DUAP & EPA, 1998) Guidelines for Consultants Reporting on Contaminated Sites (OEH, reprinted 2011) Guidelines for the NSW Site Auditor Scheme (DEC, 2006) Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	3. Assess the impacts of the project on soil salinity and how it may affect groundwater resources and hydrology. 4. Assess the impacts on soil and land resources (including erosion risk or hazard). Particular attention must be given to soil erosion and sediment transport consistent with the practices and principles in the current guidelines.	(EPA, 2015) Urban and regional salinity – guidance given in the Local Government Salinity Initiative booklets (http://www.environment.nsw.gov.au/salinity/solutions/urban.htm) which includes *Site Investigations for Urban* Salinity (DLWC, 2002) Landslide risk management guidelines presented in Australian Geomechanics Society (2007) Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2000) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008) Other guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997*
8. Heritage The design, construction and operation of the project facilitates, to the greatest extent practicable, the long-term protection, conservation and management of the heritage and cultural significance of items of environmental heritage and Aboriginal objects and places. The design, construction and operation of the project avoids or minimises impacts, to the greatest extent practicable, on the	1. Direct and/or indirect impacts (including cumulative impacts) to the significance of: (a) Aboriginal places, objects and cultural heritage values, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines; (b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan; (c) environmental heritage, as defined under the *Heritage Act 1977*; and (d) items listed on the State, National and World Heritage lists; (e) heritage items, areas of cultural significance and conservation areas identified in environmental planning instruments applicable to the project area; and	Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) Aboriginal Cultural Heritage Consultation requirements for proponents (DECCW, 2010) Code of practice for archaeological investigation of Aboriginal objects in NSW (DECCW, 2010) NSW Skeletal Remains: Guidelines for Management of Human Remains (Heritage Office, 1998) Aboriginal site recording form Aboriginal site impact recording form Aboriginal Heritage Information Management System

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
heritage significance of environmental heritage and Aboriginal objects and places	(f) heritage items in relevant Section 170 Heritage and Conservation Registers. 2. Where impacts to heritage items are identified, the assessment must: (a) include a significance assessment, a statement of heritage impact for all heritage items and a historical archaeological assessment; (b) assess the consistency of the project against conservation policies of any relevant conservation management plan; (c) consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment, drainage infrastructure, contamination remediation and site compounds (as relevant); (d) outline measures to avoid and minimise those impacts during construction and operation in accordance with the current guidelines; and (e) be undertaken by a suitably qualified heritage consultant(s), cultural consultant(s) and/or historical archaeologist (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria). 3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). 4. Impacts to Aboriginal objects and/or places must be assessed and documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). Consultation must be undertaken with Aboriginal people in accordance with the Aboriginal Cultural Heritage Consultation	site registration form Care agreement application form Criteria for the assessment of excavation directors (NSW Heritage Council, 2011) NSW Heritage Manual (Heritage Office and Department of Urban Affairs and Planning, 1996) Assessing Heritage Significance (NSW Heritage Office, 2001) The Australia ICOMOS Burra Charter

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	requirements for proponents (DECCW, 2010). The ACHAR must: (a) document the outcomes of consultation with Aboriginal people and outline measures proposed to mitigate impacts, and document the significance of cultural heritage values for Aboriginal people who have a cultural association with the land; (b) identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the project; (c) document the outcomes of the archaeological surface survey and test excavation to inform the need for targeted test excavations; (d) assess and document impacts on Aboriginal cultural heritage values and demonstrate attempts to avoid impacts upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to the AHIMS Register; and (e) outline procedures to be followed if Aboriginal objects, burials or skeletal material are found at any stage of the life of the project to formulate appropriate measures to manage unforeseen impacts.	
9. Noise and Vibration Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity. Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the	1. Construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. 2. The assessment of construction noise and vibration must address: (a) the nature of construction activities and related noise characteristics; (b) the intensity and duration of noise (both air and ground borne) and vibration impacts. This must include consideration of extended construction impacts associated with ancillary facilities (and the like) and construction fatigue;	Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC, 1990) Assessing Vibration: a technical guideline (DEC, 2006) Interim Construction Noise Guideline (DECCW, 2009) Noise Policy for Industry (EPA, 2017) Construction Noise and Vibration Strategy (TfNSW,

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
project are effectively managed to protect the amenity and well-being of the community. Increases in noise emissions and vibration affecting environmental heritage as defined in the *Heritage Act 1977* during operation of the project are effectively managed.	(c) the identification and nature of receivers, existing and proposed, during the construction period; (d) the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage). (e) the nature of the impact and the sensitivity of receivers, including but not limited to residential (permanent and short term), tourist and commercial uses, both existing and proposed, and level of impact including for out of hours works; (f) the need to balance timely conclusion of noise and vibration-generating works with periods of receiver respite, and other factors that may influence the timing and duration of construction activities (such as traffic management); (g) noise impacts of out-of-hours works (including utility works and works associated with the SSI including those undertaken under another assessment pathway), possible locations where out-of-hours works would be undertaken, the activities that would be undertaken, the estimated duration of those activities and justification for these activities in terms of the *Interim Construction Noise Guideline* (DECC, 2009); (h) sleep disturbance (including the number of noise-awakening events); (i) details and analysis of the predicted effectiveness of mitigation measures to adequately manage identified impacts, including impacts as identified in (h), (j) any potential residual noise and vibration impacts following application of mitigation measures; and (k) a description of how receiver feedback received during the preparation of the EIS has been taken into account (and would be taken into account post exhibition of the EIS) in the design of mitigation measures, including any tailored mitigation,	2018) Rail Infrastructure Noise Guideline (EPA, 2013) NSW Road Noise Policy (DECCW, 2011) Development Near Rail Corridors and Busy Roads – Interim guideline (DoP, 2008) Noise Mitigation Guideline (RMS, 2015) Noise Criteria Guideline (RMS, 2015) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures (2016)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	management and communication strategies for sensitive receivers. 3. If blasting is required, demonstration that blast impacts can comply with current guidelines.	
10. Economic, Land Use and Agriculture The project minimises adverse economic impacts and capitalises on opportunities potentially available to affected communities. The project minimises impacts to property and business including agricultural enterprises and accommodation and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.	1. Economic impacts in accordance with the current guidelines. 2. Economic impacts from construction and operation on potentially affected properties, businesses, recreational users and land and water users, including property acquisitions/adjustments, access, amenity and relevant statutory rights. 3. Opportunities and processes to prioritise local industry participation practices to source construction goods and services, including training and employment targets within communities along or near the rail alignment. 4. Agricultural land use impacts in accordance with the current guidelines including: (a) current and potential Biophysical Strategic Agricultural Land and Class 1, 2 and 3 Agricultural land Classes, including land capability and agricultural productivity; (b) division or fragmentation of property and changes to property management which could lead to the loss of viability; (c) property access and the efficient and safe crossing of the rail corridor by machinery and livestock (d) impacts to changes in water regimes; (e) connectivity of property infrastructure severed by the rail corridor; and (f) livestock exclusion/management to minimise harm and losses. 5. Biosecurity risks and management measures relating to the potential for spread of pests, diseases or weeds along the length of the project alignment, in accordance with the 'general biosecurity duty' under the	Environmental Planning and Impact Assessment Practice Note: Socio-economic Assessment (RMS, 2013) New England North West Regional Plan 2036 (DPE, 2017) Infrastructure Proposals on Rural Land, Primefact 1063, second edition (DPI, 2013) NSW Invasive Species Plan 2018-202 (DPI, 2018) Land Use Conflict Risk Assessment (LUCRA) Guide (DPI, 2011) NSW Infrastructure Skills Legacy Program NSW Aboriginal Participation in Construction Policy 2018

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
	Biosecurity Act 2015. 6. Economic impact of temporary accommodation for construction workers on communities near the project site. 7. The temporary and permanent interface with road reserves, Crown Land and Travelling Stock Routes and the use and management of these landholdings affected by the proposal.	
11. Social The project minimises adverse social impacts and capitalises on opportunities potentially available to affected communities.	1. Potential social impacts of the project from the points of view of the affected community/ies and other relevant stakeholders, i.e. how they expect to experience the project. 2. How potential environmental changes in the locality may affect people's (including, but not limited to): (a) community; (b) access to accommodation and housing; (c) access to and use of infrastructure, services, and facilities; (d) culture; (e) health and wellbeing; surroundings; (f) personal and property rights; (g) decision-making systems; and (h) fears and aspirations, as relevant and considering how different groups may be disproportionately affected. 3. Social actions and outcomes that address both negative and positive social impacts.	Draft Social Impact Assessment Guideline (DPIE, 2020) Social Impact Assessment Guideline (DPE, 2017) Social Impact Assessment Scoping Tool (DPE, 2017)

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
12. Visual Amenity The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.	1. Assess the visual impact of the project (including spoil mounds, formation, bridges, viaducts and overpasses) and any ancillary infrastructure on: (a) views and vistas; (b) streetscapes, key sites and buildings; (c) heritage items including Aboriginal places and environmental heritage; and (d) the local community. 2. Provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.	AS4282-1997 Control of the obtrusive effects of outdoor lighting Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW (RMS, 2012) NSW Sustainable Design Guidelines Version 4.0 (TfNSW, 2017) Technical guideline for Urban Green Cover in NSW (OEH, 2015)
13. Waste All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.	1. Assess predicted waste generated from the project during construction and operation, including: a) classification of the waste in accordance with the current guidelines; b) estimates / details of the quantity of each classification of waste to be generated during the construction of the project, including bulk earthworks and spoil balance; c) handling of waste including measures to facilitate segregation and prevent cross contamination; d) management of waste including estimated location and volume of stockpiles; e) waste minimisation and reuse; f) lawful disposal or recycling locations for each type of waste; and g) contingencies for the above, including managing unexpected waste volumes. 2. Assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste particularly with relation to sediment/leachate control, noise and dust.	NSW Waste Avoidance and Resource Recovery Strategy 2014-21 (EPA 2014) *Waste Classification Guidelines – Part 1: Classification of Waste* (EPA 2014) Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volume 2 (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008)
14. Climate Change and Sustainability The project reduces the NSW Government's operating costs and ensures the effective	1. Sustainability of the project in accordance with the Infrastructure Sustainability Council of Australia (ISCA) *Infrastructure Sustainability Rating Tool* and recommend an appropriate target rating for the project. 2. Sustainability of the project against the current guidelines including	Australian Government's Climate Change Impacts and Risk Management – A Guide for Business and Government (2006) ISO 31000:2018 Risk management – Guidelines

Key Issue and Desired Performance Outcome	Requirement (specific assessment requirements in addition to the general requirement above)	Current Guidelines
and efficient use of resources. Conservation of natural resources is maximised. The project is designed, constructed and operated to be resilient to the future impacts of climate change.	targets and strategies to improve Government efficiency in use of water, energy and transport. 3. The risk and vulnerability of the project to climate change in accordance with the current guidelines. 4. Climate change risks must be quantified with reference to the NSW Government's climate projections at 10km resolution (or lesser resolution if 10km projections are not available) or equivalent projection tool (such as the Climate Futures Tool from CSIRO and BoM (attenuated for project region)) and incorporate specific adaptation actions in the design.	AS 5334-2013 Climate change adaptation for settlements and infrastructure – A risk based approach Infrastructure Sustainability Rating Tool Scorecard relating to energy and carbon for large infrastructure projects, ISCA NSW Infrastructure Skills Legacy Programs' training and employment targets (DOI, 2017) Infrastructure Sustainability Rating Tool Scorecard relating to energy and carbon for large infrastructure projects, ISCA Technical Guide for Climate Change Adaptation for the State Road Network (RMS, in draft) Practical Consideration of Climate Change – Floodplain Risk Management Guideline (DECC, 2007)

ATTACHMENT A – EPBC Act Requirements

Inland Rail - Illabo to Stockinbingal (EPBC 2018/8233, SSI 18_9406)

The proposed action is being assessed for the purposes of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) under Part 5 Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This document is intended to assist NSW Department of Planning and Environment (NSW DPE) to manage the environmental impact assessment process. It is not legally binding and does not replace the requirements of the EPBC Act.

Proposed Action

To construct a rail line between Illabo and Stockinbingal, spanning approximately 37 km of new rail, as part of the Inland Rail Programme.

Matters of National Environmental Significance

The EPBC Act controlling provisions for the proposed action are:

- listed threatened species and communities (sections 18 and 18A)

All matters of national environmental significance (MNES) protected under the triggered controlling provisions are potentially relevant. The Department considers that the proposed action will have a significant impact on the following:

· White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered

· Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia – Endangered

· Regent Honeyeater (*Anthochaera phrygia*) - Critically Endangered

· Swift Parrot (*Lathamus discolor*) – Critically Endangered

· Superb Parrot (*Polytelis swainsonii*) – Vulnerable

The Department further considers that the proposed action may have a significant impact on the following:

· *Austrostipa wakoolica* – Endangered

· Tarengo Leek Orchid (*Prasophyllum petilum*) – Endangered

· Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) (*Dasyurus maculatus maculatus* (SE mainland population)) - Endangered

· Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable

· Painted Honeyeater (*Grantiella picta*) – Vulnerable

· Corben's Long-eared Bat, South-eastern Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable

· Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) – Vulnerable

· Crimson Spider-orchid, Maroon Spider-orchid (*Caladenia concolor*) – Vulnerable

· Yass Daisy (*Ammobium craspedioides*) – Vulnerable

- Pink-tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable

Note that this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under this controlling provision are assessed for the Commonwealth decision-maker's consideration.

Key Issues

- The proponent submitted a referral based on preliminary desktop and rapid assessments, and identified the action was a controlled action due to potential significant impacts to the Regent Honeyeater, Swift Parrot and Superb Parrot as well as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia ecological communities. The Department has identified a longer list of species that may be impacted, for which the referral does not contain sufficient information to determine significance, as no detailed flora and fauna surveys have been completed. Consequently, the Department recommends engagement in Stage 2, before the draft EIS is exhibited, to consider the assessments of significance and determine which species are relevant to assessment of the action for EPBC Act purposes.

General Assessment Requirements

The EIS must address the matters outlined in Schedule 4 of the EPBC Regulations and the matters outlined below in relation to the controlling provisions.

1. For each of the EPBC Act-listed species and ecological communities impacted by the proposed action, the EIS must provide:

    a. Survey results, including details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Commonwealth guidelines and policy statements.

    b. A description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and

    c. Maps displaying the above information (specific to EPBC matters) overlaid with the proposed action

Note - It is acceptable, where possible, to use the mapping and assessment of Plant Community Types (PCTs) and the species surveys prescribed by the BAM as the basis for identifying EPBC Act-listed species and communities. The EIS must clearly identify which PCTs are considered to align with habitat for the relevant EPBC Act-listed species or community, and provided individual maps for each species or community.

2. The EIS must describe the nature, geographic extent, magnitude, timing and duration of any likely direct, indirect and consequential impacts on any relevant EPBC Act-listed species and communities. It must clearly identify the location and quantify the extent of all impact areas to each relevant EPBC Act-listed species or community.

3. For each of the EPBC Act-listed species and communities that are likely to be impacted by the development, the EIS must provide information on proposed avoidance and mitigation measures to deal with the impacts of the action, and a description of the predicted effectiveness and outcomes that the avoidance and mitigation measures will achieve.

4. The EIS must identify each EPBC Act-listed species and community likely to be significantly impacted by the proposed action. Where a significant impact is likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit, how offsets will be secured, and timing of protection.

Note - A number of offsets options under the NSW *Biodiversity Conservation Act 2016* will be acceptable for EPBC Act approval purposes. It is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. Like-for-like includes protection of native vegetation that is the same EEC or habitat being impacted, or funding to provide a direct benefit to the matter being impacted i.e. threat abatement, breeding and propagation programs or other relevant conservation measures.

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix C Threatened flora likelihood of occurrence assessment

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Threatened flora database searches

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Proposal site	Outcome
Acacia ausfeldii	Ausfeld's Wattle	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat in the form of PCT 266; PCT 277 & PCT 276 was recorded within the proposal site. Though not records exist within locality of the proposal site, this species has been previously recorded to the north of Stockinbingal in Weddin Mountains National Park.	Candidate species credit species subject to targeted surveys
Ammobium craspedioides	Yass Daisy	V	V	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat in the form of PCT 266; PCT 277; PCT 276; recorded within the proposal site. Though no records exist within locality of the proposal site, an outlier population has been recorded about 30km to the south of Wagga Wagga in Livingstone National Park. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Amphibromus fluitans	Floating Swamp Wallaby-grass	V	V	Periodically inundated sites (including table drains and farm dams), notably wetlands on riverine floodplain	0	PMST	Species identified in PMST search. Habitat requirements not present within Proposal site. Associated PCTs not recorded within the proposal site. Low likelihood of occurrence.	Not considered further
Austrostipa metatoris	A spear-grass	V	V	None. No specific requirements or restrictions identified in BCC	0	PMST	Species was identified in PMST search. Associated PCTs not recorded within the proposal site. The proposal site is considered outside of this species geographic distribution. No records within the locality of the alignment. Not recorded during surveys undertaken during its flowering season.	Not considered further

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Proposal site	Outcome
Austrostipa wakoolica	A spear-grass	E	E	South of Narranderra	0	BCC, PMST	Associated habitat in the form of PCT 76 and PCT 80 was recorded. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Caladenia arenaria	Sand-hill Spider Orchid	E	E	west of Lockhart and north of Rand	1	BCC, PMST, BioNet	The proposal site is considered outside of this species known distribution. One record from 1990 exists near Bethungra Mountain. Associated habitat in the form of PCT 76 was recorded	Candidate species credit species subject to targeted surveys
Caladenia concolor	Crimson Spider Orchid	E	V	None. No specific requirements or restrictions identified in BCC	4	BCC, PMST, BioNet	Associated habitat in the form of PCT 347 was recorded. Though no recent records were in locality of the proposal site, one record from 1991 exists near Bethungra Mountain. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Caladenia tensa	Greencomb Spider-orchid	–	E	–	0	PMST	The proposal site is considered outside of this species known geographic distribution. Associated habitat was not recorded within the proposal site.	Not considered further
Cullen parvum	Small Scurf-pea	E	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat (PCT 347, PCT 277, PCT 5) was recorded within the proposal site. Preferred habitat, grassland, River Red Gum Woodland or Box-Gum Woodland, sometimes on grazed land and along watercourses was recorded in moderate condition within the proposal site.	Candidate species credit species subject to targeted surveys
Diuris tricolor	Pine Donkey Orchid	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Associated habitat was widely recorded within the proposal site (PCT 76, PCT 80 and PCT 347). Previously recorded in 2000, within locality of the proposal site, west of Jundalee National Park.	Candidate species credit species subject to targeted surveys

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Proposal site	Outcome
Euphrasia arguta	Euphrasia arguta	CE	CE	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat was recorded within the proposal site (PCT 266 and PCT 276).	Candidate species credit species subject to targeted surveys
Grevillea wilkinsonii	Tumut Grevillea	E	E	Eastern part of sub-region from 10km west of the Hume Highway and north of the Snowy Mountains Highway	0	BCC	Associated habitat was recorded within the proposal site (PCT 266). Highly restricted population known from only two locations: east of Tumut and near Gundagai.	Candidate species credit species subject to targeted surveys
Indigofera efoliata	Leafless Indigo	E	E	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat in the form of PCT 76 was recorded. Though not previously recorded within locality of the proposal site, this species is known to grow on slight rises amongst ironstone formation in stony red-brown sandy loam.	Candidate species credit species subject to targeted surveys
Lepidium aschersonii	Spiny Pepper-cress	V	V	On ridges of gilgai clays	0	PMST	Species was identified in PMST search. Associated habitat in the form of PCT 76 was recorded within the proposal site, however, habitat requirements for the species, gilgai clays, were not recorded. Closest record to the west at Temora (in 1915). Species unlikely to occur.	Not considered further
Leucochrysum albicans subsp. *tricolor*	Hoary Sunray	–	E	None. No specific requirements or restrictions identified in BCC	0	PMST	Species was identified in PMST search. Not recorded within the proposal site during surveys. No records within the locality of the alignment. Species considered unlikely to occur.	Not considered further

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Proposal site	Outcome
Prasophyllum petilum	Tarengo Leek Orchid	E	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	The proposal site is considered outside of this species known geographic distribution. Associated habitat in the form of PCT 347, PCT 277, PCT 276 was recorded. Though not previously recorded within locality of the proposal site, this species is known to grow in open native grasslands. This species was identified by DEE as a possible controlled provision.	Candidate species credit species subject to targeted surveys
Pultenaea humilis	Dwarf Bush-pea	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat (PCT 347) was recorded within the proposal site. This species is known to occur in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes.	Candidate species credit species subject to targeted surveys
Senecio garlandii	Woolly Ragwort	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Associated habitat in the form of PCT 347 was recorded**.** Closest record at Ulandra Nature Reserve (1999).	Candidate species credit species subject to targeted surveys
Swainsona recta	Small Purple-pea	E	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Associated habitat was recorded within the proposal site (PCT 277, PCT 76; PCT 266; PCT 276). Though no records within the locality of the proposal site, this species is known to occur in the grassy understorey of woodlands and open-forests.	Candidate species credit species subject to targeted surveys
Swainsona murrayana	Slender Darling Pea	V	V	Western half of sub-CMA	0	BCC	Associated habitat was recorded within the proposal site (PCT 76, PCT 80).	Candidate species credit species subject to targeted surveys
Swainsona sericea	Silky Swainson-pea	V	V	None. No specific requirements or restrictions identified in BCC	0	BCC	Associated habitat was recorded within the proposal site (PCT 76). Though no records exist within the locality of the proposal site, preferred habitat in Box-Gum Woodland in the South West Slopes was recorded.	Candidate species credit species subject to targeted surveys

Scientific name	Common name	BC Act status[1]	EPBC Act status[2]	Habitat / geographic requirements[3]	BioNet records	Source[4]	Potential habitat within the Proposal site	Outcome
Tylophora linearis	Tylophora linearis	V	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Associated habitat was recorded within the proposal site (PCT 347). The closest known record of this species is historic (1915) and is located near Temora, approximately 30km west of the proposal site.	Candidate species credit species subject to targeted surveys

(1) V = Vulnerable, E = Endangered as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(3) Habitat and geographic requirements were obtained from the BAM Credit Calculator (BCC)

(4) BCC = BAM Credit Calculator, BioNet = Office of Environment and Heritage spatial search, PlantNet = Royal Botanic gardens spatial search, PMST = Protected Matters Search Tool (Department of Agriculture, Water and the Environment)

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix D Threatened fauna likelihood of occurrence assessment

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Threatened fauna database searches

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Amphibians (3)									
Sloane's Froglet	*Crinia sloanei*	V	–	Semi-permanent/ephemeral wet areas/Containing relatively shallow sections with submergent and emergent vegetation, or within 500m of wet area/ within 500m of swamps/ within 500m of waterbody	0	BCC	Species	Some potential associated habitats are likely to occur within the proposal site. While no records occur within the locality, a precautionary approach has been taken which involved targeted surveys.	Targeted surveys undertaken
Booroolong Frog	*Litoria booroolongensis*	E	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Species	Associated habitat not recorded within the proposal site. Dams and ephemeral waterways are present within the proposal site, but would not be considered suitable for this species. No records within the locality of the proposal site.	Targeted surveys undertaken
Southern Bell Frog	*Litoria raniformis*	E	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Species	Associated habitat not recorded within the proposal site. Dams and ephemeral waterways are present within the proposal site, but would not be considered suitable for this species. No records within the locality of the proposal site.	Targeted surveys undertaken

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Birds (54)									
Australasian Bittern	*Botaurus poiciloptilus*	–	E	None. No specific requirements or restrictions identified in BCC	0	PMST	Ecosystem	Species identified in PMST search. No records within the locality and not included in BAM-C list. Associated habitat, brackish or freshwater wetlands not recorded within the Proposal site.	Not considered further
Australasian Painted Snipe	*Rostratula australis*	E	E; Ma	None. No specific requirements or restrictions identified in BCC	0	PMST, BCC	Ecosystem	Associated habitat, fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber, not recorded within the proposal site.	Ecosystem credit species
Barking Owl	*Ninox connivens*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.	0	BCC	Species/ Ecosystem	Proposal site may be within the home range of local individuals, but local records are sparse and there are no records within 10km of proposal site. The proposal site provides marginal foraging habitat for this species, however unlikely to support an individual in isolation from much higher quality habitats.	Ecosystem/ species credit species Targeted surveys undertaken

