

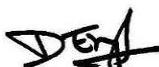


Proposed Goonoo Goonoo Road (New England Highway) Duplication - Tamworth, NSW

Biodiversity Assessment

August 2021

Document control

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Contents

Executive summary	i
Glossary.....	ii
1 Introduction	1
1.1 Proposal background	1
1.2 The proposal	1
1.3 Legislative context.....	5
2 Methods	6
2.1 Personnel	6
2.2 Background research	6
2.3 Habitat assessment.....	7
2.4 Field survey	7
2.4.1 Vegetation surveys.....	8
2.4.2 Targeted flora surveys.....	8
2.4.3 Targeted fauna surveys.....	9
2.4.4 Aquatic Surveys	10
2.5 Summary of survey effort and limitations	10
2.5.1 Limitations	11
3 Existing environment.....	12
3.1 Native vegetation communities	14
3.2 Plant Community Types	14
3.3 Threatened ecological communities.....	16
3.4 Groundwater dependent ecosystems.....	16
3.5 Threatened species.....	16
3.6 Flora results.....	20
3.7 Fauna results.....	20
3.8 Aquatic results.....	21
3.9 Areas of outstanding biodiversity value (where applicable)	22
3.10 Wildlife connectivity corridors	22
3.11 SEPPs	22
3.11.1 SEPP (Koala Habitat Protection) 2021.....	22
3.12 Matters of National Environmental Significance.....	23
4 Avoidance and minimisation	24
5 Impact assessment.....	25
5.1 Construction impacts.....	25
5.1.1 Removal of native vegetation	25
5.1.2 Removal of threatened fauna habitat	25
5.1.3 Removal of threatened flora	25
5.1.4 Aquatic impacts	26
5.1.5 Injury and mortality	26
5.2 Indirect/operational impacts	27
5.2.1 Wildlife connectivity and habitat fragmentation	27
5.2.2 Edge effects on adjacent native vegetation and habitat.....	27
5.2.3 Invasion and spread of weeds.....	27
5.2.4 Invasion and spread of pests	28
5.2.5 Invasion and spread of pathogens and disease.....	28
5.2.6 Noise, light and vibration	28
5.3 Cumulative impacts.....	28
5.4 Assessments of significance	28
6 Mitigation.....	29

7	Offset strategy.....	34
7.1	Quantification of offset or revegetation requirements.....	34
8	Conclusion	35
	References	36

List of Figures	Page
Figure 1-1 Study area	3
Figure 1-2 Proposal regional context	4
Figure 3-1 Soil landscape	13
Figure 3-2 Vegetation zones	15
Figure 3-3 Terrestrial Groundwater dependent ecosystems in relation to the study area	17
Figure 3-4 Threatened species previously recorded	19

List of Tables	
Table 2-1 Database searches	6
Table 3-1 Site attributes	14
Table 3-2 Fauna species recorded during the investigation	20
Table 6-1 Mitigation measures	30
Table 7-1 Biodiversity offset thresholds	34

Appendices	
Appendix A. Photographic record of area investigated	41
Appendix B. Habitat assessment table	45
Appendix C. Flora species recorded	60

Executive summary

A biodiversity assessment has been conducted as Transport for NSW is proposing to duplicate a 1.5 kilometre-long section of Goonoo Goonoo Road between Jack Smyth Drive and Calala Lane, about 3.3 kilometres south of the Tamworth Central Business District.

This Biodiversity Assessment has been carried out by Lesryk Environmental Pty Ltd and forms part of the Review of Environmental Factors being prepared for the proposal. This report assesses the biodiversity impact of the proposal to meet the requirements of the NSW *Environment Planning and Assessment Act 1979*.

To permit the proposal, based on a worst-case estimate, about five and a half hectares of native and predominantly exotic vegetation would require disturbance/removal; this including no more than six native trees, one of which was observed to be hollow-bearing.

By the completion of the field investigation no threatened ecological communities, or threatened flora or fauna species listed, or currently being considered for listing under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and NSW *Biodiversity Conservation Act 2016*, were recorded. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed/removed for any of their necessary lifecycle requirements.

No assessments referring to the criteria provided in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* 'Significant Impact Guidelines' and Section 7.3 of the NSW *Biodiversity Conservation Act 2016* were considered necessary.

Referrals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* are no longer required for TfNSW proposals under Part 5 of the NSW *Environment Planning and Assessment Act 1979* in accordance with the Strategic Assessment process.

The proposal does not trigger a Species Impact Statement [or alternatively a Biodiversity Development Assessment Report].

With regard to the NSW *Fisheries Management Act 1994*, no threatened aquatic species, ecological communities or habitats occur within the study area. One waterway, Barnes Gully, traverses beneath Goonoo Goonoo Road within the study area. However, as the activity does not involve harm to protected marine vegetation, dredging or reclamation, blocking of fish passage and does not involve impact to a Key Fish Habitat waterway, the work would not require a permit issued by the Minister in accordance with Part 7 of the NSW *Fisheries Management Act 1994*. Similarly, no assessment referring to Part 7A Division 12 Section 221ZV of the NSW *Fisheries Management Act 1994* is required. The proposal is not anticipated to impact biodiversity in local watercourses.

The adoption of those mitigation measures provided would ensure that the work proposed is carried out in an ecologically sustainable manner.

A biodiversity offset strategy does not need to be prepared as part of the Review of Environmental Factors.

Glossary

Definitions

Activity Means: (a) the use of land, and
(b) the subdivision of land, and
(c) the erection of a building, and
(d) the carrying out of a work, and
(e) the demolition of a building or work, and
(f) any other act, matter or thing referred to in Section 3.14 of the EPA Act that is prescribed by the regulations for the purposes of this definition, but does not include—
(g) any act, matter or thing for which development consent under Part 4 of the EPA Act is required or has been obtained, or
(h) any act matter or thing that is prohibited under an environmental planning instrument, or
(i) exempt development, or
(j) development carried out in compliance with a development control order, or
(k) any development of a class or description that is prescribed by the regulations for the purposes of this definition.

Areas of Outstanding Biodiversity An area of outstanding biodiversity value is:

- An area important at a State, national or global scale
- An area that makes a significant contribution to the persistence of at least one of the following:
 - i. Multiple species or at least one threatened species or ecological community
 - ii. Irreplaceable biological distinctiveness
 - iii. Ecological processes or ecological integrity
 - iv. Outstanding ecological value for education or scientific research.

The declaration of an area may relate, but is not limited, to protecting threatened species or ecological communities, connectivity, climate refuges and migratory species (BC Act 2016).

Biodiversity Assessment Method The Biodiversity Assessment Method (BAM) is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.

Biodiversity offsets The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020)

Calculator or BAM-C Biodiversity Assessment Method Calculator – a tool that applies the BAM to calculate the number and type of credits required to offset the impacts of development on biodiversity or credits generated at a biodiversity stewardship site.

Construction footprint The area to be directly impacted by the proposal during construction activities (see definition for subject site).

Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Development	Development (as defined in the EPA and BC Acts) is any of the following: <ul style="list-style-type: none"> (a) the use of land, (b) the subdivision of land, (c) the erection of a building, (d) the carrying out of a work, (e) the demolition of a building or work, (f) any other act, matter or thing that may be controlled by an environmental planning instrument.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat, and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020)
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.
Important population	Is a population that is necessary for a species' long-term survival and recovery; this may include populations identified as such in recovery plans, and/or that are: <ul style="list-style-type: none"> ○ Key source populations either for breeding or dispersal ○ Populations that are necessary for maintaining genetic diversity Populations that are near the limit of the species range (DE 2013).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020).
Invasive species	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020).
Local population (in regards to a threatened species)	Local population: the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: <ul style="list-style-type: none"> • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year. (OEH 2018).

MNES	A Matter of National Environmental Significance (MNES) protected by a provision of Part 3 of the EPBC Act
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020).
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality or injury.
Native vegetation	(a) trees (including any sapling or shrub or any scrub) (b) understorey plants (c) groundcover (being any type of herbaceous vegetation) (d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act).
Operational footprint	The area that will be subject to ongoing operational impact from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020).
Proposal area/site/ footprint	The area of land that is directly impacted on by the proposal that is being assessed under the EP&A Act, including access roads, and areas used to store construction materials. It includes the construction and operational areas for the proposal.
Study area	Means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly (OEH 2018a).
Study region	Is considered to 'include the lands that surround the subject site for a distance of 10 km' (DECC 2007).
Subject site	Means the area directly affected by the proposal. The subject site includes the footprint of the proposal and any ancillary works, compounds, stockpile sites, facilities, accesses or hazard reduction zones that support the construction or operation of the development or activity (OEH 2018a).
Target species	A species has been identified within the study area or is considered to have a moderate to high likelihood of occurrence and may be impacted by the proposal.

Abbreviations

°C	Degrees Celsius
AOBV	Areas of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method (DIPE 2020)
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme under the BC Act
CEEC	Critically Endangered Ecological Community
CBD	Central Business District
CEMP	Construction Environmental Management Plan
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DECC	NSW Department of Environment and Climate Change (now known as DPIE)
DoEE	[Former] Commonwealth Department of Environment and Energy (now known as DAWE)
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered ecological community
EES	NSW Environment, Energy and Science (formerly OEH)
EIS	Environmental Impact Statement
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environmental Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
GDE	Groundwater dependent ecosystems
GPS	Global Positioning System ¹
IBRA	Interim Biogeographically Regionalisation of Australia

¹ Coordinate system used: WGS84 ± 5 m. Zone 55.

KTP	Key Threatening Process
LEP	Local Environment Plan
LGA	Local Government Area
mm/cm/m/m ² /km/ha	Millimetres, centimetres, metres, square metres, kilometres, hectares
MNES	Matters of National Environmental Significance
OEH	[Former] NSW Office of Environment and Heritage (now known as NSW Environment, Energy and Science)
PCT	Plant Community Type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
RoTAP	Rare or Threatened Australian Plant
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TECs	Threatened Ecological Communities
TfNSW	Transport for NSW
VEC	Vulnerable Ecological Community
VIS	Vegetation information system
WoNS	Weeds of National Significance

1 Introduction

1.1 Proposal background

At the request of Hills Environmental Pty Ltd, on behalf of Transport for NSW (TfNSW), an ecological investigation has been conducted along a 1.5 kilometre section of Goonoo Goonoo Road (also known as the New England Highway) between Jack Smyth Drive and Calala Lane, Tamworth, NSW (Figure 1-1). For reference, the regional context of the study area is provided in Figure 1-2.

The ecological investigation has been carried out, and this Biodiversity Assessment prepared, to both accompany the project's REF and consider and assess any ecological impact associated with TfNSW's proposal to upgrade this section of road.

The proposal is located within the Tamworth Regional LGA.

1.2 The proposal

TfNSW is proposing to upgrade a 1.5 kilometre long section of Goonoo Goonoo Road, increasing it from a (current) two to four lane dual carriageway; the northern end of the proposed work located from about 3.3 kilometre south of the Tamworth CBD.

The proposed scope of work includes:

- Changes to the Calala Lane intersection, including:
 - Replacing the existing roundabout with traffic lights
 - Providing one dedicated right turn lane and one shared right / left turn lane from Calala Lane
 - Provision for protected pedestrian movements with pedestrian signal phasing on all intersection legs at Calala Lane.
 - Providing separate left and right turn lanes for traffic turning into Calala Lane
- Road widening and pavement reconstruction to provide two lanes each way with a central median between just north of Calala Lane and Jack Smyth Drive
- Changes to the Craigends Lane intersection including:
 - Construction of a roundabout to replace the existing T-intersection
 - A forth leg on roundabout that allows for access to future development on the eastern side of Goonoo Goonoo Road
- Changes to The Ringers Road, including:
 - Left turn out only on The Ringers Road (except for emergency vehicles)
 - Provision of a right turn lane for traffic turning into The Ringers Road. Left turn lane for traffic turning into The Ringers Road retained.
- Changes to the Greg Norman Drive intersection, including:
 - Installing a 'seagull' intersection which provides a two-stage movement across Goonoo Goonoo Road
 - Provision of separate right and left turn lanes out of Greg Norman Drive retained
- Completion of the shared path along the western side of Goonoo Goonoo Road between Wilburtree Street and Greg Norman Drive
- Provision of a footpath on the eastern side of Goonoo Goonoo Road between Calala Lane and Barnes Gully
- Street lighting between Calala Lane and Jack Smyth Drive
- Drainage improvements works including providing kerb and channel between Calala Lane and Greg Norman Drive, and culvert extension Barnes Gully.
- New line marking and signage.

For reference, a photographic record of the section of the New England Highway being upgraded, and the current condition of the vegetation communities and fauna habitats present, is provided in Appendix A.

To permit the construction work, TfNSW would require the establishment of a works compound and/or stockpile site; this proposed to be located within the 'central' portion of the road works area, east of the highway (generally opposite to the eastern end of Craigends Lane) (Figure 1-1). This site was chosen as it is predominantly cleared and devoid of native vegetation.

Based on a worst-case estimate it is expected that a total operational footprint of about 54,000 m² would be required [the construction footprint being less than this]; this generally restricted to the proposed road alignment being about 1.5 kilometre in length, an approximate 16 m road width, an additional 10 m clearance on either side and the area to be occupied by the works compound. Inclusive in this is the expected removal of about 5.5 ha of native and predominantly exotic vegetation.

For the purpose of the field investigation, the proposal area surveyed encompassed:

- The proposed road alignment
- An area of up to 10 m beyond the construction footprint.

Access to the proposed compound site was not available at the time of the inspection. To overcome this limitation the existing paddock was viewed from the road reserve. Restricted access to this portion of the subject site is not considered to limit the overall outcomes of this biodiversity assessment.

