# Tamworth Regional Council

## Lands Adjacent to Glen Artney Industrial Area

## Flora and Fauna Assessment

February 2015

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# Appendices

# 1. Introduction

## 1.1 Overview

GHD Pty Ltd (GHD) has been engaged by Tamworth Regional Council to complete an Ecology Assessment to investigate the potential rezoning of lands adjacent to Glen Artney Industrial Area, near Tamworth NSW (the proposal). This Ecology Assessment describes the ecological values at the site, with particular emphasis on threatened ecological communities, populations and species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *Fisheries Management Act 1994* (FM Act), and *Matters of National Environmental Significance* (MNES) listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). Broad impacts of the proposed rezoning are considered, and mitigation measures recommend to ameliorate potential impacts of the proposal are included in Section 5 of this report.

The Study Area locality plan is shown on Figure 1.

## 1.2 Terms and definitions

The following terms are used in this report:

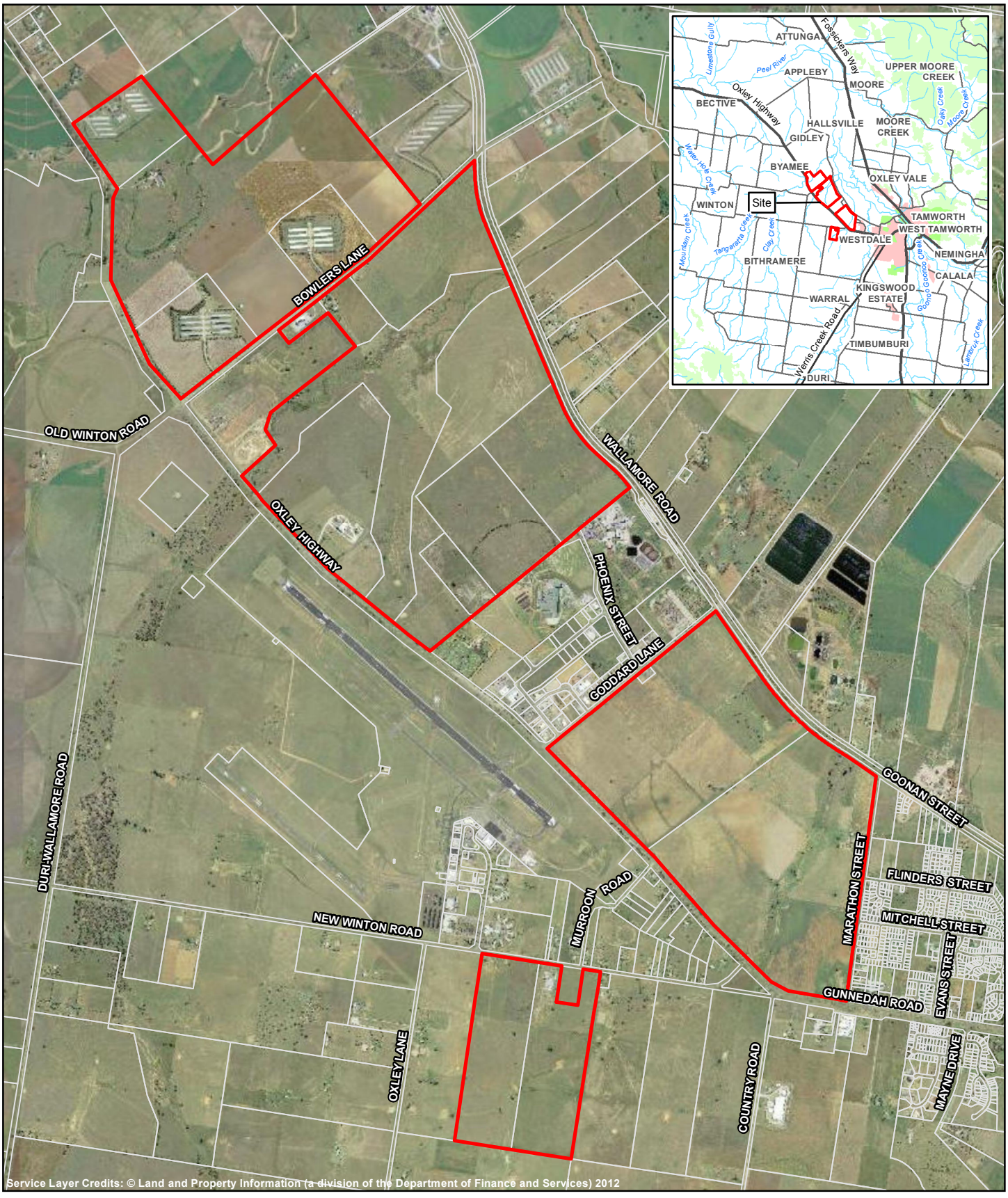
| | |
|---|---|
| **The proposal** | The proposed rezoning of lands adjacent to Glen Artney Industrial Estate at Tamworth, NSW. |
| **Study Area** | Refers to the area surveyed as part of this ecological assessment. |
| **Proposed impact area** | The area likely to be directly impacted by the proposal. In this case it comprises the all of the study area other than those areas recommended to be protected as conservation areas. |
| **Locality** | The area within a 20 km radius of the proposal. |
| **Threatened biota** | Threatened species, populations and communities that are listed under the TSC Act, FM Act and/or the EPBC Act. |



## 1.3 Scope of assessment

The aim of this ecology assessment report is to:

- Describe the existing environment of the study area, including flora species, vegetation communities, fauna habitats and flora and fauna species known or likely to occur.
- Assess the value and conservation significance of native vegetation and habitats in the study area and the likelihood of occurrence of threatened biota based on the habitats present.
- Compile a list of threatened biota previously recorded, or predicted to occur in the locality and an assessment of their potential to occur in the study area and/or be affected by the proposal.
- Provide a preliminary assessment of potential impacts of the proposed rezoning.
- Recommend conservation areas and mitigation measures to reduce potential impacts on biodiversity values.




LEGEND

- Site Boundary
- Cadastre

DRAFT

Paper Size A4

0 0.125 0.25 0.5 0.75 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Tamworth Regional Council
Glen Artney Industrial Rezoning Studies

| | |
|---|---|
| Job Number | 22-17246 |
| Revision | B |
| Date | 17 Dec 2014 |

Site Plan

Figure 1

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G:\22\17246\GIS\Maps\Deliverables\Ecology\2217246_E001_SitePlan_B.mxd



Data source:LPI: Aerial Imagery 2014, DCDB & DTDB 2012. Created by: fmackay, tmorton

# 2. Legislative context

## 2.1 NSW legislation

### 2.1.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act forms the legal and policy platform for development proposal assessment and approval in NSW and aims to, inter alia, 'encourage the proper management, proposal and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and EP&A Regulation 2000. Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the TSC Act and the FM Act. The '7-part test' is used to assist in the determination of whether a proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required.

Any development of the study area would require detailed assessment of impacts on threatened biota under Section 5A or an application for a biobanking statement (see TSC Act below).

### 2.1.2 Threatened Species Conservation Act 1995 (TSC Act)

The TSC Act provides legal status for biota of conservation significance in NSW. The Act aims to, inter alia, 'conserve biological diversity and promote ecologically sustainable proposal'. It contains schedules that list endangered, critically endangered and vulnerable species, populations, ecological communities, and key threatening processes in NSW. Potential impacts on any of this biota must be subject to an impact significance assessment ("7-part test) through the provisions of Section 5A of the EP&A Act or a biobanking statement under Part 7A of the TSC Act.

Part 7A of the TSC Act establishes the biodiversity banking and offsets scheme (BioBanking). Under Part 7A a proponent may obtain a 'biobanking statement' for a development which means that Section 5A of the EP&A Act does not apply to that development. . A biobanking statement is issued under Section 127ZL of the TSC Act and specifies the number and class of biodiversity credits to be retired for a particular development in accordance with the BioBanking assessment methodology (BBAM) in order to achieve an 'improve or maintain' outcome for biodiversity values. The statement may include other conditions to minimise the impact of the development on biodiversity values. If provided to a consent or determining authority under the EP&A Act, the statement must be included as a condition of development consent or approval.

### 2.1.3 National Parks and Wildlife Act 1979

The National Parks and Wildlife Act 1974 (NPW Act) provides the basis for the legal protection of native animals and plants in NSW. A wildlife licence is required under the NPW Act to harm or pick protected fauna and flora. All field surveys were carried out under a Section 132C scientific licence (SL100146).

The area proposed for rezoning is not located in an area of national park estate.

### 2.1.4 Fisheries Management Act 1994 (FM Act)

The FM Act contains schedules that list endangered, critically endangered and vulnerable aquatic species, populations, ecological communities, and key threatening processes of relevance to aquatic environments. The proposed rezoning does not involve any dredging or reclamation that would require specific consideration under the Act As for biota listed under the TSC Act, potential impacts on any of these species must be addressed through 7 part tests in accordance with Section 5A of the EP&A Act. If a significant impact is likely, an SIS must be completed and a licence obtained pursuant to Part 7a of the FM Act.

### 2.1.5 Noxious Weeds Act 1993 (NW Act)

The NW Act provides for the declaration of noxious weeds by the Minister for Primary Industries. Noxious weeds may be considered noxious on a National, State, Regional or Local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the NW Act. As such, if present, noxious weeds on the site should be assessed and controlled.

There are four noxious weed species present in the study area, all of which would require management as outlined in Section 4.3.2.

### 2.1.6 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) and *Native Vegetation Regulation 2005* guide the way native vegetation is managed in NSW by preventing broadscale clearing, unless it improves or maintains environmental outcomes.

Under the current land zoning a permit would be required under the NV Act to remove vegetation at the site.

## 2.2 NSW policies and guidelines

### 2.2.1 Local Environment Plan

The lands adjoining the Glen Artney Industrial area fall within the *Tamworth Regional Council Local Environment Plan 2010* (the LEP). It is currently zoned as RU1 Primary Production, RU4 Primary Production small lots and E3 Environmental Management under the LEP.

The general intent of the LEP is to conserve and manage the natural environment of the Tamworth Regional LGA.



## 2.3 State environmental planning policies

### 2.3.1 SEPP 44: Koala Habitat

State Environmental Planning Policy 44 (SEPP 44) aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus)* to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'.

Schedule 1 of SEPP No. 44 identifies Council areas where the SEPP applies.

SEPP No. 44 classifies areas of land as being 'Core Koala Habitat' or 'Potential Koala Habitat. They are defined as follows:

- Core Koala Habitat is an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.
- Potential Koala Habitat' are areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component.

The Tamworth Regional LGA is not listed on Schedule 1 of the SEPP 44. Whilst SEPP 44 does not apply to Part 5 activities, the potential for Koalas to occur in the study area was assessed during field surveys and potential impacts on the Koala have been considered in this report. Although no evidence of koalas was observed in the study area, potential koala habitat trees listed under schedule 2 (*Eucalyptus albens* and *E. melliodora*) are present within the study area and the Koala is known to occur in the locality.

### 2.3.2 Native Vegetation Act 2003 (NV Act)

The *Native Vegetation Act 2003* (NV Act) regulates the clearing of native vegetation on all land in NSW except for land listed in Schedule 1 of the Act. Excluded land under Schedule 1 of the Act includes National Parks and other conservation areas, State forests and reserves, and urban areas. Specifically, urban areas, which are excluded, include areas zoned residential (but not rural residential), village, township, industrial or business.

As the study area does not occur on excluded lands listed under Schedule 1 of the NV Act. An approval under the Act from the North West Local Land Services would be required for the removal of any native vegetation within the study area.

## 2.4 Commonwealth legislation

### 2.4.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on MNES undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, undertaking, proposal or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Government Minister for the Environment (the 'Minister').

The EPBC Act identifies MNES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development

Potential impacts on any MNES must be subject to assessments of significance pursuant to the Department of the Environment (DotE) *Significant Impact Guidelines* (DotE 2013). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Commonwealth Environment Minister. The subject contains potential habitat for a number of MNES and/or their habitat and so assessments of significance for MNES considered to have the potential to occur in the study area would be required. Formal assessments of impacts in accordance with the DotE (2013) guidelines would need to be undertaken as part of any future development application.

# 3. Methods

## 3.1 Desktop assessment

A desktop assessment was undertaken to identify threatened flora and fauna species, populations and ecological communities listed under the TSC Act and FM Act, and MNES listed under the EPBC Act that may be affected by the proposed rezoning. Database records pertaining to the study area and locality (i.e. within a 20 km radius of the study area) were reviewed and included:

- NSW Office of Environment and Heritage (OEH) Wildlife Atlas database for records of threatened species listed under the TSC Act (OEH 2014a; data downloaded on 8 May 2014).
- Department of the Environment (DotE) Protected Matters Online Search Tool for MNES listed under the EPBC Act and predicted to occur in the locality (DotE 2014a; database queried on 5 May 2014)
- Department of Primary Industries (DPI) Threatened Species Records Viewer (DPI 2014; database queried 5 May 2014) for threatened species listed under the FM Act and recorded within the Namoi catchment.
- NCMA (2009) *Regional Vegetation Communities in the Namoi Catchment* to identify vegetation communities previously mapped as occurring within the site.
- OEH (2013b) *NSW Vegetation Types Database* to define vegetation types within the study area.
- SMK Consultants (2007). *Threatened Species Assessment for Lot 2 DP 816346 and Lot 46 DP 755333, Parish of Murroon*. This report was reviewed to determine potential vegetation and threatened species that may occur on properties that were not able to be accessed during this survey.



The habitat resources present within the study area (determined during the site inspection) were compared with the known habitat associations/requirements of the relevant threatened and migratory biota identified by the desktop review. This assessment was used to determine the likelihood of each threatened ecological community, endangered population and threatened or migratory species occurring within the study area. The results of this assessment are presented in Appendix C.

## 3.2 Field survey

### 3.2.1 Overview

A four-day field survey was conducted by two ecologists between the 30 June and 3 July 2014. In addition a two day survey was also undertaken between the 15 December and 16 December 2014. This survey consisted of ground-truthing existing vegetation mapping, flora quadrats, fauna habitat mapping, threatened species searches and opportunistic observations of flora and fauna species. No detailed fauna survey was included as part of this assessment (i.e fauna trapping, call playback, Anabat survey etc.).

#### *Terrestrial Flora Survey*

Flora survey locations were selected using a combination of aerial imagery, review of previous vegetation mapping for the area and field habitat assessments. The flora survey sampled representative sites for each of the vegetation types occurring within the study area.

The flora survey involved the following techniques, which are described in detail below:

- Quadrat surveys
- Vegetation mapping
- Targeted threatened flora surveys

### *Quadrat Surveys*

Seventeen 20 x 20 metre quadrats were positioned randomly within eight vegetation types identified within the study area. The information recorded in these quadrats was used to identify and describe representative vegetation types, identify TECs and determine the conservation status of vegetation types under the TSC and EPBC Acts.

All vascular plants (i.e. not mosses, lichens or fungi) identified within quadrats were recorded on proforma field data sheets. Plant specimens that could not be identified rapidly in the field were collected and subsequently identified using the Flora of NSW (Harden 1991-2000). Plant specimens which were problematic to identify (either insufficient sample collected or no reproductive material available at the time of the survey) were identified to genus level.

Information regarding vegetation structure and disturbance history was also recorded at each quadrat location.

The locations of flora quadrats were recorded using a Trimble hand-held geographical positioning system (GPS) and are shown in Figure 2.

### *Vegetation Mapping*

Native vegetation within the study area was initially assigned a vegetation community name based on observed floristic and structural characteristics. Intact native vegetation communities were then further defined using the Regional Vegetation Community (RVC) map units of the Namoi CMA (NCMA 2009). Exotic or highly modified native vegetation was defined based on structure and species composition. All vegetation types were then mapped using aerial photographic interpretation within a geographical information system (GIS) as guided by the field survey results.

Each mapped vegetation type was assigned a NSW Vegetation type (OEH 2013a) based on dominant species and landscape position. RVC vegetation types mapped by the NCMA and the corresponding NSW vegetation type are shown in Table 4-2.

Vegetation types within the study area were then assessed against identification criteria for State and Commonwealth listed threatened ecological communities (Critically Endangered Ecological Communities [CEECs] and Endangered Ecological Communities [EECs]). Vegetation and habitats were compared with descriptions provided in OEH (2014c) and DotE (2014b) profiles.

### *Targeted threatened flora surveys*

Targeted surveys were undertaken for threatened flora species identified during the desktop review which could potentially occur within the study area given known distributions, previous records in the locality and habitat requirements for each species. Random meander transects, according to the methods of Cropper (1993), were focused in areas of proposed impact in potentially suitable habitat and within immediately adjoining vegetation.

## 3.3 Terrestrial fauna survey

A variety of survey techniques were used to detect fauna within the study area with a focus on threatened fauna species and potential fauna habitat. Descriptions of these survey techniques are provided below.

### 3.3.1 Fauna habitat assessment

General fauna habitat assessments were undertaken throughout the study area, including active searches for potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, the density of understorey vegetation, the composition of ground cover, presence of hollow-bearing trees, leaf litter and ground debris were noted.

The condition of the habitat within the study area was taken into consideration, including previous and existing land use practices and the effects on current vegetation cover, notably previous clearing and historical and current agricultural use.

Indicative habitat criteria for targeted threatened species (i.e. those determined as having the potential to occur within the study area following the TSC and EPBC Act database searches) were identified prior to fieldwork. Habitat criteria were based on information provided in OEH and DotE threatened species profiles, field guides, and the knowledge and experience of GHD field ecologists. Habitat assessment assists in the compilation of a comprehensive predictive list of fauna within the vicinity of the study area, rather than relying solely on single event surveys that are subject to seasonal limitations and may only represent a snapshot of assemblages present.

Habitat assessments included active searches for the following:

- Trees with bird nests or other potential fauna roosts
- Burrows, dens and warrens
- Distinctive scats or latrine sites (of particular relevance for the Spotted-tailed Quoll), owl white wash and regurgitated pellets under roost sites
- Tracks or animal remains
- Evidence of activity such as feeding scars, scratches and diggings
- Potential roost sites for microchiropteran bats such as bridges and caves
- Specific food trees and evidence of foraging.

The locations of significant habitat features were captured with a handheld Trimble GPS unit and photographed where appropriate.

### 3.3.2 Hollow-bearing tree assessments

Mapping of hollow-bearing trees within the study area was undertaken across the study area. All hollow bearing tees were mapped using a hand held trimble and notes taken regarding the number and size of hollows present.

### 3.3.3 Diurnal bird surveys

Targeted surveys for diurnal birds were undertaken in all habitat types present with emphasis on those habitats utilised by threatened species. Targeted bird surveys were conducted by an ecologist at dusk. Surveys followed the area search method, and birds were identified by observation with binoculars and/or call identification. Diurnal bird surveys also included searches for habitat features of relevance for particular threatened species, including searching for evidence of feeding (e.g. *Allocasuarina* chewed cones, signs of Glossy Black-cockatoo (*Calyptorhynchus lathami*) foraging) and signs of bird presence, such as pellets, whitewash, nests etc.

### 3.3.4 Opportunistic observations

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. Survey effort was concentrated on suitable areas of habitat throughout the course of the flora survey, for instance fallen timber was scanned for reptiles and paddock trees and dams were scanned for roosting birds and nests.

### 3.3.5 Aquatic habitat assessment

A rapid appraisal of aquatic habitat and riparian condition was undertaken for watercourses within the study area. These assessments aimed to identify habitat values and likely habitat for threatened and common biota, and to assist with identification of potential constraints and guide mitigation and management measures. Aquatic fauna surveys, such as macroinvertebrate and fish sampling, were not undertaken as part of the ecological assessment as they did not form part of the scope of works.



## 3.4 Likelihood of occurrence of subject species

Following collation of database records and species and community profiles a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the study area. This was further refined following field surveys. The likelihood of threatened and migratory biota occurring in the study area was assessed based on presence of records from the locality, species distribution and habitat preferences, and quality of potential habitat present in the study area. The results of this assessment are provided in Appendix C.

Table 3-1 provides a key to the likelihood of occurrence in the study area of threatened biota known or likely to occur in the locality.

**Table 3-1 Key to Likelihood of Occurrence for Threatened Species**

| Likelihood | Definition |
|---|---|
| Likely | Species previously recorded within a 20 kilometre radius of the study area and suitable habitat occurs within the study area. |
| Possible | Species previously recorded within a 20 kilometre radius of the study area but only marginal suitable habitat recorded, OR<br>Species not previously recorded within a 20 kilometre radius of the study area, but the study area is within the species known distribution and suitable habitat occurs within the study area. |
| Unlikely | Species previously recorded within a 20 kilometre radius of the study area but no suitable habitat recorded. |
| Nil | Species not previously recorded within a 20 kilometre radius of the study area, suitable habitat not recorded within subject, and/or study area outside species known distribution. |

### 3.4.1 Survey limitations

The survey was undertaken during winter and early summer and as such, it is likely that some species that utilise the study area (permanently, seasonally or transiently) were not detected during the survey. These species are likely to include flora species that are difficult or impossible to locate or identify at this time of year due to a lack of reproductive material and/or the seasonal nature (in particular, native orchids and forbs).

The desktop assessment provided an indication of the native flora and fauna and especially threatened biota that could potentially occur in the study area or be affected by any subsequent development (including seasonal, transient or cryptic species). The habitat assessment conducted for the study area allows for identification of habitat resources for such species. As such, the survey was not designed to detect all species, rather to provide an overall assessment of the ecological values of the study area in order to predict potential impacts on endangered ecological communities, threatened species and their habitats.

Survey effort undertaken to date would be insufficient to inform any future development of the study area. It is anticipated that further survey effort would be undertaken to meet the requirements of these assessment processes, and would include detailed fauna surveys (including Anabat, spotlighting, call playback etc) as well as targeted searches for threatened species identified as having the potential to occur within the study area.

It was outside the scope of works for this assessment to undertake assessments of significance in accordance with Section 5A of the EP&A Act and DotE Significant Impact Guidelines 1.1 Matters of National Environmental Significance. These would need to be undertaken for all threatened biota with a moderate or high likelihood of occurrence as part of any future development proposal.



## 3.5 Staff Qualifications

This report was prepared by Arien Quin based on field surveys conducted by GHD ecologists and review of existing information. The assessment was peer reviewed by Vanessa Owen. Staff qualifications are presented in Table 3-2.

