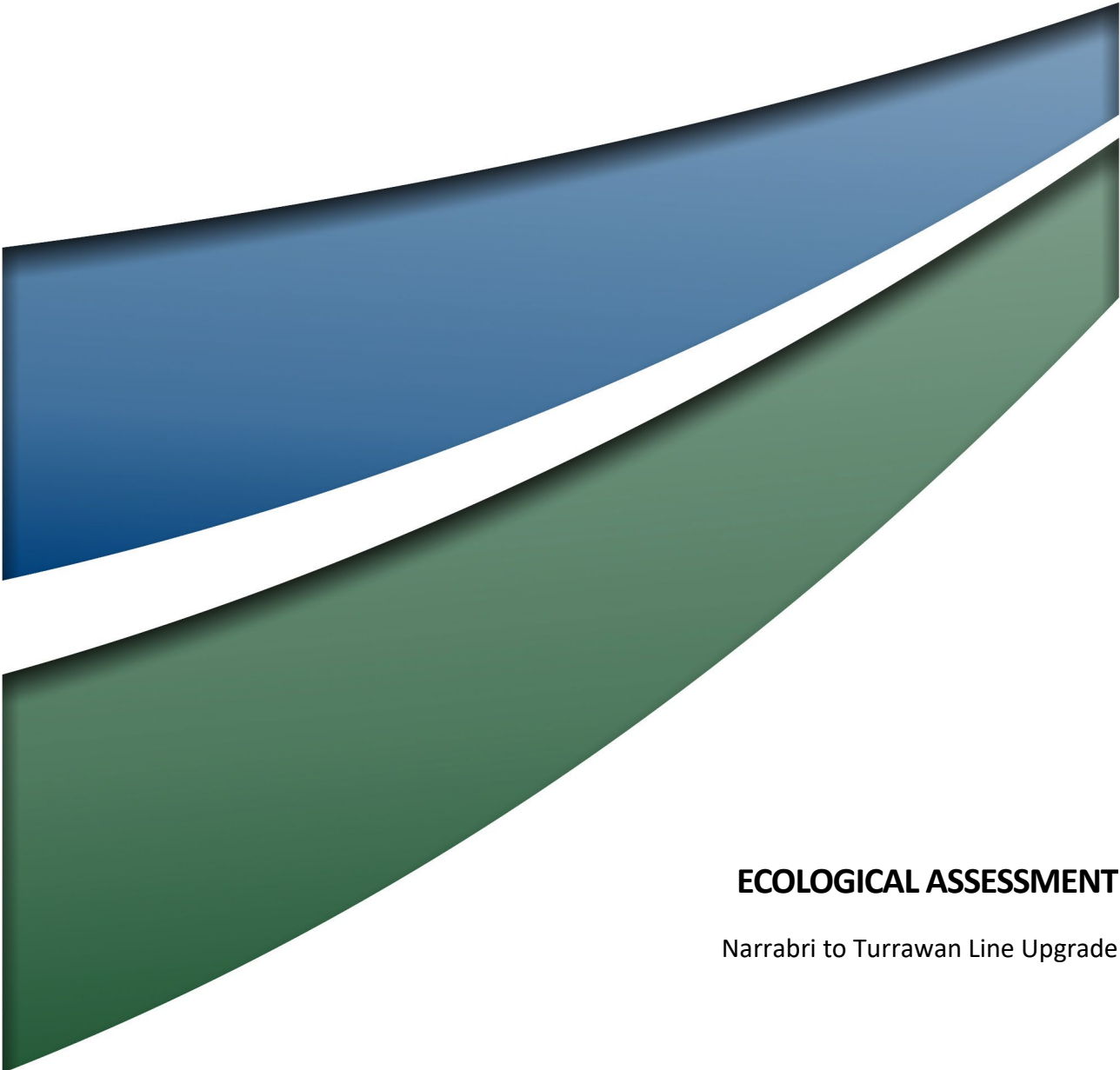




APPENDIX C

ECOLOGICAL ASSESSMENT



ECOLOGICAL ASSESSMENT

Narrabri to Turrawan Line Upgrade

FINAL

March 2022

ECOLOGICAL ASSESSMENT

Narrabri to Turrawan Line Upgrade

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Australian Rail Track Corporation

Project Director: Ryan Parsons
Project Manager: Ryan Parsons
Report No. 22132_R01
Date: March 2022



QMS Certification Services

This report was prepared using
Umwelt's ISO 9001 certified
Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Rev No.	Reviewer		Approved for Issue	
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1.0 Introduction

Umwelt (Australia) Pty Limited (Umwelt) have been engaged by Australian Rail Track Corporation (ARTC) to undertake an ecological assessment to support the Review of Environmental Factors (REF) assessing the rail upgrade between Narrabri and Turrawan (hereafter referred to as 'the Project'). The environmental assessment of the Project is being carried out in accordance with Part 5, Division 5.1 of the *Environmental Planning & Assessment Act 1979* (EP&A Act).

Element Environment are preparing the REF on behalf of ARTC for the Project and require an assessment of potential impacts on biodiversity. Preliminary biodiversity investigations were initially undertaken by Land Eco Consulting, which included approximately 1.5 days of field survey in the Project Area in October 2021, prior to the provision of proposed disturbance areas. Following the initial site survey Land Eco highlighted potential habitat within the Project Area for the threatened Pilliga mouse (*Pseudomys pilligaensis*), eastern pygmy possum (*Cercartetus nanus*), *Tylophora linearis* and spiny peppergrass (*Lepidium aschersonii*). The potential impact of the Project on these species or associated habitat has been subsequently assessed in this report following the refinement of design and construction planning.

Umwelt was engaged by ARTC to:

1. Undertake an ecological survey of the proposed disturbance area, including:
 - a. Targeted survey of flora species with potential to occur, including those that are known to occur in grassland areas in the locality, such as finger panic grass (*Digitaria porrecta*).
 - b. Habitat assessments for potentially occurring threatened fauna species.
 - c. Refinement of the ecological risk mapping to assist ARTC in the avoidance of areas with higher biodiversity value, where possible.
2. Conduct Tests of Significance for threatened species and threatened ecological communities (TECs) assessed as having potential to be impacted by the Project, including temporary and permanent impacts to vegetation described above.
3. Investigate options for minimising impacts to soil and ground cover vegetation where potential habitat for the Pilliga mouse is identified, and where disturbance to vegetation cannot be avoided (such as operational areas).

Umwelt has prepared this report to address recommendations 1 and 2 at the request of ARTC.

1.1 Project Description

It is understood that the N2TLU Project comprises upgrading two sections of track on the Main North Line between the Whitehaven Coal Junction at approximately 540.3 km and Narrabri North, at approximately 575 km (**Figure 1**).

The first section includes upgrade to ARTC Zone 3 Narrabri Coal Junction to Turrawan, between Whitehaven Coal Balloon Loop Junction (540.38km) and 52 points at the northern end of Turrawan passing loop (548.490 km) (8.1 km in length). It is understood that the upgrade of the existing track to 25TAL and 60 kg rail, includes:

- Replacement of existing steel and timber sleepers with Heavy Duty concrete sleepers.
- Replacement of the existing 47 kg/m rail with 60 kg/m rail.
- Lifting of the track to accommodate approximately 100mm of new ballast below the new concrete sleepers.
- Track formation works at bridge ends, as required.
- Partial level crossing upgrades (including new concrete sleepers, steel crossing panels and partial track lift or lifting of level crossing, where feasible), as required.

The second section includes ARTC Central North West (CNW) Turrawan to Narrabri North between 52 points at the northern end of Turrawan passing loop (548.490 km) and future Inland Rail interface at Narrabri North (575.00 km), with a total length of approximately 26.7 km. It is understood that the scope for this section is to upgrade existing track to 25TAL and cascaded 53 kg rail, including:

- Replacement of existing steel and timber sleeper with Heavy Duty concrete sleepers.
- Replacement of the existing 47 kg/m rail with 53 kg/m rail cascaded from rerailing projects on the Hunter Valley Coal Network.
- Lifting of the track to accommodate approximately 100mm of new ballast below the new concrete sleepers.
- Track formation works at bridge ends, as required.
- Partial level crossing upgrades (including new concrete sleepers, steel crossing panels and partial track lift or lifting of level crossing level, where possible).
- Repairs to existing culverts and ballast retention upgrades, as required.

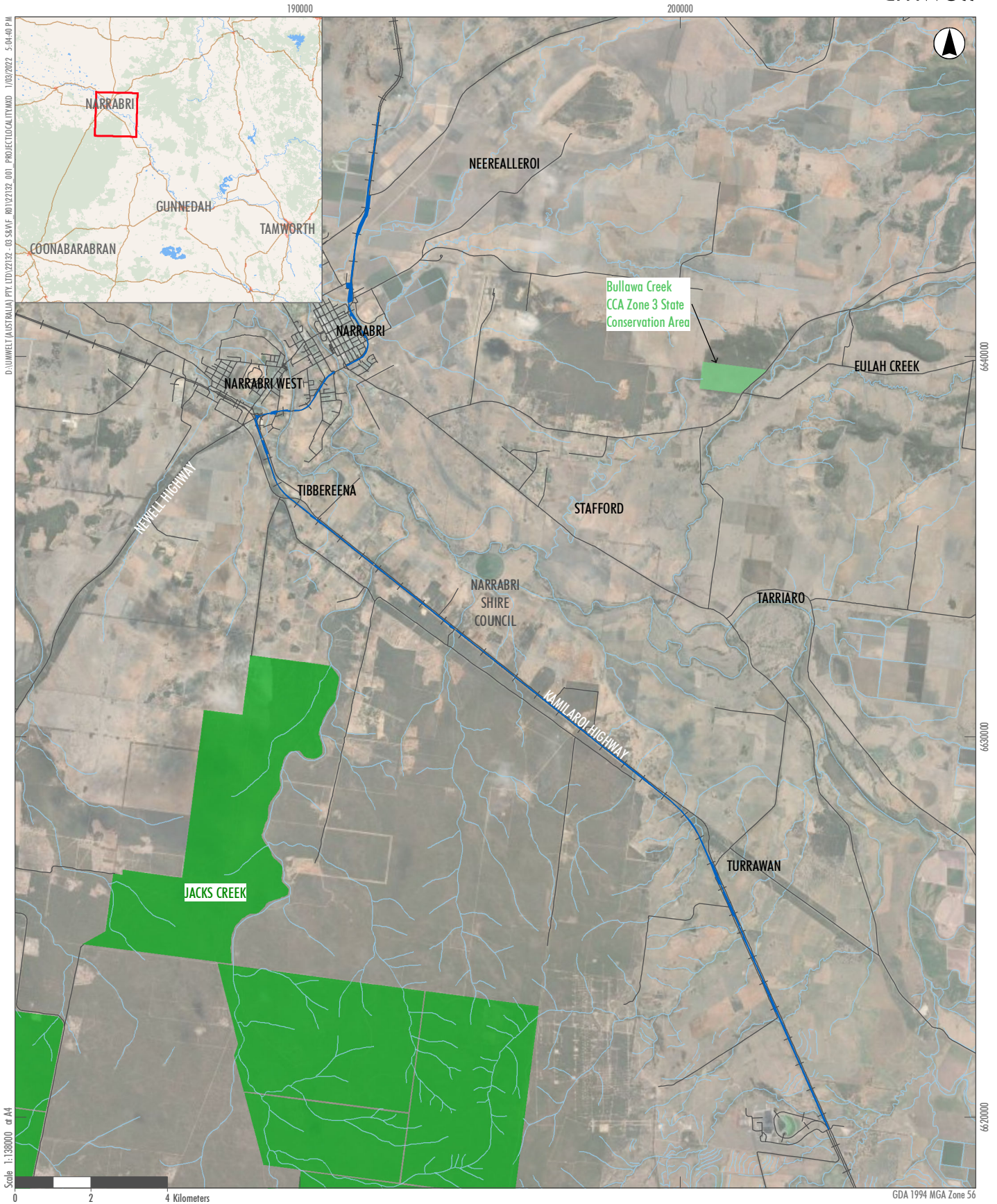
It is understood that no substantial/large pipe culverts are being replaced. There may be some repairs to minor cracks in the concrete on the outer side of the culverts and some may need to have armoured/guardrail attached above to secure additional ballast from falling off track. Additionally, it is understood that ballast may need to be installed within minor drainage channels to facilitate access, however no impacts are proposed to creeks with flowing water.

1.2 Purpose of this Report

The objectives of the ecological survey and assessment were to:

- Record flora and fauna species, describe plant community types and habitats within the Project Area.
- Identify any threatened flora and fauna species, endangered populations, threatened ecological communities (TECs), migratory species, or their habitats within the Project Area, particularly those listed under the *Biodiversity Conservation Act 2016* (BC act), *Fisheries Management Act 1994* (FM act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC act).
- Assess the significance of potential impacts of the Project on threatened species, threatened ecological communities or their habitats through consideration of the five-part test in Section 7.3 of the BC act.
- Assess the significance of potential impacts of the Project on threatened species, communities, endangered populations, or their habitats through consideration of the seven-part test in Section 220ZZ of FM act.
- Provide management options to avoid, minimise and mitigate ecological impacts associated with the Project.
- Assess whether the Project is likely to have a significant impact on the environment and therefore the necessity for a Species Impact Statement (SIS) to be prepared in accordance with section 7.6 of the of the Biodiversity Conservation Regulation 2017 and concurrence to be obtained from the Environment Agency Head consistent with section 7.12 of the BC act.

The Project Area is provided on **Figure 1**.



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- Legend**
- Project Boundary
 - Road
 - Railway Line
 - Drainage Line
 - State Forest
 - National Parks (NPWS Estate)

FIGURE 1
Project Locality Map

2.0 Methodology

2.1 Literature Review and Database Search

In order to identify threatened and migratory species, endangered populations, and threatened ecological communities (TECs) (or their habitats) with the potential to occur in the Project Area, a detailed assessment of relevant ecological databases was completed. These database searches comprised:

- A 10 km radius from the centre of the Project Area of the Department of Planning, Infrastructure and Environment (DPIE) Atlas of NSW Wildlife (January 2022) (DPIE 2022a).
- A 10 km radius from the centre of the Project Area of the Department of Agriculture, Water and Environment (DAWE) Protected Matters Database (January 2022) (DAWE 2022).
- Department of Primary Industries (DPI) Freshwater Threatened Species Distributions Maps (DPI 2022a).
- DPI Key Fish Habitat (DPI 2022b).
- A review of previous ecological assessment was also undertaken, comprising:
 - Preliminary results of ecological survey for Narrabri to Turrawan line upgrade (N2TLU) (Land Eco, unpublished).
 - Phase 2 Ecological Assessment and Risk Mapping – Morandoo, Port Waratah, Bullock Island and Carrington from Scholey Street Junction; Kooragang Island and Walsh Point; and Muswellbrook to Turrawan Junction, Final (Umwelt 2018a).

2.2 Field Survey

An inspection of the approximate 35 km of rail corridor subject to the proposed works for the Project was undertaken by an Umwelt Ecologist on 31 January to 3 February 2022. The inspection was carried out within the rail corridor in areas proposed for permanent and temporary impacts to vegetation (the inspection area). This inspection area included the western side of the rail closest to Narrabri, and the northern/eastern side of the rail along the rail corridor between Narrabri and Turrawan. The ecological surveys were undertaken to:

- Assess and describe the existing environment in relation to terrestrial and aquatic flora and fauna species and communities.
- Identify threatened species or key ecological features (such as hollow-bearing trees) with the potential to provide habitat for threatened species.
- Identify if the Project Area supports or has potential habitat for threatened and migratory species, endangered populations or TECs listed under the BC Act and/or the EPBC Act.

- Surveys of the Project Area involved the following:
 - Survey of the Project Area using foot traverses and vehicle, focusing on the areas with the potential to be disturbed by proposed works.
 - Rapid vegetation assessments.
 - Fauna habitat assessments.
 - Inspection of culverts requiring remediation works, including repair of cracks in culvert headers and replacement.
 - Qualitative aquatic habitat assessments to assess habitat.

Survey methods have been provided in **Section 2.2.1** and **2.2.2**.

Survey locations are shown on **Figure 2**.

2.2.1 Flora Survey

A preliminary review of available aerial photographs and vegetation mapping was undertaken to inform the design of the vegetation surveys.

Meandering transect surveys targeting threatened flora species known to occur in the region were undertaken. These were conducted within vegetation communities identified in the Project Area that had the potential to support threatened flora species. Any potential threatened species encountered were captured using a custom field survey designed for Collector, an ArcGIS platform. Geographic location and significant attribute details were also recorded on each feature encountered (i.e., species, health, number of individuals etc.).

A total of 160 rapid vegetation assessments were completed within the Project Area, recording dominant plant species in the canopy, mid-storey and groundcover. Key habitat features and landform descriptions were recorded to inform assessment of the likely presence of threatened species and communities.

The rapid vegetation assessments were used to classify areas of native vegetation and assess the presence of TECs.

Vegetation survey locations are shown in **Figure 2**.

2.2.2 Fauna Survey

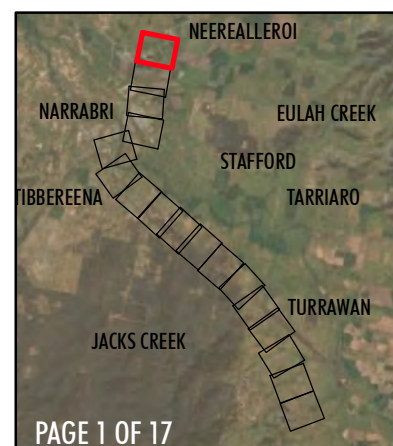
Fauna surveys undertaken in the Project Area were limited to fauna habitat assessments (aquatic and terrestrial) targeting the identification of threatened fauna habitat, including pooling or flowing water bodies, hollow-bearing trees, nests, and species-specific feed trees (for example, for the koala). Specific attention was given to identifying the location and extent of potential habitat for the Pilliga mouse and the eastern pygmy-possum, as well as any areas within the Project Area identified as key fish habitat.