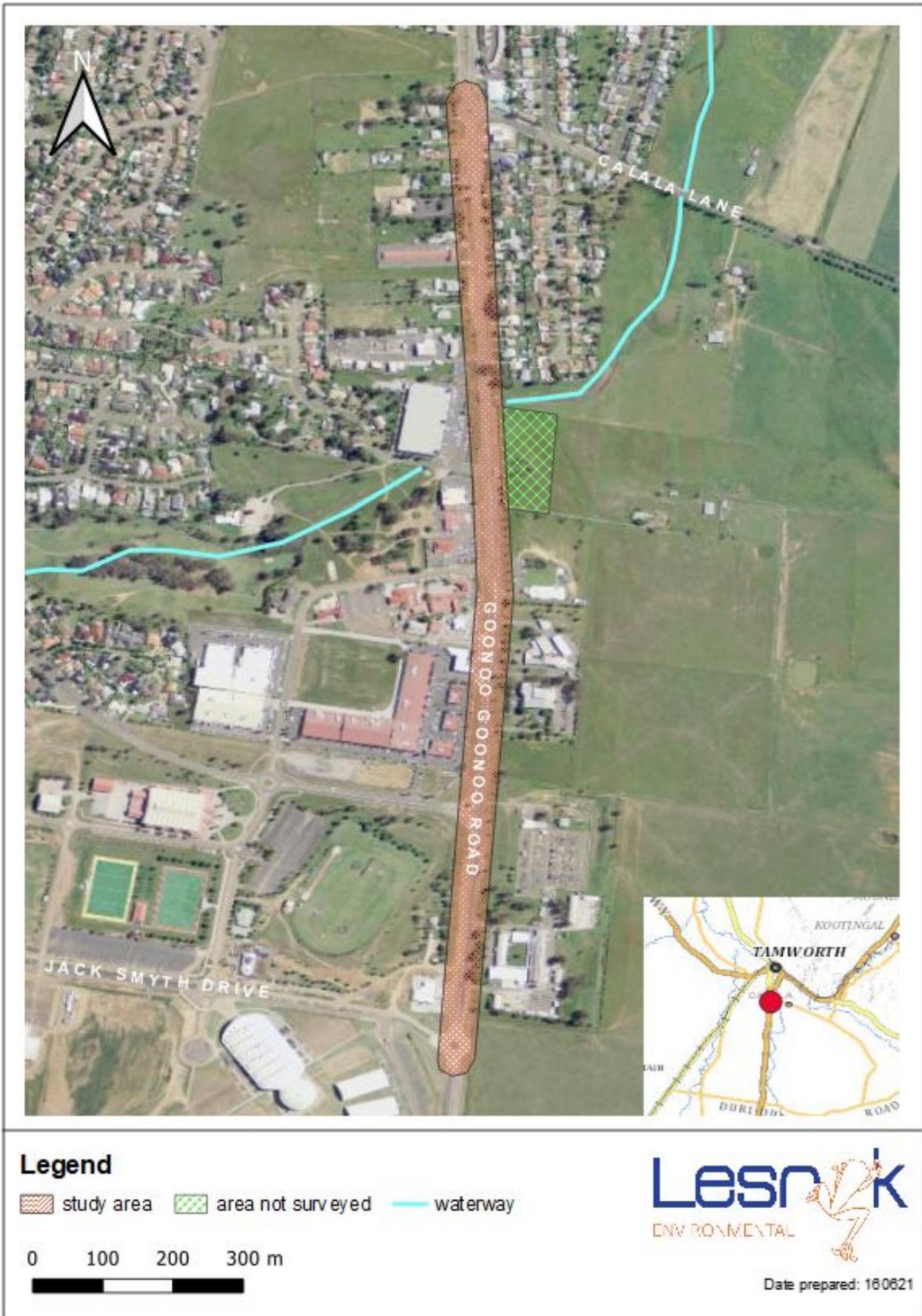


Figure 1-1: Study area



Figure 1-2: Proposal regional context

1.3 Legislative context

A Review of Environmental Factors (REF) is prepared to satisfy TfNSW obligations under s.5.5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to “examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity” and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the proposed Goonoo Goonoo Road Duplication, and assesses the biodiversity impact of the proposal to meet the requirements of the EP&A Act.

Section 7.3 of the NSW *Biodiversity Conservation Act 2016* (BC Act) and Part 7A, Division 12, Subdivision 221ZV of the NSW *Fisheries Management Act 1994* (FM Act) requires that the significance of the impact of an activity on threatened species, populations, Endangered Ecological Communities (EECs) and/or their habitats listed under the BC or FM Acts is assessed using a five and seven-part test, respectively.

If the activity is likely to have a significant impact, or would be carried out in a declared Areas of Outstanding Biodiversity Value (AOBV), the proponent must prepare a Species Impact Statement (SIS) must be prepared in accordance with the Environment Agency Head’s requirements. Alternatively, under the BC Act only, TfNSW may opt to produce a Biodiversity Development Assessment Report (BDAR) [this including the Biodiversity Offsets Scheme], this being prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

In September 2015, a “strategic assessment” approval was granted by the Federal Minister in accordance with the EPBC Act. The approval applies to TfNSW road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, TfNSW road proposals assessed via an REF:

- Must address and consider potential impacts on nationally listed threatened species, populations, ecological communities and migratory species, including application of the “avoid, minimise, mitigate and offset” hierarchy
- Do not require referral to the Department of Agriculture, Water and the Environment (DAWE) for these matters, even if the activity is likely to have a significant impact.
- Must use the Biodiversity Offset Scheme (BOS) to offset project impacts.

To assist with this, assessments are required in accordance with the Matters of National Environmental Significance: Significant impact guidelines 1.1. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DoE 2013).

2 Methods

2.1 Personnel

The personnel responsible for the carrying out of the onsite components of this ecological study, and their responsibilities, were:

- Mr Deryk Engel B.Env.Sc. (Hons): Project management, client and government agency consultation, site investigation [fauna], document preparation, review and quality assurance
- Mr John Speight B.Sc: Botanist, site investigation, document preparation, review and quality assurance.

2.2 Background research

Prior to carrying out any fieldwork, previous studies conducted in the region and known databases were consulted to identify the diversity of ecological communities, flora and fauna species known for, or potentially occurring in, the study region. The identification of those known or potentially occurring native species and communities within this portion of the Tamworth Regional LGA, particularly those listed under the Schedules to the EPBC, BC and FM Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants and animals, their vegetation associations and/or necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, either the most appropriate species-specific survey techniques may be selected [should their associated vegetation communities/habitat requirements be present] or a precautionary approach to their presence adopted.

The carrying out of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impact on, all known and likely native species, particularly any plants and animals that are of regional, State and/or national conservation concern. This approach also avoids issues inherent with a one off 'snap-shot' study.

A list of all databases, date these were accessed, and the search area employed is provided in Table 2-1.

Table 2-1: Database searches

Database	Date accessed	Search area
DAWE's PMST (DAWE 2021a)	10 March 2021	10 kilometre buffer
DPI WeedWise Database (DPI 2021)	10 March 2021	North West
EES BioNet database [Atlas of NSW Wildlife] (EES 2021)	10 March 2021	10 kilometre buffer
OEH Threatened Species website (OEH 2021a)	March 2021	N/A
DPI Fisheries Spatial Data Portal (DPI 2021b)	March 2021	Murray Darling Basin North data layer
OEH BioNet Vegetation Classification database (OEH 2021d)	May 2021	N/A
SEED datasets (NSW Government 2021b)	March 2021	N/A
Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems	March 2021	locality

Other reports and documents referred to are provided within the bibliography section of this report.

All these databases and reports were reviewed and drawn upon where relevant. While reviewing these documents, particular attention was paid to identifying relevant ecological matters listed, or currently being considered for listing, under the Schedules of the EPBC, BC and/or FM Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the proposal area.

Field guides and standard texts used include:

- Harden (1992, 1993, 2000 and 2002) and NSW Flora Online website [used to assist with the identification of those plants present]
- Brooker and Kleinig (1999) and Bower, Semple and Harcombe (2002) [eucalypts]
- Tame (1992) [acacias]
- Cogger (2014) [reptiles and frogs]
- Anstis (2017) [frogs]
- Churchill (2008) [flying mammals]
- Simpson and Day (2010) [birds]
- Van Dyck and Strahan (2008) [non-flying mammals]
- Triggs (1996) [identification of scats, tracks and markings].

Nomenclature follows that in these texts, or within the EPBC, BC and FM Acts.

It is noted that the current accepted scientific names for some of the threatened fauna species previously recorded in this locality are not consistent with the names used/provided under either the EPBC, BC and FM Acts. In these instances, nomenclature used within this report follows the current approved scientific conventions.

Where applicable, any TECs were classified and named according to the NSW Scientific Committee's Final and Preliminary Determinations [various dates].

The conservation significance of those ecological communities, plants and animals recorded is made with reference to:

- The RoTAP publication (Briggs and Leigh 1996)
- The EPBC, BC and/or FM Acts
- Vegetation mapping of the study region (State Government and DPIE 2015)
- The BioNet Vegetation Classification database (OEH 2021d).

2.3 Habitat assessment

An assessment of available habitat for each threatened species, population or community identified in the database searches, and their likelihood of occurrence, is provided in Appendix B.

2.4 Field survey

A biodiversity assessment of the study area was carried out by Deryk Engel and John Speight on 4 and 5 March 2021. The weather conditions experienced during the site investigations were generally mild temperatures [~26 °C], clear skies and light winds.

The purpose of the field investigation was to identify those vegetation communities, fauna habitats, plants and animals present within, and in close proximity to, the proposal area that are of State and/or national conservation significance as listed under the Schedules to the EPBC, BC and/or FM Acts.

While conducting the habitat assessments, efforts were made to identify features such as known vegetation associations, geological features, feed trees, mature trees with hollows, connectivity of fauna corridors, aquatic environments and other habitat features important to the lifecycle requirements of those threatened plants and animals previously recorded in the study region (as listed in Appendix B).

The survey methods employed during the field investigation were:

- The identification of those plants present, including within any areas affected by direct and indirect impact
- The identification of the structure of those vegetation communities and fauna habitats present at, and close to, the subject site
- The direct observation of those fauna species present within or near to the subject site
- Diurnal call identifications of those fauna species present, with all calls being identified in the field
- The identification of any indirect evidence such as tracks, scats, scratchings and diggings that would suggest the presence of a particular fauna species
- Leaf litter and ground debris searches for sheltering reptiles and amphibians.

Where required, a more detailed description on one or more of the survey methods employed is provided below.

The survey methods employed and level of effort required were generally based on the descriptions provided in the following:

- The OEH survey guidelines for threatened plants (OEH 2016)
- The DEC 2004 publication
- The DEWHA survey guidelines for Australia's threatened bats, bird and frogs (DEWHA 2010a, DEWHA 2010b)
- The DSEWPC survey guidelines for Australia's threatened mammals and reptiles (DSEWPC 2011a, DSEWPC 2011b).

2.4.1 Vegetation surveys

The vegetation survey investigated the entire existing road corridor between property boundaries. Where possible, an additional area of up to 10 m beyond the road corridor boundaries was also surveyed. This did not include areas of private property, nor did it include the paddock [east adjacent to Craigends Lane] proposed to be used for part of the work; access to which was not available at the time of the survey.

Survey of those accessible parts of the study area used the 'Random Meander Method' (Cropper 1993). The 'Random Meander Method' is consistent with the stratified random sampling design as specified in section 5.1 (Stratification, sampling and replication) of the publication titled Threatened biodiversity survey and assessment: Guidelines for development and activities (DEC 2004). This method is also mentioned under sections 5.2.1 (Sampling techniques) and 5.2.7 (Targeting threatened plants) of that publication.

The 'Random Meander Method' is employed until no new species have been recorded for at least 30 minutes.

Due to the narrow and linear nature of the road corridor, all of this part of the study area was able to be surveyed. This essentially involved walking along both vegetated road verges and included an investigation of the aquatic vegetation in the Barnes Gully culvert. During the traverses, notes were made on the structure and floristic composition of the vegetation present.

Given the highly modified and urbanised nature of the existing road corridor study area, no plot-based sampling survey was considered necessary.

Plant samples were also collected where necessary [in accordance with OEH Scientific licence SL10642] for later identification using standard texts.

2.4.2 Targeted flora surveys

Targeted (species specific) surveys for threatened plants was considered based on the results of the literature review, including consideration of the habitat requirements of those threatened flora species identified as potentially occurring in the study area (see Appendix B), air photography interpretation, reference to preliminary construction plans and the site specifics of the study area.

All of the plant species were considered to have a low potential to occur in the study area.

2.4.3 Targeted fauna surveys

Based on the observations made during the diurnal investigations, the disturbed and modified nature of the area investigated (i.e. road corridor and associated verge) and the identification of those habitats present, it was not considered necessary to employ any species-specific fauna survey methods (e.g. nocturnal surveys, echolocation targeting microbats).

Those survey methods that were conducted are as follows:

Diurnal bird investigation

During the field investigation birds were identified using visual identification of observed individuals or aural identification of their vocalisations. Any opportunistic observations obtained whilst carrying out other field activities were also recorded.

Ground debris searches

Ground debris searches were carried out on foot within the limited number of vegetated portions of the subject site. This involved conducting random meanders through this area and turning over any occurrences of natural debris or urban refuse.

While conducting the ground debris searches, tracks, diggings and characteristic scats were also searched for, and identified in the field.

Fauna habitat assessment

An assessment of the road corridor/areas of likely direct or indirect disturbance for important fauna habitat features such as tree hollows (potentially used by insectivorous bats [microbats also known as 'Yangochiroptera'], birds and arboreal mammals) was conducted. Other features such as the presence of water bodies, suitable cave-substitutes (culverts) and large logs were also assessed.

