OzArk Environment & Heritage ABN: 59 104 582 354

DUBBO
QUEANBEYAN

T: 02 6882 0118
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

145 Wingewarra St
PO Box 2069
DUBBO NSW 2830

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Moree Plains Shire Council

Angus Witherby
Director, Planning and Community Development
Level 2, 30 Heber Street
Moree, NSW 2400
angus.witherby@mpsc.nsw.gov.au
P 02 67573250
M: 0439 665 689

RE: East-West Bypass Ecological Assessment

Dear Angus,

Please see advice attached regarding the above mentioned project, undertaken by OzArk Environmental and Heritage Management (OzArk).

In order to prepare this advice, I visited the site on 18-19th December 2018 and undertook surveys to be able to identify the vegetation communities, fauna and flora present.

I have identified and mapped several protected matters as constraints to allow Council to reconsider the best road alignment to reduce adverse environmental outcomes. These constraints and recommendations are discussed further in Attachment 1.

Kind Regards,

Dr Emma Gray
Ecologist
OzArk Environmental & Heritage Management Pty Ltd
PO Box 2069 DUBBO 2830
Dubbo office: 02 6882 0118
emma@ozarkehm.com.au; www.ozarkehm.com.au

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1 INTRODUCTION

1.1 The proposal

Moree Plains Shire Council has identified a proposed route for an east-west bypass (the proposal), connecting the Newell Highway south of Moree to the Gwydir Highway to the north-west (**Figure 1**). The proposed bypass is part of the Moree Intermodal Park Infrastructure Project. It will be approximately 9 km in length and be built to highway standard to allow for future use as a heavy vehicle road. The route will utilize a mix of private land and crown reserves. The land immediately surrounding the subject site is zoned for primary production (RU1). However, the route also proposes crossing the Mehi River and running adjacent to Halls Creek. Therefore, the proposal will require some clearing of native vegetation and impacts on the riparian zone.

Additionally, part of the north-south link road is included in the assessment (**Figure 2**). The proposal involves realigning and sealing the roads for increased safety and improved travel times. Part of the north-south link road currently crosses a floodway of Halls Creek. Therefore, as part of the proposal, a new concrete box culvert will also be installed to increase the reliability and safety of the road.

This ecological assessment report will provide a preliminary assessment that details the vegetation and aquatic communities within the proposal site, including whether any endangered ecological communities (EEC), significant flora, fauna or their habitat are present. Recommendations regarding the proposal and impact avoidance measures will be provided. If any of these protected matters are determined to be present, these will be mapped as constraints to allow Council to reconsider the best road alignment to reduce adverse environmental outcomes.

This report does not asses the significance of any impact to threatened species or communities and does not provide recommendations for avoiding, minimising and/or mitigating impact.

1.2 Information sources

Information and data sources used in this assessment include:

- Onsite inspection and vegetation surveys undertaken on 18-19th December 2018.
- Regional Scale State Vegetation Map: Border Rivers Gwydir / Namoi Region V 2.0. (OEH, 2018)
- NSW BioNet Vegetation Classification (http://www.environment.nsw.gov.au/research/Visclassification.htm)
- NSW Threatened Biodiversity Data Collection (http://www.environment.nsw.gov.au/threatenedspeciesapp/)
- NSW BioNet Atlas (http://www.environment.nsw.gov.au/wildlifeatlas/about.htm)

- NSW Biodiversity Values Map (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap)
- Register of Declared Areas of Outstanding Biodiversity Value (AOBV) (http://www.environment.nsw.gov.au/criticalhabitat/CriticalHabitatProtectionByDoctype.htm)
- Flora of NSW (Harden 1991-2002) and Flora NSW Online (www.plantnet.rbgsyd.nsw.gov.au).

1.3 Relevant terms

The following terms and definitions are used to describe the land assessed in this study.

10 km search area – the area within a 10 km radius of the subject site. This 10 km buffer has been used to search information sources to establish the landscape context of the subject site.

Study area – the area within a 1,500 m radius of the subject site. Native vegetation has been mapped within this 1,500 m buffer to provide some context in regards to the connectivity and cover of native vegetation in the area affected by the proposal, and to inform the impact assessment of the proposal.

Subject site - The area of land that is directly impacted by a proposed development, including access roads, and construction and materials storage areas. The development footprint can also include areas where partial clearing or management of vegetation is proposed, such as an asset protection zone.

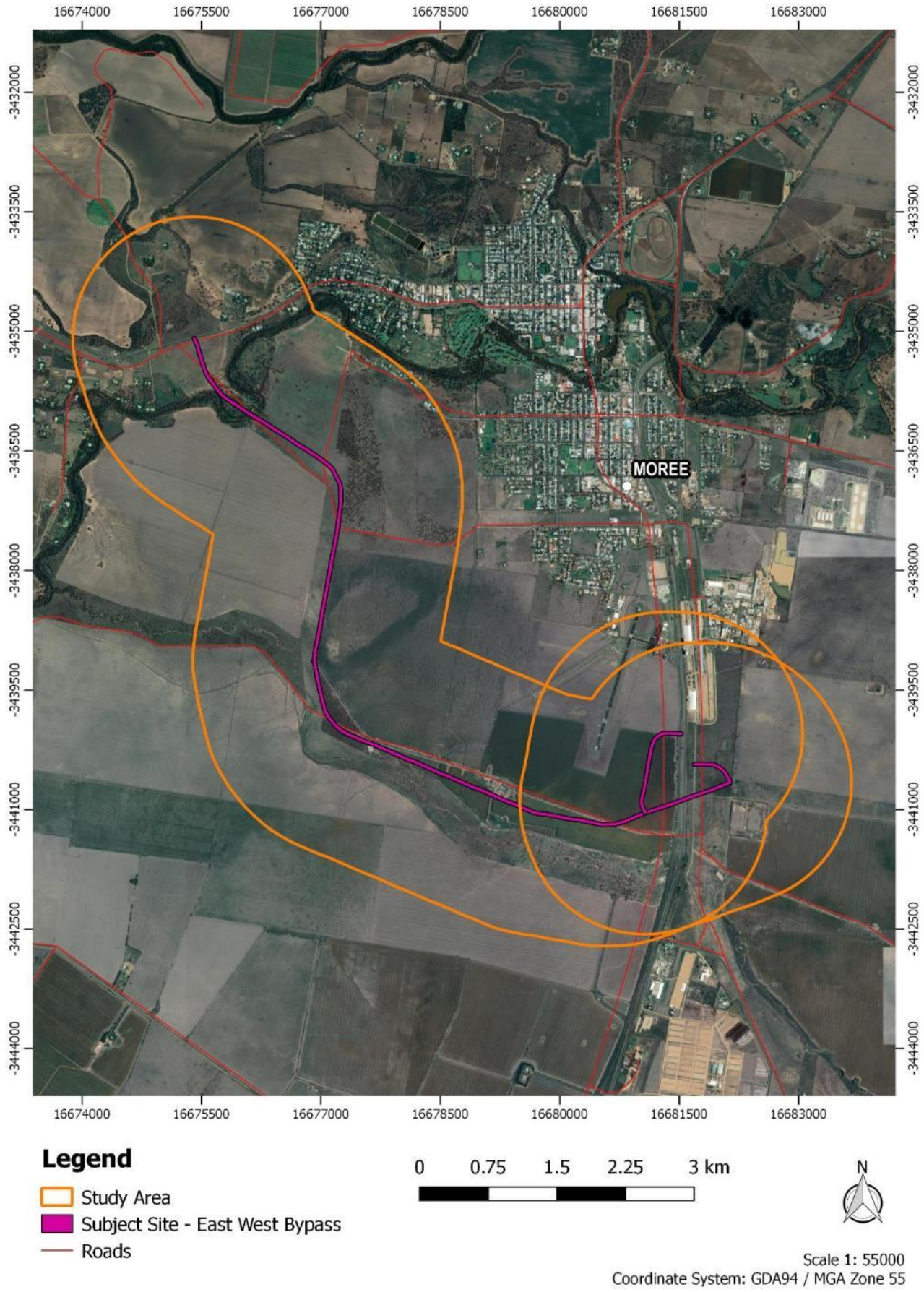

Figure 1. Proposed location of the east-west bypass.

Figure 2. Location of the north-south link road.

2 METHODS

The ecological assessment was carried out in three stages:

1. Desktop searches and review of ecological databases and information to identify threatened species, populations or ecological communities listed in the NSW *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* that have the potential to occur in the study area.

2. Field survey of the subject site to collate species lists for the purposes of identifying the vegetation communities present and target predicted threatened species and ecological communities. Where a threatened species or community or habitat feature is identified, document the nature and extent of the protected matter and describe its 'viable local population' or occurrence.

3. Preparation of written advice that details the vegetation and aquatic communities within the proposal site, including whether any endangered ecological communities (EEC), significant flora, fauna or their habitat are present. If any of these protected matters are determined to be present, these will be mapped as constraints to allow Council to reconsider the best road alignment to reduce adverse environmental outcomes.

2.1 Personnel

OzArk Environmental and Heritage Management Pty Ltd (OzArk) operates under NSW Scientific Research License 101908, and NSW Department of Primary Industries (DPI) Accreditation of a corporation as an animal research establishment Ref No. AW2017/012.

The field survey was completed by Ecologist Emma Gray. Reporting components were completed by Emma Gray with quality control provided by Jesse Carpenter. Key details of personnel are provided in provided in **Table 1**.

Table 1. Summary of OzArk personnel qualifications.

Name	Position	CV Details
Jesse Carpenter	Senior Ecologist	• Accredited BAM assessor – Accreditation #BAAS18122 • 10 years' experience as a consultant ecologist in public and private sector in NSW and NT • Master of Ornithology (in prep.) • Bachelor of Applied Science – Environmental Management – University of South Australia • 4WD Training • WH&S Induction Training for Construction Work
Dr Emma Gray	Ecologist	• Doctor of Philosophy • Bachelor of Applied Science – Ecology – Queensland University of Technology • 4WD Training • WH&S Induction Training for Construction Work

2.2 Desktop assessment

Database searches were undertaken before the field assessment to determine threatened species predicted to occur within the study area and also those previously recorded within 10 km of the subject site. The information sources and databases listed above were reviewed to identify the likely biodiversity values, vegetation types, threatened species and ecological communities that may occur at the site. Results of the database searches are provided in **Appendix A**.

2.3 Field assessment

2.3.1 SURVEY OBJECTIVES

The objectives of the field survey were to:

- Identify native species and vegetation communities present.
- Describe the quality and value of the vegetation and the flora and fauna habitat located within the subject site.
- Determine if species, populations or ecological communities listed as threatened under the BC Act or EPBC Act are/may be present.

2.3.2 VEGETATION SURVEY METHODOLOGY

The vegetation survey was as follows:

- Seven vegetation plots were surveyed according to the Biodiversity Assessment Method (BAM) as follows:
  - Each survey plot consisted of nested 20 m x 50 m and 20 m x 20 m plots
  - Species composition and structure (species and percent cover) data collected from within 20 m x 20 m plot
  - Vegetation function data (size and number of trees, presence of hollow-bearing trees and woody debris) collected from within 20 m x 50 m plot
  - Percent of litter cover data collected within five 1 m x 1 m squares positioned at 5 m, 15 m, 25 m, 35 m and 45 m points of 50 m transect.
  - Plot locations were randomly selected whilst ensuring adequate survey effort within each Plant Community Type (PCT).

All survey locations were recorded with a GPS device using GDA 94 / MGA Zone 55 coordinate system. The location of each BAM plot is shown in **Figure 3**.

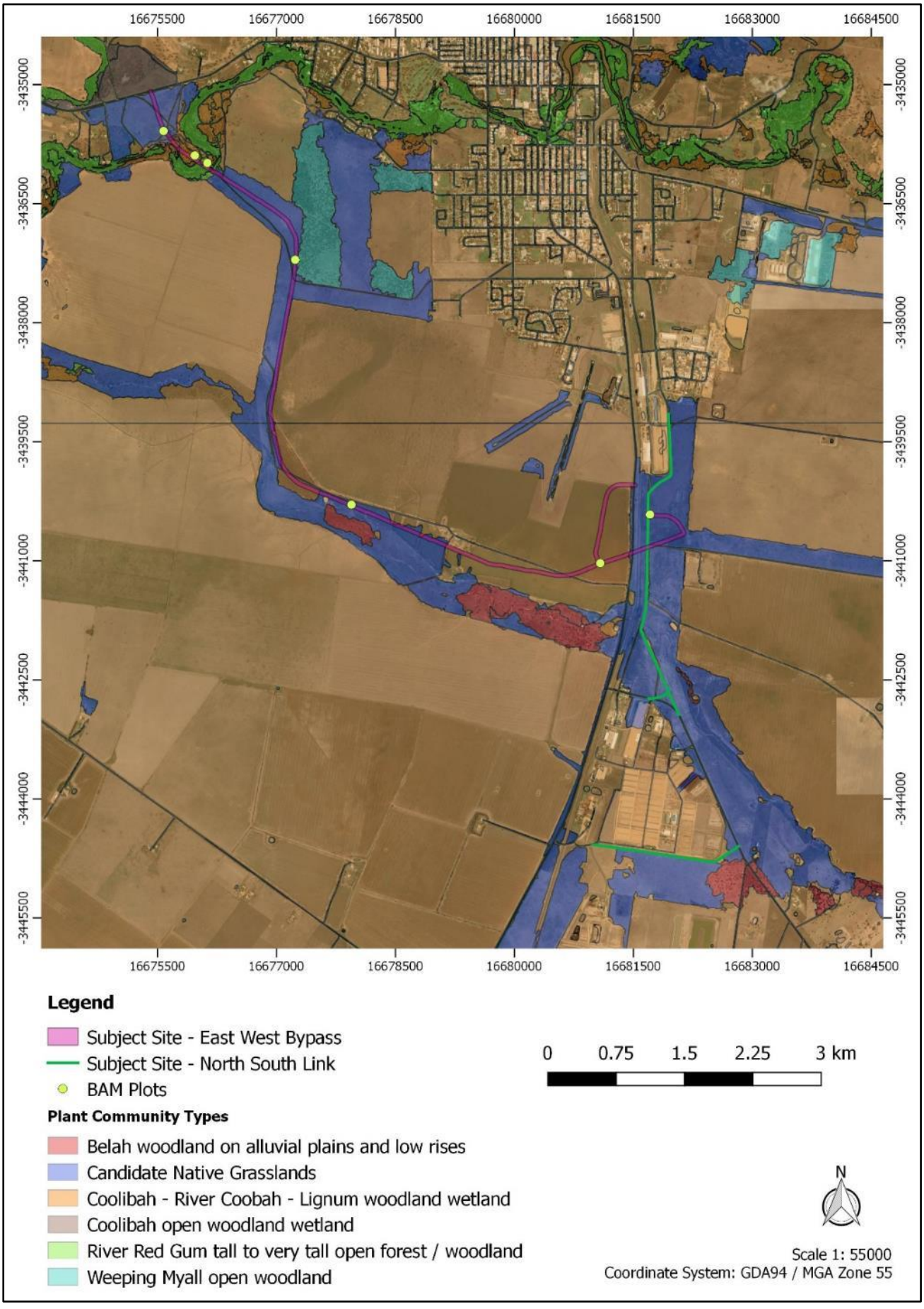

Figure 3. Locations of the BAM plots.

2.3.3 FAUNA SURVEY METHODOLOGY

The subject site was searched for fauna while traversing the entire site by foot. Birds were recorded as either present on the site, or as incidental, if recorded only as flying over (and not using) the subject site. Potential habitat such as rocks, loose bark and course woody debris was examined for cryptic species. Tracks and other areas of suitable substrate were searched for animal tracks. Other evidence of fauna presence on the subject site, such as scats, feathers and sloughed skins were also recorded. No formal frog surveys, trapping, nocturnal searches or acoustic bat surveys were undertaken.

2.4 Native vegetation classification

Vegetation communities were identified in accordance with the online NSW Master Plant Community Type Classification (OEH, 2018b), which is the current state-wide vegetation classification system for PCTs. This classification system is used for vegetation mapping, development assessment and site planning purposes. It describes over 1,500 PCTs across the state, and groups the vegetation communities into vegetation Class and Formation / Sub-formation as per Keith (2004).

In this study PCTs were identified on the basis of the following inputs:

- Regional Scale State Vegetation Map: Border Rivers Gwydir / Namoi Region V 2.0. (OEH, 2018), which provides predictive mapping of PCTs in and around the subject site. This mapping is indicative only. It is not necessarily accurate at a fine scale for the purposes of the current study.
- Professional ecological knowledge about locally-occurring vegetation types and landscape, soil and topographic patterns, including transitions from one community to another and potential for intergrades between plant communities.
- Field survey results confirming the flora species present, vegetation structure, landscape position and soil type at the subject site and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database was used to identify the candidate vegetation communities likely to be present based on the site conditions (flora species present, vegetation structure, bioregion, and landscape position and soil type) and the relevant published PCT descriptions.

If any of the PCTs were identified as having potential to be part of a Threatened Ecological Community (TEC), the relevant identification guidelines (NSW Scientific Committee listing criteria and Commonwealth identification guides) were consulted to determine the status of the vegetation community present on the subject site.

These guidelines provide the identification criteria used to positively identify the community as being part of the TEC. The criteria include location, species present, overstorey species, weed cover, number and type of native species including whether certain ‘important’ native species are present. The TEC decision process is documented in the threatened biodiversity section of this report where required.

Plant identification followed nomenclature in the Royal Botanic Gardens PlantNet online database (Royal Botanic Gardens and Domain Trust, 2018).