Diurnal surveys around culverts or culvert headers identified by ARTC as requiring replacement were undertaken to determine if these existing culverts were either being used as roosting locations for micro-bats, or evidence of past use was present. Inspections included the use of a LED-headtorch looking for signs of presence or past usage of cracks and joins within the culverts or headers by micro-bats. No culverts were entered during the inspection.



GDA 1994 MGA Zone 55

- | | | |
|------------------------|--|---|
| Legend | | |
| Project Boundary | Vegetation | BC Act |
| Rapid Assessment Point | Exotic grassland | Native vegetation on cracking clay soil |
| Drainage Line | Low condition native grassland | |
| | Native grassland on cracking clay soil | |
| | Railway | |



PAGE 1 OF 17

FIGURE 2
Project Vegetation Communities and Survey Effort



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- | | | |
|------------------------|--|---|
| Project Boundary | Vegetation | BC Act |
| Rapid Assessment Point | Exotic grassland | Native vegetation on cracking clay soil |
| Drainage Line | Native grassland on cracking clay soil | Railway |

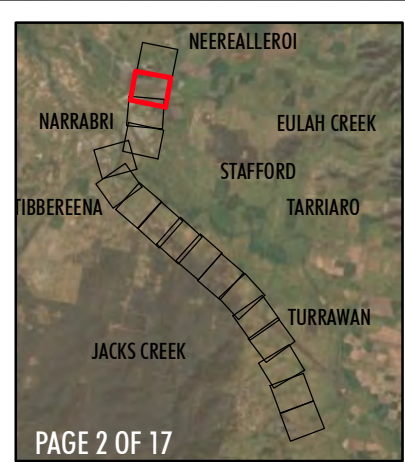


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
 - Exotic grassland
 - Railway

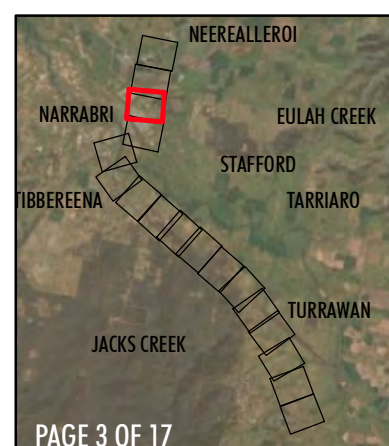


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
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 - Drainage Line
 - Vegetation**
 - Exotic grassland
 - Railway

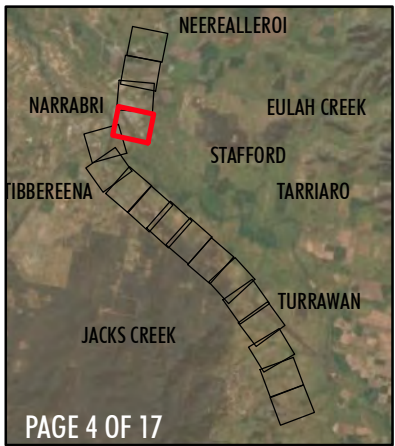


FIGURE 2
Project Vegetation Communities and Survey Effort



- | | | |
|------------------------|--|---|
| Legend | | |
| Project Boundary | Vegetation | BC Act |
| Rapid Assessment Point | Exotic grassland | Native vegetation on cracking clay soil |
| Drainage Line | Low condition native grassland | EPBC Act |
| | Native grassland | Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Qld |
| | Native grassland on cracking clay soil | |
| | Railway | |
| | Road | |

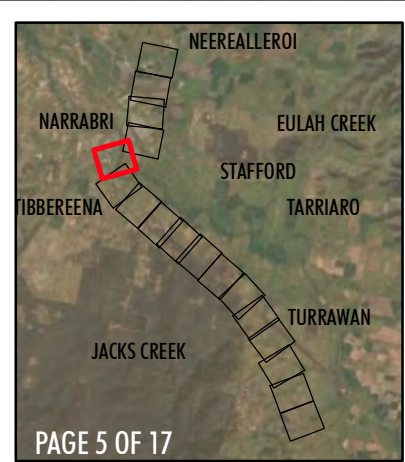


FIGURE 2
Project Vegetation Communities and Survey Effort



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- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Native grassland
 - Pilliga Box - White Cypress Pine Woodland
 - Railway

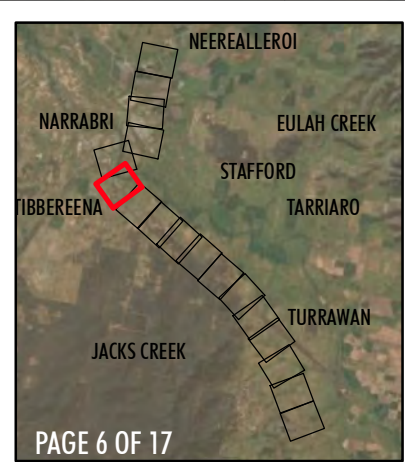


FIGURE 2
Project Vegetation Communities and Survey Effort



- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Low condition native grassland
 - Narrow-leaved Ironbark - White Cypress Pine Woodland
 - Native grassland
 - Railway

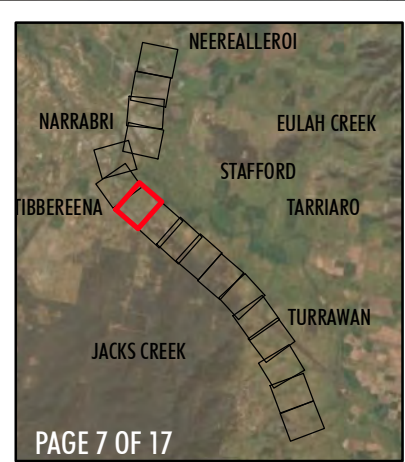
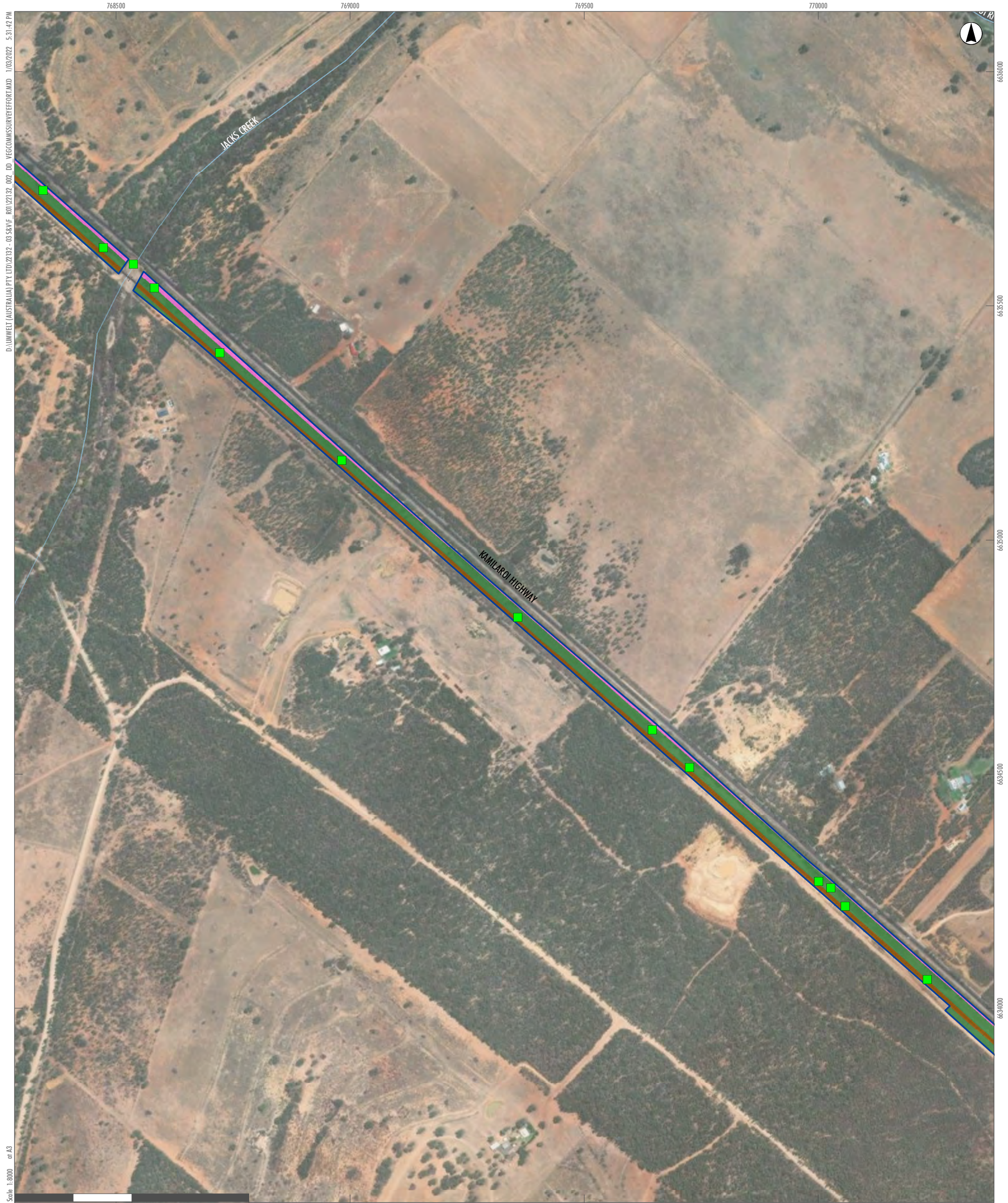


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

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- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
 - Low condition native grassland
 - Narrow-leaved Ironbark - White Cypress Pine Woodland
 - Railway

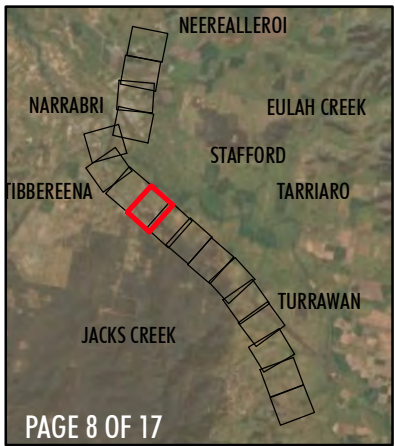


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Low condition native grassland
 - Narrow-leaved Ironbark - White Cypress Pine Woodland
 - Native grassland
 - Railway

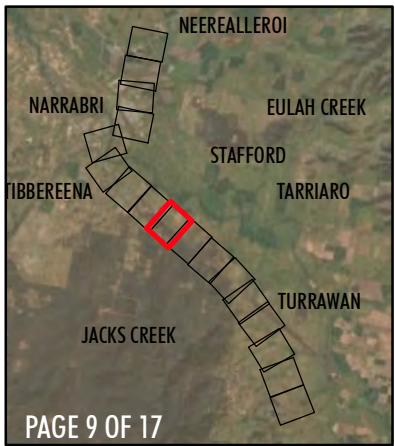


FIGURE 2
Project Vegetation Communities and Survey Effort



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- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Low condition native grassland
 - Narrow-leaved Ironbark - White Cypress Pine Woodland
 - Native grassland
 - Railway

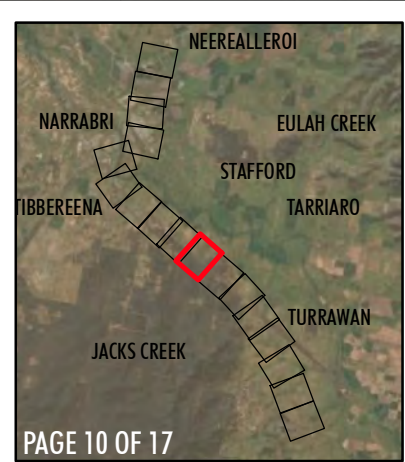


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Narrow-leaved Ironbark - White Cypress Pine Woodland
 - Native grassland
 - Railway

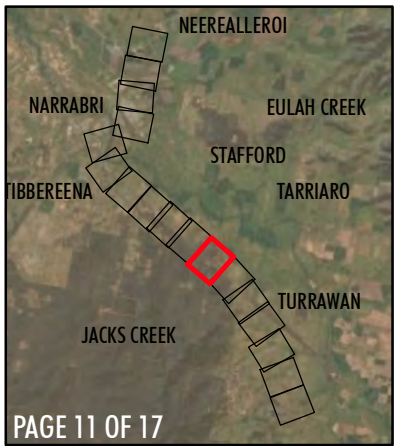


FIGURE 2
Project Vegetation Communities and Survey Effort



- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Low condition native grassland
 - Narrow-leaved Ironbark - White Cypress Pine Woodland
 - Native grassland
 - Pilliga Box - White Cypress Pine Woodland
 - Railway

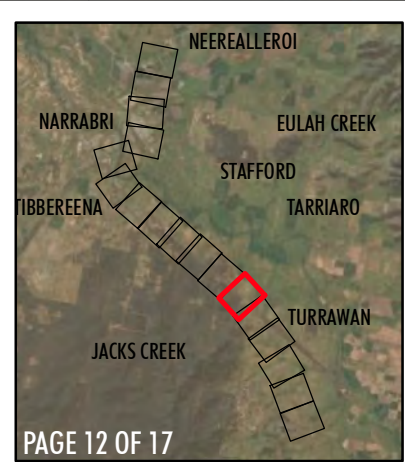


FIGURE 2
Project Vegetation Communities and Survey Effort



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- Legend**
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- Vegetation**
- Low condition native grassland
 - Native grassland
 - Pilliga Box - White Cypress Pine Woodland
 - Railway

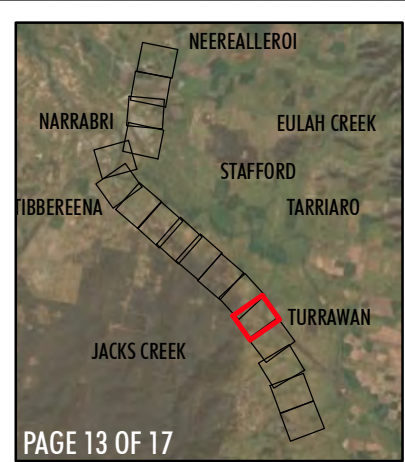


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

Legend

- | | |
|------------------------|---|
| Project Boundary | Vegetation |
| Rapid Assessment Point | Low condition native grassland |
| Drainage Line | Native grassland |
| | Pilliga Box - White Cypress Pine Woodland |
| | Railway |

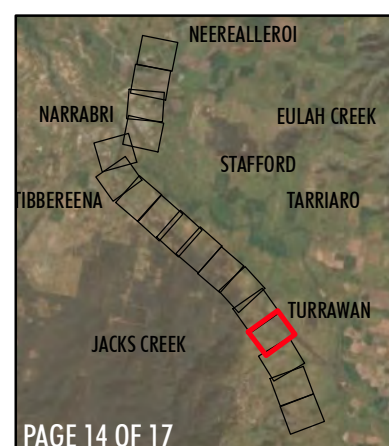


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Low condition native grassland
 - Native grassland
 - Pilliga Box - White Cypress Pine Woodland
 - Railway

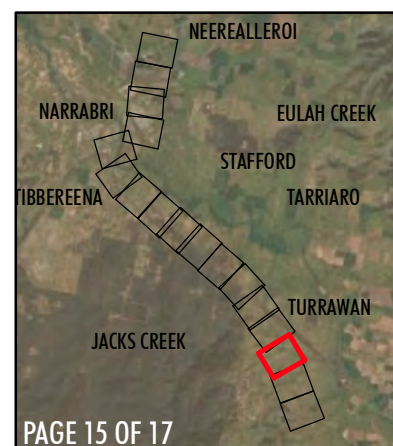


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
- Low condition native grassland
 - Native grassland
 - Pilliga Box - White Cypress Pine Woodland
 - Railway

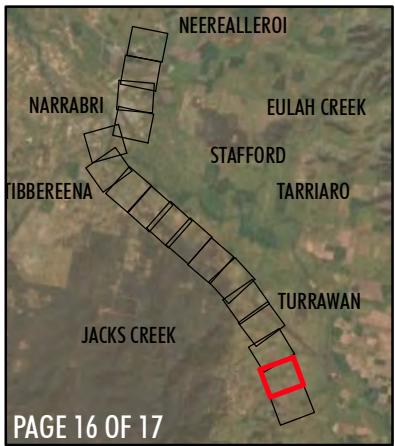


FIGURE 2
Project Vegetation Communities and Survey Effort



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Rapid Assessment Point
 - Drainage Line
- Vegetation**
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 - Native grassland
 - Pilliga Box - White Cypress Pine Woodland
 - Poplar Box - White Cypress Pine Woodland
 - Railway
 - Road

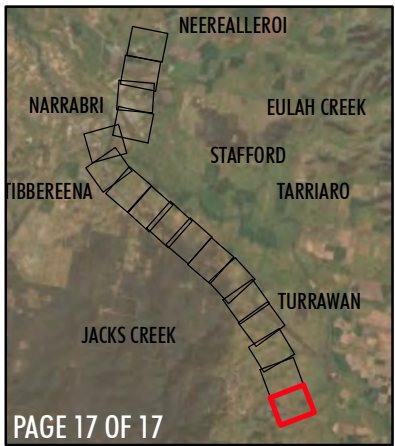


FIGURE 2
Project Vegetation Communities and Survey Effort

3.0 Results

3.1 Literature Review and Database Searches

A total of 60 threatened fauna species, 17 threatened flora species, 1 endangered population, 10 TECs and 10 migratory species were identified as having the potential to occur within the Project Site. These are listed in **Section 3.4**.