Among a stand of five isolated eucalypts that occur within the paddock that is proposed to be used as a compound site, one hollow-bearing tree with a vertical hollow of about 20 mm in diameter was observed (tree located at Easting 302091; Northing 6554654). This tree is about 10 m in height and the hollow limb located at around 8 m above ground level. During the field investigation, with the aid of binoculars, a flock of the introduced Common Starling (*Sturnus vulgaris*) was observed in the eucalypt, though no individuals were actually seen entering or exiting the tree hollow.

Culvert inspection

A five cell box [concrete] culvert that directs Barnes Gully under Goonoo Goonoo Road, is present about 115 m north of Craigends Lane.

A visual inspection of the five culverts involved using a hand-held torch (163 lumen hand-held spotlights), this being employed to determine if the structures present supported habitat suitable for cave-occupying microbats (such as small crevices) and if there was any evidence of roosting bats, bat guano or staining. When considering the habitat value of this feature for cave associated microbats, the presence of water, anthropogenic and natural barriers, dense vegetation growth and/or spider webs across the culverts opening and any crevices was looked for, the occurrence of these negating access to/occupation of the structures by bats.

No microbats were observed within the culvert, and none of the cells within the culvert were considered suitable roosting habitat.

2.4.4 Aquatic Surveys

One water body, Barnes Gully, is present within the study area, this being channelled under Goonoo Goonoo Road through the five cell box culverts previously described. With reference to *Stream Order And Waterway Classification System* (Industry and Investment NSW 2009), the section of waterway within the area investigated is a 2nd order stream and Class 3 'Minimal fish habitat' being a '*named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies)*'.

For a distance of about 280 m west of Goonoo Goonoo Road Barnes Gully is 'located' within a concrete structure that is present under a commercial development ('Forty Winks™'). South-west of Craigends Lane, for a distance of about 380 m, Barnes Gully is a regularly maintained grass and concrete storm water channel, the (linear) alignment and structure of which has been dramatically altered by urban development. Within this stretch of Barnes Gully, no natural aquatic habitat features are present and no standing pools of water occur.

The entire catchment of Barnes Gully is present within an urban catchment, this including Longyard Golf Course and its associated residential subdivision areas.

As components of the work would be conducted adjacent to Barnes Gully, an aquatic study was broadly performed in accordance with the publication titled *Aquatic Ecology in Environmental Impact Assessment* (Lincoln-Smith 2003).

The investigation involved traversing the section of waterway that is present beneath Goonoo Goonoo Road and those accessible areas that occur upstream/downstream of the highway, with notes taken on the habitat present within the section of waterway being 'disturbed', the structure of its bank, riparian community, course, and the presence of other features important to the lifecycle requirements of aquatic species present, or considered likely to occur.

In addition, information referred to included:

- Identification of known or expected aquatic species and their habitats, particularly those of conservation concern
- A review of existing information on the in-stream ecology of Barnes Gully and consultation with the relevant NSW Fisheries Zone.

Based on the nature of the habitat present and the waterway classification, it was not considered that any targeted surveys (i.e. netting, trapping or electric fishing) targeting aquatic species present, or considered likely to occur, were necessary.

2.5 Summary of survey effort and limitations

Surveys were undertaken by two researchers on the afternoon of 4 March, between about 4.00 pm and 5.00 pm and again on the morning of 5 March from 7.30 am to 8.40 am with about four (4) person hours of active searches had been accumulated. Given the disturbed and highly modified nature, and size, of the area investigated (i.e. road corridor and associated verge), this length of time is considered more than adequate when endeavouring to determine the diversity of native species present, the structure and character of the vegetation communities and fauna habitats present and the conservation status of these.

2.5.1 Limitations

Access to all parts of the proposal area that required investigation was not possible. During the flora survey, access to the paddock located opposite Craigends Lane between No.404 Goonoo Goonoo Road and the Tamworth Southside Uniting Church was unavailable at the time of survey; as such, this area was not able to be surveyed.

Historical air photographs show that this paddock was ploughed in 2019 and appears to be used for grazing and possibly fodder cropping. Historic air photography indicates the paddock has been utilised for agricultural purposes since at least 2004. One mature and four young eucalypts occur in the paddock and are expected to be removed for the proposed work. At the time of the survey (early March 2021), the paddock was vegetated by a dense cover of native and exotic grasses and weeds. Identification of some of these was able to be conducted from the boundary fence but the majority of the paddock remains unsurveyed.

No other limitations to the flora survey were encountered and all other parts of the study area were accessible and surveyed on foot.

Considering the habitats present, and the land use history of the area investigated, no limitations to the undertaking of the fauna survey were encountered. Foot traverses were not undertaken across the paddock, though the five eucalypts present were surveyed through use of binoculars from the road reserve.

While not considered to compromise the scientific rigour of the field assessment, no specific surveys (i.e. nocturnal work) were carried out.

In order to overcome this limitation:

- Database searches were conducted for threatened species, populations and ecological communities known to occur within the region
- The precautionary principle was adopted where necessary (i.e. suitable habitat for those threatened species known to occur, or that have been previously recorded within the surrounding locality, was identified).

Not all animals and plants can be fully accounted for within any given study area. The presence of threatened species is not static; it changes across time, often in response to longer term natural forces that can, at any time, be dramatically influenced by human-made disturbances.

This report is based upon data acquired from the current investigation; however, it should be recognised that the data gathered is indicative of the environmental conditions of the site at the time the field work was conducted.

During the field investigation, no adverse weather conditions or seasonal constraints were encountered.

3 Existing environment

For reference, a photographic record of the area investigated is provided in Appendix A.

The study area is located within the road corridor of a dual carriageway section of Goonoo Goonoo Road; the lanes varying from two to four, each about 2.5 m in width.

Along the length of the investigated section of road the verge is composed of sealed shoulders, gravelled areas, guttering and/or cleared and maintained (i.e. mown) exotic grassland with weeds. Within the grassland, exotic and native tree and shrub plantings are present; these range between 6 m and 15 m in height.

East adjacent to the length of road investigated are residential properties and paddocks, with commercial developments and motels primarily located along the western side of Goonoo Goonoo Road. Within the unsurveyed paddock east adjacent to Craigends Lane, a stand of five eucalypts was observed.

One waterbody, Barnes Gully, is located within the study area; a tributary of the nearby Peel River, this waterway traverses beneath Goonoo Goonoo Road through a five cell box culvert about 20 m wide, and 115 m north of the Craigends Lane intersection. The concrete bed is topped with fine sediment on which a high density of weeds (primarily on the eastern side) have established (the western side appears to be regularly cleared and maintained), with emergent aquatic plants present. Water depth is generally between 20 mm to 50 mm, and the clarity high; however, where the concrete base has eroded along the eastern side a small pool about 3 m² in size and 50 cm deep is present. Some urban refuse was noted to have been washed down into the channel. Barnes Gully, observed to be flowing at the time of the investigation, is not mapped as Key Fish Habitat (DPI 2021b).

Land uses that surround the area investigated include:

- Urban infrastructure (i.e. road network, powerlines, services)
- Residential properties (the nearest situated from within about 20 m of Goonoo Goonoo Road)
- Commercial properties (west adjacent along Goonoo Goonoo Road)
- Southside Uniting Church (opposite The Ringers Road and Goonoo Goonoo Road intersection)
- Transgrid Northern Region Tamworth Depot (west adjacent to Goonoo Goonoo Road opposite Jack Smyth Drive)
- Tamworth Regional Sporting Complex Athletic Centre (between Jack Smyth Drive and Greg Norman Drive)
- Tamworth Regional Entertainment Centre (corner of The Ringers Road and Greg Norman Drive)
- Australian Equine Livestock Events Centre (corner of Jack Smyth Drive and Goonoo Goonoo Road)
- Truck Drivers Memorial (about 30 m west of Goonoo Goonoo Road and 185 north of Jack Smyth intersection)
- A number of Council parks.

The study area does not occur within, or near to, a conservation reserve.

The Tamworth 1:100,000 Soil Landscape map sheet (Banks 2001) shows that the area investigated is located within one soil landscape, this being the Duri Residual Landscape (Figure 3-1).

The geology is complex folded Carboniferous and Devonian sedimentary rocks of the Tamworth Fold Belt (Banks 2001). The Devonian geology units include the Baldwin Formation, Keepit Conglomerate and Mandowa Mudstones; with the Carboniferous units including the Tangaratta Formation, the Namoi Formation and Talcumba Sandstone (Banks 2001).

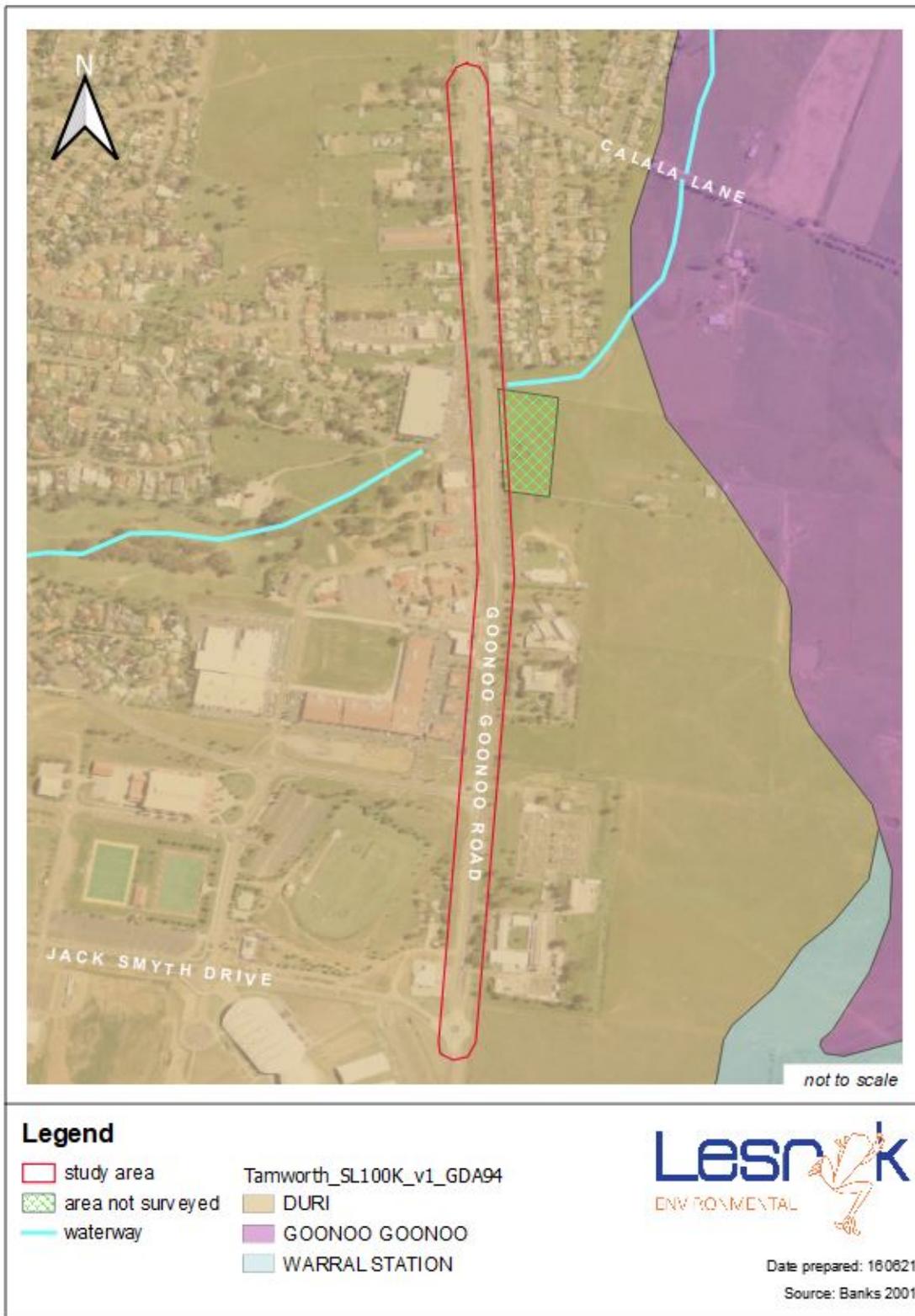


Figure 3-1: Soil landscape

Soils are extremely complex due to rapid changes in underlying lithology (Banks 2001). Generally dominated by duplex soils such as moderately deep, moderately well-drained Red and Brown Chromosols with minor occurrences of shallow, very well-drained Rudosols around rock outcrops; deep, imperfectly drained Red Vertosols and deep to very deep, imperfectly drained Red and Brown Chromosols and possibly some Sodosols occur along drainage lines and on sodic bedrock (Banks 2001).

Low to moderate limitations [exist] for urban development (Banks 2001). Many soils have moderate to high soil engineering hazard (Banks 2001). Lower slope junctions with adjacent landscapes can be sites of saline groundwater discharge and care must be taken not to overcharge the landscape and exacerbate this potential problem (Banks 2001).

For reference, Table 3-1 identifies attributes of the study area investigated.

Table 3-1: Site attributes

Site Attribute	Goonoo Goonoo Road
Estimated size (ha)	about 5.4 ha
ASL	between 395 m and 407 m
Climate ²	Mean summer high – 32.4 °C Mean winter low – 1.6 °C Average annual rainfall – 680.1 mm
Water body	Barnes Gully
Critical habitat	No
IBRA Bioregion/Subregion	Nandewar / Peel (Figure 1-2)
Mitchell Landscape Unit	NAN Peel (Figure 1-2)
Soil landscape	Duri (Figure 3-1)

3.1 Native vegetation communities

No intact native vegetation communities occur within or adjacent to the study area, including the ‘unsurveyed’ paddock. Six native trees that are considered likely to be remnants of the vegetation community that once occurred in the locality remain. These are a single mature Yellow Box (*Eucalyptus melliodora*) in the eastern road verge, and five eucalypts in the paddock that appear (from a distance) to be Blakely’s Red Gums (*E. blakelyi*). This suggests the native vegetation that once occurred was a Box – Gum woodland.