2.5 Threatened species

The proposal site was assessed for its potential to provide habitat for threatened flora and fauna known or predicted to occur in the study area. Habitat requirements of species were reviewed using a combination of ecological knowledge and the online threatened species profiles published by the NSW Office of Environment and Heritage (OEH), Department of Primary Industries (DPI) Fisheries and the Australian Government Department of Environment and Energy (DoEE). Features such as rocky outcrops, overhangs and caves, waterbodies, dense understorey vegetation and habitat trees were recorded, if present.

Any evidence of fauna (e.g. scats, tracks, calls, fur, feathers and sloughed skins) was recorded, if observed. Attention was given to identifying tree hollows with signs of breeding activity or the presence of nests which may indicate use of the site by threatened fauna species. Where habitat assessments indicate a threatened species potentially occurs on the subject site, it has been assumed as present if absence can't be established based on field survey effort.

2.6 Habitat assessment

The results of the desktop review and the field assessment were collated and reviewed in the context of local ecological knowledge to determine the likelihood of occurrence of threatened species and ecological communities, and potential impacts of the proposal (**Appendix D**). For instance, some threatened species may be predicted to occur locally but, on assessment of the site, key habitat elements or conditions are not present, in which case the species is assessed as not being present or impacted.

The likelihood of occurrence of threatened species, populations or ecological communities was categorised as follows:

- 'Yes' – the species was observed or has been previously recorded on the site.
- 'Likely' – a medium to high probability that a species uses the site, based on nearby records and suitable habitat being present.
- 'Potential' – suitable habitat for a species occurs on the site, but the species has not been observed or previously recorded at the site.
- 'Unlikely' – a very low likelihood that the species uses the site, based on lack of the preferred type and size of habitat.
- 'No' – habitat on-site and in the vicinity is unsuitable for the species.

The species confirmed to be present, or considered likely or with potential to be present at the site, were then considered as to whether the extent and type of development would be likely to impact on them.

2.7 Limitations and assumptions

This study is based upon the species data available at the time of the study, and the environmental conditions, season, and time constraints imposed by the project for the field survey. Specific limitations on this study include the following:

- The field survey was completed over two days in summer of 2018.
- Although there has been recent rainfall in the study area, an extended period of below average rainfall (i.e. drought conditions) may cause some species to be temporarily absent or difficult to detect.
- Fauna trapping, frog surveys and nocturnal spotlighting were not undertaken for the current assessment.
- Microbat ultrasonic call capture and analysis was not undertaken.

To overcome some of these limitations, a 'precautionary approach' for species presence has been adopted where required. If suitable habitat for a particular threatened species is present on the site or known to occur in the study area, then the species is assumed to also be present. The above-mentioned constraints were also considered when preparing the recommendations of avoiding, minimising and mitigating potential impacts.

3 RESULTS

3.1 Landscape context

3.1.1 BIOREGION

The study area is situated in the Northern Outwash subregion of the Brigalow Belt South bioregion as per the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The Northern Outwash subregion is characterised by geology, landforms, soil types and vegetation as described in **Table 2**.

Table 2. Description of the Brigalow Belt South, Northern Outwash subregion (OEH, 2018).

Brigalow Belt South				
Subregion	**Geology**	**Landform**	**Soils**	**Vegetation**
Northern Outwash	Tertiary and Quaternary alluvial fans and stream terraces.	Sloping plains with alluvial fans that are coarser and steeper than the Gwydir Fans downstream.	Red loams and heavy brown clays.	Poplar box with white cypress pine, wilga and budda on red soils, belah and brigalow on brown clays.

3.1.2 MITCHELL LANDSCAPES

The landscapes of NSW, termed Mitchell Landscapes, were mapped in 2002 to provide a framework for reporting reserve establishment and for determining over-cleared landscapes.

These landscapes broadly describe areas of similar topography, geology, soils and vegetation.

Two Mitchell Landscapes occur within the study area and subject site: Gwydir Alluvial Plains and Gwydir Channels and Floodplains (**Figure 4**). The characteristics of these landscapes are provided below (Mitchell, 2002).

Gwydir Alluvial Plains

Holocene fluvial sediments and backplain and channelized backplain on the Gwydir River fan, relief 2 to 5 m. Grey and brown silty clay deposited from suspended sediments in floodwater, often with gilgai. Elevated margins with red-brown texture-contrast soils.

Vegetation consists of open to scattered Myall (*Acacia pendula*), Rosewood (*Alectryon oleifolius*), Coolibah (*Eucalyptus coolibah*), Belah (*Casuarina cristata*), Wilga (*Geijera parviflora*), Bimble Box (*Eucalyptus populnea*), Whitewood (*Atalaya hemiglauca*), Leopardwood (*Flindersia maculosa*), Gidgee (*Acacia cambagei*), Thorny Saltbush (*Rhagodia spinescens*), Mueller's Saltbush (*Atriplex muelleri*), Wild Orange (*Capparis mitchelli*), Buck Bush (*Salsola kali*), Warrior Bush (*Apophyllum anomalum*), Budda (*Eremophila mitchellii*), Nepine (*Capparis lasiantha*), Mitchell Grasses (*Astrebla sp.*), Neverfail (*Eragrostis setifolia*), Goathead Burr (*Sclerolaena bicornis*), Copperburr (*Sclerolaena sp.*), and Warrego Summer-grass (*Paspalidium jubiflorum*), on lower clay plains and drainage lines. Coolibah, Black Box (*Eucalyptus largiflorens*), River Cooba (*Acacia stenophylla*), Eurah (*Eremophila bignoniflora*), and Flowering Lignum (*Eremophila polyclada*) in depressions and channels. Dense to moderate White Cypress Pine (*Callitris glaucophylla*), Bimble Box, Leopardwood, Belah (*Casuarina cristata*), Wilga, Sandplain Wattle (*Acacia murrayana*), Prickly Wattle (*Acacia victoriae*), Budda, Quinine Bush (*Alstonia constricta*), Sandhill Riceflower (*Pimelea penicillaris*) and grasses on sandy rises. Extensively cleared, cropped and grazed.

Gwydir Channels and Floodplains

Holocene fluvial sediments of channel and meander plain facies of the Gwydir River alluvial fan and distributary stream system, relief in the channels 5 to 10 m. Streamflow is nearly permanent. Sinuous channels entrenched in the meander plain with a silt and clay suspended load and some fine sand bed load. Banks and plains with brown to grey silt and cracking grey or brown clay minor areas of red-brown texture-contrast soils on low levees. The Gwydir raft is major coarse woody debris dam choking a main channel and diverting flow.

Narrow fringing River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*Eucalyptus coolabah*) with River Paper-bark (*Melaleuca trichostachya*) along deeper main channels. Floodplains with scattered to moderate Coolibah, Black Box (*Eucalyptus largiflorens*), Whitewood (*Atalaya hemiglauca*), isolated Rosewood (*Alectryon oleifolius*), Belah (*Casuarina cristata*), River Cooba (*Acacia stenophylla*), Eurah (*Eremophila bignoniflora*), Lignum (*Muehlenbeckia cunninghamii*), Nitre Goosefoot (*Chenopodium nitatriaceum*), Neverfail (*Eragrostis setifolia*), Warrego Summer-grass (*Paspalidium jubiflorum*), Windmill Grasses (*Chloris sp.*), Copperburr (*Sclerolaena sp.*) and forbs. Bimble Box (*Eucalyptus populnea*) on western plains, Yellow Box (*Eucalyptus melliodora*) and Rough-barked Apple (*Angophora floribunda*) on the distal fan and higher red brown soil on terraces. Sparse Gidgee (*Acacia cambagei*) on elevated areas.

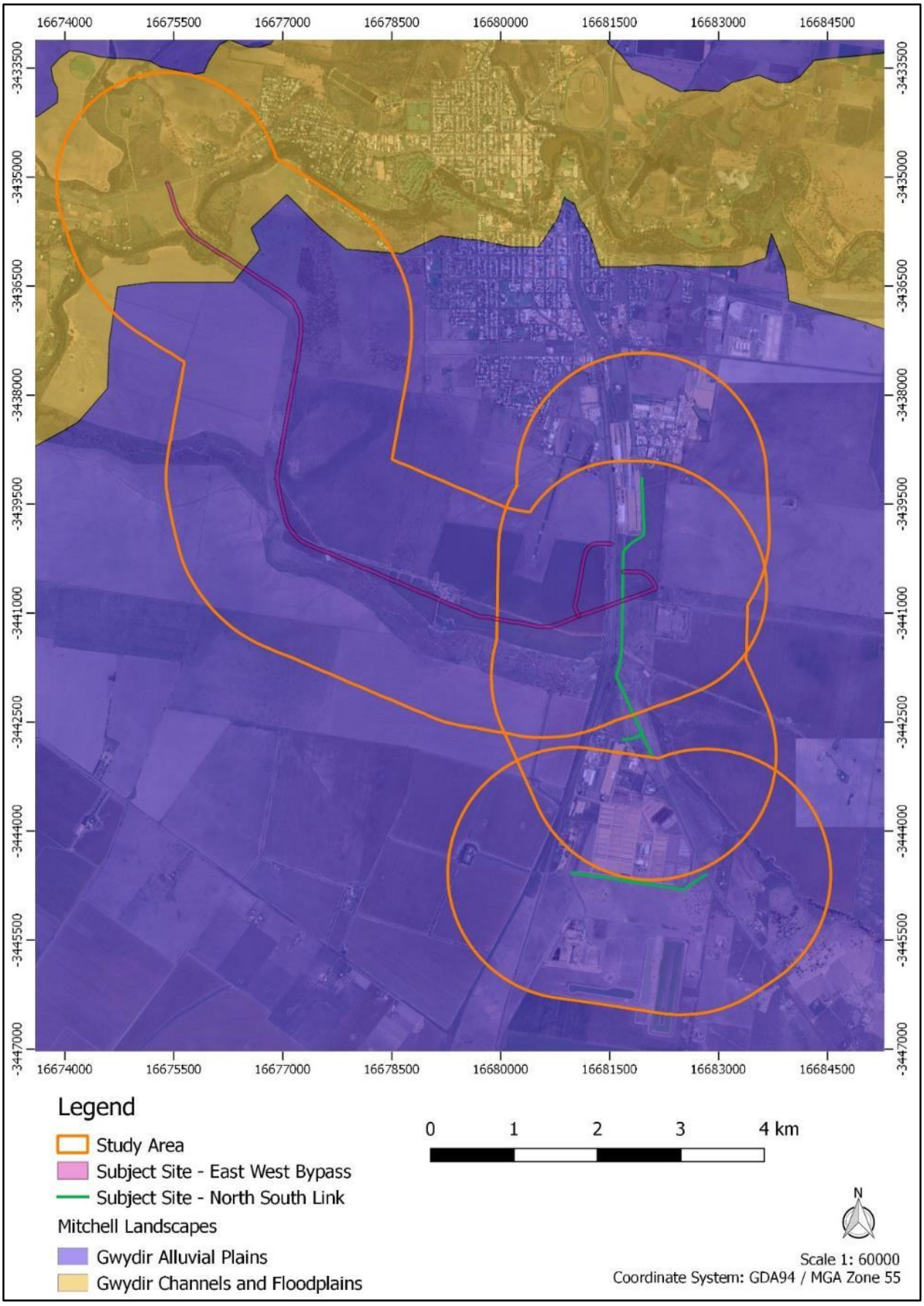

Figure 4. Mitchell Landscapes of the study area.

3.1.3 CLIMATE AND WEATHER

Climate statistics have been recorded at Moree Aero Station (station number 053027) since 1995 by the Bureau of Meteorology (BOM).

The study area experiences warm to hot summers, with the highest mean maximum temperature of 34.0 ºC experienced in January. Mild minimum temperatures are experienced during this summer period. Winters are cool to mild, with temperatures in the coolest month (July) ranging from a minimum of 4.5 ºC to a mean maximum of 18.2 ºC (Bureau of Meteorology, 2018).

An average of 576.3 mm of rainfall is recorded annually at Moree Aero Station. Although most rain on average is recorded during the summer period (November to March), BOM statistics show that consistent rainfall is experienced throughout the year, with no obvious wet or dry season (Bureau of Meteorology, 2018). The mean climate statistics recorded at Moree Aero Station are presented in **Figure 5**. Weather during the field survey was hot, dry and sunny.

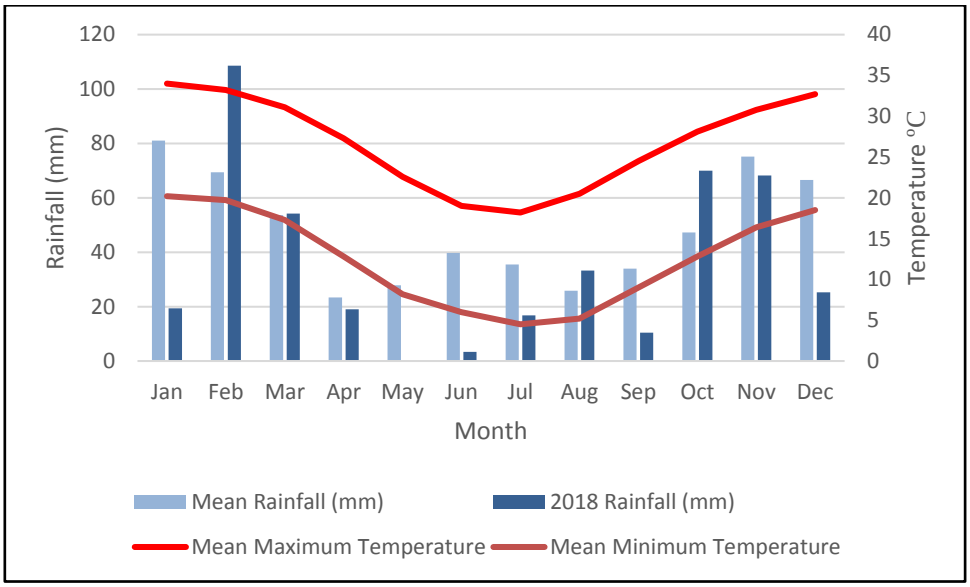

Figure 5. Climate data for Moree, showing mean minimum and maximum temperatures and rainfall (Bureau of Meteorology, 2018).

3.1.4 ENVIRONMENTALLY SENSITIVE AREAS

The presence and/or proximity of environmentally sensitive areas relative to the proposal site is summarised in **Table 3**. The subject site crosses two areas identified on the Biodiversity Values Map. These areas are associated with the Mehi River and Halls Creek. The Mehi River is considered protected riparian habitat and provides Key Fish Habitat (KFH) for three threatened fish species. The Moree Plains LGA is also listed under Schedule 1 of SEPP 44 – Koala Habitat Protection as an LGA to which the SEPP applies.

Table 3. Presence and/or proximity of environmentally sensitive areas.

Environmental Considerations	In the study area?
Land identified on the Biodiversity Values Map under the *NSW BC Act 2016*	Yes (Appendix A)
Area of Outstanding Biodiversity Value (AOBV) under the *NSW BC Act 2016*	No
Critical habitat nationally?	No
An area reserved or dedicated under the *National Parks and Wildlife Act 1974*?	No
Is the proposal located within land reserved or dedicated within the meaning of the *Crown Lands Act 1989* for preservation of other environmental protection purposes?	No
A World Heritage Area?	No
Environmental Protection Zones in environmental planning instruments?	No specific Environmental Protection Zone areas mapped (Appendix A)
Lands protected under SEPP 44 – Koala Protection?	Yes
Lands protected under SEPP Sydney Drinking Water Catchment?	No
Land identified as wilderness under the *Wilderness Act 1987* or declared as wilderness under the *National Parks and Wildlife Act 1974*?	No
Aquatic reserves dedicated under the *Fisheries Management Act 1994*?	No
Wetland areas dedicated under the Ramsar Wetlands Convention?	No
Land subject to a conservation agreement under the *National Parks and Wildlife Act 1974*?	No
Land identified as State Forest under the *Forestry Act 1916*?	No
Acid sulphate area?	No
Protected riparian habitat?	Yes
Mapped Key Fish Habitat?	Yes

3.1.5 WATERCOURSES

The Mehi River channel west of Moree is part of the Lowland Darling River Aquatic Endangered Ecological Community (EEC) (**Figure 6 and Figure 7**). This community has been greatly modified since European settlement, through activities such as river regulation, the introduction of non-native species, agricultural practices and over-fishing (DPI Fisheries, 2007).

The east-west bypass is proposed to cross the Mehi River, to join with the Gwydir Highway to the north-west of Moree (**Figure 8**). The river is a major perennial watercourse and is mapped as Key Fish Habitat (KFH) by the Department of Primary Industries - Fisheries (DPI Fisheries) (**Figure 9**). The river is also mapped as within the distribution of three threatened fish species: the Eel-tailed Catfish, Olive Perchlet and Silver Perch. Watercourse class and habitat sensitivity type, as defined by DPI Fisheries, can be used to assess the impacts of the proposal on KFH (Fairfull, 2013). These definitions are provided in **Appendix E**. The Mehi River has been classified as a Type 1, Class 1 watercourse based on these definitions.

Halls Creek, a minor non-perennial watercourse, also occurs within the subject site (**Figure 8**). The watercourse is not mapped as KFH by DPI Fisheries (**Figure 9**) and has been

classified as a Type 3, Class 3 watercourses due to its intermittent flow. The east-west bypass is proposed to run closely adjacent to the creek (potentially within 10 m) at some intervals; while, the north-south link is proposed to cross a floodway of Halls Creek to the south. A concrete box culvert will be installed across the floodway to decrease travel times and increase reliability and safety of the existing roadway.

3.1.6 GROUNDWATER DEPENDENT ECOSYSTEMS

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment. Aquifer ecosystems are inherently groundwater dependent (QLD Department of Environment and Heritage Protection, 2017).

