First Solar

Biodiversity Assessment Report

BERYL SOLAR FARM

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ACRONYMS AND ABBREVIATIONS

BBAM	BioBanking Assessment Methodology
BCC	BioBanking Credit Calculator
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
Cwth	Commonwealth
EEC	Endangered Ecological Community
EIS	Environmental impact statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FBA	Framework Biodiversity Assessment
FM Act	*Fisheries Management Act 1994* (NSW)
ha	Hectares
km	Kilometres
m	Metres
NSW	New South Wales
MW	Megawatt
OEH	(NSW) Office of Environment and Heritage (formerly DECCW and DECC)
PCTs	Plant Community Types
SEARs	Secretary Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

EXECUTIVE SUMMARY

First Solar is planning for the construction and operation of a solar photovoltaic (PV) plant with an upper limit of 100MW and associated infrastructure within the Mid-Western Regional Council Local Government Area (LGA).

This Biodiversity Assessment Report (BAR) has been prepared by NGH Environmental on behalf of First Solar. The aim of this BAR is to address the requirements of the Framework for Biodiversity Assessment (FBA), developed for Major Projects, including requirements under the NSW Biodiversity Offsets Policy for Major Projects, and to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs). This BAR will be used to inform an Environmental Impact Assessment as part of an application for a Major Project under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The FBA underpins the Biodiversity Offsets Policy for Major Projects. It contains the assessment methodology that is adopted by the policy to assess impacts and provide offset guidance for Major Projects. This report follows the BAR format required by the FBA. Specifically, this assessment uses the *site-based* landscape assessment methodology, in accordance with Appendix 4 of the FBA for major proposals.

Field surveys of the study area identified one Endangered Ecological Community (EEC): White Box Yellow Box Blakely's Red Gum Grassy Woodland listed under the *Threatened Species Conservation Act 1995* (TSC Act). The project would result in the removal of 17.13 ha of this Box-Gum Woodland EEC. The Biobanking Credit Calculator (BCC) returned a total of 684 ecosystem credits for total removal of this vegetation.

Two threatened flora and one threatened fauna species were recorded within the study area. These included the Pine Donkey Orchid (*Diuris tricolor*), the Silky Swainson-pea (*Swainsona sericea*), and the Dusky Woodswallow (*Artamus cyanopterus*). The Pine Donkey Orchid and Silky Swainson-pea are both species credit species, however all individuals were recorded outside of the development footprint and were therefore considered not to be impacted by the proposed solar farm. Based on this, no species credit were generated by the BCC.

Consideration has been given to avoiding and minimising impacts to biodiversity. The layout has been revised twice and now excludes impacts on higher value Box-Gum Woodland EEC on the project site's western corner and most of the higher value EEC associated with the site's central laneway north-south. Residual impacts are mostly in low condition EEC. The low condition EEC has limited potential for regeneration after a long history of grazing; only one tree species is present in low abundance and this is not dominant species of the EEC. Groundcover vegetation is highly modified with a low percentage of native species.

Mitigation and management measures will be put in place to adequately address impacts associated with the project, both direct and indirect.

Regarding offsetting the impacts of this proposal it is noted that:

- The solar array panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.
- Areas existing within the project site that include better quality EEC at the western corner of the project site as well low condition EEC along the south-western boundary would be appropriate offset / revegetation sites. They would contribute to local landscape connectivity.

A Biodiversity Offset Strategy (BOS) is proposed to be developed in consultation with OEH to ensure the actual impacts of the development would be appropriately offset, in accordance with the FBA.

1 INTRODUCTION

First Solar (Australia) Pty Ltd proposes to develop a large scale solar farm at Beryl, NSW. The proposed solar farm would have an upper capacity of 100 Megawatt (MW) and would supply electricity to the national electricity grid.

The proposal is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP) and is therefore a 'major project'. This Biodiversity Assessment Report (BAR) assesses the impacts of the proposed Beryl Solar Farm (the proposal) according to the NSW Framework for Biodiversity Assessment (FBA) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal (Appendix A).