3.2 Plant Community Types

The study area has been mapped by DPIE (State Government of NSW and DPIE 2015) (Figure 3-2). The study area and adjacent areas is mapped as PCT0 ‘Not Native’.

The nearest mapped native vegetation PCT’s are:

- PCT84: River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South and Nandewar Bioregions. This PCT is mapped as occurring along Goonoo Goonoo Creek about 800 m to the east of the study area.
- PCT599: Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion. The nearest stand of this PCT is mapped as occurring about 1 kilometre to the east on the opposite side of Calala Lane.

No part of Barnes Gully has been mapped as PCT84 River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland), and this PCT does not conform to any EECs that are known to occur in the Nandewar bioregion.

² Quirindi Post Office – this being the nearest operating weather station nearest to the area investigated (BOM 2021a)



Figure 3-2: Vegetation zones

PCT599 conforms to the CEEC White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland, listed under both the EPBC and BC Acts. However, no part of the study area is mapped as this community and although six remnant trees characteristic of this community occur in the study area, all likely to be removed to permit the scope of works proposed, the site survey confirms the accuracy of this mapping and the community is not assessed as occurring in the study area.

3.3 Threatened ecological communities

As discussed above, the Yellow Box and Blakely’s Red Gum trees in the study area and the nearby mapped stands of PCT599 are considered to indicate that the CEEC White Box - Yellow Box - Blakely's Red Gum Woodland and Derived Native Grassland once vegetated the study area and locality.

However, only the six eucalypt trees (including those in the paddock) and a few ground cover species were identified in the study area during the survey. The groundcover species are Barbed-wire Grass (*Cymbopogon refractus*), Tussock (*Poa labillardieri*), Hedgehog Grass (*Echinopogon* sp.) and Austral Cranesbill (*Geranium solanderi*) which occur scattered through the study area but primarily adjacent to the unsurveyed paddock. These groundcover species commonly occur in many grassland, woodland and forest communities as well as disturbed areas, and the presence of these and the six eucalypts are not considered to constitute a stand of this CEEC in the study area.

As such, no assessments on this CEEC with reference to the EPBC Act’s Significant Impact Guidelines, or Section 7.3 of the BC Act were considered necessary.

3.4 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- Wetlands
- Red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation
- Ecosystems in streams fed by groundwater
- Limestone cave systems
- Hanging valleys and swamps.

The Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems (Bureau of Meteorology 2021b) was consulted to identify those terrestrial and aquatic ecosystems that are potentially groundwater dependant within the study area.

With reference to the Bureau of Meteorology Atlas (2021b) no aquatic or subterranean GDEs were identified for the locality, with only terrestrial GDEs mapped; however, none occurred within or near to the study area (Figure 3-3).

3.5 Threatened species

Prior to conducting the field investigation, a review of the DAWE and OEH databases (DAWE 2021a, EES 2021), and applicable literature sources, were reviewed to determine the diversity of species that have been previously recorded, or are considered to have habitat, in the study region (Appendix B). Through reference to these, the potential presence of eight communities, 10 threatened plants and 35 threatened fauna listed under the EPBC, BC and/or FM Acts has been considered (Figure 3-4, note this figure only identifies those species that have actually been recorded near the study area as per the OEH database, not those predicted [DAWE database]).

All of the threatened species identified during the literature search as having the potential to occur in the study area were assessed to have only a low likelihood of occurrence, given the highly disturbed and heavily modified condition of the locality.

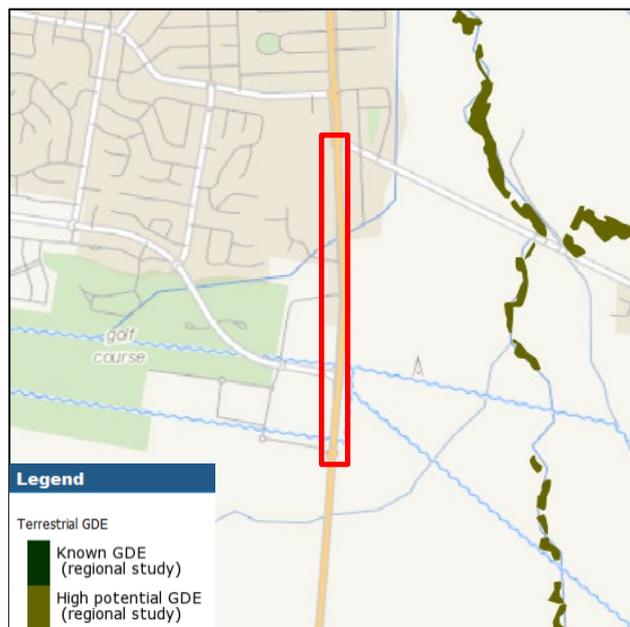


Figure 3-3: Terrestrial Groundwater dependent ecosystems in relation to the study area. Source: BOM (2021b)

One of the threatened plant species that has been previously recorded in the Tamworth area; Hawkweed (*Picris evae*), was initially considered to have some potential to occur in the study area, despite the high level of disturbance. This was based on the habitat and ecology description provided in the OEH Species Profile (OEH 2021a).

Hawkweed is described as having been collected at “Oxley Park (Tamworth)” [Oxley Park Scenic Lookout, about six kilometres to the north-east of the study area], although no record appears on the NSW BioNet Atlas database search. The species habitat and ecology in the species profile also includes: “*All recent collections appear to come from modified habitats such as weedy roadside vegetation and paddocks.*” For these reasons it was initially considered to have potential to occur in the study area.

However, analysis of the occurrence records for the species (AVH 2021) indicates that all of the records from NSW have been from natural or only slightly modified sites, including at Oxley Park. Given the highly disturbed condition of the study area, including the paddock that was unable to be surveyed, it was assessed that there was only a low potential for Hawkweed (*Picris evae*) to occur.

A record of Magenta Lilly Pilly (*Syzygium paniculatum*) also occurs just to the west of the study area in the residential area of South Tamworth. This record is well outside its natural range and habitat and it is a plant that has been a popular garden addition for many decades. Records of its occurrence in urban areas such as this are common. This specific record notes that it is located in a backyard garden.

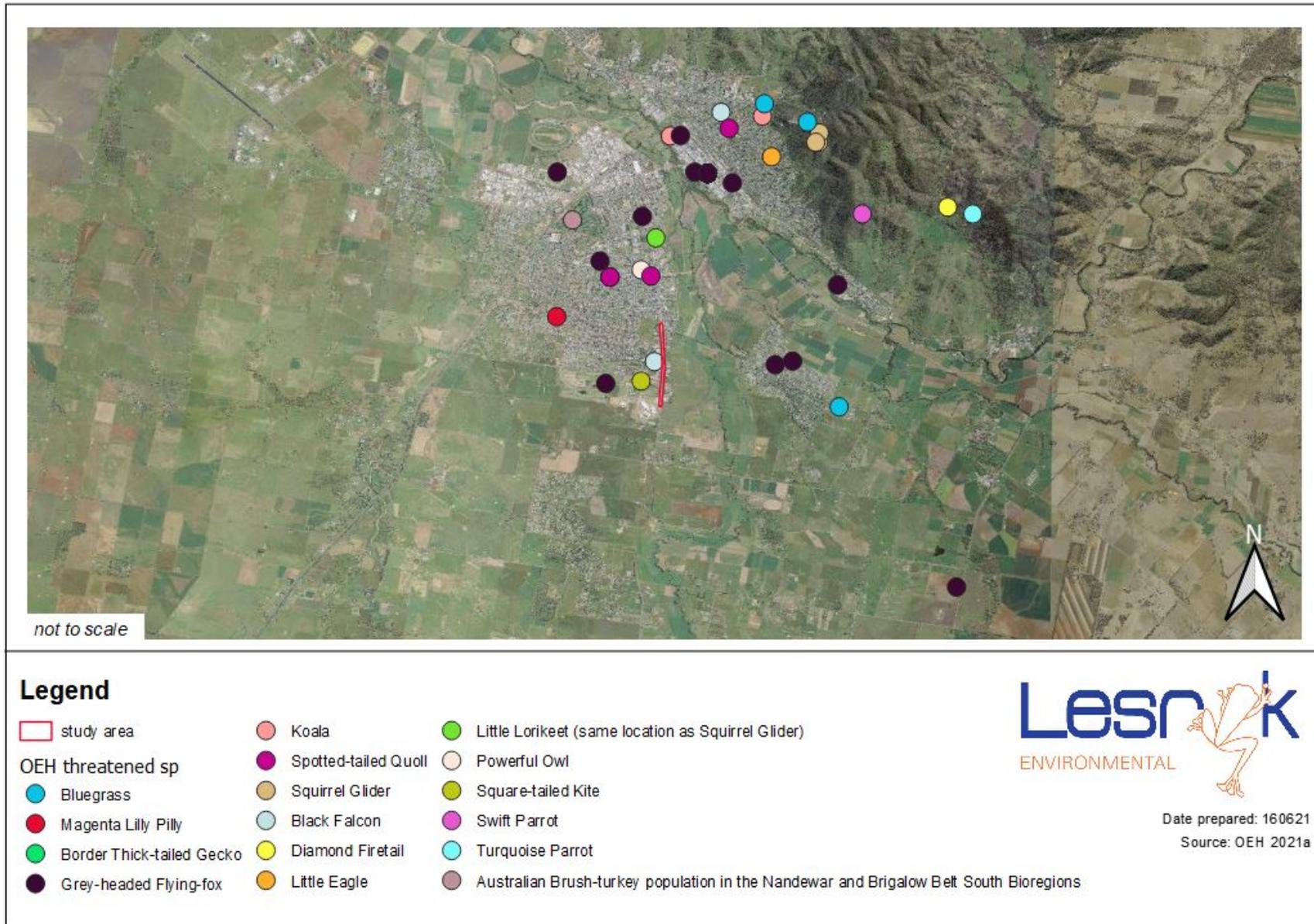


Figure 3-4: Threatened species previously recorded

3.6 Flora results

By the completion of the field survey a number of native and exotic plants had been recorded (Appendix D). It is noted that Appendix D is not intended to be a comprehensive list of all the species present within the subject site, and only represents those plants that were recorded while carrying out searches for:

- Those native species and ecological communities of State and/or national conservation concern that are known, or expected to occur, in the locality
- Weeds of significance that would require treatment.

No plants listed as threatened on the EPBC or BC Acts were recorded or considered likely to occur within the investigated study area. As previously mentioned, the paddock east adjacent to Craigends Lane has not been surveyed; as such, it is recommended that a pre-clearing inspection of this area be undertaken (to confirm the site is highly disturbed) prior to any ground disturbance work commencing in this area.

3.7 Fauna results

By the completion of the field survey 20 native birds had been recorded within, or in proximity to, the study area (Table 3-2). A number of introduced species were also recorded.

Table 3-2: Fauna species recorded during the investigation

Common Name	Family and Scientific Name	Detection Method
MAMMALS		
* Rabbit	<i>Oryctolagus cuniculus</i>	Road kill
BIRDS		
Crested Pigeon	<i>Ocyphaps lophotes</i>	Observed
Great Cormorant	<i>Phalacrocorax carbo</i>	Observed
White-necked Heron	<i>Ardea pacifica</i>	Observed
Galah	<i>Eolophus roseicapillus</i>	Observed
Little Corella	<i>Cacatua sanguinea</i>	Observed
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	Observed
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	Observed
Red-winged Parrot	<i>Aprosmictus erythropterus</i>	Observed
Eastern Rosella	<i>Platycercus eximius</i>	Observed
Red-rumped Parrot	<i>Psephotus haematonotus</i>	Observed
Superb Fairy-wren	<i>Malurus cyaneus</i>	Observed
Striated Thornbill	<i>Acanthiza lineata</i>	Observed
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	Observed
Noisy Miner	<i>Manorina melanocephala</i>	Observed
Pied Butcherbird	<i>Cracticus nigrogularis</i>	Observed
Australian Magpie	<i>Cracticus tibicen</i>	Observed
Willie Wagtail	<i>Rhipidura leucophrys</i>	Observed
Australian Raven	<i>Corvus coronoides</i>	Observed
Magpie-lark	<i>Grallina cyanoleuca</i>	Observed
Fairy Martin	<i>Petrochelidon ariel</i>	Observed
* Common Starling	<i>Sturnus vulgaris</i>	Observed
* Common Myna	<i>Sturnus tristis</i>	Observed
* House Sparrow	<i>Passer domesticus</i>	Observed
FISH		
* Mosquito Fish	<i>Gambusia holbrooki</i>	Observed

* - introduced species

The lack of native mammals, frogs and reptiles recorded during the field investigation is a reflection of the heavily disturbed and highly modified character of the subject site.

None of the native species recorded are listed, or currently being considered for listing, under the EPBC, BC and/or FM Acts were recorded during the investigation.

Predation by the Plague Minnow (also known as the Mosquito Fish) is listed as a KTP under Schedule 4 of the BC Act. This introduced fish has been listed under Schedule 4 as it is an 'aggressive and voracious predator' of native fish, invertebrates and the eggs and tadpoles of native frogs.

Reference to the EPBC Act's PMST (DAWE 2021a) indicates that the subject site is in the distribution of predicated habitat for the Corben's Long-eared Bat (*Nyctophilus corbeni*), this microbat being listed as vulnerable under both the EPBC and BC Acts. However, consultation of the BioNet (Atlas of NSW Wildlife) database (EES 2021) does not indicate the species as having been recorded within 10 kilometre of the study area. Considering the land use history of the locality and the structure of the habitats observed, this species is not considered to be present as a locally viable population. One hollow-bearing tree was recorded within the study area, however, the overall value of this plant for this hollow-dependent species is considered to be minimal, and, if utilised, its removal is not considered to have a significant effect. The removal of this tree would not limit the extent of foraging or breeding habitat sites available, nor fragment *Nyctophilus corbeni* habitat any further. As no significant effect is likely, no further assessments with reference to the EPBC Act's Significant Impact Guidelines or Section 7.3 of the BC Act are required.