Table 3-2 Staff qualifications

| Name | Position/Project Role | Qualifications | Relevant Experience |
|---|---|---|---|
| Arien Quin | Ecologist / site surveys and reporting | BA, Bsc (Botany, Anthropology & Development Studies)<br>BioBanking Assessor Accreditation | 8+ years |
| Kaycee Simuong | Ecologist / site surveys | BEnvSc, (Environmental Management) | 1+ years |
| Vanessa Owen | Senior Ecologist/Technical review | B Env Sc B Sc (Hons) | 13+ years |

# 4. Existing environment

## 4.1 Site context

### 4.1.1 Location and land Uses

The study area is comprised of 17 privately owned primary production and residential lots located approximately 9 km to the north west of the Tamworth Central Business District (CBD) directly north east of the Tamworth Airport on the Oxley Highway. (Figure 1).

The site falls within the Namoi Catchment Management Authority (CMA), and within the Nandewar Bioregion.

A summary of the zoning, as designated in the Tamworth Regional Local Environmental Plan (LEP 2010), and a brief description of each lot within the study area is provided in Table 4-1.

Table 4-1 Study Area zoning summary

| Lot | Zoning | Description |
|---|---|---|
| 43 DP 812458 | RU1 – Primary Production | Poultry farm. |
| 421 DP 855694 | RU1 – Primary Production | Poultry farm. |
| 22 DP 1121473 | RU1 – Primary Production | Poultry farm. |
| 41 DP 812458 | RU1 – Primary Production | Poultry farm. |
| 21 DP 1121473 | RU1 – Primary Production | Cropping/grazing land and small residence. |
| 41 DP 1129256 | RU1 – Primary Production | Flour mill. |
| 100 DP 1097471 | RU1 – Primary Production | Cropping/grazing land and poultry processing plant. |
| 101 DP 1097471 | E3 – Environmental Management | Cropping/grazing land. |
| 102 DP 1097471 | RU1 – Primary Production | Cropping/grazing land and small residence. |
| 6 DP 1007859 | RU1 – Primary Production | Cropping/grazing land. |
| 19 DP 871833 | RU1 – Primary Production | Former hydroponic farm. |
| 17 DP 865930 | RU1 – Primary Production | Grazing land and livestock exchange centre. |
| 431 DP 577935 | RU1 – Primary Production | Cropping/grazing land. |
| 2 DP 816346 | Northern portion: IN3 – Heavy Industrial.<br>Southern portion: RU4 – Primary Production Small Lots | Cropping/grazing land and small residence. |

| Lot | Zoning | Description |
|---|---|---|
| 2 DP 816346 | RU4 – Primary Production Small Lot | Cropping/grazing land |
| 462 DP 1178998 | RU4 – Primary Production Small Lot | Cropping/grazing land and small residence. |
| Lot 6 DP 710048 | RU4 – Primary Production Small Lot | Grazing land |
| Lot 5 DP710048 | RU4 – Primary Production Small Lot | Grazing land |

The surrounding land use to the site consists of primary production lots consisting of cropping and grazing lands, heavy industrial lots comprising the Glen Artney Industrial Estate, rural residential areas, Tamworth Regional Airport, and a recreational motorcycle racetrack to the south west of Bowlers Lane.

Historic land uses within the study area appear to include grazing, livestock keeping and timber felling and collecting. The area includes areas of derived native grassland, woodland, cropped paddocks, exotic grasslands and farm dams.

### 4.1.2 Climate

The Tamworth airport weather station is the nearest weather stations to the study area. The Tamworth weather station is located approximately 500m north of the study area. Tamworth has a mild climate, with a daily mean maximum temperature of approximately 24 degrees Celsius and a mean daily minimum temperature of approximately 10 degrees Celsius (BOM 2014). Rainfall is generally weakly seasonal with higher rainfall months occurring in summer and lower rainfall months in late winter to early spring. The mean annual rainfall for Tamworth is 673.2 mm (BOM 2014).



### 4.1.3 Hydrology

The study area contains three semi-permanent creeklines, which run through the site in a north to north easterly direction. These creeks include Tangaratta Creek, Bolton's Creek and Murroon Creek all of which flow into the Peel River which is located approximately 600 metres downstream of the site.

Both Bolton's Creek and Tangaratta creek contain dense aquatic vegetation dominated by Typha and Juncus spp. Large sections of Bolton's Creek have been revegetated as part of the North Bolton's Creek Grassy Box Woodland Conservation Project.

Murroon Creek, which is situated in the southeast of the study area has been highly degraded through past and present land use practices including land clearing and grazing.

Surface runoff generated within the study area is expected to either infiltrate into surface soils or runoff into local drainage channels, small onsite depressions or onsite dams.

### 4.1.4 Soil landscape and geology

Reference to the 1:100,000 *Soil Landscape Sheet of the Tamworth Region*, published by the NSW Department of Land and Water Conservation (Banks, 2001), indicates that the majority of the study area is characterised by the Duri (du) unit. Creeks within the study area are characterised by the Warral Station (ws) unit.

The Duri soil landscape unit comprises extensive undulating to rolling low hills and hills on sedimentary rocks of the Duri Hills. The landscape is mostly cleared open woodland and grassland used for agriculture. Local relief is less than 100 m and slopes are less than 10%. Soils are noted to be extremely complex due to rapid changes in underlying lithology . These soils are generally dominated by duplex soils such as moderately deep, well-drained Red and Brown Cromosols with minor occurrences of Rudosols around rock outcrops. Other soils less common include deep imperfectly drained Red Vertosols (Red Clays) and deep to very deep, imperfectly drained Red and Brown Sodosols in drainage lines (Banks 2001).

The Warral Station unit comprises drainage plains, small alluvial plains and fans on alluvium derived from sedimentary rocks of the Duri hills. The landscape is woodland and open woodland with approximately 70% cleared for grazing. Local relief is less than 30 m and slopes are 0.2 to 2%. Soils are noted to be diverse and virtually random in distribution according to stream deposition patterns.  Soil types include very deep moderately well drained Red Dermosols, or Mottled Subnatric Brown Sodosols (Solodic Soils), very deep moderately drained Red Dermosols; very deep, poorly drained Brown Vertosols (Brown Clays); very deep imperfectly drained Red Vertosols (Red Clats)' very deep moderately well-drained Calcic Calcorosols (calcareous Cernozems) and occasional Black Vertosols (Black Earths).

Reference to the Tamworth 1:250, 000 Geological Series Sheet SH 56-13 compiled by the Geological Survey of New South Wales (Offenberg, 1967) and published by the NSW Department of Mines, indicates that a number of geological units of the Upper Devonian Period underlie the study area. Geological units include the Mandowa Mudstone (mudstone and arenite), Keepit Conglomerate (conglomerate and greywacke) and Baldwin formation (argillite and greywacke).

### 4.1.5 Mitchell landscape

The study area occurs within the Tamworth-Keepit Slopes and Plains Mitchell Landscape (DECC, 2008a). This landscape unit contains extensive areas of undulating to rolling slopes and plains with low hills and ranges forming the western fall of the New England plateau. Elevation in this landscape is generally between 500 to 800 m ASL with a local relief of 250 m (DECC 2008b). The vegetation is characterised by grass woodland with *Eucalyptus melliodora* (Yellow Box), *E. albens* (White Box), *E. blakelyi* (Blakely's Red Gum), *Acacia salicina* (Cooba) and *A. implexa* (lightwood) common on lower slopes. *Eucalyptus melliodora* (Yellow box) and *Angophora floribunda* (Rough barked apple) dominant on flats and *Casuarina cunninghamiana* (River Oak) along major streams with *E. camaldulensis* (River Red Gum) also common to the west (DECC 2008b).

The geology of this Mitchell Landscape consists of folder and faulted sedimentary and metamorphic rocks with minor interbedded volcanics. Rock types include Silurian-Devonian cert, slate, phyllite, tuff, schist and Carboniferous conglomerate, sandstone, mudstone, andesite and small areas of limestone (DECC 2008b).

## 4.2 Flora species

A total of 176 plant species was recorded within the study area (99 native, 77 exotic). A full list of flora identified within the study area is included in Appendix A.

These results suggest that the study area contains a moderate diversity of native plants. It is likely that if additional surveys were undertaken at a different time of year (e.g. late winter or early spring), a greater diversity of native plants, in particular native herbs would be recorded.

No threatened plants were recorded within the study area during the assessment. The likelihood of occurrence in the study area of threatened flora species previously recorded in the locality is discussed in Section 4.4.

## 4.3 Vegetation and habitat

### 4.3.1 Vegetation types

***Overview***

Nine vegetation types occur within the study area. Descriptions of each of these vegetation types are provided below and there occurrence within the study area mapped in Figure 2. Table 4-2 provides as summary of vegetation type, their conservation status and area within the site.

Three of the vegetation types within the study area comprise local occurrences of threatened ecological communities (TECs) listed under the TSC Act (see Table 4-2 and Section 4.4).

The majority of the study area is characterised by undulating to rolling low hills and alluvial plains and fans on alluvium derived from sedimentary rocks, which supports derived native grasslands with scattered paddock trees. This vegetation type is a derived grassland form of White Box Yellow Box Blakely's Red Gum Woodland, which is listed as an endangered ecological community (EEC) under the TSC Act. There are also small patches of the woodland form of this community on the plains surrounding Bolton's and Tangaratta Creeks.

This vegetation type has been substantially degraded by previous grazing and clearing activities within the study area, and as such none of this community is of high enough quality to meet the condition thresholds for the equivalent EPBC listed community White Box Yellow Box Blakely's Red Gum Grassy Woodland and derived native grasslands.

The structure, species composition and condition of each of the vegetation types within the study area are described below.

Table 4-2 Vegetation types within the study area

| Vegetation Type (OEH, 2013a) | Veg Type ID (OEH 2013a) | Vegetation Type Namoi CMA Vegetation Mapping (NCMA 2009) | Veg Type ID (NCMA 2002) | Area (ha) | Conservation Significance |
|---|---|---|---|---|---|
| Plains Grass-Blue Grassland of the Nandewar and Brigalow Belt South Bioregions | NA 180 | Derived Grassland, Brigalow Belt South and Nandewar | RVC 28 | 305.8 | Some areas would constitute the derived grassland form of White Box Yellow Box Blakely's Red Gum Woodland EEC (TSC Act listed) Does not meet criteria for EEC listed on the EPBC Act. |
| White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions | NA 226 | White Box grassy woodland, Brigalow Belt South and Nandewar | RVC 18 | 4.0 | EEC listed on TSC Act (Woodland form of White Box, Yellow Box Blakely's Red Gum Grassy Woodland). Does not meet criteria for EEC listed on the EPBC Act. |

| Vegetation Type (OEH, 2013a) | Veg Type ID (OEH 2013a) | Vegetation Type Namoi CMA Vegetation Mapping (NCMA 2009) | Veg Type ID (NCMA 2002) | Area (ha) | Conservation Significance |
|---|---|---|---|---|---|
| River Red Gum Riverine Woodland and Forests in the Nandewar and Brigalow Belt South Bioregions | NA 193 | River Red Gum riverine woodlands and forests, Darling Riverine Plains, Brigalow Belt South and Nandawar | RVC 73 | 1.7 | Native vegetation |
| Cumbungi Rushland of Shallow Semi-permanent Waterbodies of the Inland River Systems | NA 133 | Tall rushlands, reedlands or sedgelands of inland river systems | RVC 95 | 14.8 | Native vegetation |
| Yellow Box – Blakely's Red Gum Grassy Woodland of the Nanderwar and Brigalow Belt South Bioregions | NA 237 | Box-Gum Grassy Woodlands Brigalow Belt South and Nanderwar | RVC 17 | 3.5 | EEC listed on TSC Act (Woodland form of White Box, Yellow Box Blakely's Red Gum Grassy Woodland) Does not meet criteria for EEC listed on the EPBC Act. |
| Couch Grass Grassland on Riverbanks and Floodplains of Inland River Systems | NA 132 | Grasslands on river banks and floodplains of inland river systems | RVC 24 | 1.5 | Native vegetation |
| Cropped Paddocks with Scattered Trees | N/A | N/A | N/A | 372.3 | |
| Predominately Exotic Vegetation | N/A | N/A | N/A | 152.2 | |
| Planted Natives | N/A | N/A | N/A | 15.9 | |
| Hardstand | N/A | N/A | N/A | 18.4 | |
| **Total area** | | | | **902.4** | |

### *Plains Grass-- Bluegrass Grassland of the Nandewar and Brigalow Belt South Bioregions (NA 180)*

This vegetation type comprises derived grassland that occurs as a result of clearing woodland or open forest vegetation. Prior to disturbance and large-scale land clearing associated with agricultural activities it is likely that either Yellow Box - Blakely's Red Gum grassy woodland or White Box Grassy Woodland would have occurred in these areas. The community is now simplified to grassland with scattered trees occasionally present. Within the study area the most common flora species include *Austrostipa aristiglumis* (Plains Grass), *Bothriochloa macra* (Red Grass), *Dichanthium sericeum* (Queensland Blue Grass), *Aristida scabra* (Purple Speargrass), *A. ramosa* (Speargrass) and *Rhytidosperma sp* (Wallaby Grass). A number of resilient herb species were also recorded within this vegetation type throughout the study area, including *Asperula conferta* (Common Woodruff), *Vittadinia cuneata subsp cuneata* (Fuzzweed),

*Chrysocephalum apiculatum* (Common Everlasting) and *Desmodium brachypodum* (Large Tick-trefoil). Scattered paddock trees within this vegetation type include *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and *Angophora floribunda (*Rough Barked Apple) (refer to Plate 1).

Across the study area this is the dominant vegetation type and predominantly occurs within grazed paddocks and on the plains surrounding Bolton's and Tangaratta Creeks.

The quality of this vegetation throughout the study area varies from low condition where there is only a few native grasses present to areas of moderate condition that contain a diversity of native grasses as well as a number of scattered trees, many of which contain hollows as well as a number of herbs species.

Common exotic species within this vegetation type include *Taraxacum officinalis* (Dandelion), *Cichorium intybus* (Chicory), *Centaurea solstitialis* (St Barnaby's Thistle), *Xanthium occidentale* (Noogoora Burr), *Verbena bonariensis* (Purpletop) and *Conyza* spp. (Fleabane).

Although the diversity of native flora species within this vegetation type is generally low. The majority of the areas where this vegetation occurs comply with the TSC Act definition of White Box Yellow Box Blakely's Red Gum grassy woodland EEC. That is they occur in the Nandewar Bioregion, are likely to have once supported White Box, Yellow Box or Blakely's Red Gum prior to being cleared and are dominated by native grasses (refer to Section 4.4.2).

At the time of the survey none of the areas assessed within this vegetation type contained sufficient species diversity, number of mature trees or natural regeneration of the overstorey to meet the criteria to be included in the EPBC Act listed CEEC White Box Yellow Box Blakely's Red Gum grassy woodland and derived native grasslands.

Along Bolton's creek there has been extensive areas revegetated with trees and shrubs that have been grown from seed collected from White Box Yellow Box Blakely's Red Gum grassy woodland located surrounding the nearby Westdale Wastewater Treatment Plant and Effluent Reuse Farm (Tamworth Regional Council 2013). At the time of the assessment the majority of these plantings were approximately 1.5 to 2 metres tall. Common species include *Eucalyptus camaldulensis* (River Red Gum), *E. albens* (White Box), *E. melliodora* (Yellow Box), *E. blakelyi* (Blakely's Red Gum), *Angophora floribunda* (Rough Barked Apple), *Acacia decora* (Pretty Wattle), *Acacia implexa* (Hickory Wattle), *Callistemon viminalis* (Weeping Bottlebrush), *C. sieberi* (River Bottlebrush), *Casuarina cunninghamiana* (River Oak) and *Leptospermum polygalifolium* (Tantoon).

Approximately 305.8 hectares of Plains Grass Bluegrass grasslands occurs within the study area.

Plate 1 Plains Grass – Bluegrass Grasslands surrounding Bolton's Creek

### *River Red Gum Riverine Woodland and Forests in the Nandewar and Brigalow Belt South Bioregions (NA 193)*

Within the study area, this vegetation type occurs as woodland dominated by *Eucalyptus camaldulensis* (River Red Gum) with scattered *E. melliodora* (Yellow Box) and *Angophora floribunda* (Rough Barked Apple). The shrub layer is mostly absent aside from localised occurrences of the noxious weed species *Lycium ferocissimum (*African Boxthorn). The understory consists of a diverse array of native grasses and herbs. Common species include *Austrostipa aristiglumis* (Plains Grass), *Bothriochloa macra* (Red Grass), *Dichanthium sericeum* (Queensland Blue Grass), *Aristida scabra* (Purple Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Cynodon dactylon* (Couch), *Glycine clandestinum (Twining Glycine)* and *Chrysocephalum apiculatum* (Common Everlasting) (refer to Plate 2).

This vegetation type occurs along the banks of the southern end of Tangaratta Creek. Within the study area it is generally in a relatively poor to moderate condition, with low structural diversity and high incidence of weeds.

This vegetation type is not listed as threatened under either the TSC or EBPC Acts for this area.

Approximately 1.7 hectares of Riverine Red Gum woodlands and forests occur within the study area.

Plate 2 River Red Gum riparian woodland along Tangaratta Creek

### *White Box Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions (NA 266)*

Within the study area white box grassy woodland occurs in two small patches within Lot 2 DP 816346 and Lot 462 DP 1178998. This vegetation is highly degraded and consist of remnant *Eucalyptus albens* (White Box) with occasional *E. melliodora* (Yellow Box), over a predominantly exotic understory that has been subject to ongoing grazing practices. Understorey species present include *Hordeum leporinum* (Barley Grass), *Paspalum dilatatum* (Paspalum), *Carthamus lanatus* (Saffron Thistle), *Polygonum aviculare* (Knotgrass) and *Echium plantagineum* (Patterson's Curse). There is also a variety of native grasses and herbs present these include *Cynodon dactylon* (Couch), *Einadia nutans* (Climbing Saltbush), *Glycine tabacina*, *Elymus scaber* (Wheat Grass), *Bothriochloa macra* (Redleg Grass), *Aristida ramosa* (Purple Wiregrass) and *Austrostipa aristiglumis* (Plains Grass).

Although this vegetation is highly degraded the definition of White Box –Yellow Box Blakely's Red Gum EEC explicitly recognises that some remnants area degraded and that highly disturbed sites that have few native species in the understorey are included in the EEC provided the soil seed bank is at least partially intact (NPWS 2002).

As the area where these patches of white box grassy woodland occur have not be subject to past cultivation it is assumed that the seed bank would be somewhat intact and as such this community would qualify as being listed as EEC under the TSC Act.

This vegetation type does not contain sufficient species diversity, number of mature trees or natural regeneration of the overstorey to meet the criteria to be included in the EPBC Act listed

CEEC White Box Yellow Box Blakely's Red Gum grassy woodland and derived native grasslands.

Within the study area this vegetation community covers an area of approximately 4.0

### *Yellow Box – Blakely's Red Gum Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions (NA 273)*

This vegetation types occurs as two small isolated patches along Bolton's and Tangaratta Creeks. The canopy is dominated by *Eucalyptus melliodora* (Yellow Box) and *Angophora floribunda* (Rough Barked Apple). The shrub layer is generally absent aside from localised occurrences of the noxious weed species *Lycium ferocissimum (*African Boxthorn) and *Rosa rubiginosa* (Briar Rose). The groundlayer of this community has been highly disturbed due to grazing and is dominated by the exotic species *Taraxacum officinalis* (Dandelion), *Echium plantagineum* (Patterson's Curse), *Cichorium intybus* (Chicory) and *Centaurea solstitialis* (St Barnaby's Thistle). Native groundstorey species occur in low abundance and include *Austrostipa aristiglumis* (Plains Grass), *Dichanthium sericeum* (Bluegrass), *Bothriochloa macra* (Redleg Grass) and *Aristida ramosa* (Purple Wiregrass) (Refer to Plate 3).

This community is commensurate with the TSC Act definition of White Box Yellow Box Blakely's Red Gum grassy woodland EEC.

Within the study area this vegetation type does not contain sufficient species diversity, number of mature trees or natural regeneration of the overstorey to meet the criteria to be included in the EPBC Act listed CEEC White Box Yellow Box Blakely's Red Gum grassy woodland and derived native grasslands.

Approximately 3.5 hectares of Yellow Box – Blakely's Red Gum Grassy Woodland occur within the study area.

Plate 3 Yellow Box Blakely's Red Gum grassy woodland west of Bolton's Creek

### *Cumbungi Rushland of Shallow Semi-permanent Water bodies of the Inland River Systems (NA 133)*

This vegetation type occurs within and along the margins of Tangaratta and Boltan's creeks. It is dominated by a dense cover of aquatic and semi-aquatic rushes, reeds and sedges. Dominant species include *Typha domingensis* (Narrow-leaved Cumbungi), *Eleocharis sphacelata* and *Juncus spp*. (Rush spp.) to 2 metres tall. This vegetation is typically in good condition although the exotic species *Paspalum dilatatum* (Paspalum), *Rumex crispus* (Curled Dock), *Cirsium vulgare* (Spear Thistle) and *Conyza bonariensis* (Flaxleaf Fleabane) were also common within this vegetation type. Along Bolton's creek there are also significant infestation of the noxious weed *Xanthium occidentale* (Noogoora Burr) (refer to Plate 4).

This vegetation type is not listed as threatened under either the TSC or EBPC Acts.

Approximately 14.8 hectares Cumbungi Rushland of Shallow Semi-permanent Water bodies occurs within the study area.

Plate 4 Common Reed-Bushy Groundsel Reedland / Forbland along margins of Tangaratta Creek

### *Couch Grass Grassland on Riverbanks and Floodplains of Inland River Systems (NA 172)*

Within the study area, couch grass grassland occurs as a small patch on the floodplains at the southern end of Tangaratta creek. It is dominated almost entirely by *Cynodon dactylon* (Couch Grass), with occasional *Chloris truncata* (Windmill Grass). Exotic species present within the community include *Trifolium subterraneum* (Subterraneum Clover) *Paspalum dilatatum* (Paspalum), *Rumex crispus* (Curled Dock), *Cirsium vulgare* (Spear Thistle) and *Conyza bonariensis* (Flaxleaf Fleabane). These weed species occur in moderate density throughout this vegetation type (refer to Plate 5.