3.2 Vegetation Communities

Descriptions of each vegetation community within the Project Area are provided in **Table 3.1** to **Table 3.8**.

The vegetation communities described below are considered unlikely to be groundwater dependent ecosystems (GDEs). The majority of the Project Area is mapped as having low potential GDEs according to the Groundwater Dependent Ecosystem Atlas (BOM 2022). The high potential areas are associated with Narrabri Creek and the Namoi River which are outside the Project Area.

A map showing the spatial distribution of the vegetation communities identified in the Project Area is provided on **Figure 2**.

Table 3.1 Brigalow – Pilliga Box Woodland description


Community Name	Brigalow – Pilliga Box Woodland	
Area	0 ha (not anticipated to be impacted)	
Canopy description	Dominated by pilliga box (<i>Eucalyptus pilligaensis</i>).	
Mid-storey description	The mid-storey layer is dominated by brigalow (<i>Acacia harpophylla</i>) and <i>Senna artemisioides</i> subsp. <i>Zygophylla</i> .	
Ground cover description	Dominated by native grasses and herbs, including <i>Enchylaena tomentosa</i> , <i>Chloris truncata</i> and <i>Themeda triandra</i> .	
BC Act Status	This vegetation community is consistent with the <i>Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions EEC</i>	
EPBC Act Status	This vegetation community is not consistent with the <i>Brigalow (Acacia harpophylla dominant and co-dominant) EEC</i> due to the small size of the remnant (<0.5 ha)	

Table 3.2 Narrow-leaved Ironbark – White Cypress Pine Woodland description


Community Name	Narrow-leaved Ironbark – White Cypress Pine Woodland	
Area	6.9 ha	
Canopy description	Dominated by narrow-leaved ironbark (<i>Eucalyptus crebra</i>), white cypress pine (<i>Callitris glaucophylla</i>), bulloak (<i>Allocasuarina luehmannii</i>) and dirty gum (<i>Eucalyptus chloroclada</i>).	
Mid-storey description	The mid-storey layer is dominated by green wattle (<i>Acacia deanei</i>), wilga (<i>Geijera parviflora</i>) and western boobialla (<i>Myoporum montanum</i>).	
Ground cover description	Dominated by native grasses and herbs, including <i>Enchylaena tomentosa</i> , <i>Chloris truncata</i> and <i>Themeda triandra</i> .	
BC Act Status	This vegetation community is not consistent with any TECs listed under the BC Act.	
EPBC Act Status	This vegetation community is not consistent with any TECs listed under the EPBC Act.	

Table 3.3 Pilliga Box – White Cypress Pine Woodland description


Community Name	Pilliga Box – White Cypress Pine Woodland	
Area	4.77 ha	
Canopy description	Dominated by poplar box (<i>Eucalyptus populnea subsp. bimbil</i>) and white cypress pine (<i>Cypress glaucophylla</i>)	
Mid-storey description	The mid-storey layer is dominated by wilga (<i>Geijera parviflora</i>).	
Ground cover description	Dominated by native grasses and herbs, including <i>Enchylaena tomentosa</i> , <i>Chloris truncata</i> and <i>Themeda triandra</i> .	
BC Act Status	This vegetation community is not consistent with any TECs listed under the BC Act.	
EPBC Act Status	This vegetation community is not consistent with any TECs listed under the EPBC Act.	

Table 3.4 Poplar Box – White Cypress Pine Woodland description



Community Name		Poplar Box – White Cypress Pine Woodland
Area	0.75 ha	
Canopy description	Dominated by poplar box (<i>Eucalyptus populnea subsp. bimbil</i>) and white cypress pine (<i>Cypress glaucophylla</i>) in the remnant areas. Closer to railway track it is mostly regenerating poplar box with no remnant trees.	
Mid-storey description	Within remnant areas, the mid-storey layer is dominated by wilga (<i>Geijera parviflora</i>) and western boobialla (<i>Myoporum montanum</i>).	
Ground cover description	Predominantly exotic understorey comprising Guinea grass (<i>Megathyrsus maximus</i>), Johnsons grass (<i>Sorghum halepense</i>) and paspalum (<i>Paspalum dilatatum</i>).	
BC Act Status	This vegetation community is not consistent with any TECs listed under the BC Act.	
EPBC Act Status	This vegetation community is broadly consistent with Poplar Box Grassy Woodland on Alluvial Plains EEC listed under the EPBC Act.	

Table 3.5 Native Grassland on Cracking Clay Soil description

Community Name		Native Grassland on Cracking Clay Soil
Area	2.84 ha	
Canopy description	Canopy is generally absent from this community, however occurrences of yellow box (<i>Eucalyptus melliodora</i>), white box (<i>Eucalyptus albens</i>), belah (<i>Casuarina cristata</i>) and weeping myall (<i>Acacia pendula</i>) are occasionally present.	


Community Name	Native Grassland on Cracking Clay Soil	
Mid-storey description	A mid-storey is generally absent from this community, <i>Myoporum montanum</i> was recorded in association with weeping myall (<i>Acacia pendula</i>).	
Ground cover description	Dominated by native grasses such as bluegrass (<i>Dichanthium sericeum</i>), spring grass (<i>Eriochloa procera</i>), couch (<i>Cynodon dactylon</i>), <i>Chloris truncata</i> , <i>Enteropogon acicularis</i> , plains grass (<i>Austrostipa aristiglumis</i>) with nardoo (<i>Marsilea drummondii</i>) <i>Sclerolaena muricata</i> also commonly occurring. Exotic grasses are generally also present, but account for less than 50% of the vegetation cover.	
BC Act Status	This vegetation community is consistent with the <i>Native Vegetation on Cracking Clay Soils of the Liverpool Plains EEC</i> .	
EPBC Act Status	Some occurrences of this vegetation community within the Project Area are consistent with the <i>Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CEEC</i> .	

Table 3.6 Native Grassland description


Community Name	Native Grassland	
Area	34.06 ha	
Canopy description	Canopy is generally absent.	
Mid-storey description	A mid-storey is generally absent from this community however occasional regrowth of western boobiolla (<i>Myoporum montanum</i>), wilga (<i>Geijera parviflora</i>) and green wattle (<i>Acacia deanei</i>) are present, along with regenerating eucalypts consistent with the adjacent remnant woodland.	
Ground cover description	Dominated by a mixture of native grasses including kangaroo grass (<i>Themeda triandra</i>), <i>Chloris truncata</i> , <i>Digitaria divaricatissima</i> , bluegrass (<i>Dichanthium sericeum</i>), spring grass (<i>Eriochloa procera</i>), <i>Aristida</i> spp. and couch (<i>Cynodon dactylon</i>). Native forbs are present and include <i>Calotis lappulacea</i> and <i>Chrysocephalum apiculatum</i> .	
BC Act Status	This vegetation community is not consistent with any TECs listed under the BC Act.	
EPBC Act Status	This vegetation community is not consistent with any TECs listed under the EPBC Act.	

Table 3.7 Low Condition Native Grassland description



Community Name	Low Condition Native Grassland	
Area	34.87 ha	
Canopy description	Canopy is generally absent.	
Mid-storey description	A mid-storey is generally absent from this community, however occasional regrowth of <i>Myoporum montanum</i> is present.	
Ground cover description	Dominated by native grasses and herbs such as spring grass (<i>Eriochloa procerata</i>) and nodding saltbush (<i>Einadia nutans</i>), but also contains weed grass species such as Rhodes grass (<i>Chloris gayana</i>) and Guinea grass (<i>Megathyrsus maximus</i>).	
BC Act Status	This vegetation community is not consistent with any TECs listed under the BC Act.	
EPBC Act Status	This vegetation community is not consistent with any TECs listed under the EPBC Act.	

Table 3.8 Exotic Grassland description

Community Name	Exotic Grassland	
Area	41.31 ha	
Canopy description	Absent	
Mid-storey description	Absent	
Ground cover description	<p>Dominated by exotic grasses such as Rhodes grass (<i>Chloris gayana</i>), Guinea grass (<i>Megathyrsus maximus</i>), Johnsons grass (<i>Sorghum halepense</i>) and paspalum (<i>Paspalum dilatatum</i>).</p> <p>This community includes regularly mown grassland in road verges.</p>	
BC Act Status	This vegetation community is not consistent with any TECs listed under the BC Act.	
EPBC Act Status	This vegetation community is not consistent with any TECs listed under the EPBC Act.	

3.3 Fauna Habitat

3.3.1 Terrestrial Fauna Habitat

Terrestrial fauna habitats are varied but limited in the complexity of habitat being provided, given the proximity to the existing active rail corridor. The cracking clay soils may provide habitat to ground-dwelling reptiles and frogs, while the shrubby habitats may provide habitat for woodland birds and mammals. Grassland areas are likely to provide foraging habitat for a range of predatory birds and microbat species.

Small culverts (approx. 0.5 m wide) were inspected for potential use by microbat species, with none detected. These culverts are considered unlikely to provide habitat to microbats, given the lack of cracks and fissures, and no evidence of occupation observed, in the form of guano or other signs.

No hollows or nests were observed during the site survey.

Potential habitat for the Pilliga mouse was observed between chainage 554.00 km and 556.00 km in the form of dense, low shrubs on sandy soil.

3.3.2 Aquatic Fauna Habitat

The Project Area passes over several named waterbodies and unnamed drainage lines, including Jack's Creek, Narrabri Creek and the Namoi River. Several of these waterbodies likely contain permanent pools, thus providing an important resource for native fauna. These waterbodies will not be impacted by the works.

3.4 Threatened Species, Populations and Ecological Communities

Table 3.9, Table 3.10 and Table 3.11 list threatened species, populations and ecological communities that were recorded within the Project Area during the site inspection and those threatened species, populations and ecological communities identified by the Atlas of NSW Wildlife Database (DPIE 2022a) and the PMST (DAWE 2022) as having a potential to occur within the Project Area.

Table 3.9 Threatened ecological communities recorded, or with potential to occur, in the Project Area

Threatened Ecological Community	Status		Likelihood of occurrence	Assessment of Significance Required?
	BC Act	EPBC Act		
Threatened Ecological Communities				
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions	EEC	-	Recorded adjacent to the Project Area and will not be impacted.	No
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	-	EEC	Recorded adjacent on the edge of the Project Area and will not be impacted by the Project.	No
Poplar Box Grassy Woodland on Alluvial Plains	-	EEC	Recorded	Yes
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South-western bioregions	EEC	-	Not recorded	No
Weeping Myall Woodlands	-	EEC	Not recorded	No
Native Vegetation on Cracking Clay Soils of the Liverpool Plains	EEC	-	Recorded	Yes
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	-	CEEC	Recorded	Yes
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	EEC	EEC	Not recorded	No
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC	EEC	Not recorded	No
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CEEC	CEEC	Not recorded	No

Table 3.10 Threatened species and endangered populations recorded, or with potential to occur in the Project Area

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
Flora					
finger panic grass	<i>Digitaria porrecta</i>	E	-	Not recorded, however potential habitat is present.	Yes
	<i>Tylophora linearis</i>	V	E	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
spiny peppergrass	<i>Lepidium aschersonii</i>	V	V	Potential habitat is present. If present, the species was unlikely to be recorded during surveys due to recent flooding, therefore potential presence is assumed.	Yes
winged peppergrass	<i>Lepidium monoplocoides</i>	E	E	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
	<i>Cyperus conicus</i>	E	-	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
Coolabah bertya	<i>Bertya opponens</i>	V	V	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
slender darling pea	<i>Swainsona murrayana</i>	V	V	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
	<i>Androcalva procumbens</i> (syn. <i>Commersonia procumbens</i>)	V	V	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
pine donkey orchid	<i>Diuris tricolor</i>	V	-	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
greenhood orchid	<i>Pterostylis cobarensis</i>	V	-	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
bluegrass	<i>Dichanthium setosum</i>	V	V	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
native milkwort	<i>Polygala linariifolia</i>	E	-	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
scant pomaderris	<i>Pomaderris queenslandica</i>	E	-	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
ooline	<i>Cadellia pentastylis</i>	V	V	Not recorded during surveys and unlikely to occur in the area to be impacted by the project.	No
austral toadflax	<i>Thesium australe</i>	V	V	The Project Area is outside of the known range of this species, and it is unlikely to occur.	No
Belson's panic	<i>Homopholis belsonii</i>	E	V	The project area is outside of the known range of this species, and it is unlikely to occur.	No
leek orchid	<i>Prasophyllum</i> sp. Wybong	-	CE	The Project Area is outside of the known range of this species, and it is unlikely to occur.	No
Birds					
Australian Brush-turkey population in the Nandewar and Brigalow Belt South Bioregions	<i>Alectura lathamii</i>	EP	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
magpie goose	<i>Anseranas semipalmata</i>	V	-	No habitat present.	No
blue-billed duck	<i>Oxyura australis</i>	V	-	No habitat present.	No
freckled duck	<i>Stictonetta naevosa</i>	V	-	No habitat present.	No
white-throated needle-tail	<i>Hirundapus caudacutus</i>	V	V	Aerial foraging habitat only. No impacts.	No
black-necked stork	<i>Ephippiorhynchus asiaticus</i>	E	-	No habitat present.	No
spotted harrier	<i>Circus assimilis</i>	E	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
white-bellied sea-eagle	<i>Haliaeetus leucogaster</i>	V	-	No habitat present.	No

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
black-breasted buzzard	<i>Hamirostra melanosternon</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
little eagle	<i>Hieraetus morphnoides</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
square-tailed kite	<i>Lophoictinia isura</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
black falcon	<i>Falco subniger</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
Australian bustard	<i>Ardeotis australis</i>	E	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
bush stone-curlew	<i>Burhinus grallarius</i>	E	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
Australian painted snipe	<i>Rostratula australis</i>	E	E	No habitat present.	No
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
little lorikeet	<i>Glossopsitta pusilla</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
turquoise parrot	<i>Neophema pulchella</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
superb parrot	<i>Polytelis swainsonii</i>	V	V	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
barking owl	<i>Ninox connivens</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
eastern grass owl	<i>Tyto longimembris</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
masked owl	<i>Tyto novaehollandiae</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
brown treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
speckled warbler	<i>Chthonicola sagittata</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
regent honeyeater	<i>Anthochaera phrygia</i>	CE	CE	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
piebald honeyeater	<i>Certhionyx variegatus</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
white-fronted chat	<i>Epthianura albifrons</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
painted honeyeater	<i>Grantiella picta</i>	V	V	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
black-chinned honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
grey-crowned babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
varied sittella	<i>Daphoenositta chrysoptera</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
dusky woodswallow	<i>Artamus cyanopterus cyanopterus</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
hooded robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
scarlet robin	<i>Petroica boodang</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
diamond firetail	<i>Stagonopleura guttata</i>	V	-	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
Australasian bittern	<i>Botaurus poiciloptilus</i>	E	E	No habitat present.	No
grey falcon	<i>Falco hypoleucos</i>	E	V	Potential impacts to foraging habitat, particularly over grasslands.	Yes
red goshawk	<i>Erythrotriorchis radiatus</i>	CE	V	Potential impacts to foraging habitat, particularly over grasslands.	Yes
malleefowl	<i>Leipoa ocellata</i>	E	V	No habitat present.	No
Mammals					
koala	<i>Phascolarctos cinereus</i>	V	E	Marginal habitat present due to location along rail corridor and no mature trees to be impacted. Species unlikely to be impacted.	No
eastern pygmy-possum	<i>Cercartetus nanus</i>	V	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
squirrel glider	<i>Petaurus norfolcensis</i>	V	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
greater glider	<i>Petauroides volans</i>	-	V	No habitat present.	No
black-striped wallaby	<i>Macropus dorsalis</i>	E	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
brush-tailed rock-wallaby	<i>Petrogale penicillata</i>	E	V	No habitat present.	No
yellow-bellied sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
eastern coastal free-tailed bat	<i>Micronomus norfolcensis</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
little pied bat	<i>Chalinolobus picatus</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
eastern cave bat	<i>Vespadelus troughtoni</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
large bent-winged bat	<i>Miniopterus orianae oceanensis</i>	V	-	Potential impacts to foraging habitat, particularly over grasslands.	Yes
pilliga mouse	<i>Pseudomys pilligaensis</i>	V	V	Potential habitat present.	Yes
large-eared pied bat	<i>Chalinolobus dwyeri</i>	V	V	Potential impacts to foraging habitat, particularly over grasslands.	Yes
spotted-tailed quoll	<i>Dasyurus maculatus</i>	V	E	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
Corben's long-eared bat	<i>Nyctophilus corbeni</i>	V	V	Potential impacts to foraging habitat, particularly over grasslands.	Yes

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
grey-headed flying fox	<i>Pteropus poliocephalus</i>	V	V	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
Reptiles					
border thick-tailed gecko	<i>Uvidicolus sphyrurus</i>	V	V	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
five-clawed worm-skink	<i>Anomalopus mackayi</i>	E	V	Potential habitat in cracking clay soil habitats.	Yes
pale-headed snake	<i>Hoplocephalus bitorquatus</i>	V	-	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
pink-tailed worm-lizard	<i>Aprasia parapulchella</i>	-	V	Marginal habitat present due to location along rail corridor. Species unlikely to be impacted.	No
Fish					
Murray cod	<i>Maccullochella peelii</i>	-	V	No habitat present.	No
flathead galaxias	<i>Galaxias rostratus</i>	-	CE	No habitat present.	No
Migratory Species					
white-throated needletail	<i>Hirundapus caudacutus</i>	-	V, J, C, and R	Aerial foraging habitat only. No potential impact.	No
yellow wagtail	<i>Motacilla flava</i>	-	J, C, and R	No habitat present.	No
satin flycatcher	<i>Myiagra cyanoleuca</i>	-	B	No habitat present.	No
sharp-tailed sandpiper	<i>Calidris acuminata</i>	-	C	No habitat present.	No
rufous fantail	<i>Rhipidura rufifrons</i>	-	J	No habitat present.	No
curlew sandpiper	<i>Calidris ferruginea</i>	-	V	No habitat present.	No
Latham's snipe, Japanese snipe	<i>Gallinago hardwickii</i>	-	C,J	No habitat present.	No