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Black-breasted Buzzard	*Hamirostra melanosternon*	V	–	None. No specific requirements or restrictions identified in BCC	1	BioNet	Species/ Ecosystem	Species was not identified in BAM-C however, a record in the locality was identified in Bionet search. The potential for this species to occur within the Proposal site cannot be entirely discounted, however no associated PCTs occur within the Proposal site (Department of Planning industry and Environment 2021), and there is only one record within the locality from 1997 (Department of Planning Industry and Environment 2021). Diurnal bird surveys during breeding season (September to November) did not identify large stick nests or any individuals.	Not considered further (Diurnal bird surveys during breeding season)
Black Falcon	*Falco subniger*	V	–	None. No specific requirements or restrictions identified in BCC	3	BioNet	Ecosystem	Although not identified in BCC, species was recorded. The proposal site may occur within the home-range of one or more individuals. The proposal site's habitats are considered unlikely to support this species in isolation from habitats that are more productive in terms of prey species.	Inclusion of species as ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	–	None. No specific requirements or restrictions identified in BCC	6	BioNet, BCC	Ecosystem	The potential for this species to occur within the proposal site cannot be entirely discounted, however it does not conform to high quality woodland habitats types that this species is dependent upon for foraging and breeding purposes, so its likelihood of occurrence is considered low.	Ecosystem credit species
Blue-billed Duck	*Oxyura australis*	V	–	None. No specific requirements or restrictions identified in BCC	1	BioNet	Ecosystem	Species was not identified in BAM-C however, a record in the locality was identified in Bionet search. Species occurs in large permanent wetlands and swamps with dense aquatic vegetation (Office of Environment & Heritage 2017). Associated habitat was not recorded within the Proposal site. Although dams and ephemeral waterways are present within the Proposal site, these would not be considered suitable to support this species. No associated PCTs (Department of Planning industry and Environment 2021) occur within the Proposal site, and there is only one record within the locality from 1997 (Department of Planning industry and Environment 2021). Diurnal bird surveys did not identify this species within the site.	Species not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	–	East of Newell Highway – west is hybrid zone where intergrades with the arid zone subspecies of Brown Treecreeper (Climacteris picumnus picumnus), East of Newell Highway – west is hybrid zone with western subspecies, East of Walbundrie – west within hybrid zone with inland subspecies	60	BioNet, BCC	Ecosystem	Potential habitat in the form of open eucalypt forests and woodlands recorded within the proposal site.	Ecosystem credit species
Bush Stone-curlew	*Burhinus grallarius*	E1	–	Fallen/standing dead timber including logs	0	BCC	Species	There is a lack of quality understorey habitat to support this species.	Targeted surveys undertaken
Common Sandpiper	*Actitis hypoleucos*	–	M	None. No specific requirements or restrictions identified in BCC		PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Species associated habitat, littoral and estuarine habitats, not recorded within the proposal site. Low likelihood of occurrence.	Not considered further
Curlew Sandpiper	*Calidris ferruginea*	E1	CE; M	None. No specific requirements or restrictions identified in BCC	2	BioNet, PMST	Species/ Ecosystem	Species records within the locality and not included in BAM-C list. Species associated habitat, littoral and estuarine habitats, not recorded within the proposal site.	Not considered further
Diamond Firetail	*Stagonopleura guttata*	V	–	None. No specific requirements or restrictions identified in BCC	13	BioNet, BCC	Ecosystem	Potential habitat in the form of open eucalypt forests and woodlands recorded within the proposal site.	Ecosystem credit species
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	–	None. No specific requirements or restrictions identified in BCC	22	BioNet, BCC	Ecosystem	Associated habitat in the form of open eucalypt forests and woodlands recorded within the proposal site.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Eastern Curlew	*Numenius madagascariensis*	–	CE; M;	None. No specific requirements or restrictions identified in BCC	0	PMST	Species/ Ecosystem	Species identified in PMST search. No records within the locality and not included in BAM-C list. Associated with sheltered coasts, estuaries, bays, harbours, inlets with intertidal mudflats. Species associated habitat was not recorded within the proposal site. Species unlikely to occur.	Not considered further
Flame Robin	*Petroica phoenicea*	V	–	None. No specific requirements or restrictions identified in BCC	19	BioNet, BCC	Ecosystem	Associated habitat, moist eucalypt forests, were not recorded within the proposal site. However, the potential for this species to occur within the proposal site cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for marginal foraging.	Ecosystem credit species
Fork-tailed Swift	*Apus pacificus*	–	M; Ma	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Almost exclusively aerial. Commonly recorded over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. May irregularly occur foraging over proposal site.	Not considered further (migratory species further discussed in report)
Freckled Duck	*Stictonetta naevosa*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	Dams and ephemeral waterways are present within the proposal site, but these would not be considered suitable to support this species.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	E	Hollow bearing trees; Eucalypt tree species with hollows greater than 9cm diameter	4	BCC, BioNet	Species	The proposal site is outside of species distribution.	Targeted surveys undertaken
Gilbert's Whistler	*Pachycephala inornata*	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Ecosystem	Associated habitat, dense shrub layer in box-ironbark communities, was not recorded. Species known breeding habitat (dense foliage of plants such as wattles or cypress pines) was sparse within the proposal site.	Ecosystem credit species
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	V	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. Presence of Allocasuarina and casuarina species	0	BCC	Species/ Ecosystem	No Allocasuarina species observed on site upon which this species is dependent. Likely too distant from such resources to represent breeding sites in larger hollows on site. No records in locality.	Not considered further (targeted surveys were still undertaken)
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	–	None. No specific requirements or restrictions identified in BCC	50	BioNet, BCC	Ecosystem	Potential habitat in the form of open eucalypt forests and woodlands recorded within the proposal site.	Ecosystem credit species
Grey Falcon	*Falco hypoleucos*	E	V	None. No specific requirements or restrictions identified in BCC	0	PMST	Ecosystem	Species identified in PMST search. No records within the locality and not included in BAM-C list. Proposal site is on the eastern fringes of range. Associated PCTs do not occur within the proposal site. Species unlikely to occur.	Not considered further
Gull-billed Tern	*Gelochelidon nilotica*	–	M; Ma	None. No specific requirements or restrictions identified in BCC	1	BioNet	–	Species identified in PMST search and not included in BAM-C list. Outside species regular distribution. May occur as rare nomadic/visitor within the locality.	Not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	–	None. No specific requirements or restrictions identified in BCC	3	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in the proposal site. The species is known in wider locality with associated with structural intact open eucalypt woodland.	Ecosystem credit species
Latham's Snipe	*Gallinago hardwickii*	–	M	None. No specific requirements or restrictions identified in BCC	7	BioNet, PMST	–	Inhabits open, freshwater wetlands with low, dense vegetation. Associated habitat not recorded within the proposal site. Species unlikely to occur.	Not considered further
Little Eagle	*Hieraaetus morphnoides*	V	–	Nest trees – live (occasionally dead) large old trees within vegetation	10	BCC, BioNet	Species/ Ecosystem	Moderate. The proposal site may occur within the home-range of one or more individuals. The proposal sites habitats are considered unlikely to support this species in isolation from habitats that are more productive in terms of prey species.	Targeted surveys undertaken for species and to identify if nests present Ecosystem credit species
Little Lorikeet	*Glossopsitta pusilla*	V	–	None. No specific requirements or restrictions identified in BCC	8	BioNet, BCC	Ecosystem	Moderate. Potential foraging and habitat within intact vegetation where presence of mature Eucalypts occur. May be an irregular visitor during abundance of blossoming eucalypts.	Ecosystem credit species
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V	–	Hollow bearing trees; Living or dead tree with hollows greater than 10cm diameter	1	BCC	Species/ Ecosystem	Low. Proposal site is on the eastern fringes of range. Although it may occur rarely in the proposal site habitats are unlikely to represent important foraging resources locally.	Targeted surveys undertaken Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Malleefowl	*Leipoa ocellata*	E1	V	None. No specific requirements or restrictions identified in BCC	0	PMST	Ecosystem	Low. Species was not identified in BCC. Associated PCTs do not occur within the proposal site. Associated mallee habitat not recorded within the proposal site.	Not considered further
Marsh Sandpiper	*Tringa stagnatilis*	–	M; Ma	None. No specific requirements or restrictions identified in BCC	7	BioNet	–	Species not identified in either PMST search or BAM-C list. Occurs in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. Associated habitat not recorded within the proposal site. Species unlikely to occur.	Not considered further
Masked Owl	*Tyto novaehollandiae*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	0	BCC	Species/ Ecosystem	Proposal site may be within the home range of local individuals; however, this species is unlikely to occur due to the scarcity of local records and habitats within the proposal site are of insufficient quality and size to support individuals.	Targeted surveys undertaken Ecosystem credit species
Painted Honeyeater	*Grantiella picta*	V	V	Mistletoes present at a density of greater than five mistletoes per hectare	3	BCC, PMST, BioNet	Ecosystem	Marginal foraging habitat within remnant vegetation. A specialist feeder on mistletoes (Amyema) which did not occur in high densities.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Powerful Owl	*Ninox strenua*	V	–	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.		BCC	Species/ Ecosystem	Proposal site may be within the home range of local individuals; however, this species is unlikely to occur due to the paucity of local records and habitats within the proposal site are of insufficient quality to support individuals. Records occur further to the east in association with the Great Dividing Range and coastal habitats.	Targeted surveys undertaken Ecosystem credit species
Pectoral Sandpiper	*Calidris melanotos*	–	M	–	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Associated habitat not recorded within the proposal site.	Not considered further
Pied Honeyeater	*Certhionyx variegatus*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	Preferred habitat of wattle shrub, primarily Mulga (Acacia aneura), Mallee and spinifex not within the proposal site.	Ecosystem credit species
Purple-crowned Lorikeet	*Glossopsitta pporphyrocephala*	V		None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	No records within the locality, however, potential habitat present.	Ecosystem credit species
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	As per mapped areas	2	BCC, BioNet, PMST	Species/ Ecosystem	Potential to occur during seasonal movements and to utilise blossoming eucalypts. Proposal site does not conform to high quality woodland habitats types that this species is dependent upon for foraging and breeding purposes. The proposal site is not identified as a breeding area for the species.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Rufous Fantail	*Rhipidura rufifrons*	–	M	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Mainly inhabits wet sclerophyll forests. During seasonal movements sometimes recorded in drier sclerophyll forests and woodlands. Associated habitat not found within the proposal site.	Not considered further
Satin Flycatcher	*Myiagra cyanoleuca*	–	M	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands. During seasonal movements, occurs in coastal forests, woodlands, mangroves and drier woodlands and open forests. Preferred habitat not within proposal site, rare occurrences during seasonal movements may occur.	Not considered further
Scarlet Robin	*Petroica boodang*	V	–	None. No specific requirements or restrictions identified in BCC	21	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in proposal site. The potential for this species to occur within the proposal site cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for foraging.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Sharp-tailed Sandpiper	*Calidris acuminata*	–	M	–	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. Associated habitat not within proposal site.	Not considered further
Speckled Warbler	*Chthonicola sagittata*	V	–	None. No specific requirements or restrictions identified in BCC	42	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in proposal site. The potential for this species to occur within the proposal site cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for foraging.	Ecosystem credit species
Spotted Harrier	*Circus assimilis*	V	–	None. No specific requirements or restrictions identified in BCC	1	BioNet, BCC	Ecosystem	May occur over the proposal site during local movements, but habitats are not of sufficient quality to support this species, due to a lack of habitat supporting an abundance of prey species.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Square-tailed Kite	*Lophoictinia isura*	V	–	Nest trees: The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.	2	BioNet, BCC	Species/ Ecosystem	May occur over the proposal site during locally movements, but habitats are not of sufficient quality to support this species, due to a lack of habitat supporting an abundance of small bird species.	Targeted surveys undertaken Ecosystem credit species
Superb Parrot	*Polytelis swainsonii*	V	V	Hollow bearing trees: Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.	124	BCC, BioNet, PMST	Species/ Ecosystem	The proposal site provides foraging and breeding habitat for the species.	Species credit species Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Swift Parrot	*Lathamus discolor*	E1	CE	Hollow bearing trees	7	BCC, BioNet, PMST	Species/ Ecosystem	May occur within the proposal site during seasonal movements and to utilise blossoming eucalypts. Dependent on winter flowering resources of which E.microcarpa occurs widely within proposal site. No records locally and local resources are sparse, so occurrences are likely to be rare but cannot be discounted. Proposal site is outside of species known breeding habitat.	Targeted surveys undertaken Ecosystem credit species
Turquoise Parrot	*Neophema pulchella*	V	–	None. No specific requirements or restrictions identified in BCC	6	BioNet, BCC	Ecosystem	Local records occur within areas of higher quality woodland. The proposal site provides marginal foraging habitat.	Ecosystem credit species
Varied Sittella	*Daphoenositta chrysoptera*	V	–	None. No specific requirements or restrictions identified in BCC	13	BioNet, BCC	Ecosystem	Prefers good patches of woodland habitat with complex understorey diversity, which is limited in the proposal site. The potential for this species to occur within the proposal site cannot be entirely discounted, as the species is known to occur within the locality and may utilise the habitats present for foraging.	Ecosystem credit species
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	Ma	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	0	BCC	Species/ Ecosystem	Preferred breeding and foraging habitat was not recorded within the proposal site. May occur as a vagrant.	Targeted surveys undertaken Ecosystem credit species
White-fronted Chat	*Epthianura albifrons*	V	–	None. No specific requirements or restrictions identified in BCC	4	BioNet	Ecosystem	The proposal site provides marginal foraging habitat.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
White-throated Needletail	*Hirundapus caudacutus*	–	V; M	None. No specific requirements or restrictions identified in BCC	1	BioNet, PMST	–	Almost exclusively aerial. Occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings. May irregularly occur foraging over the proposal site.	Considered further in MNES section of report
Yellow Wagtail	*Motacilla flava*	–	M	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Occurs in open country near swamps, salt marshes and sewage ponds. Rare visitor to coastal areas. Associated habitat not within proposal site. Unlikely to occur within the proposal site.	Not considered further
Fish (3)									
Macquarie Perch	*Macquaria australasica*	–	E	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Suitable habitat not recorded within the proposal site.	Not considered further
Trout Cod	*Maccullochella macquariensis*	E	E	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Suitable habitat not recorded within the proposal site.	Not considered further
Murray Cod	*Maccullochella peeli*	–	V	None. No specific requirements or restrictions identified in BCC	0	PMST	–	Species identified in PMST search. No records within the locality and not included in BAM-C list. Suitable habitat not recorded within the proposal site. No records within the locality.	Not considered further

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Mammals (14)									
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Species	Suitable habitat not recorded within the proposal site. No records within the locality. Targeted surveys undertaken.	Targeted surveys undertaken
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	0	BCC	Species	Suitable habitat not recorded within the proposal site. No records within the locality.	Targeted surveys undertaken
Corben's Long Eared Bat	*Nyctophilus corbeni*	V	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Ecosystem	Associated habitat in the form of box dominated woodlands, tree hollows and loose bark were recorded within the proposal site.	Ecosystem credit species (targeted surveys completed)
Large Bentwing-bat	*Miniopterus orianae oceanensis*	V	–	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat with numbers of individuals >500	0	BCC	Species/ Ecosystem	Suitable habitat not recorded within the proposal site. No records within the locality.	Ecosystem credit species (targeted surveys completed)
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	Suitable habitat not recorded within the proposal site. No records within the locality.	Ecosystem credit species
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Species	A lack of suitable patch size and quality in terms of understorey nectar-producing plants and shelter opportunities.	Targeted surveys undertaken

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Grey-headed Flying-fox	*Pteropus poliocephalus*		V	Breeding camps	1	BCC, PMST, BioNet	Species/ Ecosystem	Not observed during nocturnal surveys, but may visit the proposal site when blossom resources are scarce in other regions. Records within the locality are scarce and no camps occur nearby.	Targeted surveys undertaken Ecosystem credit species
Koala	*Phascolarctos cinereus*	E	E	Areas identified via survey as important habitat – Important' habitat is defined by the density of koalas and quality of habitat determined by on-site survey.	1	BCC, BioNet, PMST	Species/ Ecosystem	A lack of continuity between woodland patches, patch size and sufficient foraging resources suggest that this species does not occur in the proposal site. May occur randomly due to roaming movements.	Targeted surveys undertaken Ecosystem credit species
Large-eared Pied Bat	*Chalinolobus dwyeri*	–	V	Cliffs within two km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two km of old mines or tunnels	0	BCC	Species	No suitable roosting habitats associated with the proposal site or its vicinity – may rarely extend to the site during foraging movements but the proposal site is likely to be of low importance to this species.	Targeted surveys undertaken
Little Pied Bat	*Chalinolobus picatus*	V	–	None. No specific requirements or restrictions identified in BCC	0	BCC	Ecosystem	No suitable roosting habitats associated with the proposal site or its vicinity – may rarely extend to the site during foraging movements but the proposal site is likely to be of low importance to this species.	Targeted surveys undertaken

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Southern Myotis	*Myotis macropus*	V	–	Hollow bearing trees/Within 200m of riparian zone/ Bridges, caves or artificial structures within 200m of riparian zone	1	BCC, BioNet	Species	Preferred riparian foraging habitats and roosting locations are limited within the proposal site, but it's presence cannot be discounted during local movements.	Species credit species (assumed) Although not recorded during targeted surveys following BAM seasonal requirements and survey guidelines, this species cannot be discounted and has been assumed as present.
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Ecosystem	The proposal site is generally outside of species known distribution.	Ecosystem credit species
Squirrel Glider	*Petaurus norfolcensis*	V	–	None. No specific requirements or restrictions identified in BCC	6	BCC, BioNet	Species	Potential foraging and roosting habitat within remnant vegetation.	Species credit species (recorded)
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	–	None. No specific requirements or restrictions identified in BCC	1	BCC, BioNet	Ecosystem	Potential foraging and roosting habitat within remnant vegetation.	Ecosystem credit species

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Reptiles (2)									
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Rocky areas or within 50m of rocky areas	0	BCC, PMST	Species	Marginal habitat (rocky outcrops, scattered rocks) were recorded within the proposal site. However, this species is unlikely to occur due to a lack of high quality groundcover habitats with sufficient natural features for cover and foraging, and lack of records within the locality.	Targeted surveys undertaken
Striped Legless Lizard	*Delma impar*	–	V	None. No specific requirements or restrictions identified in BCC	0	BCC, PMST	Species	Although elements of preferred habitat were recorded within the proposal site, the proposal site is on the boundary of this species known distribution and hasn't historically been recorded within locality.	Targeted surveys undertaken
Invertebrates (1)									
Key's Matchstick Grasshopper	*Keyacris scurra*	E	–	Species is generally reliant on an understorey of tussock grasses, typically *Themeda* for shelter and possibly food (unconfirmed), but may use similar grasses. Food sources include a range of dicotyledon species. Indicator species include the daisy *Chrysocephalum apiculatum.*	0	BCC	Species	Marginal understorey habitat in PCT's 266, 276 and 277	Assumed presence

Common name	Scientific name	BC Act[1]	EPBC Act[2]	Habitat requirements / geographic restrictions[3]	BioNet records	Source[4]	Credit type[5]	Potential habitat within the Proposal site	Outcome
Golden Sun Moth	*Synemon plana*	E	V	Wallaby grass (*Rytidosperma* sp), Chilean needlegrass (*Nassella nessiana*) or Serrated Tussock (*Nassella trichotoma*)	0	BCC	Species	Preferred natural temperate grassland not present. No Serrated Tussock grass recorded and *Rytidosperma* spp. had low cover. Habitat requirement not met.	Not considered further – species excluded

(1) V = Vulnerable, E = Endangered as listed under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered as listed under the EPBC Act

(3) Habitat requirements and geographic requirements were obtained from the BAM Credit Calculator (BCC)

(4) BCC = BAM Credit Calculator, BioNet = Office of Environment and Heritage spatial search, PlantNet = Royal Botanic gardens spatial search, PMST = Protected Matters Search Tool (Department of Agriculture, Water and the Environment)

(5) Credit types as prescribed by the BAM Credit Calculator

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix E BAM scattered tree report

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Scattered Tree Report

Proposal Details

Assessment Id
00015402/BAAS18097/19/00015403

Assessment name
Inland Rail I2S - Paddock Trees

BAM data last updated *
16/06/2022

Assessor Name
Mark Stables

Report Created
25/08/2022

BAM Data version *
54

Assessor Number
BAAS18097

BAM Case Status
Finalised

Date Finalised
25/08/2022

Assessment Revision
1

Assessment Type
Scattered Trees

BOS entry trigger
Major Project

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees

PCT code	PCT name	No. of trees	Species	DBHOB Category	Contain hollows	Class	Assessment required
5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	1	Eucalyptus camaldulensis	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Scattered Tree Report

5	River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	0	Eucalyptus camaldulensis	>= 20cm and <50cm	True	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	29	Eucalyptus microcarpa	>= 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2	Eucalyptus microcarpa	>= 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	2	Eucalyptus microcarpa	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
80	Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3	Callitris glaucophylla	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Scattered Tree Report

80	Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	3	Callitris glaucophylla	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
80	Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	1	Callitris glaucophylla	< 20cm	False	1	No
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	2	Eucalyptus albens	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	1	Eucalyptus albens	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
276	Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	4	Eucalyptus melliodora	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
276	Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3	Eucalyptus melliodora	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

Scattered Tree Report

276	Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	3	Eucalyptus melliodora	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2	Eucalyptus blakelyi	> 50cm	True	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1	Eucalyptus blakelyi	> 50cm	False	3	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species
277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	2	Eucalyptus blakelyi	>= 20cm and <50cm	False	2	Visual assessment for hollows, presence of important habitat features and habitat suitability for threatened species

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix F EPBC Act significance assessments

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

F.1 Grey Box Grassy Woodlands and Derived Native Grasslands

Status

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Grey Box Woodlands) is listed as an Endangered Ecological Community under the EPBC Act (Department of the Environment 2016). This is broadly equivalent to Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions listed as Endangered under the *Biodiversity Conservation Act 2016* (BC Act).

Description

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia (Grey Box Woodlands) occupy a position in the landscape that is transitional between the temperate woodlands and forests of the lower slopes and tablelands of south-eastern Australia, and the semi-arid communities further inland. The ecological community typically occurs in landscapes of low-relief on productive soils derived from alluvial or colluvial materials but may occur on a range of substrates. The ecological community tends to occupy drier sites of the belt of grassy woodlands in south-eastern Australia, within a rainfall zone of 375–700mm/year (Department of the Environment 2016).

This community includes those woodlands in which the dominant tree species is *Eucalyptus microcarpa* (Inland Grey Box) and is often found in association with *E. populnea* subsp. *bimbil* (Bimble or Poplar Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Bulloak) or *E. melliodora* (Yellow Box), and sometimes with *E. albens* (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25m tall, but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey (Department of the Environment 2016).

Distribution

The Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South Eastern Australia ecological community occurs from central-western NSW, through northern and central Victoria into South Australia. Occurring predominantly within the Riverina and South West Slopes regions of NSW down to the Victorian border (Department of the Environment 2016).

Only 10 to 15 per cent of the original extent of this ecological community remains across its range (central New South Wales through northern Victoria and into South Australia) (Department of Sustainability Environment Water Population and Communities 2012). Commonwealth listing advice (Threatened Species Scientific Committee 2010) for this community states that within the NSW South Western Slopes and Riverina bioregion PCT 76 and PCT 80 have declined in extent by 92% and 82.5% respectively.

Specific impacts

Grey Box Woodlands within the proposal site generally occur a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action will involve the removal of vegetation along a linear development which is 42.5km in length. The proposed action will result in the direct removal of up to 23.5ha of this EPBC listed ecological community. This is comprised of PCT 76 and PCT 80 recorded in good and moderate condition and derived native grasslands (low condition).

F.1.1 EPBC Act Significance Assessment

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia is listed as Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community.**

The proposed action would result in a reduction of the extent of the Grey Box Woodlands within the proposal site. A total of 23.5ha of the EPBC listed ecological community will be removed from 30 patches along the 42.5km route. Only 1.1ha of this is in good condition. The majority (20.1ha) is in moderate condition with the remaining 2.3ha occurring as low condition derived grassland. .

In NSW an estimated 300 000 to 330 000ha of the community is thought to remain with an additional 400,000ha of derived grassland estimated (Threatened Species Scientific Committee 2010). The removal of this community associated with the proposed action, would represent 0.003 per cent of the remaining community within NSW. Within the proposal site, this community is comprised of PCT 76 and PCT 80. The current extent of PCT 76 and 80 remaining in NSW is estimated to be 40,000ha and 140,000ha respectively (Threatened Species Scientific Committee 2010). Impacts on these PCTs within the proposal site equates to the removal of approximately 0.05 per cent of the remaining extent of PCT 76, and removal of 0.001 per cent of the remaining extent of PCT 80 in NSW. In addition, the ecological community within the proposal site exists as 30 patches in an agricultural landscape that are exposed and less resilient to edge effect disturbances. Larger, better condition remnants generally occur as narrow roadside remnants.

- **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.**

Overall the habitat present within the landscape has been heavily fragmented due to agricultural practices (i.e. cropping and livestock use). Existing connectivity is predominantly limited to creeklines and road reserves.

Grey Box Woodlands within the proposal site occurs as 30 patches along the 42.5km route. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action will involve the removal of vegetation along a linear development 42.5km in length. Of the 30 patches of *Grey Box Woodlands* within the proposal site, eight would be fragmented.

The proposal is likely to result in a reduction in vegetation patch sizes resulting in increases in fragmentation of the regional wildlife patches along the mentioned creeklines and road reserves. Due to the importance of connectivity, dispersal opportunities and habitat quality for species at a local scale, this impact has the potential to be negative to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles.

- **Adversely affect habitat critical to the survival of an ecological community**

No critical habitat has been listed for the *Grey Box Woodlands* ecological community under the *EPBC Act* (Department of Environment and Energy 2017).

Habitat critical to the survival of ecological communities also refers to areas that are necessary:

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

Grey Box Woodlands recorded within the proposal site currently occurs as fragmented patches. These areas are unlikely to be habitat critical for the community based on the above criteria given the current extent of the community. Furthermore, the proposal has avoided these areas where possible (i.e. along Ironbong Road) and indirect impacts will also be minimised through the implementation of mitigations measures.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.**

The proposal would clear of 23.5ha of *Grey Box Woodlands* and may require alterations to the topography of the land within the immediate construction footprint to ensure technical viability. The proposal will also cross over several creek lines including Dudauman Creek, Ironbong Creek, Ulandra Creek, Powderhorn Creek and numerous other crossings small shallow ephemeral creeks and drainage lines.

Any large-scale excavation that occurs in close proximity to the community or to marginal patches will involve mitigation measures to minimise sedimentation and hydrological impacts. Therefore, the proposal is considered unlikely to substantially modify or destroy these abiotic factors.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.**

The proposal will involve the clearing of 23.5ha of *Grey Box Woodlands.* The proposal would not result in increased burning or include fauna or fauna harvesting. Mitigation measures to minimise indirect impacts such as weed invasion including weed control will be enforced to ensure the proposal does not substantially change the species composition of an occurrence of this community outside of the impact area.

Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

Grey Box Woodlands within the proposal site are currently subject to weed and pest invasion. Additionally, the majority of the proposal site occurs on agricultural properties which are subjected to high disturbances relating to agricultural practices such as cropping, grazing, and the application of fertilisers. The proposal is unlikely to cause regular mobilisation of fertilisers, herbicides or other chemicals or pollutants. Mitigation measures would include standard spill control measures.

Due to current condition and land use, it is considered unlikely that the proposal would substantially reduce the quality or integrity of the community's occurrence or increase spread of invasive species. Additionally, mitigation measures will be implemented during construction to minimise the likelihood of spread of weeds or pathogens. These mitigation measures will aid in reducing potential impacts associated with the proposal that may otherwise result in the further reduction of the community's quality.

Interfere with the recovery of an ecological community

To date, no recovery plan has been developed by the Department of Agriculture, Water and Environment for *Grey Box Woodlands* (Department of the Environment 2016). Conservation Advice on *Grey Box Woodlands* (Department of the Environment 2010) recognises the main ongoing threats to this ecological community to include:

- incremental clearance of vegetation for various purposes (e.g. cropping, infrastructure works and maintenance)
- inappropriate grazing regimes
- fragmentation into small remnants
- loss or decline of mature trees due to dieback or other causes
- lack of natural regeneration for understorey and canopy species
- invasion by exotic plants
- addition of fertilisers to improve sites
- inappropriate application of herbicides
- firewood collection
- salinity.

The proposal will contribute towards incremental clearance of vegetation by 21.46ha, increased fragmentation and loss of mature trees. The invasion of exotic plants and lack of natural regeneration are potential indirect impacts which will be managed through mitigation measures.

Conclusion

The vegetation recorded within the proposal site is considered consistent with *Grey Box Woodlands,* occurred in good condition and moderate condition and as derived native grassland. The proposal will include clearing of 23.5ha of this community of which 1.1ha of this is in good condition, 20.1ha is in moderate condition with the remaining 2.3ha occurring as low condition derived grassland.

Though the proposal occurs in an agricultural landscape which is largely cleared and fragmented, the *Grey Box Woodlands* recorded were predominantly in moderate to good condition and included important roadside remnants.

This is likely to have a significant impact for the following reasons:

- The proposal would clear 23.5ha of the community, equivalent to approximately 0.003% of the remaining extent of the community.
- The proposal will fragment eight patches of the community and is likely to exacerbate fragmentation at a regional scale that is likely to be significant to the community given its already fragmented state.