This vegetation does not comprise a TEC listed under either the TSC or EPBC Acts.

Plate 5 Couch grass grassland on floodplain for Tangaratta creek

***Cropped Paddocks with Scattered Trees***

Lands surrounding the poultry farms west of Bowlers lane, northeast of the Tamworth Regional Livestock Exchange near Phoenix Street and east of Goodard Lane have been cultivated and planted with various grain crops and exotic pastoral grasses (refer to Plate 6). These areas are in poor condition and contain no native vegetation other than occasional scattered paddock trees. These trees are almost all mature and most contain numerous hollows.

Approximately 372.3 hectares of this vegetation types occurs within the study area.

Plate 6 Cropped Paddock northeast of Tamworth Regional Livestock Exchange

### *Predominately-Exotic Vegetation*

These areas have been cleared and probably subject to more severe grazing and/or exotic plant infestation, that has precluded native vegetation. Groundcover vegetation is predominantly exotic species such as *Rapistrum rugosum* (Turnip Weed), *Centaurea solstitialis* (St Barnaby's Thistle), *Paspalum dilatatum* (Paspalum), *Taraxacum officinalis* (Dandelion) and *Trifolium* spp. Patches of noxious and environmental weeds such as *Marrubium vulgare (*Horehound), *Urtica urens* (Small Nettle) and *Cirsium vulgare* (Spear Thistle) also occur throughout this vegetation type. There are occasional native understorey species such as *Austrostipa aristiglumis* (Plains Grass), *Bothriochloa biloba* (Lobed Bluegrass) and *Dichanthium sericeum* (Bluegrass) but these grasses generally comprise less than 10 percent cover (refer to Plate 7).

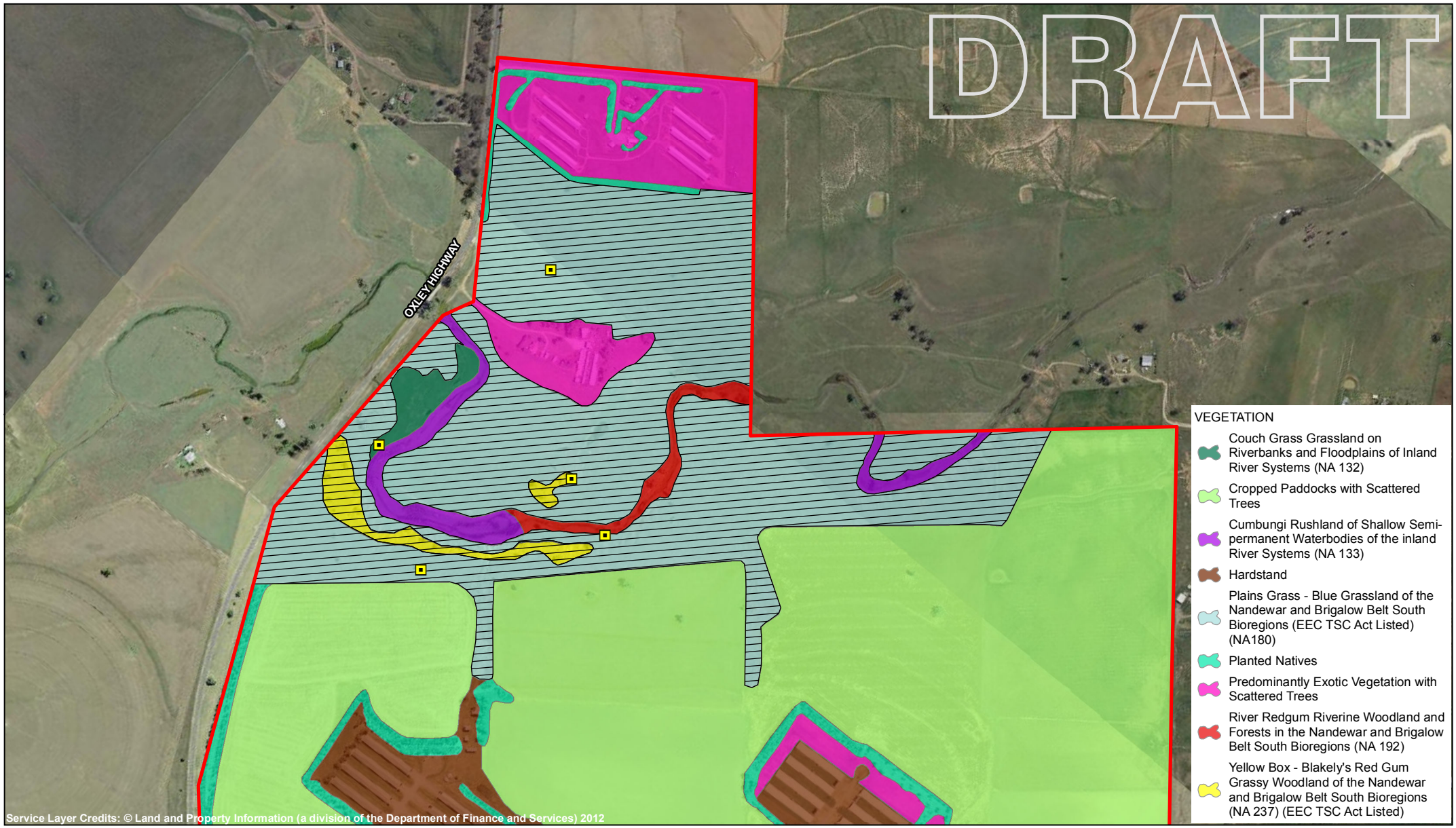
The study area contains approximately 152.2 hectares of this vegetation type.

Plate 7 Predominantly exotic vegetation south east of Bowlers Lane

### *Planted Natives*

The study area contains numerous areas that have been planted out with rows of native trees and shrubs. These plantings occur around the poultry farms to the north of Bowlers Lane, along the southern fence line of the Baiada Poultry rendering plant (Lot 100 DP 1097471) and along the fenceline of Lot 431 DP 577935. Common planted species include *Eucalyptus camaldulensis* (River Red Gum), *E. blakelyi* (Blakely's Red Gum), *E. cinerea* (Argyle Apple), *E. melliodora* (Yellow Box), *E. albens* (White Box), *E. melanophloia* (Silver Leaved Ironbark), *E. populneus* subsp. *bimbil* (Bimxle Box), *Casuarina cunninghamiana* (River Oak) and *Acacia baileyana* (Cootamundra Wattle) (refer to Plate 8).

Plate 8 Planted Natives near Lot 22 DP 1121471

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

- Site boundary
- Endangered Ecological Community
- Quadrat

SHEET LAYOUT

Tamworth Regional Council
Glen Artney Industrial Rezoning Studies

Job Number 22-17246
Revision B
Date 17 Dec 2014

# Vegetation and survey locations
Sheet 1 of 5

Figure 2a

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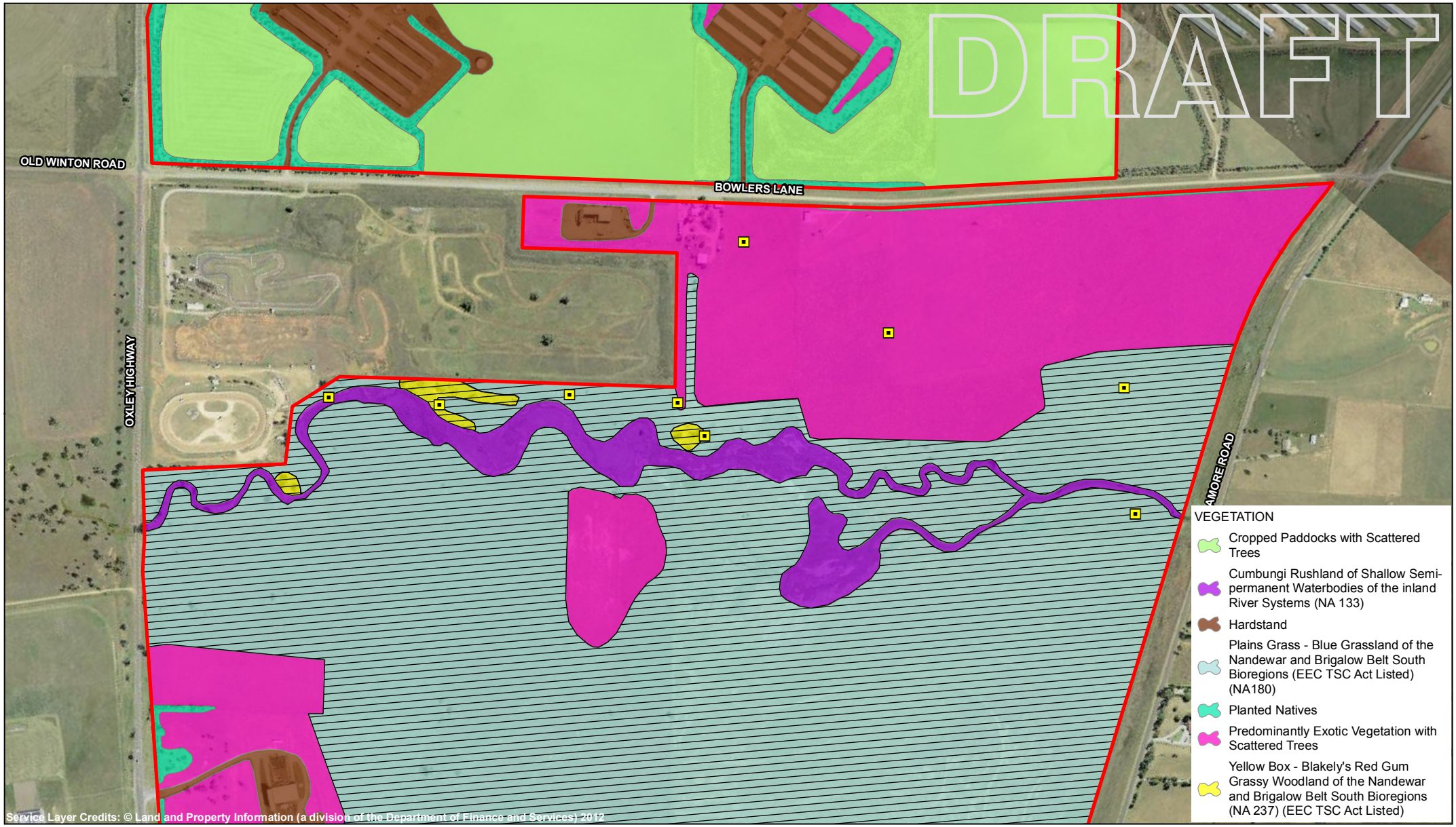
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au



Data source: LPI: Aerial Imagery 2014, DCDB & DTDB 2012.. Created by: fmackay, tmorton

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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

LEGEND

- Site boundary
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SHEET LAYOUT

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# Vegetation and survey locations
Sheet 2 of 5

Figure 2b

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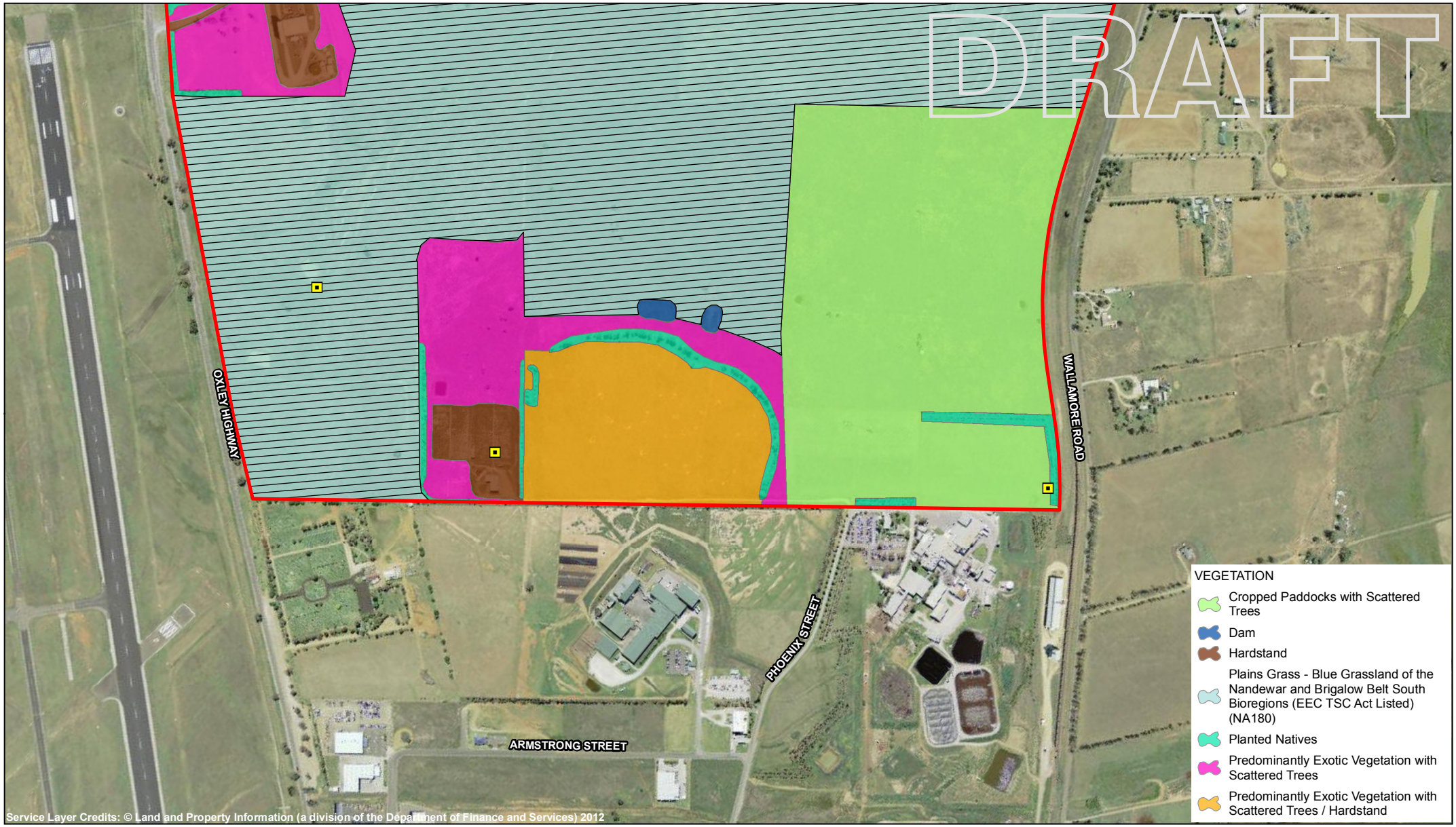


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Grid: GDA 1994 MGA Zone 56

LEGEND

- Site boundary
- Endangered Ecological Community
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SHEET LAYOUT

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# Vegetation and survey locations
Sheet 3 of 5

Figure 2c

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Data source: LPI: Aerial Imagery 2014, DCDB & DTDB 2012.. Created by: fmackay, tmorton


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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

Site boundary

Endangered Ecological Community

SHEET LAYOUT

Tamworth Regional Council
Glen Artney Industrial Rezoning Studies

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Vegetation and survey locations
Sheet 4 of 5

Figure 2d

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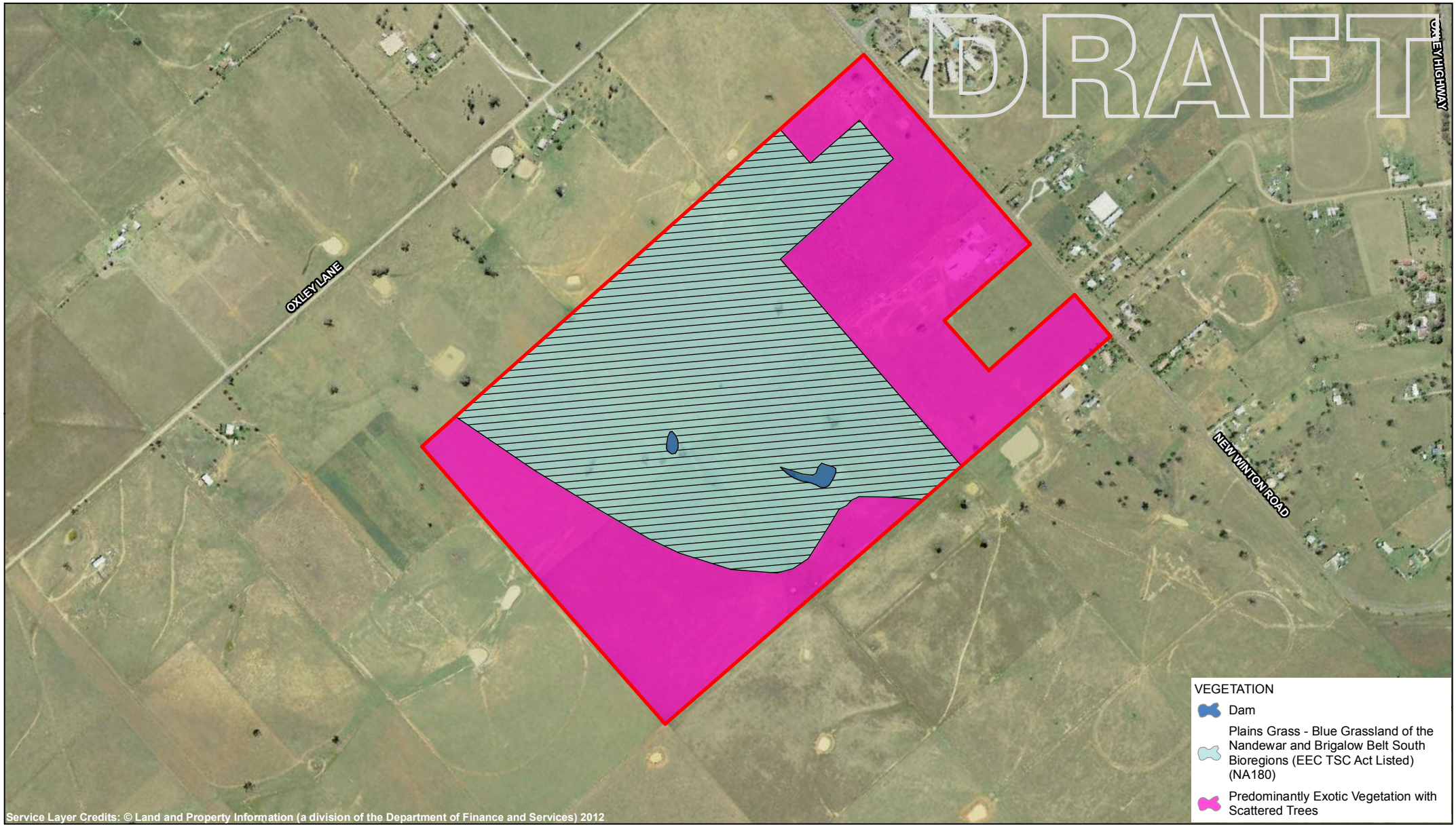
Data source: LPI: Aerial Imagery 2014, DCDB & DTDB 2012.. Created by: fmackay, tmorton




Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

Site boundary

Endangered Ecological Community

SHEET LAYOUT

Tamworth Regional Council
Glen Artney Industrial Rezoning Studies

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Revision B
Date 17 Dec 2014

# Vegetation and survey locations
Sheet 5 of 5

Figure 2e

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Data source: LPI: Aerial Imagery 2014, DCDB & DTDB 2012.. Created by: fmackay, tmorton

### 4.3.2 Noxious and environmental weeds

The *Noxious Weeds Act 1993* provides for the declaration of noxious weeds in local government areas. Landowners and occupiers must control noxious weeds according to the control category specified in the Act. Public authorities must control noxious weeds according to the control category to the extent necessary to prevent their spread to adjoining land.

The study area contains four species declared as noxious weeds in the Tamworth Regional LGA, as shown in Table 4-3. These noxious species occur in low densities throughout the study area although there are some dense infestations of *Xanthium occidental* (Noogoora Burr) along Bolton's Creek.

Wetlands and water bodies in the study area appear to be free of noxious aquatic weeds such as Alligator weed (*Alternanthera philoxeroides*) and Water Hyacinth (*Eichhornia crassipes*).

Table 4-3 Declared noxious weeds in Tamworth LGA recorded during the field survey

| Scientific Name | Common Name | Control category | Legal Requirements |
|---|---|---|---|
| *Lycium ferocissimum* | African Boxthorn | 4 | The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant reduces its numbers, spread and must not be sold propagated or knowingly distributed. |
| *Xanthium occidental* | Noogoora Burr | 4 | The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread. |
| *Rosa rubiginosa* | Sweet Briar | 4 | The growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction |
| *Senecio madagascariensis* | Fireweed | 4 | The plant must not be sold, propagated or knowingly distributed. |

### 4.3.3 Fauna habitats

Five broad fauna habitat types were recorded within the study area:

- Grasslands
- Grassy woodland.
- Creek lines and wetland habitats.
- Planted trees

The suitability of these habitats for native fauna is discussed below, with particular emphasis on habitat resources of relevance to threatened fauna. The majority of the site is generally in poor condition with low habitat complexity and as such is likely to support a low diversity of fauna species. Areas along creeklines are likely to support a moderate diversity of arboreal mammal and bird species. Species recorded were limited to those generalist species able to utilise disturbed agricultural land (however note that no targeted fauna surveys were undertaken). Native fauna species which have been sighted opportunistically are also mentioned: a list of opportunistic fauna sightings from the study area is included in Appendix B.

Figure 4 shows significant habitat features that were recorded in the field, including locations of hollow bearing trees, piles of large woody debris and waterbodies.

### *Grasslands*

The majority of the study area is dominated by derived and exotic grassland. As discussed in Section 4.3.1, these areas would have historically supported native woodland vegetation but have been extensively modified by previous clearing and agricultural activities.