Common Name	Scientific Name	Status		Likelihood of Occurrence	Assessment of Significance Required?
		BC Act	EPBC Act		
common sandpiper	<i>Actitis hypoleucos</i>	-	C,J	No habitat present.	No
pectoral sandpiper	<i>Calidris melanotos</i>	-	C,J	No habitat present.	No
fork-tailed swift	<i>Apus pacificus</i>	-	C	Aerial foraging habitat only. No potential impact.	No

Table 3.11 Threatened Aquatic Species and Endangered Populations listed under the *Fisheries Management Act 1994*, with potential to occur in the Project Area

Common Name	Scientific Name	FM Act Status	Likelihood of Occurrence	Assessment of Significance Required?
eel tailed catfish	<i>Tandanus tandanus</i>	EP	Mapped distribution – Namoi River and Narrabri Creek. No impacts to proposed to these areas.	No
olive perchlet	<i>Ambassis agassizii</i>	EP	Mapped distribution – Namoi River and Narrabri Creek. No impacts to proposed to these areas.	No
silver perch	<i>Bidyanus bidyanus</i>	V	Mapped distribution – Namoi River. No impacts to proposed to these areas.	No
southern purple spotted gudgeon	<i>Mogurnda adspersa</i>	E	Mapped distribution – Namoi River, Tulla Mullen Creek, and Jacks Creek, as well as small unnamed tributaries	Yes
flathead galaxis	<i>Galaxias rostratus</i>	CE	Mapped distribution – Namoi River and Narrabri Creek. No impacts to proposed to these areas.	No

4.0 Impact Assessment

The Project will have direct impacts on ecological values within the Project Area through clearance/disturbance of approximately 84.2 hectares of native vegetation (12.5 ha of woodland and 71.8 ha of native grassland) for the rail corridor upgrades. Impacts are largely limited to cleared areas and grassland and will likely involve the removal of some shrubs and regenerating trees for ballast/sleeper storage and vehicle access. Some tree trimming may be required where necessary, however no mature trees or dead stags will be impacted. Some ground disturbance may occur.

While ARTC have sought to avoid and minimise the project disturbance as far as practicable, the nature of the works means that impacts to native vegetation are unavoidable. The residual impact of the project following all avoidance and minimisation measures are presented in **Table 4.1** below.

Table 4.1 Summary of Biodiversity Impacts of the Project

Vegetation Community	Area (ha)
Narrow-leaved Ironbark – White Cypress Pine Woodland	6.9
Pilliga Box – White Cypress Pine Woodland	4.8
Poplar Box – White Cypress Pine Woodland	0.7
Native Grassland on Cracking Clay Soils	2.8
Native Grassland	34.1
Low- condition Native Grassland	34.9
Exotic Grassland	41.3
Railway and Roads	29.6
Total Area	155.1

Some small culverts (up to approx. 0.5 m wide) will be replaced as part of works. Some cracked headers are also likely to be upgraded with concrete headers, however these are considered unlikely to provide micro-bat habitat.

A constraints assessment has been provided in **Figure 3** depicting the low, medium, and high biodiversity constraints in relation to impacts. This should be used to inform the location and placement of disturbance within the Project Area. Within the low constraints' grasslands, disturbance should be targeted to exotic grasslands over native grassland areas.

Threatened species, populations and communities listed under the BC Act and EPBC Act that have the potential to occur within the Project Area are detailed in **Section 3.4** and assessments of significance are provided in **Appendix A** (BC Act) and **Appendix B** (EPBC Act). A summary of the results is provided below.

4.1 Biodiversity Conservation Act 2016

The following TECs and threatened species require a five-part test of significance under Section 7.3 of the BC Act as they have been recorded or were considered likely to occur within the Project Area with the potential to be significantly impacted by the Project.

Endangered Ecological Community (EEC)

- Native Vegetation on Cracking Clay Soils of the Liverpool Plains EEC.

Threatened Species

- Finger panic grass (*Digitaria porrecta*) listed as Endangered under the BC Act.
- Spiny peppergrass (*Lepidium aschersonii*) listed as Vulnerable under the BC Act.
- Dusky woodswallow (*Artamus cyanopterus cyanopterus*) listed as Vulnerable under the BC Act.
- Spotted harrier (*Circus assimilis*) listed as Endangered under the BC Act.
- Black-breasted buzzard (*Hamirostra melanosternon*) listed as Vulnerable under the BC Act.
- Little eagle (*Hieraaetus morphnoides*) listed as Vulnerable under the BC Act.
- Square-tailed kite (*Lophoictinia isura*) listed as Vulnerable under the BC Act.
- Black falcon (*Falco subniger*) listed as Vulnerable under the BC Act.
- Barking owl (*Ninox connivens*) listed as Vulnerable under the BC Act.
- Eastern grass owl (*Tyto longimembris*) listed as Vulnerable under the BC Act.
- Masked owl (*Tyto novaehollandiae*) listed as Vulnerable under the BC Act.
- Grey falcon (*Falco hypoleucos*) listed as Endangered under the BC Act.
- Red goshawk (*Erythrotriorchis radiatus*) listed as Critically Endangered under the BC Act.
- Pilliga mouse (*Pseudomys pilligaensis*) listed as Vulnerable under the BC Act.
- Yellow-bellied sheath-tail-bat (*Saccolaimus flaviventris*) listed as Vulnerable under the BC Act.
- Eastern coastal free-tailed bat (*Micronomus norfolkensis*) listed as Vulnerable under the BC Act.
- Little pied bat (*Chalinolobus picatus*) listed as Vulnerable under the BC Act.
- Eastern cave bat (*Vespadelus troughtoni*) listed as Vulnerable under the BC Act.
- Large bent-winged bat (*Miniopterus orianae oceanensis*) listed as Vulnerable under the BC Act.
- Large-eared pied bat (*Chalinolobus dwyeri*) listed as Vulnerable under the BC Act (three culverts providing potential roosting habitat).
- Corben's long-eared bat (*Nyctophilus corbeni*) listed as Vulnerable under the BC Act (three culverts providing potential roosting habitat).

- Five-clawed worm-skink (*Anomalopus mackayi*) listed as Endangered under the BC Act.

The five-part tests concluded that the Project is not likely to result in a significant impact to the above TECs or threatened species (refer to **Appendix A**).

4.2 Environment Protection and Biodiversity Conservation Act 1999

Assessments of Significance were also undertaken in accordance with the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance (DoE 2013) for the following:

- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CEEC.
- Poplar Box Grassy Woodland on Alluvial Plains EEC.
- Spiny peppercress (*Lepidium aschersonii*) listed as Vulnerable under the EPBC Act.
- Grey falcon (*Falco hypoleucos*) listed as Vulnerable under the EPBC Act.
- Red goshawk (*Erythrotriorchis radiatus*) listed as Vulnerable under the EPBC Act.
- Pilliga mouse (*Pseudomys pilligaensis*) listed as Vulnerable under the EPBC Act.
- Large-eared pied bat (*Chalinolobus dwyeri*) listed as Vulnerable under the EPBC Act.
- Corben's long-eared bat (*Nyctophilus corbeni*) listed as Vulnerable under the EPBC Act.
- Five-clawed worm-skink (*Anomalopus mackayi*) listed as Vulnerable under the EPBC Act.

The outcomes of the Assessment of Significance under the EPBC Act found that the proposed works will not result in a significant impact to the above TEC or threatened species (refer to **Appendix B**).

4.3 Fisheries Management Act 1994

Habitat for the following threatened species listed under the FM Act was identified in the broader locality of the Project:

- Eel tailed catfish (*Tandanus tandanus*), listed as an endangered population under the FM Act.
- Olive perchlet (*Ambassis agassizii*), listed as an endangered population under the FM Act.
- Silver perch (*Bidyanus bidyanus*), listed as vulnerable under the FM Act.
- Purple Spotted Gudgeon (*Mogurnda adspersa*) listed as endangered under the FM Act.

The Project Area is only considered to contain potential habitat for the Southern purple spotted gudgeon. An assessment of significance was therefore required for the Southern purple spotted gudgeon listed under the FM Act (Refer to **Appendix C**).



- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - High Ecological Risk

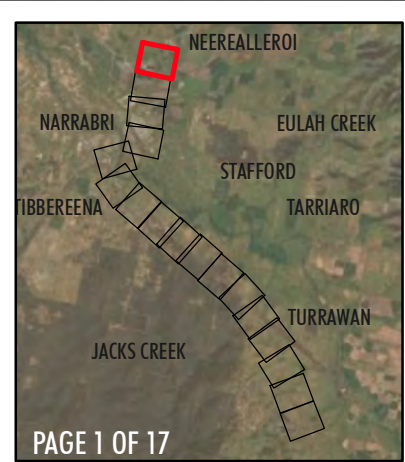


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales

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- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - High Ecological Risk

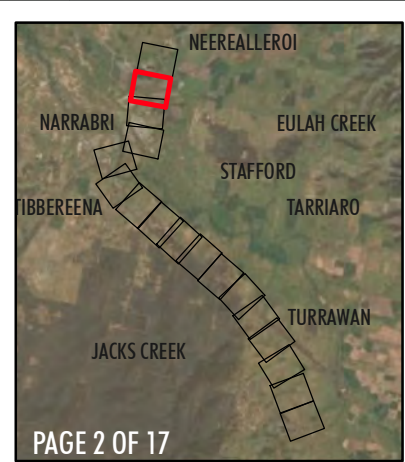


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk

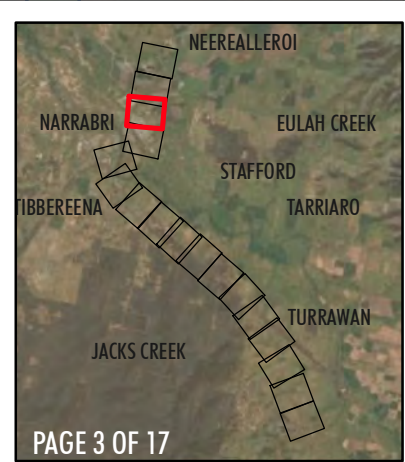


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales

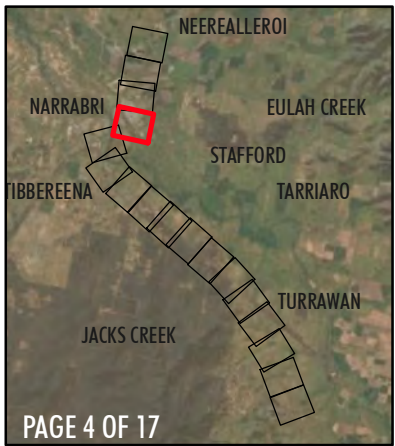


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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk



PAGE 4 OF 17

FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - High Ecological Risk

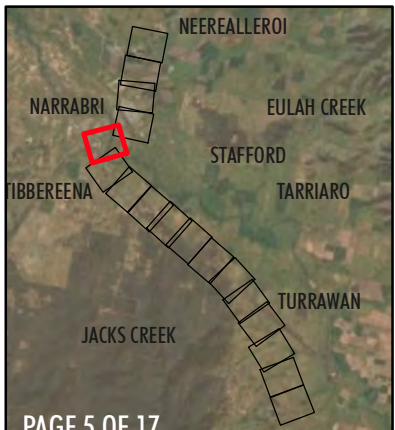


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales

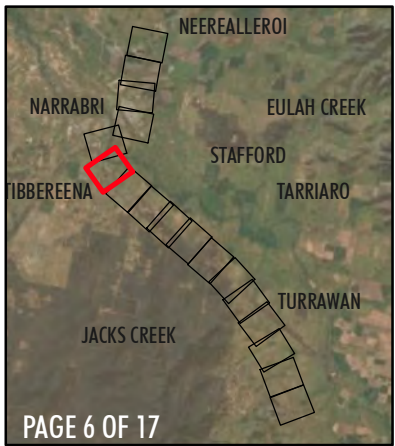


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Scale: 1:8000 at A3

GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk



PAGE 6 OF 17

FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

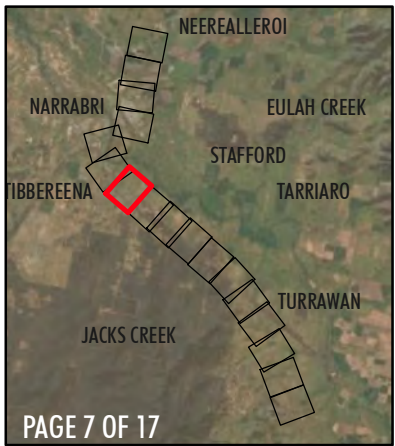


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

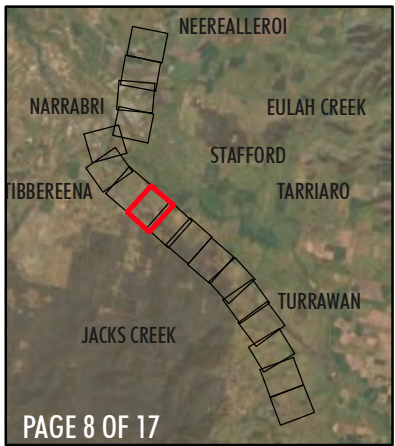


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

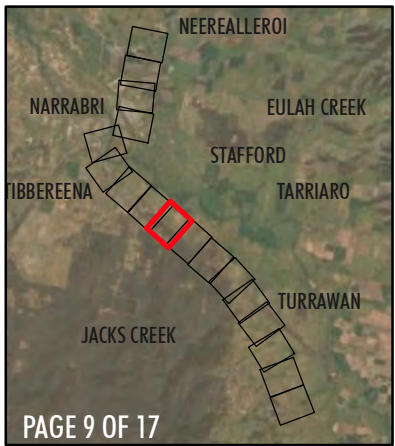


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

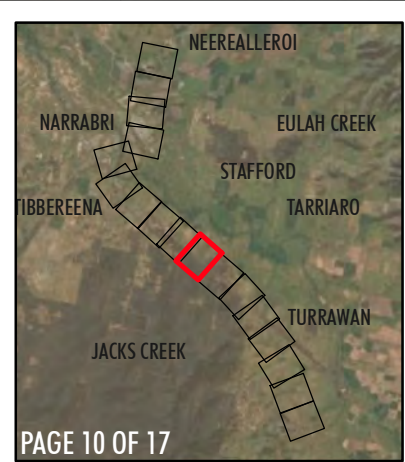


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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 - Drainage Line
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 - Medium Ecological Risk