The Bureau of Meteorology (BoM) Atlas of Groundwater Dependant Ecosystems (Bureau of Meteorology, 2017) identified several high potential terrestrial and aquatic groundwater dependant ecosystems within the study area and subject site (**Figure 8**). These areas are predominantly associated with the Mehi River crossing. The proposal does not include the extraction of groundwater; however, contamination from land operations for the proposal may impact on the quality of groundwater if adequate mitigation measures are not taken.

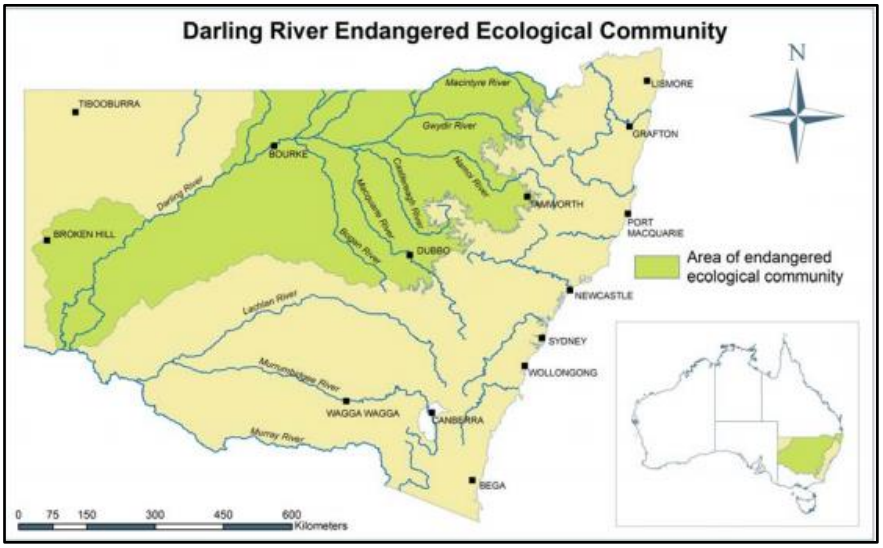

Figure 6. Darling River Endangered Ecological Community (DPI Fisheries).

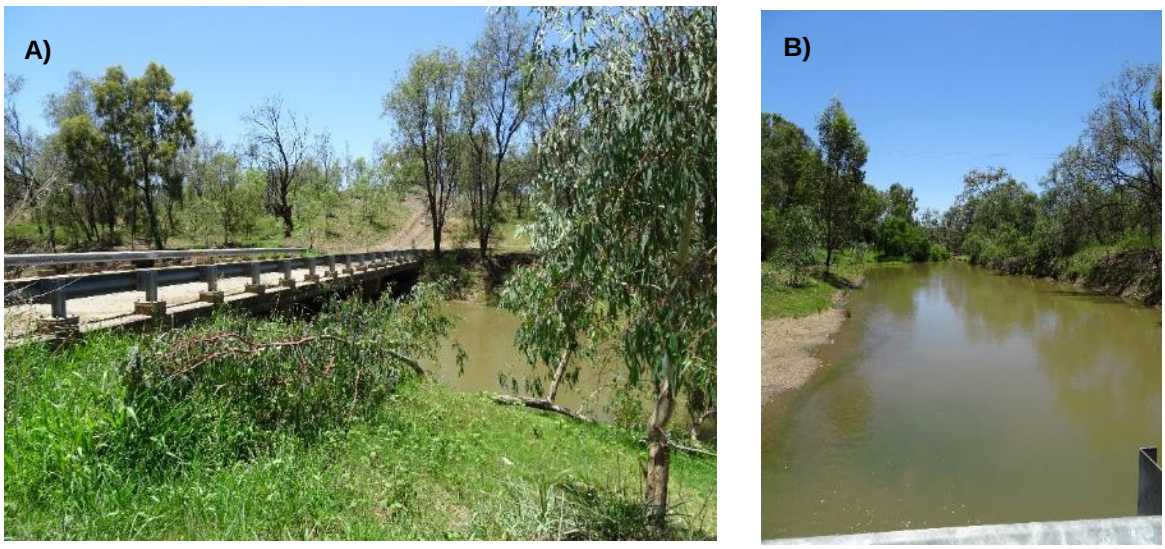

Figure 7. Images of the Mehi River A) taken at the existing river crossing and B) taken on the existing crossing looking upstream.

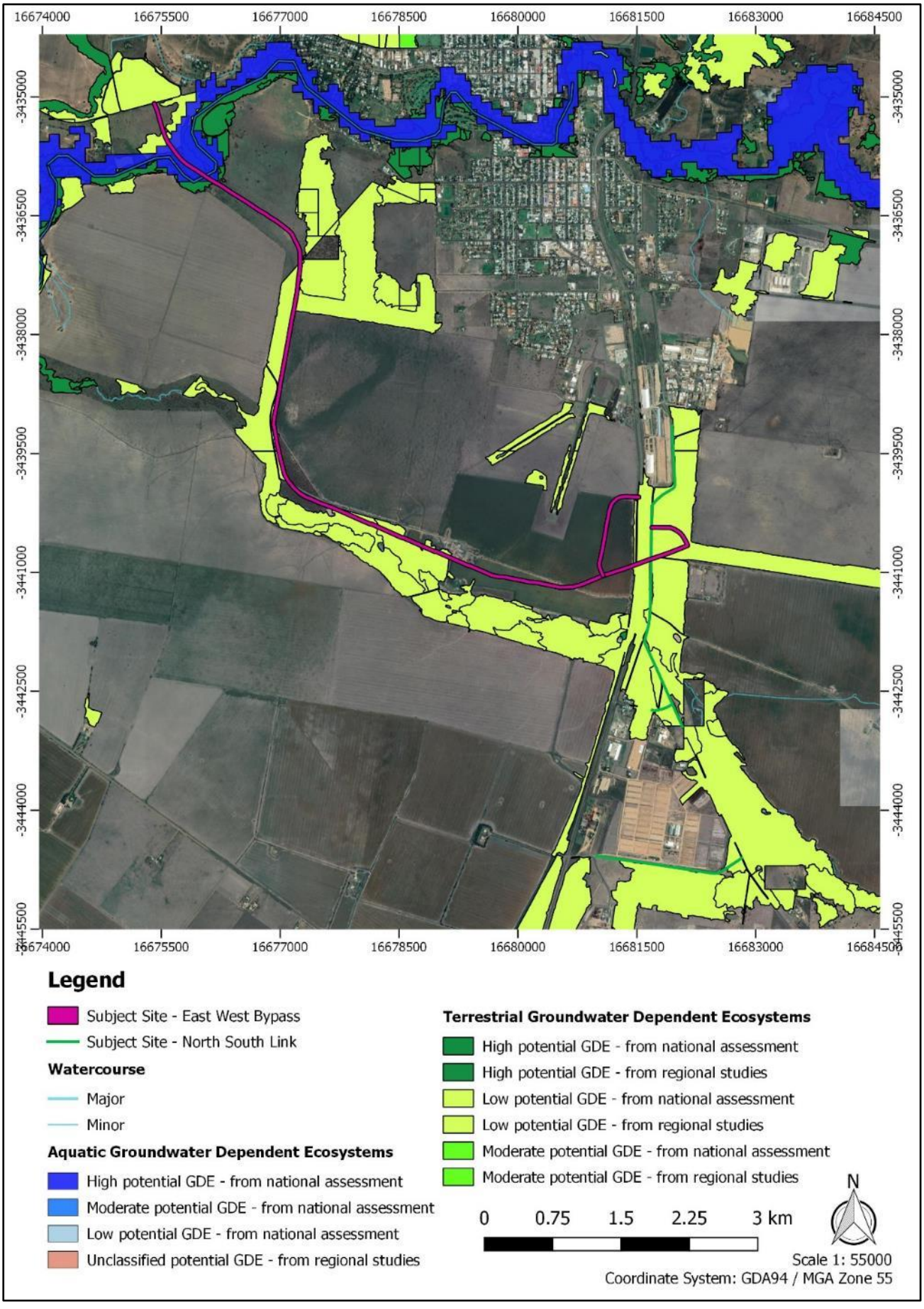

Figure 8. Watercourses and groundwater dependant ecosystems of the study area.

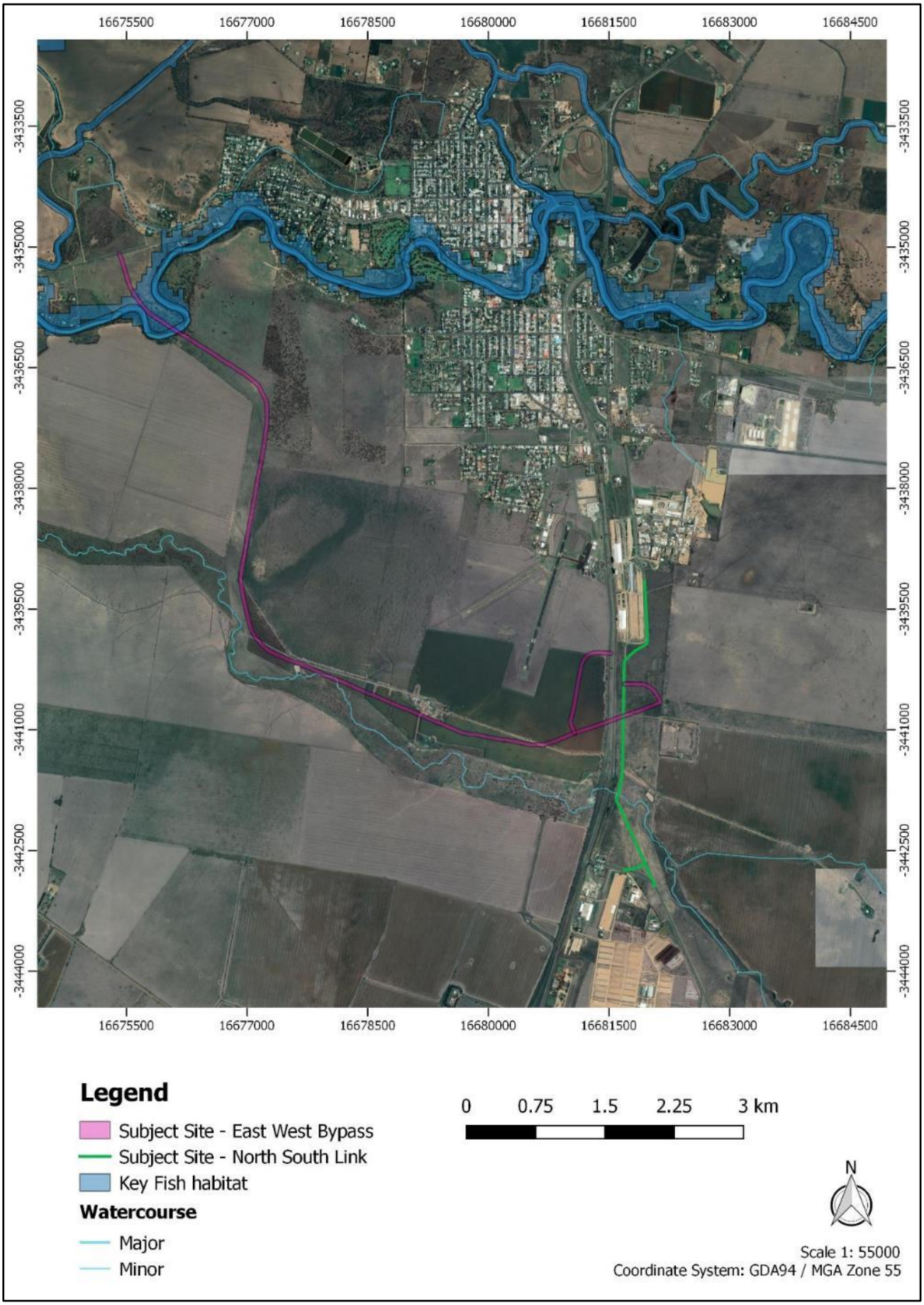

Figure 9. Map of watercourses containing Key Fish Habitat.

3.2 Native vegetation

3.2.1 VEGETATION SURVEY PLOTS

Vegetation survey plots were distributed across the subject site to ensure adequate representation of each PCT:

- PCT 1. Candidate Native Grasslands – 4 BAM plots
- PCT 36. River Red Gum tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion – 1 BAM plot
- PCT 39. Coolabah – River Coobah – Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion – 1 BAM plot
- PCT 0. Non-native – 1 BAM plot

The locations of these plots are displayed in **Figure 3**. Accompanying photographs and data sheets completed in the field are provided in **Appendix B**.

3.2.2 FLORA SPECIES OBSERVED

Thirty-six plant species were recorded during the field survey (**Appendix C**). Of these, thirty-two were native species. As expected, exotic vegetation cover was dominant in EWB01, the non-native plot located within a cropped paddock (**Figure 10**). Native vegetation was dominant in all of the other plots (**Figure 10**). Native vegetation cover was higher within the River Red Gum tall open forest / woodland wetland (EWB06) and Coolabah – River Coolabah – Lignum woodland wetland (EWB07) compared with the plots located within derived native grasslands (EWB02-EWB05).

There was generally a high volume of Mimosa Bush (*Vachellia farnesiana*) in the derived grassland plots (**Figure 11**), which contributed to their estimates of native cover. This species is native to the region; however, it has been listed under the *Biosecurity Act 2015* as a priority weed in NSW for its ability to form dense thickets within grazing properties and grasslands. It thus effectively out-competes both native grassland flora and improved pasture where dense infestations occur.

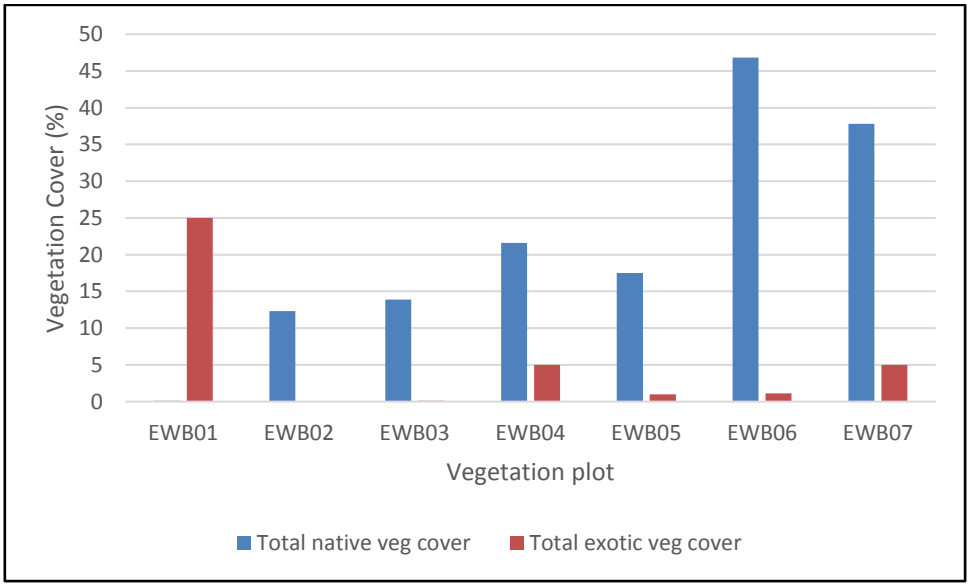

Figure 10. Percentage cover of native and exotic plant species at vegetation plots

Figure 11. Example of the density of Mimosa Bush (*Vachellia farnesiana*) within some areas of derived native grassland within the subject site.

3.2.3 INTRODUCED PLANTS AND WEEDS

Caltrop (*Tribulus terrestris*) was the most common introduced plant, occurring in four vegetation plots. African Love Grass (*Eragrostis curvula*) occurred in plot EWB04, accounting for 5% cover. African Box Thorn (*Lycium ferocissimum*) was also recorded within the alignment of the east west bypass during traverses of the subject site. Both African Love Grass and African Box Thorn are listed under the *Biosecurity Act 2015* as a Priority Weed for all of NSW. Under the above legislation, the proponent has a General Biosecurity Duty to prevent, eliminate or minimise any biosecurity risk these plants may pose, including preventing their spread to new areas.

3.3 Fauna

3.3.1 FAUNA SPECIES OBSERVED

Six fauna species were recorded during the field survey. This included four bird species and two mammal species. A list of these species is provided in **Appendix C**.

No threatened fauna were recorded.

3.3.2 IMPORTANT HABITAT ATTRIBUTES

No rock outcrops or caves and overhangs occur within the subject site.

Two watercourses (the Mehi River and Halls Creek) occur within the subject site. River Red Gum tall open forest / woodland wetland occurs in the area proposed for the Mehi river crossing. The proposed alignment also runs through Coolibah – River Coobah – Lignum woodland wetland to the north-east. Both of these PCTs contain numerous large, mature hollow bearing trees that likely provide suitable foraging and nesting / roosting habitat for

threatened animal and plant species listed under the BC Act and EPBC Act (e.g., Little Eagle and Yellow-bellied Sheathtail-bat).

Seventy six planted trees were also recorded within the alignment (**Figure 12**). These trees consisted of native Eucalypt species including, River Red Gum (*Eucalyptus camaldulensis*), Red Gum (*Eucalyptus chloroclada*) and Black Box (*Eucalyptus largiflorens*). Although the trees were too young to bear hollows, they likely still provide foraging habitat for a variety of bird and mammal species in the local area.

Additionally, there were several isolated paddock trees and trees growing along the roadside within the alignment. Trees that contained hollows or contained nests were recorded as habitat trees (**Figure 13**).

Figure 12. Image of *Eucalyptus* trees that have been planted in rows

Figure 13. Location of the Eucalypt plantation area and recorded habitat trees.