Native grasses and herbs provide foraging resources for relatively mobile and opportunistic native fauna, including birds such as the Australian Magpie (*Cracticus tibicen*) and Galah (*Eolophus roseicapillus*) and mammals such as the Eastern Grey Kangaroo (*Macropus giganteus*) which were observed in the study area. Threatened birds such as the Diamond Firetail (*Stagonopleura guttata*), Scarlet Robin (*Petroica boodang*) and Turquoise Parrot (*Neophema pulchella*) may also occasionally utilise these areas to forage on native grass seed.

Birds of prey such as the Wedge-tailed Eagle (*Aquila audax*), the Nankeen Kestrel (*Falco cenchroides*), the Black-shouldered Kite (*Elanus axillaris*) and the Whistling Kite (*Haliastur sphenurus*) were observed foraging within grassland areas at various locations. It is possible that threatened raptors such as the Black Falcon (*Falco subniger*) and Square-tailed Kite (*Lophoictinia isura*) may also forage within these areas.

Grassland areas within the study area contain numerous large mature trees containing hollows of varying sizes, fissures or decorticating bark also occur within woodland patches. These resources may be used by a range of native fauna, including threatened birds, microbats and arboreal mammals. Examples of threatened species which may use such nesting or roosting sites include threatened birds such as Little Lorikeets (*Glossopsitta pusilla*), Turquoise Parrot (*Neophema pulchella*), and microbats such as the Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*).

The study area contains 165 large hollow bearing trees. A range of hollow sizes and shapes are present, catering for a variety of species. Around 320 vertebrate species use tree hollows and shedding bark in Australia, and the shelter provided by these habitat features is essential for the survival of many of these species (Lindenmayer 2012). A number of parrots and lorikeets were utilising these hollows at the time of the assessment.

Within grassland areas some fallen logs and piles of large wood debris were observed with varying sized hollows.  These piles are likely to provide habitat for lizards, skinks and other reptiles.

Leaf litter was not abundant and no termite mounds were recorded.

Plate 9 Example of hollow in Yellow Box

Plate 10 Pile of logs within grasslands

### *Grassy Woodland*

Open grassy woodlands occur as small scattered patches within the study area. Structural diversity of these patches is low with an absent shrub layer and disturbed groundlayer. Dominant canopy species include *Eucalyptus melliodora* (Yellow Box), *Eucalyptus albens* (White Box) and *Angophora floribunda* (Rough Barked Apple).

These patches constitute isolated remnants in a landscape that has been extensively cleared for agriculture.

Eastern Grey Kangaroos (*Macropus giganteus*) was common across the study area, utilising open pastures and grassy woodlands for grazing.

Myrtaceous trees provide foraging resources for a range of birds, including cockatoos, parrots and honeyeaters, as well as for arboreal mammals. No honeyeaters were observed during the survey which is likely due to the lack of flowering trees at the time of survey.

Large mature trees containing hollows of varying sizes, fissures or decorticating bark occur within woodland patches. These resources may be used by a range of native fauna, including threatened birds, microbats and arboreal mammals. Examples of threatened species which may use such nesting or roosting sites include threatened birds such as Little Lorikeets (*Glossopsitta pusilla*), Turquoise Parrot (*Neophema pulchella*), and microbats such as the Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*).

Eucalypts in the study area such as *Eucalyptus melliodora* (Yellowbox) and *E. albens* (White Box) represent secondary feed trees the Koala. Due to the isolated nature of the site from any large tracks of vegetation, lack of evidence of koalas utilising these trees, lack of recent local records and the sparse occurrence of these trees it is determined unlikely that the site would provide habitat for Koalas.

### *Creek Lines and Wetlands*

The study area contains three ephemeral creeklines which are tributaries of the Peel River.

As discussed in Section 4.3.1, these waterways have been highly modified through land clearing and agricultural activities along there lengths. These waterways are lined with dense thickets of *Typha domingensis* (Narrow-leaved Cumbungi), *Juncus spp.* (Rushes) and *Eleocharis spathulata* (Spike Sedge).

There are a number of wetland areas adjoining Bolton's and Tangaratta Creeks. These wetlands contained common, generalist frogs and reptiles during the field survey such as the Common Eastern Froglet (*Crinia signifera*) and Dwarf Eastern Tree Frog (*Litoria fallax*) and would also be likely to provide habitat for additional reptile species such as the Red-bellied Black-snake (*Pseudechis porphyriacus*), Spotted Marsh Frog (*Limnodynastes tasmaniensis*) and Eastern Water Skink (*Eulamprus quoyii*).

The wetlands are likely to support a moderately high diversity and abundance of native waterfowl, waders and other wetland birds, including the Purple Swamphen (*Porphyrio porphyria*), Australian Wood duck (*Chenonetta jubata*) and Pacific Black Duck (*Anas superciliosa*), all of which were observed within the study area (Appendix A). These wetlands may also provide foraging habitat for threatened wetland birds such as the Australasian Bittern (*Botaurus poiciloptilus*)) or Australian Painted Snipe (*Rostratula australis*).

The ephemeral nature of these creeklines mean that they are unlikely to support the threatened aquatic fish that occur in the local area.

Plate 11 Northern section of Bolton's Creek

Plate 12 Southern section of Tarangatta Creek

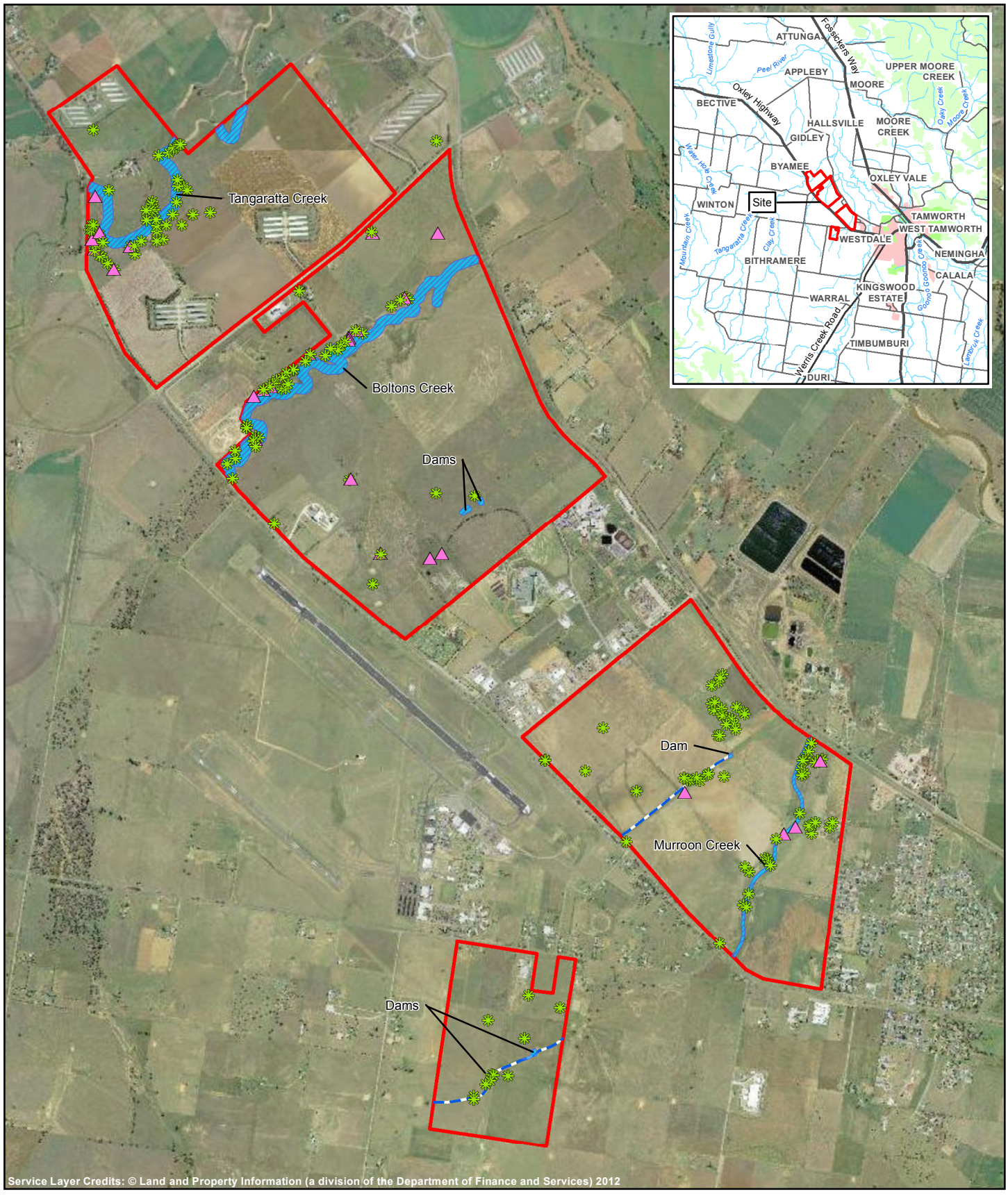
### *Other habitat resources*

Study area contains does not contain any caves, cliffs, rock outcrops or substantial surface rock and would therefore not support fauna that rely on rocky substrate for shelter. There are a number of threatened reptile and frog species known or predicted to occur in the locality (OEH 2014a; DotE 2014a), including the Broad-headed Snake (*Hoplocephalus bungaroides*), Giant Burrowing Frog (*Heleioporus australiacus),* and Pink-tailed Legless Lizard (*Aprasia parapulchella*). Due to a lack of suitable rocky habitat features within the site it is unlikely that any of these species would occur within the study area.

### *Connectivity*

Vegetation within the locality of the study area has been extensively cleared and the closest large patch of remnant native vegetation is located in the Attung State forest approximately 11 km to the north-east of the study area.

The scattered remnant trees along Bolton's and Tangaratta Creek provide some connectivity to other areas of sparse woodland up and downstream from the site.




LEGEND

- Site Boundary
- Aquatic habitat
- Drainage line (modified)
- Large woody debris
- Hollow bearing tree

DRAFT

Paper Size A4

0 0.1 0.2 0.4 0.6 0.8 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Tamworth Regional Council
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| | |
|---|---|
| Job Number | 22-17246 |
| Revision | B |
| Date | 17 Dec 2014 |

# Fauna habitat

Figure 3

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\17246\GIS\Maps\Deliverables\Ecology\2217246_E004_FaunaHabitat_B.mxd



Data source:LPI: Aerial Imagery 2014, DCDB & DTDB 2012. Created by: fmackay, tmorton

## 4.4 Conservation significance

### 4.4.1 Overview

Based on the desktop assessment the following threatened biota and MNES are known or predicted to occur in the locality:

- Ten threatened ecological communities (TECs)
- Five threatened flora species
- Thirty-seven threatened fauna species, comprising one frog, 19 birds, three fish, 12 mammals and two reptiles
- Ten migratory bird species
- Three fish and one aquatic TEC

This list does not include marine threatened and migratory species or shorebirds, which were highlighted by the database searches because the locality does not contain any marine or estuarine habitats.

The potential occurrence of these threatened biota within the study area is discussed in the following sections.

### 4.4.2 State listed threatened biota (TSC Act and FM Act)

The database searches identified three threatened flora species, 36 threatened fauna species and eight TECs listed under the TSC Act as having been previously recorded or predicted to occur in the locality (see Appendix B).

Three fish and one TEC listed under the FM Act have also been previously recorded or are predicted to occur in the locality of the study area (see Appendix B).

The potential for these threatened biota to occur within the study area is discussed in the following sections.



#### *Threatened ecological communities*

Three native vegetation types within the study area are consistent with TECs listed under the TSC Act:

- Plains Grass – Blue Grass Grassland of the Nandewar and Brigalow Belt South Bioregions (NA 180), which is consistent with the derived grassland form of White Box – Yellow Box Blakely's Red Gum Woodland community listed as endangered under the TSC Act.
- Yellow Box – Blakely's Red Gum Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions (NA 237) which is consistent with the woodland form of White Box – Yellow Box Blakely's Red Gum Woodland community listed as endangered under the TSC Act.
- White Box Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions (NA 266), which is consistent with the woodland form of White Box –Yellow Box Blakely's Red Gum Woodland community listed as endangered under the TSC Act.

These TECs occur on the fertile lower slopes and plains surrounding Bolton's, Tangaratta and Muroon Creek, as shown on Figure 2. No other threatened ecological communities are present in the study area.

One aquatic community listed as endangered under the FM Act also occurs within the study area. The aquatic community along Bolton's and Tarangatta Creeks occurs within the aquatic EEC listed under the FM Act as *Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River*.

A further six threatened ecological communities listed on the TSC Act are known to occur in the locality of the study area but were not recorded during the field surveys. These communities are associated with habitat types and geomorphic settings that are not present in the study area and are therefore are unlikely to occur.

### *TSC Act White Box Yellow Box Blakely's Red Gum Woodland Assessment*

The scientific determination for White Box Yellow Box Blakely's Red Gum Woodland EEC states that this community can exist in a number of states. Due to wide spread clearing of this community intact stands of this community are rare, however it has been determined that modified versions of this community may also considered the EEC (OEH 2002). These can include:

- Areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species and / or
- Sites where the trees have been removed and only the grassy groundlayer and some herbs remain.

The key provided in the NSW Parks and Wildlife identification guidelines for White Box Yellow Box Blakely's Red Gum Woodland was used to determine if the areas mapped as Yellow Box – Blakely's Red Gum Grassy Woodlands and Plains Grass – Blue Grass Grassland are commensurate with this EEC (NPWS 2002) Table 4-4 summarises the steps followed through this key.



Table 4-4 Identification criteria for White Box Yellow Box Blakely's Red Gum Woodland (NPWS 2002)

| Questions in NPWS Key (NPWS 2002) | NPWS Comment | Plains Grass – Blue Grass Grassland<br><br>Answer | Yellow Box – Blakely's Red Gum Grassy Woodlands<br>Answer | White Box Grassy Woodland<br><br>Answer |
|---|---|---|---|---|
| 1. The study area is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions: | | Yes – the study areas is located in the Nandewar Bioregion | Yes – the study areas is located in the Nandewar Bioregion | Yes – the study areas is located in the Nandewar Bioregion |
| 1* The study area is outside the above bioregions | The site is not Box Gum Woodland | No | No | No |
| 2 There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration | The site is not Box Gum Woodland | No | No | No |

| Questions in NPWS Key (NPWS 2002) | NPWS Comment | Plains Grass – Blue Grass Grassland<br><br>Answer | Yellow Box – Blakely's Red Gum Grassy Woodlands<br>Answer | White Box Grassy Woodland<br><br>Answer |
|---|---|---|---|---|
| 2*The understorey is otherwise | | Yes – these areas are dominated by native understorey species | Yes – although the understorey is degraded where is potential it would respond to assisted natural regeneration | Yes – although the understorey is degraded there is potential it would respond to assisted natural regeneration |
| 3. The site has trees | Go to Q 4 | | Yes- these areas are dominated by Yellow Box and other tree species characteristic of box gum woodland | Yes- these areas are dominated by White Box and other tree species characteristic of box gum woodland |
| 3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum | Go to Q 5 | Yes – although this vegetation type is mostly treeless there are remnant yellow box and white box nearby which suggests the site would have once supported these species. | N/A | N/A |
| 4. White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or where present | | Yes – although this vegetation type is mostly treeless there are remnant yellow box and white box nearby which suggests the site would have once supported these species. | Yes- these areas are dominated by Yellow Box and other tree species characteristic of box gum woodland | Yes- these areas are dominated by White Box and other tree species characteristic of box gum woodland |
| 4*. White Box, Yellow Box or Blakely's Red Gum have | The site is | No | No | No |

| Questions in NPWS Key (NPWS 2002) | NPWS Comment | Plains Grass – Blue Grass Grassland<br><br>Answer | Yellow Box – Blakely's Red Gum Grassy Woodlands<br>Answer | White Box Grassy Woodland<br><br>Answer |
|---|---|---|---|---|
| never been present | not Box Gum Woodland | | | |
| 5 The site is predominantly grassy | The site **is** Box Gum Woodland | Yes – this vegetation types is dominated by native grasses | Yes – this vegetation type has a predominantly grassy understorey. | Yes – this vegetation type has a predominantly grassy understorey. |
| 5* The understorey of the site is dominated by shrubs excluding pioneer species | | No | No | No |

Based on the identification guidelines it was determined that the vegetation communities mapped as Yellow Box –Blakely's Red Gum Grassy Woodland, White Box Grassy Woodland, and Plains Grass – Blue Grass Grassland are commensurate with the White Box Yellow Box Blakely's Red Gum Woodland EEC listed under the TSC Act.

Approximately 305.8 hectares of native vegetation within the study area complies with the TSC Act criteria for White Box Yellow Box Blakely's Red Gum Woodland EEC. Areas of EEC are shown in Figure 2.



### Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River

This EEC is listed under Part 7A, Division 2 of the FM Act. It includes all native fish and aquatic invertebrates within all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches and the floodplains of the Darling River within the state of NSW (Fisheries Scientific Community undated).

The final determination made by the Fisheries Scientific determined that north-western slope rivers including the Peel River from Chaffey Dam (and its tributaries) are included in as part of this endangered aquatic ecological community.

Within the study area Bolton's Creek, Murroon Creek and Tarangatta Creek form tributaries that flow into the Peel river they are therefore included within this EEC.

There is approximately 16 hectares of this EEC within the study area

#### *Threatened flora species*

No threatened flora species were recorded in the study area during this assessment, however four threatened flora species listed under the TSC Act have been previously recorded or are predicted to occur in the locality of the study area.

An assessment of the likelihood of occurrence of all listed species previously recorded or predicted to occur in the locality has been completed and is attached as Appendix B.

Based on an assessment of habitats, soil types and vegetation occurring within the study area it is likely that one threatened flora species Bluegrass (*Dichanthium setosum*) could occur. This species is listed as vulnerable under the TSC Act.

*Dichanthium setosum* (Bluegrass) grows in heavy basaltic soils often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed agricultural pasture. It occurs on the New England Tablelands, North West Slopes and Plains and the Central West Slopes. The species also occurs in Queensland and Western Australia (OEH 2014). There is suitable habitat for this species within areas mapped as Plains Grassland – Bluegrass derived grasslands, White Box Grassy Woodland and White Box – Yellow Box Woodland.

### *Threatened fauna species*

No threatened fauna species listed under the TSC Act were recorded during the field surveys. A total of 15 threatened fauna species have been assessed as having the potential to utilise the study area based on the habitats present. These species are listed in Table 4-5 and comprise 13 threatened birds and three threatened bats. The value of habitats within the study area for these species is discussed in Sections 4.3.1 and 4.3.3.

See Appendix B for details of the records and habitats of each of these threatened species.

Table 4-5 Threatened fauna that may occur within the Study Area

| Scientific name | Common Name | TSC Act status | EPBC Act status |
|---|---|---|---|
| **Birds** | | | |
| *Botaurus poiciloptilus* | Australasian Bittern | E | E |
| *Climacteris picumnus victoriae* | Brown Treecreeper | V | |
| *Circus assimilis* | Spotted Harrier | V | |
| *Falco subniger* | Black Falcon | V | |
| *Glossopsitta pusilla* | Little Lorikeet | V | |
| *Lophoictinia isura* | Square-tailed Kite | V | |
| *Melithreptus gularis gularis* | Black-chinned Honeyeater (eastern subspecies) | V | |
| *Neophema pulchella* | Turquoise Parrot | V | |
| *Ninox connivens* | Barking Owl | V | |
| *Petroica boodang* | Scarlet Robin | V | |
| *Rostratula australis* | Australian Painted Snipe | E | V,M |
| *Stagonopleura guttata* | Diamond Firetail | V | |
| ***Mammals*** | | | |
| *Miniopterus schreibersii oceanensis* | Eastern Bentwing-bat | V | |
| *Saccolaimus flaviventris* | Yellow-bellied Sheathtail-bat | V | |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | V | |

The remainder of the threatened fauna species that are known or predicted to occur in the locality have a close association with specific habitat resources that are not present in the study

area. Notably there are a number of fauna species that are associated with shrubby sclerophyll and moist forest vegetation types that would not occur in the grasslands and grassy woodlands that characterise the study area (refer Appendix B).

The desktop review revealed three threatened fish species (Murray Cod *Maccullochella peelii*, Freshwater Catfish *Tandanus tandanus* and Silver Perch *Bidyanus bidyanus*) which are predicted to occur in the locality of the site. A review of the specific habitat requirements of these species and the habitat present led to the conclusion that these aquatic species are unlikely to occur in the study area (Appendix C) as there are no permanent aquatic habitat suitable for these species.

### 4.4.3 EPBC Act Matters of National Environmental Significance

The database searches identified four threatened ecological communities, five threatened flora species, 14 threatened fauna species and 10 migratory species listed under the EPBC Act as potentially occurring in the study area (see Appendix C).

#### *Threatened ecological communities*

No TEC listed under the EPBC Act occur within the study area. Although there are patches of White Box Yellow Box Blakely's Red Gum Woodland and associated derived native grasslands within the study area, none of this vegetation contains a high enough diversity of native herb species to be commensurate with the White Box -Yellow Box grassy woodlands and derived native grasslands CEEC listed under the EPBC Act.

#### *Threatened flora*

As stated in Section 4.4.2 there is suitable habitat within the study area for threatened flora species (*Dichanthium setosum*) which is listed as vulnerable under both the TSC and EPBC Acts

None of the other four EPBC Act listed flora species that have been previously recorded in the locality or are predicted to occur are likely to occur within the study area due to the lack of suitable habitat for these species.

#### *Threatened fauna*

No threatened fauna species listed under the EPBC Act were recorded within the study area. As discussed in Section 4.4.2, two fauna species listed as threatened under the EPBC Act (the Australasian Bittern and Australian Painted Snipe) have the potential to occur in the area based on the habitats present. These fauna species are also listed under the TSC Act and are listed in Table 4-5. Relevant habitats for these species are discussed in Section 4.3.3.

#### *Migratory and marine fauna*

One migratory marine bird species, four wetland birds and five 'terrestrial' migratory bird species were identified by the database searches as known or having the potential to occur within the locality.

None of these migratory bird species was recorded during field surveys of the study area.