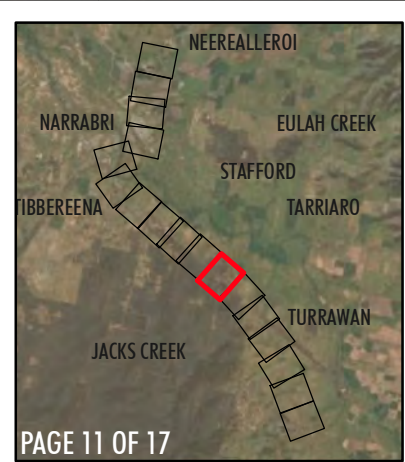


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

0 250 500 Metres

GDA 1994 MGA Zone 55

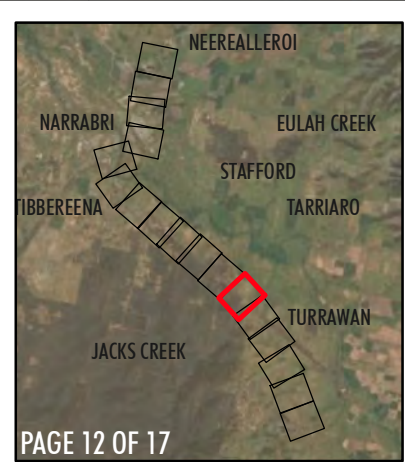
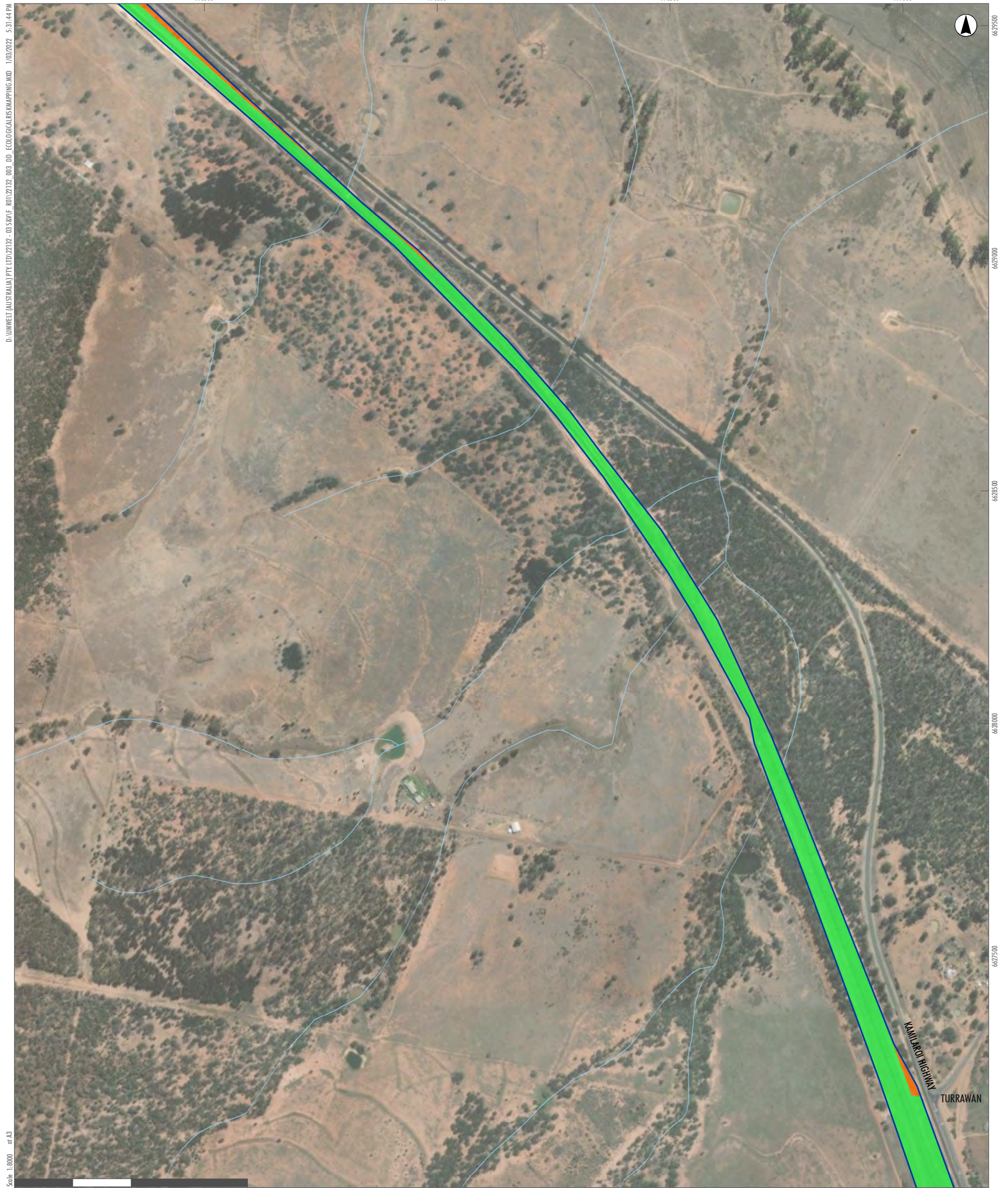


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

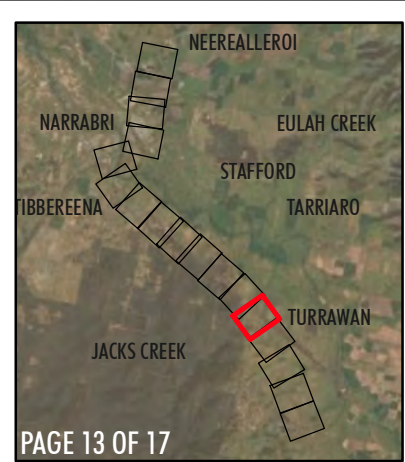


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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 - Drainage Line
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 - Medium Ecological Risk

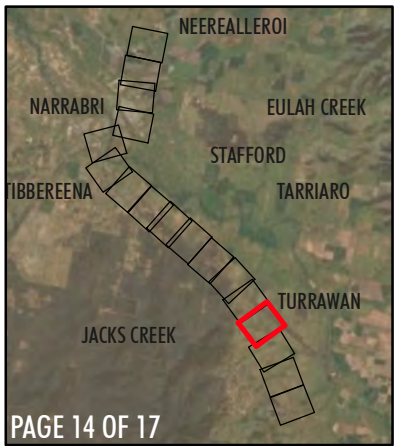


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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GDA 1994 MGA Zone 55

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

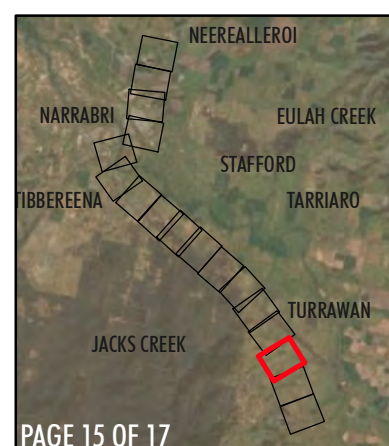


FIGURE 3

Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk

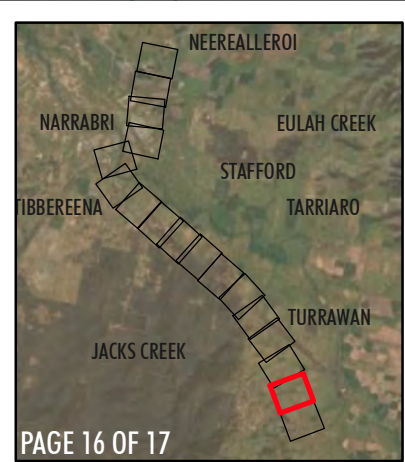


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales



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Scale: 1:8000 at A3

- Legend**
- Project Boundary
 - Drainage Line
 - Minimal Ecological Risk
 - Medium Ecological Risk
 - High Ecological Risk

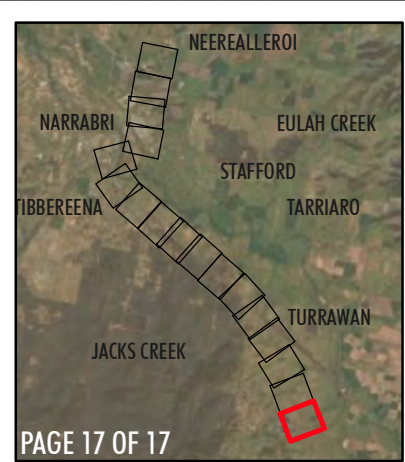


FIGURE 3
Ecological Risk Mapping
Between Narrabri to Turrawan
New South Wales

5.0 Mitigation Measures, Recommendations and Conclusion

Residual impacts of the Project are to be managed through all necessary mitigation measures implemented with consideration to the following:

- Perform a daily pre-start brief identifying sensitive habitat areas, species, and controls.
- Manage risk of sediment runoff and adverse water quality:
 - Erosion and sediment controls would be established in accordance with a soil and water management plan to be produced for the proposed works.
 - All erosion and sediment control measures will be inspected and maintained during the proposed works, removal, and management activities.

Vegetation management:

- Undertake the proposed works considering the Ecological Management Plan - Native Vegetation on Cracking Clay Soils of the Liverpool Plains (EEC) and Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland (CEEC) (Umwelt 2018b) (as provided as an Appendix to the overall REF report).
- Avoid where possible the medium and high ecological risk areas as shown on **Figure 3**.
- Retain mature/established trees where feasible.
- Avoid parking vehicles, storing construction materials, and placing stockpiles within the drip zone of trees (generally provide at least 5 metres distance) or as far as is practicable in order to avoid disturbance to the root zone.
- Undertake weed management during works, in particular for any noxious weeds and weeds of national significance.
- Remove all waste containing noxious weeds and seeds from site and dispose of so that spread of weeds is minimised.
- Use existing access tracks to minimise disturbance to vegetated areas.
- Where clearing has occurred, consider revegetating areas using native species, preferably those endemics to the local area, where appropriate.

General Fauna management:

- Retain mature trees and shrub species where possible.
- If native fauna species are present, works should avoid the fauna species or wait until the fauna species has relocated away from the site.
- If native fauna is injured or trapped onsite, contact the state wildlife authority to arrange for collection/removal from site.

- If previously unidentified nesting animals (including bats and birds) stop works in the immediate vicinity and contact the Environmental Advisor.
- Trees should be ‘soft felled’ (if required) and inspected immediately by a licensed wildlife carers or ecologist for displaced fauna which are to be relocated as close as possible to the development site.
- Five-clawed Worm-skink management, summarised below according to Section 5.11.3 of the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022) and provided in **Appendix D**.
- Avoid and minimise where possible, however where disturbance is required in areas of high-quality habitat (represented by Native Grassland on Cracking Clay Soils) or where direct ground disturbance is required in areas identified as potential habitat (Native Grassland on Cracking Clay Soils, exotic grassland, low condition native grassland, native grassland, and remnant woodland) (north of 558.5 km) the following mitigation measures must be implemented:
 - Site induction - all construction personnel will be subject to a five-clawed worm-skink induction.
 - Pre-clearance surveys will be undertaken by an Ecologist and/or Spotter-Catcher Team prior to and during direct ground disturbance activities within the Five-clawed Worm-skink habitat areas. Ground disturbance includes any disturbance to soil, including vegetation clearing which results in the disturbance to root systems e.g., grubbing works. Slashing or pruning of vegetation is not considered to result in direct ground disturbance.
 - The surveys would include active searches of microhabitats, including, carefully turning woody debris, rocks, and artificial debris, raking the soil surface or leaf litter beneath trees and looking beneath peeling bark for reptiles or their sloughs, searching for animals during topsoil stripping (working closely with the grader operator).
 - Targeted pre-clearing surveys would comprise a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species (scaled up or down depending on site complexity).
 - Requirement for detailed data to be collected on any future records of five-clawed worm-skink, including GPS coordinates of capture and relocation sites, date and time capture, description of microhabitats, validation photos and measurement of specimens.
 - Detection protocol – works to be ceased in the vicinity, temporary exclusion zone established, project ecologist notified to capture and relocate individuals, and immediate notification of Environmental Manager.
 - Reporting - Should the detection of a five-clawed worm-skink be validated, ARTC will cease all works in the vicinity of the find. ARTC will review statutory assessments/approvals required under both the BC Act and EPBC Act.
 - Should the five-clawed worm-skink be recorded as part of surveys, consider additional mitigation measures as detailed in Section 5.11.2 of the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022) and provided in Appendix D.
 - Prior to commencement of works, check for any relevant changes to the Construction Biodiversity Management Subplan - N2NS (Trans4m 2022, current version dated 6 January 2022).

It is recommended that impacts to the area of Pilliga mouse habitat between chainage 554 and 556 are avoided or minimised wherever possible. It is understood that removal of shrubs within one to two metres either side of the tracks are required to be removed, however any shrubby habitat further from the tracks towards the remnant vegetation is recommended to be retained.

Wherever possible, it is recommended that *Native Vegetation on Cracking Clay Soils of the Liverpool Plains* EEC is avoided, particularly the southernmost occurrence within the Project Area, as this is the highest quality of this EEC observed throughout the surveys.

The impact assessment has identified that the Project would not have a significant impact on State or Commonwealth listed threatened species, endangered populations, or threatened ecological communities. The construction works as part of the Project would have some minimal short-term environmental impacts associated with the construction activities which can be ameliorated satisfactorily through the implementation of specific controls and mitigation measures.

6.0 References

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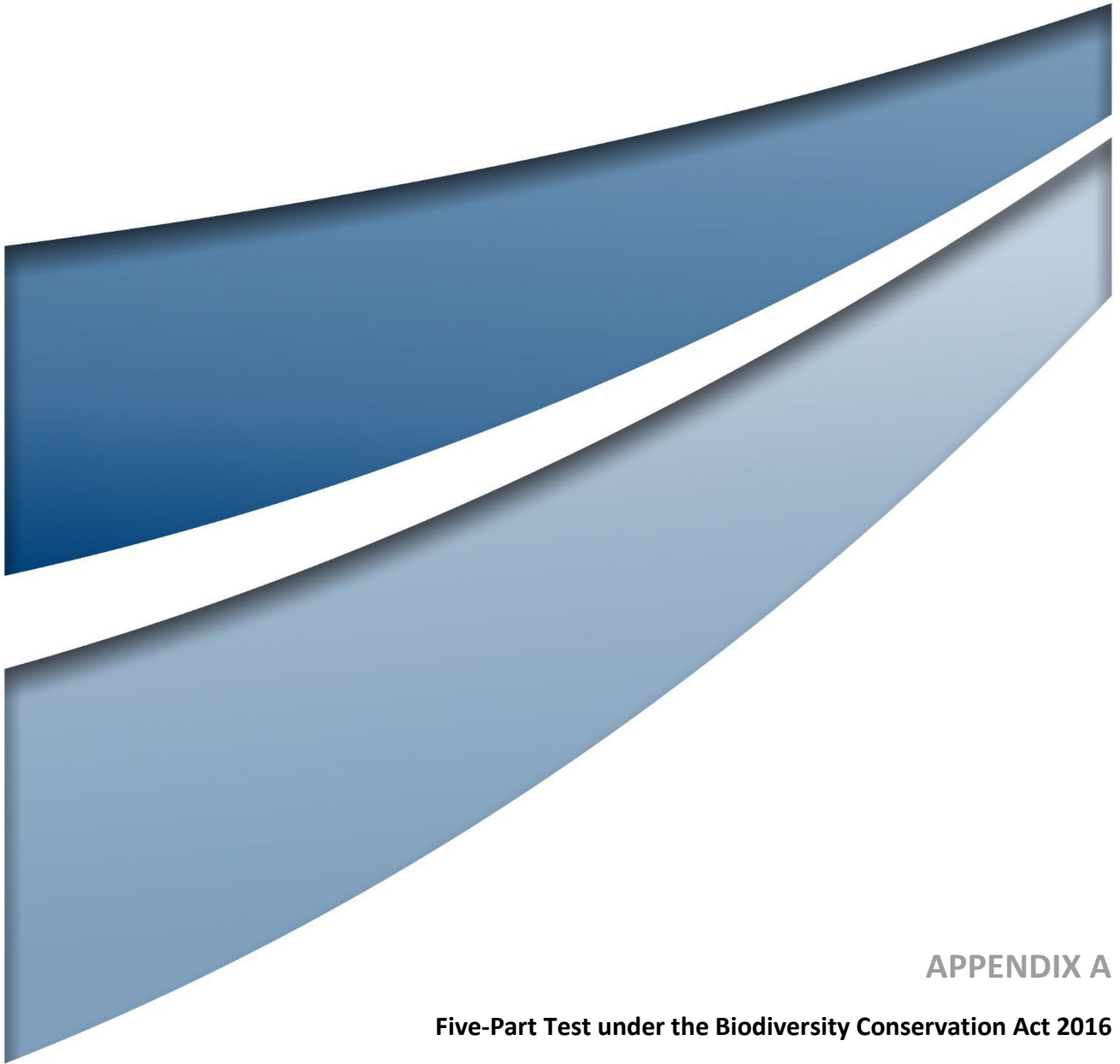
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APPENDIX A

Five-Part Test under the Biodiversity Conservation Act 2016

Five- part Tests of Significance under the BC Act

Five-part test for the threatened ecological community *Native Vegetation on Cracking Clay Soils of the Liverpool Plains* EEC

Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>Not relevant.</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>The Project is likely to impact approximately 2.8 hectares of <i>Native Vegetation on Cracking Clay Soils of the Liverpool Plains</i>.</p> <p>The minor reduction in the extent of the EEC, and the minor nature of the works, is not expected to result in a substantial change in native species composition, or any other form of composition, in the wider locality such that the composition of species in adjacent areas of EEC is affected. Furthermore, it is unlikely that the proposal will have a significant adverse effect on the ecological community such that its local occurrence is likely to be placed at risk of extinction.</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species or ecological community:</p> <p>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.</p> <p>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.</p> <p>The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality.</p>	<p>The Project is likely to impact approximately 2.8 hectares of <i>Native Vegetation on Cracking Clay Soils of the Liverpool Plains</i>, which represents a fairly minor extent of an already fragmented community, being within the rail corridor.</p> <p>Works within the Project Area are unlikely to result in an area of the EEC becoming further fragmented or isolated from other areas of habitat.</p> <p>The marginal impact of the Project means that the habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of the ecological community in the locality.</p>
<p>Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</p>	<p>There are no declared areas of outstanding biodiversity value in the vicinity of the Project Area. The proposed works will not result in a direct or indirect impact on any declared areas of outstanding biodiversity value.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <p>Clearing of native vegetation</p> <p>Invasion of native plant communities by exotic perennial grasses</p>
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to <i>Native Vegetation on Cracking Clay Soils of the Liverpool Plains</i>.</p>

Five- part test for the threatened flora species finger panic grass (*Digitaria porrecta*) and spiny peppergrass (*Lepidium aschersonii*)

Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>These species were not detected within the Project Area during the site inspection. They are considered to have potential habitat within the native grasslands.</p> <p>If present, the removal/disturbance of 36.9 ha of higher quality habitat and 34.9 ha of low condition habitat is highly unlikely to have an adverse effect on these species, such that they would be at risk of extinction. This consideration takes into account the very large area of suitable habitat in the surrounding region, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance.</p> <p>The small area of potential habitat to be removed is highly unlikely to place these species at risk of extinction.</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>Not relevant.</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species or ecological community:</p> <p>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.</p> <p>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.</p> <p>The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality.</p>	<p>The Project is likely to impact approximately 36.9xx ha of higher quality habitat and 34.9 ha of low condition habitat for these species. The availability of habitat surrounding the Project Area immediately adjacent is also likely to be more important to these species given the rail corridor itself is already creating fragmented habitat. Therefore, works within the Project Area are unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat.</p> <p>The marginal impact of the Project means that the potential habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of these threatened species in the locality.</p>
<p>Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</p>	<p>There are no declared areas of outstanding biodiversity value in the vicinity of the Project Area. The proposed works will not result in a direct or indirect impact on any declared areas of outstanding biodiversity value.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <ul style="list-style-type: none"> - Clearing of native vegetation - Invasion of native plant communities by exotic perennial grasses
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to finger panic grass or spiny peppergrass.</p>

Five- part test for foraging habitat for the threatened birds dusky woodswallow (*Artamus cyanopterus cyanopterus*), spotted harrier (*Circus assimilis*), black-breasted buzzard (*Hamirostra melanosternon*), little eagle (*Hieraaetus morphnoides*), square-tailed kite (*Lophoictinia isura*), black falcon (*Falco subniger*), barking owl (*Ninox connivens*), eastern grass owl (*Tyto longimembris*), masked owl (*Tyto novaehollandiae*), grey falcon (*Falco hypoleucos*) and red goshawk (*Erythrotriorchis radiatus*).

Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>These species were not detected within the Project Area during the site inspection. They are considered to have potential to aerially forage over the majority of the Project Area, wherever there is vegetation, but particularly over the open grasslands.</p> <p>If present, the removal, or disturbance of 12.5 ha of native woodland and 71.8 ha of native grassland representing potential foraging habitat is unlikely to have an adverse effect on these species, such that they would be at risk of extinction. This consideration takes into account the considerable area of suitable habitat in the surrounding region, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance.</p> <p>The potential impacts are to foraging habitat only, with no anticipated impact to roosting or breeding activity. Therefore, there should be no impact to the lifecycle of these species, which can avoid the areas during construction, and can continue to forage aerially above them upon completion of works.</p> <p>The impacts are largely limited to cleared areas which may require some shrub and regenerating tree removal for ballast/sleeper storage and vehicle access (access points off highway). Some tree trimming may also be required; however, no breeding habitat will be removed for these species as no mature trees will be removed.</p> <p>The potential foraging habitat to be impacted is highly unlikely to place a viable local population of these species at risk of extinction.</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>Not relevant.</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species or ecological community:</p> <p>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.</p> <p>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.</p> <p>The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality.</p>	<p>The Project is likely to impact approximately 12.5 ha of native woodland and 71.8 ha of native grassland representing foraging habitat for these species. The availability of habitat surrounding the Project Area immediately adjacent is also likely to be more important to these species because the rail corridor itself is already creating fragmented habitat. Therefore, works within the Project Area are unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat. These species are also highly mobile and can avoid areas of prolonged disturbance.</p> <p>The habitat to be impacted is considered highly unlikely to be important to these threatened birds, given its linear and narrow nature within a rail corridor which is subject to human disturbance.</p> <p>The marginal impact of the Project and the location within the rail corridor means that the habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of these threatened species in the locality.</p>
<p>Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</p>	<p>There are no declared areas of outstanding biodiversity value in the vicinity of the Project Site. The proposed works will not result in a direct or indirect impact on any declared areas of outstanding biodiversity value.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <ul style="list-style-type: none"> - Clearing of native vegetation - Invasion of native plant communities by exotic perennial grasses
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to these species.</p>

Five- part test for foraging habitat for threatened microbats yellow-bellied sheath-tail-bat (*Saccolaimus flaviventris*), eastern coastal free-tailed bat (*Micronomus norfolkensis*), eastern cave bat (*Vespadelus troughtoni*), Corben’s long eared bat (*Nyctophilus corbeni*), large-eared pied bat (*Chalinolobus dwyeri*) and little pied bat (*Chalinolobus picatus*).

Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>These species were not detected within the Project Area during the site inspection. They are considered to have potential to aerially forage over the majority of the Project Area, wherever there is vegetation.</p> <p>If present, the removal, or disturbance of 12.5 ha of native woodland and 71.8 ha of native grassland representing potential foraging habitat is highly unlikely to have an adverse effect on these species, such that they would be at risk of extinction. This consideration takes into account the very large area of suitable habitat in the surrounding region, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance. Proposed impacts to these species represent foraging habitat only, with no roosting habitat to be impacted.</p> <p>The potential impacts are to foraging habitat only, with no anticipated impact to roosting or breeding activity. Therefore, there should be no impact to the lifecycle of these species, which can avoid the areas during construction, and can continue to forage aerially above them upon completion of works.</p> <p>The Project Area contains only small culverts (up to approx. 0.5 m wide) which are to be replaced as part of works. Some cracked headers are likely to be upgraded with concrete headers. These structures are considered unlikely to provide micro-bat habitat and were checked for any signs of use (with none detected).</p> <p>The small area of potential habitat to be disturbed is highly unlikely to place these species at risk of extinction.</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>Not relevant.</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species or ecological community:</p> <p>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.</p> <p>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.</p> <p>The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality.</p>	<p>The Project is likely to impact approximately 12.5 ha of native woodland and 71.8 ha of native grassland representing potential foraging habitat for these species. The availability of habitat surrounding the Project Area immediately adjacent is also likely to be more important to these species because the rail corridor itself is already creating fragmented and disturbed habitat. Therefore, works within the Project Area are unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat. These species are also highly mobile and can avoid areas of prolonged disturbance.</p> <p>The potential habitat to be impacted is not considered to be important to these microbat species, given its location within the rail corridor.</p> <p>The culverts and headers which are to be replaced and upgraded are considered unlikely to provide micro-bat habitat.</p> <p>The marginal impact of the Project and the location within the rail corridor means that the habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of these threatened species in the locality.</p>
<p>Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</p>	<p>There are no declared areas of outstanding biodiversity value in the vicinity of the Project Site. The proposed works will not result in a direct or indirect impact on any declared areas of outstanding biodiversity value.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <ul style="list-style-type: none"> - Clearing of native vegetation - Invasion of native plant communities by exotic perennial grasses
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to these species.</p>

Five- part test for the threatened five-clawed worm-skink (*Anomalopus mackayi*)

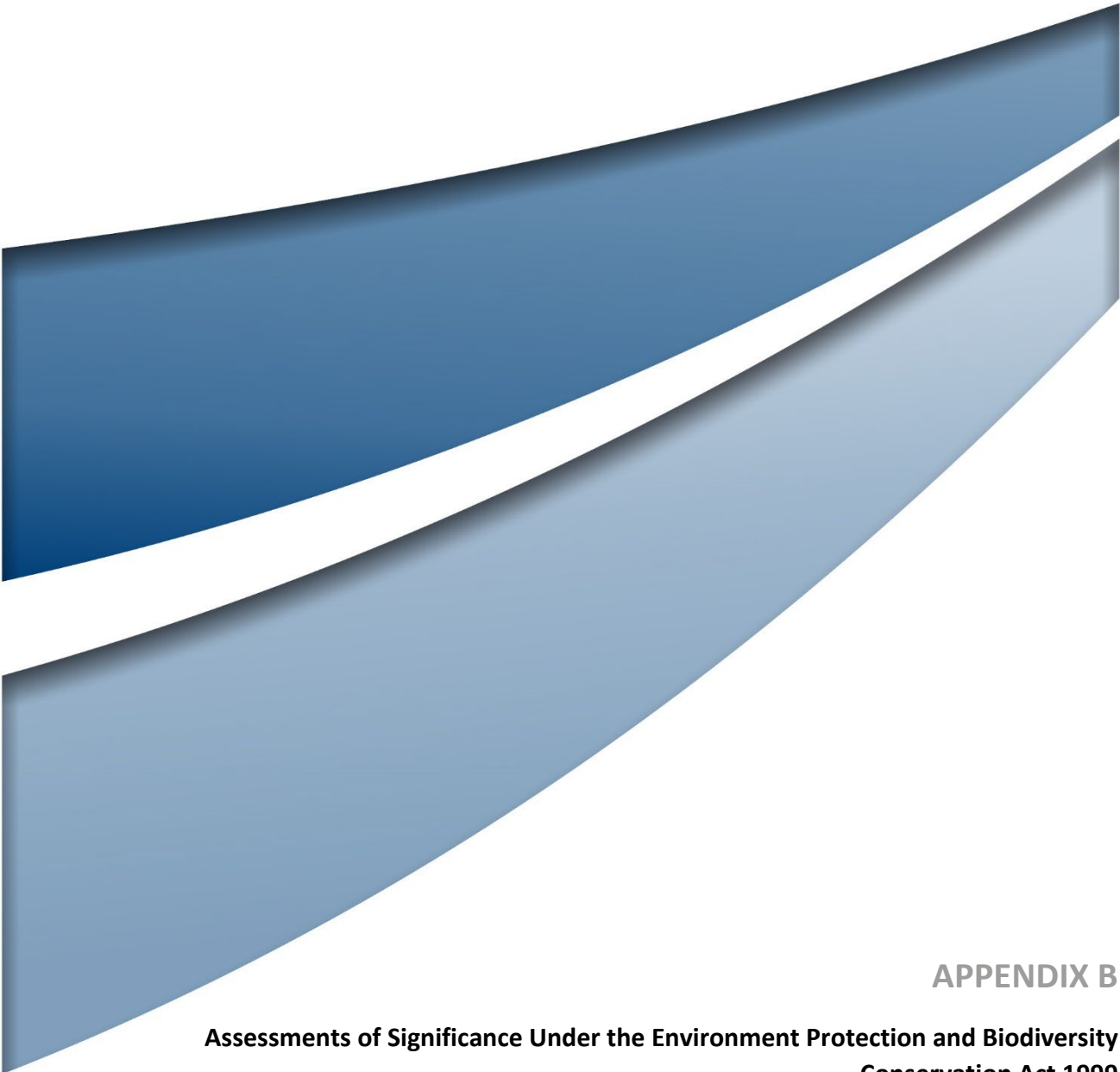
Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>This species was not detected within the Project Area during the site inspection. It is considered to have potential habitat within the cracking clay soils within the Project Area. The area of potential habitat has been defined for the purposes of this assessment where the rail corridor enters the Pilliga Outwash IBRA subregion.</p> <p>If present, the disturbance of approximately 2.8 ha of high-quality habitat (native grassland on cracking clay) and 59 ha of potential habitat (exotic grassland, low condition native grassland, native grassland, and remnant woodland) is unlikely to have an adverse effect on this species, such that they would be at risk of extinction. This consideration takes into account the very large area of suitable habitat in the surrounding region, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance.</p> <p>Some ground disturbances may occur where ground leveling is required, however these areas will be relatively small, and represent a very small portion of the total Project Area. The lifecycle of this species is therefore highly unlikely to be impacted such that it would become extinct in the local area.</p> <p>The small area of high-quality habitat to be disturbed is highly unlikely to place this species at risk of extinction.</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>Not relevant.</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species or ecological community:</p> <p>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.</p> <p>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.</p> <p>The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality.</p>	<p>The Project is likely to impact approximately 2.8 ha of high-quality habitat (native grassland on cracking clay) and 59 ha of potential habitat (exotic grassland, low condition native grassland, native grassland, and remnant woodland) for this species. The works within the Project Area are unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat.</p> <p>The impact of the Project and minimal direct ground disturbance means that the habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of this threatened species in the locality.</p>
<p>Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</p>	<p>There are no declared areas of outstanding biodiversity value in the vicinity of the Project Site. The proposed works will not result in a direct or indirect impact on any declared areas of outstanding biodiversity value.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <ul style="list-style-type: none"> - Clearing of native vegetation - Invasion of native plant communities by exotic perennial grasses
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to the Five-clawed worm-skink.</p>

Five- part test for the threatened Pilliga mouse (*Pseudomys pilligaensis*).

Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>This species was not detected within the Project Area during the site inspection. However, if present, the removal of 18.1 ha of potential habitat is unlikely to have an adverse effect on this species, such that it would be at risk of extinction. Potential habitat for this species comprises woodland or scrub areas (12.5 ha), as well as native grasslands with a higher density of shrubs (5.6 ha) between chainage 554 km and 556 km. This consideration takes into account the very large area of far more suitable habitat in the surrounding region, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance. Furthermore, it has been recommended that the best area of habitat for this species (located between chainage 554 and 556 in the rail corridor).</p> <p>The Project Area is considered to provide negligible adequate habitat to support the Pilliga mouse given that the species typically is found in greatest abundance in recently burnt moist gullies. Furthermore, the Pilliga mouse generally prefers habitats containing a relatively high plant species richness; a moderate to high density of low-level shrub cover; and a moist groundcover of plants, litter, and fungi. The existing disturbance of the Project Area suggests it is unlikely to provide habitat for this species.</p> <p>The proposed impacts are considered unlikely to place this species at risk of extinction.</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>Not relevant.</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species or ecological community:</p> <p>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.</p> <p>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity.</p> <p>The importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality.</p>	<p>The Project is likely to impact approximately 18.1 hectares of potential habitat for this species. The availability of habitat surrounding the Project Area immediately adjacent is also likely to be more important to these species because the rail corridor itself is already creating fragmented and disturbed habitat. Therefore, works within the Project Area are unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat.</p> <p>The Project Area is considered to provide negligible adequate habitat to support the Pilliga mouse. Furthermore, avoidance of potential Pilliga mouse habitat has been recommended.</p> <p>The marginal impact of the Project and the location within the rail corridor means that the habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of this threatened species in the locality.</p>
<p>Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</p>	<p>There are no declared areas of outstanding biodiversity value in the vicinity of the Project Site. The proposed works will not result in a direct or indirect impact on any declared areas of outstanding biodiversity value.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <ul style="list-style-type: none"> - Clearing of native vegetation - Invasion of native plant communities by exotic perennial grasses
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to the Pilliga mouse.</p>



APPENDIX B

**Assessments of Significance Under the Environment Protection and Biodiversity
Conservation Act 1999**

Assessments of Significance under the EPBC Act

An Assessment of Significance test under the EPBC Act were completed for the threatened ecological community. Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland.

Matters for Consideration	Comment
<p>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:</p> <p>Reduce the extent of an ecological community;</p>	<p>The Project is likely to impact approximately 1.5 hectares of natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland. The estimated total current national extent of the CEEC is 29,318 ha (TSSC 2008). With over 90% of the original extent of these grasslands being removed from the Liverpool and Moree Plains and at least a 95% reduction of the total original extent of this ecological community. The impact of up to 1.5 ha as a result of the Project represents an approximately 0.005% reduction in the estimated current extent of the community across its range. Thus, it is unlikely that the proposal will significantly reduce the extent this ecological community.</p>
<p>Fragment or increase fragmentation of an ecological community;</p>	<p>The Project is likely to impact approximately 1.5 hectares of natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland.</p> <p>The area of this CEEC to be impacted is already highly fragmented, given that it occurs within a rail corridor, and the works proposed are relatively minor and localised.</p> <p>Therefore, works within the Project Area are unlikely to result in an area of this CEEC becoming further fragmented or isolated from other areas of habitat.</p>
<p>Adversely affect habitat critical to the survival of an ecological community;</p>	<p>The small amount of habitat to be disturbed, when compared to the national extent, is considered highly unlikely to be critical to the survival of the CEEC.</p>
<p>Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;</p>	<p>The Proposed Action includes maintenance activities within the existing Rail Corridor. While the Proposed Action may affect surface water drainage patterns and other abiotic factors, these are considered likely to be negligible, due to the existing presence of the rail line and the nature of the maintenance activities. These are considered highly unlikely to modify or destroy factors necessary for the survival of the CEEC.</p>
<p>Cause substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species; or</p>	<p>There is potential for the Proposed Action to impact the CEEC by reducing the overall species diversity and composition currently present, however, the potential CEEC already exists within a disturbed and fragmented landscape, and therefore any potential impacts on the species composition of the CEEC are considered to be negligible.</p>

Matters for Consideration	Comment
<p>Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:</p> <p>assisting invasive species that are harmful to the listed ecological community to become established, or</p> <p>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</p>	<p>There is potential for the Proposed Action to impact the CEEC by assisting invasive species to establish, however, the CEEC already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.</p> <p>The Proposed Action may include weed spraying within operational areas and access tracks to maintain access. With proper application of herbicides by suitably qualified and experienced personnel, the impact of herbicide uses on the CEEC present in and adjoining the Rail Corridor is likely to be negligible.</p>
<p>Interfere with the recovery of an ecological community;</p>	<p>The Project is estimated to contain a total potential area of 1.5 ha of the CEEC.</p> <p>The Rail Corridor comprises an operational rail line, requiring regular maintenance activities (the Proposed Action) be undertaken, thereby preventing recovery of the CEEC in this area.</p> <p>Although the proposed works will interfere with the recovery of the CEEC by the disturbance of no more than 1.5 ha of vegetation consistent with this CEEC, the:</p> <ul style="list-style-type: none"> • extent being disturbed is minimal. • does not comprise a large contiguous patch of this CEEC. <p>Therefore, it is unlikely that the extent of vegetation being removed will substantially interfere with the recovery of this CEEC.</p>
<p>Outcome</p>	<p>The proposed project is unlikely to result in any significant impact to the natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CEEC.</p>

An assessment of Significance test under the EPBC Act were completed for the threatened ecological community Poplar Box Grassy Woodland on Alluvial Plains

Matters for Consideration	Comment
<p>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:</p> <p>Reduce the extent of an ecological community;</p>	<p>The Project is likely to impact approximately 0.75 hectares of Poplar Box Grassy Woodland on Alluvial Plains. This consideration takes into account the large area of this community in better condition in the surrounding region, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance. Therefore, the extent of the total community to be removed is relatively minor when the entire locality is considered.</p> <p>Thus, it is unlikely that the proposal will significantly reduce the extent this ecological community.</p>
<p>Fragment or increase fragmentation of an ecological community;</p>	<p>The Project is likely to impact approximately 0.75 hectares of Poplar Box Grassy Woodland on Alluvial Plains.</p> <p>The area of this EEC to be impacted is already highly fragmented and disturbed, given that it occurs within a rail corridor, and the works proposed are relatively minor and localised.</p> <p>Therefore, works within the Project Area are unlikely to result in an area of this EEC becoming further fragmented or isolated from other areas of habitat.</p>
<p>Adversely affect habitat critical to the survival of an ecological community;</p>	<p>The minor impact of the Project is considered unlikely to be critical to the survival of the EEC.</p>
<p>Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;</p>	<p>The Proposed Action includes maintenance activities within the existing Rail Corridor. While the Proposed Action may affect surface water drainage patterns and other abiotic factors, these are considered likely to be negligible, due to the existing presence of the rail line and the nature of the maintenance activities. These are considered highly unlikely to modify or destroy factors necessary for the survival of the EEC.</p>
<p>Cause substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species; or</p>	<p>There is potential for the Proposed Action to impact the EEC by reducing the overall species diversity and composition currently present, however, the EEC already exists within a disturbed and fragmented landscape, and therefore any potential impacts on the species composition of the EEC are considered negligible.</p>

Matters for Consideration	Comment
<p>Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:</p> <p>assisting invasive species that are harmful to the listed ecological community to become established, or</p> <p>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</p>	<p>There is potential for the Proposed Action to impact the EEC by assisting invasive species to establish, however, the EEC already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.</p> <p>The Proposed Action may include weed spraying within operational areas and access tracks to maintain access. With proper application of herbicides by suitably qualified and experienced personnel, the impact of herbicide uses on the EEC present in and adjoining the Rail Corridor is likely to be negligible.</p>
<p>Interfere with the recovery of an ecological community;</p>	<p>The Project is estimated to contain a total area of 0.75 ha of the EEC.</p> <p>The Rail Corridor comprises an operational rail line, requiring regular maintenance activities (the Proposed Action) be undertaken, thereby preventing recovery of the EEC in this area.</p> <p>Although the proposed works will interfere with the recovery of the EEC by the disturbance of no more than 0.75 ha of vegetation consistent with this EEC, the:</p> <ul style="list-style-type: none"> • extent being disturbed is minimal. • is adjacent to vegetation of a similar or higher quality in nature that will not be interfered with. • does not comprise a large contiguous fragment of this EEC. <p>Therefore, it is unlikely that the extent of vegetation being removed will substantially interfere with the recovery of this EEC.</p>
<p>Outcome</p>	<p>The proposed project is unlikely to result in any significant impact to the Poplar Box Grassy Woodland on Alluvial Soils EEC.</p>

Assessment of Significance tests under the EPBC Act were completed for the following species listed as Vulnerable under the EPBC Act:

Flora:

- spiny peppercress (*Lepidium aschersonii*).