Overall, the proposal is considered likely to have a significant impact on Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

F.2 White Box Yellow Box Blakely's Red Gum Woodland

Status

The White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland community is listed as a Critically Endangered Ecological Community under the EPBC Act (Department of Environment Climate Change and Water 2011). This is generally consistent with White Box Yellow Box Blakely's Red Gum Woodland listed as Critically Endangered under the BC Act.

Description

White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box *Eucalyptus albens*, Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi*. tree-cover is generally discontinuous and consists of widely-spaced trees of medium height (Department of Environment and Heritage 2006).

In its pre-1750 state, this ecological community was characterised by:

- a ground layer dominated by tussock grasses
- an overstorey dominated or co-dominated by White Box, Yellow Box or Blakely's Red Gum, or Grey Box in the Nandewar bioregion
- a sparse or patchy shrub layer.

The Australian Government listing of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is slightly different to the NSW listing. Areas that are part of the Australian Government listed ecological community must have either:

- an intact tree layer and predominately native ground layer
- an intact native ground layer with a high diversity of native plant species but no remaining tree layer.

Due to the ecological community's occurrence on fertile soils it has been extensively cleared for agriculture and intact remnants, including both trees and unmodified understorey, are now extremely rare. Clearing and fragmentation for urban, rural residential, agricultural and infrastructure development remain on-going threats to this ecological community, while degradation resulting from inappropriate management and weed invasion by introduced perennial grasses continues to erode the conservation value of remnant areas.

Distribution

Box-Gum Grassy Woodland occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through New South Wales and the Australian Capital Territory to Victoria.

Specific impacts

Box-Gum Woodlands within the proposal site generally occur a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action would result in a reduction of the extent of the *Box-Gum Woodlands* within the proposal site by 19.93ha. This is comprised of PCT 266, PCT 276, PCT 277 and PCT 347 all of which were recorded in moderate condition.

F.2.1 EPBC Act Significance Assessment

White Box Yellow Box Blakely's Red Gum Woodland (*Box-Gum Woodlands)* community is Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- **Reduce the extent of an ecological community.**

Box-Gum Woodlands at a national level are thought to have lost more than 90% of its pre-European distribution. In addition, this has led to a critical loss of integrity, and only half of the remaining 10 per cent distribution is considered likely to meet the minimum condition criteria of the listed ecological community. Estimates reported in the 2011 National Recovery Plan (Department of Environment Climate Change and Water 2011) indicated that only 405,000ha of the ecological community remains in various conditions. The proposed action would result in a reduction of the extent of the *Box-Gum Woodlands* within the proposal site by 19.93ha. This is comprised of PCT 266, PCT 276, PCT 277 and PCT 347 all of which were recorded in moderate condition. The removal of 19.93ha equates to a 1% reduction of this community within the locality (10km radius from proposal site) and 0.005% nationally.

- **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.**

Box-Gum Woodlands within the proposal site generally occur a combination of large patches, small isolated stands and roadside remnants. The most intact remnants occur in areas where agricultural grazing has been excluded such as roadside remnants. The proposed action will involve the removal of vegetation along a linear development which is 42.5km in length. As such, the proposal will fragment large patches and roadside remnants of *Box-Gum Woodlands* in the locality and increase fragmentation between smaller patches.

- **Adversely affect habitat critical to the survival of an ecological community**

No critical habitat has been listed for the *Box-Gum Woodlands* ecological community under the *EPBC Act* (Department of Environment and Energy 2017).

The National Recovery Plan for Box-Gum Woodlands (Department of Environment, Climate Change and Water, 2010) states:

"…habitat critical to the survival of *Box-Gum Grassy Woodland* is on the moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range from southern Queensland through NSW and the ACT. Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria outlined in section 3 should be considered critical to the survival of this ecological community" (Page 12).

Section 3 refers to the condition criteria for EPBC listed *Box-Gum Woodlands.* PCT 266, PCT 267, PCT 276, PCT 277 and PCT 347 in moderate condition were considered commensurate (refer to section 7 of main report).

As such all occurrences of EPBC-listed *Box-Gum Grassy Woodland* with the proposal site are considered habitat critical to the survival of this community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.**

The proposal is limited to the clearing of 19.93ha of *Box-Gum Woodlands.* Any large-scale excavation that occurs in close proximity to the community or to marginal patches will involve mitigation measures to minimise sedimentation and hydrological impacts. Therefore, the proposal is considered unlikely to substantially modify or destroy these abiotic factors.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.**

The proposal will involve the clearing of 19.93ha of Box-Gum Woodlands. Mitigation measures will be enforced to ensure the proposal does not substantially change the species composition of an occurrence of this community outside of the impact area.

Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

Box-Gum Woodlands within the proposal site currently subject to weed and pest invasion. Additionally, the majority of the proposal site occurs on agricultural properties which are subjected to high disturbances relating to agricultural practices such as cropping, grazing, and the application of fertilisers. Therefore, it is considered unlikely that the proposal would substantially reduce the quality or integrity of the community's occurrence or increase spread of invasive species.

Additionally, mitigation measures will be implemented during construction to minimise the likelihood of spread of weeds or pathogens. These mitigation measures will aid in reducing potential impacts associated with the proposal that may otherwise result in the further reduction of the community's quality.

Interfere with the recovery of an ecological community

The National Recovery Plan for Box-Gum Woodlands (Department of Environment Climate Change and Water 2011) outlines the following recovery actions in Table 3:

- 1.1 Establish agreed protocols across jurisdictions for the assessment of Box-Gum Woodland condition in Year 1 of the recovery plan implementation and apply these on an ongoing basis.
- 1.2 Share data and reporting between jurisdictions, government and nongovernment agencies.
- 1.3 Investigate the occurrence of Box-Gum Grassy Woodland in South Australia.
- 1.4 Collate existing survey and mapping data relating to Box-Gum Grassy woodland into a central, updatable repository for use by stakeholder government agencies in mapping extent, protected areas and priority areas. Update repository on an annual basis.
- 1.5 Identify gaps in survey and mapping data across the predicted distribution of Box-Gum Grassy Woodland and engage communities and conduct future surveys to fill these gaps.
- 1.6 Investigate the further use of remote sensing and other assessment techniques to assist with the preceding actions and with Actions 2.2, 2.3 and 2.4.
- 1.7 Establish and apply protocols for non-technical monitoring of remnant areas. These should include as many of the elements as possible of the condition assessment protocols developed in Action 1.1. These protocols are to reflect the condition assessment protocols developed under Action 1.1.

- 1.8 Identify gaps in current monitoring to ensure the geographic range and ecological variation within the ecological community is represented, and to coordinate implementation and analysis of all monitoring.
- 1.9 Improve baseline knowledge of condition and generate benchmark data against which sites can be assessed for management actions and cost effectiveness of revegetation ranked.

The proposal is unlikely to interfere with any of the recovery actions outlined.

Conclusion

The vegetation recorded within the proposal site consistent with *Box-Gum Woodlands* occurred in moderate condition. Though the proposal occurs in an agricultural landscape which is largely cleared and fragmented, the *Box-Gum Woodlands* was recorded as large patches, roadside remnants and isolated smaller patches.

This is likely to have a significant impact for the following reasons:

- The proposal would clear 19.93ha of the community in moderate condition.
- The proposal will create fragmentation in large patches and roadside remnants of Box-Gum Woodlands and increase fragmentation between smaller patches.
- Given the currently highly fragmented and degraded state of this ecological community, all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria should be considered critical to the survival of this ecological community. As such all occurrences of EPBC-listed Box-Gum Grassy Woodland within the proposal site are considered habitat critical to the survival of this community.

Overall, the proposal is considered likely to have a significant impact on White Box Yellow Box Blakely's Red Gum Woodland.

F.3 Swift Parrot

Status

Swift Parrot (*Lathamus discolor*) is listed as Critically Endangered under the EPBC Act and Endangered under the BC Act.

Distribution and habitat

Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering *Acacia pycnantha*, is indicated. Sites used vary from year to year. (Garnett, 2000; Swift Parrot Recovery Team, 2001).

Specific impacts

The proposed will impact approximately 60.33ha of potential foraging habitat for Swift Parrot. Habitat to be impact occurs predominately as vegetation limited to the margins of existing vegetation patches. EPBC Act Significance Assessment

The Swift Parrot is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of a population of a species**

Approximately 60.33ha of potential foraging habitat for Swift Parrot would be affected by the action proposed. While limited habitat in the proposal site has the potential to be used by these species, it is not likely to be of high importance due to its relatively small area and the availability of equal or greater quality habitat within the locality and wider region. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 60.33ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Any identified population of Swift Parrot in the area would not be restricted to habitat within the proposal site. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of the species**

The action proposed is likely to affect approximately 60.33ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 60.33ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Nevertheless, the removal of approximately 60.33ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Swift Parrot during seasons when individuals of this species may be reliant on local resources.

- **Fragment an existing population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 60.33ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation. As the proposal site is small in nature, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the proposal site and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat has been listed for the Swift Parrot to date. The proposal site does not occur within the breeding areas (Tasmania) nor is the proposal site the only limiting foraging area for this species, as such it is unlikely that this action proposed will adversely affect habitat critical to the survival of this species.

- **Disrupt the breeding cycle of a population**

Swift Parrots breed in Tasmania during spring and summer, migrating to south-eastern Australia during autumn and winter (Department of Environment and Conservation 2006). While Swift Parrots are dependent on flowering resources across a wide range of habitats (woodlands and forests) within their NSW wintering grounds, the removal of approximately 60.33ha of potential foraging habitat is unlikely to disrupt their movements to Tasmanian breeding grounds. As such the action proposed is unlikely to affect their breeding cycle.

- **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The action proposed would remove approximately 60.33ha of potential habitat for this species. The removal of approximately 60.33ha of potential foraging habitat is considered to be an incremental loss of suitable habitat locally. As such the removal of 60.33ha of potential foraging habitat for the Swift Parrot is unlikely to be at an extent in which these species are likely to decline.

- **Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat**

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Swift Parrot would become further established as a result of the action proposed.

- **Introduce disease that may cause the species to decline**

No. It is unlikely that disease would be increased by the action proposed.

- **Interfere with the recovery of the species**

The *Action Plan for Australian Birds* (Garnett and Crowley 2000) notes pressure on Swift Parrot breeding areas from forestry and firewood collection in Tasmania. On the mainland though pressures relate to the loss of foraging habitats due to clearing for agriculture and residential development (Garnett and Crowley 2000).

A National Recovery Plan for the Swift Parrot (*Lathamus discolour)* was prepared in 2011 (Saunders 2011). Recovery actions outlined in this plan include:

- identify the extent and quality of habitat
- manage and protect swift parrot habitat at the landscape scale
- monitor and manage the impact of collisions, competition and disease
- monitor population and habitat.

Based on the impacts of the action proposed on the Swift Parrot, as discussed above, it is likely the action proposed would be in conflict with the second recovery action above, to manage and protect swift parrot habitat at the landscape scale. However, based on the relatively small extent of habitat to be removed it is unlikely that is would significant affect the recovery of the species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the proposal site is considered to be small in terms of available habitat for the species within region. The irregular distribution of blossom resources, which is a key driver of nomadism of these species, may cause this species to occasionally forage within the proposal site. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Swift Parrot, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of these species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

F.4 Regent Honeyeater

Status

Regent Honeyeater (*Anthochaera Phrygia*) is listed as Critically Endangered under both the EPBC Act and BC Act.

Distribution and habitat

Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Spotted Gum and Swamp Mahogany forests are also important feeding areas in coastal areas. Important food trees include *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum) (Garnett, 2000).

The Regent Honeyeater (*Anthochaera phrygia*) primarily occurs across the inland slopes of south-east Australia where it inhabits temperate woodlands and open forests. In some years, the species is also found in drier coastal woodlands and forests (Office of Environment & Heritage 2017). Movements of the species through the landscape corresponds with the flowering of select eucalypt species (Department of the Environment and Energy 2019). The species range has contracted dramatically in the last 30 years, and now occurs between north-eastern Victoria and south-eastern Queensland. Three key breeding regions are known to remain, they include: north-eastern Victoria (Chiltern-Albury), and Capertee Valley and the Bundarra-Barraba regions in NSW. The species distribution in NSW is patchy but is mainly confined to the two main breeding areas, and their surrounding fragmented woodlands. Every few years, the species is recorded foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Additionally, birds are occasionally recorded on the south coast (Office of Environment & Heritage 2017). Within the NSW South Western Slopes region, the species is known to occur within the Capertee Valley, Inland Slopes, and Lower Slopes sub-regions (Office of Environment & Heritage 2017). Within the South Eastern Highlands, the species is known to occur in the Bathurst, Bondo, Bungonia, Capertee Uplands, Crookwell, Hill End, Kybeyan-Gourock, Monaro, Murrumbateman, Oberon, and Orange sub-regions. Additionally, it is predicted to occur in the Kanangra sub-region (Office of Environment & Heritage 2017).

Specific impacts

The proposed will impact approximately 30.23ha of potential foraging habitat for Regent Honeyeater. Habitat to be impact occurs predominately as vegetation limited to the margins of existing vegetation patches.

EPBC Act significance assessment

The Regent Honeyeater is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013).

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of a population of a species**

Approximately 25.29ha of potential foraging habitat for Regent Honeyeater would be affected by the action proposed. While limited habitat in the proposal site has the potential to be used by these species, it is not likely to be of high importance due to its relatively small extent, low quality, small patch size and the availability of equal or greater quality habitat within the locality and wider region. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 60.33ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is

accessible to the species. Any identified population of Regent Honeyeater in the area would not be restricted to habitat within the proposal site. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of the species**

The action proposed is likely to affect approximately 30.23ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 60.33ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Nevertheless, the removal of approximately 30.23ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Regent Honeyeater during seasons when individuals of this species may be reliant on local resources.

- **Fragment an existing population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 30.23ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation or on the edges of small vegetation patches. As the proposal site will disturb a relatively small area of marginal habitat, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the proposal site and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat has been listed for the Regent Honeyeater to date. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The proposal site does not occur within these breeding areas nor is the proposal site the only limiting foraging area for this species, as such it is unlikely that this action proposed will adversely affect habitat critical to the survival of this species.

- **Disrupt the breeding cycle of a population**

Regent Honeyeaters are known to have three key breeding regions which include north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The proposed action would not impact these known breeding areas. Furthermore, this species is highly mobile and is known to disperse widely (Higgins, Peter et al. 2001). The 30.23ha of potential marginal foraging habitat likely to be affected is a small area of habitat which the species would not only be restricted too. Therefore, the removal of about 39.54ha of potential marginal foraging habitat is unlikely to disrupt the breeding cycle of a population of Regent Honeyeater. As such the action proposed is unlikely to affect their breeding cycle.

- **Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The action proposed would remove approximately 30.23ha of potential habitat for this species. The removal of approximately 39.54ha of potential foraging habitat is considered to be an incremental loss of suitable habitat locally, however would only constitute. As such the removal of 30.23ha of potential foraging habitat for the Regent Honeyeater is unlikely to be at an extent in which these species are likely to decline.

- **Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat**

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Regent Honeyeater would become further established as a result of the action proposed.

- **Introduce disease that may cause the species to decline**

No. It is unlikely that disease would be increased by the action proposed.

- **Interfere with the recovery of the species**

For the Regent Honeyeater, the *Action Plan for Australian Birds* (Garnett and Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Recovery strategies outlined in Regent Honeyeater Recovery Plan (Department of the Environment 2016) include:

- improve the extent and quality of regent honeyeater habitat
- bolster the wild population with captive-bred birds until the wild population becomes self-sustaining
- increase understanding of the size, structure, trajectory and viability of the wild population
- maintain and increase community awareness, understanding and involvement in the recovery program.

Based on the potential ecological impacts of the proposal on these species, as discussed above, it is likely that the proposal would be in conflict with the first objective above to a minor extent, by not improving the extent of habitat for the Regent Honeyeater. However, it is unlikely that the impact of small areas of marginal foraging habitat would cause significantly interfere with the recovery of the species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the proposal site is considered to be small in terms of available habitat for the species within region. The irregular distribution of blossom resources, which is a key driver of nomadism of the species, may cause this species to occasionally forage within the proposal site. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Regent Honeyeater, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of the species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

F.5 Superb Parrot

Status

Superb parrot (*Polytelis swainsonii*) is listed as Vulnerable under both the EPBC Act and BC Act.

Distribution and habitat

The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round.

The Superb Parrot mainly inhabits forests and woodlands dominated by eucalypts, especially River Red Gums and Box-Gums, but also occurs in Box-Cypress-pine and Boree Woodlands. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees.

Specific impacts

The proposed will impact approximately 60.33ha of foraging and potential nesting habitat for Superb Parrot. Habitat to be impact occurs predominately as vegetation limited to the margins of existing vegetation patches.

EPBC Act Significance Assessment

The Superb Parrot is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

This species was recorded during the field surveys foraging within the proposal site. There are previous records of these species within the locality. Potential habitat for this species occurred within the survey area as disjunct remnant patches of highly modified woodland, scattered across a fragmented landscape. The habitat has been previously disturbed by agricultural cropping and grazing.

It was estimated that the proposal will involve the removal of approximately 72.93ha of foraging habitat of which 60.33ha is potential nesting habitat for this species. This species is considered as one single population across its range (Department of the Environment and Energy 2017) with majority of breeding occurring in the Riverina and South-west Slopes of NSW. Local occurrences of this species are likely part of key source populations for breeding and dispersal. Therefore, individuals that occur within the area are considered as part of ‘an important population’.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **Lead to a long-term decrease in the size of an important population of a species**

The proposal would impact approximately 72.93ha of foraging habitat, in the form of native disjunct remnant patches of highly modified woodland and derived native grassland, scattered across a fragmented landscape. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 7260ha of habitat associated with the species (i.e. PCT 266, 276, 277, 347, 5 & 76) has been mapped within the locality of the proposal, this habitat would be still be accessible to the species. The loss of 60.33ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining available mapped habitat in the locality. The extent of potential habitat to be removed is a small component of available habitat locally with an abundance of similar quality habitat and that of much higher quality in the greater locality, such as occurs in Bethungra and Ulandra Mountain range. It is unlikely that the disturbance of 72.93ha of potential habitat associated with the proposal would lead to a long term decrease in the size of the population.

- **Reduce the area of occupancy of an important population**

The Superb Parrot is known to prefer forests and woodlands dominated by eucalypts including, River Red Gums (*Eucalyptus camaldulensis*), Yellow Box (*Eucalyptus melliodora*) and Grey Box (*Eucalyptus microcarpa*). In addition, it prefers large mature eucalypts typically close to watercourses and associated with extensive tracts of suitable foraging habitat (Department of the Environment and Energy 2017). Whilst the survey area has small occurrences of woodland (approximately 62.83ha) and derived native grassland (10.1ha) these areas are isolated and fragmented within the landscape. Although it is likely that individuals may occur within the survey area on an intermittent basis, the availability of habitat within the survey area is unlikely to constitute important habitat, due to the marginal quality of survey area habitat resources. Therefore, it is considered unlikely that the disturbance of 72.93ha of potential habitat will reduce the area of occupancy of the population.

- **Fragment an existing important population into two or more populations**

The Superb Parrot is a highly mobile species able to transverse fragmented landscapes to isolated patches of vegetation. It is known that part of the population undertakes regular seasonal movements from breeding areas to foraging habitats across central and north-central NSW, often coinciding with flowering eucalypts (Department of the Environment and Energy 2017). In addition, it is also known that when Superb Parrots undertake local movements they prefer to move along wooded corridors and limit traversing extensive open areas (Department of the Environment and Energy 2017). As potential habitat within the survey area already occurs within a highly fragmented landscape, it is considered unlikely that the disturbance of habitat in the survey area would fragment the existing population into two or more populations.

- **Adversely affect habitat critical to the survival of a species**

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. No ‘critical habitat’ has been listed for the Superb Parrot under the *EPBC Act* (Department of Environment and Energy 2017).

Habitat critical to the survival of species also refers to areas that are necessary:

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

The proposal will involve the removal of an estimated 72.93ha of potential foraging, roosting and nesting habitat for this species, differing in overall quality.

The habitat observed within the survey area was highly fragmented and of degraded condition, therefore the removal of 60.33ha of habitat is considered unlikely to be critical to the survival of this species.

- **Disrupt the breeding cycle of an important population**

Approximately 72.93ha potential habitat would be disturbed as part of the proposal. Superb Parrots nest in large hollow-bearing trees usually River Red Gums, Blakely's Red Gum and Box eucalypts. Approximately 4276ha of Red Gum woodland has been mapped within the locality, the impact of 60.33ha of preferred habitat would be a loss of <1% of habitat when compared to the remaining preferred mapped habitat in the locality. Preferred nest trees are located along watercourses and within 10km of foraging habitat (Department of the Environment and Energy 2017). Whilst the survey area has the presence of hollow-bearing trees, the location of these do not occur within preferred breeding habitat (i.e. watercourse). Despite this, there is still potential for individuals to utilise hollow trees within the survey area. However, it is unlikely that the removal of 60.33ha of potential habitat would disrupt the breeding cycle of this population, as this would be a small proportion of available resources within the greater locality.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will involve the removal of approximately 72.93ha of foraging habitat and potential breeding habitat. Potential habitat occurred as disjunct remnant patches of highly modified woodland, scattered across a fragmented landscape. Potential habitat has been previously and/or currently disturbed by a long history of agricultural cropping and grazing.

The proposal generally exists within areas cleared of vegetation or on the edge of native vegetation. Although habitat within the proposal is of relatively low quality for the Superb Parrot, the proposal will decrease and modify available habitat for this species within the proposal site. Considering the mobile nature of the Superb Parrot, this action is unlikely to isolate Superb Parrot habitat to an extent that will cause the species to decline. Given the highly modified nature of observed habitats, a long history of pastoral land-use practices over these areas (i.e. cropping and agricultural grazing) and the poor condition of woodland habitat observed, it is considered unlikely that the proposal will modify, destroy, remove or isolate habitat for this species to the extent that it may cause the species to decline locally.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat**

Habitat for this species within the survey area is in highly disturbed condition and is subject to weed and pest invasion. In addition, the majority of the survey area occurs on agricultural properties which have been long subjected to high disturbances relating to agricultural practices such as cropping, grazing, burning and the application of fertilisers. Therefore it is considered unlikely that the proposal would substantially reduce the quality or integrity of the community's occurrence or increase spread of invasive species. Additionally, mitigation measures will be developed to minimise the likelihood of an increase or establishment of invasive species into the habitat of this species.

- **Introduce disease that may cause the species to decline**

It is not considered likely that the proposal would introduced disease into the proposal site.

Nevertheless, mitigation measures will be prepared to minimise the likelihood of spread of pathogens into potential Superb Parrot habitats within the survey area.

- **Will the action interfere with the recovery of the species?**

A national recovery plan for Superb Parrot has been developed by the Department of Environment (Baker-Gabb 2011). The recovery plan has outlined four recovery objectives for this species, which are outlined in Table F.1. The proposal will not impact upon any of the objectives of the national recovery plan for this species.

Table F.1 National recovery actions for Superb Parrot

Recovery objective	Affected by the proposal
Determine population trends	No
Increase knowledge of ecological requirements	No
Develop and implement threat abatement strategies	No
Increase community involvement and awareness of recovery program	No

Conclusion

The proposal traverses a highly fragmented and degraded landscape that contains potential foraging and roosting habitat for the Superb Parrot. Superb Parrots occurring on the South-west Slopes of NSW are part of a key breeding population and therefore considered an important population. While the proposal will remove 72.93ha of Superb Parrot habitat, the degraded nature of the habitat, and its subsequent low value to the species, is considered to render it as of low significance to the population as a whole. It is suggested that mitigation measures be implemented during the design, construction and operational phases of the proposal to minimise impacts on local Superb Parrot habitat, especially those areas that contain tree stands which may represent potential breeding habitat for the species.

For the following reasons the works are unlikely to significantly affect these species or their habitat:

- habitat affected is of marginal quality
- the habitat affected is a very small proportion of potential habitat for the species in the locality
- the works are unlikely to interfere with the recovery objectives of the species
- management measures would be implemented to minimise potential impacts during works. For example pre-work/construction surveys for nesting birds.

The works are unlikely to contribute significantly to key threatening processes.

F.6 Corben's Long-eared Bat

Status

Corben's Long-eared Bat (*Nyctophilus corbeni*) is listed as Vulnerable under both the EPBC Act and BC Act.

Distribution and habitat

The south-eastern long-eared bat is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (Duncan, Baker et al. 1999, Turbill and Ellis 2006). Most records are from inland of the Great Dividing Range.

The species occurs in a range of inland woodland vegetation types being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer (Parnaby 1995, Ellis, Lumsden et al. 1999, Dominelli 2000, Turbill and Ellis 2006). Roosting and breeding habitat includes in tree hollows, crevices and under loose bark in arid and semi-arid Australia (Strahan 1995) and forages in the understorey of woodlands and open savannah and swamps (Churchill 1998).

Specific impacts

The proposed will impact approximately 11ha of potential foraging and roosting habitat (hollow-bearing trees) for Corben's Long-eared Bat.

EPBC Act Significance Assessment

The Corben's Long-eared Bat (*Nyctophilus corbeni*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

The Corben's Long-eared Bat occurs across a wide range of different vegetation contexts, including box eucalypt dominated communities west of the divide. Roosts in tree hollows, crevices, and under loose bark. The Corben's Long-eared Bat is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (Threatened Species Scientific Committee 2015). The species occurs throughout much of inland New South Wales with at least 50% of the species' known distribution occurring in this state. The Pilliga scrub region is a known stronghold for this species (Threatened Species Scientific Committee 2015).

The site predominately provides foraging opportunities, due to the presence of insect attracting canopy foliage, such habitat occurs widely within the vicinity of the proposal site and the wider locality. Consequently, foraging and roosting resources within the proposal site are not considered critical to maintaining populations, breeding or dispersal. Potential occurrences of this species within the proposal site are not at the limit of the species' distribution and as such the proposal site can only be considered to represent a part of the foraging range of widely occurring individuals. For these reasons, if present within the proposal site, individuals of this species would not be considered to be part of an important population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of an important population of a species**

Not applicable. Corben's Long-eared Bat in the proposal site is not part of an important population (refer to above).

- **Reduce the area of occupancy of an important population**

Not applicable. Corben's Long-eared Bat in the proposal site is not part of an important population (refer to above).

- **Fragment an existing important population into two or more populations**

Not applicable. Corben's Long-eared Bat in the proposal site is not part of an important population (refer to above).

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of Environment and Climate Change 2006).

The proposal would impact approximately 11ha of potential foraging habitat only for this species. The proposal site contains potential roosting habitat (hollow bearing trees, dead trees/spouts, and under bark). This impact to potential foraging habitat will only constitute a small amount of available habitat for this species. As a result, it is unlikely that the removal of this potential foraging habitat would be classified as critical habitat for the species.

- **Disrupt the breeding cycle of an important population**

Not applicable. Corben's Long-eared Bat in the proposal site is not part of an important population (refer to above).