3.4 Threatened biodiversity

3.4.1 AQUATIC ECOLOGICAL COMMUNITIES

Endangered aquatic ecological communities are determined by the NSW Fisheries Scientific Committee and listed under the FM Act as aquatic systems that have undergone a very large reduction in ecological function, geographic distribution or genetic diversity, and continue to be affected by a threatening process (NSW Department of Primary Industries, 2016).

The Mehi River channel west of Moree is part of the Lowland Darling River Aquatic EEC. The proposed alignment will cross the Mehi River to the north-west of Moree in order to connect with the Gwydir Highway.

3.4.2 THREATENED ECOLOGICAL COMMUNITIES

The Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions TEC is known to be associated with Coolabah – River Coobah – Lignum woodland wetland, which occurs within part of the subject site. The data collected on the subject site for the Coolabah – River Coobah – Lignum woodland wetland is compared with the diagnostic characteristics (**Table 4**) and condition thresholds (**Table 5**) for the TEC.

The Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions is a floodplain ecological community situated within the upper reaches of the Murray-Darling Basin and the southern Fitzroy basin. The ecological community has undergone a considerable degree of disturbance although the nature of these disturbances is variable across its range. For instance, the ecological community has been subject to a greater degree of clearing in its eastern extent than further west. Also, many of the plant species present are widespread or occur in other vegetation types that adjoin or intergrade with the ecological community. These issues present some challenges in prescribing detailed and specific key diagnostic attributes that would apply to every patch of the national ecological community (NSW Threatened Species Scientific Committee, 2010).

Table 4. Key diagnostic features for the Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (NSW Threatened Species Scientific Committee, 2010).

Criteria	Subject Site
Distribution is limited to the Darling Riverine Plains and the Brigalow Belt South bioregions (IBRA v6.1).	Yes. Part of the subject site occurs within the Brigalow Belt South Bioregion.
It typically occurs on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands and stream levees.	Yes. Part of the subject site occurs on floodplains / wetlands on the margins of the Mehi River.
• A tree canopy layer is present that shows these features: – *Eucalyptus coolabah subsp. coolabah* (Coolibah) must be present in the tree canopy. – Coolibah typically is dominant (≥50% of tree crown cover) – Where Coolibah and *E. largiflorens* (Black Box) co-occur, together they make up the dominant species in the tree canopy layer (≥50% of tree crown cover) – Hybrids of Coolibah or Black Box with each other and other *Eucalyptus* species (typically Bimble Box) are included as dominant tree species.	– Yes. *Eucalyptus coolabah* is present – Yes. *Eucalyptus coolabah* dominant – N/A. – N/A
The mid or shrub layer may or may not be present. When present it is typically sparse or clumped and is of variable composition.	Shrub layer is present.
The ground layer is of variable composition and cover ranging from sparse to dense. Ground cover lifeforms typically comprise native graminoids, other herbs, chenopods and other low shrubs that are typically under 50 cm tall.	Yes. Ground layer is variable and includes native chenopods, forbs and grasses.

Table 5. Condition thresholds for the Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (NSW Threatened Species Scientific Committee, 2010).

Category and rationale	Thresholds	Subject site
Patch size AND	The minimum patch[6] size is 5 ha. This may include areas of native vegetation that may be naturally open or contain regrowth.	Yes. The patch size is greater than 5 ha.
Tree canopy layer AND	The crown cover[7] of trees in the patch must be ≥8%	Yes. The crown cover of trees is ~20%
	• Coolibah and/or Black Box in the tree canopy must be present in the patch that are either: – mature trees with a main stem that has a dbh[8] of ≥20 cm; OR – hollow-bearing trees (live or dead); OR – coppiced trees with a main stem that has a dbh of ≥20 cm.	– Yes. dbh of majority of trees >20 cm – Yes. Some *E. coolabah* trees hollow bearing – N/A
Ground layer AND	10% or more of the ground cover[9] comprises native graminoids, other herbs, chenopods and/or native low shrubs (i.e. woody plants typically less than 50 cm tall).	Yes. Native forbs, shrubs account for 12.7% cover.
Exotic species AND	In the ground layer, the percentage cover of non-native perennial plant species[10] does not exceed the percentage cover of native plant species (annual or perennial).	No. Native species account for 17.8% cover and exotic species account for 5% cover.

[6] A patch is defined as a discrete and continuous area of the ecological community. [7] Crown cover is the percentage plant cover of an area within the vertical projection of the periphery of crowns. In this case, crowns are treated as opaque. [8] dbh means diameter at breast height (i.e. 1.3 m above the ground). [9] Ground cover is the percentage ground surface covered by vegetation or other cover including rocks, plant litter, mosses, lichens or bare ground. [10] Plant species refers to vascular plants.

Based on the key diagnostic features and condition thresholds listed above, the Coolabah – River Coobah – Lignum woodland wetland within the subject site meets the criteria for listing as the Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions TEC.

3.4.3 THREATENED FLORA

Review of the Threatened Species Profiles database has found that 11 threatened flora species listed under the BC Act and EPBC Act are predicted or are known to occur in the Brigalow Belt South, Northern Outwash subregion (**Appendix A**). Based on the proximity of past records, habitat requirements and the results of the field survey, five species were

assessed as having potential to occur on the subject site (**Appendix D**). These are listed in **Table 6**. Creeping Tick Foil (*Desmodium campylocaulon*) and Finger Panic Grass (*Digitaria* porrecta) have been recorded in derived native grassland close to the subject site (**Figure 14**) and are considered likely to occur.

Table 6. Threatened plant species likely or with potential to occur on subject site.

Species Name	Common Name	NSW Status*	Comm. Status. +	Records within 10 km	Nature of Occurrence
Desmodium campylocaulon	Creeping Tick-trefoil	E1		Yes	Likely
Swainsona murrayana	Slender Darling Pea	V	V	Yes	Potential
Phyllanthus maderaspatensis		E1		No	Potential
Dichanthium setosum	Bluegrass	V	V	Yes	Potential
Digitaria porrecta	Finger Panic Grass	E1		Yes	Likely

*Listed under the BC Act, where E1 = Endangered, P = Protected and V = Vulnerable
+Listed under the EPBC Act, where V = Vulnerable

3.4.4 THREATENED FAUNA

Review of the Threatened Species Profiles database found 44 BC Act and EPBC Act listed threatened fauna species are predicted or known to occur in the Brigalow Belt South, Northern Outwash subregion (**Appendix A**). Threatened species records near the subject site are mapped in **Figure 14**.

An EPBC Act protected matters search for the 10 km search area identified 12 EPBC listed threatened fauna, 9 migratory species and 15 marine species.

The likelihood of occurrence of all BC Act and EBPC Act listed threatened and migratory fauna species was assessed according to methods described in **Section 2.7**.

No threatened fauna species were recorded during the field surveys. However, 33 species were assessed as likely or potentially occurring based on habitat requirements. These species are listed in **Table 7**.

Table 7. BC Act and EPBC Act listed threatened species, including aquatic species, assessed as likely or potentially occurring on the subject site.

Scientific Name	Common Name	NSW status	Comm. status	Record within 10 km	Likelihood of Occurrence
Anomalopus mackayi	Five-clawed Worm-skink	E1,P	V	No	Potential
Hoplocephalus bitorquatus	Pale-headed Snake	V,P		Yes	Potential
Anseranas semipalmata	Magpie Goose	V,P		Yes	Likely
Hirundapus caudacutus	White-throated Needletail	P	C,J,K	No	Potential
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P		Yes	Potential
Plegadis falcinellus	Glossy Ibis	P	C	Yes	Likely
Circus assimilis	Spotted Harrier	V,P		Yes	Potential
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	C	No	Potential
Hieraaetus morphnoides	Little Eagle	V,P		Yes	Likely
Lophoictinia isura	Square-tailed Kite	V,P,3		Yes	Potential
Falco hypoleucos	Grey Falcon	E1,P,2		No	Potential
Falco subniger	Black Falcon	V,P		No	Potential
Ardeotis australis	Australian Bustard	E1,P		No	Potential
Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K	Yes	Potential
Gallinago hardwickii	Latham's Snipe	P	C,J,K	Yes	Potential
Numenius minutus	Little Curlew	P	C,J,K	No	Potential
Neophema pulchella	Turquoise Parrot	V,P,3		No	Potential
Ninox connivens	Barking Owl	V,P,3		Yes	Likely
Merops ornatus	Rainbow Bee-eater	P	J	No	Likely
Pomatostomus temporalis temporal	Grey-crowned Babbler (eastern subspecies)	*V,P*		No	Potential
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P		No	Potential
Chthonicola sagittata	Speckled Warbler	V,P		No	Potential
Grantiella picta	Painted Honeyeater	V,P	V	No	Potential
Daphoenositta chrysoptera	Varied Sittella	V,P		No	Potential
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		No	Potential
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V,P		No	Potential
Stagonopleura guttata	Diamond Firetail	V,P		No	Potential
Sminthopsis macroura	Stripe-faced Dunnart	V,P		No	Potential
Phascolarctos cinereus	Koala	V,P	V	Yes	Potential
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	No	Potential
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		Yes	Potential
Chalinolobus picatus	Little Pied Bat	V,P		No	Potential
Nyctophilus corbeni	Corben's Long-eared Bat	V,P	V	No	Potential

*Listed under the BC Act, where E1 = Endangered, P = Protected and V = Vulnerable Listed under the EPBC Act, where V = Vulnerable, CE = Critically Endangered, J = JAMBA, K = ROKAMBA

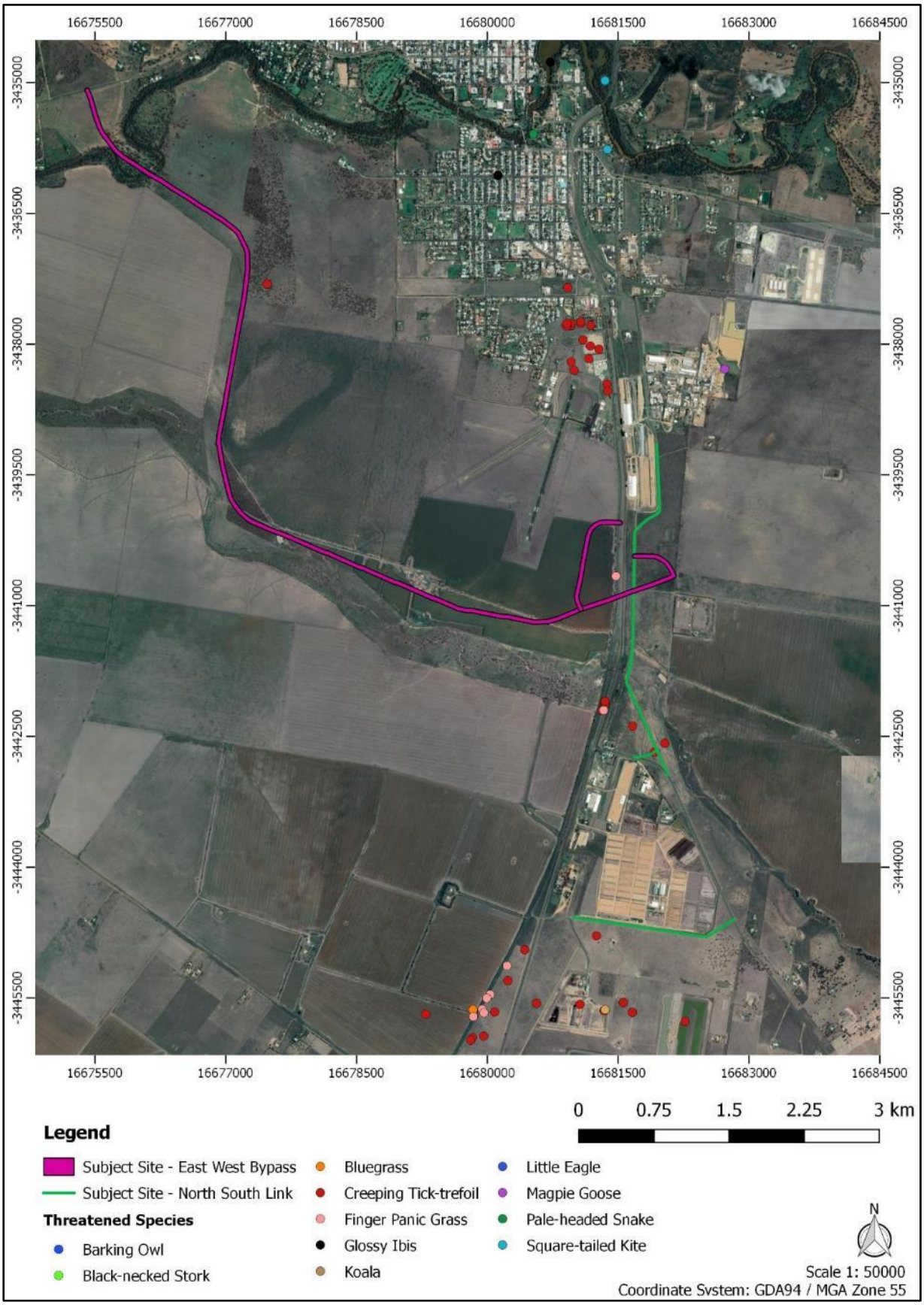

Figure 14. Selection of threatened species records located near the subject site.

3.5 Constraints and recommendations

3.5.1 AQUATIC ECOLOGICAL COMMUNITIES

The proposal involves constructing a new waterway crossing across the Mehi River. Dredging works may be required to construct the footings or foundations for the crossing. In addition, reclamation works will likely be required to construct pylons and abutments for the bridge and/or create in-stream construction pads or coffer dams to access the works. The Mehi River is part of the Lowland Darling River Aquatic EEC, has been classified as a Type 1, Class 1 watercourse and is identified as Key Fish Habitat for three threatened fish species: the Eel-tailed Catfish, Olive Perchlet and Silver Perch. Therefore, the proposal will require consultation and approval with Department of Primary Industries (DPI) Fisheries to dredge and/or reclaim under part 7 of the FM Act. A permit will also likely be required under s219 of the FM Act for any works that may result in the temporary or permanent obstruction of fish passage within the waterway (Fairfull, 2013). Such obstructions can include silt fencing across waterways for sediment and erosion control and bunding and dewatering works during the construction and maintenance of crossings (Fairfull, 2013).

The proposal also involves installing a concrete box culvert across a floodway of Halls Creek. The installation of a culvert is a Key Threatening Process (KTP) under schedule 6 of the FM Act and because the culvert could act as a barrier to fish passage, it is recommended the proponent notify and liaise with DPI Fisheries to determine whether a permit is required.

3.5.2 THREATENED ECOLOGICAL COMMUNITIES

A TEC (Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions) occurs within part of the subject site. The Coolibah – Black Box Woodlands provide habitat for a wide range of animal species, both vertebrate and invertebrate. A number of characteristic habitat features of value to particular fauna include a grassy understorey with scattered fallen logs, areas of deep-cracking clay soils, patches of thick regenerating *Eucalyptus* saplings and large trees containing a diverse bark and foliage foraging resource and an abundance of small and large hollows. The fertile and relatively mesic environment of these woodlands provides essential resources for the persistence of fauna in the semi-arid region (NSW Scientific Committee, 2010).

Removal of vegetation, including large hollow trees and resulting fragmentation caused by the construction of a new road corridor possibly constitutes a significant impact. In that case, the proponent would need to take one of the following actions:

1) Avoid the significant impact by careful project design
2) Prepare a Species Impact Statement for the TEC impacted, or
3) Enter the NSW Biodiversity Offset Scheme (BOS) to mitigate the significant impact (as the proposal will be approved under Part 5 of the EP & A Act, entry into the BOS is voluntary).

3.5.3 THREATENED FLORA

Five threatened plant species were assessed as having potential to occur on the subject site. This includes Creeping Tick Foil (*Desmodium campylocaulon*) and Finger Panic Grass

(*Digitaria* porrecta), which have been recorded in derived native grassland close to the subject site. Approval under Part 5 of the EP&A Act will require undertaking the 5 part test of significance for these species and, unless the proponent wishes to assume their presence, targeted searches at the appropriate season.

3.5.4 THREATENED FAUNA

Thirty-two threatened fauna species were assessed as likely or potentially occurring based on habitat requirements, including the Koala. Approval under Part 5 of the EP&A Act will require undertaking the 5 part test of significance for these species. Additionally, the Moree Plains LGA is listed under Schedule 1 of SEPP 44 – Koala Habitat Protection as an LGA to which the SEPP applies. Part of the subject site, specifically the River Red Gum tall open forest / woodland wetland, contains mature River Red Gum trees that are listed as Koala feed tree species in the SEPP. Because the subject site contains potential Koala habitat, the proponent will be required to prepare plans of management to minimize the impact of the development before consent from Moree Plains Shire Council is granted.

To determine the actual presence or absence of species listed in Table 7, targeted surveys using appropriate methodology would be required. In the absence of targeted surveys, these species are assumed to be present.

3.5.5 IMPORTANT HABITAT FEATURES

The proposed alignment runs through River Red Gum tall open forest / woodland wetland. This PCT contains numerous large, mature hollow bearing trees that likely provide suitable foraging and nesting / roosting habitat for threatened animal and plant species listed under the BC Act and EPBC Act. Seventy six planted trees were also recorded within the alignment, including River Red Gum, Red Gum and Black Box species. Additionally, there were several isolated paddock trees and trees growing along the roadside within the alignment.

Removal of this vegetation, particularly the habitat trees, would possibly constitute a ‘significant impact’.