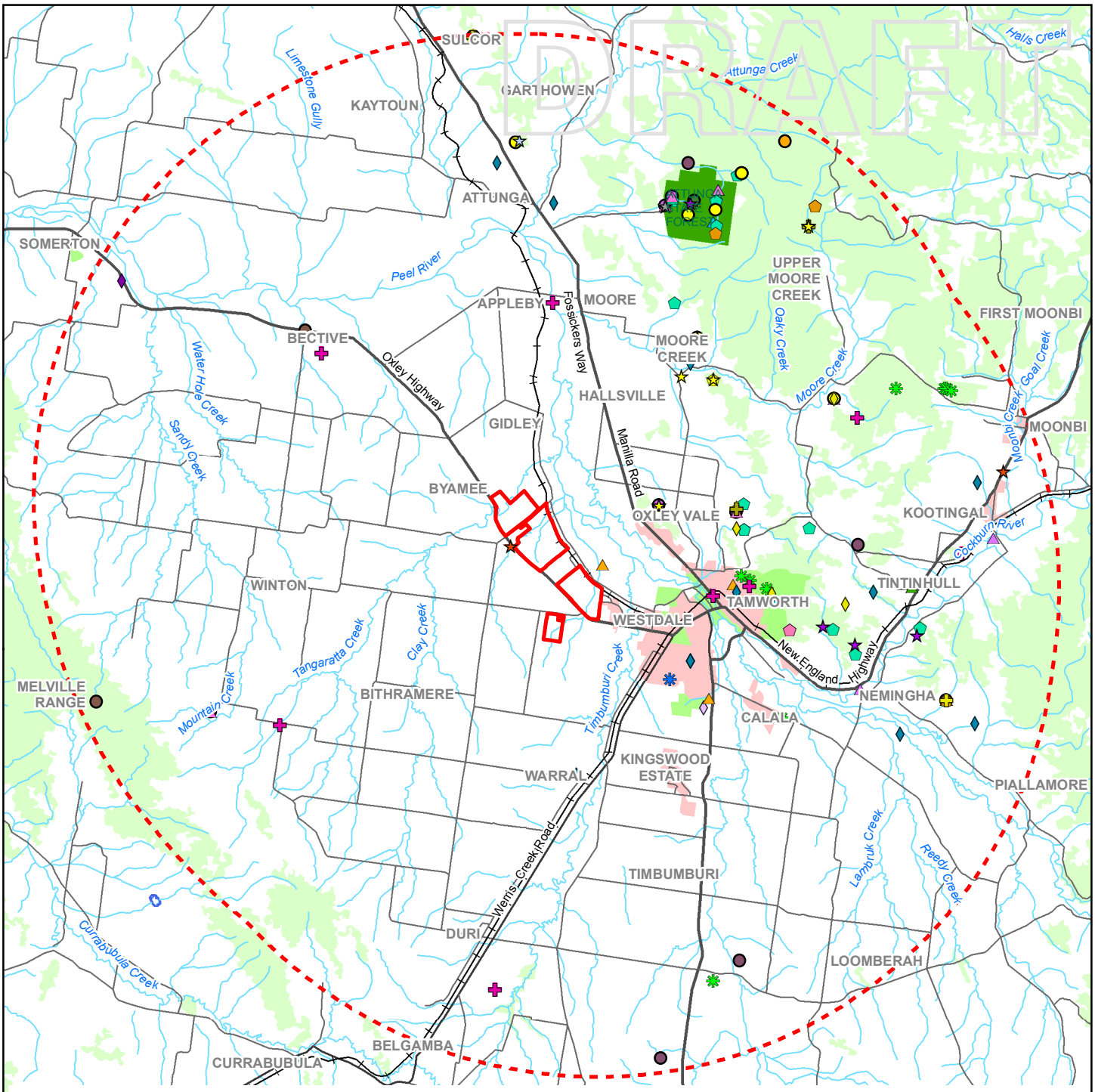
Given the habitats present it is possible that the following migratory species may utilise the site on a transient basis as part of a wider area of occupation.

- Rainbow Bee-eater (*Merops ornatus*)
- Great Egret (*Ardea alba*; also listed as marine)
- Cattle Egret (*Ardea ibis*; also listed as marine

- Latham's Snipe (*Gallinago hardwickii*)
- Painted Snipe (*Rostratula benghalensis*), also listed as an endangered species under the EPBC Act.

It is also possible that two migratory species (White-throated Needletail (*Hirundapus caudacutus*) and Fork-tailed Swift (*Apus pacificus*)) which are predominantly aerial species may fly over the site on occasions.

Other seasonally migratory or nomadic species would also be likely to utilise habitats within the study area on occasion.




**Threatened Species within 20km of the Study Area**

**Threatened Fauna**

- Barking Owl
- Black Falcon
- Black-chinned Honeyeater
- Booroolong Frog
- Border Thick-tailed Gecko
- Brown Treecreeper
- Brush-tailed Rock-wallaby
- Corben's Long-eared Bat
- Diamond Firetail
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Hooded Robin (south-eastern form)
- Koala
- Large-eared Pied Bat
- Little Eagle
- Little Lorikeet
- Masked Owl
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Spotted Harrier
- Spotted-tailed Quoll
- Square-tailed Kite
- Squirrel Glider
- Swift Parrot
- Turquoise Parrot
- Varied Sittella
- Yellow-bellied Sheathtail-bat

**Threatened Flora**

- Bluegrass
- Magenta Lilly Pilly

LEGEND

- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Railway
- Watercourse
- Built Up Area
- Recreation Area
- State Forest
- National Park
- Forest Or Shrub
- 20km Buffer
- Site Boundary

Paper Size A4

0 1 2 4 6 8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Job Number 22-17246
Revision B
Date 17 Dec 2014

# Threatened Species previously recorded in the Locality (OEH 2014)

Figure 4

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G:\22\17246\GIS\Maps\Deliverables\Ecology\2217246_E002_OEHThreatSpecies_B.mxd



Data source: Geoscience Australia: 250k Topographic Data Series 3 2006; OEH: Threatened Species Records, May 2014. Created by: fmackay, tmorton

# 5. Preliminary impact assessment

## 5.1 Overview

A preliminary assessment of impacts of the proposed rezoning is included below. This assessment is based on the assumption that the entire site other than areas recommended as conservation zones in Section 5.2 could potentially be cleared as part of the proposed rezoning and is intended to provide an overview of the potential impacts associated with the proposed rezoning. It should be noted, however, that a more comprehensive impact assessment, based on the final development footprint and informed by more extensive survey effort and assessment, would need to be undertaken at the Development Application stage should this rezoning application be successful. This impact assessment would need to include assessments of significance in accordance with Section 5A of the EP&A Act for the following threatened biota listed on the TSC Act and FM Act which are known or have potential to occur at the site:

- White Box Yellow Box Blakely's Red Gum Woodland EEC
- Aquatic Ecological Community in the natural drainage systems of the lowland catchment of the Darling River
- *Dichanthium setosum* (Bluegrass)
- *Botaurus poiciloptilus* (Australasian Bittern)
- *Climacteris picumnus victoriae* (Brown Treecreeper)
- *Circus assimilis* (Spotted Harrier)
- *Falco subniger* (Black Falcon)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Lophoictinia isura* (Square-tailed Kite)
- *Melithreptus gularis gularis* (Black-chinned Honeyeater (eastern subspecies)
- *Neophema pulchella* (Turquoise Parrot)
- *Ninox connivens* (Barking Owl)
- *Petroica boodang* (Scarlet Robin)
- *Rostratula australis* (Australian Painted Snipe)
- *Stagonopleura guttata* (Diamond Firetail)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)

The impact assessment would also need to include assessments of significance in accordance with the DotE (2013) guidelines for threatened and migratory fauna listed on the EPBC Act which are likely to occur.

List threatened and migratory fauna listed on the EPBC Act which have the potential to occur are:

- *Dichanthium setosum* (Bluegrass)
- *Rostratula australis* (Australian Painted Snipe)

- *Botaurus poiciloptilus* (Australasian Bittern)
- *Merops ornatus* (Rainbow Bee-eater)
- *Ardea alba* (Great Egret); also listed as marine)
- *Ardea ibis* (Cattle Egret); also listed as marine
- *Gallinago hardwickii* (Latham's Snipe).

## 5.2 Proposed conservation land

Lands immediately surrounding the three creeklines comprise the majority of remnant hollow bearing trees and associated woodland habitat through the study area. It is therefore recommended that these areas be set aside for conservation. These proposed conservation lands include the following vegetation types and fauna habitat as outlined in Table 5-1 and shown on Figure 5.

Table 5-1 Vegetation and habitat within proposed conservation areas

| Vegetation type/habitat | Conservation significance | Area (ha) / number conserved |
|---|---|---|
| **Vegetation type** | | |
| Couch Grass Grassland on Riverbanks and Floodplains of Inland River Systems (NA 132) | Native | 1.5 |
| Cumbungi Rushland of Shallow Semi-permanent Waterbodies of the inland River Systems (NA 133) | Native | 14.8 |
| Plains Grass - Blue Grassland of the Nandewar and Brigalow Belt South Bioregions (EEC TSC Act Listed) (NA180) | White Box Yellow Box Blakely's Red Gum Woodland EEC | 50.6 |
| River Red Gum Riverine Woodland and Forests in the Nandewar and Brigalow Belt South Bioregions (NA 192) | Native | 1.7 |
| Yellow Box - Blakely's Red Gum Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions (NA 237) (EEC TSC Act Listed) | White Box Yellow Box Blakely's Red Gum Woodland EEC | 3.5 |
| White Box Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions (NA 266) (EEC TSC Act Listed) | White Box Yellow Box Blakely's Red Gum Woodland EEC | 2.7 |
| Cropped Paddocks with Scattered Trees | | 3.2 |
| Predominantly Exotic Vegetation with Scattered Trees | | 14.2 |
| **Total area of native vegetation conserved** | | **74.7** |
| **Habitat Features** | | |
| Hollow bearing trees | Potential habitat for threatened species | 79 |
| Piles of large woody debris | Fauna habitat | 16 |
| Aquatic habitat along Bolton's and Tarangatta Creek | Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River EEC | 16 ha |

## 5.3 Direct impacts

### 5.3.1 Removal of vegetation and habitat

The proposed rezoning has the potential to result in the removal or modification of up to 257.1 ha of native vegetation. Including up to 256.5 ha of highly degraded White Box Yellow Box Blakely's Red Gum derived native grassland, which is listed as an EEC under the TSC Act.

There is likely to be scope to retain native trees and some understorey vegetation within the area, and to retain native trees within asset protection zones.

The extent of vegetation and habitats within the study area is summarised in Table 5-2. Vegetation removal could include the clearing of one EEC and potential habitat for 15 threatened species. Impacts on this EEC and threatened species that may occur within the study area as a result of the proposed rezoning are discussed in detail in Section 5.6.

Table 5-2 Potential extent of vegetation removal or modification within the study area

| Vegetation community | TSC Act Status | EPBC Act Status | Area within study area (hectares) | Area within study area excluding conservation zones (hectares) | Area mapped within locality (NCMA 2009)[a] (hectares) | Percentage of extent mapped in locality within the impact area |
|---|---|---|---|---|---|---|
| Plains Grass-Blue Grassland of the Nandewar and Brigalow Belt South Bioregions | EEC | Nil | 305.8 | 255.2 | 72180.6 | 0.2 |
| White Box Grassy Woodland in the Nandewar and Brigalow Belt South Bioregions | EEC | Nil | 4.0 | 1.3 | 1,693 | 0.07 |
| River Red Gum Riverine Woodland and Forests in the Nandewar and Brigalow Belt South Bioregions | | Nil | 1.7 | 0 | 1090.4 | 0 |
| Cumbungi Rushland of Shallow Semi-permanent Water bodies of the Inland River Systems) | | Nil | 14.9 | 0 | 0 | 0 |
| Yellow Box – Blakely's Red Gum Grassy Woodland of the Nanderwar and Brigalow Belt South Bioregions | EEC | Nil | 3.5 | 0 | 3553.8 | 0 |
| Couch Grass Grassland on Riverbanks and Floodplains of Inland River Systems | | Nil | 1.5 | 0 | 0 | 0 |

| Vegetation community | TSC Act Status | EPBC Act Status | Area within study area (hectares) | Area within study area excluding conservation zones (hectares) | Area mapped within locality (NCMA 2009)[a] (hectares) | Percentage of extent mapped in locality within the impact area |
|---|---|---|---|---|---|---|
| Cropped Paddocks with Scattered Trees | | | 372.3 | 369.2 | N/A | N/A |
| Predominately Exotic Vegetation | | | 165.6 | 83.74 | N/A | N/A |
| Planted Natives | | | 15.9 | 15.9 | N/A | N/A |
| **Total Native Vegetation** | | | **331.2** | **256.5** | | |

### 5.3.2 Impacts on aquatic habitats

Three creeklines and associated wetland habitat occur within the study area as shown on Figure 2. These creeks are within the areas recommended for conservation and therefore the proposed rezoning should not have any direct impacts on these areas.

The habitat value for aquatic and wetland fauna may be reduced by the removal of surrounding vegetation and potential impacts to water quality through increased runoff from hardstand areas and potential for contamination from industrial operations that may occur in the area. These processes have the potential to impact on up to 16 hectares of the aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River EEC.

### 5.3.3 Habitat fragmentation and isolation

As discussed in Sections 4.3.3, vegetation along Tangaratta, Murroon and Bolton's creek forms part of sparse woodland corridor that extends further upstream and downstream to the Peel River. This vegetation would be protected within the proposed conservation areas. The remainder of the vegetation in the study area contains derived or exotic grassland that does not provide connectivity with any of the surrounding lands. The proposed rezoning would therefore be unlikely to have any significant impacts on habitat connectivity in the area nor would any areas of habitat be isolated as a result of the proposed rezoning.

The removal of scattered canopy trees may increase existing gaps between 'stepping stones' for more mobile fauna (e.g. birds and bats). However, most of the remnant trees within the study area would be retained within the proposed conservation areas and as such the proposed rezoning is unlikely to prevent or substantially modify such species movements through the landscape.

### 5.3.4 Fauna injury and mortality

As described above, the study area provides habitat resources for range of native fauna species. More mobile native fauna such as adult birds, microbats, terrestrial and arboreal mammals are highly unlikely to be affected by the proposed rezoning. Vegetation removal that may be associated with the proposed rezoning may result in the injury or mortality of small terrestrial fauna that may be sheltering in vegetation within the study area. The fauna species that are known or likely to occur within the study area are widespread and abundant and so the

potential injury or mortality of individuals is highly unlikely to affect an ecologically significant proportion of any local populations. Impacts on threatened fauna are discussed in detail in Section 5.6.3.

Nesting birds and roosting microbats may be vulnerable to injury or mortality if present during clearing of trees. Notably, these less mobile fauna may be resident in habitat trees occurring within the study area. Pre-clearing fauna surveys should be included as part of any Construction Environmental Management Plans (CEMP) to reduce the risk of injury or mortality to native fauna and especially tree-dwelling fauna. These surveys should involve the inspection of trees for resident fauna as a precautionary measure prior to felling. The CEMP should also contain protocols for the felling of habitat trees and measures for the safe management of native fauna if detected within construction areas during any construction activities on the rezoned lots (see Section 6).

The proposed rezoning is likely to result in a minor increase in the volume of traffic in the area. This may slightly increase the risk of vehicle collisions with native fauna. Recommended mitigation measures to address this issue would include signposting and enforcing safe speed limits (see Section 6.3). Given the relatively small increase to traffic volume that is likely to be associated with the proposed rezoning potential impacts associated with vehicle strike are anticipated to be minor.

## 5.4 Indirect impacts

### 5.4.1 Erosion, sedimentation and contamination

There are potential for indirect impacts on aquatic habitats in the study area. Potential impacts that could result in a decline in aquatic habitat value include:

- Alterations to riparian and floodplain geomorphology
- Alterations to catchment hydrology
- Reduced water quality through hydrocarbon contamination or through increased nutrient or sediment inputs.



The hydrology and water quality of the study area is already substantially modified by clearing, and livestock access. The proposed rezoning may result in an increase in the proportion of hardstand surfaces within the study area and may also modify drainage through drains and other engineered structures. Given the current modified nature of aquatic habitats, it is anticipated that potential impacts such as those listed above could be controlled through appropriate mitigation measures as outlined in Section 6.

It is also anticipated that erosion, sedimentation and contamination effects on retained native vegetation in areas directly adjacent to the areas proposed to be rezoned would be minimised or avoided through mitigation measures as described in Section 6.

### 5.4.2 Weed invasion and edge effects

'Edge effects' refers to changed environmental conditions at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. As the study area has already been cleared no new edges would be created as a result of the proposed rezoning and therefore this is unlikely to be an issue.

Potential construction activities on rezoned lands may increase the degree of weed infestation through dispersal of weed propagules (seeds, stems and flowers) into areas of native vegetation via wind and water and via worker's shoes, clothing and through construction vehicles. The risk

of introduction of weeds would continue during operation of the proposal through wind or water transmission of propagules.

A Vegetation Management Plan is recommended for any works within the proposed rezoned lands, which should contain measures to avoid direct and indirect impacts on native vegetation contained within proposed conservation zones (refer Section 6).

### 5.4.3 Pests and pathogens

Potential construction activities associated with the rezoning have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*), Myrtle Rust (*Uredo rangelii*) and Chytrid fungus (*Batrachochytrium dendrobatidis*) through vegetation disturbance and increased visitation. There is little available information about the distribution of these pathogens within the locality, and no evidence of these pathogens was observed during surveys. As the majority of the site is cleared it is unlikely that Phytophthora and Myrtle Rust would cause a problem in the study area. Chytrid fungus affects both tadpoles and adult frogs and can eliminate entire populations once introduced into an area, this pathogen has the potential to impact on frogs living in the creeks and wetland habitats within the study area.

As a precautionary measure a 'clean on entry, clean on exit' policy should be implemented during any construction activities that may occur as a result of the proposed rezoning (detailed further in Section 6.3.1) to prevent the introduction or spread of these pathogens.

### 5.4.4 Light, noise and vibration

The proposed rezoning has the potential to result in an increase the level of light, noise and vibration disturbance in retained habitats within areas adjacent to the proposed rezoning. Given the highly disturbed nature of the site it is anticipated that these impacts would be relatively minor.



## 5.5 Key threatening processes

A key threatening process (KTP) is defined in the TSC Act as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities.
- Could cause species, populations or ecological communities that are not currently threatened to become threatened.

KTPs are listed under the TSC Act, the FM Act and also under the EPBC Act. A number of KTPs are listed under more than one Act. Those potentially relevant to this proposed rezoning are discussed in Table 5-3 below. Mitigation measures to limit the impacts of these KTPs are discussed in Section 6.

Table 5-3 Key threatening processes

| KTP | Status | Comment |
|---|---|---|
| Clearing of native vegetation | TSC Act; EPBC Act | The proposed rezoning has the potential to result in the increase of this KTP with approximately 256 hectares of native vegetation that could be removed with the study area including approximately 255 hectares of vegetation consistent with threatened ecological communities. |

| KTP | Status | Comment |
|---|---|---|
| Clearing of hollow-bearing trees | TSC Act; EPBC Act | It is likely that the proposed rezoning could result in the removal of a number of hollow bearing trees. Some hollow-bearing trees may be retained within public spaces or on private land but their habitat value could be reduced by the removal of surrounding vegetation and increase in noise, light and fragmentation disturbances. |
| Removal of dead wood and dead trees | TSC Act | It is likely that the proposed rezoning could result in impacts on habitat resources for native fauna through clearing of a small number of piles of dead wood and up to 68 hollow bearing trees. |
| Invasion of plant communities by perennial exotic grasses | TSC Act | Disturbed areas within the study area features moderate to severe infestation with perennial exotic grasses. Adjoining areas of native vegetation also feature localised moderate infestation. There is the potential for perennial exotic grasses to further invade native vegetation through disturbance during construction activities that may be associated with the proposed rezoning and an increased in disturbed edge habitats around the indicative development footprint. A Vegetation Management Plan is recommended, which should include measures to limit the spread of weeds. Retained conservation areas should also be managed to reduce the incidence and spread of weeds. These mitigation measures would be likely to effectively limit the operation of this KTP. |
| Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands | TSC Act; FM Act | The hydrology of the study area is already substantially modified by clearing for agriculture. Potential impacts on downstream areas could be effectively limited through the implementation of appropriate mitigation measures. The proposed rezoning is therefore likely to result in only a potential minor increase of the operation of this KTP. |
| The degradation of native riparian vegetation along NSW water courses | FM Act | Native riparian vegetation at the site occurs within the proposed conservation areas. This KTP would need to be considered if riparian vegetation is cleared. |
| Removal of large woody debris from NSW rivers and streams | FM Act | Instream woody debris at the site occurs within the proposed conservation areas. This KTP would need to be considered if woody debris are cleared. |
| Infection of frogs by amphibian chytrid causing the disease chytridiomycosis | TSC Act; EPBC Act | Construction activities that may be associated with the proposed rezoning have the potential to introduce amphibian chytrid to the study area, which could lead to death of local frogs. The implementation of a Fauna Management Plan is recommended to limit the potential for adverse impacts on fauna and their habitats as discussed in Section 6. The proposed rezoning is unlikely to increase the operation of this KTP. |

## 5.6 Impacts on threatened biota

The proposed rezoning has the potential to in impacts to known EEC and potential habitat for threatened biota, comprising:

- Potential impacts on up to 255 hectares of the derived grassland form of White Box Yellow Box Blakely's Red Gum Woodland EEC.

- Potential impacts on up to 1.3 hectares of the woodland form of White Box Yellow Box Blakely's Red Gum Woodland EEC.
- Potential indirect impacts on approximately 16 hectares of aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River.

The proposed rezoning also has the potential to impact on a further one threatened flora, 15 threatened fauna and 5 migratory species through the removal of potentially suitable habitat.

As previously discussed, this impact assessment is preliminary and a more detailed assessment would be required at the Development Application stage if the proposed rezoning is approved.

### 5.6.1 Threatened ecological communities

Approximately 255 hectares of native vegetation commensurate the derived grassland form of White Box Yellow Box Blakely's Red Gum Woodland as defined by OEH occurs within the study area (OEH 2011) in addition there is approximately 1.3 hectares of the woodland form of this community (excluding proposed conservation areas). Both forms of this community are in relatively poor condition with low species diversity and areas of significant weed infestation.