As noted previously, whilst not actually observed utilising the hollow, the Common Starling (a hollow-nesting aggressive introduced species) was seen near this feature during the course of the field survey.

The native species recorded are protected, as defined by the BC Act, but considered to be common to abundant throughout the surrounding region. The species recorded would not be solely reliant upon those habitats present within, or near to, the subject site such that the removal or further disturbance of these would threaten the 'local' occurrence of these animals. The species recorded are all expected to be present within both the study area and surrounding locality post-work.

3.8 Aquatic results

Within the proposed study area, one waterway, Barnes Gully, is present. As stated previously, for a distance of about 280 m west (upstream) of Goonoo Goonoo Road Barnes Gully is 'located' within a concrete structure that is present under a commercial development ('Forty WinksTM'). South-west of Craigends Lane, for a distance of about 380 m, Barnes Gully is a regularly maintained grass and concrete storm water channel, the (linear) alignment and structure of which has been dramatically altered by urban development.

Downstream of the study area the alignment of this drainage line also appears to have been altered, with several linear sections present. Whilst modified, due to the agricultural nature of the property through which it flows, within these stretches, pools of water and aquatic vegetation was noted/appears to be present (based on a review aerial photography).

The entire catchment of Barnes Gully is present within an urban catchment, this including Longyard Golf Course and its associated residential subdivision areas.

Barnes Gully is considered a 2nd order stream and Class 3 waterway (Industry and Investment NSW 2009). Class 3 waterways are identified as offering potential fish refuge, breeding or feeding areas; however, Barnes Gully is not mapped as Key Fish Habitat (DPI 2021b).

Barnes Gully traverses beneath Goonoo Goonoo Road through a five cell box culvert that is about 20 m wide. The concrete bed (within the section of waterway investigated) is topped with fine sediment on which a high density of weeds (primarily on the eastern side) has established, with emergent aquatic plants present. Water depth is generally between 20

mm to 50 mm, and the clarity high; however, where the concrete base has eroded along the eastern side a small pool about 3 m² in size and 50 cm deep is present.

With reference to the DAWE PMST (DAWE 2021a), habitat for the Murray Cod (*Maccullochella peelii*) has been identified within 10 kilometre of the subject site. While this is the case, apart from the introduced Mosquito Fish, no fish were observed within the waterway during the course of the site investigation.

Activities carried out as part of the proposal would involve include extension of the existing Barnes Gully culvert; however, the proposal would not involve:

- An overall reduction in water quality
- Erection of any barriers to fish movement
- The permanent obstruction of fish passage
- Isolation of fragmentation of any aquatic environments
- The use of explosives, electrical devices and other dangerous substances.

3.9 Areas of outstanding biodiversity value (where applicable)

None of the AOBVs listed under Part 3 of the Biodiversity Conservation Regulation 2017 occur within, or in the vicinity of, the subject site.

Reference to the Critical Habitat and AOBV registers (DAWE 2021c, DPIE 2021a) indicated no such area occurs in or near to the study area.

3.10 Wildlife connectivity corridors

The section of Goonoo Goonoo Road investigated is not part of a significant vegetation corridor. Goonoo Goonoo Creek, from about 830 m east of the study area, provides the nearest wildlife corridor; this traversing in a north-south direction, connecting to larger tracts of bushland areas within the surrounding region (from 4 kilometre beyond the study area).

Within the area investigated, small stands and/or isolated trees provide a highly fragmented link through the proximate urban and agricultural landscape to those larger parcels of bushland areas.

The proposal would require the clearing of some vegetation totalling no more than 5.5 ha and including the removal of about six trees.

While groundcover, shrubs and some trees are proposed to be removed, no significant occurrences of native vegetation would be cleared. As such, the work proposed would not isolate or further fragment any habitat areas, nor erect any additional barriers to the movement and dispersal patterns of flying species (i.e. birds, bats) that may be currently negotiating the proposal area at this location. Ground traversing species, including nocturnal mammals, if currently doing so, would still be able to negotiate the resultant proposal width. Given the scope of the work proposed, all of the animals currently traversing the study area's 'corridor' are also expected to do so post-work.

3.11 SEPPs

3.11.1 SEPP (Koala Habitat Protection) 2021

Tamworth Regional LGA is identified under Schedule 1 - LGAs of SEPP (Koala Habitat Protection) 2021, and within the Northern Tablelands Koala management area. This Policy seeks to encourage the proper conservation and management of areas that provide habitat for Koalas.

SEPP 2021 only applies to development applications assessed under Part 4 of EPA Act, not those considered under Part 5. That stated, it is TfNSW's practice to consider the SEPP criteria as part of the environmental assessment process.

No evidence (i.e. sightings, calls, scats etc.) to suggest that the area investigated supported a resident Koala population were identified. The identified Eucalypt species are listed on

the SEPP as Koala use tree species for the Northern Tablelands Koala management area. However, in accordance with the following definitions provided under the SEPP, the study area is not considered to constitute Core Koala habitat:

- (a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or
- (b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

As such, the carrying out of the proposed work would not require the preparation of a Plan of Management for the conservation and management of areas of Koala habitat.

3.12 Matters of National Environmental Significance

By the completion of the field investigation no ecological communities, threatened flora or fauna species listed under the EPBC Act had been recorded within, or near to, the subject site. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed for any of their necessary lifecycle requirements.

In addition, no World or National Heritage listed places or wetlands of international importance were identified.

No assessments referring to the EPBC Act's Significant Impact Guidelines are required. As such, it is considered that the proposed action does not require referral to the Federal Minister for the Environment as a controlled action.

4 Avoidance and minimisation

The key principles of TfNSW's Biodiversity Guidelines (RTA 2011), with regard to managing biodiversity for road projects and the associated impact on the natural and social environment, is that TfNSW should aim to:

- Avoid and minimise the impact first
- Mitigate the impact where avoidance is not possible
- Offset where residual impact cannot be avoided.

The proposed work is taking place within the previously disturbed and modified environment of the existing road corridor, its associated verges and an adjacent paddock. The potential to avoid impact to biodiversity is high. While disturbance/removal of vegetation as a result of the proposal is unavoidable, the approximate 5.5 ha of vegetation that would be cleared is considered to provide minimal habitat resources for those species recorded or expected.

To minimise the impact on native vegetation and fauna habitat adjacent to the work area, it is expected that TfNSW would:

- Prepare a Construction Environmental Management Plan (CEMP) to limit soil erosion and sediment transfer off-site.
- A pre-clearing survey of the paddock between No.404 Goonoo Goonoo Road and the Tamworth Southside Uniting Church to be used for part of the proposed work should be conducted prior to any ground work in this area commencing. This investigation should be undertaken to confirm that the paddock is highly degraded and of little ecological value.
- Endeavour to retain the mature hollow-bearing tree within the layout of the compound site. The remaining semi-mature eucalypt trees can be cleared.
- Ensure that, if the hollow-bearing tree requires clearing, that an ecologist or similar be present on site to supervise its removal and collect, and relocated locally, any sheltering native species if these are present. Exotic species are to be taken to a local veterinarian for euthanising. Any injured native species are to be cared for by a local wildlife carer/veterinarian.
- Limit vegetation clearing to the minimum required to successfully complete the proposal.
- Identify the limits of clearing; these should be provided to the construction contractor, identified both on site maps/plans and on site through the erection of temporary fencing, bunting or similar. Para-web material and star pickets (Type 3 fencing in Guide 2 of RTA 2011) is suitable in this situation. Fencing etc. should be established at the outer limits of the drip line of any retained trees present. These areas should be marked as 'no-go zones'.
- Any native fauna injured during the course of the construction works should be taken to a local veterinarian or wildlife carer for treatment.
 - Any introduced species should be collected and taken to a local veterinarian for euthanising.
- Store/park vehicles and machinery in designated areas devoid of shrub and canopy species.

5 Impact assessment

Potential impact as a result of the proposal includes the disturbance/removal of up to about 5.5 ha of native and exotic vegetation, including the possible removal of one hollow-bearing tree to achieve the scope of works proposed.

Given the land use history of the subject site, its high levels of long-term modification and disturbance, no TECS or threatened flora or fauna species, or their populations, were recorded. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed/removed for any of their necessary lifecycle requirements.

No significant adverse impact is expected during the operational phase of the proposal.

5.1 Construction impacts

5.1.1 Removal of native vegetation

Based on a worst-case estimate, up to about 5.5 ha of native (i.e. grasses, herbs and forbs) and exotic vegetation would require disturbance/removal to permit the proposal, including no more than six native trees; one of which was observed to be hollow-bearing, and suitable for habitation by vertebrate fauna.

No TECs were mapped as occurring within or near to the study area.

It is expected that appropriate personnel movement fences would be erected if required, and sediment barriers would be installed to protect Barnes Gully.

Post-work, disturbed areas not part of the proposal are expected to naturally regenerate or be landscaped.

Clearing within the site would be carried out in accordance with the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) to minimise disturbance to surrounding flora and fauna habitats.

5.1.2 Removal of threatened fauna habitat

One hollow-bearing tree (hollow diameter of about 20 mm) was recorded during the investigation, about 35 m east of Goonoo Goonoo Road within an adjacent paddock; this potentially available to threatened microbats. It is expected that this tree would require removal to permit use of the paddock as a compound site. Though available for use by hollow-occupying threatened fauna, it is noted that the hollow nesting introduced Common Starling was observed near this feature.

With reference to the final determination of 'loss of hollow-bearing trees' as a KTP under Schedule 4 of the BC Act, it is noted that the following is mentioned 'Where feral species and unusually abundant native species (e.g. Galah³) occur, competition for hollows limits their availability to other species. This is more common in smaller reserves'.

The loss of this tree would not limit the extent of foraging or breeding habitat sites available within the surrounding area for hollow-dependent fauna. The overall value of this plant for hollow-dependent fauna is considered to be minimal, and its removal is not considered to have a significant adverse effect.

No further habitat for threatened fauna species was recorded during the investigation.

5.1.3 Removal of threatened flora

No threatened flora species or vegetation communities listed under the EPBC or BC Acts were recorded or considered likely to occur within the area investigated; as such, as no

³ This species also being recorded during the course of the field survey

threatened species are considered to be adversely impacted on by the proposal, the conducting of assessments referring to the EPBC Act's Significant Impact Guidelines and Section 7.3 of the BC Act is not required.

The paddock (east adjacent to Craigends Lane) to be used for the proposed work was not surveyed; however, it is considered unlikely that any threatened plant species would occur within or adjacent to the paddock (including the waterway) due to the very high level of disturbance by farming activities.

5.1.4 Aquatic impacts

No major areas of aquatic habitat are to be removed, modified or disturbed to permit the proposed scope of work. The work proposed is not considered to result in any fish species, aquatic-associated animals or their populations becoming extinct in the locality. Post-work, the resources offered by this habitat type for those species expected, particularly any fish (i.e. Eels [*Anguilla spp.*]) that may traverse along Barnes Gully, are considered to remain and be available for their lifecycle requirements.

While habitat of the Murray Cod was predicted within 10 kilometre of the subject site (DAWE 2021a), the character of Barnes Gully does not conform to that which is required by this species.

Based on a qualitative assessment of the waterway and a consideration of the scope of work proposed it is expected that, post-development, the subject site would generally reflect its pre-disturbance character.

As the activity does not involve harm to protected marine vegetation, dredging or reclamation, blocking of fish passage and does not involve impact to a Key Fish Habitat waterway, the work would not require a permit issued by the Minister in accordance with Part 7 of the FM Act. Similarly, no assessment referring to Part 7A Division 12 Section 221ZV of the FM Act is required, nor is the preparation of a SIS. The proposal is not anticipated to impact biodiversity in local watercourses.

The proposal does not involve the extraction of groundwater, nor would there be any direct or indirect changes to hydrology.

The proposed work has the potential to have a minor adverse effect on the water quality of Barnes Gully within the study area. This may be in the form of debris entering the waterway, or sediment or pollutant laden runoff leaving the work site. Removal of vegetation would also potentially disturb soils and could create erosion hazards.

Mitigation measures within Section 6 of this report have been provided to ensure these impacts are avoided.

5.1.5 Injury and mortality

Vegetation clearing to permit the proposal would involve the removal of up to about 5.5 ha; the work affecting six trees, groundcover vegetation, shrubs and natural ground debris. Given the proposal would be conducted within a previously disturbed and modified environment, there is minimal expectation that sheltering animals would be injured during the course of the proposed work. No bird nests were observed within the study area during the investigation.

One hollow-bearing tree was observed during the field survey, this potentially requiring removal to permit the proposal. Clearing of this tree may result in injury or mortality to any hollow-dependent species present. Recommendations have been presented to minimise the impact of the proposed work on these animals if present.

During the construction phase of the proposal some urban adaptable, sheltering fauna species (i.e. frogs and ground-traversing mammals) could be present and be subject to injury. Mitigation measures such as checking beneath vehicles/machinery prior to their use have been provided to address this matter.

Beyond current levels of impact due to the existing presence of Goonoo Goonoo Road and the volume of traffic that currently uses this network, the proposal is not expected to significantly increase injuring or mortality of fauna within the study area. The proposed road upgrade work is not expected to significantly alter vehicle strikes on those fauna species recorded or potentially occurring than may be currently transpiring. The proposal would not have an adverse impact on the long-term viability of these species or their local populations.

5.2 Indirect/operational impacts

5.2.1 Wildlife connectivity and habitat fragmentation

Given the proposal footprint is located within an existing road network and a highly fragmented landscape, connectivity between areas of vegetation to either side of this within the study area is currently limited by the road itself.

Within the area investigated, small stands and/or isolated trees provide a highly fragmented link through the proximate urban and agricultural landscape to those larger parcels of bushland areas within the surrounding region (from 4 kilometre beyond the study area).