It is recommended that native vegetation removal be minimised as part of the design process to avoid any significant impact. There are several large, hollow bearing River Red Gum trees along the bank of the Mehi River that could potentially be avoided by altering the alignment (see **Figure 15**). The impact on the native Eucalypt plantation could also be potentially avoided or minimised by shifting the alignment slightly to the west (see **Figure 16**). A Construction Environmental Management Plan, or equivalent, should be developed in which additional impact avoidance, minimisation and mitigation actions are determined.

Figure 15. Preliminary alternative Mehi River crossing route.

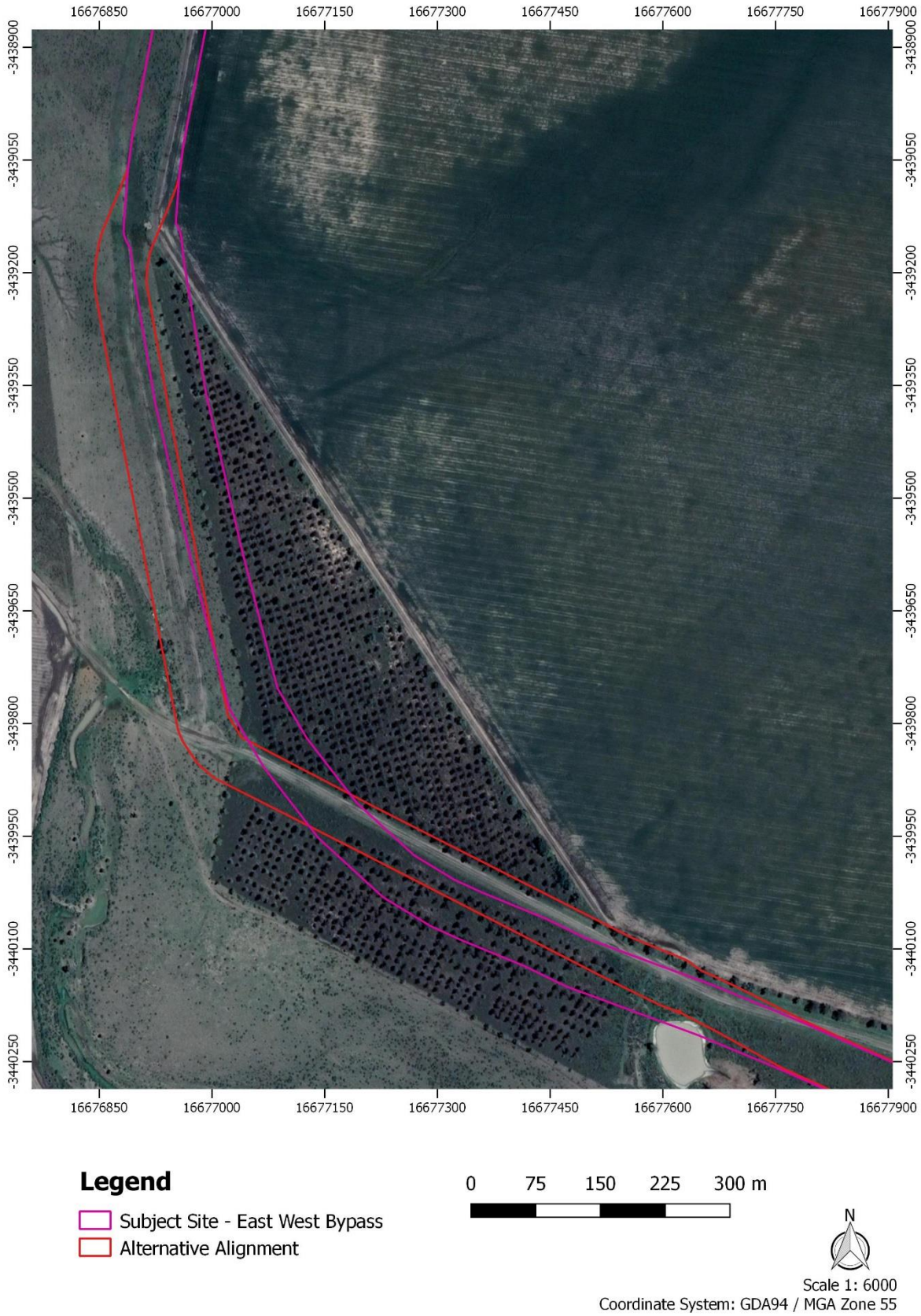

Figure 16. Preliminary alternative route to minimise impact on Eucalypt plantation.

4 SUMMARY AND CONCLUSIONS

The following summary of constraints and conclusions are provided to assist with ongoing project planning.

- The subject site is mapped as containing candidate native grasslands, Coolabah – River Coobah – Lignum Woodland Wetland, River Red Gum tall open forest / woodland wetland and non-native vegetation.

- Part of the subject site is identified on the Biodiversity Values Map.

- The Coolabah – River Coobah – Lignum Woodland Wetland is classified as being part of the Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions Threatened Ecological Community (TEC).

- The Mehi River is part of the Lowland Darling River Aquatic EEC, has been classified as a Type 1, Class 1 watercourse and is identified as Key Fish Habitat for three threatened fish species: the Eel-tailed Catfish, Olive Perchlet and Silver Perch.
    - It is recommended the proponent notify and liaise with Department of Primary Industries (DPI) Fisheries as a permit is required to dredge and/or reclaim under part 7 of the FM Act. A permit will also likely be required under s219 of the FM Act for any works that may result in the temporary or permanent obstruction of fish passage within the waterway.

- No threatened species were recorded on the subject site. However, five threatened plant species and Thirty-two threatened fauna species were assessed as likely or potentially occurring based on habitat requirements.
    - Approval under Part 5 of the EP&A Act will require undertaking the 5 part test of significance for these species.

- There is potential Koala habitat on the subject site.
    - The proponent will be required to prepare plans of management to Moree Plains Shire Council.

It is recommended that native vegetation removal be minimised as part of the design process. A Construction Environmental Management Plan, or equivalent, should be developed in which additional impact avoidance, minimisation and mitigation actions are determined.

5 REFERENCES

Australian Government Department of Sustainability, Environment, Water, Population and Communities. (2012). Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions). Canberra.

Bureau of Meteorology. (2017, November). *Atlas of Groundwater Dependent Ecosystems*. Retrieved from Australian Government Bureau of Meteorology: http://www.bom.gov.au/water/groundwater/gde/map.shtml

Bureau of Meteorology. (2018). *Climate Statistics for Australian Locations: Moree Aero Station* (053027). Retrieved from Australian Government Bureau of Meteorology: http://www.bom.gov.au/climate/data/?ref=ftr

Fairfull, S. (2013). *Policy and Guidelines for Fish Habitat Conservation and Management.* Sydney: NSW Department of Primary Industries.

Keith, D. (2004). *Ocean Shores to Desert Dunes: the Vegetation of New South Wales and the ACT.* Department of Environment and Conservation NSW.

Mitchell. (2002). *Descriptions for NSW (Mitchell) Landscapes.* NSW: Department of Envrionment and Climate Change.

NSW Threatened Species Scientific Committee. (2010). Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions listing advice.

OEH. (2017). *Biodiversity Assessment Method.* Sydney: Office of Environment and Heritage for the NSW Government.

OEH. (2018). *Regional Scale State Vegetation Map: Border Rivers Gwydir / Namoi Region Version 2.0.* Sydney: Office of Environment and Heritage for the NSW Government.

OEH. (2018b). NSW Vegetation Information System: Classification. Retrieved from NSW Office of Environment and Heritage. http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx

QLD Department of Environment and Heritage Protection. (2017). *Groundwater dependent ecosystems*. Retrieved from Queensland Government Department of Environment and Heritage Protection:https://wetlandinfo.ehp.qld.gov.au/wetlands/ecology/aquatic-ecosystems-natural/groundwater-dependent/

Royal Botanic Gardens and Domain Trust. (2018). *PlantNET*. (Royal Botanic Gardens and Domain Trust) Retrieved 2015, from PlantNET - The Plant Information Network System of The Royal Botanic Gardens and Domain Trust: http://plantnet.rbgsyd.nsw.gov.au

Thackway, R., & Cresswell, I. (1995). *An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program.* Canberra: Australian Nature Conservation Agency.

APPENDIX A: DATABASE SEARCH RESULTS

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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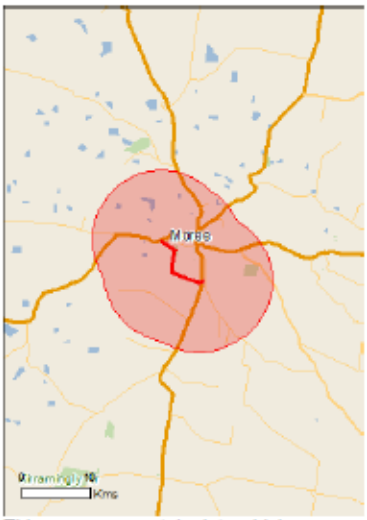

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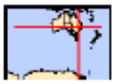


Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	12
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	18
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties [Resource Information]

Name	State	Status
Indigenous		
Moree Baths and Swimming Pool	NSW	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	1000 - 1100km
Gwydir wetlands: gingham and lower gwydir (big leather) watercourses	30 - 40km upstream
Riverland	900 - 1000km upstream
The coorong, and lakes alexandrina and albert wetland	1100 - 1200km

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Plants		
Cadellia pentastylis		
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Anomalopus mackayi		
Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Telstra Corporation Limited

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-29.513267 149.852413,-29.515807 149.84692,-29.505275 149.816708,-29.503034 149.811214,-29.49773 149.81027,-29.480322 149.81439,-29.47823 149.814991,-29.469562 149.798683,-29.465901 149.797481

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

BioNET Atlas search – threatened species predicted to occur within the Northern Outwash IBRA subregion.

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.
+Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable.
-Number of Records: P = predicted to occur.

Class	Scientific Name	Common Name	NSW status	Comm. status	Records
Reptilia	*Anomalopus mackayi*	Five-clawed Worm-skink	E1P	V	1
Reptilia	*Furina dunmalli*	Dunmall's Snake	P	V	P
Reptilia	*Hoplocephalus bitorquatus*	Pale-headed Snake	VP		4
Aves	*Alectura lathami*	Australian Brush-turkey population in the Nandewar and Brigalow Belt South Bioregions	E2P		P
Aves	*Anseranas semipalmata*	Magpie Goose	VP		3
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	CJK	1
Aves	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1P		1
Aves	*Plegadis falcinellus*	Glossy Ibis	P	C	4
Aves	*Circus assimilis*	Spotted Harrier	VP		9
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	VP	C	2
Aves	*Hieraaetus morphnoides*	Little Eagle	VP		5
Aves	*Lophoictinia isura*	Square-tailed Kite	VP3		2
Aves	*Falco hypoleucos*	Grey Falcon	E1P2		P
Aves	*Falco subniger*	Black Falcon	VP		4
Aves	*Ardeotis australis*	Australian Bustard	E1P		3
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1P		P
Aves	*Calidris acuminata*	Sharp-tailed Sandpiper	P	CJK	1
Aves	*Gallinago hardwickii*	Latham's Snipe	P	CJK	3
Aves	*Numenius minutus*	Little Curlew	P	CJK	1
Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	VP2		9

Aves	*Neophema pulchella*	Turquoise Parrot	VP3		3
Aves	*Ninox connivens*	Barking Owl	VP3		2
Aves	*Tyto longimembris*	Eastern Grass Owl	VP3		1
Aves	*Merops ornatus*	Rainbow Bee-eater	P	J	1
Aves	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	VP		1
Aves	*Chthonicola sagittata*	Speckled Warbler	VP		1
Aves	*Grantiella picta*	Painted Honeyeater	VP	V	30
Aves	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	VP		3
Aves	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	VP		30
Aves	*Daphoenositta chrysoptera*	Varied Sittella	VP		7
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	VP		1
Aves	*Melanodryas cucullata cucullata*	Hooded Robin (south-eastern form)	VP		2
Aves	*Stagonopleura guttata*	Diamond Firetail	VP		2
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	VP	E	1
Mammalia	*Sminthopsis macroura*	Stripe-faced Dunnart	VP		P
Mammalia	*Phascolarctos cinereus*	Koala	VP	V	98
Mammalia	*Macropus dorsalis*	Black-striped Wallaby	E1P		8
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	VP	V	P
Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	VP		5
Mammalia	*Mormopterus eleryi*	Bristle-faced free-tailed bat Hairy-nosed Freetail Bat	E1P		P
Mammalia	*Chalinolobus picatus*	Little Pied Bat	VP		3
Mammalia	*Nyctophilus corbeni*	Corben's Long-eared Bat	VP	V	P
Mammalia	*Pseudomys gouldii*	Gould's Mouse	E4P	X	1
Insecta	*Jalmenus eubulus*	Pale Imperial Hairstreak	E4A2		4
Flora	*Tylophora linearis*		V	E	1
Flora	*Lepidium aschersonii*	Spiny Peppercress	V	V	P

Flora	*Cyperus conicus*		E1		P
Flora	*Desmodium campylocaulon*	Creeping Tick-trefoil	E1		78
Flora	*Swainsona murrayana*	Slender Darling Pea	V	V	7
Flora	*Phyllanthus maderaspatensis*		E1		1
Flora	*Dichanthium setosum*	Bluegrass	V	V	4
Flora	*Digitaria porrecta*	Finger Panic Grass	E1		24
Flora	*Homopholis belsonii*	Belson's Panic	E1	V	118
Flora	*Polygala linariifolia*	Native Milkwort	E1		P
Flora	*Cadellia pentastylis*	Ooline	V	V	P

BioNET Atlas search – threatened ecological communities predicted to occur within the Northern Outwash IBRA subregion.

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.
+Comm. Status: CE=Critically endangered, E=Endangered, V=Vulnerable.

Community	NSW status	Comm. status	Records
Cadellia pentastylis (Ooline) community in the Nandewar and Brigalow Belt South Bioregions	E3		K
Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions	E3		K
Coolibah-Black Box Woodland in the Darling Riverine Plains Brigalow Belt South Cobar Peneplain and Mulga Lands Bioregions	E3	E	P
Inland Grey Box Woodland in the Riverina NSW South Western Slopes Cobar Peneplain Nandewar and Brigalow Belt South Bioregions	E3	E	P
Myall Woodland in the Darling Riverine Plains Brigalow Belt South Cobar Peneplain Murray-Darling Depression Riverina and NSW South Western Slopes bioregions	E3	E	K
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions	E3	E	P
White Box Yellow Box Blakely's Red Gum Woodland	E3	CE	K

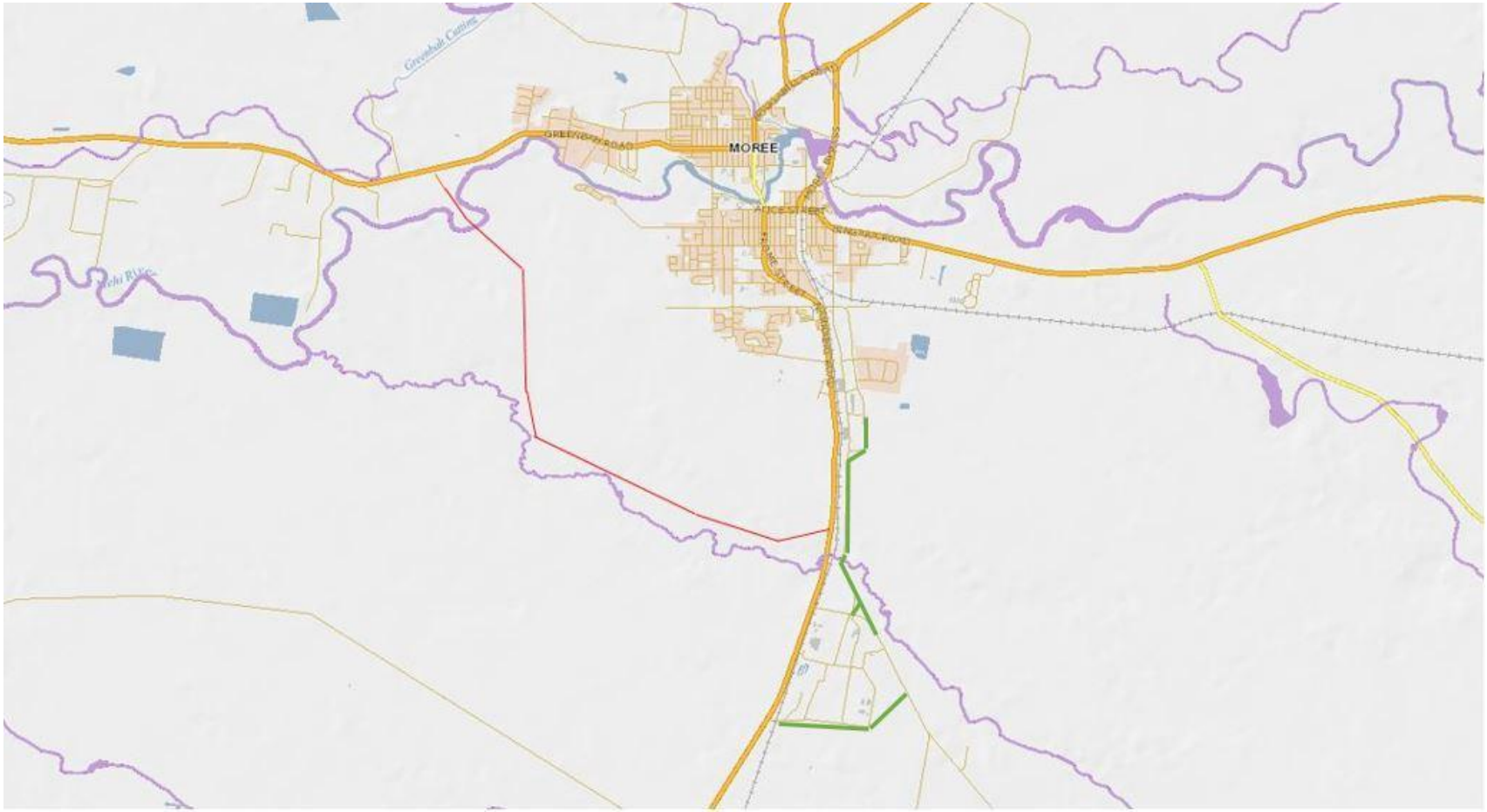
BioNET Atlas search – key threatening processes predicted to occur within the Northern Outwash IBRA subregion.