The local occurrence of White Box Yellow Box Blakely's Red Gum Woodland EEC includes approximately 72180 hectares of this community plus an additional 3553 hectares of the woodland form of this community. There is potential therefore for the proposed rezoning to impact on approximately 0.2 percent of this community within the locality.

The proposed rezoning also has the potential to modify the composition of the ecological community through the introduction or spread of weeds. Earthworks and general disturbance from machinery and vehicles and the removal of canopy trees may also create conditions conducive to weed establishment. Weed control measures such as chemical and manual removal of noxious weed species and measures to ensure vehicle and machinery hygiene would need to be implemented during construction activities and operation of new land uses associated with the rezoning to minimise the potential for the introduction or spread of invasive weeds.



### 5.6.2 Threatened flora

The proposed rezoning would not result in the remove any known individuals or populations of threatened plants. However one threatened flora species (*Dichanthium setosum* Blue Grass) is considered to have a possible chance of occurrence based on the presence of suitable habitat within the study area (Appendix C).

It is anticipated that targeted surveys for this species would be undertaken to inform a more detailed impact assessment at the Development Application stage.

### 5.6.3 Threatened fauna

The proposed rezoning could potentially remove habitat for up to 15 threatened species listed under the TSC Act two of which are also listed as threatened under the EPBC Act.

Thirteen of these species are highly mobile bird and microbat species, which may utilise resources within the study area for roosting and foraging.

It is anticipated that targeted surveys for these species would be undertaken to inform a more detailed impact assessment at the Development Application stage.

### 5.6.4 Aquatic habitat

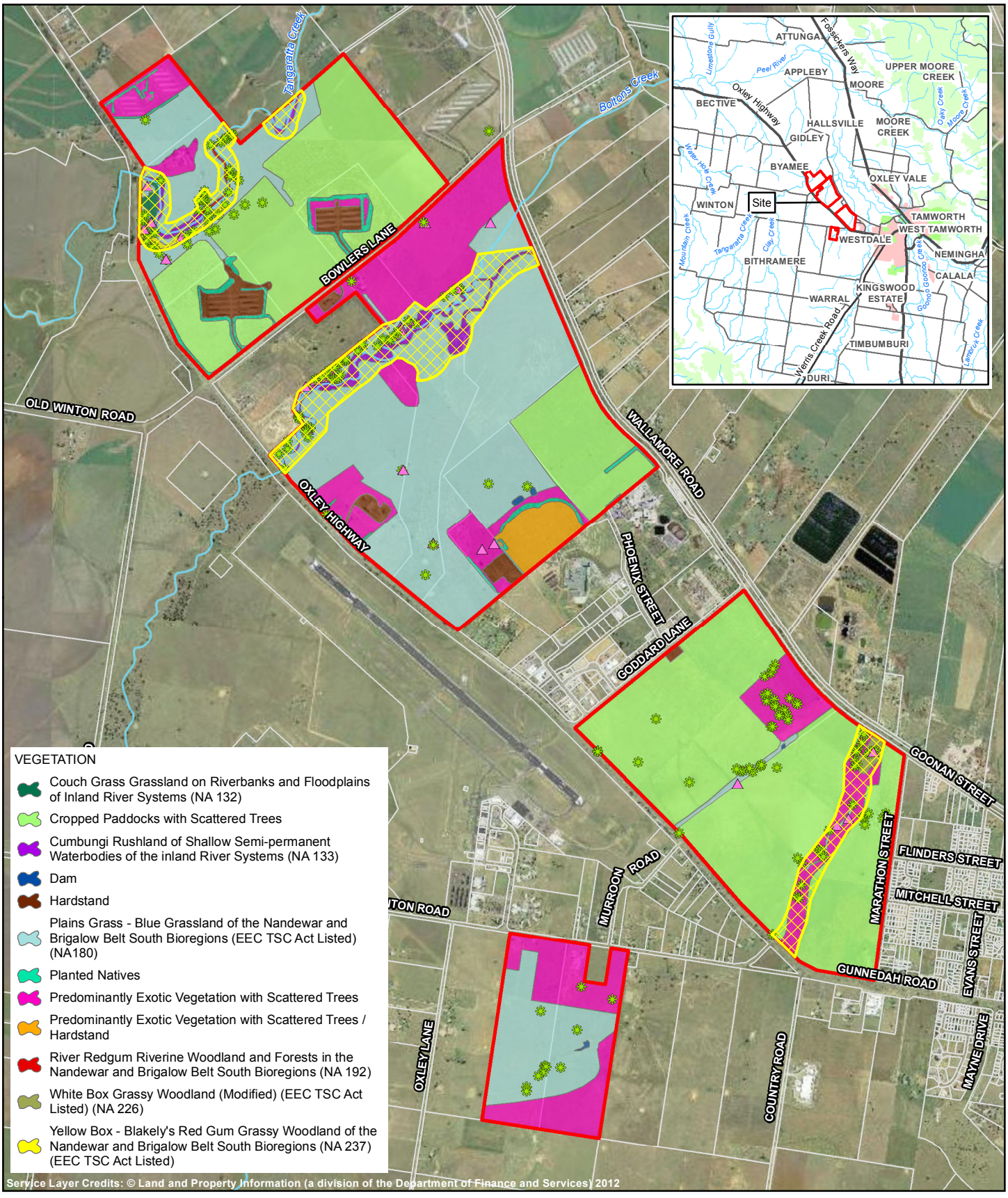
The proposed rezoning has the potential to impact aquatic and riparian habitat included in the aquatic ecological community in the natural drainage system of the lowland catchment of the

Darling River EEC . These areas of aquatic habitat are proposed to be retained in the conservation lands. The impact on aquatic habitat and species would be undertaken for the Development Application stage.

### 5.6.5 Migratory species

Up to five species of migratory birds listed under the EPBC Act have the potential to occur within the study area, based on the habitat types present.

The five migratory species identified in Section 4.4.3 are all highly mobile species, which would readily traverse gaps in habitat that may be caused as a result of vegetation removal associated with the proposed rezoning. The proposed rezoning would therefore represent a reduction in potential habitat for these species in the locality.




LEGEND

- Site Boundary
- Cadastre
- Proposed conservation area
- Watercourse
- Large wood debris
- Hollow bearing tree

DRAFT

Paper Size A4

0 0.125 0.25 0.5 0.75 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Tamworth Regional Council
Glen Artney Industrial Rezoning Studies

| | |
|---|---|
| Job Number | 22-17246 |
| Revision | B |
| Date | 17 Dec 2014 |

## Proposed Conservation Areas

Figure 5

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\17246\GIS\Maps\Deliverables\Ecology\2217246_E005_ProposedConservationZones_B.mxd



Data source:LPI: Aerial Imagery 2014, DCDB & DTDB 2012. Created by: fmackay, tmorton

# 6. Mitigation measures

## 6.1 Overview

Any rezoning and subsequent development has the potential to result in direct impacts on native biota and their habitats within the study area. There is also the potential for indirect impacts on retained areas of native vegetation adjacent to proposal. The following sections provide an overview of recommended mitigation measures likely to be required to avoid or minimise such impacts. These measures are presented according to the hierarchy of avoidance and mitigation of impacts, and the provision of offsets to counter residual impacts of the proposed rezoning. It is anticipated that these measures would be revised based on a more detailed and accurate assessment of potential impacts which would be undertaken during the Development Application stage.

## 6.2 Avoidance of impacts

The majority of fauna habitat including a large number of hollow bearing trees is concentrated along the three creeklines within the study area, including 97 of the 165 hollow bearing trees that were mapped within the study area. For this reason it is recommended that these areas are retained as conservation areas. Suggested conservation areas are shown on Figure 5.

Where possible other hollow bearing trees within the remainder of the site should also be retained.

## 6.3 Mitigation of impacts

### *Construction Environmental Management Plan*

A Construction Environmental Management Plan (CEMP) would be required for prior to any development at the site. The CEMP should include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures including the procedures outlined below. The CEMP should be prepared and implemented by the contractor. The proposed measures would include environmental safeguards for protection of downstream properties and waterways in accordance with relevant policy documentation and Government guidelines.

The CEMP would be required to address the following as a minimum:

- An erosion and sediment control plan, which would require:
  - Installation of erosion and sediment control measures prior to construction.
  - Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality.
  - Restriction of stockpiles to identified construction compounds, in areas of cleared land and exotic grassland and management of these stockpiles to ensure no offsite impacts through dust generation or sedimentation.
- A vegetation management plan (VMP), which should include (but not be limited to) the following:
  - Delineation and protection of exclusion zones around native vegetation to be retained.
  - Communication with construction personnel of the conservation value of surrounding habitats and their responsibilities with regards to protecting these habitats during construction.
- A weed management sub-plan to the VMP, including a description of:

  - Type and location of weeds of concern (including noxious weeds) within the study area.
  - Sensitive receivers (such as native vegetation and waterways) within or adjacent to the study area.
  - Measures to prevent the spread of weeds, including hygiene procedures for equipment, footwear and clothing.
  - Proposed weed control methods and targeted areas.
  - Weed disposal protocols.
- A fauna management plan, including (but not limited to) the following:
  - Minimising the clearing of mature trees where possible.
  - A fauna management protocol, including pre-clearing surveys for nests or sheltering terrestrial fauna and rescue and salvage (where possible) of fauna entering the construction site.
  - A habitat feature protocol, including pre-clearing surveys for habitat features such as hollow logs and hollow-bearing trees that can be retained or salvaged and placed in adjoining retained vegetation, and protocols for the safe clearing of hollow-bearing trees to ensure no resident fauna are injured.
  - Protocols to prevent introduction or spread of chytrid fungus should be implemented following OEH Hygiene protocol for the control of disease in frogs (DECCW, 2008c).

***Pre-clearance surveys***

Prior to clearing of areas of native vegetation, pre-clearance surveys by a qualified ecologist should be undertaken. The required methodology and targeted species for these surveys should be developed as part of the CEMP. Surveys should include:

- Clear marking/erection of exclusion fencing around protected vegetation areas and delineation of 'no-go' areas.
- Inspections of native vegetation for other resident fauna and/or nests or other signs of fauna occupancy.
- Capture and relocation or captive rearing of less mobile fauna (such as roosting microbats, nestling birds or any injured fauna) by a trained fauna handler and with assistance from Wildlife Information Rescue and Education Service (WIRES) as required.
- Inspection and identification/marking of hollow-bearing trees adjacent to construction footprints to help ensure against accidental impacts.

### 6.3.1 Construction phase

The following principles should be followed throughout the construction phase:

- All works should be undertaken in accordance with the CEMP.
- Clearing surveys should be undertaken by a suitably qualified ecologist during any construction stages that involve removal of native vegetation. Clearing methods and presence/fate of any resident fauna should be documented.

- Wildlife should not be handled wherever possible. Construction staff should only handle wildlife in an emergency situation. Uninjured wildlife should be gently encouraged to leave the site by the ecologist/ wildlife specialist. Injured wildlife would be taken to a local WIRES carer or veterinarian for treatment and care if necessary.
- All equipment must be refuelled at least 20 metres away from drainage lines or wetlands and all fuel and chemical storages should be bunded.

# 7. Conclusions

This report has been prepared to investigate ecological constraints associated with the potential rezoning of lands around the Glen Artney Industrial Estate.

Based on this assessment, the study area contains:

- 331 hectares of native vegetation of which 56.7 occurs within proposed conservation areas.
- 305.8 hectares of vegetation consistent with the derived grassland form of White Box Yellow Box Blakely's Red Gum Woodland, which is listed as an EEC under the TSC Act. Approximately 50.5 hectares of this vegetation occurs within proposed conservation areas
- 7.5 hectares of vegetation consistent with the woodland form of White Box Yellow Box Blakely's Red Gum Woodland, which is listed as an EEC under the TSC Act. Approximately 6.2 hectares of this vegetation occurs within proposed conservation areas
- 165 large hollow bearing trees, of which 97 occur within proposed conservation areas.
- Potentially suitable habitat for one threatened flora, 15 threatened fauna and 5 migratory species.
- 16 hectares of aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River, which is listed as an EEC under the FM Act.

It is anticipated that targeted surveys for threatened species that have potential to occur in the study area would be undertaken to inform a more detailed impact assessment at the Development Application stage.

Any rezoning and subsequent development of the study area would constitute or increase the operation of a number of key threatening processes (KTPs), in particular, clearing of native vegetation and loss of hollow-bearing trees.

Recommendations have been made to protect those portions of the study area deemed to have high biodiversity, including the area surrounding Bolton's Creek, Muroon Creek and Tangaratta Creek.

Potential ecological constraints could be minimised by retaining areas of vegetation and habitat along creeklines within the study area. Recommended mitigation measures to further minimise impacts and prevent secondary impacts on adjoining areas of native vegetation have been included in this report and should be considered as part of any future development proposal for the study area.

# 8. Disclaimer

*This report: has been prepared by GHD for Tamworth Regional Council* and *may only be used and relied on by Tamworth Regional Council for the purpose agreed between GHD and the Tamworth Regional Council as set out in Section 1.3 of this report.*

*GHD otherwise disclaims responsibility to any person other than Tamworth Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

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

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.*

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*Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.*

*Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.*

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# Appendices

# Appendix A – Flora species list

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Amaranthaceae | * | *Amaranthus viridis* | Green Amaranth | | | |
| Anacardiaceae | * | *Schinus areira* | Pepper Tree | | | |
| Apiaceae | | *Daucus glochidiatus* | Native Carrot | | | |
| Apiaceae | * | *Foeniculum vulgare* | Fennel | | | |
| Apiaceae | | *Hydrocotyle hirta* | Hairy Pennywort | | | |
| Apocynaceae | * | *Gomphocarpus fruticosus* | Narrow-leaved Cotton Bush | | | |
| Asteraceae | * | *Ambrosia tenuifolia* | Lacy Ragweed | | | |
| Asteraceae | * | *Bidens pilosa* | Cobbler's Pegs | | | |
| Asteraceae | * | *Bidens subalternans* | Greater Beggar's Ticks | | | |
| Asteraceae | | *Calocephalus citreus* | Lemon Beauty-heads | | | |
| Asteraceae | | *Calotis cuneata* | Mountain Burr-Daisy | | | |
| Asteraceae | * | *Carthamus lanatus* | Saffron Thistle | | | |
| Asteraceae | | *Calotis lappulacea* | Yellow Burr-daisy | | | |
| Asteraceae | * | *Centaurea solstitialis* | St Barnaby's Thistle | | | |
| Asteraceae | * | *Chondrilla juncea* | Skeleton Weed | | | |
| Asteraceae | | *Chrysocephalum apiculatum* | Common Everlasting | | | |
| Asteraceae | * | *Cichorium intybus* | Chicory | | | |
| Asteraceae | * | *Cirsium vulgare* | Spear Thistle | | | |
| Asteraceae | * | *Conyza bonariensis* | Flaxleaf Fleabane | | | |
| Asteraceae | * | *Conyza sumatrensis* | Tall fleabane | | | |
| Asteraceae | * | *Gamochaeta calviceps* | Cudweed | | | |
| Asteraceae | * | *Hypochaeris radicata* | Catsear | | | |
| Asteraceae | * | *Silybum marianum* | Variegated Thistle | | | |
| Asteraceae | * | *Sonchus asper* subsp. *glaucescens* | Prickly Sowthistle | | | |

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Asteraceae | * | *Sonchus oleraceus* | Common Sowthistle | | | |
| Asteraceae | * | *Taraxacum officinale* | Dandelion | | | |
| Asteraceae | | *Vittadinia cuneata* | A Fuzzweed | | | |
| Asteraceae | | *Vittadinia* spp. | Fuzzweed | | | |
| Asteraceae | * | *Xanthium occidentale* | Noogoora Burr | | | |
| Boraginaceae | * | *Echium plantagineum* | Patterson's Curse | | | |
| Brassicaceae | * | *Capsella bursa-pastoris* | Shepherd's Purse | | | |
| Brassicaceae | * | *Lepidium africanum* | Common Peppercress | | | X |
| Brassicaceae | * | *Rapistrum rugosum* | Turnip Weed | | | |
| Campanulaceae | | *Wahlenbergia communis* | Tufted Bluebell | | | |
| Campanulaceae | | *Wahlenbergia gracilis* | Sprawling Bluebell | | | X |
| Campanulaceae | | *Wahlenbergia stricta* | Tall Bluebell | | | |
| Caryophyllaceae | * | *Paronychia brasiliana* | Chilean Whitlow Wort, Brazilian Whitlow | | | |
| Casuarinaceae | | *Casuarina cunninghamiana* subsp. *cunninghamiana* | River Oak | | | P |
| Casuarinaceae | | *Casuarina glauca* | Swamp Oak | | | P |
| Casuarinaceae | | *Casuarina spp.* | | | | |
| Chenopodiaceae | | *Atriplex nummularia* | Old Man Saltbush | | | P |
| Chenopodiaceae | | *Atriplex semibaccata* | Creeping Saltbush | | | |
| Chenopodiaceae | * | *Chenopodium murale* | Nettle-leaf Goosefoot | | | |
| Chenopodiaceae | | *Einadia nutans* | Climbing Saltbush | | | |
| Chenopodiaceae | | *Enchylaena tomentosa* | Ruby Saltbush | | | |
| Chenopodiaceae | | *Maireana microphylla* | Small-leaf Bluebush | | | |
| Chenopodiaceae | | *Sclerolaena muricata* | Black Rolypoly | | | |
| Convolvulaceae | | *Convolvulus erubescens* | Pink Bindweed | | | |
| Convolvulaceae | | *Dichondra repens* | Kidney Weed | | | |
| Cucurbitaceae | * | *Cucumis myriocarpus* subsp. *leptodermis* | Paddy Melon | | | |

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Cupressaceae | | *Callitris glaucophylla* | White Cypress Pine | | | P |
| Cyperaceae | | *Carex breviculmis* | | | | |
| Cyperaceae | | *Carex inversa* | Knob Sedge | | | |
| Cyperaceae | * | *Cyperus brevifolius* | | | | |
| Cyperaceae | * | *Cyperus eragrostis* | Umbrella Sedge | | | |
| Cyperaceae | | *Cyperus polystachyos* | | | | |
| Cyperaceae | 0 | *Ficinia nodosa* | Knobby Club-rush | | | |
| Fabaceae (Faboideae) | | *Desmodium brachypodum* | Large Tick-trefoil | | | |
| Fabaceae (Faboideae) | | *Glycine clandestina* | Twining glycine | | | |
| Fabaceae (Faboideae) | | *Glycine tabacina* | Variable Glycine | | | |
| Fabaceae (Faboideae) | * | *Indigofera* spp. | | | | |
| Fabaceae (Faboideae) | * | *Medicago minima* | Woolly Burr Medic | | | |
| Fabaceae (Faboideae) | * | *Medicago polymorpha* | Burr Medic | | | |
| Fabaceae (Faboideae) | | *Swainsona spp.* | | | | |
| Fabaceae (Faboideae) | * | *Trifolium campestre* | Hop Clover | | | |
| Fabaceae (Faboideae) | * | *Trifolium pratense* | Red Clover | | | |
| Fabaceae (Faboideae) | * | *Trifolium repens* | White Clover | | | |
| Fabaceae (Faboideae) | * | *Trifolium* spp. | A Clover | | | |
| Fabaceae (Faboideae) | * | *Trifolium subterraneum* | Subterranean Clover | | | |
| Fabaceae (Mimosoideae) | | *Acacia baileyana* | Cootamundra Wattle | | | |
| Fabaceae (Mimosoideae) | | *Acacia cultriformis* | Knife-leaved Wattle | | | |
| Fabaceae (Mimosoideae) | | *Acacia decora* | Western Silver Wattle | | | |
| Fabaceae (Mimosoideae) | | *Acacia implexa* | Hickory Wattle | | | |
| Fabaceae (Mimosoideae) | | *Acacia rubida* | Red-stemmed Wattle | | | |
| Fabaceae (Mimosoideae) | | *Acacia saligna* | Golden Wreath Wattle | | | |
| Fabaceae (Mimosoideae) | | *Acacia* spp. | Wattle | | | |
| Geraniaceae | | *Geranium retrorsum* | Cranesbill Geranium | | | |

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Geraniaceae | | *Geranium solanderi* var. *solanderi* | | | | |
| Haloragaceae | | *Gonocarpus tetragynus* | Poverty Raspwort | | | |
| Juncaceae | | *Juncus flavidus* | | | | |
| Juncaceae | | *Juncus* spp. | A Rush | | | |
| Juncaceae | | *Juncus usitatus* | | | | |
| Lamiaceae | * | *Lamium amplexicaule* | Dead Nettle | | | |
| Lamiaceae | * | *Marrubium vulgare* | White Horehound | | | |
| Lamiaceae | * | *Salvia verbenaca* | Vervain | | | |
| Lomandraceae | | *Lomandra longifolia* | Spiny-headed Mat-rush | | | P |
| Lomandraceae | | *Lomandra multiflora* subsp. *multiflora* | Many-flowered Mat-rush | | | |
| Malvaceae | * | *Malva parviflora* | Small-flowered Mallow | | | |
| Malvaceae | * | *Modiola caroliniana* | Red-flowered Mallow | | | |
| Malvaceae | * | *Pavonia hastata* | | | | |
| Malvaceae | * | *Sida rhombifolia* | Paddy's Lucerne | | | |
| Myoporaceae | | *Eremophila debilis* | Amulla | | | |
| Myrtaceae | | *Angophora floribunda* | Rough-barked Apple | | | |
| Myrtaceae | | *Callistemon sieberi* | River Bottlebrush | | | P |
| Myrtaceae | | *Callistemon* spp. | Bottlebrush | | | P |
| Myrtaceae | | *Callistemon viminalis* | Weeping Bottlebrush | | | |
| Myrtaceae | | *Eucalyptus albens* | White Box | | | |
| Myrtaceae | | *Eucalyptus blakelyi* | Blakely's Red Gum | | | P |
| Myrtaceae | | *Eucalyptus camaldulensis* | Eucalyptus camaldulensis population in the Hunter catchment | | | |
| Myrtaceae | | *Eucalyptus cinerea* | Argyle Apple | | | P |
| Myrtaceae | | *Eucalyptus crebra* | Narrow-leaved Ironbark | | | P |
| Myrtaceae | | *Eucalyptus melanophloia* | Silver-leaved Ironbark | | | |
| Myrtaceae | | *Eucalyptus melliodora* | Yellow Box | | | |