Within the section of Goonoo Goonoo Road investigated, significant portions of land adjacent to, and alongside the length of road are occupied by residential and commercial properties and associated infrastructure; therefore, the section of Goonoo Goonoo Road investigated is not part of a significant vegetation corridor.

The proposal is not considered to further fragment any habitat areas or erect any additional barriers to the movement and dispersal patterns of flying species (i.e. birds, bats), nor any gliding arboreal mammals, that may be currently negotiating the roadway at the site investigated. Ground traversing species, including nocturnal mammals, if currently doing so, would continue to be able to negotiate its width.

5.2.2 Edge effects on adjacent native vegetation and habitat

Weeds are readily spread by existing dispersal factors such as wind, birds, water and the movement of vehicles along the road. Clearing and opening up of new vegetation edges can facilitate the recruitment of these species and provide opportunity for the establishment of other weed species. These weeds are often able to out-compete native flora and fauna species and reduce the habitat values of these areas. While this is the case, edge effects beyond those that are currently occurring within the section of Goonoo Goonoo Road investigated are not expected to be exaggerated due to the carrying out of the proposed work.

5.2.3 Invasion and spread of weeds

Under the *Biosecurity Act 2015*, 'all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.'

Of those introduced plant species recorded, none are listed:

- Under Schedule 3 of the NSW Biosecurity Regulation 2017
- As a 'priority weed' in the North West region (which includes the Tamworth LGA) (DPI 2021a)
- As a WoNS (Weeds Australia 2021)⁴.

⁴ The list of WoNS is part of a combined State and Commonwealth initiative to combat invasive species.

However, the survey provides only a 'snapshot' of the site and cannot account for non-perennial weeds that exist only as seed at the time, or weeds that may be brought in to the site between the time of the survey and the beginning of construction activities.

5.2.4 Invasion and spread of pests

Several introduced fauna species were recorded within the study area during the investigation. While this is the case, beyond existing levels, the proposal is unlikely to introduce or increase the presence of pest species within the study area.

5.2.5 Invasion and spread of pathogens and disease

There is a risk that the proposal would introduce, spread or exacerbate the plant diseases caused by *Phytophthora cinnamomi* and Myrtle Rust (*Puccinia psidii*). These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

Although there was no obvious evidence for the presence of *Phytophthora cinnamomi* or Myrtle Rust in the vegetation of the study area, recommendations to disinfect vehicles and machinery prior to its use in construction activities have been presented.

5.2.6 Noise, light and vibration

During construction, activities associated with the proposal may cause additional noise and vibration; however, given the presence of the existing road network, it is not considered that the proposal would result in adverse changes to existing levels of noise, vibration and light from this existing source such that there would be a significant impact to native fauna species.

The impact is considered to be temporary and short-term. The Interim Construction Noise Guideline (OEH 2009) would be referenced as should compliance of all vehicles and machinery with industry noise guidelines.

Mitigation measures have been provided in Section 6 of this report.

5.3 Cumulative impacts

Given the surrounding land uses adjacent to the existing road network, the proposed work is not considered to contribute to a cumulative ecological impact in a local and regional context.

The work is not considered to further contribute to the decline of any threatened species, populations or ecological communities within the locality.

5.4 Assessments of significance

No assessments referring to the criteria provided in the EPBC Act's 'Significant Impact Guidelines', Section 7.3 of the BC Act or Part 7A, Division 12, Subdivision 221ZV of the FM Act were considered necessary as no TECs, threatened flora or fauna, or their populations, were recorded or considered likely to occur.

Referrals under the EPBC Act are no longer required for TfNSW proposals under Part 5 of the EP&A Act in accordance with the Strategic Assessment process. In any case, a referral to the Federal Minister for the Environment for further consideration or approval of the project is not required, nor does it trigger a SIS (or alternatively a BDAR).

6 Mitigation

Table 6-1 provides a number of mitigation measures that aim to ensure that the proposed work carried out does not have an adverse impact on those environments that occur within or near to the study area.

Where applicable, safeguards are made with reference to TfNSW's *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

Table 6-1: Mitigation measures

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Removal and/or disturbance of native vegetation	Native vegetation removal would be minimised through detailed design.	Detailed design	Effective	There would be residual impact from loss of about 5.5 ha of native and exotic vegetation, this including six native trees.
	<p>Pre-clearing surveys would be conducted in accordance with <i>Guide 1: Pre-clearing process</i> (RTA 2011), including:</p> <ul style="list-style-type: none"> – Preparation of a clearing and grubbing plan in accordance with Roads and Maritime Specification G40. <p>A pre-clearing survey is also to be conducted of the paddock between No.404 Goonoo Goonoo Road and the Tamworth Southside Uniting Church, prior to any ground work in the area commencing.</p>	Prior to construction	Effective	
	Vegetation removal would be conducted in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock</i> (RTA 2011).	During construction	Effective	
	Re-use of large woody debris must be managed in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> (RTA 2011) to minimise loss or damage to native flora and fauna habitats.	During construction	Effective	
	Native vegetation would be re-established in accordance with <i>Guide 3: Re-establishment of native vegetation</i> (RTA 2011).	Post construction	Effective	
	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Removal of threatened species habitat and habitat features (e.g. hollow-bearing tree removal)	Habitat removal would be minimised through detailed design.	Detailed design	Effective	Loss of one hollow-bearing tree.
	Habitat removal will be conducted in accordance with <i>Guide 4</i> .	During construction	Effective	
	<p>Fauna handling must be carried out in accordance with the requirements stipulated within <i>Guide 9: Fauna handling</i> (RTA 2011).</p> <p>An ecologist or similar is to supervise the clearing of the hollow-bearing tree present.</p> <p>If any native species are present, the licenced ecologist or a wildlife carer must collect the animal and relocate it locally. If injured, the animal would be taken to a local veterinarian or wildlife carer for treatment.</p> <p>Exotic injured wildlife would be taken to a local veterinarian and ethically euthanised.</p>	During construction	Effective	
	Re-use of large woody debris must be managed in accordance with <i>Guide 5</i> .	During construction	Effective	
	The unexpected species find procedure is to be followed.	During construction	Proven	
Removal of threatened plants	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	None

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Aquatic impacts	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management, Update 2013</i> (DPI 2013).	During construction	Effective	None
	Erosion and sediment controls per the CEMP will be followed.	During construction	Effective	
	Vehicles and construction equipment will be regularly maintained and checked for leaks; while all re-fuelling of vehicles and equipment will be carried out in an impervious bunded area located more than 50 m from any river or drainage line	During construction	Effective	
Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones</i> (RTA 2011).	During construction	Effective	None
Injury and mortality of fauna	Fauna would be managed in accordance with <i>Guide 9</i> .	During construction	Effective	None
	Inspections for the presence of any sheltering native species would be carried out under vehicles and machinery prior to their use.	During construction	Effective	None
Invasion and spread of weeds	Weed species would be managed in accordance with <i>Guide 6: Weed management</i> (RTA 2011) and the <i>Biosecurity Act 2015</i> .	During construction	Effective	None beyond the current situation.
Invasion and spread of pests	Pest species would be managed within the proposal site.	During construction	Effective	None beyond the current situation.

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Invasion and spread of pathogens and disease	Pathogens would be managed in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and <i>Guide 7: Pathogen Management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	None
Noise, light and vibration	Noise and vibration impact would be minimised through detailed design.	Detailed design	Effective	Minor increase in noise and vibration during construction.

7 Offset strategy

7.1 Quantification of offset or revegetation requirements

TfNSW is committed to offsetting impact associated with a proposal in line with its biodiversity offsetting guidelines (Roads and Maritime 2016) and in general accordance with the OEH principles for the use of biodiversity offsets in NSW.

The Guideline for Biodiversity Offsets V2.0 (Roads and Maritime 2016) provides offset thresholds which are appropriate and proportional for the scale of EP&A Act Division 5.1 assessments, and the activity's expected impact on biodiversity. Table 1, within Section 4.2 of the biodiversity offsetting guidelines, outlines the offsetting thresholds for REFs. The thresholds relevant to this proposal are outlined within Table 7-1.

Given the outcomes of Table 7-1, a biodiversity offset strategy is not required.

Table 7-1: Biodiversity offset thresholds

Description of activity or impact	Consider offsets or supplementary measures	Subject species/Subject EEC meeting threshold
Activities in accordance with Roads and Maritime Services Environmental assessment procedure: Routine and Minor Works (RTA 2011)	No	N/A
Works on cleared land, plantations, exotic vegetation where there are no threatened species or habitat present	No	N/A
Works involving clearing of vegetation planted as part of a road corridor landscaping program (this includes where threatened species or species comprising listed ecological communities have been used for landscaping purposes)	No	Only hybrid native or exotic plantings being removed. Landscaping not part of fauna dispersal corridor.
Works involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of an CEEC in moderate to good condition	N/A
Works involving clearing of nationally listed TEC or nationally listed threatened species habitat	Where clearing > one hectare of a TEC or habitat in moderate to good condition	N/A. No nationally listed TEC recorded.
Works involving clearing of NSW endangered or vulnerable ecological community	Where clearing > five hectares or where the ecological community is subject to an SIS	No. No listed TEC recorded.
Works involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the OEH Threatened Species Profile Database (TSPD)	Where clearing > one hectare or where the species is the subject of an SIS	No. One hollow-bearing tree to be removed.
Works involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH's Threatened Species Profile Database (TSPD)	Where clearing > five hectares or where the species is the subject of an SIS	No. One hollow-bearing tree to be removed.
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	No

8 Conclusion

A biodiversity assessment has been carried out along a 1.5 kilometre long section of Goonoo Goonoo Road between Jack Smyth Drive and Calala Lane, Tamworth, NSW; as part of the upgrade of the New England Highway.

By the completion of the field investigation no TECS or threatened flora or fauna (terrestrial or aquatic) species, or their populations, listed or currently being considered for listing under the EPBC, BC or FM Acts were recorded. Similarly, none were considered likely to occur or rely upon the habitat to be disturbed/removed for any of their necessary lifecycle requirements.

No assessments referring to the criteria provided in the EPBC Act's 'Significant Impact Guidelines', Section 7.3 of the BC Act or Part 7A, Division 12, Subdivision 221ZV of the FM Act were considered necessary. Therefore, the proposal does not trigger a SIS (or alternatively a BDAR), while referrals under the EPBC Act are no longer required for TfNSW proposals under Part 5 of the EP&A Act in accordance with the Strategic Assessment process.

Based on a worst-case estimate, the proposal would require the disturbance/removal of up to about 5.5 ha of native vegetation, including the removal of one hollow-bearing tree.

Mitigation measures have been recommended to reduce any ecological impact as a result of the proposed work. Two primary measures include:

- Minimising impact through detail design.
- Adhering to the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

Based on the principles of Ecologically Sustainable Development, as identified in Schedule 2 of the Environmental Planning and Assessment Regulation, the following recommendations are provided:

- Prepare a CEMP to limit soil erosion and sediment transfer off-site.
- A pre-clearing survey of the paddock between No.404 Goonoo Goonoo Road and the Tamworth Southside Uniting Church to be used for part of the proposed work should be conducted prior to any ground work in this area commencing. This investigation should be undertaken to confirm that the paddock is highly degraded and of little ecological value.
- Endeavour to retain the mature hollow-bearing tree within the layout of the compound site. The remaining semi-mature eucalypt trees can be cleared.
- Ensure that, if the hollow-bearing tree requires clearing, that an ecologist or similar be present on site to supervise its removal and collect, and relocated locally, any sheltering native species if these are present. Exotic species are to be taken to a local veterinarian for euthanising. Any injured native species are to be cared for by a local wildlife carer/veterinarian.
- Limit vegetation clearing to the minimum required to successfully complete the proposal.
- Identify the limits of clearing; these should be provided to the construction contractor, identified both on site maps/plans and on site through the erection of temporary fencing, bunting or similar. Para-web material and star pickets (Type 3 fencing in Guide 2 of RTA 2011) is suitable in this situation. Fencing etc. should be established at the outer limits of the drip line of any retained trees present. These areas should be marked as 'no-go zones'.
- Any native fauna injured during the course of the construction works should be taken to a local veterinarian or wildlife carer for treatment.
 - Any introduced species should be collected and taken to a local veterinarian for euthanising.
- Store/park vehicles and machinery in designated areas devoid of shrub and canopy species.

With adherence to those recommendations provided in this report, no ecological constraints to the proposal proceeding as planned were identified or considered likely to occur.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

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Appendix A - Photographic record of area investigated



Character of the exotic grassland and associated infrastructure along the southbound lane in the vicinity of Greg Norman Drive. Photo taken looking south.



Character of the intersection with Greg Norman Drive. Photo looking north-west.



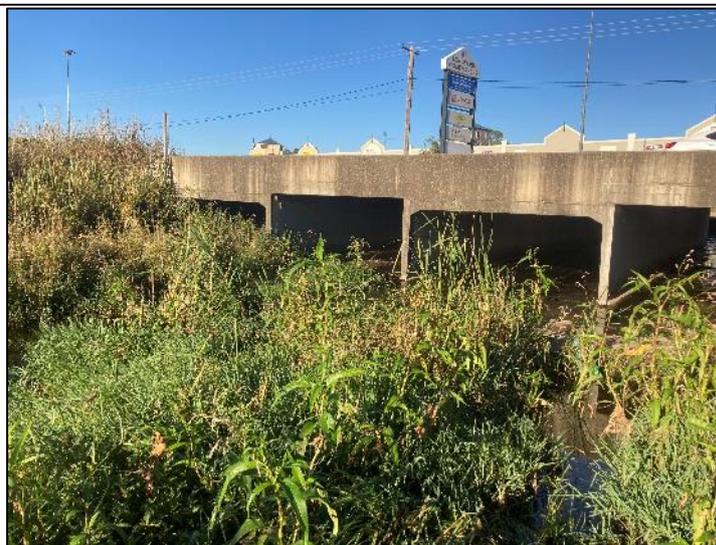
Photo taken looking north-west across Goonoo Goonoo Road in the vicinity of Greg Norman Drive.