Fauna:

- Predatory birds including grey falcon (*Falco hypoleucos*) and red goshawk (*Erythrotriorchis radiatus*).
- Bats including large-eared pied bat (*Chalinolobus dwyeri*) and Corben's long-eared bat (*Nyctophilus corbeni*).
- Pilliga mouse (*Pseudomys pilligaensis*).
- five-clawed worm-skink (*Anomalopus mackayi*).

Spiny peppercress (*Lepidium aschersonii*)

Matters for Consideration	Comment
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; or	This species was not detected within the Project Area during the site inspection, and any occurrence is not considered likely to be an important population. However, if present, the removal/disturbance of 36.9xx ha of higher quality habitat and 34.9 ha of low condition habitat is unlikely to lead to a long-term decrease in the size of an important population of spiny peppercress. This consideration takes into account the very large area of suitable habitat in the surrounding region. Thus, the small area of potential habitat to be removed is unlikely to lead to a long-term decline in an important population of the species.
reduce the area of occupancy of an important population; or	This species was not detected within the Project Area during the site inspection. There is a large area of suitable habitat in the surrounding region. Thus, it is unlikely that the Proposed Action will reduce the area of occupancy of an important population of Spiny peppercress.
fragment an existing important population into two or more populations; or	The Project is unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat.
adversely affect habitat critical to the survival of a species; or	Given the occurrence of the habitat in a fragmented, disturbed rail corridor, the Project Area is considered unlikely to host habitat critical to the survival of the species. As such, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the Spiny peppercress.
disrupt the breeding cycle of an important population; or	There is a large area of suitable habitat in the surrounding region in which the species can continue to reproduce, Thus, it is considered unlikely that the Proposed Action will significantly disrupt the breeding cycle of an important population of Spiny peppercress.

Matters for Consideration	Comment
modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or	Given the currently disturbed nature of the railway corridor and since the surveys did not record this species, the Project is considered unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of the habitat to the extent that this species is likely to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or	There is potential for the Proposed Action to impact the habitat of this species by assisting invasive species to establish, however, any potential habitat for the species within the Project Area already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.
introduce disease that may cause the species to decline; or	No diseases are directly attributed to the decline in Spiny peppercress populations. The Project is not expected to introduce any disease that may cause Spiny peppercress to decline
interfere substantially with the recovery of the species.	No important populations of this species were recorded within the Project Area. The Proposed Action is not considered to interfere with the recovery of this species.
Outcome	The proposed project is unlikely to result in any significant impact to the Spiny peppercress.

Predatory birds including grey falcon (*Falco hypoleucos*) and red goshawk (*Erythrotriorchis radiatus*)

Matters for Consideration	Comment
<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p> <p>lead to a long-term decrease in the size of an important population of a species; or</p>	<p>These species were not detected within the Project Area during the site inspection. However, if present, the removal of 12.5 ha of native woodland and 71.8 ha of native grassland representing potential foraging habitat is highly unlikely to have an adverse effect on these species, such that they would be at risk of extinction. This consideration takes into account the large area of suitable habitat in the surrounding region. These species can also continue to aerially forage above the Project Area at the completion of works.</p> <p>The small area of potential foraging habitat to be disturbed is highly unlikely to lead to a long-term decline in the size of an important population of these species.</p>
<p>reduce the area of occupancy of an important population; or</p>	<p>The removal of 12.5 ha of native woodland and 71.8 ha of native grassland representing potential foraging habitat is unlikely to have an adverse effect on these species.</p> <p>While the project will remove potential foraging habitat for these species, it is not likely to lead to a significant reduction in the occupancy of an important population for these species in the locality or the wider region.</p>
<p>fragment an existing important population into two or more populations; or</p>	<p>The availability of habitat surrounding the Project Area immediately adjacent is also likely to be more important to these species because the rail corridor itself is already creating fragmented habitat. These species are also highly mobile and will remain relatively unaffected by habitat fragmentation, in regard to foraging habitat.</p> <p>Therefore, works within the Project Area are unlikely to fragment a population of these species.</p>
<p>adversely affect habitat critical to the survival of a species; or</p>	<p>It is considered unlikely that the disturbance of potential foraging habitat will adversely affect habitat critical to the survival of these species, given the availability of large areas of suitable habitat adjacent</p>
<p>disrupt the breeding cycle of an important population; or</p>	<p>The Project is considered likely to only impact foraging habitat for these species. Therefore, the breeding cycle of these species is unlikely to be impacted, especially given that no large trees (suitable for nests) will be removed.</p>
<p>modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or</p>	<p>The area of habitat to be modified is relatively minor and currently exists within a disturbed rail corridor.</p> <p>Thus, the Proposed action is not considered to significantly modify destroy, remove, isolate, or decrease the availability or quality of habitat for these species.</p>
<p>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or</p>	<p>There is potential for the Proposed Action to impact the habitat of these species by assisting invasive species to establish, however, any potential habitat for the species within the Project Area already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.</p>

Matters for Consideration	Comment
introduce disease that may cause the species to decline; or	No diseases are directly attributed to the decline of these species. The Project is not expected to introduce any disease that may cause these species to decline.
interfere substantially with the recovery of the species.	No important populations of this species were recorded within the Study Area. The Proposed Action is not considered to interfere with the recovery of these species.
Outcome	The proposed project is unlikely to result in any significant impact to the grey falcon and red goshawk.

Bats including large-eared pied bat (*Chalinolobus dwyeri*) and Corben's long-eared bat (*Nyctophilus corbeni*)

Matters for Consideration	Comment
<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p> <p>lead to a long-term decrease in the size of an important population of a species; or</p>	<p>The Project is likely to impact approximately 12.5 ha of native woodland and 71.8 ha of native grassland representing potential foraging habitat for these species. Any occurrence of these species is not considered likely to be an important population. These species are also highly mobile and can aerially forage above the Project Area upon completion of the works.</p> <p>The culverts and headers which are to be replaced and upgraded are considered unlikely to provide habitat for these species.</p> <p>Thus, the minimal impacts of the Proposed Action on these species are considered unlikely to lead to a long-term decrease in the size of an important population of these species.</p>
<p>reduce the area of occupancy of an important population; or</p>	<p>The availability of habitat surrounding the Project Area immediately adjacent is likely to be more important to these species given the rail corridor itself comprises fragmented habitat. Given these species are highly mobile, the area of occupancy is unlikely to be reduced.</p> <p>Furthermore, culverts and headers which are to be replaced and upgraded are considered unlikely to provide habitat for these species.</p>
<p>fragment an existing important population into two or more populations; or</p>	<p>These species are highly mobile and are likely to be able to aerially forage above the Project Area upon completion of works. Therefore, works within the Project Area are unlikely to result in an area of threatened species habitat becoming further fragmented or isolated from other areas of habitat.</p>
<p>adversely affect habitat critical to the survival of a species; or</p>	<p>The fragmented and disturbed habitat within the Project Area is not considered likely to be critical to the survival of these species.</p> <p>Likewise, culverts and headers which are to be replaced and upgraded are considered unlikely to provide habitat for these species.</p>
<p>disrupt the breeding cycle of an important population; or</p>	<p>No impacts to breeding or roosting habitat is proposed, with no large trees to be removed.</p> <p>Culverts and headers which are to be replaced and upgraded are considered unlikely to provide habitat for these species.</p> <p>The impacts to potential foraging habitat is unlikely to disrupt the breeding cycle of an important population of these species.</p>
<p>modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or</p>	<p>The availability of habitat surrounding the Project Area immediately adjacent is likely to be more important to these species given the rail corridor itself comprises fragmented habitat. These species are also highly mobile.</p> <p>Thus, the Proposed action is not considered to significantly modify destroy, remove, isolate, or decrease the availability or quality of habitat for the species.</p>

Matters for Consideration	Comment
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or	There is potential for the Proposed Action to impact the habitat of these species by assisting invasive species to establish, however, any potential habitat for the species within the Project Area already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.
introduce disease that may cause the species to decline; or	No diseases are directly attributed to the decline of these species. The Project is not expected to introduce any disease that may cause these species to decline.
interfere substantially with the recovery of the species.	No important populations of these species were recorded within the Project Area. The Proposed Action is not considered to interfere with the recovery of these species.
Outcome	The Project is unlikely to result in any significant impact to the Large-eared pied bat and Corben's long-eared bat.

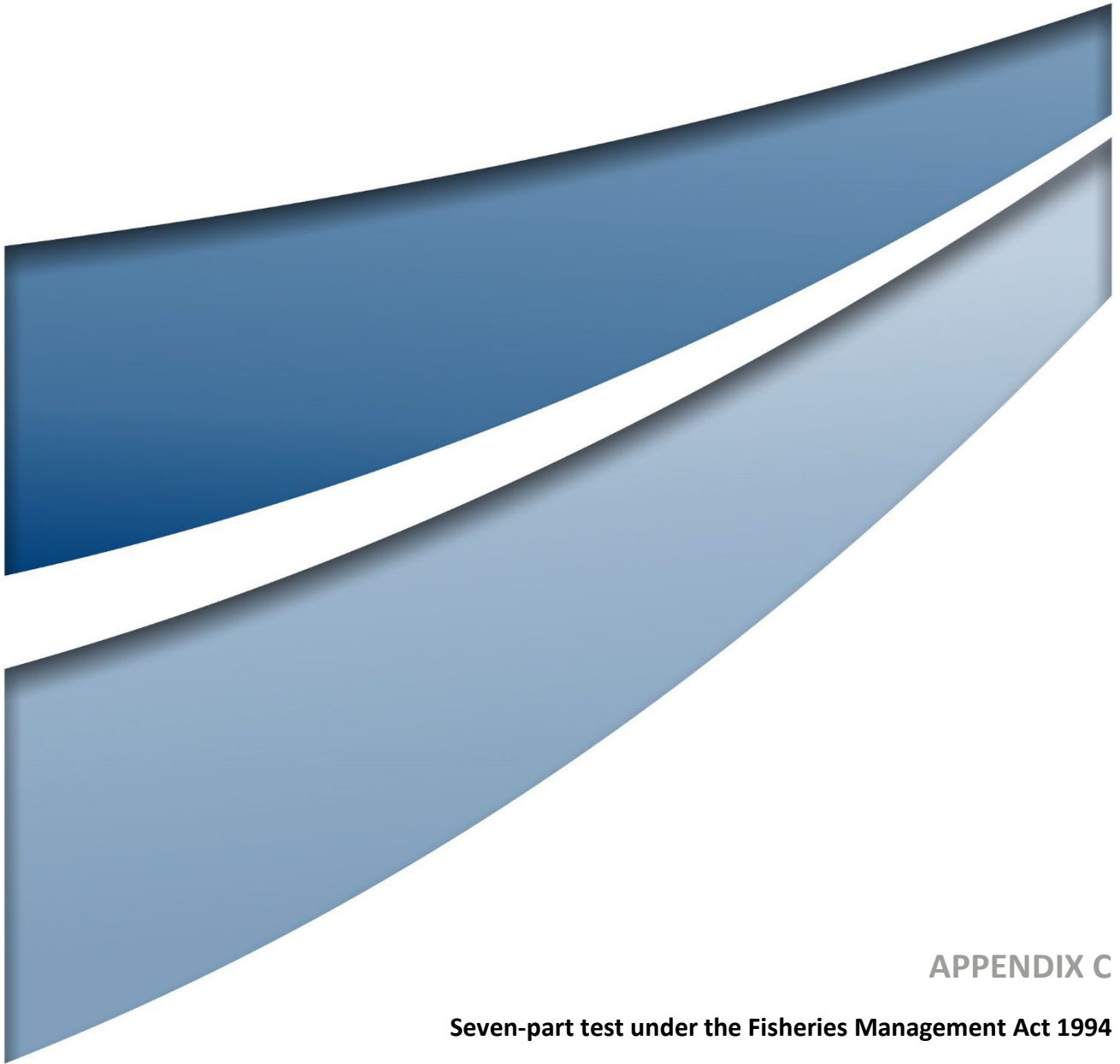
Pilliga mouse (*Pseudomys pilligaensis*)

Matters for Consideration	Comment
<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p> <p>lead to a long-term decrease in the size of an important population of a species; or</p>	<p>This species was not detected within the Project Area during the site inspection. Any occurrence is not considered likely to be an important population.</p> <p>However, if present, the removal, or disturbance of potential habitat comprising woodland or scrub areas (12.5 ha), as well as native grasslands with a higher density of shrubs (5.6 ha) between chainage 554 km and 556 km, is unlikely to cause a long-term decline in this species. This consideration takes into account the very large area of suitable habitat in the surrounding region.</p> <p>The Project Area is considered to provide negligible adequate habitat to support the Pilliga mouse given that the species typically is found in greatest abundance in recently burnt moist gullies. Furthermore, the Pilliga mouse generally prefers habitats containing a relatively high plant species richness; a moderate to high density of low-level shrub cover; and a moist groundcover of plants, litter, and fungi. The existing disturbance of the Project Area provides marginal habitat for this species.</p> <p>Thus, the proposed negligible impacts are considered unlikely to lead to a long-term decrease in the size of an important population of this species.</p>
<p>reduce the area of occupancy of an important population; or</p>	<p>The habitat to be removed within the Project Area is unlikely to be important to this species, given its occurrence in a disturbed rail corridor. Therefore, the removal of this habitat is unlikely to reduce the area of occupancy of the species, such that it would become extinct.</p>
<p>fragment an existing important population into two or more populations; or</p>	<p>The project is not considered likely to fragment any existing populations, given that the works are minor in nature and the Project Area is already fragmented.</p>
<p>adversely affect habitat critical to the survival of a species; or</p>	<p>The removal or disturbance of potential habitat comprising woodland or scrub areas (12.5 ha), as well as native grasslands with a higher density of shrubs (5.6 ha) between chainage 554 km and 556 km is unlikely to adversely affect habitat critical to the survival of this species, especially given that the Project Area is within an existing rail corridor, which is subject to frequent human disturbance.</p>
<p>disrupt the breeding cycle of an important population; or</p>	<p>The removal or disturbance of already disturbed habitat is highly unlikely to disrupt the breeding cycle of an important population of this species.</p>
<p>modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or</p>	<p>The quality of habitat to be impacted is considered low for this species, given its preference for habitats containing a relatively high plant species richness; a moderate to high density of low-level shrub cover; and a moist groundcover of plants, litter, and fungi. Thus, the Proposed action is not considered to significantly modify, destroy, remove, isolate, or decrease the availability or quality of habitat for the species.</p>
<p>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or</p>	<p>There is potential for the Proposed Action to impact the habitat of the Pilliga mouse by assisting invasive species to establish, however, any potential habitat for the species within the Project Area already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.</p>

Matters for Consideration	Comment
introduce disease that may cause the species to decline; or	No diseases are directly attributed to the decline of this species. The Project is not expected to introduce any disease that may cause this species to decline.
interfere substantially with the recovery of the species.	No important populations of this species were recorded within the Study Area. The Proposed Action is not considered to interfere with the recovery of this species.
Outcome	The Proposed Action is unlikely to result in any significant impact to the Pilliga mouse.

five-clawed worm-skink (*Anomalopus mackayi*)