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

A relatively small area of potential foraging and roosting habitat (11ha) will be affected. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 1430ha of habitat associated with the species (i.e. PCT 266) has been mapped within the locality of the proposal, this habitat would be still be accessible to the species. The loss of 11ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining available mapped habitat in the locality. The proposal would not impact habitat considered critical to the long-term survival of populations in the locality and is unlikely to further create a barrier to movement for these species. The proposal is not likely to significantly affect the availability of quality habitat for this species.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The proposal is not likely to increase the likelihood of an invasive species becoming established in the habitat.

- **Introduce disease that may cause the species to decline**

The proposal is not likely to increase the likelihood of a disease becoming established or proliferating in a local population that would result in a decline of this species.

- **Interfere substantially with the recovery of the species**

Due to the small amount of foraging habitat likely to be affect by the proposal (11ha) the proposal is not likely to interfere with the recovery of this species.

Conclusion

The Corben's Long-eared Bat forages and roosts across a wide range of woodland types, including those within the proposal site. Although a relatively small area of potential foraging habitat will be removed, there is an abundance of similar and potentially higher quality habitat elsewhere within the wider locality. The loss of 11ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining available mapped habitat in the locality. As a consequence, habitat to be removed is not considered to be significant to this species. Therefore, the action proposed is unlikely to lead to a significant impact on the Corben's Long-eared Bat.

F.7 Grey-headed Flying-fox

Status

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under both the EPBC Act and BC Act.

Distribution and habitat

The Grey-headed Flying-fox Occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum Corymbia maculata) and on the northwest slopes (generally associated with flowering White Box *Eucalyptus albens* or Mugga Ironbark *E. sideroxylon*). Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.

Specific impacts

The proposed will impact approximately 54.6ha of potential foraging habitat for Grey-headed Flying-fox. Majority of the habitat to be impacted is associated with Box-Gum Woodland. Habitat to be impact occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment.

EPBC Act Significance Assessment

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water. Grey-headed Flying-foxes can migrate up to 75km north during the winter and during this time young flying-foxes establish camps.

With reference to DoEE's National Flying-fox monitoring viewer, there are no recorded Flying-fox camps within the study area (DoEE 2021). The closest recorded camps to the study area include:

- Wagga Wagga (camp #641) – according to the National Flying Fox monitoring viewer this camp has last recorded Grey-headed Flying-fox between1-499 individuals in 2015.

Occurrences of this species within the study area are not at the limits of the species' distribution, nor are any maternity camps present in the study area, and as such the habitat within the study area can only be considered to represent a part of the foraging range of widely occurring individuals. However, the Grey-headed Flying-fox has no separate or distinct populations (DoE 2014a). The species constantly exchanges genetic information between camps throughout its geographic range. Therefore, the species occurs as one population and therefore any individuals that occur in the study area would be considered to form part of 'an important population'.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of an important population of a species**

The proposal would impact approximately 54.6ha of potential foraging habitat for Grey-headed Flying-fox. Habitat to be impact occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment. Due to the nomadic nature of Grey-headed Flying-fox and their ability to forage up to 50km from roost sites, the Grey-headed Flying-fox would not be restricted to habitat in the study area. While limited habitat in the proposal site has the potential to be used by these species, it is not likely to be of high importance due to its relatively small area and the availability of equal or greater quality habitat within the locality and wider region. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 54.6ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Any identified population of Grey-headed Flying-fox in the area would not be restricted to habitat within the proposal site. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of an important population**

The action proposed is likely to affect approximately 54.6ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species. The impact of habitat would compromise a small proportion of available habitat for the species. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 54.6ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. Nevertheless, the removal of approximately 54.6ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Grey-headed Flying-fox during seasons.

- **Fragment an existing important population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 54.6ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation. As the proposal site is small in nature, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the proposal site and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of Environment and Climate Change 2006).

The foraging habitat within the study area meets the DECCW (2009) criteria for habitat critical for the survival of Grey-headed Flying-fox due to its proximity to existing camps (within 50km) but removal of small proportion (<1% Box-Gum Woodland) of foraging habitat is unlikely to significantly impact on this species, given the abundance of higher quality myrtaceous foraging habitat within the greater locality.

- **Disrupt the breeding cycle of an important population**

No roost sites/camps occur within the study area nor would the proposed action affect any roosts/camps in the locality. Therefore, it is unlikely that the proposed action would disrupt the breeding cycle of the population of Grey-headed Flying-fox.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

No. The action proposed would only affect approximately <1% of suitable foraging habitat for this species. As this species is known to forage up to 50km from roost sites, the action proposed is unlikely to significantly affect the availability of quality habitat for this species.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

It is not likely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become further established as a result of the proposed action.

- **Introduce disease that may cause the species to decline**

No. There are no known diseases that are likely to increase in the area as a result of the proposed action.

Australian flying-foxes, including the Grey-headed Flying-fox, are natural reservoirs for at least three diseases- Australian Bat Lyssavirus (ABL), Hendra virus and Menangle virus. While injured and orphaned Grey-headed Flying-foxes have a higher chance of testing positive for ABL, it is unlikely the proposed action will introduce this disease.

White-nosed syndrome, a fungal disease causing widespread concern due to its impact upon bat populations in North America, has only been identified in microbats. The disease has not been identified in Australia

- **Interfere substantially with the recovery of the species**

Due to the relatively small foraging habitat likely to be affect by the proposed action (<1% Box-Gum Woodland) and as no roost camps are located in the study area, the proposed action is not likely to interfere with the recovery of this species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the proposal site is considered to be small in terms of available habitat for the species within region. The irregular distribution of blossom resources, which is a key driver of nomadism of these species, may cause this species to occasionally forage within the proposal site. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Grey-headed Flying-fox, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. There are no Grey-headed Flying-fox camps within the proposal site. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of these species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

F.8 White-throated Needletail

Status

The White-throated Needletail (*Hirundapus caudacutus*) is listed as Vulnerable and Migratory under the EPBC Act.

Distribution and habitat

The White-throated Needletail is widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. In Australia, White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats.

Specific impacts

This species previously recorded in aerial habitats in the proposal locality. The study area only provides aerial foraging habitat for this species. The proposal has been identified to impact on about 60.33ha of vegetation communities associated with aerial foraging habitat. Majority of the habitat to be impacted is associated with Box-Gum Woodland. Habitat to be impact occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment.

EPBC Act Significance Assessment

The White-throated Needletail (*Hirundapus caudacutus*) is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment 2013) and Draft Referral guideline for migratory species (Department of the Environment 2015). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

The White-throated Needletail is a migratory species and occurs in Australia only between late spring and early autumn, but mostly in summer. This species is a non-breeding migrant with breeding taking place in Northern Asia (Birdlife Australia, 2020). The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. They have been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows. Probably recorded most often above wooded areas, including open forest and rainforest (Birdlife Australia, 2020). This species is not or near the limit of its range as it occurs over eastern and northern Australia and in Northern Asia (Birdlife Australia, 2020).

White-throated Needletail is almost exclusively aerial and although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps.

The study area does not contain key resources for breeding or dispersal, does not occur at the limit of the species distribution range and is unlikely to be necessary for maintaining genetic diversity populations which may occur. However, the species is a migratory species and the individuals which migrate to Australia would be considered as one population and therefore any individuals within the study area is considered to form part of an 'important population'. One hundred individuals would be considered internationally important, while ten individuals would be considered nationally important (Department of the Environment 2015).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

- **Lead to a long-term decrease in the size of an important population of a species**

The threshold for a significant impact nationally would be impacts to ten individuals (Department of the Environment 2015). This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. Forage over most types of habitat, they are recorded most often above wooded areas, including habitat identified in the study area. The species may use the study area for aerial foraging on an intermittent basis but is not known to breed in Australia. It is unlikely that the impact of 61.13ha of vegetation communities associated with aerial foraging habitat, of which, occurs predominately as vegetation limited to the margins of existing small patches of vegetation across the entire alignment, would have a significant impact upon for this species to lead to a long-term decrease in the size of its population.

- **Reduce the area of occupancy of an important population**

The proposal will impact 61.13ha of vegetation limited to the margins of existing small patches, this represents potential aerial foraging habitat for this species. Majority of the habitat to be impacted is associated with Box-Gum Woodland. Approximately 405,000ha of Box-Gum Woodland ecological community remains in various conditions which would be accessible to the species (Department of Environment Climate Change and Water 2011). The loss of 61.13ha of habitat for this species would be a loss of <1% of habitat when compared to the remaining Box-Gum Woodland that is accessible to the species. This species forages on the wing and the vegetation within the study area is likely to provide aerial foraging habitat for this species. This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. It is unlikely that the impact of potential foraging habitat would significantly impact upon available resources for this species to the point that it would significantly reduce of the area of occupancy for the species.

- **Fragment an existing important population into two or more populations**

Habitat connectivity is not likely to be affected by the proposal. The majority of the study area occurs within or adjacent to previously disturbed land (i.e. agriculture). Approximately 61.13ha of habitat is likely to be affected by the proposal with vegetation removal largely limited to a linear disturbance corridor. As the study area is linear in nature and largely avoids significant vegetation, the proposal would not further fragment or isolate any previously undisturbed patches of habitat than what already exists in the study area and locality. Furthermore, the White-throated Needletail is a highly mobile and aerial species able to transverse fragmented landscapes to isolated patches of vegetation. As potential habitat within the study area already occurs within a highly fragmented landscape, it is considered unlikely that the disturbance of habitat in the study area would fragment the existing population into two or more populations.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

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

The proposal will impact a relatively small proportion of potential aerial foraging habitat (<1%) for this species. The White-throated Needletail is a migratory species and breeds in northern Asia. This species forages on the wing and the vegetation within the study area is likely to provide aerial foraging habitat for this species. This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. Therefore, this would not meet the above criteria and the study area is not critical to the survival of the White-throated Needletail.

- **Disrupt the breeding cycle of an important population**

White-throated Needletail does not breed within Australia. The removal of approximately of potential foraging habitat is unlikely to disrupt their movements to Northern Asia breeding grounds. As such the proposal is unlikely to affect the breeding cycle of a population of White-throated Needletail.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will impact a small proportion (<0.1%) of potential foraging habitat for the White-throated Needletail. The impact is predominately of vegetation limited to the margins of existing small patches, this represent potential aerial foraging habitat for this species. This species occurs widely within NSW and QLD whilst in Australia and suitable foraging resources could be accessed widely throughout the locality and beyond. It is unlikely that the impact of potential foraging habitat would significantly impact upon available resources for this species to the point that it would significantly isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

It is not likely that invasive species (such as introduced predators) that are harmful to the White-throated Needletail would become further established as a result of the proposal.

- **Introduce disease that may cause the species to decline**

No. There are no known diseases that are likely to increase in the area as a result of the proposal.

- **Interfere substantially with the recovery of the species**

As this species does not breed in Australia and forages on the wing and has the potential to occur intermittently within the locality, the proposal is not likely to interfere with the recovery of this species.

Conclusion

The threshold for a significant impact nationally would be impacts to ten individuals (Department of the Environment 2015). The proposal will impact a small proportion (<0.1%) of potential foraging habitat for the White-throated Needletail. The impact is predominately of vegetation limited to the margins of existing small patches, this represent potential aerial foraging habitat for this species. No breeding occurring within Australia and therefore the proposal will not impact life-cycle for the species. The White-throated Needletail may use the study area for aerial foraging on an intermittent basis and the proposal is not likely to have a significant impact upon available resources for this species in the vicinity of the study area or its wider locality. Therefore, the habitat to be impacted is not considered important to the long-term survival of the White-throated Needletail.

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix G BAM data

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

BAM vegetation integrity plot data

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q1: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	14	1	0	8	4	0	1	7	1
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			52.6	47.5	35	0	10.8	1.3	0	0.4	5.1	1
Alternanthera denticulata	0.1	2	FG					0.1				
Bothriochloa macra	2	20	GG				2					
*Bromus diandrus**	1	10	HT									1
Carex appressa	4	40	GG				4					
Carex inversa	0.1	3	GG				0.1					
*Cirsium vulgare**	0.2	4	EX								0.2	
Cynodon dactylon	3	60	GG				3					
Digitaria divaricatissima	0.2	2	GG				0.2					
*Echium plantagineum**	0.5	20	EX								0.5	
Einadia nutans	0.1	3	FG					0.1				
Enteropogon acicularis	0.2	2	GG				0.2					
Eucalyptus camaldulensis	35	5	TG		35							
Glycine tabacina	0.4	20	OG							0.4		
*Hordeum vulgare**	1	20	EX								1	
Juncus usitatus	0.5	10	GG				0.5					
*Lactuca serriola**	0.2	4	EX								0.2	
*Lolium perenne**	2	30	EX								2	
Oxalis perennans	0.1	2	FG					0.1				
Rumex brownii	1	30	FG					1				
Rytidosperma setaceum	0.8	20	GG				0.8					
*Sonchus oleraceus**	0.2	10	EX								0.2	

Easting	571287
Northing	6149401
Orientation	145
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	3
50-79	2
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	Yes
Hollows	1
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	78
Bare Ground (%)	17
Vegetation (%)	1
Rock (%)	4

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q2: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			28	11	2	0	2	7	0	0	17	1
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			65	41.6	40	0	0.4	1.2	0	0	23.4	5
*Avena barbata**	15	200	EX								15	
Boerhavia dominii	0.1	2	FG					0.1				
*Bromus diandrus**	5	100	HT									5
*Chondrilla juncea**	0.1	3	EX								0.1	
*Cirsium vulgare**	0.2	3	EX								0.2	
*Conyza spp.**	0.1	1	EX								0.1	
Cyperus gracilis	0.2	20	GG				0.2					
Dysphania pumilio	0.1	6	FG					0.1				
*Echium plantagineum**	0.2	20	EX								0.2	
Einadia nutans subsp. nutans	0.1	3	FG					0.1				
Erodium crinitum	0.1	10	FG					0.1				
Eucalyptus melliodora	35	1	TG		35							
Eucalyptus spp. (juvenile)	5	10	TG		5							
*Hordeum vulgare**	1	20	EX								1	
*Hypochaeris radicata**	0.1	10	EX								0.1	
Juncus continuus	0.2	3	GG				0.2					
*Lactuca serriola**	0.3	30	EX								0.3	
*Malva parviflora**	0.1	3	EX								0.1	
*Modiola caroliniana**	0.1	10	EX								0.1	
Rumex brownii	0.2	3	FG					0.2				
Senna barclayana	0.2	2	FG					0.2				
Sida corrugata	0.4	20	FG					0.4				
*Solanum nigrum**	0.2	10	EX								0.2	
*Sonchus oleraceus**	0.2	20	EX								0.2	
*Sorghum spp.**	0.5	2	EX								0.5	
*Tribulus terrestris**	0.1	1	EX								0.1	
*Trifolium arvense**	0.1	2	EX								0.1	
*Trifolium spp.**	0.1	2	EX								0.1	

Easting	571498
Northing	6149445
Orientation	310
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	0
30-49	No
20-29	No
10-19	No
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	5
Attributes 1x1 plot (%)	
Litter (%)	70
Bare Ground (%)	26
Vegetation (%)	4
Rock (%)	0

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q3: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	15	2	0	7	5	0	1	4	0
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			51.7	**44.5**	35	0	8.3	1	0	0.2	**7.2**	0
Alternanthera denticulata	0.1	1	FG					0.1				
Austrostipa scabra subsp. scabra	0.5	15	GG				0.5					
Austrostipa setacea	3	50	GG				3					
*Cirsium vulgare**	0.1	3	EX								0.1	
Cyperus gracilis	3	100	GG				3					
Dichondra repens	0.5	100	FG					0.5				
Enteropogon acicularis	0.1	5	GG				0.1					
Eucalyptus melliodora	15	16	TG		15							
Eucalyptus microcarpa	20	1	TG		20							
Glycine tabacina	0.2	4	OG							0.2		
*Lolium perenne**	5	150	EX								5	
Maireana enchylaenoides	0.1	1	FG					0.1				
Oxalis perennans	0.1	1	FG					0.1				
*Phalaris aquatica**	2	6	EX								2	
*Plantago lanceolata**	0.1	8	EX								0.1	
Rumex brownii	0.2	10	FG					0.2				
Rytidosperma caespitosum	0.5	15	GG				0.5					
Rytidosperma setaceum	1	40	GG				1					
Schoenus latelaminatus	0.2	5	GG				0.2					

Easting	572410
Northing	6149556
Orientation	170
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	17
Attributes 1x1 plot (%)	
Litter (%)	90
Bare Ground (%)	9
Vegetation (%)	1
Rock (%)	0

Date: 3/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q4: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			26	20	2	2	8	5	1	2	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			83	69.2	18	11	36	2.8	0.2	1.2	13.8	10
Acacia paradoxa	10	8	SG			10						
Acacia pycnantha	3	4	TG		3							
Acacia rubida	1	1	SG			1						
*Aira spp.**	0.3	20	EX								0.3	
Anthosachne scabra	3	50	GG				3					
Austrostipa densiflora	6	80	GG				6					
Austrostipa scabra subsp. scabra	10	150	GG				10					
Austrostipa setacea	15	200	GG				15					
*Avena barbata**	3	50	EX								3	
Bothriochloa macra	0.6	6	GG				0.6					
*Briza maxima**	0.2	15	EX								0.2	
Cheilanthes sieberi	0.2	10	EG						0.2			
Digitaria divaricatissima	0.3	3	GG				0.3					
*Echium plantagineum**	0.2	15	EX								0.2	
Eucalyptus blakelyi	15	2	TG		15							
*Euphorbia drummondii**	0.2	2	FG					0.2				
Glycine canescens	1	0.1	OG							1		
Glycine clandestina	0.2	40	OG							0.2		
*Hypericum perforatum**	10	60	HT									10
*Hypochaeris radicata**	0.1	15	EX								0.1	
Oxalis perennans	0.1	3	FG					0.1				
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma auriculatum	0.7	50	GG				0.7					
Rytidosperma setaceum	0.4	30	GG				0.4					
Sida corrugata	2	80	FG					2				
Vittadinia gracilis	0.4	3	FG					0.4				

Easting	572540
Northing	6149618
Orientation	260
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	1
Attributes 1x1 plot (%)	
Litter (%)	50
Bare Ground (%)	26
Vegetation (%)	24
Rock (%)	0

Date: 03/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q5: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			28	22	1	4	9	7	1	0	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			133.3	129.5	30	24.2	64	11.1	0.2	0	3.8	1
Acacia buxifolia subsp. buxifolia	2	4	SG			2						
Acacia decora	15	9	SG			15						
Acacia implexa	7	3	SG			7						
Acacia verniciflua	0.2	1	SG			0.2						
Anthosachne scabra	0.3	10	GG				0.3					
Austrostipa densiflora	40	500	GG				40					
Austrostipa scabra subsp. scabra	0.6	20	GG				0.6					
Austrostipa setacea	20	200	GG				20					
*Avena barbata**	0.5	20	EX								0.5	
*Briza maxima**	2	50	EX								2	
Cheilanthes sieberi subsp. sieberi	0.2	4	EG						0.2			
*Chondrilla juncea**	0.1	4	EX								0.1	
Dianella revoluta var. revoluta	4	50	FG					4				
*Echium plantagineum**	0.1	10	EX								0.1	
Einadia nutans subsp. nutans	0.2	5	FG					0.2				
Eucalyptus microcarpa	30	13	TG		30							
Euphorbia drummondii	0.5	20	FG					0.5				
Goodenia hederacea subsp. hederacea	0.1	2	FG					0.1				
*Hypericum perforatum**	1	30	HT									1
*Hypochaeris radicata**	0.1	2	EX								0.1	
Lomandra bracteata	0.1	1	GG				0.1					
Lomandra filiformis subsp. filiformis	0.1	1	GG				0.1					
Lomandra multiflora subsp. multiflora	0.5	5	GG				0.5					
Panicum decompositum	0.4	10	GG				0.4					
Rytidosperma spp. (no fertile material)	2	60	GG				2					
Sida corrugata	6	90	FG					6				
Tricoryne elatior	0.1	3	FG					0.1				
Wahlenbergia gracilis	0.2	15	FG					0.2				

Easting	5725579
Northing	6149547
Orientation	350
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	No
50-79	No
30-49	No
20-29	Yes
10-19	Yes
5-9	Yes
<5	No
Hollows	1
Length logs (m)	3
Attributes 1x1 plot (%)	
Litter (%)	48
Bare Ground (%)	12
Vegetation (%)	32
Rock (%)	8

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q6: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	1	1	0	0	0	0	0	12	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			86.5	35	35	0	0	0	0	0	51.5	8
*Bromus catharticus**	6	80	EX								6	
*Bromus diandrus**	8	100	HT									8
*Bromus molliformis**	1	10	EX								1	
*Cirsium vulgare**	0.2	4	EX								0.2	
Eucalyptus camaldulensis	35	5	TG		35							
*Hordeum vulgare**	20	200	EX								20	
*Lolium perenne**	6	100	EX								6	
*Marrubium vulgare**	5	50	EX								5	
*Polygonum aviculare**	0.1	1	EX								0.1	
*Sisymbrium erysimoides**	2	30	EX								2	
*Sonchus oleraceus**	0.1	2	EX								0.1	
*Trifolium pratense**	0.1	1	EX								0.1	
*Vulpia myuros**	3	50	EX								3	

Easting	574273
Northing	6155224
Orientation	210
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	5
50-79	4
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	9
Length logs (m)	47
Attributes 1x1 plot (%)	
Litter (%)	56
Bare Ground (%)	40
Vegetation (%)	4
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q7: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			11	3	2	0	1	0	0	0	8	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			81.9	31.5	31	0	0.5	0	0	0	50.4	35
*Bromus catharticus**	1	20	EX								1	
*Bromus diandrus**	35	500	HT									35
Cynodon dactylon	0.5	10	GG				0.5					
Eucalyptus camaldulensis	25	3	TG		25							
Eucalyptus melliodora	6	1	TG		6							
*Hordeum vulgare**	1	40	EX								1	
*Lolium perenne**	10	200	EX								10	
*Marrubium vulgare**	3	30	EX								3	
*Sisymbrium erysimoides**	0.2	2	EX								0.2	
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Trifolium pratense**	0.1	2	EX								0.1	

Easting	574208
Northing	6154946
Orientation	60
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	4
50-79	4
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	5
Length logs (m)	62
Attributes 1x1 plot (%)	
Litter (%)	72
Bare Ground (%)	8
Vegetation (%)	20
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q8: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			6	1	1	0	0	0	0	0	5	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			60.8	35	35	0	0	0	0	0	25.8	0
Eucalyptus melliodora	35	5	TG		35							
*Hordeum vulgare**	5	100	EX								5	
*Lolium perenne**	0.5	10	EX								0.5	
*Malva parviflora**	0.1	3	EX								0.1	
*Medicago sativa**	20	500	EX								20	
*Sisymbrium erysimoides**	0.2	5	EX								0.2	

Easting	574761
Northing	6157447
Orientation	80
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	0
Length logs (m)	18
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	90
Vegetation (%)	10
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q9: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			9	2	2	0	0	0	0	0	7	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			56.1	27	27	0	0	0	0	0	29.1	0
Callitris glaucophylla	7	1	TG		7							
Eucalyptus microcarpa	20	1	TG		20							
*Hordeum vulgare**	5	200	EX								5	
*Lolium perenne**	3	50	EX								3	
*Malva parviflora**	1	50	EX								1	
*Medicago sativa**	15	500	EX								15	
*Sisymbrium erysimoides**	3	100	EX								3	
*Trifolium pratense**	0.1	1	EX								0.1	
*Vulpia myuros**	2	50	EX								2	

Easting	574413
Northing	6155853
Orientation	85
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	1
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	1
Bare Ground (%)	88
Vegetation (%)	11
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q10: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	5	2	0	0	3	0	0	8	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.1	31.3	31	0	0	0.3	0	0	30.8	0
Callitris glaucophylla	6	2	TG		6							
*Capsella bursa-pastoris**	0.1	1	EX								0.1	
Dysphania pumilio	0.1	20	FG					0.1				
*Echium plantagineum**	0.1	1	EX								0.1	
Eucalyptus microcarpa	25	4	TG		25							
*Hordeum vulgare**	15	500	EX								15	
*Lepidium africanum**	0.2	10	EX								0.2	
*Lolium perenne**	2	50	EX								2	
Maireana enchylaenoides	0.1	2	FG					0.1				
*Malva parviflora**	0.4	50	EX								0.4	
*Medicago sativa**	10	500	EX								10	
Oxalis perennans	0.1	3	FG					0.1				
*Sisymbrium erysimoides**	3	100	EX								3	

Easting	574661
Northing	6155862
Orientation	20
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	4
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	9
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	60.6
Vegetation (%)	9.4
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q11: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	13	2	0	7	4	0	0	5	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			122.3	112	34	0	73.4	4.6	0	0	10.3	2.1
Alternanthera denticulata	0.1	2	FG					0.1				
Aristida behriana	0.1	1	GG				0.1					
*Bromus diandrus**	2	20	HT									2
Carex appressa	55	60	GG				55					
Chloris truncata	3	40	GG				3					
*Cirsium vulgare**	0.2	2	EX								0.2	
Cynodon dactylon	4	40	GG				4					
Dichondra repens	4	200	FG					4				
Enteropogon acicularis	1	10	GG				1					
Eucalyptus camaldulensis	30	5	TG		30							
Eucalyptus microcarpa	4	2	TG		4							
*Hordeum vulgare**	5	100	EX								5	
Juncus spp. (grazed)	0.3	1	GG				0.3					
*Lolium perenne**	3	60	EX								3	
*Lycium ferocissimum**	0.1	1	HT									0.1
Microlaena stipoides var. stipoides	10	100	GG				10					
Oxalis perennans	0.3	20	FG					0.3				
Rumex brownii	0.2	2	FG					0.2				

Easting	576289
Northing	6160764
Orientation	210
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	48
Attributes 1x1 plot (%)	
Litter (%)	34
Bare Ground (%)	40
Vegetation (%)	26
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q12: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	12	1	0	7	4	0	0	7	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			118.6	105.2	45	0	59.2	1	0	0	13.4	3.5
Alternanthera denticulata	0.1	1	FG					0.1				
*Bromus diandrus**	3	50	HT									3
Carex appressa	45	100	GG				45					
Chloris truncata	5	60	GG				5					
*Cirsium vulgare**	0.3	7	EX								0.3	
Cynodon dactylon	3	40	GG				3					
Dichondra repens	0.4	20	FG					0.4				
Enteropogon acicularis	3	40	GG				3					
Eucalyptus camaldulensis	45	6	TG		45							
*Hordeum vulgare**	4	80	EX								4	
Juncus usitatus	0.1	2	GG				0.1					
*Lactuca serriola**	0.3	10	EX								0.3	
*Lolium perenne**	5	100	EX								5	
*Lycium ferocissimum**	0.5	2	HT									0.5
Microlaena stipoides var. stipoides	3	50	GG				3					
Oxalis perennans	0.2	3	FG					0.2				
Rumex brownii	0.3	10	FG					0.3				
Rytidosperma caespitosum	0.1	2	GG				0.1					
*Sonchus oleraceus**	0.3	3	EX								0.3	