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Myrtaceae | | *Eucalyptus populnea* subsp. *bimbil* | Bimble Box | | | P |
| Myrtaceae | | *Eucalyptus* spp. | | | | |
| Myrtaceae | | *Leptospermum polygalifolium* | Tantoon | | | P |
| Myrtaceae | | *Leptospermum* spp. | Tea-tree | | | P |
| Oleaceae | * | *Fraxinus angustifolia* subsp. *angustifolia* | Desert Ash | | | P |
| Onagraceae | | *Epilobium* spp. | | | | |
| Oxalidaceae | | *Oxalis perennans* | | | | |
| Plantaginaceae | * | *Plantago lanceolata* | Lamb's Tongues | | | |
| Poaceae | | *Aristida leptopoda* | White Speargrass | | | |
| Poaceae | | *Aristida ramosa* | Purple Wiregrass | | | |
| Poaceae | | *Austrostipa aristiglumis* | Plains Grass | | | |
| Poaceae | | *Austrostipa scabra* subsp. *falcata* | Rough Speargrass | | | |
| Poaceae | | *Austrostipa verticillata* | Slender Bamboo Grass | | | |
| Poaceae | * | *Avena barbata* | Bearded Oats | | | |
| Poaceae | * | *Avena fatua* | Wild Oats | | | |
| Poaceae | | *Bothriochloa biloba* | Lobed Bluegrass | | | |
| Poaceae | | *Bothriochloa macra* | Red Grass | | | |
| Poaceae | * | *Bromus hordeaceus* | Soft Brome | | | |
| Poaceae | * | *Chloris gayana* | Rhodes Grass | | | |
| Poaceae | * | *Chloris* spp. | | | | |
| Poaceae | | *Chloris truncata* | Windmill Grass | | | |
| Poaceae | * | *Chloris virgata* | Feathertop Rhodes Grass | | | |
| Poaceae | | *Chrysopogon fallax* | | | | |
| Poaceae | | *Cynodon dactylon* | Common Couch | | | |
| Poaceae | * | *Cynosurus echinatus* | Rough Dog's Tail | | | |
| Poaceae | | *Dichanthium sericeum* | Queensland Bluegrass | | | |

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Poaceae | | *Dichelachne micrantha* | Shorthair Plumegrass | | | |
| Poaceae | * | *Echinochloa* spp. | | | | |
| Poaceae | * | *Ehrharta erecta* | Panic Veldtgrass | | | |
| Poaceae | | *Elymus scaber* | Common Wheatgrass | | | |
| Poaceae | | *Enneapogon cylindricus* | Jointed Nineawn | | | |
| Poaceae | * | *Eragrostis* spp. | A Lovegrass | | | |
| Poaceae | | *Lachnagrostis filiformis* | | | | |
| Poaceae | | *Panicum effusum* | Hairy Panic | | | |
| Poaceae | * | *Paspalum dilatatum* | Paspalum | | | |
| Poaceae | * | *Pennisetum clandestinum* | Kikuyu Grass | | | |
| Poaceae | * | *Phalaris aquatica* | Phalaris | | | |
| Poaceae | | *Poa labillardierei* var. *labillardierei* | Tussock | | | |
| Poaceae | | *Rytidosperma caespitosum* | Ringed Wallaby Grass | | | |
| Poaceae | | *Rytidosperma richardsonii* | Straw Wallaby Grass | | | |
| Poaceae | | *Rytidosperma* spp. | Wallaby Grass | | | |
| Poaceae | | *Rytidosperma tenuius* | | | | |
| Poaceae | * | *Sorghum bicolor* | Sorghum | | | |
| Poaceae | * | *Sorghum halepense* | Johnson Grass | | | |
| Poaceae | * | *Sporobolus africanus* | Parramatta Grass | | | |
| Poaceae | | *Sporobolus creber* | Slender Rat's Tail Grass | | | |
| Poaceae | | *Themeda australis* | Kangaroo Grass | | | |
| Poaceae | * | *Triticum* spp. | Wheat | | | |
| Poaceae | | *Walwhalleya proluta* | | | | |
| Polygonaceae | * | *Acetosella vulgaris* | Sheep Sorrel | | | |
| Polygonaceae | * | *Polygonum aviculare* | Wireweed | | | |
| Polygonaceae | | *Rumex brownii* | Swamp Dock | | | |
| Polygonaceae | * | *Rumex crispus* | Curled Dock | | | |

| Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Planted |
|---|---|---|---|---|---|---|
| Proteaceae | | *Grevillea robusta* | Silky Oak | | | |
| Rhamnaceae | | *Cryptandra amara* | Bitter Cryptandra | | | |
| Rosaceae | * | *Rosa rubiginosa* | Sweet Briar | | | |
| Rosaceae | * | *Sanguisorba minor* subsp. *muricata* | Sheep's Burnet | | | |
| Rubiaceae | | *Asperula conferta* | Common Woodruff | | | |
| Rubiaceae | * | *Galium aparine* | Goosegrass | | | |
| Rutaceae | | *Geijera parviflora* | Wilga | | | |
| Salicaceae | * | *Populus nigra* | Lombardy Poplar | | | |
| Scrophulariaceae | * | *Verbascum virgatum* | Twiggy Mullein | | | |
| Simaroubaceae | * | *Ailanthus altissima* | Tree of Heaven | | | |
| Solanaceae | * | *Lycium ferocissimum* | African Boxthorn | | | |
| Solanaceae | | *Solanum esuriale* | Quena | | | |
| Sterculiaceae | | *Brachychiton populneus* | Kurrajong | | | P |
| Thymelaeaceae | | *Pimelea linifolia* | Slender Rice Flower | | | |
| Typhaceae | | *Typha domingensis* | Narrow-leaved Cumbungi | | | |
| Typhaceae | | *Typha orientalis* | Broad-leaved Cumbungi | | | |
| Urticaceae | * | *Urtica urens* | Small Nettle | | | |
| Verbenaceae | * | *Verbena bonariensis* | Purpletop | | | |
| Violaceae | | *Viola hederacea* | Ivy-leaved Violet | | | |

# Appendix B - Fauna species recorded in study area

| Class | Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Observation Type |
|---|---|---|---|---|---|---|---|
| Amphibia | Myobatrachidae | | *Limnodynastes tasmaniensis* | Spotted grass frog | | | W |
| Amphibia | Myobatrachidae | | *Crinia signifera* | Common Eastern Froglet | | | W |
| Aves | Acanthizidae | | *Gerygone olivacea* | White-throated gerygone | | | O |
| Aves | Acanthizidae | | *Acanthiza chrysorrhoa* | Yellow-rumped thornbill | | | O |
| Aves | Acanthizidae | | *Smicrornis brevirostris* | Weebill | | | |
| Aves | Accipitridae | | *Aquila audax* | Wedge-tailed eagle | | | O |
| Aves | Accipitridae | | *Milvus migrans* | Black kite | | | O |
| Aves | Accipitridae | | *Elanus axillaris* | Black-shouldered kite | | | O |
| Aves | Anatidae | | *Chenonetta jubata* | Australian wood duck | | | O |
| Aves | Artamidae | | *Strepera graculina* | Pied currawong | | | O |
| Aves | Artamidae | | *Cracticus nigrogularis* | Pied butcherbird | | | O |
| Aves | Artamidae | | *Cracticus torquatus* | Grey butcherbird | | | O |
| Aves | Cacatuidae | | *Eolophus roseicapillus* | Galah | | | O |
| Aves | Cacatuidae | | *Cacatua sanguinea* | Little corella | | | O |
| Aves | Campephagidae | | *Coracina novaehollandiae* | Black-faced cuckoo-shrike | | | O |
| Aves | Charadriidae | | *Vanellus miles* | Masked lapwing | | | O |
| Aves | Columbidae | | *Ocyphaps lophotes* | Crested pigeon | | | O |
| Aves | Corvidae | | *Corvus coronoides* | Australian raven | | | O |
| Aves | Estrildidae | | *Taeniopygia guttata* | Zebra finch | | | O |
| Aves | Estrildidae | | *Taeniopygia bichenovii* | Double-barred finch | | | O |
| Aves | Falconidae | | *Falco cenchroides* | Nankeen kestrel | | | O |
| Aves | Maluridae | | *Malurus cyaneus* | Superb fairy-wren | | | O |
| Aves | Meliphagidae | | *Lichenostomus penicillatus* | White-plumed honeyeater | | | O |
| Aves | Meliphagidae | | *Manorina melanophrys* | Bell Miner | | | O |

| Class | Family | Exotic | Scientific Name | Common Name | TSC Status | EPBC Status | Observation Type |
|---|---|---|---|---|---|---|---|
| Aves | Monarchidae | | *Grallina cyanoleuca* | Magpie-lark | | | O |
| Aves | Motacillidae | | *Anthus novaeseelandiae* | Australian Pipit | | | O |
| Aves | Pachycephalidae | | *Colluricincla harmonica* | Grey Shrike-thrush | | | O |
| Aves | Pelecanidae | | *Pelecanus conspicillatus* | Australian pelican | | | O |
| Aves | Phasianidae | | *Coturnix ypsilophora* | Brown quail | | | O |
| Aves | Psittacidae | | *Platycercus eximius* | Eastern Rosella | | | O |
| Aves | Psittacidae | | *Psephotus haematonotus* | Red-rumped parrot | | | O |
| Aves | Psittacidae | | *Platycercus elegans* | Crimson rosella | | | O |
| Aves | Rallidae | | *Fulica atra* | Eurasian coot | | | O |
| Aves | Rhipiduridae | | *Rhipidura leucophrys* | Willie wagtail | | | O |
| Aves | Rhipiduridae | | *Rhipidura albiscapa* | Grey fantail | | | O |
| Aves | Sturnidae | * | *Sturnus vulgaris* | Common starling | | | O |
| Aves | Sturnidae | * | *Sturnus tristis* | Common myna | | | O |
| Aves | Threskiornithidae | | *Threskiornis spinicollis* | Straw-necked ibis | | | O |
| Mammalia | Canidae | * | *Vulpes vulpes* | Fox | | | S |
| Mammalia | Leporidae | * | *Oryctolagus cuniculus* | Rabbit | | | O |
| Mammalia | Macropodidae | | *Macropus giganteus* | Eastern grey kangaroo | | | O |

*Key O – observed, W – heard, S-identified from scats*

# Appendix C - Threatened Biota known or predicted from the locality, habitat association and likelihood of occurring at the study area

**Threatened Ecological Communities**

| Name | NSW Status | EPBC Status | Source | Description | Likelihood of occurrence |
|---|---|---|---|---|---|
| Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River | E | | Listed as occurring in the Namoi CMA (DPI 2014b) | Includes all native fish and aquatic invertebrates within all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, anabranches, flow diversions to anabranches and the floodplains of the Darling River within NSW, and including Menindee Lakes and the Barwon River. Specifically, these areas include the main Barwon-Darling channel from Mungindi (Qld-NSW border) to the confluence with the Murray River, the arid zone intermittent intersections streams (Warrego, Culgoa, and Narran Rivers), Border Rivers (Macintyre, Severn and Dumaresq Rivers), and regulated tributaries (Gwydir, Namoi, Macquarie, Castlereagh, and Bogan Rivers). Excluded from the definition are man-made/artificial canals, water distribution and drainage works, farm dams and off-stream reservoirs. The community occurs in a lowland riverine environment characterised by meandering channels and a variety of habitats that form an integral part of the river system, including deep channels and pools, wetlands, gravel beds and floodplains. It includes 21 native fish species and hundreds of native invertebrate species (DPI 2014c). | Present – Bolton's Creek and Tarangatta Creek form part of this EEC. |
| Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions | E3 | E | Community known to occur within 10km (OEH 2014a) | Low woodland or forest community dominated by Brigalow (Acacia harpophylla), with pockets of Belah (Casuarina cristata) and Poplar Box (Eucalyptus populnea subsp. bimbil). The canopy tends to be quite dense and the understorey and ground cover are only sparse. Occurs as scattered remnants on the North West Slopes and Plains and Darling River Plains in NSW; also in Queensland. Usually occurs on heavy clay soils. | Not present |
| Howell Shrublands in the New England Tableland and Nandewar Bioregions | E3 | | Community predicted to occur within 10km (OEH 2014a) | Usually dominated by low shrubs, particularly Babingtonia densifolia and Granite Homoranthus Homoranthus prolixus, 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. Occurs as scattered patches found between Inverell and Manilla on the New England Tablelands and North West Slopes of NSW, confined to areas of extensive granite outcropping. | Not present |

| Name | NSW Status | EPBC Status | Source | Description | Likelihood of occurrence |
|---|---|---|---|---|---|
| Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions | E3 | E | Community known to occur within 10km (OEH 2014a) | Grey box woodlands includes those woodlands in which the most characteristic tree species, *Eucalyptus microcarpa* (Inland Grey Box), is often found in association with *E. populnea* subsp. *bimbil* (Bimble or Poplar Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Bulloak) or *E. melliodora* (Yellow Box), and sometimes with E. albens (White Box). The community occurs on fertile soils of the western slopes and plains of NSW. The community generally occurs where average rainfall is 375-800 mm pa and the mean maximum annual temperature is 22- 26°C. | Not present |
| Native Vegetation on Cracking Clay Soils of the Liverpool Plains | E3 | Equivalent to native Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland | Community known to occur within 10km (OEH 2014a) | Occurs on fertile cracking clays of the Liverpool Plains on the North West Slopes and Plains of NSW around Coonabarabran, Gunnedah, Murrurundi, Narrabri, Parry, and Quirindi. Most of this community has been transformed by agriculture and none of it is within Formal Reserves, although the majority of remnants are on Travelling Stock Routes. Structurally the community mostly consists of grasses, herbs and forbs. The dominant grass species are Plains Grass (*Austrostipa aristiglumis*), Queensland Bluegrass (*Dichanthium sericeum*) and Coolibah Grass (*Panicum queenslandicum*). The trees present have a scattered and patchy distribution. The dominant tree species being Boree (*Acacia pendula*), Rough-barked Apple (*Angophora floribunda*), Fuzzy Box (*Eucalyptus conica*), Bimble Box (*E. populnea*) and Yellow Box (*E. melliodora*). This community is associated with highly fertile, rich cracking soils of the Liverpool Plains. The assemblage of flora species can be very similar to the species assemblage of native grasslands 'derived' from the clearing of canopy trees in grassy white box – yellow box woodlands. | Not present |
| Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland | Portions equivalent to "Native Vegetation on Cracking Clay Soils of the Liverpool Plains" EEC | CE | Community likely to occur within 10km (DotE 2014a) | Occurs from Darling Downs in Qld to Dubbo in NSW, incorporating Liverpool and Moree Plains. Occurs on fine textured (often cracking clay) soils from basalt or quaternary alluvium. Typically occurs on flats or low slopes. Natural grassland with <10% tree canopy cover, composed of native perennial grasses. Species composition varies with location. The assemblage of flora species can be very similar to the species assemblage of native grasslands 'derived' from the clearing of canopy trees in grassy white box – yellow box woodlands. | Not present – grassland within the study area does not have the required characteristic species to be considered this community. |
| New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands | Component listed as E3 | CE | Community may occur within 10km (DotE 2014a) | The New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands ecological community is a type of temperate grassy eucalypt woodland to open forest in which the tree canopy is dominated or co-dominated by Eucalyptus nova-anglica (New England Peppermint) and the ground layer is mostly grassy. | Not recorded within study area. |

| Name | NSW Status | EPBC Status | Source | Description | Likelihood of occurrence |
|---|---|---|---|---|---|
| Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions | E3 | E | Community known to occur within 10km (OEH 2014a) | Has a scattered distribution near Gunnedah, Barraba, Bingara and north of Warialda on the NSW North West Slopes and Plains, and also in Queensland. 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. 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. The main canopy is dominated by rainforest species such as Red Olive Plum (Cassine australis var. angustifolia), Wilga (Geijera parvifolia) Native Olive (Notelaea microcarpa var. microcarpa) and Peach Bush (Ehretia membranifolia), with taller eucalypts and cypress pines from surrounding woodland vegetation emerging above the main canopy. Currant Bush (Carissa ovata) is often present and typical vines include Gargaloo (Parsonsia eucalytophylla) and Wonga Vine (Pandorea pandorana). | Not recorded within study area. |
| Weeping Myall Woodlands | E3 | E | Community may occur within 10km (DotE 2014a) | Occurs on inland alluvial plains west of the Great Dividing Range, on black, brown, red-brown or grey clay/ clay-loam soils. Typically on flat areas, shallow depressions or gilgais on raised plains, not associated with drainage lines and rarely flooded. Open woodland to woodland with Acacia pendula the dominant or sole canopy species. Often includes an open layer of shrubs above an open ground layer of grasses and herbs, though can exist naturally either as a shrubby or a grassy woodland. | Not recorded within study area. |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Equivalent to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland. EEC | CE | Community predicted to occur within 10km (OEH 2014a) | Occurs on the tablelands and western slopes of NSW, on moderate to highly fertile soils. Found in areas with annual rainfall between 400 - 1200 mm, at altitudes between 170 - 1200 m asl. Open woodland/forest, characterised by Eucalyptus albens, E. melliodora and E. blakelyi. Intact sites are rare, but contain a high species diversity of trees, shrubs, climbers, grasses and particularly herbs. The NSW listing includes sites with/without canopy layer and areas with predominately exotic groundlayer, whereas to meet the federal listing criteria areas must have either intact tree layer and predominately native groundlayer, or an intact ground layer with high species diversity but no remaining tree layer. | Not recorded within study area. |

| Name | NSW Status | EPBC Status | Source | Description | Likelihood of occurrence |
|---|---|---|---|---|---|
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland. | E3 | Portions Equivalent to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Community likely to occur within 10km (DotE 2014a); | Occurs on the tablelands and western slopes of NSW, on moderate to highly fertile soils. Found in areas with annual rainfall between 400 - 1200 mm, at altitudes between 170 - 1200 m asl. Open woodland/forest, characterised by Eucalyptus albens, E. melliodora and E. blakelyi. Intact sites are rare, but contain a high species diversity of trees, shrubs, climbers, grasses and particularly herbs. The NSW listing includes sites with/without canopy layer and areas with predominately exotic groundlayer, whereas to meet the federal listing criteria areas must have either intact tree layer and predominately native groundlayer, or an intact ground layer with high species diversity but no remaining tree layer. | Present – occurs as both a grassland and woodland form within the study area. |

Note that all community habitat and distribution information is derived from the relevant NSW (OEH 2014b) or Commonwealth (DotE 2014b) threatened species profile, unless otherwise stated.

Codes: **NSW Status:** Refers to status under the NSW TSC Act unless otherwise indicated. V – listed as vulnerable, E/E3 – listed as an endangered ecological community under the NSW TSC or FM Acts. **EPBC Status:** E – listed as endangered, CE – listed as critically endangered under the EPBC Act.