Matters for Consideration	Comment
<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p> <p>lead to a long-term decrease in the size of an important population of a species; or</p>	<p>The disturbance of approximately 2.8 ha of high-quality habitat (native grassland on cracking clay) and 59 ha of potential habitat (exotic grassland, low condition native grassland, native grassland, and remnant woodland) unlikely to have an adverse effect on this species.</p> <p>Any ground disturbance which is to occur will be very localized in nature and in a small portion of the already disturbed Project Area.</p> <p>Thus, the proposed negligible impacts are considered unlikely to lead to a long-term decrease in the size of an important population.</p>
<p>reduce the area of occupancy of an important population; or</p>	<p>The small area of potential habitat to be disturbed is highly unlikely to reduce the area of occupancy of an important population, given the availability of habitat in surrounding areas.</p>
<p>fragment an existing important population into two or more populations; or</p>	<p>The Project Area is already highly fragmented and disturbed and is unlikely to be further fragmented or disturbed by the proposed actions.</p>
<p>adversely affect habitat critical to the survival of a species; or</p>	<p>The habitat within the Project Area is highly unlikely to be critical to the survival of this species, given the disturbed and fragmented nature.</p>
<p>disrupt the breeding cycle of an important population; or</p>	<p>The small area of potential habitat to be disturbed is highly unlikely to disrupt the breeding cycle of this species. The works will be minor in nature and very localized.</p>
<p>modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or</p>	<p>The habitat within the Project Area is not considered to be of a high quality, given the already disturbed and fragmented nature. Therefore, further disturbance to this habitat is unlikely to cause a further decline in this species.</p> <p>Thus, the Proposed action is not considered to significantly modify destroy, remove, isolate, or decrease the availability or quality of habitat for the species.</p>
<p>result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or</p>	<p>There is potential for the Proposed Action to impact the habitat of the five-clawed worm-skink by assisting invasive species to establish, however, any potential habitat for the species within the Project Area already exists within a disturbed and fragmented landscape subject to edge effects and weed invasion, and therefore the potential encroachment of additional invasive species as a result of the Proposed Action is considered to be negligible.</p>
<p>introduce disease that may cause the species to decline; or</p>	<p>No diseases are directly attributed to the decline of this species. The Project is not expected to introduce any disease that may cause this species to decline.</p>
<p>interfere substantially with the recovery of the species.</p>	<p>No important populations of this species were recorded within the Study Area.</p> <p>The Proposed Action is not considered to interfere with the recovery of this species.</p>
<p>Outcome</p>	<p>The proposed project is unlikely to result in any significant impact to the five-clawed worm-skink</p>



APPENDIX C

Seven-part test under the Fisheries Management Act 1994

Seven- part test under the Fisheries Management Act 1994

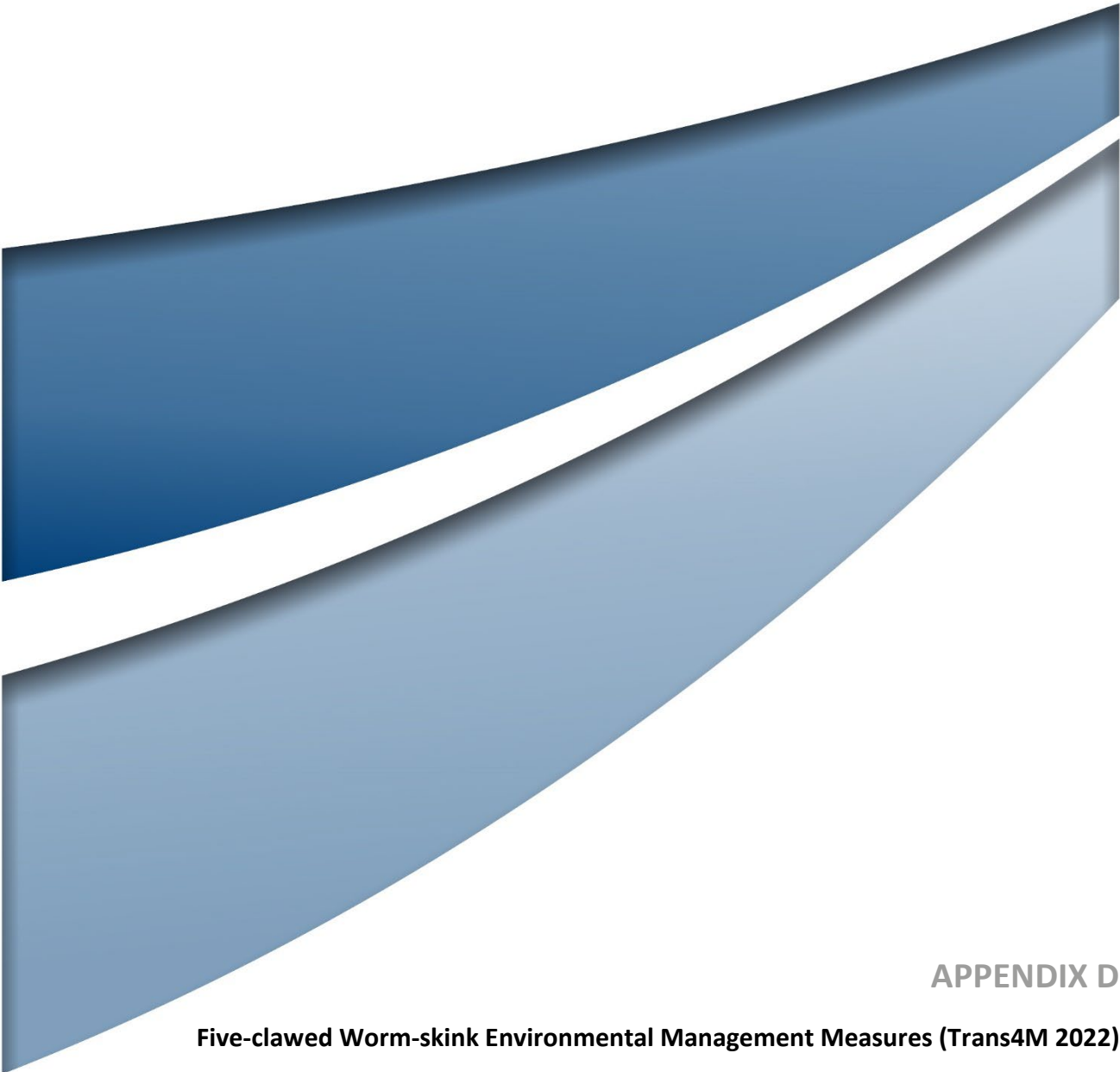
Seven- part test for the threatened southern purple spotted gudgeon (*Mogurnda adspersa*).

The following factors are to be taken into account in making a determination under the FM Act as to whether the proposed activity is likely to significantly affect threatened species, populations or ecological communities:

Matters for Consideration	Comment
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>If present, the very minor disturbance of a small area of habitat is highly unlikely to have an adverse effect on this species, such that it would be at risk of extinction. This consideration takes into account the large area of similar habitat in the surrounding waterways, which will not be impacted by the Project.</p> <p>Given many habitat features can be found at the waterways present within the Project Area, and the waterways connect to or are mapped as habitat for the species, an impact to this species may occur.</p> <p>The Project Area is proposed to encompass 3 underbridges for the Namoi River, Narrabri Creek, and Mulgate Creek. These are suggested to have negligible implications to the potential habitat of the species. It is understood that works will not be undertaken in these areas.</p> <p>There is one level crossing proposed to occur at Sandy Creek which is not considered to impact upon the species given it is not mapped as key habitat for the species.</p> <p>The small area of potential habitat to be disturbed is highly unlikely to place this species at risk of extinction.</p>

Matters for Consideration	Comment
<p>In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,</p>	<p>Not applicable</p>
<p>In the case of and endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p>Not applicable</p>

Matters for Consideration	Comment
<p>In relation to the habitat of a threatened species, populations, or ecological community:</p> <p>i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</p> <p>ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</p> <p>iii) the importance of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species or ecological community in the locality,</p>	<p>The waterways running through the Project Area are considered to hold potential habitat for this species given the broad habitats it can occupy. The species can be found in a variety of habitats such as rivers, creeks, streams, and billabongs with slow-flowing or still waters. Cover in the form of aquatic vegetation, overhanging vegetation from riverbanks, leaf litter, rocks or snags are important for the species. Given many of these features can be found at the waterways present within the Project Area, and the waterways connect to or are mapped as habitat for the species, an impact to this species may occur.</p> <p>The Project Area is proposed to encompass 3 underbridges for the Namoi River, Narrabri Creek, and Mulgate Creek. These are suggested to have negligible implications to the potential habitat of the species. It is understood that works will not be undertaken in these areas.</p> <p>There is one level crossing proposed to occur at Sandy Creek which is not considered to impact upon the species given it is not mapped as a key habitat for the species.</p> <p>The marginal impact of the Project and the location within the rail corridor means that the habitat to be removed, modified, fragmented, or isolated will not negatively impact the long-term survival of this threatened species in the locality.</p>
<p>Whether the proposed development or activity is likely to have an adverse effect on critical habitat (either directly or indirectly)</p>	<p>The Project Area passes over several named waterbodies and unnamed drainage lines, including Jack's Creek, Narrabri Creek and the Namoi River. Several of these waterbodies likely contain permanent pools and may be critical to the survival of this species in the local area. These waterbodies will not be impacted by the works and therefore it is unlikely that the development would have an adverse effect on this habitat.</p>
<p>Whether the proposed development or activity is consistent with the objectives of a recovery plan or threat abatement plan</p>	<p>No recovery plan exists for this species, however there is a priorities action statement for the species. This states that one of the key actions is to undertake work to identify, restore, and protect known and potential Southern Purple Spotted Gudgeon habitats and address key threats such as habitat degradation and water quality decline from expanding development.</p> <p>Therefore, the works are not strictly in line with the priorities action statement for the species, however it is unlikely that any direct impacts to the species would occur as a result of the proposed Project.</p> <p>No threat abatement plan exists.</p>
<p>Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.</p>	<p>The proposed works may or will contribute to the following key threatening processes:</p> <ul style="list-style-type: none"> ○ Degradation of native riparian degradation along NSW water courses
<p>Conclusion</p>	<p>The proposed project is unlikely to result in any significant impact to the southern purple spotted gudgeon.</p>



APPENDIX D

Five-clawed Worm-skink Environmental Management Measures (Trans4M 2022)

5.11 Five-clawed Worm-Skink

5.11.1 Five-clawed Worm-skink Encounter Protocol

A protocol to be enacted when a Five-clawed Worm-skink is encountered on the project within identified habitat areas (Stage 1: Chainage 603.000 to 625.000 and Stage 3: Chainage 735.000 to 754.250) is presented in **Appendix I**, which replaces **Appendix G**. In the event of a Five-clawed Worm-skink find, the fauna handling procedure (**Appendix H**) would be applicable with the following exceptions; data collection and record (i.e. fauna register), treatment of injured and deceased individuals and reporting requirements (refer **Appendix I**).

5.11.2 Additional Mitigation measures

Additional mitigation measures to be implemented in Stage 3: Chainage 735.000 to 754.250 are set out in more detail below.

Habitat enhancement and refuge placement

Two phases of habitat enhancement/refuge placement are proposed, with Phase 1 comprising works to be undertaken during clearing and grubbing activities, and Phase 2 comprising works to be undertaken during landscaping activities.

Key objectives of Phase 1: Clearing and grubbing are the enhancement of retained habitats to improve population viability and the provision of refuge for relocated Five-clawed Worm-skinks. The key objective of Phase 2: Post landscaping is to encourage re-colonisation of the site post landscaping works to improve population viability.

Phase 1 temporary habitat enhancement would include the placement of hay bales at 100 m intervals on freehold land within the construction boundary. Phase 1 permanent habitat enhancement on public land within the construction boundary would include the placement of hay bales initially at 100 m intervals and the placement of coarse woody debris (e.g. logs, sleepers, or mulched woody vegetation piles) at 10 m intervals (or in a grid, depending on site configuration).

Phase 2 permanent habitat enhancement within the rail corridor would be implemented during landscaping works and would include the placement of coarse woody debris such as logs, sleepers or mulched woody vegetation piles at 10 m intervals within the revegetated rail corridor at confirmed Five-clawed Worm-skink habitat areas.

Pre-soil disturbance mitigating activities

The following activities are to be implemented prior to soil disturbance, including:

- ▶ A spotter-catcher shall undertake diurnal pre-clearing surveys 0.5 hr/ha to search under logs, shelter sites, and a spotter catcher shall follow the slasher when vegetation is being cleared.
- ▶ Cleared vegetation removal: Cut grass and vegetation shall be moved from the topsoil strip area, directly after slashing, into habitat refuge areas as described above.
- ▶ Waiting period: 7 days/nights between slashing/ vegetation clearance and topsoil stripping.
- ▶ Establishment of relocation areas, including the use of silt fencing where practicable to prevent any relocated Five-clawed Worm-skinks from potentially returning to within the construction works area.
- ▶ Erection of silt fencing alongside topsoil strip areas adjacent to Five-clawed Worm-skink habitat areas where practicable.

Soil disturbance mitigating activities

The following measures are to be implemented during soil disturbance activities, including:

- ▶ Dusk salvage survey for Five-clawed Worm-skink
 - Two ecologists undertaking dusk survey (spotlighting and active searches). 1.5 person hours per ha commencing 5:30 pm.
 - Flag off area subject to dusk survey as limit for the next day's work
- ▶ Early Five-clawed Worm-skink salvage survey starting at sunrise and cover area to be grubbed.
- ▶ Topsoil ripping when soils are dry/hard with a spotter-catcher undertaking Five-clawed Worm-skink salvage surveys prior to topsoil stripping.
- ▶ Topsoil stripping with two spotter-catchers per machine shall survey an area.

5.11.3 Five-clawed Worm-skink Environmental Management Measures

Environmental management measures for the identified Five-clawed Worm-skink habitat areas (Stage 1: Chainage 603.000 to 625.000 and Stage 3: Chainage 735.000 to 754.250) are outlined below and included in **Section 6, Table 9** (B43-B46).

Five-clawed Worm-skink Induction

All Project personnel would be subject to a Five-clawed Worm-skink induction that includes:

- ▶ A general description of the Five-clawed Worm-skink (including photos and key identification features).
- ▶ Locations where Five-clawed Worm-skink surveys are required on the project site i.e. Stage 1 CH603.000 to CH625.000 and Stage 3 CH735.000 to CH754.250.
- ▶ Provision of Section 5 of this Biodiversity Management Plan.

Records of induction / toolbox training would be retained.

Targeted Five-clawed Worm-skink surveys

Targeted Five-clawed Worm-skink surveys outlined in **Section 5.11.2** above would be undertaken by the Project Ecologist and/or Spotter-Catcher Team prior to and during slashing, clearing of woody vegetation and topsoil stripping activities within the Five-clawed Worm-skink habitat areas.

The surveys would include active searches of microhabitats, including, carefully turning woody debris, rocks and artificial debris, raking the soil surface or leaf litter beneath trees and looking beneath peeling bark for reptiles or their sloughs; searching for animals during topsoil stripping (working closely with the grader operator).

Targeted pre-clearing surveys would comprise a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species (scaled up or down depending on site complexity).

Relocation Sites

Proposed release sites would be selected prior to the commencement of works in an area. The following criteria would be considered when selecting specific relocation points:

- ▶ Area adjacent to or comprising native grassland or woodland on public land
- ▶ Specific relocation sites are to be as close to the capture site as possible
- ▶ Sites must support suitable microhabitat of loose friable soil, with areas of leaf litter, mulch or dense vegetative groundcover which provides cover and foraging resources
- ▶ No more than 10 adults and 5 sub adults or hatchlings per 100 m² of suitable habitat may be relocated to reduce the risk of over stocking
- ▶ Relocations would be strategic to minimise the risk of relocated fauna re-entering the site.

Establishment of relocation sites would include:

- ▶ Creating a minimum 100 m² relocation areas at 200 m intervals (where possible)
- ▶ Placement of hay bales (minimum one per 25m²).
- ▶ Erection of exclusion fence (silt fence) along the CIZ boundary at the hub plus 10 m either side of the relocation hub where practicable. Justification shall be documented for areas where silt fencing is not deemed practicable.
- ▶ Appropriate signage and a high visibility boundary at every relocation site, where practicable.
- ▶ Relocation of up to 10 adults and 5 subadult skinks per 100m².

Fauna Register Details

Any Five-clawed Worm-Skinks captured during the works would have the following data collected:

- ▶ Capture date and time;
- ▶ Condition (Good, Injured, Deceased);
- ▶ Microhabitat at capture site;
- ▶ Soil at capture site;
- ▶ Activity undertaken at time of find;
- ▶ Detection method (e.g. survey);
- ▶ GPS Coordinates for capture and relocation site;
- ▶ Details of the person/s who made the discovery;
- ▶ Description of vegetation/PCT; Validation photos from on top, side, below and close-up photos of forelimbs and hindlimbs; and
- ▶ Series of measurements including; snout-vent length, tail length and total length.

Photographs of the site (general location, vegetation, habitat features where the individual/s was discovered) shall be captured each day for each work area.

In addition to the above, the following microhabitat features should be recorded for each find where practicable:

- ▶ Soil crack density and size range (depth if possible)
- ▶ % litter cover
- ▶ % bare ground
- ▶ % grass cover and/or tussock spacing
- ▶ 3 most abundant groundcover species
- ▶ Soil type, soil structure (blocky, small peds, massive) and pH if possible
- ▶ Large surface debris abundance
- ▶ Ground moisture levels (including recent rainfall amount if known/relevant).