Easting	576137
Northing	6160789
Orientation	210
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	4
50-79	3
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	2
Length logs (m)	154
Attributes 1x1 plot (%)	
Litter (%)	78
Bare Ground (%)	5
Vegetation (%)	17
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q13: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			24	15	1	0	10	4	0	0	9	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			49.4	44.4	0.3	0	43.4	0.7	0	0	5	0
Anthosachne scabra	1	20	GG				1					
Aristida behriana	3	60	GG				3					
Austrostipa scabra subsp. scabra	0.2	5	GG				0.2					
Austrostipa setacea	6	100	GG				6					
*Avena barbata**	2	60	EX								2	
Bothriochloa macra	3	100	GG				3					
*Bromus molliformis**	1	20	EX								1	
Chloris truncata	6	200	GG				6					
*Echium plantagineum**	0.4	40	EX								0.4	
Enteropogon acicularis	4	100	GG				4					
*Erodium brachycarpum**	0.1	2	EX								0.1	
Erodium crinitum	0.1	2	FG					0.1				
Eucalyptus dwyeri	0.3	1	TG		0.3							
Euphorbia drummondii	0.2	15	FG					0.2				
*Hypochaeris radicata**	0.1	2	EX								0.1	
Juncus usitatus	0.2	2	GG				0.2					
Lomandra multiflora subsp. multiflora	5	100	GG				5					
*Polygonum aviculare**	0.1	1	EX								0.1	
Rumex brownii	0.2	4	FG					0.2				
Rytidosperma auriculatum	15	500	GG				15					
Sida corrugata	0.2	20	FG					0.2				
*Trifolium angustifolium**	0.1	1	EX								0.1	
*Trifolium spp.**	0.2	10	EX								0.2	
*Vulpia myuros**	1	20	EX								1	

Easting	576713
Northing	6160608
Orientation	180
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	80
Vegetation (%)	16
Rock (%)	2

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q14: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			23	16	0	0	9	7	0	0	7	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			56.4	40.4	0	0	38.7	1.7	0	0	16	0
Alternanthera nana	0.1	2	FG					0.1				
Anthosachne scabra	0.2	10	GG				0.2					
Aristida behriana	0.1	3	GG				0.1					
Austrostipa scabra subsp. scabra	35	500	GG				35					
Austrostipa setacea	0.2	6	GG				0.2					
*Avena barbata**	15	200	EX								15	
Bothriochloa macra	0.7	20	GG				0.7					
*Bromus molliformis**	0.2	6	EX								0.2	
Chloris truncata	1	35	GG				1					
*Cucumis myriocarpus subsp. leptodermis**	0.1	1	EX								0.1	
Dysphania pumilio	0.1	3	FG					0.1				
*Echium plantagineum**	0.2	10	EX								0.2	
Enteropogon acicularis	0.1	2	GG				0.1					
*Erodium brachycarpum**	0.1	1	EX								0.1	
Erodium crinitum	0.2	30	FG					0.2				
Euphorbia drummondii	0.5	20	FG					0.5				
*Hypochaeris radicata**	0.3	15	EX								0.3	
Lomandra multiflora subsp. multiflora	0.4	15	GG				0.4					
*Polygonum aviculare**	0.1	2	EX								0.1	
Rumex brownii	0.4	8	FG					0.4				
Rytidosperma auriculatum	1	100	GG				1					
Sida corrugata	0.3	15	FG					0.3				
Vittadinia gracilis	0.1	2	FG					0.1				

Easting	576623
Northing	6160426
Orientation	270
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	81
Vegetation (%)	17
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q15: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	16	0	0	8	7	1	0	5	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			46.8	21.3	0	0	8.9	12.1	0.3	0	25.5	0
Aira spp.	20	150	EX								20	
Aristida behriana	0.5	20	GG				0.5					
Austrostipa scabra subsp. scabra	1	30	GG				1					
Austrostipa setacea	0.4	15	GG				0.4					
*Avena barbata**	5	200	EX								5	
Bothriochloa macra	1	30	GG				1					
Cheilanthes sieberi subsp. sieberi	0.3	10	EG						0.3			
Chloris truncata	5	70	GG				5					
Dichondra repens	0.2	3	FG					0.2				
*Echium plantagineum**	0.3	6	EX								0.3	
Enteropogon acicularis	0.6	20	GG				0.6					
Erodium crinitum	0.2	15	FG					0.2				
Euphorbia drummondii	0.3	10	FG					0.3				
Gonocarpus elatus	10	80	FG					10				
*Hypochaeris radicata**	0.1	1	EX								0.1	
Lomandra multiflora subsp. multiflora	0.1	2	GG				0.1					
Oxalis perennans	1	50	FG					1				
Rytidosperma auriculatum	0.3	10	GG				0.3					
Sida corrugata	0.2	10	FG					0.2				
Tricoryne elatior	0.2	10	FG					0.2				
*Vulpia myuros**	0.1	1	EX								0.1	

Easting	576546
Northing	6160227
Orientation	200
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	72
Vegetation (%)	21
Rock (%)	7

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q16: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	11	0	0	5	5	1	0	4	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			44.5	42.8	0	0	41.6	1.1	0.1	0	1.7	0
Austrostipa scabra subsp. scabra	0.2	4	GG				0.2					
Bothriochloa macra	0.4	10	GG				0.4					
*Bromus molliformis**	0.4	20	EX								0.4	
Cheilanthes sieberi subsp. sieberi	0.1	1	EG						0.1			
Chloris truncata	1	80	GG				1					
Dichondra repens	0.1	5	FG					0.1				
*Echium plantagineum**	0.1	1	EX								0.1	
Enteropogon acicularis	20	200	GG				20					
Erodium crinitum	0.2	10	FG					0.2				
Euphorbia drummondii	0.5	40	FG					0.5				
*Lolium perenne**	0.9	20	EX								0.9	
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma auriculatum	20	200	GG				20					
Sida corrugata	0.2	8	FG					0.2				
*Vulpia myuros**	0.3	10	EX								0.3	

Easting	576098
Northing	6160021
Orientation	90
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	11
Bare Ground (%)	58
Vegetation (%)	31
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q17: PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			5	2	1	0	1	0	0	0	3	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			55.7	30.1	30	0	0.1	0	0	0	25.6	0
Enteropogon acicularis	0.1	1	GG				0.1					
Eucalyptus melliodora	30	8	TG		30							
Hordeum vulgare	25	500	EX								25	
*Lactuca serriola**	0.5	10	EX								0.5	
*Malva parviflora**	0.1	1	EX								0.1	

Easting	575500
Northing	6159232
Orientation	30
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	0
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	60
Bare Ground (%)	36
Vegetation (%)	4
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q18: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	7	1	0	1	5	0	0	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			50.2	40.7	35	0	5	0.7	0	0	9.5	0
*Cucumis myriocarpus subsp. leptodermis**	0.1	2	EX								0.1	
Dysphania pumilio	0.2	5	FG					0.2				
Eucalyptus microcarpa	35	3	TG		35							
*Hordeum vulgare**	3	80	EX								3	
*Lepidium africanum**	0.2	10	EX								0.2	
*Lolium perenne**	5	100	EX								5	
Maireana enchylaenoides	0.1	2	FG					0.1				
*Malva parviflora**	1	20	EX								1	
Oxalis perennans	0.1	2	FG					0.1				
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma spp. (no fertile material)	5	100	GG				5					
*Sisymbrium erysimoides**	0.2	2	EX								0.2	
Urtica incisa	0.2	10	FG					0.2				

Easting	575166
Northing	6158661
Orientation	330
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	4
Attributes 1x1 plot (%)	
Litter (%)	26
Bare Ground (%)	71
Vegetation (%)	1
Rock (%)	2

Date: 4/12/18			**Covers**	**Native**	Trees	Shrubs	Grass	Forb	Fern	Other	**Exotic**	HighThreat
Q19: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)			**# spp**	**Count**	Count	Count	Count	Count	Count	Count	**Count**	Count
			7	**3**	2	0	0	1	0	0	**4**	0
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			51.5	**29.2**	29	0	0	0.2	0	0	**22.3**	0
Callitris glaucophylla	7	2	TG		7							
Dysphania pumilio	0.2	15	FG					0.2				
Eucalyptus microcarpa	22	1	TG		22							
*Hordeum vulgare**	20	500	EX								20	
*Lepidium africanum**	0.1	1	EX								0.1	
*Malva parviflora**	0.2	3	EX								0.2	
*Medicago sativa**	2	50	EX								2	

Easting	574975
Northing	6158622
Orientation	60
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	10
Bare Ground (%)	84
Vegetation (%)	6
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q20: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			11	11	3	0	4	4	0	0	0	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			44.8	44.8	36	0	8.1	0.7	0	0	0	0
Austrostipa scabra subsp. scabra	1	30	GG				1					
Austrostipa setacea	6	60	GG				6					
Callitris glaucophylla	12	30	TG		12							
Dianella revoluta var. revoluta	0.3	2	FG					0.3				
Dichondra sp. A	0.1	1	FG					0.1				
Einadia nutans subsp. nutans	0.1	2	FG					0.1				
Eucalyptus albens	4	1	TG		4							
Eucalyptus microcarpa	20	4	TG		20							
Lomandra multiflora subsp. multiflora	0.1	1	GG				0.1					
Rytidosperma setaceum	1	20	GG				1					
Sida corrugata	0.2	20	FG					0.2				

Easting	574437
Northing	6156519
Orientation	335
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	2
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	5
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	52
Bare Ground (%)	43
Vegetation (%)	5
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q21: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			22	14	3	1	5	5	0	0	8	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			72.2	69.1	10	2	41.7	15.4	0	0	3.1	2.2
Austrostipa scabra subsp. scabra	40	7	GG				40					
Austrostipa setacea	1	1	GG				1					
Brachychiton populneus subsp. populneus	4	5	TG		4							
*Bromus diandrus**	0.2	7	HT									0.2
Callitris glaucophylla	4	40	TG		4							
Dichondra repens	10	100	FG					10				
Dysphania pumilio	0.3	20	FG					0.3				
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Eucalyptus microcarpa	2	30	TG		2							
*Hordeum vulgare**	0.2	15	EX								0.2	
*Lolium perenne**	0.1	1	EX								0.1	
Lomandra multiflora subsp. multiflora	0.4	15	GG				0.4					
Maireana enchylaenoides	2	30	FG					2				
Maireana microphylla	2	40	SG			2						
*Malva parviflora**	0.2	2	EX								0.2	
*Marrubium vulgare**	0.2	5	EX								0.2	
*Olea europaea**	2	30	HT									2
Rumex brownii	3	70	FG					3				
Rytidosperma auriculatum	0.2	1	GG				0.2					
Rytidosperma caespitosum	0.1	1	GG				0.1					
*Sisymbrium erysimoides**	0.1	1	EX								0.1	
*Solanum nigrum**	0.1	1	EX								0.1	

Easting	574401
Northing	6155950
Orientation	180
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	6
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	5
Length logs (m)	12
Attributes 1x1 plot (%)	
Litter (%)	78
Bare Ground (%)	20
Vegetation (%)	2
Rock (%)	0

Date: 05/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q22: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	11	2	0	8	1	0	0	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			35.8	32.1	25	0	7	0.1	0	0	3.7	0
*Avena fatua**	0.1	1	EX								0.1	
Casuarina cristata	8	1	TG		8							
Chloris truncata	1	20	GG				1					
Cynodon dactylon	0.2	10	GG				0.2					
Cyperus gracilis	0.2	10	GG				0.2					
Dysphania pumilio	0.1	1	FG					0.1				
Eucalyptus microcarpa	17	1	TG		17							
*Hordeum vulgare**	0.5	50	EX								0.5	
Juncus spp. (grazed)	0.2	20	GG				0.2					
*Lepidium africanum**	1	25	EX								1	
*Lepidium bonariense**	0.1	1	EX								0.1	
*Lolium perenne**	1	30	EX								1	
Lomandra multiflora subsp. multiflora	0.2	10	GG				0.2					
Panicum effusum	0.2	8	GG				0.2					
*Polygonum aviculare**	1	25	EX								1	
Rytidosperma caespitosum	1	50	GG				1					
Rytidosperma racemosum	4	500	GG				4					

Easting	576955
Northing	6165561
Orientation	260
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	0
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	1
Length logs (m)	13
Attributes 1x1 plot (%)	
Litter (%)	27
Bare Ground (%)	72
Vegetation (%)	1
Rock (%)	0

Date: 5/12/2018			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q23: PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	13	2	0	7	4	0	0	8	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			50.6	48.7	45	0	3.1	0.6	0	0	1.9	0
Alternanthera nana	0.1	1	FG					0.1				
Austrostipa scabra subsp. scabra	0.5	15	GG				0.5					
Chloris truncata	0.2	6	GG				0.2					
*Cucumis myriocarpus subsp. leptodermis**	0.1	2	EX								0.1	
Dysphania pumilio	0.1	1	FG					0.1				
Eucalyptus albens	15	1	TG		15							
Eucalyptus blakelyi	30	11	TG		30							
*Hordeum vulgare**	0.9	30	EX								0.9	
Juncus spp.	0.1	2	GG				0.1					
*Lepidium africanum**	0.3	7	EX								0.3	
*Lolium perenne**	0.2	5	EX								0.2	
Lomandra multiflora subsp. multiflora	0.2	5	GG				0.2					
*Malva parviflora**	0.1	1	EX								0.1	
Oxalis perennans	0.2	10	FG					0.2				
Panicum effusum	0.6	10	GG				0.6					
*Polygonum aviculare**	0.1	1	EX								0.1	
Rumex brownii	0.2	5	FG					0.2				
Rytidosperma caespitosum	1	35	GG				1					
Rytidosperma racemosum	0.5	20	GG				0.5					
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Vulpia myuros**	0.1	1	EX								0.1	

Easting	576964
Northing	6165446
Orientation	350
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	1
Length logs (m)	34
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	68
Vegetation (%)	2
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q25: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			30	20	1	0	8	10	0	1	10	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			30.9	28.2	15	0	10.3	2.7	0	0.2	2.7	0.5
Anthosachne scabra	3	50	GG				3					
Austrostipa scabra subsp. scabra	3	50	GG				3					
*Avena fatua**	0.5	10	EX								0.5	
Bothriochloa macra	0.5	10	GG				0.5					
*Bromus diandrus**	0.5	30	HT									0.5
Chloris truncata	1	10	GG				1					
*Cucumis myriocarpus subsp. leptodermis**	0.2	15	EX								0.2	
Desmodium varians	0.2	5	OG							0.2		
Dichondra repens	0.3	30	FG					0.3				
Dysphania pumilio	0.5	50	FG					0.5				
*Echium plantagineum**	0.4	20	EX								0.4	
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Erodium crinitum	0.3	30	FG					0.3				
Eucalyptus albens	15	1	TG		15							
Euphorbia drummondii	0.2	5	FG					0.2				
Geranium solanderi	0.1	1	FG					0.1				
Hypericum gramineum	0.2	5	FG					0.2				
*Lepidium africanum**	0.2	20	EX								0.2	
*Lolium perenne**	0.3	20	EX								0.3	
Lomandra multiflora subsp. multiflora	0.3	6	GG				0.3					
Oxalis perennans	0.2	10	FG					0.2				
Panicum effusum	0.2	10	GG				0.2					
*Polygonum aviculare**	0.1	2	EX								0.1	
Rumex brownii	0.5	30	FG					0.5				
Rytidosperma carphoides	0.3	20	GG				0.3					
Rytidosperma caespitosum	2	40	GG				2					
Sida corrugata	0.3	20	FG					0.3				
*Trifolium glomeratum**	0.1	1	EX								0.1	
*Vulpia myuros**	0.1	10	EX								0.1	
*Xanthium occidentale**	0.3	10	EX								0.3	

Easting	576999
Northing	6165202
Orientation	210
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	6
Attributes 1x1 plot (%)	
Litter (%)	10
Bare Ground (%)	73
Vegetation (%)	3
Rock (%)	14

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q26: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			26	18	2	0	9	6	0	1	8	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			52.8	49.6	35	0	12.7	1.8	0	0.1	3.2	0.6
Anthosachne scabra	0.2	20	GG				0.2					
Aristida behriana	0.3	4	GG				0.3					
Austrostipa scabra subsp. scabra	1	40	GG				1					
*Avena fatua**	0.5	20	EX								0.5	
Bromus diandrus	0.6	40	HT									0.6
Desmodium varians	0.1	2	OG							0.1		
Dysphania pumilio	0.5	10	FG					0.5				
Eucalyptus albens	15	1	TG		15							
Eucalyptus macrorhyncha	20	7	TG		20							
Euphorbia drummondii	0.2	4	FG					0.2				
Hordeum vulgare	0.2	10	EX								0.2	
*Hypochaeris radicata**	0.2	3	EX								0.2	
Juncus spp.	0.1	2	GG				0.1					
*Lolium perenne**	1	40	EX								1	
Lomandra multiflora subsp. multiflora	0.5	20	GG				0.5					
Oxalis perennans	0.3	20	FG					0.3				
Panicum effusum	0.2	15	GG				0.2					
Rumex brownii	0.4	6	FG					0.4				
Rytidosperma auriculatum	0.2	5	GG				0.2					
Rytidosperma carphoides	10	250	GG				10					
Rytidosperma setaceum	0.2	10	GG				0.2					
Stypandra glauca	0.2	1	FG					0.2				
Trifolium arvense	0.1	1	EX								0.1	
*Vulpia myuros**	0.5	25	EX								0.5	
Wahlenbergia gracilis	0.2	5	FG					0.2				
*Xanthium occidentale**	0.1	1	EX								0.1	

Easting	576894
Northing	6165215
Orientation	165
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	71
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	57.6
Vegetation (%)	0.4
Rock (%)	12

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q27: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			7	3	1	0	2	0	0	0	4	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			46.3	36.1	35	0	1.1	0	0	0	10.2	4
Austrostipa scabra subsp. scabra	0.1	1	GG				0.1					
*Bromus diandrus**	4	80	HT									4
Eucalyptus blakelyi	35	3	TG		35							
*Hordeum vulgare**	6	100	EX								6	
Juncus spp. (grazed)	1	8	GG				1					
*Polygonum aviculare**	0.1	3	EX								0.1	
*Vulpia myuros**	0.1	5	EX								0.1	

Easting	576937
Northing	6165033
Orientation	130
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	2
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	16
Bare Ground (%)	79
Vegetation (%)	0
Rock (%)	5

Date: 5/14/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q28: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	10	2	0	5	2	0	1	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			45.8	42.4	35	0	7.1	0.2	0	0.1	3.4	0
Anthosachne scabra	4	200	GG				4					
Austrostipa scabra subsp. scabra	0.5	10	GG				0.5					
*Avena fatua**	0.1	1	EX								0.1	
*Bromus molliformis**	1	30	EX								1	
Chloris truncata	0.2	10	GG				0.2					
*Chondrilla juncea**	0.2	10	EX								0.2	
Desmodium varians	0.1	2	OG							0.1		
Eucalyptus albens	10	1	TG		10							
Eucalyptus macrorhyncha	25	6	TG		25							
Geranium solanderi	0.1	1	FG					0.1				
*Hypochaeris radicata**	0.1	2	EX								0.1	
*Lolium perenne**	1	100	EX								1	
Lomandra multiflora subsp. multiflora	2	0.2	GG				2					
Rumex brownii	0.1	15	FG					0.1				
Rytidosperma caespitosum	0.4	30	GG				0.4					
*Vulpia myuros**	1	100	EX								1	

Easting	576911
Northing	6166628
Orientation	80
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	59
Attributes 1x1 plot (%)	
Litter (%)	38
Bare Ground (%)	30
Vegetation (%)	32
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q29: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	6	1	0	5	0	0	0	4	0
Species	**Cover**	**Abundance**	Sum cover	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			47	44.2	35	0	9.2	0	0	0	2.8	0
Anthosachne scabra	2	100	GG				2					
Austrostipa scabra subsp. scabra	2	60	GG				2					
*Bromus molliformis**	0.2	10	EX								0.2	
Eucalyptus macrorhyncha	35	10	TG		35							
*Hordeum vulgare**	0.5	50	EX								0.5	
*Lolium perenne**	0.1	10	EX								0.1	
Panicum effusum	0.2	5	GG				0.2					
Rytidosperma caespitosum	1	30	GG				1					
Rytidosperma setaceum	4	100	GG				4					
*Vulpia myuros**	2	200	EX								2	

Easting	576916
Northing	6167167
Orientation	170
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	67
Attributes 1x1 plot (%)	
Litter (%)	52
Bare Ground (%)	46
Vegetation (%)	2
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q31: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			31	15	1	0	8	5	0	1	16	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			76.4	57.4	50	0	6.4	0.8	0	0.2	19	4.3
Anthosachne scabra	1	30	GG				1					
Austrostipa scabra subsp. scabra	0.1	2	GG				0.1					
*Avena fatua**	0.1	2	EX								0.1	
Bothriochloa macra	1	20	GG				1					
*Bromus diandrus**	0.3	5	HT									0.3
*Bromus molliformis**	0.2	30	EX								0.2	
Carex inversa	0.1	2	GG				0.1					
*Cirsium vulgare**	0.2	2	EX								0.2	
Cynodon dactylon	0.5	10	GG				0.5					
Dichondra repens	0.1	20	FG					0.1				
*Echium plantagineum**	0.1	1	EX								0.1	
Einadia nutans subsp. nutans	0.1	2	FG					0.1				
Eucalyptus camaldulensis	50	31	TG		50							
Geranium homeanum	0.1	1	FG					0.1				
Glycine tabacina	0.2	10	OG							0.2		
*Hordeum vulgare**	0.5	10	EX								0.5	
Juncus spp.	3	20	GG				3					
*Lolium perenne**	0.5	10	EX								0.5	
Microlaena stipoides var. stipoides	0.5	10	GG				0.5					
*Modiola caroliniana**	0.2	15	EX								0.2	
*Onopordum acanthium subsp. acanthium**	2	100	EX								2	
Oxalis perennans	0.1	5	FG					0.1				
*Phalaris aquatica**	10	40	EX								10	
Rumex brownii	0.4	10	FG					0.4				
Rytidosperma auriculatum	0.2	10	GG				0.2					
*Schinus molle**	3	1	HT									3
*Solanum nigrum**	0.1	1	EX								0.1	
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Trifolium repens**	0.1	1	EX								0.1	
*Vulpia myuros**	0.6	50	EX								0.6	
*Xanthium spinosum**	1	5	HT									1

Easting	576934
Northing	6166945
Orientation	265
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	4
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	2
Length logs (m)	8
Attributes 1x1 plot (%)	
Litter (%)	85
Bare Ground (%)	15
Vegetation (%)	0
Rock (%)	0

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q32: PCT 347 White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			20	15	4	0	6	4	0	1	5	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			37.2	36.3	26	0	9.7	0.5	0	0.1	0.9	0.1
Anthosachne scabra	4	100	GG				4					
Austrostipa scabra subsp. scabra	2	50	GG				2					
Bothriochloa macra	0.6	20	GG				0.6					
Brachychiton populneus subsp. populneus	3	2	TG		3							
*Bromus diandrus**	0.1	5	HT									0.1
*Bromus hordeaceus**	0.1	5	EX								0.1	
*Chondrilla juncea**	0.1	2	EX								0.1	
Desmodium varians	0.1	2	OG							0.1		
Dichondra repens	0.1	20	FG					0.1				
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Eucalyptus albens	4	1	TG		4							
Eucalyptus blakelyi	15	5	TG		15							
Eucalyptus macrorhyncha	4	3	TG		4							
Euphorbia drummondii	0.1	1	FG					0.1				
*Lolium perenne**	0.4	50	EX								0.4	
Oxalis perennans	0.2	5	FG					0.2				
Panicum effusum	0.1	2	GG				0.1					
Rytidosperma caespitosum	2	50	GG				2					
Rytidosperma setaceum	1	50	GG				1					
*Vulpia myuros**	0.2	30	EX								0.2	

Easting	576929
Northing	6166817
Orientation	240
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	57
Attributes 1x1 plot (%)	
Litter (%)	59
Bare Ground (%)	18
Vegetation (%)	7
Rock (%)	16

Date: 5/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q33: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)			Count									
			# spp		Count	Count	Count	Count	Count	Count	Count	Count
			33	18	1	0	11	5	0	1	15	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.2	58	40	0	15.2	2.7	0	0.1	4.2	0.4
Austrostipa scabra subsp. scabra	0.8	50	GG				0.8					
*Avena fatua**	0.2	20	EX								0.2	
Bothriochloa macra	1	15	GG				1					
*Bromus diandrus**	0.2	6	HT									0.2
*Bromus molliformis**	0.1	1	EX								0.1	
Carex inversa	0.1	10	GG				0.1					
Carex spp.	0.2	13	GG				0.2					
*Chondrilla juncea**	0.2	10	EX								0.2	
Cynodon dactylon	0.6	20	GG				0.6					
*Echium plantagineum**	0.1	2	EX								0.1	
Eucalyptus camaldulensis	40	3	TG		40							
Geranium homeanum	0.2	3	FG					0.2				
Glycine tabacina	0.1	4	OG							0.1		
Juncus usitatus	0.2	1	GG				0.2					
*Lactuca serriola**	0.1	1	EX								0.1	
*Lepidium africanum**	0.5	6	EX								0.5	
*Lolium perenne**	0.7	50	EX								0.7	
Lomandra filiformis subsp. filiformis	0.1	1	GG				0.1					
*Marrubium vulgare**	0.1	4	EX								0.1	
Microlaena stipoides var. stipoides	10	250	GG				10					
*Modiola caroliniana**	0.2	4	EX								0.2	
*Onopordum acanthium subsp. acanthium**	0.1	1	EX								0.1	
Oxalis perennans	1	100	FG					1				
Panicum effusum	1	50	GG				1					
*Phalaris aquatica**	1	6	EX								1	
*Romulea rosea var. australis**	0.2	40	HT									0.2
Rumex brownii	0.4	6	FG					0.4				
Rytidosperma caespitosum	1	60	GG				1					
Rytidosperma setaceum	0.2	10	GG				0.2					
Sida corrugata	1	30	FG					1				
*Tribulus terrestris**	0.1	1	EX								0.1	
*Vulpia myuros**	0.4	20	EX								0.4	
Wahlenbergia communis	0.1	1	FG					0.1				