Character of the road reserve vegetation adjacent to the southbound lane of Goonoo Goonoo Road, just north of Greg Norman Drive. Photo taken looking south.



Character of the maintained road reserve vegetation adjacent to the southbound lane. Photo taken looking north towards the culvert present.



Character of the culvert (eastern and western sides, respectively) about 115 m north of Craigends Lane along Goonoo Goonoo Road.



Character of the mature Yellow Box (*Eucalyptus melliodora*) located within the southbound lane road reserve. Photo taken looking north.



Photo taken looking north along Goonoo Goonoo Road.



Photo taken looking north along Goonoo Goonoo Road towards the northern extent of the proposed road work.



Photo taken looking south along Goonoo Goonoo Road from near the northern extent of the proposed road work.

Appendix B - Habitat assessment table

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important lifecycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important lifecycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10 km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important lifecycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.

Key

V - vulnerable

E - endangered

CE - critically endangered

EP - endangered population

M - migratory

Species underlined are those which only the EPBC PMST predicted as having habitat in the search area. All other species have been recorded within 10 km of the study area.

As these habitats are not present, no pelagic, estuarine or wetland species have been considered in the following table.

Given that the proposed work is not located within the Commonwealth marine area, this being from 3 to 200 nautical miles from the coast, no species listed as marine under the EPBC Act have been considered; nor has the marine status of any species been acknowledged.

* - habitat requirements were generally extracted from DAWE (2021a) OEH (2021a), Harden (1992-2002), Frith (2007), Churchill (2008), Cogger (2014) and Van Dyck and Strahan (2008), with other references used being identified in the bibliography.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Endangered Ecological Communities					
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions.	E	E	The Brigalow community is a low woodland or forest community dominated by Brigalow (<i>Acacia harpophylla</i>), with pockets of Belah (<i>Casuarina cristata</i>) and Poplar Box (<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>). The canopy tends to be quite dense and the understorey and ground cover are only sparse. Scattered remnants on the North West Slopes and Plains and Darling River Plains in NSW; also in Queensland. Usually occurs on heavy clay soils.	(EES 2021) PMST	Low. Suitable soils available but remnant trees suggest that the community never occurred in the locality. Not identified in the study area.
Howell Shrublands in the New England Tableland and Nandewar Bioregions.		E	This community is confined to areas of extensive granite outcropping. A community usually dominated by low shrubs, particularly <i>Babingtonia densifolia</i> and Granite Homoranthus <i>Homoranthus prolixus</i> , with a range of other shrubs, forbs and grasses also present. The mix of species at a site changes over time, and occasionally all the shrubs may be absent, giving the community a grassland structure, or various eucalypts and cypress pine may be present, giving a low open shrubby woodland structure. In the Nandewar bioregion Howell Shrublands are associated with Black Cypress Pine - Tumbledown Red Gum - Caley's Ironbark shrubby open forest, Caley's Ironbark - Orange Gum - Black Cypress Pine shrubby open forest on acid volcanics and White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest. Also associated with heathy shrublands.	(EES 2021)	Low. Granite outcropping does not occur in the study area and none of the associated vegetation formations occur. Not identified in the study area.
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar	E	E	Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, <i>Eucalyptus microcarpa</i> (Inland Grey Box), is often found in association with <i>E. populnea</i> subsp. <i>bimbil</i>	(EES 2021) PMST	Low. The soils of the locality are derived from Carboniferous and

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Peneplain, Nandewar and Brigalow Belt South Bioregions.			<p>(Bimble or Poplar Box), <i>Callitris glaucophylla</i> (White Cypress Pine), <i>Brachychiton populneus</i> (Kurrajong), <i>Allocasuarina luehmannii</i> (Bulloak) or <i>E. melliodora</i> (Yellow Box), and sometimes with <i>E. albens</i> (White Box).</p> <p>There is a correlation between the distribution of <i>Eucalyptus microcarpa</i> communities and soils of Tertiary and Quaternary alluvial origin, largely corresponding with the Red Brown Earths.</p> <p>The majority of remnant patches of Inland Grey Box Woodland survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification.</p>		<p>Devonian era sedimentary geology.</p> <p>None of the characteristic tree species occur in the study area or in the nearest mapped native vegetation communities.</p> <p>Not identified in the study area.</p>
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions.	E	E	<p>A low, dense form of dry rainforest generally less than 10 m high, made up of vines and rainforest trees as well as some shrubs.</p> <p>The main canopy is dominated by rainforest species such as Red Olive Plum (<i>Cassine australis</i> var. <i>angustifolia</i>), Wilga (<i>Geijera parvifolia</i>) Native Olive (<i>Notelaea microcarpa</i> var. <i>microcarpa</i>) and Peach Bush (<i>Ehretia membranifolia</i>), with taller eucalypts and cypress pines from surrounding woodland vegetation emerging above the main canopy. Currant Bush (<i>Carissa ovata</i>) is often present and typical vines include Gargaloo (<i>Parsonsia eucalytophylla</i>) and Wonga Vine (<i>Pandorea pandorana</i>).</p> <p>This community often occurs on rocky hills, in deep, loam, high nutrient soils derived from basalt or other volcanic rocks, in areas which are sheltered from frequent fire.</p>	(EES 2021) PMST	<p>Low.</p> <p>The topography, geology and soils associated with the community does not occur in the study area or the locality and associated vegetation types do not occur.</p> <p>Not identified in the study area.</p>

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived native grassland	CE	CE	<p>This ecological community is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box <i>Eucalyptus albens</i>, Yellow Box <i>E. melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i>, with a generally grassy understorey.</p> <p>Commonly co-occurring eucalypts include Apple Box (<i>E. bridgesiana</i>), Red Box (<i>E. polyanthemos</i>), Red Stringybark (<i>E. macrorhyncha</i>), Coastal Grey Box (<i>E. moluccana</i>), Candlebark (<i>E. rubida</i>), Bundy (<i>E. gonioocalyx</i>), Youman's Stringybark (<i>E. youmanii</i>) and others.</p> <p>The understorey in intact sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include Kangaroo Grass (<i>Themeda triandra</i>), Poa Tussock (<i>Poa sieberiana</i>), wallaby grasses (<i>Rytidosperma</i> spp.), spear-grasses (<i>Austrostipa</i> spp.), Common Everlasting (<i>Chrysocephalum apiculatum</i>), Scrambled Eggs (<i>Goodenia pinnatifida</i>), Small St John's Wort (<i>Hypericum gramineum</i>), Narrow-leafed New Holland Daisy (<i>Vittadinia muelleri</i>) and blue-bells (<i>Wahlenbergia</i> spp.).</p> <p>Shrubs are generally sparse or absent, though they may be locally common.</p> <p>A highly variable community that has been heavily cleared and is now highly fragmented.</p>	(EES 2021) PMST	<p>High.</p> <p>Expected to have occurred in the study area and locality prior to clearing and farming activities. Yellow Box and possibly Blakely's Red Gum occurs in the study area.</p> <p>Existing vegetation does not meet condition threshold for EPBC Act purposes.</p> <p>Identified as occurring in the study area.</p>
Natural grasslands on basalt and fine-textured alluvial plains	CE	E ⁵	<p>Mainly a native grassland community which includes a range of small forb and herb species. The main grass species include Plains Grass (<i>Austrostipa aristiglumis</i>), Queensland Bluegrass (<i>Dichanthium</i></p>	PMST	<p>Low.</p> <p>Although the study area and the locality may have been</p>

⁵ Listed as Native Vegetation on Cracking Clay Soils of the Liverpool Plains under the BC Act.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
<u>of northern New South Wales and southern Queensland</u>			<p><i>sericeum</i>) and Coolibah Grass (<i>Panicum queenslandicum</i>). It also contains scattered and patchy shrubs and trees, including Boree (<i>Acacia pendula</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Fuzzy Box (<i>Eucalyptus conica</i>), Bimble Box (<i>E. populnea</i>) and Yellow Box (<i>E. melliodora</i>).</p> <p>Occurs on cracking clays derived from either basalt or quaternary alluvium in the Liverpool Plains, Moree Plains and Darling Downs. Generally dominated by <i>Austrodanthonia</i>, <i>Austrostipa</i>, <i>Bothriochloa</i>, <i>Chloris</i>, <i>Enteropogon</i>, or <i>Themeda</i> grass genera.</p>		<p>vegetated by a grassland community, the soils of the locality are not derived from basalt or Quaternary alluvium.</p> <p>Not identified in the study area.</p>
<u>New England Peppermint (<i>Eucalyptus nova-anglica</i>) Grassy Woodlands</u>	CE	CE ⁶	<p>A community dominated by trees of New England Peppermint <i>Eucalyptus nova-anglica</i> and occasionally Mountain Gum <i>E. dalrympleana</i> subsp. <i>heptantha</i>, around 8-20 m tall.</p> <p>Occurs in valley flats subject to cold air drainage in the New England Tablelands. The valley flats are composed of basaltic soils, fine-grained sedimentary and acid volcanic substrates with poorly drained loam-clay soils.</p>	PMST	<p>Low.</p> <p>The study area is outside the known or potential distribution of the community. Typical tree species absent.</p> <p>Not identified in the study area.</p>
<u>Weeping Myall Woodlands</u>	E	E ⁷	<p>Eastern parts of the alluvial plains of the Murray-Darling river system. Typically occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall. Community structure varies from low woodland and low open woodland to low sparse woodland or open shrubland, depending on site quality and disturbance history. The tree layer grows up to a height of about 10 m and invariably</p>	PMST	<p>Low.</p> <p><i>Acacia pendula</i> does not occur in the study area and was not observed in stands of native vegetation in the locality.</p> <p>Not identified in the study area.</p>

⁶ Listed as *New England Peppermint (Eucalyptus nova-anglica) Woodland on Basalts and Sediments in the New England Tableland Bioregion* under the BC Act.

⁷ Listed as Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions under the BC Act

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
			includes <i>Acacia pendula</i> (Weeping Myall or Boree) as one of the dominant species or the only tree species present. Not known from Tamworth LGA but may occur.		
PLANTS					
<u>Ooline</u> <i>Cadellia pentastylis</i>	V	V	Ooline is a medium-sized spreading tree usually about 10 m tall, and rarely to 25 m. It is very slow-growing. It forms a closed or open canopy mixing with eucalypt and cypress pine species. There appears to be a strong correlation between the presence of Ooline and low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth.	PMST	Low. No suitable habitat present due to high levels of long-term modification and disturbance. Not found during the survey.
<i>Callistemon pungens</i>	V		<i>Callistemon pungens</i> occurs in south-east Queensland and the northern tablelands of north-east NSW. In NSW, it occurs from near Inverell to the eastern escarpment in New England, along rocky watercourses usually with sandy granite (or occasionally basalt) creek beds, and generally among naturalised species.	PMST	As above.
Bluegrass <i>Dichanthium setosum</i>	V	V	Bluegrass is an upright grass less than 1 m tall. It has mostly hairless leaves about 2-3 mm wide. The flowers are densely hairy and are clustered together along a stalk in a cylinder-shape. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Flowering time is mostly in summer.	3 (EES 2021) PMST	Low. Potential habitat occurs and records nearby at Calala to the east, and also to the north-east at Tamworth Scenic Lookout park. Records are from natural grasslands dominated by native species, with one record from a disturbed area at the lookout where the species is thought to have been imported with topsoil.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
					Not found during the survey.
<u><i>Euphrasia arguta</i></u>	CE	CE	<p><i>Euphrasia arguta</i> is a root-parasitic herb to 35 cm high. It was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, <i>Euphrasia arguta</i> has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha.</p> <p>Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance. Local populations had also apparently declined at Nundle sites that had been disturbed twice within three years, in contrast with sites that were disturbed only once.</p> <p>Flowering occurs between January and April.</p>	PMST	<p>Low.</p> <p>No suitable habitat present due to high levels of long-term modification and disturbance.</p> <p>Not found during the survey.</p>
<u><i>Homoranthus prolixus</i></u>	V	V	<p>A horizontally spreading shrub about 80 cm high with the ends of the branches growing upwards and more or less glaucous leaves. Occurs in scattered locations between Inverell and Manilla. Grows in heath patches, in skeletal soil among crevices of granite outcrops. Red to yellow flowers occur from October to November.</p>	PMST	<p>Low.</p> <p>No suitable soils or rock outcrops occur and no habitat present.</p> <p>Not found during the survey.</p>
<u>Hawkweed</u> <u><i>Picris evae</i></u>	V	V	<p>A soft-stemmed annual plant to 130 cm tall with most of the leaves growing around the base of the plant.</p> <p>Known in NSW north from the Inverell area, in the north-western slopes and plains regions. It has also been collected from Oxley Scenic Lookout Park at Tamworth (however no valid records appear in the NSW BioNet Atlas).</p>	PMST	<p>Low.</p> <p>Recent collections have come from modified habitats including paddocks, but it is not known if these paddocks are subject to ploughing.</p>