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| ***THREATENED FLORA*** | | | | | | |
| *Dichanthium setosum* | Bluegrass | V | V | Species or species habitat likely to occur within 10km (DotE 2014a); 4 records within 10km (OEH 2014a) | Occurs on the New England Tablelands, NW Slopes and Plains and the CW Slopes. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas, and appears to have wide environmental tolerances. | Possible – suitable habitat present within areas mapped as Plains Grassland – Bluegrass derived grasslands and White Box – Yellow Box Woodlands. |
| *Euphrasia arguta* | | E4A | CE | Species or species habitat may occur within 10km (DotE 2014a); Known to occur within the Peel subregion of the Namoi CMA (OEH 2014b) | Recently rediscovered near Nundle on the north-western slopes and tablelands, once known from scattered locations between Sydney, Bathurst and Walcha. Known populations occur in eucalypt forest with a mixed grass/shrub understorey, while previous records are described as occurring in open forest, grassy country and river meadows. Annual and dies back over winter. Dense stands observed in cleared firebreak areas, suggesting it may respond well to disturbance. | Unlikely - suitable habitat not present and not previously recorded within 20 km of study area. |
| *Philotheca ericifolia* | | | V | Species or species habitat likely to occur within 10km (DotE 2014a) | This species occurs in drainage areas in dry sclerophyll open forest or woodland on sandstone and in heath on damp sandy flats and gullies. Specific microclimates include damp sandy flats, alluvial deposits of coarse gravel in dry creek beds and along a spur receiving soakage from high ground. Associated species include Eucalyptus crebra, Beyeria viscosa and Philotheca australis. | Unlikely - suitable habitat not present and not previously recorded within 20 km of study area. |
| *Thesium australe* | Austral Toadflax | V | V | Species or species habitat likely to occur within 10km (DotE 2014a); Known to occur within the Peel subregion of the Namoi CMA (OEH 2014b) | Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass (Themeda australis). | Unlikely - suitable habitat not present and not previously recorded within 20 km of study area. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Tylophora linearis* | | V | E | Species or species habitat may occur within 10km (DotE 2014a); Known to occur within the Peel subregion of the Namoi CMA (OEH 2014b) | Found in the Barraba, Mendooran, Temora and West Wyalong districts in the northern and central western slopes of NSW. Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii. | Unlikely - suitable habitat not present and not previously recorded within 20 km of study area. |
| ***THREATENED FAUNA*** | | | | | | |
| ***Fish*** | | | | | | |
| *Maccullochella peelii* | Murray Cod | | V | 64 records from the Namoi CMA, comprising records from the Macdonald, Manilla, Namoi and Peel Rivers and Macdonald Creek (DPI 2014a); Species or species habitat may occur within 10km (DotE 2014a) | Occurs throughout the Murray-Darling Basin. Can live in a wide range of habitats, from clear, rocky streams in the upper western slopes regions of New South Wales to the slow flowing, turbid rivers and billabongs of the western plains. Generally, they are found in waters up to 5m deep and in sheltered areas with cover from rocks, timber or overhanging banks. The presence of wood debris has been shown to be the primary factor determining Murray cod presence (Kearney and Kildea 2001). | Unlikely – creeks within the study area unlikely to provide suitable habitat for this species. Recorded in the Peel river but unlikely to inhabit the shallow ephemeral waters of Bolton's, Tangaratta or Murroon Creeks. |
| *Tandanus tandanus* | Freshwater Catfish | EP | | 24 records from the Namoi CMA, comprising records from the Cockburn, Manilla, Namoi and Peel Rivers and Goonoo Goonoo, Halls and Ironbark Creeks (DPI 2014a) | Once widespread and abundant throughout the Murray-darling system, has declined rapidly and in NSW is currently only regularly observed in the Macquarie catchment upstream of Warren, the Castlereagh catchment upstream of Mendooran, the Namoi catchment upstream of Wee Waa, the Gwydir catchment upstream of Moree and the Border Rivers catchment upstream of Goondiwindi. Present in a range of riverine and lake habitats, preferring sluggish or still waters. Found in both clear and turbid waters, in areas ranging from mud to gravel to rock substrates. Now rare in riverine habitats in inland NSW and Queensland but can be found in farm dams (DPI 2011b). | Unlikely – creeks within the study area unlikely to provide suitable habitat for this species. Recorded in the Peel river but unlikely to inhabit the shallow ephemeral waters of Bolton's, Tangaratta or Murroon Creeks. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Bidyanus bidyanus* | Silver Perch | V | CE | 3 records from the Namoi River (DPI 2014a); Listed as occurring in the Namoi CMA (DPI 2014b) | In NSW now absent from much of their former range across the Murray-Darling. Most abundant remaining natural population occurs in the central Murray River downstream of Yarrawonga Weir as well as several of its anabranches and tributaries including the Edward River - an anabranch of the Murray River that flows through Deniliquin, and the Murrumbidgee River. Prefer fast-flowing, open waters, especially where there are rapids and races, however they will also inhabit warm, sluggish water with cover provided by large woody debris and reeds. Information on habitat preferences is scarce for this species (NSW DPI 2006a) | Unlikely – creeks within the study area unlikely to provide suitable habitat for this species |
| ***Frogs*** | | | | | | |
| *Litoria booroolongensis* | Booroolong Frog | E1 | E | Species or species habitat may occur within 10km (DotE 2014a); No records within 10km, 2 records within 20km (OEH 2014a) | Restricted to western slopes and tablelands, mainly in western-flowing streams and their headwaters on the Great Dividing Range. Has disappeared from the Northern Tablelands and rare throughout the rest of its range. Occurs along permanent streams with some fringing vegetation cover, ranging from slow-flowing creeks to large rivers, in both forested/ open pasture areas. Found on or near cobble banks and other rock structures within stream margins and shelter under rocks or amongst vegetation near the ground on the stream edge. | Unlikely - suitable habitat not present within study area. |
| ***Reptiles*** | | | | | | |
| *Underwoodisaurus sphyrurus* | Border Thick-tailed Gecko | V | V | Species or species habitat likely to occur within 10km (DotE 2014a); 6 records within 10km (OEH 2014a) | Occurs on the tablelands and slopes of northern NSW and southern Queensland, south to Tamworth and west to Moree. Most common in the granite country of the New England Tablelands. Prefers forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter, often found in sites with dense tree canopy and sparse understorey. | Unlikely - suitable rocky habitat not present within study area. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Aprasia parapulchella* | Pink-tailed Legless Lizard | V | V | Species or species habitat may occur within 10km (DotE 2014a) | Populations occur in the Queanbeyan/Canberra district, Cooma, Yass, Bathurst, Albury and West Wyalong areas. Inhabits grassland and open woodland with substantial embedded rock cover in sunny situations. Recorded in both native and non-native grasslands. Usually recorded under small rocks (150 - 600 mm basal area) shallowly embedded in the soil (2 - 5 cm, and use ant burrows under these rocks. | Unlikely - suitable rocky habitat not present and not previously recorded within 20 km of study area. |
| ***Birds*** | | | | | | |
| *Chthonicola sagittata* | Speckled Warbler | V | | 1 record within 10km (OEH 2014a) | Within NSW most frequently reported from the hills and tablelands of the Great Dividing Range, rarely from the coast. Inhabits a wide range of Eucalyptus-dominated communities with a grassy understorey, a sparse shrub layer, often on rocky ridges or in gullies. Sedentary and requires large, relatively undisturbed remnants to persist in an area. Forages on the ground for seeds and insects, and nests in a slight hollow in the ground or at the base of a low dense plant. | Unlikely - suitable habitat not present and not previously recorded within 20 km of study area. |
| *Circus assimilis* | Spotted Harrier | V | | No records within 10km, 1 record within 20km (OEH 2014a) | Occurs throughout Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Inhabits grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). Most commonly in native grassland, but also in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn). | Possible – suitable habitat present within areas of derived grassland and white box –yellow box woodland. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Hieraaetus morphnoides* | Little Eagle | V | | 1 record within 10km (OEH 2014a) | Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. | Possible – suitable foraging habitat present within areas of derived grassland and white box –yellow box woodland. |
| *Lophoictinia isura* | Square-tailed Kite | V | | 1 record within 10km (OEH 2014a) | Occurs across NSW, resident in North, northeast and along west-flowing rivers. Summer breeding migrant to southeast of state. Inhabits a variety of habitats including woodlands and open forests, with preference for timbered watercourses. Favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah/River Red Gum on the inland plains. In Sydney area nests in mature living trees within 100m of ephemeral/permanent watercourse. Large home range > 100 km2. | Possible – suitable foraging habitat present within areas of derived grassland and white box –yellow box woodland |
| *Botaurus poiciloptilus* | Australasian Bittern | E1 | E | Species or species habitat known to occur within 10km (DotE 2014a); Known to occur within the Peel subregion of the Namoi CMA (OEH 2014b) | Widespread but uncommon over most NSW except the northwest. Favours permanent freshwater wetlands with tall dense reedbeds particularly Typha spp.and Eleocharis spp., with adjacent shallow, open water for foraging. Roosts during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails. | Possible – suitable foraging habitat present adjacent to Tangaratta Creek. |
| *Climacteris picumnus victoriae* | Brown Treecreeper (eastern subspecies) | V | | 1 record within 10km (OEH 2014a) | Occurs from Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell to the east coast, in areas such as the Snowy River Valley, Cumberland Plain, Hunter Valley and parts of the Richmond and Clarence Valleys. Most common on the inland slopes and plains. Inhabits eucalypt woodlands and dry open forest, usually dominated by stringybarks or rough-barked species with open grassy understorey. Fallen timber is important foraging habitat. Nests in hollows in standing trees or stumps. | Possible – suitable foraging habitat present within areas of derived grassland and white box –yellow box woodland. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Stagonopleura guttata* | Diamond Firetail | V | | 3 records within 10km (OEH 2014a) | Typically found west of the Great Dividing Range, but populations also occur in drier coastal areas including W Sydney, Hunter, Clarence and Snowy River valleys. Occurs in grassy eucalypt woodlands including Box Gum and Snow Gum communities, as well as open forest, mallee and natural and derived grasslands. Often found in riparian areas and occasionally in lightly wooded farmland. Nests in shrubby understorey or higher up under nests of other species. | Likely – suitable foraging habitat present within areas of derived grassland and white box –yellow box woodland. |
| *Falco subniger* | Black Falcon | V | | 4 records within 10km (OEH 2014a) | The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. Occurs in plains, grasslands, foothills, timbered watercourses, wetland environs, crops, and occasionally over towns and cities. Breeding occurs along timbered waterways in in land areas. | Possible – suitable foraging habitat present within areas of derived grassland and white box –yellow box woodland |
| *Anthochaera phrygia* | Regent Honeyeater | E4A | E | Foraging, feeding or related behaviour likely to occur within 10km (DotE 2014a); No records within 10km, 3 records within 20km (OEH 2014a) | In NSW confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. Inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes. | Unlikely – suitable habitat not present within study area. |
| *Melithreptus gularis gularis* | Black-chinned Honeyeater (eastern subspecies) | V | | No records within 10km, 3 records within 20km (OEH 2014a) | Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). | Possible – suitable foraging habitat present within areas of derived grassland and white box –yellow box woodland. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Daphoenositta chrysoptera* | Varied Sittella | V | | No records within 10km, 4 records within 20km (OEH 2014a) | Sedentary, occurs across NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. | Unlikely – study area unlikely to provide suitable habitat due to disturbances associated with agricultural activity and isolation from large patches of remnant vegetation. |
| *Melanodryas cucullata cucullata* | Hooded Robin (south-eastern form) | V | | No records within 10km, 2 records within 20km (OEH 2014a) | Considered a sedentary species, but local seasonal movements are possible. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Nests on low, live or dead forks or branches of trees or stumps, or occasionally on fallen trees or limbs. | Unlikely – study area unlikely to provide suitable habitat due to disturbances associated with agricultural activity and isolation from large patches of remnant vegetation. |
| *Petroica boodang* | Scarlet Robin | V | | No records within 10km, 1 record within 20km (OEH 2014a) | In NSW occurs from coast to inland slopes. Breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within open understorey of shrubs and grasses and sometimes in open areas. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. Abundant logs and coarse woody debris are important habitat components. | Possible – suitable habitat present within areas of derived grassland and white box –yellow box woodland. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Glossopsitta pusilla* | Little Lorikeet | V | | 1 record within 10km (OEH 2014a) | Occurs from coast to western slopes of the Great Dividing Range. Inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands *Eucalyptus albens* and *E. melliodora* are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially *Eucalyptus viminalis, E. blakelyi* and *E. dealbata*. Most breeding records are from the western slopes. | Unlikely – study area unlikely to provide suitable habitat due to disturbances associated with agricultural activity and isolation from large patches of remnant vegetation. |
| *Lathamus discolor* | Swift Parrot | E1 | E | Species or species habitat likely to occur within 10km (DotE 2014a); 2 records within 10km (OEH 2014a) | Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus robusta, Corymbia maculata and C. gummifera dominated coastal forests are also important habitat. | Unlikely – suitable habitat not present within study area. |
| *Neophema pulchella* | Turquoise Parrot | V | | 5 records within 10km (OEH 2014a) | Occurs from coast to inland slopes. In coastal area, most common between Hunter and Northern Rivers, and further south in S Coast. Inhabits open eucalypt woodlands and forests, typically with a grassy understorey. Favours edges of woodlands adjoining grasslands or timbered creek lines and ridges. Feeds on the seeds of native and introduced grasses and other herbs. Grasslands and open areas provide important foraging habitat for this species while woodlands provide important roosting and breeding habitat. Nests in tree hollows, logs or posts from August to December. | Possible – suitable habitat present within areas of derived grassland and white box –yellow box woodland. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Rostratula australis* | Australian Painted Snipe | E1 | E | Species or species habitat may occur within 10km (DotE 2014a); Predicted to occur within the Peel subregion of the Namoi CMA (OEH 2014b) | Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. Nests on the ground amongst tall reed-like vegetation near water. Feeds on mudflats and the water's edge taking insects, worm and seeds. Prefers fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber. | Possible – suitable habitat along Bolton's and Tangaratta Creeks. |
| *Ninox connivens* | Barking Owl | V | | No records within 10km, 1 record within 20km (OEH 2014a), last recorded 1991 | Occurs from coast to inland slopes and plains, though is rare in dense, wet forests east of the Great Dividing Range and sparse in higher parts of the tablelands and in the arid zone. Inhabits eucalypt woodlands, open forest, swamp woodlands, and, especially in inland areas, timber along watercourses. Roosts along creek lines in dense, tall understorey foliage (e.g. in Acacia and Casuarina), or dense eucalypt canopy. Nests in hollows of large, old eucalypts including Eucalyptus camaldulensis, Eucalyptus albens, Eucalyptus polyanthemos and Eucalyptus blakelyi. Birds and mammals important prey during breeding. Territories range from 30 to 200 hectares. | Possible – suitable nesting and foraging habitat present within study area. |
| *Tyto novaehollandiae* | Masked Owl | V | | No records within 10km, 1 record within 20km (OEH 2014a) | Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken. | Unlikely – suitable habitat not present within study area. |
| ***Mammals*** | | | | | | |
| *Dasyurus maculatus* | Spotted-tailed Quoll | V | E | Species or species habitat may occur within 10km (DotE 2014a); 6 records within 10km (OEH 2014a) | Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, usually traversed along densely vegetated creek lines. | Unlikely – suitable habitat not present within study area. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Saccolaimus flaviventris* | Yellow-bellied Sheathtail-bat | V | | 1 record within 10km (OEH 2014a) | Migrates from tropics to SE Aus in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts communally in large tree hollows and buildings (Churchill 2008). | Possibly – suitable roosting and foraging habitat present within study area. |
| *Petrogale penicillata* | Brush-tailed Rock-wallaby | E1 | V | Species or species habitat may occur within 10km (DotE 2014a); No records within 10km, 1 record within 20km (OEH 2014a) | Occurs from the Shoalhaven north to the Queensland border. Now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. Occurs on rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Diet consists of vegetation in adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. | Unlikely – suitable habitat not present within study area. |
| *Mormopterus norfolkensis* | Eastern Freetail-bat | V | | 1 record within 10km (OEH 2014a) | Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark (Churchill 2008). | Possibly – suitable roosting and foraging habitat present within study area. |
| *Petaurus norfolcensis* | Squirrel Glider | V | | 5 records within 10km (OEH 2014a) | Occurs along the drier inland slopes as well as coastal habitats. Inhabits woodland and open forest with a Eucalyptus, Corymbia or Angophora overstorey and a shrubby understorey of Acacia or Banksia. Key habitat components include reliable winter and early-spring flowering Eucalypts, Banksia or other nectar sources, and hollow-bearing trees for roost and nest sites (van der Ree and Suckling 2008, Quin et al 2004), with social groups moving between multiple hollows. Social groups include one or two adult males and females with offspring, and have home ranges of 5-10ha within NSW (van der Ree and Suckling 2008, Kavanagh 2004). | Unlikely – suitable habitat not present within study area. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Phascolarctos cinereus* | Koala, Hawks Nest and Tea Gardens population | V | V | Species or species habitat known to occur within 10km (DotE 2014a); 4 records within 10km (OEH 2014a) | Occurs from coast to inland slopes and plains. Restricted to areas of preferred feed trees in eucalypt woodlands and forests. Home range varies depending on habitat quality, from < 2 to several hundred hectares. | Unlikely – preferred feed trees not present within study area. |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | V | Foraging, feeding or related behaviour may occur within 10km (DotE 2014a); Known to occur within the Peel subregion of the Namoi CMA (OEH 2014b) | Roosts in camps within 20 km of a regular food source, typically in gullies, close to water and in vegetation with a dense canopy. Forages in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps and street trees, particularly in eucalypts, melaleucas and banksias. Highly mobile with movements largely determined by food availability (Eby and Law 2008). Will also forage in urban gardens and cultivated fruit crops. | Unlikely – suitable habitat not present within study area. |
| *Chalinolobus dwyeri* | Large-eared Pied Bat | V | V | Species or species habitat may occur within 10km (DotE 2014a); 1 record within 10km (OEH 2014a) | Occurs from the coast to the western slopes of the divide. Largest numbers of records from sandstone escarpment country in the Sydney Basin and Hunter Valley (Hoye and Schulz 2008). Roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. An insectivorous species that flies over the canopy or along creek beds (Churchill 2008). In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys. | Unlikely – suitable habitat not present within study area. |
| *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | V | | 1 record within 10km (OEH 2014a) | Occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts in hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded) (Churchill 2008, Law et al 2008). | Possible – suitable foraging and roosting habitat present within study area. One record adjacent to site on Bolton's Creek. |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Miniopterus schreibersii oceanensis* | Eastern Bentwing-bat | V | | 3 records within 10km (OEH 2014a) | Generally occurs east of the Great Dividing Range along NSW coast (Churchill 2008). Inhabits various habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. Essentially a cave bat but may also roost in road culverts, stormwater tunnels and other man-made structures. Only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Females may travel hundreds of kilometres to the nearest maternal colony (Churchill 2008). | Possible – suitable foraging habitat present within study area. |
| *Nyctophilus corbeni* | Corben's Long-eared Bat | V | V | Species or species habitat may occur within 10km (DotE 2014a); No records within 10km, 2 records within 20km (OEH 2014a) | Little known about the biology or social structure of these bats - rarely recorded and scattered distribution (DotE 2014b). Limited distribution that is retricted to the Murray-Darling Basin and western slopes in south-eastern Australia. Occur in a wide range of habitats including River Red Gum, Black Box, Allocasuarina, Belah, Mallee, open woodlands and savannahs, but are most common in box, ironbark and cypress open forests and buloke woodlands of inland northern NSW (Churchill 2008). In SA known to roost in tree hollows less than 3 m above the ground with multiple small entrances, elsewhere they roost in fissures in branches and under exfoliating bark. Tree hollows used as maternity sites (Churchill 2008). | Unlikely – suitable habitat not present within study area. |

Note that all species' habitat and distribution information is derived from the relevant NSW (OEH 2014b) or Commonwealth (DotE 2014b) threatened species profile, unless otherwise stated.

Marine and littoral threatened species (particularly shorebirds) which are restricted to coastal or estuarine environments were excluded from the threatened biota table.

All information in this table has been taken from NSW OEH and Commonwealth DotE Threatened Species profiles (OEH, 2014a; DotE 2014b) unless otherwise stated. **NSW Status:** Refers to status under the NSW TSC Act unless otherwise indicated. V – listed as vulnerable, E/E1 – listed as endangered, EP/E2 – listed as an endangered population, E4A/ CE – listed as critically endangered under the NSW TSC or FM Acts. **EPBC Status:** V – listed as vulnerable, E – listed as endangered, CE – listed as critically endangered

**Migratory Birds**

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | | C; Migratory terrestrial | Species or species habitat likely to occur within 10km (DotE 2014a) | Primarily coastal but may extend inland over major river systems. Breeds close to water, mainly in tall open forest/woodland but also in dense forest, rainforest, closed scrub or remnant trees. Usually forages over large expanses of open water, but also over open terrestrial habitats (e.g. grasslands). | Unlikely – suitable habitat not present within study area. |
| *Apus pacificus* | Fork-tailed Swift | | C,J,K; Migratory marine | Species or species habitat likely to occur within 10km (DotE 2014a) | Recorded in all regions of NSW. Non- breeding, and almost exclusively aerial while in Australia. Occurs over urban and rural areas as well as areas of native vegetation. | Possible – may fly over site |
| *Hirundapus caudacutus* | White-throated Needletail | | C,J,K; Migratory terrestrial | Species or species habitat likely to occur within 10km (DotE 2014a) | Recorded along NSW coast to the western slopes and occasionally from the inland plains. Breeds in northern hemisphere. Almost exclusively aerial while in Australia. Occur above most habitat types, but are more frequently recorded above more densely vegetated habitats (rainforest, open forest and heathland) than over woodland or treeless areas. | Possible – may fly over site |
| *Ardea ibis* | Cattle Egret | | C,J; Migratory wetlands | Species or species habitat likely to occur within 10km (DotE 2014a) | Occurs across NSW. Principal breeding sites are the central east coast from Newcastle to Bundaberg. Also breeds in major inland wetlands in north NSW (notably the Macquarie Marshes). Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. Uses predominately shallow, open and fresh wetlands with low emergent vegetation and abundant aquatic flora. Sometimes observed in swamps with tall emergent vegetation and commonly use areas of tall pasture in moist, low-lying areas. | Possible – suitable habitat present in study area |
| *Ardea modesta* | Eastern Great Egret | | Migratory wetlands | Species or species habitat known to occur within 10km (DotE 2014a) | Occurs across NSW. Within NSW there are breeding colonies within the Darling Riverine Plains and Riverina regions, and minor colonies across its range including the north and north-east of the state. Reported from a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial). | Possible – suitable habitat present in study area |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Merops ornatus* | Rainbow Bee-eater | | J; Migratory terrestrial | Species or species habitat may occur within 10km (DotE 2014a); 2 records within 10km (OEH 2014a) | Distributed across much of mainland Australia, and several near-shore islands. Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches. Occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages. Common in cleared and semi-cleared habitats and is regularly recorded in other disturbed habitats including roadside vegetation. It has also been recorded in towns and suburbs. | Possible – suitable habitat present in study area |
| *Myiagra cyanoleuca* | Satin Flycatcher | | Migratory terrestrial | Species or species habitat known to occur within 10km (DotE 2014a) | In NSW widespread on and east of the Great Divide, sparsely scattered on the western slopes, very occasional records on the western plains. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, often near wetlands and watercourses. On migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Generally not in rainforests. | Unlikely – suitable habitat not present within study area |
| *Rhipidura rufifrons* | Rufous Fantail | | Migratory terrestrial | Species or species habitat known to occur within 10km (DotE 2014a) | Found along NSW coast and ranges. Inhabits rainforest, dense wet forests, swamp woodlands and mangroves. During migration, it may be found in more open habitats or urban areas (Birds Australia 2008). | Unlikely – suitable habitat not present within study area |
| *Rostratula australis* | Australian Painted Snipe | E1, | E; Migratory wetlands | Species or species habitat may occur within 10km (DotE 2014a) | Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. Nests on the ground amongst tall reed-like vegetation near water. Feeds on mudflats and the water's edge taking insects, worm and seeds. Prefers fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber. | Possible – suitable habitat present in study area along Bolton's and Tarangatta Creeks |

| Scientific Name | Common Name | NSW Status | EPBC Status | Source | Habitat description | Likelihood of occurrence |
|---|---|---|---|---|---|---|
| *Gallinago hardwickii* | Latham's Snipe | | C,J,K; Migratory wetlands | Species or species habitat may occur within 10km (DotE 2014a) | Occurs along the coast and west of the great dividing range. Non breeding visitor to Australia. Inhabit permanent and ephemeral wetlands up to 2000 m asl. Typically in open, freshwater wetlands with low, dense vegetation (incl. swamps, flooded grasslands and heathlands). Can also occur in saline/brackish habitats and in modified or artificial habitats close to human activity. | Possible – suitable habitat present in study area along Boltons and Tarangatta Creeks |

Note that all species' habitat and distribution information is derived from the relevant NSW (OEH 2014b) or Commonwealth (DotE 2014b) threatened species profile, unless otherwise stated.

Codes: **NSW Status:** E1 – Listed as endangered under the NSW TSC Act. **EPBC Status:** E – listed as endangered; C – listed under the China – Australia Migratory Bird Agreement (CAMBA); J – listed under the Japan – Australia Migratory Bird Agreement (JAMBA); K – listed under the Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA).

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