Easting	576975
Northing	6166491
Orientation	0
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	1
30-49	No
20-29	No
10-19	Yes
5-9	Yes
<5	No
Hollows	1
Length logs (m)	16
Attributes 1x1 plot (%)	
Litter (%)	50
Bare Ground (%)	38
Vegetation (%)	12
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q34: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	6	2	0	3	1	0	0	9	3
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			83.6	**44.9**	42	0	2.7	0.2	0	0	**38.7**	3.3
*Avena fatua**	15	200	EX								15	
Brachychiton populneus subsp. populneus	2	3	TG		2							
*Bromus catharticus**	0.4	5	EX								0.4	
*Bromus diandrus**	3	60	HT									3
Carex inversa	0.5	10	GG				0.5					
Eucalyptus blakelyi	40	18	TG		40							
*Hordeum vulgare**	0.8	30	EX								0.8	
Juncus usitatus	0.2	2	GG				0.2					
*Lactuca serriola**	0.2	3	EX								0.2	
*Lolium perenne**	4	100	EX								4	
Lomandra bracteata	2	15	GG				2					
*Paspalum dilatatum**	0.2	5	HT									0.2
*Phalaris aquatica**	15	60	EX								15	
Rumex brownii	0.2	4	FG					0.2				
*Xanthium spinosum**	0.1	1	HT									0.1

Easting	579453
Northing	6174694
Orientation	180
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	2
50-79	2
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	2
Length logs (m)	4
Attributes 1x1 plot (%)	
Litter (%)	86
Bare Ground (%)	1
Vegetation (%)	13
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q35: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	6	2	0	1	3	0	0	9	2
Species	**Cover**	**Abundance**	Sum cover	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			46	**11.6**	11	0	0.1	0.5	0	0	**34.4**	17
Alternanthera denticulata	0.1	1	FG					0.1				
*Avena fatua**	10	200	EX								10	
Bromus diandrus	2	50	HT									2
*Cucumis myriocarpus subsp. leptodermis**	0.1	1	EX								0.1	
Dysphania pumilio	0.2	20	FG					0.2				
*Echium plantagineum**	1	50	EX								1	
Eucalyptus blakelyi	2	1	TG		2							
Eucalyptus melliodora	9	4	TG		9							
*Hordeum vulgare**	1	50	EX								1	
*Lolium perenne**	5	200	EX								5	
Lomandra bracteata	0.1	2	GG				0.1					
*Malva parviflora**	0.2	5	EX								0.2	
*Paspalum dilatatum**	15	80	HT									15
Rumex brownii	0.2	2	FG					0.2				
*Sonchus oleraceus**	0.1	1	EX								0.1	

Easting	579664
Northing	6176300
Orientation	160
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	2
30-49	No
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	77.2
Bare Ground (%)	11
Vegetation (%)	11.8
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q36: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	9	1	1	4	2	0	1	12	5
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			87.8	56.4	35	12	8.6	0.6	0	0.2	31.4	6.3
Austrostipa setacea	4	40	GG				4					
*Avena fatua**	20	400	EX								20	
*Bromus diandrus**	3	50	HT									3
Carex inversa	0.4	3	GG				0.4					
*Chamaecytisus palmensis**	0.1	1	HT									0.1
Desmodium varians	0.2	3	OG							0.2		
Eucalyptus melliodora	35	8	TG		35							
*Hordeum vulgare**	0.3	5	EX								0.3	
*Hypericum perforatum**	0.1	1	HT									0.1
Juncus remotiflorus	0.2	1	GG				0.2					
*Lolium perenne**	4	100	EX								4	
Lomandra bracteata	4	30	GG				4					
*Marrubium vulgare**	0.3	1	EX								0.3	
*Medicago sativa**	0.1	1	EX								0.1	
*Paspalum dilatatum**	3	5	HT									3
Pultenaea blakelyi	12	2	SG			12						
*Romulea rosea var. australis**	0.1	1	HT									0.1
*Setaria palmifolia**	0.3	10	EX								0.3	
Sida corrugata	0.4	5	FG					0.4				
*Sonchus oleraceus**	0.1	3	EX								0.1	
Wahlenbergia communis	0.2	5	FG					0.2				

Easting	579656
Northing	6176878
Orientation	180
Plot size	10x40X100
Attributes 10x100m plot	
Stem classes	
80+	1
50-79	2
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	1
Length logs (m)	2
Attributes 1x1 plot (%)	
Litter (%)	68
Bare Ground (%)	24
Vegetation (%)	7
Rock (%)	1

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q37: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			25	16	1	0	11	3	0	1	9	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			58.7	35.9	19	0	15.6	1.1	0	0.2	22.8	13.3
Anthosachne scabra	0.8	20	GG				0.8					
Aristida ramosa	0.8	15	GG				0.8					
Austrostipa scabra subsp. scabra	0.7	20	GG				0.7					
Austrostipa setacea	4	50	GG				4					
*Avena fatua**	5	60	EX								5	
Bothriochloa macra	2	30	GG				2					
*Bromus diandrus**	5	60	HT									5
Chloris truncata	0.8	10	GG				0.8					
Desmodium varians	0.2	2	OG							0.2		
Digitaria divaricatissima	5	60	GG				5					
*Echium plantagineum**	0.1	2	EX								0.1	
Eucalyptus melliodora	19	6	TG		19							
*Hypericum perforatum**	0.3	2	HT									0.3
*Lolium perenne**	1	30	EX								1	
Oxalis perennans	0.3	10	FG					0.3				
Panicum effusum	0.1	4	GG				0.1					
*Paspalum dilatatum**	8	60	HT									8
Rumex brownii	0.3	20	FG					0.3				
Rytidosperma auriculatum	0.4	5	GG				0.4					
Rytidosperma caespitosum	0.5	10	GG				0.5					
Rytidosperma setaceum	0.5	10	GG				0.5					
Setaria parviflora	3	50	EX								3	
Sida corrugata	0.5	40	FG					0.5				
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Vulpia myuros**	0.3	15	EX								0.3	

Easting	579847
Northing	6177724
Orientation	180
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	68
Bare Ground (%)	17
Vegetation (%)	12
Rock (%)	3

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q38: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			27	17	1	0	11	4	0	1	10	4
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			69	51.2	30	0	20.1	0.9	0	0.2	17.8	6.4
*Alternanthera pungens**	0.2	3	HT									0.2
Austrostipa scabra subsp. scabra	0.2	2	GG				0.2					
Austrostipa setacea	0.5	10	GG				0.5					
*Avena fatua**	8	180	EX								8	
Carex inversa	5	40	GG				5					
Chloris truncata	0.3	5	GG				0.3					
Cynodon dactylon	0.1	1	GG				0.1					
Desmodium varians	0.2	2	OG							0.2		
Einadia nutans subsp. nutans	0.3	1	FG					0.3				
Eucalyptus microcarpa	30	9	TG		30							
Euphorbia drummondii	0.1	1	FG					0.1				
*Hypericum perforatum**	0.2	6	HT									0.2
*Hypochaeris radicata**	0.1	1	EX								0.1	
Juncus remotiflorus	0.1	1	GG				0.1					
*Lolium perenne**	2	50	EX								2	
Lomandra bracteata	8	100	GG				8					
Lomandra filiformis subsp. coriacea	0.2	1	GG				0.2					
*Paspalum dilatatum**	2	20	HT									2
*Romulea rosea var. australis**	4	200	HT									4
Rumex brownii	0.3	6	FG					0.3				
Rytidosperma caespitosum	2	40	GG				2					
Rytidosperma setaceum	0.7	20	GG				0.7					
Rytidosperma spp. (no fertile material)	3	30	GG				3					
*Setaria parviflora**	1	30	EX								1	
Sida corrugata	0.2	3	FG					0.2				
*Solanum nigrum**	0.1	1	EX								0.1	
*Vulpia myuros**	0.2	20	EX								0.2	

Easting	580020
Northing	6178064
Orientation	0
Plot size	10x40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	2
Attributes 1x1 plot (%)	
Litter (%)	75
Bare Ground (%)	18
Vegetation (%)	7
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q39: PCT 5 River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
Sheet version: 20170224.1531			20	5	1	0	3	1	0	0	15	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			117.6	45.6	35	0	7.6	3	0	0	72	0.5
*Avena fatua**	2	40	EX								2	
Bothriochloa macra	0.1	2	GG				0.1					
*Bromus diandrus**	0.2	10	HT									0.2
*Bromus molliformis**	0.2	5	EX								0.2	
Carex inversa	0.5	6	GG				0.5					
*Cirsium vulgare**	1	6	EX								1	
*Cucumis myriocarpus subsp. leptodermis**	0.1	1	EX								0.1	
Cynodon dactylon	7	100	GG				7					
*Echium plantagineum**	0.1	1	EX								0.1	
Eucalyptus camaldulensis	35	8	TG		35							
*Hordeum vulgare**	0.2	5	EX								0.2	
*Lolium perenne**	60	1000	EX								60	
*Modiola caroliniana**	0.4	16	EX								0.4	
*Phalaris aquatica**	5	4	EX								5	
Rumex brownii	3	5	FG					3				
*Solanum nigrum**	0.2	4	EX								0.2	
*Sonchus oleraceus**	0.4	18	EX								0.4	
*Stellaria media**	0.9	30	EX								0.9	
*Vulpia myuros**	1	40	EX								1	
*Xanthium spinosum**	0.3	4	HT									0.3

Easting	576384
Northing	6170305
Orientation	10
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	5
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	No
Hollows	0
Length logs (m)	20
Attributes 1x1 plot (%)	
Litter (%)	66
Bare Ground (%)	0
Vegetation (%)	34
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q40: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			14	4	1	0	1	2	0	0	10	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			80.4	42.5	40	0	2	0.5	0	0	37.9	18
*Bromus diandrus**	15	500	HT									15
*Cirsium vulgare**	3	40	EX								3	
*Cucumis myriocarpus subsp. leptodermis**	0.2	4	EX								0.2	
*Echium plantagineum**	0.7	30	EX								0.7	
Eucalyptus melliodora	40	4	TG		40							
*Lolium perenne**	10	500	EX								10	
*Malva parviflora**	1	20	EX								1	
*Marrubium vulgare**	2	20	EX								2	
Panicum effusum	2	100	GG				2					
Rumex brownii	0.2	5	FG					0.2				
*Solanum nigrum**	1	40	EX								1	
Urtica incisa	0.3	10	FG					0.3				
*Vulpia myuros**	2	100	EX								2	
*Xanthium spinosum**	3	100	HT									3

Easting	577435
Northing	6170718
Orientation	240
Plot size	20x20X50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	4
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	4
Length logs (m)	29
Attributes 1x1 plot (%)	
Litter (%)	54
Bare Ground (%)	22
Vegetation (%)	24
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q41: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			29	17	0	0	10	6	0	1	12	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.8	37.9	0	0	36.9	0.9	0	0.1	24.9	1
Aristida behriana	0.5	20	GG				0.5					
Austrostipa scabra subsp. scabra	0.7	15	GG				0.7					
Austrostipa setacea	2	30	GG				2					
*Avena barbata**	10	500	EX								10	
Bothriochloa macra	6	80	GG				6					
*Bromus diandrus**	1	30	HT									1
*Bromus molliformis**	0.5	20	EX								0.5	
*Chondrilla juncea**	1	30	EX								1	
*Cirsium vulgare**	2	20	EX								2	
*Cucumis myriocarpus subsp. leptodermis**	0.3	1	EX								0.3	
Cynodon dactylon	3	30	GG				3					
Desmodium varians	0.1	1	OG							0.1		
Dysphania pumilio	0.1	5	FG					0.1				
*Echium plantagineum**	1	40	EX								1	
Erodium crinitum	0.1	1	FG					0.1				
Euphorbia drummondii	0.1	1	FG					0.1				
Geranium solanderi	0.1	6	FG					0.1				
*Hypochaeris radicata**	4	80	EX								4	
*Lolium perenne**	0.2	10	EX								0.2	
Lomandra bracteata	0.2	1	GG				0.2					
Lomandra filiformis subsp. filiformis	20	100	GG				20					
Oxalis perennans	0.3	15	FG					0.3				
Panicum effusum	1	30	GG				1					
Rumex brownii	0.2	3	FG					0.2				
Rytidosperma caespitosum	3	40	GG				3					
Rytidosperma setaceum	0.5	20	GG				0.5					
*Sonchus oleraceus**	0.8	20	EX								0.8	
*Trifolium spp.**	0.1	1	EX								0.1	
*Vulpia myuros**	4	200	EX								4	

Easting	577970
Northing	6170932
Orientation	50
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	14
Vegetation (%)	86
Rock (%)	0

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q42: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			28	14	0	0	9	4	0	1	14	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			66.7	26.6	0	0	25.7	0.8	0	0.1	40.1	1.6
*Aira spp.**	0.2	1	EX								0.2	
Anthosachne scabra	2	30	GG				2					
Aristida behriana	1	20	GG				1					
Austrostipa scabra subsp. scabra	4	60	GG				4					
*Avena barbata**	10	300	EX								10	
Bothriochloa macra	8	100	GG				8					
*Bromus diandrus**	1	20	HT									1
*Bromus hordeaceus**	6	100	EX								6	
*Chondrilla juncea**	0.2	10	EX								0.2	
*Cirsium vulgare**	1	10	EX								1	
Desmodium varians	0.1	3	OG							0.1		
Dysphania pumilio	0.2	10	FG					0.2				
*Echium plantagineum**	1	30	EX								1	
*Hypericum perforatum**	0.4	5	HT									0.4
*Hypochaeris radicata**	11	100	EX								11	
*Lolium perenne**	0.4	10	EX								0.4	
Lomandra bracteata	0.6	15	GG				0.6					
Lomandra filiformis subsp. coriacea	0.1	1	GG				0.1					
Oxalis perennans	0.2	1	FG					0.2				
Panicum effusum	4	60	GG				4					
*Romulea rosea var. australis**	0.2	10	HT									0.2
Rumex brownii	0.3	4	FG					0.3				
Rytidosperma caespitosum	3	50	GG				3					
Rytidosperma spp. (no fertile material)	3	60	GG				3					
Trifolium arvense	0.6	10	EX								0.6	
*Trifolium spp.**	0.1	2	EX								0.1	
*Vulpia myuros**	8	500	EX								8	
Wahlenbergia communis	0.1	2	FG					0.1				

Easting	577846
Northing	6170932
Orientation	100
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	24
Vegetation (%)	60
Rock (%)	14

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q43: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	5	1	0	2	2	0	0	14	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			38.9	6.6	4	0	2	0.6	0	0	32.3	6
*Alternanthera pungens**	1	50	HT									1
*Avena fatua**	10	300	EX								10	
*Bromus diandrus**	4	100	HT									4
*Bromus hordeaceus**	3	80	EX								3	
*Cucumis myriocarpus subsp. leptodermis**	0.4	10	EX								0.4	
Cynodon dactylon	1	10	GG				1					
Dysphania pumilio	0.1	5	FG					0.1				
*Echium plantagineum**	1	80	EX								1	
Erodium crinitum	0.5	20	FG					0.5				
Eucalyptus albens	4	30	TG		4							
*Hordeum vulgare**	3	300	EX								3	
*Lolium perenne**	4	200	EX								4	
*Malva parviflora**	0.5	20	EX								0.5	
*Marrubium vulgare**	1	6	EX								1	
Panicum effusum	1	20	GG				1					
*Solanum nigrum**	0.2	50	EX								0.2	
*Sonchus oleraceus**	0.2	10	EX								0.2	
*Vulpia myuros**	3	300	EX								3	
*Xanthium spinosum**	1	100	HT									1

Easting	578717
Northing	6171477
Orientation	105
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	3
50-79	3
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	5
Length logs (m)	14
Attributes 1x1 plot (%)	
Litter (%)	36
Bare Ground (%)	34
Vegetation (%)	26
Rock (%)	4

Date: 6/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q44: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	9	0	0	6	3	0	0	8	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			47.7	28.5	0	0	28	0.5	0	0	19.2	0.1
Austrostipa scabra subsp. scabra	5	100	GG				5					
*Avena barbata**	10	500	EX								10	
Bothriochloa macra	15	80	GG				15					
*Bromus diandrus**	0.1	5	HT									0.1
*Bromus hordeaceus**	4	100	EX								4	
Chloris truncata	1	20	GG				1					
Dysphania pumilio	0.1	2	FG					0.1				
*Echium plantagineum**	0.5	20	EX								0.5	
Euphorbia drummondii	0.1	4	FG					0.1				
Hypericum gramineum	0.3	8	FG					0.3				
*Hypochaeris radicata**	0.5	20	EX								0.5	
*Lolium perenne**	1	40	EX								1	
Lomandra bracteata	1	50	GG				1					
Panicum effusum	3	100	GG				3					
Rytidosperma caespitosum	3	100	GG				3					
*Sonchus oleraceus**	0.1	1	EX								0.1	
*Vulpia myuros**	3	200	EX								3	

Easting	578716
Northing	6171496
Orientation	90
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2
Bare Ground (%)	24
Vegetation (%)	60
Rock (%)	14

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q45: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			36	26	4	3	10	6	1	2	10	3
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			63	58	40	2.7	12.5	2.5	0.1	0.2	5	3.3
Acacia baileyana	2	1	SG			2						
Acacia decora	0.5	1	SG			0.5						
Alternanthera denticulata	0.1	1	FG					0.1				
Aristida spp.	0.1	2	GG				0.1					
Asperula conferta	0.1	2	FG					0.1				
Austrostipa scabra subsp. scabra	5	100	GG				5					
*Avena barbata**	0.1	2	EX								0.1	
Bothriochloa macra	3	50	GG				3					
Brachychiton populneus subsp. populneus	6	4	TG		6							
Cheilanthes sieberi subsp. sieberi	0.1	10	EG						0.1			
Chloris truncata	0.2	2	GG				0.2					
Cynodon dactylon	0.3	10	GG				0.3					
Desmodium varians	0.1	1	OG							0.1		
Dichondra repens	0.1	10	FG					0.1				
Einadia nutans subsp. nutans	2	40	FG					2				
Eucalyptus albens	1	1	TG		1							
Eucalyptus blakelyi	30	12	TG		30							
Eucalyptus melliodora	3	1	TG		3							
Glycine tabacina	0.1	5	OG							0.1		
*Hedypnois rhagadioloides**	0.1	2	EX								0.1	
Hypericum perforatum	0.3	10	HT									0.3
*Hypochaeris radicata**	0.1	1	EX								0.1	
*Juncus tenuis**	1	5	EX								1	
Lissanthe strigosa subsp. subulata	0.2	1	SG			0.2						
Lomandra bracteata	0.1	1	GG				0.1					
*Lycium ferocissimum**	2	1	HT									2
*Marrubium vulgare**	0.2	1	EX								0.2	
Microlaena stipoides var. stipoides	3	20	GG				3					
Panicum effusum	0.1	2	GG				0.1					
*Rosa rubiginosa**	1	1	HT									1
Rytidosperma spp. (no fertile material)	0.2	5	GG				0.2					
Sida corrugata	0.1	10	FG					0.1				
*Sonchus oleraceus**	0.1	2	EX								0.1	
Sporobolus creber	0.5	10	GG				0.5					
*Vulpia myuros**	0.1	1	EX								0.1	
Wahlenbergia communis	0.1	3	FG					0.1				

Easting	579490
Northing	6182484
Orientation	80
Plot size	20x20
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	4
Length logs (m)	19
Attributes 1x1 plot (%)	
Litter (%)	89
Bare Ground (%)	10
Vegetation (%)	1
Rock (%)	0

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q46: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	15	3	0	6	6	0	0	3	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			34.5	32.3	21.1	0	9.9	1.3	0	0	2.2	2.1
Austrostipa scabra subsp. scabra	4	180	GG				4					
Brachychiton populneus subsp. populneus	0.1	1	TG		0.1							
Chloris truncata	0.2	2	GG				0.2					
Dichondra repens	0.1	20	FG					0.1				
Einadia nutans subsp. nutans	0.1	5	FG					0.1				
Eucalyptus blakelyi	20	5	TG		20							
Eucalyptus melliodora	1	1	TG		1							
Hypericum gramineum	0.2	4	FG					0.2				
*Lolium perenne**	0.1	1	EX								0.1	
Lomandra bracteata	0.2	3	GG				0.2					
Oxalis perennans	0.1	2	FG					0.1				
Paspalidium constrictum	0.5	10	GG				0.5					
*Romulea rosea var. australis**	0.1	1	HT									0.1
*Rosa rubiginosa**	2	1	HT									2
Rumex brownii	0.2	15	FG					0.2				
Rytidosperma auriculatum	1	20	GG				1					
Rytidosperma setaceum	4	180	GG				4					
Sida corrugata	0.6	30	FG					0.6				

Easting	579444
Northing	6182353
Orientation	50
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	2
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	2
Length logs (m)	2
Attributes 1x1 plot (%)	
Litter (%)	88
Bare Ground (%)	8
Vegetation (%)	3
Rock (%)	1

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q47: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	15	1	0	6	8	0	0	1	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			40.8	40.6	30	0	4	6.6	0	0	0.2	0
Austrostipa scabra subsp. scabra	0.5	40	GG				0.5					
Bothriochloa macra	2	80	GG				2					
Chloris truncata	1	20	GG				1					
Dichondra repens	5	2000	FG					5				
Dysphania pumilio	0.1	1	FG					0.1				
Einadia nutans subsp. nutans	0.1	1	FG					0.1				
Eragrostis brownii	0.1	1	GG				0.1					
Erodium crinitum	0.1	5	FG					0.1				
Eucalyptus albens	30	2	TG		30							
*Marrubium vulgare**	0.2	10	EX								0.2	
Oxalis perennans	0.1	3	FG					0.1				
Panicum effusum	0.1	2	GG				0.1					
Rumex brownii	0.1	2	FG					0.1				
Rytidosperma spp.	0.3	15	GG				0.3					
Sida corrugata	1	50	FG					1				
*Urtica incisa**	0.1	10	FG					0.1				

Easting	579723
Northing	6182768
Orientation	220
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	3
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	16
Attributes 1x1 plot (%)	
Litter (%)	42
Bare Ground (%)	57
Vegetation (%)	0.6
Rock (%)	0.4

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q48: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Low - DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	7	0	0	5	2	0	0	3	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			15	14.7	0	0	14.3	0.4	0	0	0.3	0
Aristida spp.	1	20	GG				1					
Austrostipa scabra subsp. scabra	2	100	GG				2					
Bothriochloa macra	10	500	GG				10					
Chloris truncata	1	40	GG				1					
*Chondrilla juncea**	0.1	3	EX								0.1	
Euphorbia drummondii	0.1	2	FG					0.1				
*Hypochaeris radicata**	0.1	4	EX								0.1	
Juncus fockei	0.3	10	GG				0.3					
*Marrubium vulgare**	0.1	2	EX								0.1	
Sida corrugata	0.3	20	FG					0.3				

Easting	579656
Northing	6182878
Orientation	130
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	81
Vegetation (%)	17
Rock (%)	2

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q49: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			30	28	2	5	9	11	0	1	2	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			94.1	88.4	31	13.4	39.9	4	0	0.1	5.7	0.7
Acacia leucoclada	2	5	SG			2						
Anthosachne scabra	10	180	GG				10					
Austrostipa scabra subsp. scabra	10	180	GG				10					
*Avena fatua**	5	10	EX								5	
Brachyscome ciliaris	0.1	1	FG					0.1				
*Bromus diandrus**	0.7	20	HT									0.7
Callitris glaucophylla	6	20	TG		6							
Calotis cuneifolia	1	50	FG					1				
Cassinia uncata	5	10	SG			5						
Chenopodium desertorum	0.1	10	SG			0.1						
Dianella longifolia var. longifolia	1	5	FG					1				
Digitaria divaricatissima	0.5	10	GG				0.5					
Dodonaea viscosa subsp. cuneata	6	15	SG			6						
Einadia nutans subsp. nutans	0.6	20	FG					0.6				
Enteropogon acicularis	8	80	GG				8					
Eremophila debilis	0.3	3	SG			0.3						
Eucalyptus microcarpa	25	6	TG		25							
Glycine clandestina	0.1	1	OG							0.1		
Goodenia hederacea subsp. hederacea	0.2	2	FG					0.2				
Lomandra bracteata	0.1	2	GG				0.1					
Lomandra filiformis subsp. filiformis	2	10	GG				2					
Lomandra multiflora subsp. multiflora	0.3	2	GG				0.3					
Oxalis perennans	0.3	10	FG					0.3				
Rumex brownii	0.1	1	FG					0.1				
Rytidosperma caespitosum	3	50	GG				3					
Rytidosperma setaceum	6	100	GG				6					
Sida corrugata	0.3	20	FG					0.3				
Vittadinia gracilis	0.2	4	FG					0.2				
Wahlenbergia communis	0.1	5	FG					0.1				
Wahlenbergia gracilis	0.1	2	FG					0.1				

Easting	580796
Northing	6185450
Orientation	345
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	3
30-49	Yes
20-29	Yes
10-19	No
5-9	Yes
<5	No
Hollows	4
Length logs (m)	47
Attributes 1x1 plot (%)	
Litter (%)	83
Bare Ground (%)	3
Vegetation (%)	14
Rock (%)	0

Date: 7/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q50: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Moderate condition)			Count									
			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			9	6	1	0	4	1	0	0	3	2
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			48.6	32.6	20	0	9.6	3	0	0	16	6
Bromus diandrus	2	0.1	HT									2
Dianella longifolia var. longifolia	3	0.2	FG					3				
Eucalyptus microcarpa	20	40	TG		20							
Hordeum vulgare	10	0.2	EX								10	
Juncus spp.	7	0.41	GG				7					
Lomandra bracteata	1	0.1	GG				1					
Lomandra multiflora	0.6	-	GG				0.6					
*Lycium ferocissimum**	4	2	HT									4
Rytidosperma spp. (no fertile material)	1	0.1	GG				1					

Easting	574483
Northing	6156914
Orientation	95
Plot size	20x20x50
Attributes 20x50m plot	
Stem classes	
80+	1
50-79	5
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	9
Length logs (m)	37
Attributes 1x1 plot (%)	
Litter (%)	36
Bare Ground (%)	64
Vegetation (%)	0
Rock (%)	0

Date: 4/12/18			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q51: PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			15	12	1	0	7	4	0	0	3	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			49.6	46.5	25	0	21	0.5	0	0	3.1	0
Alternanthera nana	0.1	1	FG					0.1				
Aristida jerichoensis var. jerichoensis	1	20	GG				1					
Austrostipa scabra subsp. scabra	5	100	GG				5					
Austrostipa setacea	5	100	GG				5					
*Avena barbata**	1	20	EX								1	
Chloris truncata	2	40	GG				2					
Enteropogon acicularis	2	50	GG				2					
*Erodium brachycarpum**	0.1	2	EX								0.1	
Erodium crinitum	0.2	4	FG					0.2				
Eucalyptus dwyeri	25	2	TG		25							
Euphorbia drummondii	0.1	2	FG					0.1				
*Lolium perenne**	2	80	EX								2	
Lomandra multiflora subsp. multiflora	3	40	GG				3					
Rytidosperma auriculatum	3	100	GG				3					
Sida corrugata	0.1	1	FG					0.1				

Easting	576777
Northing	6160338
Orientation	345
Plot size	20 x 20
Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	No
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	20
Bare Ground (%)	64
Vegetation (%)	14
Rock (%)	2