Threat	NSW status	Comm. status	Records
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala (Latham 1802)	KTP	KTP	P
Alteration of habitat following subsidence due to longwall mining	KTP		P
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		P
Anthropogenic Climate Change	KTP	KTP	P
Bushrock removal	KTP		P
Clearing of native vegetation	KTP	KTP	P
Competition and grazing by the feral European Rabbit Oryctolagus cuniculus (L.)	KTP	KTP	P
Competition and habitat degradation by Feral Goats Capra hircus Linnaeus 1758	KTP	KTP	P
Competition from feral honey bees Apis mellifera L.	KTP		P
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		P
Herbivory and environmental degradation caused by feral deer	KTP		P
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		P
Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	KTP	KTP	P
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	P
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	P
Infection of native plants by Phytophthora cinnamomi	KTP	KTP	P
Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	KTP		P

Invasion and establishment of exotic vines and scramblers	KTP		P
Invasion and establishment of Scotch Broom (Cytisus scoparius)	KTP		P
Invasion and establishment of the Cane Toad (Bufo marinus)	KTP	KTP	P
Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.	KTP		P
Invasion of native plant communities by Chrysanthemoides monilifera	KTP		P
Invasion of native plant communities by exotic perennial grasses	KTP		P
Invasion of the Yellow Crazy Ant Anoplolepis gracilipes (Fr. Smith) into NSW	KTP		P
Invasion establishment and spread of Lantana (Lantana camara L. sens. Lat)	KTP		P
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants including aquatic plants	KTP	KTP	P
Loss of Hollow-bearing Trees	KTP		P
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		P
Predation and hybridisation by Feral Dogs Canis lupus familiaris	KTP		P
Predation by Gambusia holbrooki Girard 1859 (Plague Minnow or Mosquito Fish)	KTP		P
Predation by the European Red Fox Vulpes Vulpes (Linnaeus 1758)	KTP	KTP	P
Predation by the Feral Cat Felis catus (Linnaeus 1758)	KTP	KTP	P
Predation habitat degradation competition and disease transmission by Feral Pigs Sus scrofa Linnaeus 1758	KTP	KTP	P
Removal of dead wood and dead trees	KTP		P

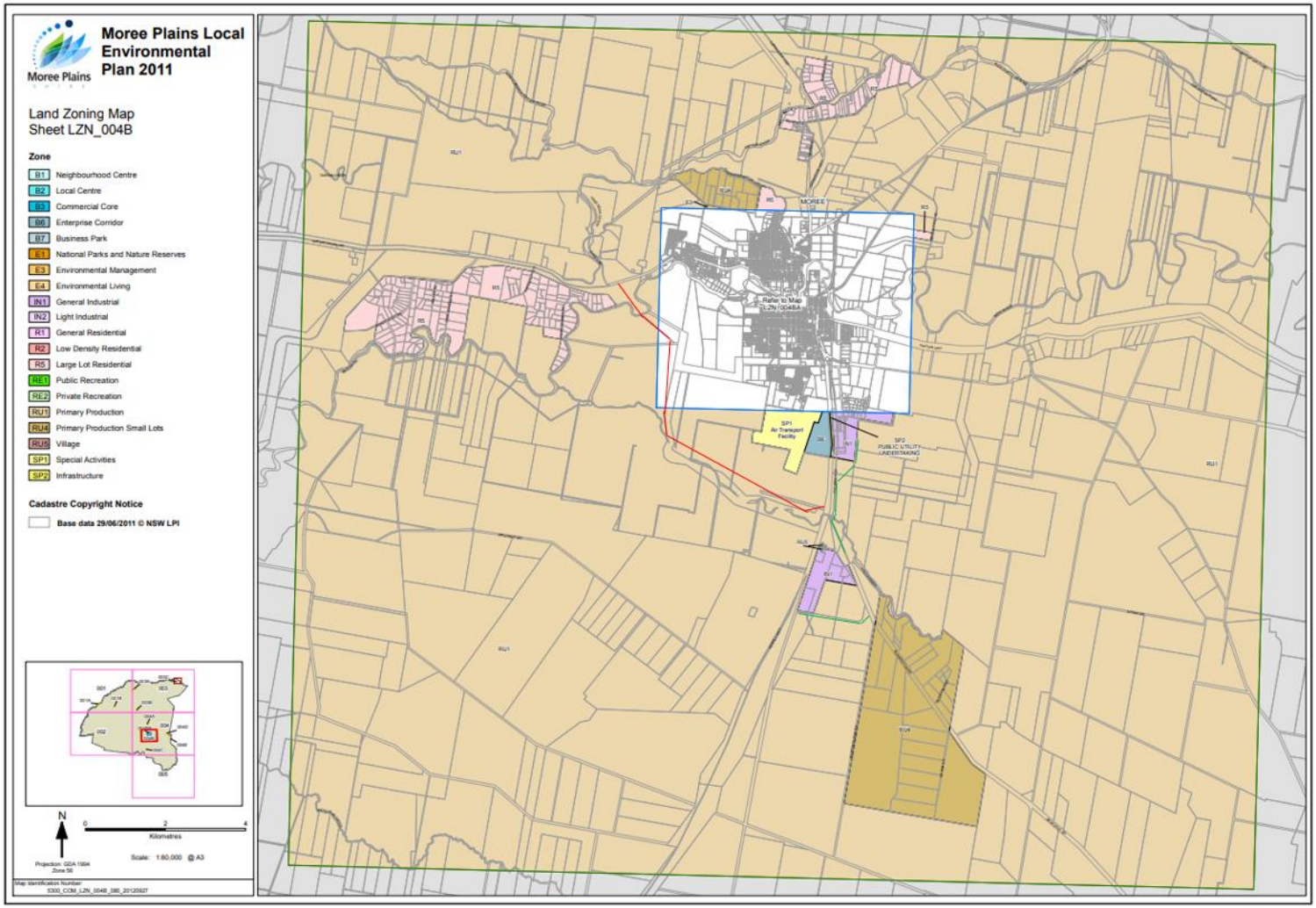
Biodiversity Values Map.

Areas marked as purple are areas of biodiversity value. The red polygon indicates the approximate location of the east-west bypass. The green polygon represents the approximate location of the north-south link road.

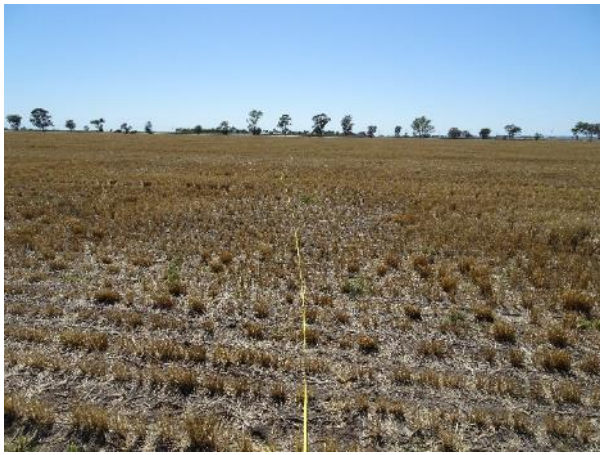
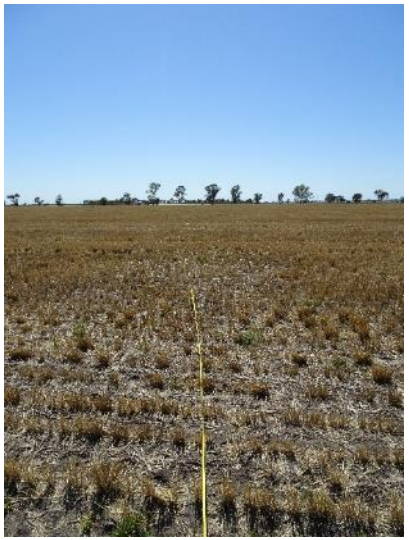


Moree Plains Shire Council Local Environment Plan.

The red polygon indicates the approximate location of the east-west bypass. The green polygon represents the approximate location of the north-south link road.



APPENDIX B: VEGETATION PLOT DATA

Plot Name	Easting (MGA Zone 55)	Northing (MGA Zone 55)	Photographs	
EWB01	-29.5124	149.9487		

EWB02	-29.5053	149.8216		

EWB03	-29.4825	149.8141		
EWB04	-29.5076	149.8543		

EWB05	-29.4698	149.7892		
EWB06	-29.4729	149.8042		

EWB07	-29.4722	149.8027		

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 18/12/2018	Survey Name East-West Bypass and North-South link		
Recorders EG		Plot ID # EWB01	Zone ID
Photo #		Plot dimensions 20x50	
Datum 94GDA	Zone 55	Plot bearing along midline 90°	
Easting -29.512444	Northing 149.94971	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern Outwash
Likely Vegetation Class	
Plant Community Type	Non-native. Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m / 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	0
	Shrubs	0
	Grasses etc	0
	Forbs	1
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	Trees	0
	Shrubs	0
	Grasses etc	0
	Forbs	0.1
	Ferns	0
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m / 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) —	Record stems for living trees only, and for all species
30 - 49	(+/-) —	For multistemmed trees, record only the largest stem
20 - 29	(+/-) —	Presence of <5cm stems records regeneration
10 - 19	(+/-) —	Record # trees with hollows, not number of hollows
5 - 9	(+/-) —	Count as one stem where tree is multistemmed
< 5	(+/-) —	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total # 0
	>20cm**	
Length of logs		Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	0	0	0	0	0	0
	Bare ground	80	90	95	80	80	85
	Cryptogam	0	0	0	0	0	0
	Rock	0	0	0	0	0	0

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

	Severity	Timing		
Disturbance			Landform	Plain
Clearing (incl. logging)	3	NR	Microrelief	
Cultivation	3	R	Slope	
Grazing (native / stock)	0		Aspect	
Soil erosion	0		Soil surface texture	
Firewood removal	0		Soil colour	
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage	
Storm damage	0		Distance to nearest water	
Weediness	3	R	Distance to nearest rock outcrop /cave	

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Cropped Paddock with Paddock trees along the eastern corner

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date	Survey Name				
Recorders		Plot ID #		Zone ID	
GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
GG	Hordeum glaucum	25		E	G
FG	Calotis sp.	0.1	5	N	G

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).

Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems

N=native, E=exotic, HTE=high threat exotic

All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc

Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 19/12/2018	Survey Name East-west Bypass and north-South link		
Recorders EG		Plot ID # EWB02	Zone ID
Photo #		Plot dimensions 20x50	
Datum 94 GDA	Zone 55	Plot bearing along midline 270°	
Easting -29.505336	Northing 149.82163	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern outwash
Likely Vegetation Class	
Plant Community Type	Candidate native grassland — Condition state Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m; 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	0
	Shrubs	3
	Grasses etc	3
	Forbs	1
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	Trees	0
	Shrubs	5.2
	Grasses etc	7
	Forbs	0.1
	Ferns	0
	Other	0
High threat weed cover		5%

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m; 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#)	Stem size class records # large trees (cf. benchmark)
50 - 79	(#)	Record stems for living trees only, and for all species
30 - 49	(+/-)	For multistemmed trees, record only the largest stem
20 - 29	(+/-)	Presence of <5cm stems records regeneration
10 - 19	(+/-)	Record # trees with hollows, not number of hollows
5 - 9	(+/-)	Count as one stem where tree is multistemmed
< 5	(+/-)	Hollow bearing stem may be a dead stem (incl. stag)
# Trees with hollows	<20cm	Total # 0
	>20cm**	
Length of logs		Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	50	20	20	5	60	31
	Bare ground	5	40	20	90	20	35
	Cryptogam	0	0	0	0	0	0
	Rock	0	0	0	0	0	0

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	NR	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness	0		Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East-west Bypass and North-South link		
Recorders EG		Plot ID # EWB02	Zone ID

GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
GG	Enteropogon acicularis	5		N	C
GG	Panicum effusum	1	25	N	C
GG	Paspalidium jubiflorum	1	40	N	C
SG	Sclerolaena muricata	0.1	5	N	M
SG	Vachellia farnesiana	5		N	M
SG	Maireana sp.	0.1	20	N	M
FG	Chenopodium sp.	0.1	30	N	C

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).

Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems

N=native, E=exotic, HTE=high threat exotic

All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc

Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 18/12/2018	Survey Name East-west Bypass north-south link		
Recorders EG		Plot ID # EWB03	Zone ID
Photo #		Plot dimensions 20x50	
Datum 94GDA	Zone 55	Plot bearing along midline 348°	
Easting -29.4825	Northing 149.8141/59	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern outwash
Likely Vegetation Class	
Plant Community Type	Candidate native grassland — Condition state: moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): (20 x 20 m) / 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	0
	Shrubs	2
	Grasses etc	5
	Forbs	3
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	Trees	0
	Shrubs	1
	Grasses etc	12.6
	Forbs	0.3
	Ferns	0
	Other	0
High threat weed cover		0.5%

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): (20 x 50 m) / 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#)	Stem size class records # large trees (cf. benchmark)
50 - 79	(#)	Record stems for living trees only, and for all species
30 - 49	(+/-)	For multistemmed trees, record only the largest stem
20 - 29	(+/-)	Presence of <5cm stems records regeneration
10 - 19	(+/-)	Record # trees with hollows, not number of hollows
5 - 9	(+/-)	Count as one stem where tree is multistemmed
< 5	(+/-)	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total # 0
	>20cm**	
Length of logs		Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	0	10	10	15	10	9
	Bare ground	95	80	80	70	80	81
	Cryptogam	0	0	0	0	0	0
	Rock	0	0	0	0	0	0

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

	Severity	Timing		
Disturbance	Severity	Timing	Landform	
Clearing (incl. logging)	3	NR	Microrelief	
Cultivation	0		Slope	
Grazing (native / stock)	2	R	Aspect	
Soil erosion	0		Soil surface texture	
Firewood removal	0		Soil colour	
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage	
Storm damage	0		Distance to nearest water	
Weediness	1	R	Distance to nearest rock outcrop /cave	

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Candidate native grassland. Weeping myall open woodland observed nearby blocked off by fence.

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BAM Plot - Field Survey Sheet

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Date 18/12/2018	Survey Name East-west Bypass North-South link		
Recorders EG		Plot ID # EWB03	Zone ID

GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
FG	Calotis sp.	0.1	30	N	L
GG	Panicum effusum	10		N	L
FG	Tribulus terrestris	0.1	20	E	L
SG	Sclerolaena sp.	0.5	20	N	M
FG	Solanum esuriale	0.1	30	N	L
GG	Austrostipa nodosa	1	50	N	L
FG	Oxalis perennans	0.1	50	N	L
GG	Austrostipa bigeniculata	1	50	N	L
GG	Panicum buncei	0.5	30	N	L
GG	Dactyloctenium radulans	0.1	5	N	L
SG	Vachellia farnesiana	0.5	3	N	M

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).

Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems

N=native, E=exotic, HTE=high threat exotic

All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc

Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East-west Bypass North-South link		
Recorders EG		Plot ID # EWB04	Zone ID
Photo #		Plot dimensions 20x50	
Datum 94 GDA	Zone 55	Plot bearing along midline 182°	
Easting -29.50765 1	Northing 149.95434 1	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern outwash
Likely Vegetation Class	
Plant Community Type	Condidale native grassland — Condition state moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	0
	Shrubs	1
	Grasses etc	4
	Forbs	6
	Ferns	1
	Other	0
Cover (sum of cover of natives species)	Trees	0
	Shrubs	5
	Grasses etc	11
	Forbs	5.5
	Ferns	0.1
	Other	0
High threat weed cover		5%

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#)	Stem size class records # large trees (cf. benchmark)
50 - 79	(#)	Record stems for living trees only, and for all species
30 - 49	(+/-)	For multistemmed trees, record only the largest stem
20 - 29	(+/-)	Presence of <5cm stems records regeneration
10 - 19	(+/-)	Record # trees with hollows, not number of hollows
5 - 9	(+/-)	Count as one stem where tree is multistemmed
< 5	(+/-)	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
	<20cm	
	>20cm**	0
Length of logs		Total (m)
		0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	5	40	5	10	0	20
	Bare ground	90	5	60	70	80	61
	Cryptogam	0	0	0	0	0	0
	Rock	5	0	10	5	10	6

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform Plain
Clearing (incl. logging)	3	NR	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	1	R	Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 19/12/2018 | Survey Name East-west Bypass North-South link | Recorders EG | Plot ID # EWB04 | Zone ID

GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
SG	Vachellia farnesiana	5		N	M
GG	Enteropogon acicularis	5		N	L
FG	Calotis hispidula	0.1	20	N	L
GG	Eragrostis curvula	5		E	L
GG	Dichanthium sericeum	5		N	L
EG	Marsilea drummondii	0.1	15	N	L
FG	Vittadinia cuneata	0.1	30	N	L
FG	Goodenia gracilis	0.1	10	N	L
FG	Zaleya galericulata	0.1	5	N	L
FG	Atriplex muelleri	5		N	L
GG	Austrostipa bigeniculata	0.5	10	N	L
GG	Austrostipa nodosa	0.5	20	N	L
FG	Boerhavia dominii	0.1	20	N	L

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East-West Bypass and North-South Link		
Recorders EG		Plot ID # EWB05	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 180°	
Easting -29.469852	Northing 149.79424	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern outwash
Likely Vegetation Class	
Plant Community Type	Candidate native grassland — Condition state: Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	0
	Shrubs	0
	Grasses etc	3
	Forbs	2
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	Trees	0
	Shrubs	0
	Grasses etc	6.5
	Forbs	11
	Ferns	0
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		
>80	(#)	-
50 - 79	(#)	1
30 - 49	(+/-)	-
20 - 29	(+/-)	-
10 - 19	(+/-)	-
5 - 9	(+/-)	-
< 5	(+/-)	+

Notes on function attributes:
- Stem size class records # large trees (cf. benchmark)
- Record stems for living trees only, and for all species
- For multistemmed trees, record only the largest stem
- Presence of <5cm stems records regeneration
- Record # trees with hollows, not number of hollows
- Count as one stem where tree is multistemmed
- Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows			Total #
1	<20cm	2	3
	>20cm**	1	

Length of logs	Total (m)
	5m

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	0	5	10	5	5	5
	Bare ground	60	70	70	60	70	66
	Cryptogam	0	0	0	0	0	0
	Rock	0	0	0	0	0	0

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform Plain
Clearing (incl. logging)	3	NR	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour Brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East-West Bypass, North-South Link		
Recorders		Plot ID # EWB05	Zone ID

GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
OG	Enteropogon acicularis	1	20	N	L
FG	Tribulus terrestris	1		E	L
GG	Paspalidium constrictum	0.5	40	N	L
GG	Panicum effusum	5		N	L
FG	Zaleya galericulata	1	20	N	L
FG	Atriplex muelleri	10		N	L

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).

Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems

N=native, E=exotic, HTE=high threat exotic

All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc

Identify top 3 dominants in each stratum (use own stratum definitions)

Cover ... area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East-West Bypass, North-South link		
Recorders EG		Plot ID # EWB06	Zone ID
Photo #		Plot dimensions 20x50	
Datum -	Zone	Plot bearing along midline 255°	
Easting -29.472994	Northing 149.804202	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern outwash
Likely Vegetation Class	
Plant Community Type	36 - River Red Gum tall Open forest — Condition state

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m; 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	2
	Shrubs	1
	Grasses etc	2
	Forbs	4
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	Trees	20
	Shrubs	0.1
	Grasses etc	25
	Forbs	1.7
	Ferns	0
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m; 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) 3	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) 1	Record stems for living trees only, and for all species
30 - 49	(+/-) +	For multistemmed trees, record only the largest stem
20 - 29	(+/-) -	Presence of <5cm stems records regeneration
10 - 19	(+/-) -	Record # trees with hollows, not number of hollows
5 - 9	(+/-) -	Count as one stem where tree is multistemmed
< 5	(+/-) +	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
2	<20cm 4	8
	>20cm** 4	

Length of logs — Total (m): 22m

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	60	70	80	80	20	62
	Bare ground	20	20	20	20	80	32
	Cryptogam	0	0	0	0	0	0
	Rock	0	0	0	0	0	0

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	1	NR	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	0		Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes There were Piles of rubbish scattered along the ground

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East West Bypass, North South link		
Recorders EG		Plot ID # EWB06	Zone ID

GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
TG	Eucalyptus camaldulensis	10		N	U
TG	Eucalyptus coolabah	10		N	U
GG	Paspalidium burce:	20		N	L
FG	Einadia sp.	1	50	N	L
FG	Chenopodium sp.	0.1	10	N	L
SG	Sclerolaena sp.	0.1	5	N	M
FG	Sida corrugata	0.5	40	N	L
GG	Austrostipa bigeniculata	5		N	L
FG	Tribulus terrestris	0.1	5	E	L
GG	Urochloa mosambicensis	1	30	E	L
FG	Ghinus lotoides	0.1	5	N	L

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).

Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems

N=native, E=exotic, HTE=high threat exotic

All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc

Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East west Bypass, north South link		
Recorders EG		Plot ID # EWB07	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum 94GDA	Zone 55	Plot bearing along midline 255°	
Easting -29.472261	Northing 149.802786	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Brigalow Belt South
Subregion	Northern Outwash
Likely Vegetation Class	
Plant Community Type	39 - Coolabah - River coolabah - lignum woodland Condition state

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m (10 x 40 m)

		Sum values*
Native Richness (count of native species)	Trees	1
	Shrubs	2
	Grasses etc	1
	Forbs	5
	Ferns	1
	Other	0
Cover (sum of cover of natives species)	Trees	20
	Shrubs	1.5
	Grasses etc	5
	Forbs	11.2
	Ferns	0.1
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m (10 x 100 m)

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) 3	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) 1	Record stems for living trees only, and for all species
30 - 49	(+/-) —	For multistemmed trees, record only the largest stem
20 - 29	(+/-) —	Presence of <5cm stems records regeneration
10 - 19	(+/-) —	Record # trees with hollows, not number of hollows
5 - 9	(+/-) —	Count as one stem where tree is multistemmed
< 5	(+/-) +	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
2	<20cm 2	3
	>20cm** 1	

Length of logs — Total (m): 16m

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	10	20	70	90	38
	Bare ground	90	90	90	10	20	54
	Cryptogam	0	0	0	0	0	0
	Rock	0	0	0	0	0	0

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

	Severity	Timing		
Disturbance			Landform	Plain
Clearing (incl. logging)	2	NR	Microrelief	
Cultivation	0		Slope	
Grazing (native / stock)	2	R	Aspect	
Soil erosion	0		Soil surface texture	
Firewood removal	0		Soil colour	Brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage	
Storm damage	0		Distance to nearest water	
Weediness			Distance to nearest rock outcrop /cave	

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

KH - Version * .* - Date 1/12/2017

BAM Plot - Field Survey Sheet

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Date 19/12/2018	Survey Name East west bypass, north-South link		
Recorders EG		Plot ID # EWB07	Zone ID

GF code	*Genus species* (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
GG	Austrostipa nodosa	5		N	L
FG	Zaleya galericulata	1	40	N	L
FG	Tribulus terrestris	5		E	L
FG	Wahlenbergia sp.	0.1	10	N	L
FG	Einadia sp.	5		N	L
FG	Glinus lotoides	0.1	5	N	L
FG	Maireana sp.	5		N	L
SG	Sclerolaena intricata	1	4	N	M
EG	Marsilea drummondii	0.1	10	N	L
TG	Eucalyptus coolabah	20		N	U
SG	Rhagodia spinescens	0.5	1	N	M

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)

Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).

Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems

N=native, E=exotic, HTE=high threat exotic

All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc

Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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APPENDIX C: FIELD SURVEY RESULTS

Flora species list

These species were identified on the site during the December 2018 field survey:

*FG = Forb, GG = Grass and Grass-like, SG = Shrub, TG = Tree

+N = Native, P = Priority Weed, W = Introduced.

Growth Form*	Species Name	Common Name	Exotic+	High Threat Weed
GG	*Hordeum glaucum*	Northern Barley Grass	E	-
GG	*Enteropogon acicularis*	Curly Windmill Grass	N	-
GG	*Panicum effusum*	Hairy Panic	N	-
GG	*Paspalidium jubiflorum*	Warrego Grass	N	-
SG	*Sclerolaena muricata*	Black Rolypoly	N	-
SG	*Vachellia farnesiana*	Mimosa Bush	N	Y
FG	*Maireana Sp.*		N	-
FG	*Chenopodium Sp.*		N	-
FG	*Calotis Sp.*		N	-
FG	*Tribulus terrestris*	Caltrop	E	-
FG	*Solanum esuriale*	Quena	N	-
GG	*Austrostipa nodosa*		N	-
FG	*Oxalis perennans*		N	-
GG	*Austrostipa bigeniculata*		N	-
GG	*Panicum buncei*		N	-
GG	*Dactyloctenium radulans*	Button Grass	N	-
FG	*Calotis hispidula*	Bogan Flea	N	-
GG	*Eragrostis curvula*	African Lovegrass	E	Y
GG	*Dichanthium sericeum*	Queensland Bluegrass	N	-
EG	*Marsilea drummondii*	Common Nardoo	N	-
FG	*Vittadinia cuneata*	Fuzzweed	N	-
FG	*Goodenia gracilis*		N	-
FG	*Zaleya galericulata*	Hogweed	N	-
FG	*Atriplex muelleri*		N	-
FG	*Boerhavia dominii*	Tarvine	N	-
GG	*Paspalidium constrictum*	Knottybutt Grass	N	-
TG	*Eucalyptus camaldulensis*	River Red Gum	N	-
TG	*Eucalyptus coolabah*	Coolibah	N	-
FG	*Einadia Sp.*		N	-
SG	*Sclerolaena Sp.*		N	-
FG	*Sida Corrugata*	Corrugated Sida	N	-
GG	*Urochloa mosambicensis*	Sabi Grass	E	-
FG	*Glinus lotoides*		N	-
FG	*Wahlenbergia Sp.*		N	-

SG	*Sclerolaena intricata*	Poverty Bush	N	-
SG	*Rhagodia spinescens*	Spiny Saltbush	N	-

Fauna species list

These species were identified on the site during the December 2018 field survey:

Class	Species Name	Common Name	Exotic
Bird	*Eolophus roseicapilla*	Galah	N
Bird	*Corvus orru*	Torresian Crow	N
Bird	*Cacatua galerita*	Sulphur-crested Cockatoo	N
Bird	*Gymnorhina tibicen*	Australian Magpie	N
Mammal	*Macropus giganteus*	Eastern Grey Kangaroo	N
Mammal	*Oryctolagus cuniculus*	European Rabbit	E

APPENDIX D: HABITAT ASSESSMENT FOR THREATENED SPECIES AND COMMUNITIES PREDICTED TO OCCUR

Habitat assessment table for BC Act listed threatened species and EPBC Act migratory species within the Northern Outwash IBRA subregion, NSW Bionet records and incorporating sightings of species within 10 km. Unless otherwise indicated, habitat information has been taken from OEH Threatened Biodiversity Profiles, available at https://www.environment.nsw.gov.au/threatenedSpeciesApp/. Likelihood of occurrence has been determined based on professional judgement, observations made during field surveys and information available in species profiles and other sources.

NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.
Commonwealth Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable.

THTREATENED FLORA

Scientific Name	Common Name	NSW Status	Comm. Status	Record within 10 km	Likelihood of Occurrence
Tylophora linearis		V	E	No	Majority of linearis records occur in the central western region. Records from Goonoo, Pillaga West, Pillaga East, Bibblewindi, Cumbil and Eura State Forests, Coolbaggie NR, Goobang NP and Beni SCA. Also has been recorded Hiawatha State Forest near West Wyalong in the south and there are old records as far north as Crow Mountain near Barraba and near Glenmorgan in the western Darling Downs. 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*. Also grows in association with *Acacia hakeoides, Acacia lineata, Melaleuca uncinata, Myoporum species and Casuarina species*. **No – correct vegetation community does not occur on the subject site.**

Lepidium aschersonii	Spiny Peppercress	V	V	No	The spiny peppercress is not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). In the north of the State recent surveys have recorded a number of new sites including Brigalow Nature Reserve, Brigalow State Conservation Area, Leard State Conservation Area and Bobbiwaa State Conservation Area. Also known from the West Wyalong in the south of the State. Found on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), Belah (Casuarina cristata), Buloke (Allocasuarina luehmanii) and Grey Box (Eucalyptus microcarpa). In the south has been recorded growing in Bull Mallee (Eucalyptus behriana). Often the understorey is dominated by introduced plants. The species grows as a a component of the ground flora, in grey loamy clays. Vegetation structure varies from open to dense, with sparse grassy understorey and occasional heavy litter. **No – correct vegetation community does not occur on the subject site.**
Cyperus conicus		E1		No	Occurs rarely in the Pilliga area of NSW and is also found in Victoria, Qld, the NT and WA. Grows in open woodland on sandy soil, often in association with other sedge species. In central Australia, the species grows near waterholes and on the banks of streams in sandy soils. In Qld the species usually found on heavy soils. Recorded from Callitris forest in the Pilliga area, growing in sandy soil with Cyperus gracilis, C. squarrosus and C. fulvus. **No - correct vegetation community does not occur on the subject site.**
Desmodium campylocaulon	Creeping Tick-trefoil	E1		Yes	The Creeping Tick-trefoil grows on cracking black soils in the Narrabri, Moree and Walgett LGAs. Also occurs in the NT and Darling Downs district of south-eastern Queensland. It is confined to clay soils, usually with Astrebla and Iseilema species. Associated species include *Acacia harpophylla, Astrebla pectinata* and *Sorghum, Dichanthium and Panicum* species. **Likely – The species is known from the LGA and associated soil and plant species occur in the vicinity of the subject site.**
Swainsona murrayana	Slender Darling Pea	V	V	Yes	Found throughout NSW, the Slender Darling Pea has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. The species may require some disturbance and has been known to occur in paddocks that have been moderately grazed or occasionally cultivated.

					Potential - The species is known from the LGA and associated soil and plant species occur in the vicinity of the subject site.
Phyllanthus maderaspatensis		E1		No	*Phyllanthus maderaspatensis* is recorded for the Brewarrina and Collarenebri districts in the north-western plains of NSW. Grows in floodplain areas on heavy soils and may rely on appropriate and intermittent rainfall and flooding events for its survival. The species is described as being a summer-growing annual and is thus dependent on seasonal conditions. Often associated with open grasslands and eucalypt woodlands in or near creek beds, and grassy flats and levees near watercourses. **Potential - Grows in floodplain areas on heavy soils. Associated with River Red Gum tall to very tall open forest and Coolabah – River Coobah – Lignum woodland.**
Dichanthium setosum	Bluegrass	V	V	Yes	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched). **Potential – Records within 10 km of subject site. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.**
Digitaria porrecta	Finger Panic Grass	E1		Yes	Finger Panic Grass occurs in NSW and Queensland. In NSW it is found on the North West Slopes and Plains, from near Moree south to Tambar Springs and from Tamworth to Coonabarabran. It largely occurs on private land. Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire. **Likely - Records within 10 km of subject site. Occurs within native grassland, woodlands or open forest with a grassy understorey on richer soils.**
Homopholis belsonii	Belson's Panic	E1	V	No	It occurs on the northwest slopes and plains of NSW, mostly between Wee Waa, Goondiwindi and Glen Innes. It also occurs in Queensland, mainly in the Brigalow Belt South bioregion. Grows in dry woodland (e.g. Belah) often on

					poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils. **No - correct vegetation community does not occur on the subject site.**
Polygala linariifolia	Native Milkwort	E1		No	North from Copeton Dam and the Warialda area to southern Queensland; also found on the NSW north coast near Casino and Kyogle, and there is an isolated population in far western NSW near Weebah Gate, west of Hungerford. This species also occurs in Western Australia. Sandy soils in dry eucalypt forest and woodland with a sparse understorey. The species has been recorded from the Inverell and Torrington districts growing in dark sandy loam on granite in shrubby forest of *Eucalyptus caleyi, Eucalyptus dealbata* and *Callitris*, and in yellow podsolic soil on granite in layered open forest. In the Pilliga area, this species has been recorded in Fuzzy Box woodland, White Cypress Pine-Bulloak - Ironbark woodland, Rough-barked Apple riparian forb-grass open forest, and Ironbark - Brown Bloodwood shrubby woodland. **No - correct vegetation community does not occur on the subject site.**
Cadellia pentastylis	Ooline	V	V	No	Occurs along the western edge of the North West Slopes from north of Gunnedah to west of Tenterfield. Also occurs in Queensland. Forms a closed or open canopy mixing with eucalypt and cypress pine species. **No - correct vegetation community does not occur on the subject site.**

THREATENED FAUNA

Scientific Name	Common Name	NSW status	Comm. status	Record within 10 km	Likelihood of Occurrence
Anomalopus mackayi	Five-clawed Worm-skink	E1,P	V	No	The Five-clawed Worm-skink is found in the North West Slopes and Plains of north-east NSW and south-east Queensland, from the Ashford area west to Mungindi and Walgett in NSW and north to Dalby in Queensland. Occurs close to or on the lower slopes of slight rises in grassy White Box woodland on moist black soils, and River Red Gum-Coolibah-Bimble Box woodland on deep cracking loose clay soils. May also occur in grassland areas and open paddocks with scattered trees. **Potential – Known within the study area. River Red Gum-Coolibah-Bimble Box woodland occurs within subject site.**
Furina dunmalli	Dunmall's Snake	P	V	No	The distribution of Dunmall's Snake extends from near the Queensland border throughout the Brigalow Belt South and Nandewar bioregions, as far south as Ashford in New South Wales. Dunmall's Snake has been found in a broad range of habitats, including: Forests and woodlands on black alluvial cracking clay and clay loams dominated by Brigalow (*Acacia harpophylla*), other Wattles (*A. burowii, A. deanii, A. leioclyx*), native Cypress (*Callitris spp*.) or Bull-oak (*Allocasuarina luehmannii*). Various Blue Spotted Gum (*Corymbia citriodora*), Ironbark (*Eucalyptus crebra and E. melanophloia*), White Cypress Pine (*Callitris glaucophylla*) and Bulloak open forest and woodland associations on sandstone derived soils. **No - correct vegetation community does not occur on the subject site.**
Hoplocephalus bitorquatus	Pale-headed Snake	V,P		Yes	A patchy distribution from north-east Queensland to the north-eastern quarter of NSW. The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. **Potential - Known within 10 km of the subject site. Part of the subject site occurs in a riparian area within woodland / eucalypt forest, which is suitable habitat for this species.**
Alectura lathami	Australian Brush-turkey population in the Nandewar and Brigalow Belt South Bioregions	E2,P		No	A population of the Australian Brush-turkey is known from the Nandewar and Brigalow Belt South Bioregions. Recent records for the species show the population to range from north east of Warialda, to Narrabri, approximately 115 km to the south-west, and occur within the local government areas of Yallaroi, Bingara, Narrabri, Barraba and Moree Plains.