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
			<p>All recent collections appear to come from modified habitats such as weedy roadside vegetation and paddocks. Soils are black, dark grey or red-brown soils, and reddish clay-loam or medium clay soils. Its main habitat is open Eucalypt forest.</p> <p>The flowering and fruiting period is mainly October to January, with a few plants collected in flower or fruit until May.</p>		<p>The NSW BioNet Atlas does not have a valid record for the Tamworth site.</p> <p>Not found during the survey.</p>
<p>a leek-orchid <i>Prasophyllum</i> sp. <i>Wybong</i> (<i>C.Phelps</i> ORG 5269)</p>	CE		<p>A ground orchid to 35 cm high. The species is only highly visible above ground during its flowering period.</p> <p>Natural populations are known from a total of five sites in NSW. These are near Boorowa, the Queanbeyan area, Ilford, Delegate and a newly recognised population c.10 km west of Muswellbrook. It also occurs at Hall in the Australian Capital Territory.</p> <p>Grows in open sites within Natural Temperate Grassland at the Delegate site.</p> <p>Also grows in grassy woodland in association with River Tussock (<i>Poa labillardieri</i>), Black Gum (<i>Eucalyptus aggregata</i>) and tea-trees (<i>Leptospermum</i> spp.) near Queanbeyan and within the grassy ground layer dominated by Kangaroo Grass (<i>Themeda triandra</i>) under Box-Gum Woodland at Ilford (and Hall, ACT).</p> <p>Apparently highly susceptible to grazing, being retained only at little-grazed travelling stock reserves (Boorowa & Delegate) and in cemeteries (near Queanbeyan, Ilford and Hall).</p> <p>Flowers in October at Boorowa and Ilford, and December at sites near Queanbeyan and Delegate.</p>	PMST	<p>Low.</p> <p>No suitable habitat present due to high levels of long-term modification and disturbance, including urban development in the existing road corridor and, ploughing and grazing in the adjacent paddock.</p> <p>Unlikely to have been noted during the survey due to the time of year.</p> <p>Not found during the survey.</p>

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	V	E	<p>Small to medium sized rainforest tree that grows to 8 m tall. Found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.</p> <p>It has also been cultivated as a popular garden plant for many decades and occurs in gardens across Australia.</p>	1 (EES 2021)	<p>Low.</p> <p>No suitable habitat present.</p> <p>The record from the Tamworth area is from a garden planting.</p> <p>Not found during the survey.</p>
Austral Toadflax <i>Thesium australe</i>	V	V	<p>Small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring.</p> <p>Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass.</p> <p>A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.</p> <p>Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia.</p>	PMST	<p>Low.</p> <p>No suitable habitat present.</p> <p>Not found during the survey.</p>
<i>Tylophora linearis</i>	E	V	<p>A slender, almost hairless twiner with a clear sap. Leaves are dark green and linear. Flowers are purplish in radiating groups of 3-8. Fruit is cigar shaped and up to 100 mm long. Flowers in spring, with flowers also recorded in November or May.</p> <p>Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of <i>Eucalyptus fibrosa</i>, <i>Eucalyptus sideroxylon</i>,</p>	PMST	As above.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
			<i>Eucalyptus albens</i> , <i>Callitris endlicheri</i> , <i>Callitris glaucophylla</i> and <i>Allocasuarina luehmannii</i> . Also grows in association with <i>Acacia hakeoides</i> , <i>Acacia lineata</i> , <i>Melaleuca uncinata</i> , <i>Myoporum</i> species and <i>Casuarina</i> species.		
MAMMALS					
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	E	V	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	5 (EES 2021) PMST	Low. No suitable habitat present.
Koala <i>Phascolarctos cinereus</i>	V	V	Open eucalypt forest and woodland, containing a variety of 'preferred' food tree species.	10 (EES 2021) PMST	As above.
<u>Greater Glider</u> <i>Petauroides volans</i>	V		Largely restricted to eucalypt forests and woodlands, utilising tree hollows.	PMST	As above.
Squirrel Glider <i>Petaurus norfolcensis</i>		V	Inhabits woodlands and dry sclerophyll forests, usually in diverse stands of shrubs and trees. Shelters and breeds in tree hollows, and is primarily an insectivorous animal but, has also been known to ingest plant exudates.	4 (EES 2021)	As above.
<u>Brush-tailed Rock-wallaby</u> <i>Petrogale penicillata</i>	V	E	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	PMST	As above.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	25 (EES 2021) PMST	As above.
<u>Large-eared Pied Bat</u> <i>Chalinolobus dwyeri</i>	V	V	Cave-roosting bat that forages in timbered woodland and dry sclerophyll forest.	PMST	As above.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
<u>Corben's Long-eared Bat</u> <i>Nyctophilus corbeni</i>	V	V	Inhabits a variety of vegetation types, including mallee, bulloke and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST	Suitable habitat recorded; however, this species would not be reliant upon those environments to be disturbed by the proposed work for any of its lifecycle requirements.
BIRDS					
Australian Brush-turkey population in the Nandewar and Brigalow Belt South Bioregions <i>Alectura lathami</i>		EP	A population of the Australian Brush-turkey is known from the Nandewar and Brigalow Belt South Bioregions. Recent records for the species show the population to range from north east of Warialda, to Narrabri, approximately 115 km to the south-west, and occur within the local government areas of Yallaroi, Bingara, Narrabri, Barraba and Moree Plains. Usually prefers dry rainforest that is found within the Semi-evergreen Vine Thicket.	2 (EES 2021)	Low. No suitable habitat present.
<u>Australasian Bittern</u> <i>Botaurus poiciloptilus</i>	E	E	Occupies shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of <i>Typha</i> sp., <i>Juncus</i> sp. and <i>Phragmites</i> sp. Nests on platforms of reeds and rushes, usually built over water in dense cover.	PMST	As above.
<u>Red Goshawk</u> <i>Erythrotriorchis radiatus</i>	V	CE	Very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. In NSW, preferred habitats include mixed subtropical rainforest, <i>Melaleuca</i> swamp forest and riparian <i>Eucalyptus</i> forest of coastal rivers.	PMST	As above.
Square-tailed kite <i>Lophoictinia isura</i>		V	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	1 (EES 2021)	As above.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
<u>Osprey</u> <i>Pandion haliaetus</i>	M	V	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	PMST	As above.
<u>Grey Falcon</u> <i>Falco hypoleucos</i>	V	E	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	PMST	As above.
Black Falcon <i>Falco subniger</i>		V	Found along tree-lined watercourses and in isolated stands of trees, mainly in arid and semi-arid areas.	3 (EES 2021)	As above.
Little Eagle <i>Hieraaetus morphnoides</i>		V	Occupies open eucalypt forest, woodland or open woodland. Sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW are also used.	2 (EES 2021)	As above.
<u>Australian Painted Snipe</u> <i>Rostratula australis</i>	E	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	PMST	As above.
Little Lorikeet <i>Glossopsitta pusilla</i>		V	Forages primarily in the open Eucalypt forest and woodland canopies, particularly along water courses; occasionally in Angophoras, Melaleucas and other tree species, also riparian habitats are used.	1 (EES 2021)	As above.
Swift Parrot <i>Lathamus discolor</i>	CE	E	Eucalypt forests. When over-wintering on the mainland, this species is dependent on winter-flowering eucalypt species.	2 (EES 2021) PMST	As above.
<u>Superb Parrot</u> <i>Polytelis swainsonii</i>	V	V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	PMST	As above.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Turquoise Parrot <i>Neophema pulchella</i>		V	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	1 (EES 2021)	As above.
Powerful Owl <i>Ninox strenua</i>		V	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.	1 (EES 2021)	As above.
<u>White-throated Needletail</u> <i>Hirundapus caudacutus</i>	V, M		Almost exclusively aerial. Takes insects on wing over a range of habitat types. Recorded most often above wooded areas, including open forest and rainforest.	PMST	As above.
<u>Fork-tailed Swift</u> <i>Apus pacificus</i>	M		Summer migrant that does not land in Australia. Almost exclusively aerial. Takes insects on wing over a range of habitat types, but also less than 1 m above open areas or over water. Mostly occur over inland plains but sometimes above foothills or in coastal areas.	PMST	As above.
<u>Regent Honeyeater</u> <i>Anthochaera phrygia</i>	CE	CE	Inhabits dry open forest and woodland. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	PMST	As above.
<u>Painted Honeyeater</u> <i>Grantiella picta</i>	V	V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	PMST	As above.
<u>Yellow Wagtail</u> <i>Motacilla flava</i>	M		Open country near swamps, salt marshes and sewage ponds.	PMST	As above.
<u>Rufous Fantail</u> <i>Rhipidura rufifrons</i>	M		Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts.	PMST	As above.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
<u>Satin Flycatcher</u> <i>Myiagra cyanoleuca</i>	M		Mainly inhabit eucalypt forests, often near wetlands or watercourses.	PMST	As above.
Diamond Firetail <i>Stagonopleura guttata</i>		V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum <i>Eucalyptus pauciflora</i> Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	1 (EES 2021)	As above.
REPTILES					
<u>Pink-tailed worm-lizard</u> <i>Aprasia parapulchella</i>	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass. Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	PMST	Low. No suitable habitat present.
Border Tick-tailed Gecko <i>Uvidicolus sphyrurus</i>	V	V	Often occurs on steep rocky or scree slopes, especially granite. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey.	6 (EES 2021) PMST	As above.
<u>Bell's Turtle</u> <i>Wollumbinia belli</i>	V	E	Found only in the upper reaches of the Namoi, Gwydir and Border Rivers systems on the escarpment of the North West Slopes of NSW, this turtle occupies shallow to deep pools in upper reaches or small tributaries of major rivers in granite country. Most typically uses narrow stretches of river 30 - 40 m wide, running through grazing land. Nests are dug out in a sandbank.	PMST	As above.

Common Name (Scientific Name)	EPBC Act	BC Act/ FM Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
AMPHIBIANS					
<u>Booroolong Frog</u> <i>Litoria booroolongensis</i>	E	E	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	PMST	Low. No suitable habitat present.
FISH					
<u>Murray Cod</u> <i>Maccullochella peelii</i>	V		Utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs.	PMST	Low. No suitable habitat present.

Appendix C - Flora species recorded

Key

* - introduced species.

HP – horticultural or garden ornamental planting.

S - significant weed.

Family	Scientific Name	Common name
MAGNOLIOPSIDA - DICOTYLEDONS		
Aceraceae	<i>Acer buergerianum</i> * HP	Trident Maple
Adoxaceae	<i>Viburnum</i> sp. *HP	a Viburnum cultivar
Apiaceae	<i>Foeniculum vulgare</i> *	Fennel
Apocynaceae	<i>Nerium oleander</i> * HP	Oleander
Asteraceae	<i>Centaurea solstitialis</i> *	St Barnabys Thistle
	<i>Conyza bonariensis</i> *	Tall Fleabane
	<i>Gazania</i> sp. * HP	Gazania
	<i>Hypochaeris radicata</i> *	Catsear
	<i>Sonchus oleraceus</i> *	Common Sowthistle
	<i>Tagetes minuta</i> *	Stinking Roger
	<i>Xanthium</i> sp. *	a Nagoora Burr
Casuarinaceae	<i>Casuarina cunninghamiana</i> HP	River She-Oak
Chenopodiaceae	<i>Atriplex</i> sp. HP	a saltbush
Fabaceae (Faboideae)	<i>Medicago</i> sp. *	a Medic
	<i>Trifolium</i> sp. *	a Clover
	<i>Trifolium repens</i> *	White Clover
Gentianaceae	<i>Centaurium tenuiflorum</i> *	
Geraniaceae	<i>Geranium solanderi</i> var. <i>solanderi</i>	Austral Cranesbill
Lythraceae	<i>Lagerstroemia</i> sp. * HP	Crepe Myrtle
Myrtaceae	<i>Acmena</i> sp. HP	a Lilly Pilly hybrid
	<i>Callistemon</i> sp. HP	a Bottlebrush
	<i>Eucalyptus ?blakelyi</i>	Blakely's Red Gum
	<i>Eucalyptus melliodora</i>	Yellow Box
	<i>Eucalyptus</i> sp. HP	a flowering gum
	<i>Melaleuca ?rigidus</i> HP	a Honey Myrtle
Oleaceae	<i>Fraxinus griffithii</i> * HP	Flowering Ash
	<i>Fraxinus</i> sp. * HP	an Ash cultivar
Plantaginaceae	<i>Plantago lanceolata</i> *	Lamb's Tongue
	<i>Veronica anagallis-aquatica</i> *	Blue Water Speedwell
Plumbaginaceae	<i>Plumbago auriculata</i> *	Blue Plumbago
Polygonaceae	<i>Persicaria lapathifolia</i>	Pale Knotweed
Proteaceae	<i>Grevillea robusta</i> HP	Silky Oak
	<i>Grevillea</i> sp. HP	a Grevillea cultivar
Sapindaceae	<i>Acer negundo</i> * HP	Box Elder
Verbenaceae	<i>Verbena incompecta</i> *	Verbena
MAGNOLIOPSIDA – MONOCOTYLEDONS		
Arecaeae	<i>Phoenix canariensis</i> * HP	Canary Island Palm
Cyperaceae	<i>Cyperus congestus</i> *	a Rice Sedge
Lomandraceae	<i>Lomandra longifolia</i> HP	Spiny-headed Mat Rush
Poaceae	<i>Cenchrus clandestinus</i> *	Kikuyu
	<i>Chloris gayana</i> *	Rhodes Grass
	<i>Cymbopogon refractus</i>	Barbed-wire Grass
	<i>Cynodon dactylon</i>	Common Couch
	<i>Echinochloa</i> sp. *	a Barnyard Grass
	<i>Echinopogon intermedius</i>	Erect Hedgehog Grass
	<i>Eleusine indica</i> *	Crowsfoot Grass

Family	Scientific Name	Common name
	<i>Eragrostis curvula</i> *	African Lovegrass
	<i>Hordeum leporinum</i> *	Barley Grass
	<i>Lolium rigidum</i> *	Ryegrass
	<i>Panicum</i> sp. *	a Panic Grass
	<i>Paspalum dilatatum</i> *	Paspalum
	<i>Poa annua</i> *	Winter Grass
	<i>Poa labillardieri</i>	Tussock
	<i>Setaria ?pumila</i> *	Pale Pigeon Grass
	<i>Triticum aestivum</i> *	Wheat
Typhaceae	<i>Typha orientalis</i>	Broadleaf Cumbungi