Date: 6/12/2018			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q52: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Good condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	14	1	2	7	4	0	0	3	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			67.7	65.1	40	10	12.7	2.4	0	0	2.6	0.2
Acacia montana	8	12	SG			8						
Austrostipa scabra subsp. scabra	5	180	GG				5					
Austrostipa setacea	4	100	GG				4					
*Avena barbata**	0.4	10	EX								0.4	
Chloris truncata	0.2	10	GG				0.2					
Dianella revoluta var. revoluta	2	5	FG					2				
Dodonaea viscosa subsp. cuneata	2	2	SG			2						
Eucalyptus microcarpa	40	22	TG		40							
Hibiscus sturtii	0.2	20	FG					0.2				
*Lolium perenne**	2	80	EX								2	
Lomandra bracteata	0.2	2	GG				0.2					
Maireana enchylaenoides	0.1	1	FG					0.1				
Poa sieberiana var. sieberiana	0.5	10	GG				0.5					
*Romulea rosea var. australis**	0.2	10	HT									0.2
Rytidosperma caespitosum	2	80	GG				2					
Rytidosperma setaceum	0.8	30	GG				0.8					
Sida corrugata	0.1	1	FG					0.1				

Easting	574038
Northing	6152610
Orientation	60
Plot size	10X40x100
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	2
30-49	Yes
20-29	No
10-19	Yes
5-9	Yes
<5	Yes
Hollows	2
Length logs (m)	7
Attributes 1x1 plot (%)	
Litter (%)	85
Bare Ground (%)	1
Vegetation (%)	14
Rock (%)	0

Date: 13/05/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q53: PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			25	20	2	1	6	10	0	1	6	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			60.1	55.9	37	0.1	9.6	9	0	0.2	4.2	0
Alternanthera nana	0.5	3	FG					0.5				
Asperula cunninghamii	0.6	10	FG					0.6				
Atriplex semibaccata	0.1	2	SG			0.1						
Atriplex spinibractea	1	10	FG					1				
Austrostipa scabra subsp. scabra	1	25	GG				1					
Callitris glaucophylla	2	2	TG		2							
Dichondra repens	0.4	6	FG					0.4				
*Echium plantagineum**	0.8	9	EX								0.8	
Einadia polygonoides	3	25	FG					3				
Enteropogon acicularis	4	35	GG				4					
Eucalyptus melliodora	35	31	TG		35							
Glycine canescens	0.2	1	OG							0.2		
Goodenia hederacea subsp. hederacea	0.3	2	FG					0.3				
Lomandra filiformis subsp. coriacea	3	40	GG				3					
Maireana enchylaenoides	1	25	FG					1				
*Malva parviflora**	0.1	3	EX								0.1	
*Marrubium vulgare**	1	4	EX								1	
*Medicago polymorpha**	0.1	1	EX								0.1	
*Oxalis corniculata**	0.2	2	EX								0.2	
Oxalis perennans	0.2	4	FG					0.2				
Panicum decompositum	1	10	GG				1					
Panicum effusum	0.4	3	GG				0.4					
Rytidosperma spp.	0.2	1	GG				0.2					
Sida corrugata	1	20	FG					1				
*Triticum aestivum**	2	50	EX								2	
Wahlenbergia luteola	1	40	FG					1				

Easting	574248
Northing	6158490
Orientation	175
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	1
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	1
Length logs (m)	7
Attributes 1x1 plot (%)	
Litter (%)	55
Bare Ground (%)	48
Vegetation (%)	0
Rock (%)	0

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q54: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			25	16	0	0	7	9	0	0	10	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			79.5	67	0	0	53	14	0	0	12.5	1
Acaena novae-zelandiae	0.4	25	FG					0.4				
Austrostipa scabra subsp. scabra	5	120	GG				5					
Bothriochloa macra	35	200	GG				35					
Chloris truncata	5	120	GG				5					
Chondrilla juncea	0.1	1	EX								0.1	
Cucumis myriocarpus subsp. leptoderm	0.2	1	EX								0.2	
Cynodon dactylon	1	100	GG				1					
Dichondra repens	2	50	FG					2				
Dysphania pumilio	0.5	10	FG					0.5				
*Echium plantagineum**	3	90	EX								3	
Enteropogon acicularis	4	150	GG				4					
*Eragrostis cilianensis**	4	70	EX								4	
Erodium crinitum	5	250	FG					5				
Euphorbia drummondii	0.6	25	FG					0.6				
*Hypochaeris radicata**	0.4	6	EX								0.4	
Lepidium africanum	0.2	2	EX								0.2	
Lomandra filiformis subsp. coriacea	1	40	GG				1					
Oxalis perennans	3	80	FG					3				
Polygonum aviculare	0.5	16	EX								0.5	
Romulea rosea var. australis	1	25	HT									1
Rumex brownii	1	12	FG					1				
Rytidosperma caespitosum	2	50	GG				2					
Sida corrugata	1	40	FG					1				
Tribulus terrestris	0.1	2	EX								0.1	
*Trifolium repens**	3	50	EX								3	
Vittadinia gracilis	0.5	15	FG					0.5				

Easting	575727
Northing	6159424
Orientation	65
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	2.6
Bare Ground (%)	54.8
Vegetation (%)	41.2
Rock (%)	1.4

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q55: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			17	13	0	0	6	6	1	0	5	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			62.1	57.5	0	0	53	4.3	0.2	0	4.6	1
Austrostipa scabra subsp. scabra	20	250	GG				20					
Bothriochloa macra	5	150	GG				5					
Chloris truncata	5	100	GG				5					
Cynodon dactylon	1	20	GG				1					
Dysphania pumilio	0.1	2	FG					0.1				
*Echium plantagineum**	1	40	EX								1	
Erodium crinitum	3	200	FG					3				
Euphorbia drummondii	0.4	6	FG					0.4				
*Hypochaeris radicata**	0.2	5	EX								0.2	
Lomandra filiformis subsp. coriacea	2	60	GG				2					
Oxalis perennans	0.1	1	FG					0.1				
Polygonum aviculare	0.4	5	EX								0.4	
Romulea rosea var. australis	1	35	HT									1
Rytidosperma caespitosum	20	250	GG				20					
Sida corrugata	0.5	10	FG					0.5				
Cheilanthes sieberi subsp. sieberi	0.2	15	EG						0.2			
*Medicago polymorpha**	2	200	EX								2	
Vittadinia muelleri	0.2	3	FG					0.2				

Easting	576185
Northing	6159853
Orientation	350
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	69.6
Vegetation (%)	30.4
Rock (%)	0

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q56: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			23	18	1	0	9	7	1	0	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			87.4	69.8	15	0	42.9	11.7	0.2	0	17.6	6
Alternanthera nana	0.1	1	FG					0.1				
Austrostipa scabra subsp. scabra	7	120	GG				7					
Bothriochloa macra	5	100	GG				5					
Cheilanthes sieberi subsp. sieberi	0.2	10	EG						0.2			
Chloris truncata	7	150	GG				7					
Cynodon dactylon	0.8	25	GG				0.8					
Dysphania pumilio	0.2	4	FG					0.2				
*Echium plantagineum**	2	60	EX								2	
Enteropogon acicularis	10	200	GG				10					
Eragrostis brownii	0.1	2	GG				0.1					
Erodium crinitum	8	200	FG					8				
Eucalyptus blakelyi	15	5	TG		15							
Euphorbia drummondii	0.4	10	FG					0.4				
*Hypochaeris radicata**	5	200	EX								5	
Lomandra filiformis subsp. coriacea	2	45	GG				2					
*Malva parviflora**	0.1	1	EX								0.1	
Oxalis perennans	1	20	FG					1				
Panicum effusum	1	15	GG				1					
Rapistrum rugosum	0.5	15	EX								0.5	
Romulea rosea var. australis	6	100	HT									6
Rumex brownii	1	15	FG					1				
Rytidosperma spp.	10	100	GG				10					
Sida corrugata	1	20	FG					1				
*Trifolium repens**	4	150	EX								4	

Easting	576196
Northing	6160018
Orientation	275
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	160
Attributes 1x1 plot (%)	
Litter (%)	33.2
Bare Ground (%)	60.8
Vegetation (%)	2
Rock (%)	4

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q57: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			19	16	1	2	8	3	1	1	4	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			90	87.5	35	1.8	49.5	0.6	0.5	0.1	2.5	1
Acacia decora	0.8	1	SG			0.8						
Acacia spp.	1	1	SG			1						
Austrostipa scabra subsp. scabra	20	200	GG				20					
Bothriochloa macra	10	150	GG				10					
Cheilanthes sieberi subsp. sieberi	0.5	10	EG						0.5			
Cynodon dactylon	0.3	5	GG				0.3					
Desmodium varians	0.1	1	OG							0.1		
Dichondra repens	0.2	10	FG					0.2				
Enteropogon acicularis	4	80	GG				4					
Erodium crinitum	0.3	15	FG					0.3				
Eucalyptus blakelyi	35	33	TG		35							
*Hypochaeris radicata**	0.6	25	EX								0.6	
Juncus spp.	3	60	GG				3					
Lomandra filiformis subsp. coriacea	5	100	GG				5					
*Medicago polymorpha**	0.3	15	EX								0.3	
Oxalis perennans	0.1	3	FG					0.1				
Panicum effusum	0.2	4	GG				0.2					
Rapistrum rugosum	0.6	35	EX								0.6	
Romulea rosea var. australis	1	40	HT									1
Rytidosperma caespitosum	7	150	GG				7					

Easting	576542
Northing	6160131
Orientation	217
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	30
Bare Ground (%)	43
Vegetation (%)	29.4
Rock (%)	3

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q58: PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			21	18	1	2	6	7	1	1	4	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			67.2	61.1	20	3.9	30	6.1	0.8	0.3	6.1	0
Acacia decora	3	10	SG			3						
Acacia spp.	0.9	1	SG			0.9						
Austrostipa scabra subsp. scabra	10	250	GG				10					
Cheilanthes sieberi subsp. sieberi	0.8	18	EG						0.8			
Chloris truncata	2	25	GG				2					
Dichondra repens	0.4	20	FG					0.4				
Dysphania pumilio	0.1	1	FG					0.1				
*Echium plantagineum**	1	60	EX								1	
Enteropogon acicularis	5	100	GG				5					
Eucalyptus blakelyi	20	4	TG		20							
Glycine clandestina	0.3	6	OG							0.3		
Gonocarpus elatus	1	12	FG					1				
*Hypochaeris radicata**	1	60	EX								1	
*Lolium perenne**	0.1	1	EX								0.1	
Lomandra filiformis subsp. coriacea	2	40	GG				2					
Lomandra multiflora	1	15	GG				1					
*Medicago polymorpha**	4	90	EX								4	
Oxalis perennans	3	100	FG					3				
Rumex brownii	0.5	5	FG					0.5				
Rytidosperma caespitosum	10	250	GG				10					
Sida corrugata	1	20	FG					1				
Vittadinia muelleri	0.1	2	FG					0.1				

Easting	576542
Northing	6160476
Orientation	300
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	Yes
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	15.4
Bare Ground (%)	51.4
Vegetation (%)	8.2
Rock (%)	25

Date: 14/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q59: PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	10	2	0	3	5	0	0	7	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			83.2	39.7	32	0	1.1	6.6	0	0	43.5	0
Austrostipa scabra subsp. scabra	0.2	8	GG				0.2					
Callitris glaucophylla	7	1	TG		7							
*Chenopodium album**	0.2	2	EX								0.2	
Dysphania pumilio	3	30	FG					3				
Einadia nutans subsp. nutans	2	30	FG					2				
Erodium crinitum	1	30	FG					1				
Eucalyptus microcarpa	25	3	TG		25							
*Hypochaeris radicata**	1	10	EX								1	
Maireana enchylaenoides	0.2	15	FG					0.2				
*Malva parviflora**	0.2	3	EX								0.2	
Medicago sativa	10	80	EX								10	
*Modiola caroliniana**	0.1	1	EX								0.1	
Panicum effusum	0.1	4	GG				0.1					
Rapistrum rugosum	2	40	EX								2	
Rytidosperma caespitosum	0.8	15	GG				0.8					
*Triticum aestivum**	30	500	EX								30	
*Urtica incisa**	0.4	15	FG					0.4				

Easting	574948
Northing	6158383
Orientation	116
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	1
50-79	1
30-49	Yes
20-29	No
10-19	No
5-9	No
<5	No
Hollows	2
Length logs (m)	6
Attributes 1x1 plot (%)	
Litter (%)	19.4
Bare Ground (%)	35.6
Vegetation (%)	45
Rock (%)	0

Date: 15/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q60: PCT 347 White Box - Blakelys Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	8	1	0	2	5	0	0	11	2
Species	**Cover**	**Abundance**	**Sum cover**	**Sum**	Sum	Sum	Sum	Sum	Sum	Sum	**Sum**	Sum
			80.6	**21.1**	10	0	0.5	10.6	0	0	**59.5**	8
Acacia novae-zelandiae	8	150	FG					8				
Dysphania pumilio	1	100	FG					1				
Echium plantagineum *	4	25	EX								4	
Eragrostis cilianensis *	0.1	2	EX								0.1	
Erodium crinitum	1	25	FG					1				
Eucalyptus blakelyi	10	3	TG		10							
Heliotropium amplexicaule	1	10	HT									1
Lepidium africanum	0.5	8	EX								0.5	
Malva parviflora *	6	30	EX								6	
Panicum effusum	0.4	10	GG				0.4					
Paspalidium constrictum	0.1	1	GG				0.1					
Polygonum aviculare	0.3	6	EX								0.3	
Rapistrum rugosum	10	200	EX								10	
Rumex brownii	0.5	25	FG					0.5				
Solanum nigrum *	0.1	2	EX								0.1	
Tribulus terrestris	0.5	8	EX								0.5	
Triticum aestivum *	30	500	EX								30	
Xanthium spinosum *	7	30	HT									7
Zoleya galericulata subsp. australis	0.1	1	FG					0.1				

Easting	576362
Northing	6166168
Orientation	95
Plot size	20 x 20, 20 x 50
tributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	No
5-9	No
<5	No
Hollows	0
ength logs (	55
tributes 1x1 plot (%)	
Litter (%)	5.4
Bare Ground	40.6
Vegetation	53.6
Rock (%)	0.4

Date: 15/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q61: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			18	14	0	1	6	6	0	1	5	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			59.3	42	0	4	19.9	17.8	0	0.3	17.3	4
Acaena novae-zelandiae	1	40	FG					1				
Austrostipa scabra subsp. scabra	3	60	GG				3					
Bothriochloa macra	6	100	GG				6					
Cucumis myriocarpus subsp. leptodermis	0.2	1	EX								0.2	
Cynodon dactylon	0.4	10	GG				0.4					
Desmodium varians	0.3	8	OG							0.3		
Dichondra repens	5	90	FG					5				
*Eragrostis cilianensis**	0.1	1	EX								0.1	
Erodium crinitum	10	100	FG					10				
Lissanthe strigosa subsp. subulata	4	33	SG			4						
Lomandra filiformis subsp. coriacea	0.2	2	GG				0.2					
Lomandra multiflora subsp. multiflora	0.3	1	GG				0.3					
*Medicago polymorpha**	1	30	EX								1	
Oxalis perennans	0.5	10	FG					0.5				
Paspalidium constrictum	10	150	GG				10					
Rapistrum rugosum	12	150	EX								12	
Rumex brownii	0.4	6	FG					0.4				
Romulea rosea var. australis	4	60	HT									4
Sida corrugata	0.9	15	FG					0.9				

Easting	579336
Northing	6183280
Orientation	245
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	84.2
Vegetation (%)	12.4
Rock (%)	3.4

Date: 15/05/2019			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q62: PCT 309 Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion (Low-DNG)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	9	0	0	3	6	0	0	2	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			21.4	18.9	0	0	12	6.9	0	0	2.5	2
Acaena novae-zelandiae	0.4	10	FG					0.4				
Austrostipa scabra subsp. scabra	1	25	GG				1					
Bothriochloa macra	10	100	GG				10					
Dichondra repens	0.2	5	FG					0.2				
Erodium crinitum	4	250	FG					4				
*Medicago polymorpha**	0.5	42	EX								0.5	
Paspalidium constrictum	1	20	GG				1					
Rumex brownii	0.2	2	FG					0.2				
Romulea rosea var. australis	2	120	HT									2
Sida corrugata	2	38	FG					2				
*Urtica incisa**	0.1	1	FG					0.1				

Easting	579426
Northing	6183369
Orientation	218
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	0
Bare Ground (%)	88
Vegetation (%)	10.2
Rock (%)	1.8

Date: 3/9/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q63: Miscellaneous Ecosystem			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			10	2	0	0	1	1	0	0	9	0
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			84.5	2	0	0	1	1	0	0	82.5	0
*Avena barbata**	5	60	EX								5	
*Echium plantagineum**	3	34	EX								3	
*Erodium cicutarium**	0.5	18	EX								0.5	
Hordeum vulgare	35	500	EX								35	
*Malva parviflora**	1	40	EX								1	
*Lolium perenne**	20	200	EX								20	
Panicum effusum	1	20	GG				1					
*Arctotheca calendula**	15	200	EX								15	
Rumex brownii	1	9	FG					1				
*Trifolium repens**	1	15	EX								1	
*Xanthium occidentale**	2	15	EX								2	

Easting	576975
Northing	6166034
Orientation	320
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	No
20-29	No
10-19	No
5-9	No
<5	No
Hollows	0
Length logs (m)	0
Attributes 1x1 plot (%)	
Litter (%)	1.5
Bare Ground (%)	8.5
Vegetation (%)	90
Rock (%)	0

Date: 3/9/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q65: PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (Moderate condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			16	11	1	0	6	3	1	0	6	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			75.22	46	15	0	30.2	0.4	0.4	0	29.22	25
Acaena novae-zelandiae	0.1	3	FG					0.1				
*Arctotheca calendula**	0.12	3	EX								0.12	
Aristida ramosa	8	40	GG				8					
Austrostipa scabra subsp. scabra	14	60	GG				14					
Cheilanthes sieberi subsp. sieberi	0.4	18	EG						0.4			
*Erodium cicutarium**	0.5	40	EX								0.5	
Eucalyptus albens	15	3	TG		15							
*Hypochaeris radicata**	3	25	EX								3	
Lomandra filiformis subsp. coriacea	2	16	GG				2					
Lomandra multiflora subsp. multiflora	0.2	1	GG				0.2					
*Medicago polymorpha**	0.4	10	EX								0.4	
*Nothoscordum gracile**	0.2	2	EX								0.2	
Oxalis perennans	0.1	1	FG					0.1				
Panicum effusum	5	65	GG				5					
Romulea rosea var. australis	25	250	HT									25
Rumex brownii	0.2	2	FG					0.2				
Rytidosperma spp.	1	40	GG				1					

Easting	577050
Northing	6165278
Orientation	330
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	Yes
Hollows	3
Length logs (m)	48
Attributes 1x1 plot (%)	
Litter (%)	22
Bare Ground (%)	30
Vegetation (%)	40
Rock (%)	8

Date: 3/9/19			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Q66: PCT 267 White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion (Poor condition)			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
			13	6	2	0	0	4	0	0	8	1
Species	**Cover**	**Abundance**	Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
			84.6	32.5	17	0	0	15.5	0	0	52.1	1
Acaena novae-zelandiae	0.1	2	FG					0.1				
*Arctotheca calendula**	4	100	EX								4	
*Avena fatua**	20	200	EX								20	
*Brassica napus**	0.8	20	EX								0.8	
*Echium plantagineum**	0.5	10	EX								0.5	
Einadia nutans subsp. nutans	0.2	3	FG					0.2				
*Erodium cicutarium**	0.4	20	EX								0.4	
Eucalyptus albens	12	6	TG		12							
Eucalyptus microcarpa	5	1	TG		5							
*Lolium perenne**	25	240	EX								25	
Romulea rosea var. australis	1	50	HT									1
Rumex brownii	0.2	6	FG					0.2				
*Stellaria media**	0.4	12	EX								0.4	
*Urtica incisa**	15	120	FG					15				

Easting	572185
Northing	6149778
Orientation	230
Plot size	20 x 20, 20 x 50
Attributes 10x100m plot	
Stem classes	
80+	0
50-79	0
30-49	Yes
20-29	Yes
10-19	Yes
5-9	No
<5	No
Hollows	2
Length logs (m)	26
Attributes 1x1 plot (%)	
Litter (%)	23
Bare Ground (%)	7
Vegetation (%)	70
Rock (%)	0

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix H Recorded fauna

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Fauna species recorded

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Amphibians (5)			
Beeping Froglet	*Crinia parinsignifera*		
Giant Banjo Frog	*Limnodynastes interioris*		
Green Tree Frog	*Litoria caerulea*		
Peron's Tree Frog	*Litoria peronii*		
Spotted Grass Frog	*Limnodynastes tasmaniensis*		
Birds (79)			
Apostlebird	*Struthidea cinerea*		
Australasian Grebe	*Tachybaptus novaehollandiae*		
Australian (Richards) Pipit	*Anthus australis*		
Australian Hobby	*Falco longipennis*		
Australian Magpie	*Cracticus tibicen*		
Australian Raven	*Corvus coronoides*		
Australian Reed-warbler	*Acrocephalus australis*		
Australian Shelduck	*Tadorna tadornoides*		
Australian White Ibis	*Threskiornis molucca*		
Australian Wood Duck	*Chenonetta jubata*		
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		
Black Falcon	*Falco subniger*	V	
Black-fronted Dotterel	*Elseyornis melanops*		
Blue-faced Honeyeater	*Entomyzon cyanotis*		
Brown Falcon	*Falco berigora*		
Brown Goshawk	*Accipiter fasciatus*		
Brown Songlark	*Cinclorhamphus cruralis*		
Brown Treecreeper	*Climacteris picumnus victoriae*	V	
Cockatiel	*Nymphicus hollandicus*		
Common Blackbird*	*Turdus merula*		
Common Bronzewing	*Phaps chalcoptera*		
Common Starling*	*Sturnus vulgaris*		
Crested Pigeon	*Ocyphaps lophotes*		
Diamond Firetail	*Stagonopleura guttata*	V	
Dollarbird	*Eurystomus orientalis*		

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Eastern Rosella	*Platycercus eximius*		
Fairy Martin	*Hirundo ariel*		
Flame Robin	*Petroica phoenicea*	V	
Forest Raven	*Corvus tasmanicus*		
Fuscous Honeyeater	*Lichenostomus fuscus*		
Galah	*Cacatua roseicapilla*		
Great Cormorant	*Phalacrocorax carbo*		
Grey Butcherbird	*Cracticus torquatus*		
Grey Fantail	*Rhipidura albiscapa*		
Grey Shrike-thrush	*Colluricincla harmonica*		
Grey Teal	*Anas gracilis*		
Grey-Crowned Babbler	*Pomatostomus temporalis temporalis*	V	
House Sparrow*	*Passer domesticus*		
Jacky Winter	*Microeca fascinans*		
Laughing Kookaburra	*Dacelo novaeguineae*		
Leaden Flycatcher	*Myiagra rubecula*		
Little Corella	*Cacatua sanguinea*		
Little Friarbird	*Philemon citreogularis*		
Little Pied Cormorant	*Phalacrocorax melanoleucos*		
Little Raven	*Corvus mellori*		
Magpie-lark	*Grallina cyanoleuca*		
Masked Lapwing	*Vanellus miles*		
Masked Woodswallow	*Artamus personatus*		
Nankeen Kestrel	*Falco cenchroides*		
Noisy Miner	*Manorina melanocephala*		
Pacific Black Duck	*Anas superciliosa*		
Peaceful Dove	*Geopelia striata*		
Pied Butcherbird	*Cracticus nigrogularis*		
Pied Currawong	*Strepera graculina*		
Rainbow Bee-eater	*Merops ornatus*		M
Red Wattlebird	*Anthochaera carunculata*		
Red-rumped Parrot	*Psephotus haematonotus*		
Rock Dove*	*Columba livia*		
Rufous Songlark	*Cincloramphus mathewsi*		

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Rufous Whistler	*Pachycephala rufiventris*		
Sacred Kingfisher	*Todiramphus sanctus*		
Singing Bushlark	*Mirafra javanica*		
Southern Boobook	*Ninox novaeseelandiae*		
Southern Whiteface	*Aphelocephala leucopsis*		
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		
Spotted Pardalote	*Pardalotus punctatus*		
Straw-necked Ibis	*Threskiornis spinicollis*		
Striated Pardalote	*Pardalotus striatus*		
Sulphur-crested Cockatoo	*Cacatua galerita*		
Superb Fairy-wren	*Malurus cyaneus*		
Superb Parrot	*Polytelis swainsonii*	V	V
Tawny Frogmouth	*Podargus strigoides*		
Weebill	*Smicrornis brevirostris*		
Welcome Swallow	*Hirundo neoxena*		
Western Gerygone	*Gerygone fusca*		
Whistling Kite	*Haliastur sphenurus*		
White-browed Woodswallow	*Artamus superciliosus*		
White-faced Heron	*Egretta novaehollandiae*		
White-fronted Chat	*Epthianura albifrons*	V	
White-necked Heron	*Ardea pacifica*		
White-plumed Honeyeater	*Ptilotula penicillata*		
White-winged Chough	*Corcorax melanorhamphos*		
White-winged Triller	*Lalage sueurii*		
Willie Wagtail	*Rhipidura leucophrys*		
Yellow Thornbill	*Acanthiza nana*		
Yellow-billed Spoonbill	*Platalea flavipes*		
Yellow-plumed Honeyeater	*Lichenostomus ornatus*		
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		

Common name	Scientific name	BC Act listing[1]	EPBC Act listing[2]
Mammals (11)			
Chocolate Wattle Bat^	*Chalinolobus morio*		
Common Brushtail Possum	*Trichosurus vulpecula*		
Common Ringtail Possum	*Pseudocheirus peregrinus*		
Cow*	*Bos taurus*		
Eastern Grey Kangaroo	*Macropus giganteus*		
Fox*	*Vulpes vulpes*		
Gould's Wattled Bat	*Chalinolobus gouldii*		
Gould's Wattled Bat^	*Chalinolobus gouldii*		
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		
Little Forest Bat	*Vespadelus vulturnus*		
Long-eared Bats^	*Nyctophilus* spp.		
Rabbit*	*Oryctolagus cuniculus*		
Sheep*	*Ovis aries*		
Squirrel Glider	*Petaurus norfolcensis*	V	
Vespadelus species^	*Vespadelus* spp.		
White-striped Free-tailed Bat^	*Austronomus australis*		
Reptiles (2)			
Bearded Dragon	*Pogona barbata*		
Lace Monitor	*Varanus varius*		