					No – Predicted to be present in the Moree Plains LGA. No records within 10 km of subject site. The subject site does not contain any associated vegetation communities preferred by this species.
Anseranas semipalmata	Magpie Goose	V,P		Yes	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation. **Likely – Multiple records within 10 km of the subject site. Part of the subject site contains riparian habitat and wetland.**
Hirundapus caudacutus	White-throated Needletail	P	C,J,K	No	The White-throated Needletail is widespread in across the coast of eastern and south-eastern Australia, and Tasmania. White-throated Needletails only occur as vagrants in the Northern Territory and in Western Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. They are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Potential – The species may fly over the subject site. Part of the subject site contains woodland / forest.**
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P		Yes	In Australia, Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Storks usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish). **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse.**

Plegadis falcinellus	Glossy Ibis	P	C	Yes	The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse.**
Circus assimilis	Spotted Harrier	V,P		Yes	The Spotted Harrier occurs throughout the Australian mainland, except in densly forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse.**
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	C	No	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea and sewage ponds). Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and even urban areas. Breeding territories are located close to water, and mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest (including rainforest), closed scrub or in remnant trees on cleared land. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse.**
Hieraaetus morphnoides	Little Eagle	V,P		Yes	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. **Likely - Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a**

				major watercourse. The site also contains large hollow trees suitable for nesting.
Lophoictinia isura	Square-tailed Kite	V,P,3	Yes	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse. The site also contains many large hollow trees.**
Falco hypoleucos	Grey Falcon	E1,P,2	No	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse. The site also contains many large hollow trees.**
Falco subniger	Black Falcon	V,P	No	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres. Populations are likely to occur in most substantial reserve of flat, open habitats in the arid and semi-arid zones, particularly those with riparian habitats. The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded (eucalypt dominated) watercourses; it also uses agricultural land with scattered remnant trees. The Falcon is often associated with streams or wetlands, visiting them in search of prey. It uses standing dead trees as lookout posts. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse. The site also contains many large hollow trees.**

Ardeotis australis	Australian Bustard	E1,P		No	The Australian Bustard mainly occurs in inland Australia and is now scarce or absent from southern and south-eastern Australia. In NSW, they are mainly found in the north-west corner and less often recorded in the lower western and central west plains regions. Occasional vagrants are still seen as far east as the western slopes and Riverine plain. Breeding now only occurs in the north-west region of NSW. Mainly inhabits tussock and hummock grasslands, though prefers tussock grasses to hummock grasses; also occurs in low shrublands and low open grassy woodlands; occasionally seen in pastoral and cropping country, golf courses and near dams. Breeds on bare ground on low sandy ridges or stony rises in ecotones between grassland and protective shrubland cover; roosts on ground among shrubs and long grasses or under trees. **Potential – Known from the Moree LGA. The subject site contains derived native grasslands and pastoral country which may provide suitable habitat.**
Burhinus grallarius	Bush Stone-curlew	E1,P		No	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. **Unlikely - Subject site within predicted habitat. The subject site contains River Red Gum tall to very tall open forest / woodland wetland thought to be associated with the species.**
Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K	Yes	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse.**
Gallinago hardwickii	Latham's Snipe	P	C,J,K	Yes	Latham's Snipe is a non-breeding visitor to south-eastern Australia, and is a passage migrant through northern Australia. The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense

					vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. The structure and composition of the vegetation that occurs around these wetlands is not important in determining the suitability of habitat. **Potential – Species has been recorded within 10 km of subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse. The site also contains many large hollow trees.**
Numenius minutus	Little Curlew	P	C,J,K	No	In Australia, the Little Curlew is a bird of the coastal and inland plains of the north, where it often occurs around wetlands and flooded ground, as well as in open grassy areas, including farmland, playing fields and airstrips. They often form large flocks, occasionally comprising thousands of birds. **Potential – The subject site contains wetlands and flooded ground, as well as in open grassy areas, including farmland suitable for this species.**
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2		No	The Glossy Black-Cockatoo is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*). Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina and Allocasuarina species*), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May. **No – the species feeds on a variety of sheoaks and Belah which is not present within the subject site.**
Neophema pulchella	Turquoise Parrot	V,P,3		No	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.

					Potential – Known within the Northern Outwash subregion. The species is associated with River Red Gum tall to very tall open forest / woodland wetland which occurs on site.
Ninox connivens	Barking Owl	V,P,3		Yes	The Barking Owl is found throughout continental Australia except for the central arid regions and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains (especially the Pilliga) and in some northeast coastal and escarpment forests. Sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. **Likely – Has been recorded within 10 km of the subject site. Part of the subject site contains riparian habitat close to the Mehi River, a major watercourse. The site also contains many large hollow trees which would be suitable for nesting.**
Tyto longimembris	Eastern Grass Owl	V,P,3		No	Eastern Grass Owls have been recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east. Eastern Grass Owl numbers can fluctuate greatly, increasing especially during rodent plagues. Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. **No – Predicted within the Northern Outwash subregion. However, associated vegetation communities not present within subject site.**
Merops ornatus	Rainbow Bee-eater	P	J	No	The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels (Birdlife Australia, 2018c). **Potential – Part of the subject site occurs near water. The species can also be found on farmland.**
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P		No	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of the species runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell. The eastern subspecies lives in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands. Found in eucalypt

					woodlands (including Box-Gum Woodland) and dry open forest; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging. **Potential – The subject site contains River Red Gum tall to very tall open forest bordering river/wetlands.**
Chthonicola sagittata	Speckled Warbler	V,P		No	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. **Potential - Known within the Northern Outwash subregion. The subject site contains eucalypt woodland.**
Grantiella picta	Painted Honeyeater	V,P	V	No	The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. **Potential – Known from the Northern Outwash subregion. The species is associated with River Red Gum tall to very tall open forest / woodland wetland, which occurs on site.**
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V,P		No	In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter. 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*). Also inhabits open forests of

				smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. **No - Occupies mostly upper levels of drier open forests or woodlands that do not occur on site.**
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V,P	No	The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. **Potential - Occupies mostly upper levels of drier open forests or woodlands, but also listed as utilizing River Red Gum tall to very tall open forest / woodland wetland, which occurs on site.**
Daphoenositta chrysoptera	Varied Sittella	V,P	No	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. **Potential - Inhabits eucalypt forests and woodlands, which occur on the subject site.**
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P	No	The Dusky Woodswallow is a woodland dependant bird. It is found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests. Common habitat requirements are an open understorey with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Birds are also often observed in farm land, road sides and golf courses, usually at the edges of forest or woodland or wind breaks with dead timber. **Potential – The species is known from the subregion and the subject site contains suitable habitat.**
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V,P	No	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and

					rarely found on the coast. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey. **Potential – The species is known from the subregion and the subject site contains suitable habitat.**
Stagonopleura guttata	Diamond Firetail	V,P		No	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Cental and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. **Potential - The species is known from the subregion and the subject site contains suitable habitat in a riparian area.**
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	No	The spotted-tailed Quoll is recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. **No – Not known within the Northern Outwash subregion.**
Sminthopsis macroura	Stripe-faced Dunnart	V,P		No	The Stripe-faced Dunnart is found throughout much of inland central and northern Australia, extending into central and northern NSW, western Queensland, Northern Territory, South Australia and Western Australia. They are rare on the NSW Central West Slopes and North West Slopes with the most easterly records of recent times located around Dubbo, Coonabarabran, Warialda and Ashford. Native dry grasslands and low dry shrublands, often along drainage lines where food and shelter resources tend to be better. They shelter in cracks in the soil, in grass tussocks or under rocks and logs. Co-occupies areas with the more common Fat-

					tailed Dunnart, but prefers relatively ungrazed habitats with greater diversity and healthier understorey vegetation. **Potential – The Northern Outwash subregion is predicted habitat for this species. The subject site contains associated plant communities.**
Phascolarctos cinereus	Koala	V,P	V	Yes	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. **Potential – Recorded within 10 km of the subject site. Part of the subject site contains Koala feed trees (mature River Red Gums).**
Macropus dorsalis	Black-striped Wallaby	E1,P		Yes	On the north west slopes of NSW, Black-striped Wallaby occurs in Brigalow remnants to south of Narrabri. On the north coast it is confined to the upper catchments of the Clarence and Richmond Rivers. Preferred habitat is characterised by dense woody or shrubby vegetation within three metres of the ground. This dense vegetation must occur near a more open, grassy area to provide suitable feeding habitat. On the north west slopes, associated with dense vegetation, including brigalow, ooline and semi-evergreen vine thicket. On the north coast, closely associated with dry rainforest but also occur in moist eucalypt forest with a rainforest understorey or a dense shrub layer. **No – Subject site not within known distribution. Does not contain associated plant communities.**
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	No	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. **Potential – Known to occur in woodlands, close to water.**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		Yes	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in

					most habitats across its very wide range, with and without trees; appears to defend an aerial territory. **Potential – Records within 10 km of the subject site. Part of the subject site contains large hollow trees which may be suitable for nesting.**
Mormopterus eleryi	Bristle-faced free-tailed bat	E1,P		No	*Mormopterus eleryi* is distributed from the southern half of the Northern Territory to central Queensland and north-western NSW. In NSW, the species has been recently recorded from only three disjunct locations: thirteen individuals from Gundabooka National Park, south of Bourke; one individual from Dhinnia Dthinawan Nature Reserve (formerly Bebo State Forest), north of Warialda two individuals near Bonshaw. Evidence suggests that the species depends on hollows and tree fissures for roosting sites. **Unlikely – Extremely rare throughout its range. Predicted to occur in the Northern Outwash subregion. Knowledge of ecology limited but species depend on hollows and tree fissures for nesting. Part of the subject site contains many large hollow bearing trees, which may be suitable for this species.**
Chalinolobus picatus	Little Pied Bat	V,P		No	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Can tolerate high temperatures and dryness but need access to nearby open water. **Potential - Known within the Northern Outwash subregion. A vegetation community associated with this species occurs within the subject site i.e. River Red Gum tall to very tall open forest / woodland.**
Nyctophilus corbeni	Corben's Long-eared Bat	V,P	V	No	Overall, the distribution of the Corben's Long-eared Bat coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. **Potential - Predicted within the Northern Outwash subregion. A vegetation community associated with this species occurs within the subject site i.e. River Red Gum tall to very tall open forest / woodland.**

Pseudomys gouldii	Gould's Mouse	E4,P	X	Yes	Sightings of live animals and reports of subfossil remains indicate that Gould's Mouse was formerly distributed throughout south-west Western Australia, eastern South Australia and New South Wales. **No – This species is presumed extinct.**
Jalmenus eubulus	Pale Imperial Hairstreak	E4A,2		No	*Jalmenus eubulus* is found in Queensland and NSW. In NSW it is found only in brigalow-dominated open forests and woodlands in northern areas of the state. Only known to breed in old-growth forest or woodland and does not appear to colonise regowth habitats following clearing or other major disturbance. Suitable habitat is dominated by brigalow, *Acacia harpophylla* and Buloke, *Casuarina cristata* on clay soils on flat to gently undulating plains, usually with scattered emergent euclypts such as Poplar Box, *Eucalyptus populnea* and low trees of Wilga, *Geijera parviflora*. **No – The subject site does not contain associated vegetation or communities.**

APPENDIX E: TERMS AND ABBREVIATIONS

Abbreviation	Terminology	Description
BC Act	*Biodiversity Conservation Act 2016* (NSW)	The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. This Act contains schedules relating to the listing of threatened species, populations and communities in NSW. It also outlines the framework regulating development impact assessments in relation to biodiversity.
	Biosecurity Act 2015 (NSW)	The broad objectives for biosecurity in NSW are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by • Preventing their entry into NSW • Quickly finding, containing and eradicating any new entries • Effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements. The *Biosecurity Act 2015* provides a statutory framework to help achieve these objectives.
CAMBA	China-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with China entered into in 1986. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
DoEE	Australian Government Department of Environment and Energy	The Department of the Environment designs and implements the Australian Government's policies and programmes to protect and conserve the environment, water and heritage and promote climate action.
EEC	Endangered Ecological Community	An ecological community identified by relevant legislation likely to become extinct or is in immediate danger of extinction.
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW).	Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).	Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
FM Act	*Fisheries Management Act 1994* (NSW)	The objects of this Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. This Act protects aquatic habitats and species which are not protected under the BC Act.
IBRA	Interim Biogeographic Regionalisation of Australia	The Interim Biogeographic Regionalisation for Australia (IBRA) is a biogeographic regionalisation of Australia developed by the Australian Government's Department of the Environment. Each region is a land area made up of a group of interacting ecosystems repeated in similar form across the landscape.
JAMBA	Japan-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with Japan entered into in 1974. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.

Abbreviation	Terminology	Description
Key Fish Habitat (KFH) and associated sensitivity classification (Fairfull, 2013)		**Type 1** **Highly Sensitive KFH** • *Posidonia australis* (strapweed) • *Zostera, Heterozostera, Halophila* and *Rupia* species of seagrass beds >5m^2 • Coastal saltmarsh >5m^2 • Coral communities • Coastal lakes and lagoons that have a natural opening and closing regime • Marine Park, an aquatic reserve or intertidal protected area • SEPP 14 coastal wetlands, wetlands recognised under international agreements, wetlands listed in the Directory of Important Wetlands of Australia • Freshwater habitats that contain in-steam gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 m in length, or native aquatic plants • Any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the Fisheries Management Act Mound springs **Type 2** **Moderately Sensitive KFH** • *Zostera, Heterozostera, Halophila* and *Rupia* species of seagrass beds >5m^2 • Coastal saltmarsh <5m^2 • Mangroves • Marine macroalgae • Esturine and marine rocky reefs • Coastal lakes and lagoon that are permanently open or subject to artificial opening via agreed management arrangements • Aquatic habitat within 100 m of a marine park, an aquatic reserve or intertidal protected area • Stable intertidal sand/mud flats, coastal and esturine sandy beaches with large populations of in-fauna • Freshwater habitats and brackish wetlands, lakes, lagoons other than those defined in Type 1 Weir pools and dams up to full supply level where the weir or dam is across a natural waterway **Type 3** **Minimally sensitive KFH** • Unstable or unvegetated sand or mud substrate, coastal and esturine sandy beaches with minimal in-fauna • Coastal and freshwater habitats not included in Types 1 or 2 • Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation
Key Fish Habitat (KFH) and associated classification of waterways for fish passage (Fairfull, 2013)		**Class 1** **Major KFH** • Marine or esturine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or 'critical habitat'. **Class 2** **Moderate KFH** • Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-

Abbreviation	Terminology	Description
		permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. Type 1 and 2 habitats present. **Class 3** **Minimal KFH** • Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other Class 1, 2 or 3 fish habitat. **Class 4** **Unlikely KFH** • Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools post rain events (e.g. dry gullies or shallow floodplain depressions with no aquatic flora present).
Recommended riparian buffer zone		NSW DPI will assess the width of the riparian buffer zone based on the habitat TYPE and waterway CLASS (see above), the possible extent of the disturbance and the susceptibility of the riverbank to erosion. As a guide the following are recommended: • TYPE 1, CLASS 1: 100 metres • TYPE 2, CLASS 2-3: 50 metres • TYPE 3, CLASS 3-4: 10-50 metres
KTP	Key Threatening Process	A key threatening process is defined as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. A requirement of their listing on the TSC Act is that the process adversely affects two or more threatened species, populations or ecological communities, or may cause species, populations or ecological communities not threatened to become threatened.
MNES	Matters of national environmental significance	Refers to the seven matters of national environmental significance outlined under the EPBC Act.
NPW Act	*National Parks and Wildlife Act 1974* (NSW)	The objects of this Act are as follows: The conservation of nature, including, but not limited to, the conservation of: habitat, ecosystems and ecosystem processes, and biological diversity at the community, species and genetic levels, and landforms of significance, including geological features and processes, and landscapes and natural features of significance including wilderness and wild rivers, The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to: places, objects and features of significance to Aboriginal people, and places of social value to the people of New South Wales, and places of historic, architectural or scientific significance, Fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation, Providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation. The objects of this Act are to be achieved by applying the principles of ecologically sustainable development.

Abbreviation	Terminology	Description
OEH	Office of Environment and Heritage	The Office of Environment and Heritage (OEH) is a separate agency within the Planning and Environment cluster. OEH was formed on 4 April 2011 and works to protect and conserve the NSW environment, including the natural environment, Aboriginal country, culture and heritage and our built heritage, and manages NSW national parks and reserves.
RAMSAR	Convention on Wetlands of International Importance	The Ramsar Convention's broad aims are to halt the worldwide loss of wetlands and to conserve, through wise use and management, those remaining. This requires international cooperation, policy making, capacity building and technology transfer.
	Risk of extinction	The likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with the Republic of Korea entered into in 2007. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
SEPP 44	State Environmental Planning Policy No.44 – Koala Habitat	This Policy aims to encourage the proper conservation and management of areas of natural vegetation with habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline: by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and by encouraging the identification of areas of core koala habitat, and by encouraging the inclusion of areas of core koala habitat in environment protection zones.
Significant impact		A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity.
Strahler stream order		Strahler stream order and are used to define stream size based on a hierarchy of tributaries.