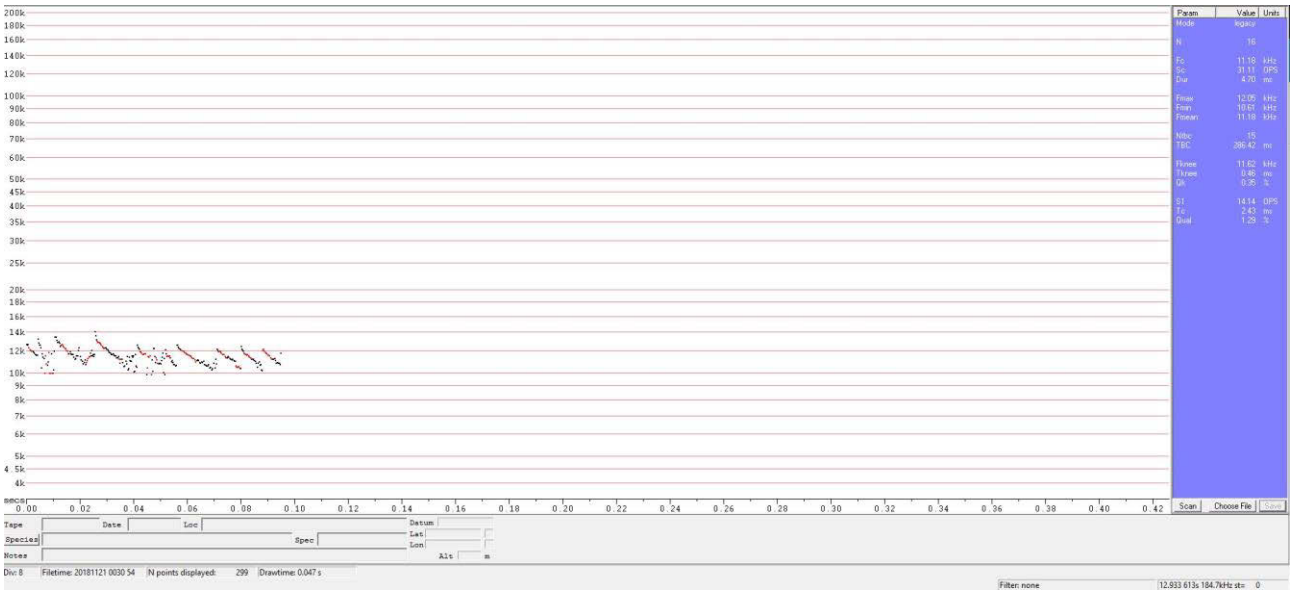
(1) V = Vulnerable, E = Endangered as listed under the BC Act

(2) V = Vulnerable, M = Migratory listed under the EPBC Act

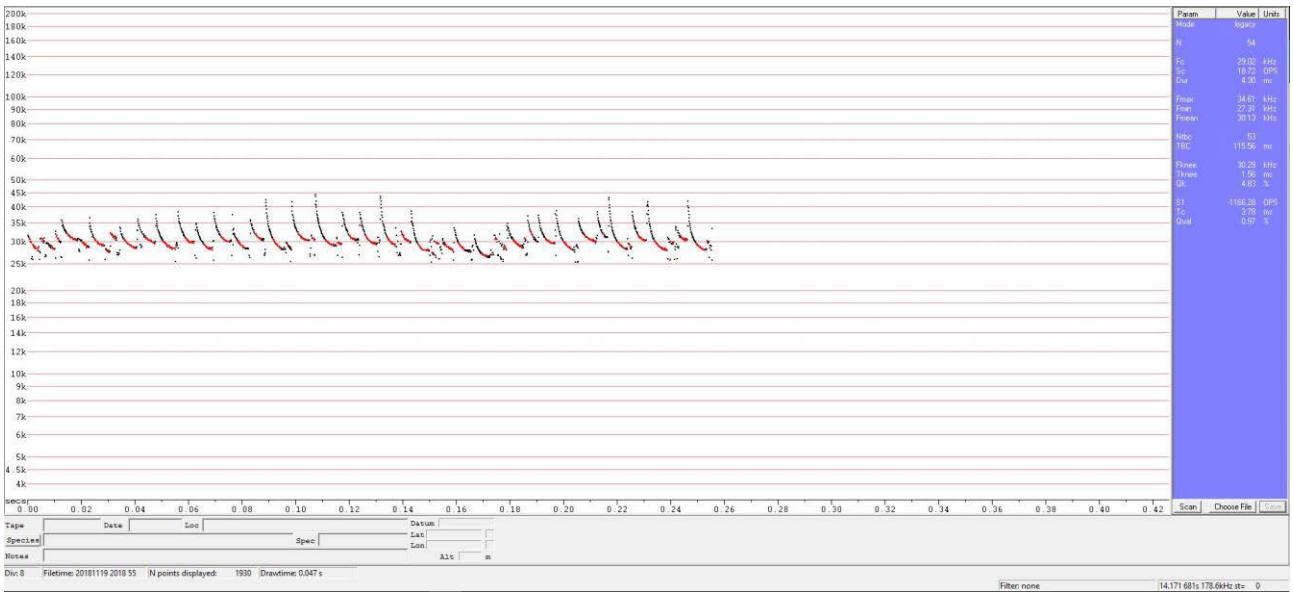
* Exotic species

^ Ultrasonic Anabat bat detection.

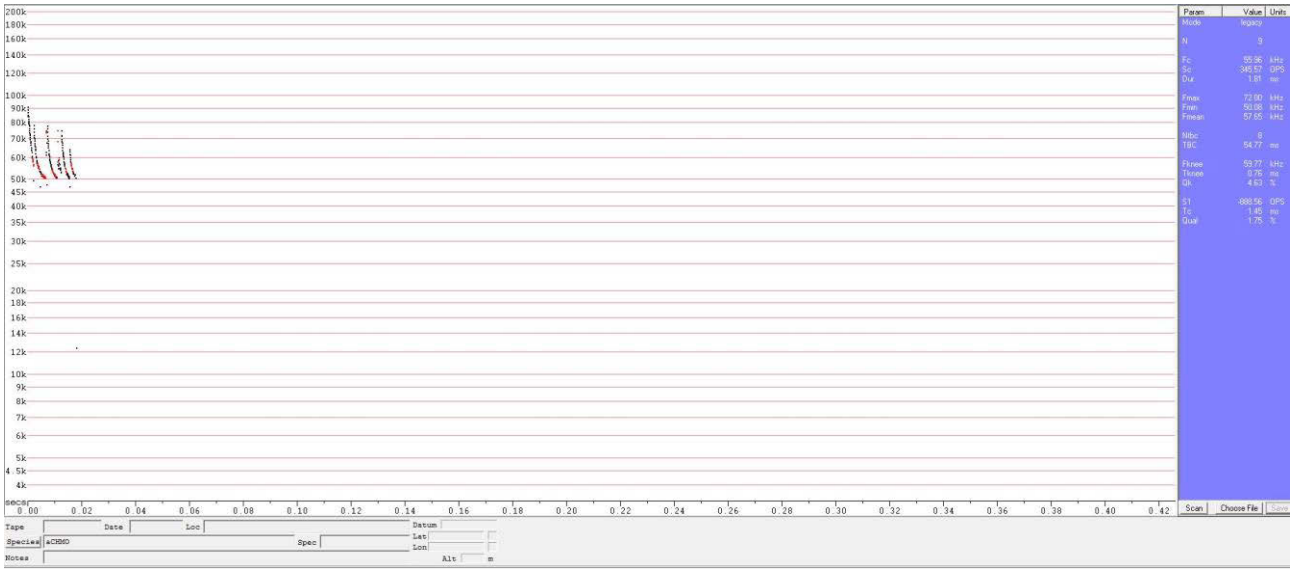
ANABAT sample calls



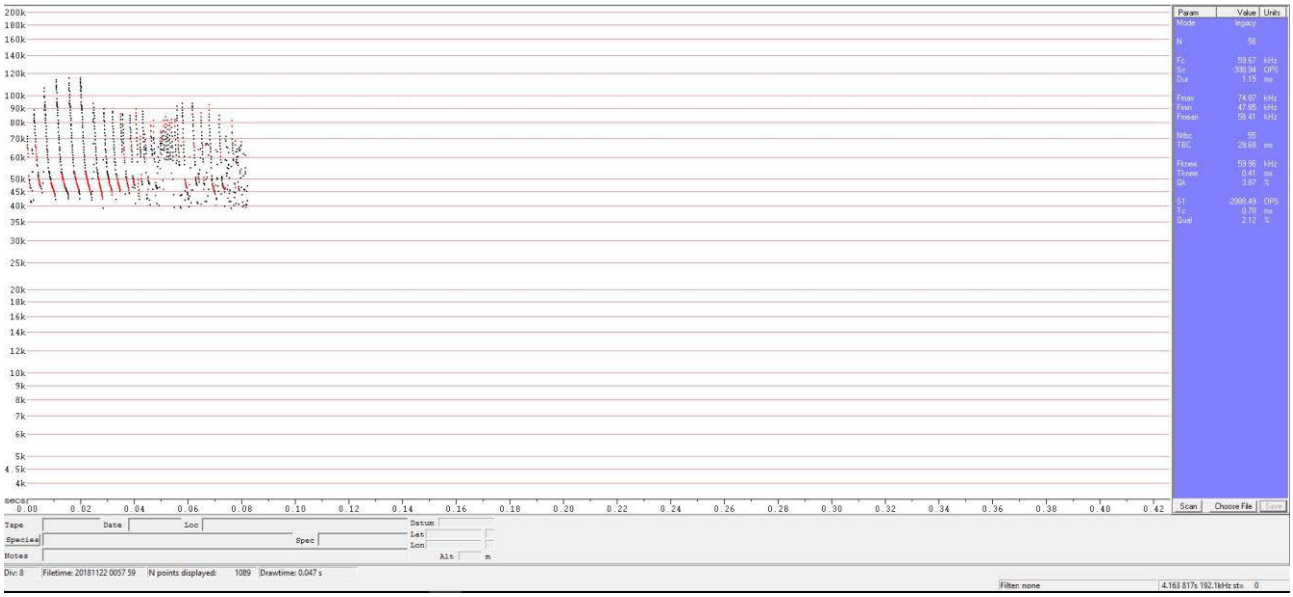
An example of *Austronomus australis* (White-striped Freetail-bat) recorded from the study area



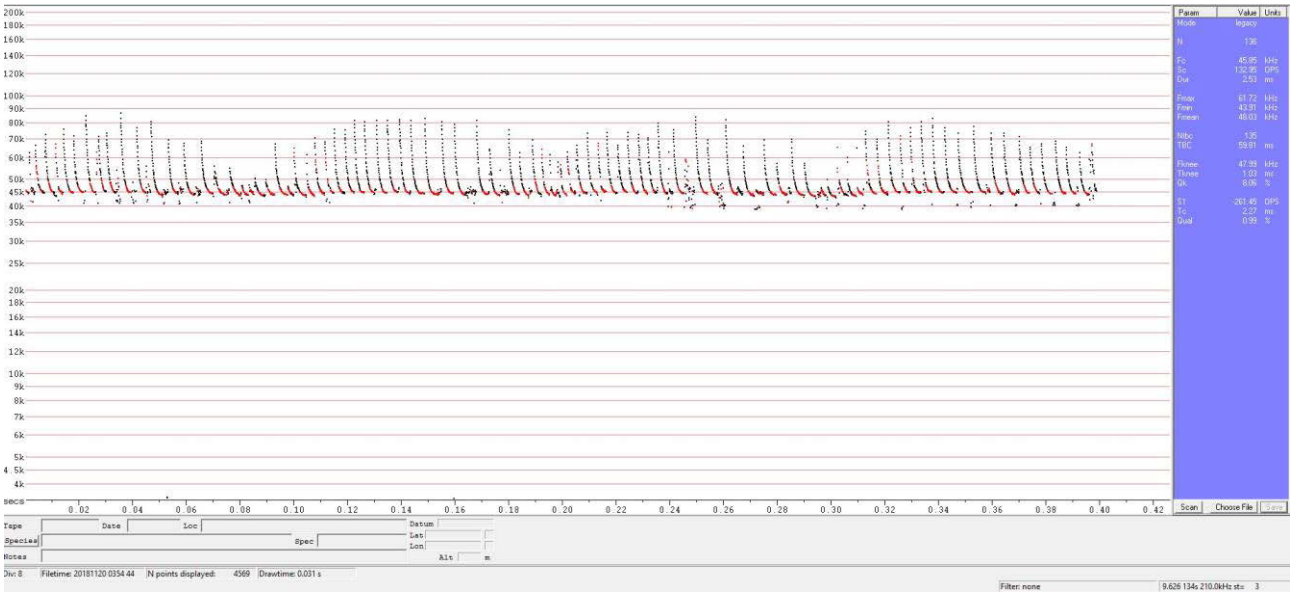
An example of *Chalinolobus gouldii* (Gould's Wattled Bat) recorded from the study area



An example of *Chalinolobus morio* (Chocolate Wattled Bat) recorded from the study area



An example of *Nyctophilus* spp. (Long-eared Bat) recorded from the study area



An example of *Vespadelus vulturnus* (Little Forest Bat) recorded from the study area

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix I EPBC Act threatened ecological community condition threshold assessment

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

Table I.1 Native vegetation assessment against Grey Box (Eucalyptus Microcarpa) grassy woodlands and derived grasslands EPBC Act condition thresholds

<table>
<tr><th rowspan="2">Condition threshold</th><th colspan="5">PCT 76</th><th colspan="2">PCT 80</th></tr>
<tr><th>VZ3 Good</th><th>VZ4 Moderate</th><th>VZ5 Poor</th><th>VZ6 Low</th><th>VZ7 Moderate</th><th>VZ8 Poor</th></tr>
<tr><td colspan="8">Criteria that are broadly applicable</td></tr>
<tr><td rowspan="3">1a. The minimum patch size is 0.5ha;
AND
1b. The canopy layer contains Grey Box (E. microcarpa) as the dominant or co-dominant tree species;
AND
1c. The vegetative cover of non-grass weed species in the ground layer is less than 30% at any time of the year.</td><td colspan="7">All patches within the proposal site are considered to meet this criterion</td></tr>
<tr><td colspan="3">Yes – canopy was dominated Grey Box (E. microcarpa)</td><td rowspan="2">No – Grey Box (E. microcarpa) was absent</td><td colspan="2">Yes – canopy was dominated Grey Box (E. microcarpa)</td></tr>
<tr><td>Yes – The vegetative cover of non-grass weed species <30%
Q5 – 3.8%
Q49 – 5.7%
Q52 – 2.6%</td><td>Yes – The vegetative cover of non-grass weed species <30%
Q21 – 3.1%
Q22 – 3.7%
Q38 – 17.8%</td><td>No - The vegetative cover of non-grass weed species >30%
Q9 – 29.1% (native 0%) >30%
Q10 – 30.8% (native 0.3%) >30%</td><td>Yes – The vegetative cover of non-grass weed species <30%
Q20 – 0%
Q50 – 16%</td><td>No - The vegetative cover of non-grass weed species >30%
Q18 – 9.5% (native 5.7%) > 30%
Q19 – 22.3% (native 0.2%) >30%
Q59 – 51.2% (native 7.7%) >30%</td></tr>
<tr><td>Outcome of step 1 criteria</td><td>Meets listing – additional steps do not apply</td><td>Meets listing – additional steps do not apply</td><td>Does not meet listing additional criteria applies</td><td>Does not meet listing additional criteria applies</td><td>Meets listing – additional steps do not apply</td><td>Does not meet listing additional criteria applies</td></tr>
</table>

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Additional criteria that apply to smaller patches (0.5 to <2ha in area) with tree crown cover >10%						
2a. At least 50% of the vegetative cover in the ground layer comprises perennial native species at any time of the year; AND 2b. 8 or more perennial native species are present in the mid and ground layers at any time of the year.	Criteria does not apply	Criteria does not apply	No – ground layer perennial native species cover <50% No Q9 – 0 native species Q10 – 3 native species	No – Canopy <10%	Criteria does not apply	No – ground layer perennial native species cover <50% No Q18 – 6 native species Q10 – 1 native species Q59 – 8 native species
Outcome of step 2 criteria	N/A	N/A	Does not meet listing additional criteria applies	Does not meet listing additional criteria applies	N/A	Does not meet listing additional criteria applies

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Additional criteria that apply to larger woodland patches with a well-developed canopy (2ha or more in area)						
3a. At least 8 trees/ha are hollow bearing or have a diameter at breast height of 60cm or more; AND 3b. at least 10% of the vegetative ground cover comprises perennial native grasses at any time of the year; OR 4a. At least 20 trees/ha have a diameter at breast height of 12cm or more; AND 4b. at least 50% of the vegetative cover in the ground layer comprises perennial native species.	Criteria does not apply	Criteria does not apply	No – Patches <2ha	No – Well developed canopy absent	Criteria does not apply	No – Patches <2ha
Outcome of step 3 & 4 criteria	N/A	N/A	Does not meet listing	Does not meet listing additional criteria applies	N/A	Does not meet listing

Condition threshold	PCT 76				PCT 80	
	VZ3 Good	VZ4 Moderate	VZ5 Poor	VZ6 Low	VZ7 Moderate	VZ8 Poor
Additional criteria that apply to patches where the canopy is less developed or absent (derived grassland) (≥0.5ha in area)						
5a. Woodland density does not meet criteria 3a or 4a, or is a derived grassland with clear evidence that the site formerly was a woodland with a tree canopy dominated or co-dominated by *E. microcarpa;* AND 5b. At least 50% of the vegetative cover in the ground layer is made up of perennial native species at any time of the year; AND 5c. 12 or more native species are present in the ground layer at any time of the year.	Criteria does not apply	Criteria does not apply	Criteria does not apply	Yes – formally a woodland dominated by Grey Box (*E. microcarpa*)	Criteria does not apply	Criteria does not apply
	Criteria does not apply	Criteria does not apply	Criteria does not apply	Yes - Q16 exhibits >50% perennial native cover Yes – Q16 recorded 11 native species under drought conditions (20x20m). It is assumed that 12 native species would be recorded during optimal conditions.	Criteria does not apply	Criteria does not apply
Outcome of step 5 criteria	N/a	N/A	N/A	Meets listing	N/A	N/A
Outcome	**Meets listing**	**Meets listing**	**Does not meet listing**	**Meets listing**	**Meets listing**	**Does not meet listing**

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix J BAM predicted species report

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015331/BAAS18097/19/00015332	Inland Rail I2S	16/06/2022
Assessor Name	Report Created	BAM Data version *
Mark Stables	25/08/2022	54
Assessor Number	Assessment Type	BAM Case Status
BAAS18097	Major Projects	Finalised
Assessment Revision		Date Finalised
5		25/08/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australian Painted Snipe	Rostratula australis	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
Barking Owl	Ninox connivens	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Barking Owl	Ninox connivens	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Black Falcon	Falco subniger	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Corben's Long-eared Bat	Nyctophilus corbeni	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Diamond Firetail	Stagonopleura guttata	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

Diamond Firetail	Stagonopleura guttata	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Flame Robin	Petroica phoenicea	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Freckled Duck	Stictonetta naevosa	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
Gang-gang Cockatoo	Callocephalon fimbriatum	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Gang-gang Cockatoo	Callocephalon fimbriatum	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Gilbert's Whistler	Pachycephala inornata	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

Grey-headed Flying-fox	Pteropus poliocephalus	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Little Eagle	Hieraaetus morphnoides	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.

Little Eagle	Hieraaetus morphnoides	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Little Lorikeet	Glossopsitta pusilla	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Little Pied Bat	Chalinolobus picatus	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.

Little Pied Bat	Chalinolobus picatus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Major Mitchell's Cockatoo	Lophochroa leadbeateri	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Masked Owl	Tyto novaehollandiae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
Painted Honeyeater	Grantiella picta	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

Painted Honeyeater	Grantiella picta	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Pied Honeyeater	Certhionyx variegatus	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
Powerful Owl	Ninox strenua	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
Purple-crowned Lorikeet	Glossopsitta porphyrocephala	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
Regent Honeyeater	Anthochaera phrygia	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Scarlet Robin	Petroica boodang	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.

Scarlet Robin	Petroica boodang	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Speckled Warbler	Chthonicola sagittata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Spotted Harrier	Circus assimilis	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Square-tailed Kite	Lophoictinia isura	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Square-tailed Kite	Lophoictinia isura	266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Superb Parrot	Polytelis swainsonii	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Swift Parrot	Lathamus discolor	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Swift Parrot	Lathamus discolor	80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Turquoise Parrot	Neophema pulchella	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Varied Sittella	Daphoenositta chrysoptera	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.

Varied Sittella	Daphoenositta chrysoptera	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion

White-bellied Sea-Eagle	Haliaeetus leucogaster	347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
White-throated Needletail	Hirundapus caudacutus	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.
		76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	276-Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
		277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Glossy Black-Cockatoo	Calyptorhynchus lathami	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
		80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
		266-White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
		309-Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion
		347-White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints

TECHNICAL PAPER 1

Biodiversity Development Assessment Report

Appendix K BAM credit report

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

BAM Credit Summary Report

Proposal Details

Assessment Id
00015331/BAAS18097/19/00015332

Proposal Name
Inland Rail I2S

BAM data last updated *
16/06/2022

Assessor Name
Mark Stables

Report Created
25/08/2022

BAM Data version *
54

Assessor Number
BAAS18097

BAM Case Status
Finalised

Date Finalised
25/08/2022

Assessment Revision
5

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Black Cypress Pine - Red Stringybark - red gum - box low open forest on siliceous rocky outcrops in the NSW South Western Slopes Bioregion												
17	309_moderate	Not a TEC	51.2	51.2	1.7	PCT Cleared - 15%	High Sensitivity to Gain			1.50		33
											Subtotal	**33**

Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion												
14	277_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	75.1	75.1	13.3	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	624

15	277_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	43.8	43.8	2.2	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	60

16	277_low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	2.7	2.7	2.4	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	0
											Subtotal	**684**
River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.												
1	5_moderate	Not a TEC	78.5	78.5	6.1	PCT Cleared - 40%	High Sensitivity to Gain			1.50		180
2	5_poor	Not a TEC	28.9	28.9	0.7	PCT Cleared - 40%	High Sensitivity to Gain			1.50		8
											Subtotal	**188**

Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion												
7	80_moderate	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	54.6	54.6	1.4	PCT Cleared - 83%	High Sensitivity to Gain	Endangered Ecological Community		2.00		38
8	80_poor	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	33.5	33.5	4.7	PCT Cleared - 83%	High Sensitivity to Gain	Endangered Ecological Community		2.00		79
											Subtotal	**117**

Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions												
3	76_good	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	83.6	83.6	1.1	PCT Cleared - 92%	High Sensitivity to Gain	Endangered Ecological Community		2.00		46
4	76_moderate	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	68	68.0	18.7	PCT Cleared - 92%	High Sensitivity to Gain	Endangered Ecological Community		2.00		636
5	76_poor	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	27.8	27.8	5	PCT Cleared - 92%	High Sensitivity to Gain	Endangered Ecological Community		2.00		69

6	76_low	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	11.6	11.6	2.3	PCT Cleared - 92%	High Sensitivity to Gain	Endangered Ecological Community		2.00		0
											Subtotal	**751**
White Box - Blakely's Red Gum shrub/grass woodland on metamorphic hillslopes in the mid-southern part of the upper slopes sub-region of the NSW South Western Slopes Bioregion												
18	347_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	46.9	46.9	0.13	PCT Cleared - 63%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	4

19	347_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	31	31.0	0.3	PCT Cleared - 63%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	6
											Subtotal	**10**

White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion												
9	266_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	68.3	68.3	4.5	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	192

10	266_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	27.8	27.8	0.4	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	7

11	266_low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	2	2.0	5.4	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	0
											Subtotal	**199**

Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion												
12	276_moderate	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	69.5	69.5	2	PCT Cleared - 90%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	87

13	276_poor	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	27.7	27.7	0.6	PCT Cleared - 90%	High Sensitivity to Gain	Critically Endangered Ecological Community		2.50	True	10
											Subtotal	**97**
											Total	**2079**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Keyacris scurra / Key's Matchstick Grasshopper (Fauna)									
266_moderate	68.3	68.3	4.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	154
266_poor	27.8	27.8	0.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	6
266_low	2.0	2.0	5.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	5
276_moderate	69.5	69.5	2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	69
276_poor	27.7	27.7	0.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	8
277_moderate	75.1	75.1	13.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	499
277_poor	43.8	43.8	2.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	48

277_low	2.7	2.7	2.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	3
								Subtotal	**792**
Myotis macropus / Southern Myotis (Fauna)									
5_moderate	78.5	78.5	6.1			Vulnerable	Not Listed	False	239
5_poor	28.9	28.9	0.6			Vulnerable	Not Listed	False	9
276_moderate	69.5	69.5	1			Vulnerable	Not Listed	False	35
276_poor	27.7	27.7	0.6			Vulnerable	Not Listed	False	8
								Subtotal	**291**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
5_moderate	78.5	78.5	6.1			Vulnerable	Not Listed	False	239
5_poor	28.9	28.9	0.6			Vulnerable	Not Listed	False	9
76_good	83.6	83.6	1.1			Vulnerable	Not Listed	False	46
76_moderate	68.0	68.0	18.7			Vulnerable	Not Listed	False	636
76_poor	27.8	27.8	4.9			Vulnerable	Not Listed	False	68
80_moderate	54.6	54.6	1.4			Vulnerable	Not Listed	False	38
80_poor	33.5	33.5	4.7			Vulnerable	Not Listed	False	79
266_moderate	68.3	68.3	4.5			Vulnerable	Not Listed	False	154
276_moderate	69.5	69.5	2			Vulnerable	Not Listed	False	69
276_poor	27.7	27.7	0.6			Vulnerable	Not Listed	False	8
277_moderate	75.1	75.1	13.3			Vulnerable	Not Listed	False	499
277_poor	43.8	43.8	2.2			Vulnerable	Not Listed	False	48

347_moderate	46.9	46.9	0.13			Vulnerable	Not Listed	False	3
								Subtotal	**1896**
Polytelis swainsonii / Superb Parrot (Fauna)									
5_moderate	78.5	78.5	6.1			Vulnerable	Vulnerable	False	239
5_poor	28.9	28.9	0.6			Vulnerable	Vulnerable	False	9
76_good	83.6	83.6	1.1			Vulnerable	Vulnerable	False	46
76_moderate	68.0	68.0	18.7			Vulnerable	Vulnerable	False	636
76_poor	27.8	27.8	4.9			Vulnerable	Vulnerable	False	68
80_moderate	54.6	54.6	1.4			Vulnerable	Vulnerable	False	38
80_poor	33.5	33.5	4.7			Vulnerable	Vulnerable	False	79
266_moderate	68.3	68.3	4.5			Vulnerable	Vulnerable	False	154
276_moderate	69.5	69.5	2			Vulnerable	Vulnerable	False	69
276_poor	27.7	27.7	0.6			Vulnerable	Vulnerable	False	8
277_moderate	75.1	75.1	13.3			Vulnerable	Vulnerable	False	499
277_poor	43.8	43.8	2.2			Vulnerable	Vulnerable	False	48
347_moderate	46.9	46.9	0.13			Vulnerable	Vulnerable	False	3
								Subtotal	**1896**