As stipulated in Section 1.3 of the FBA, proponents must also identify and assess the impacts of the proposal on all nationally listed threatened species and threatened ecological communities that may be on the development site. The following sections present the detail required to adequately assess the impacts on biodiversity for the Beryl Solar Farm proposal according to the FBA.

Note that this report in its current form is provided as a preliminary assessment only, and is to be reviewed in the context of it providing information on the project feasibility with regards to offsetting requirements. The report is not, at this stage, to be considered a final Biodiversity Assessment Report.

1.1 THE PROPOSAL

1.1.1 Site location

The Beryl Solar Farm proposal site is located within the Beryl locality and is situated approximately five kilometres west of Gulgong and 80 kilometres (km) east of Dubbo, within the Mid-Western Local Government Area (LGA). The proposed solar farm would connect to an existing substation immediately adjacent to the site (Figure 1-1).

1.1.2 Site description

The Beryl Solar Farm proposal site would be located on Lot 20 DP 1173059 and Lot 1 DP 1012926, Beryl. The site is approximately 300 ha in size. It is agricultural land used for grazing and cropping purposes. A residence is located at the eastern end of the site.

The majority of the site is derived from a community of conservation significance: the Box Gum Woodland Endangered Ecological Community which is listed under both the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Cwth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The community remains present across some of the site in varying levels of condition (refer to Figure 3-5).

Two ephemeral waterways and eight wetlands/farm dams occur within the proposal site. One waterway, located within the south western area of site, is a tributary of the Cudgegong River. The waterway enters the Cudgegong River approximately 900 m south west of the site. The other waterway transverses the eastern area of the site, and is a tributary of the Wialdra Creek. The confluence of these two waterways is located approximately 1.2 km north of the site boundary.

Access to the site would be from Beryl Road which bounds part of the site to the north. The Castlereagh Highway, which intersects with Beryl Road 2.5 km from the proposed site entrance, would be the major transport route for haulage and site vehicles during construction and operation of the project.

Three existing electricity transmission lines pass through the proposal site mostly in a north-south direction. The proposal would require an additional transmission line to connect to the adjacent existing substation. The line would be overhead and would be a maximum of 300 m in length.

In the centre of the site, a partly raised embankment (a former railway line) intersects the proposal site in an east-west direction. The railway line infrastructure has been removed.

1.1.3 Proposal description

The Beryl Solar Farm proposal would comprise of the installation of a solar plant with an upper capacity of 100 MW that would supply electricity to the national electricity grid. First Solar (Australia) Pty Ltd proposes to purchase the land and develop around 206 ha of the 300 ha proposal site. An indicative development area is included in the site context map at Figure 1-1. A more precise development area would be informed by detailed site investigations and assessment during the planning and design stage.

Subdivision

Existing lot boundaries are shown in Figure 1-2. First Solar (Australia) Pty Ltd are proposing to purchase the land proposed for the development. As part of the project, a subdivision is proposed. This is described more fully in the EIS and is not part of / applicable to this biodiversity assessment.

The subdivision would result in the following:

1. Lot 20 DP1173059, currently 301.5 hectares, would be reduced to 12 hectares and would contain the existing residence.
2. Lot 1 DP 1012926, currently 10.05 hectares would be increased to 299.55 hectares. This lot would contain the solar farm infrastructure.

Solar farm infrastructure

The solar farm development would include the following elements:

- PV modules mounted on a fixed or tracking structure.
- Site office and maintenance building.
- An access track off Beryl Road
- Overhead cabling for grid connection to the adjacent substation (66kV)
- Underground electrical conduits and cabling to connect the arrays on the array site
- Internal inverter stations to allow conversion of DC module output to AC electricity
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing.
- Native vegetation screening, where required to break up views of infrastructure to specific receivers.

The Beryl Solar Farm is expected to operate for around 30 years. The construction phase of the proposal is expected to take twelve months. After the initial operating period the solar farm would either be decommissioned, removing all above ground infrastructure and returning the site to its existing land capability, or repowered with new PV equipment.

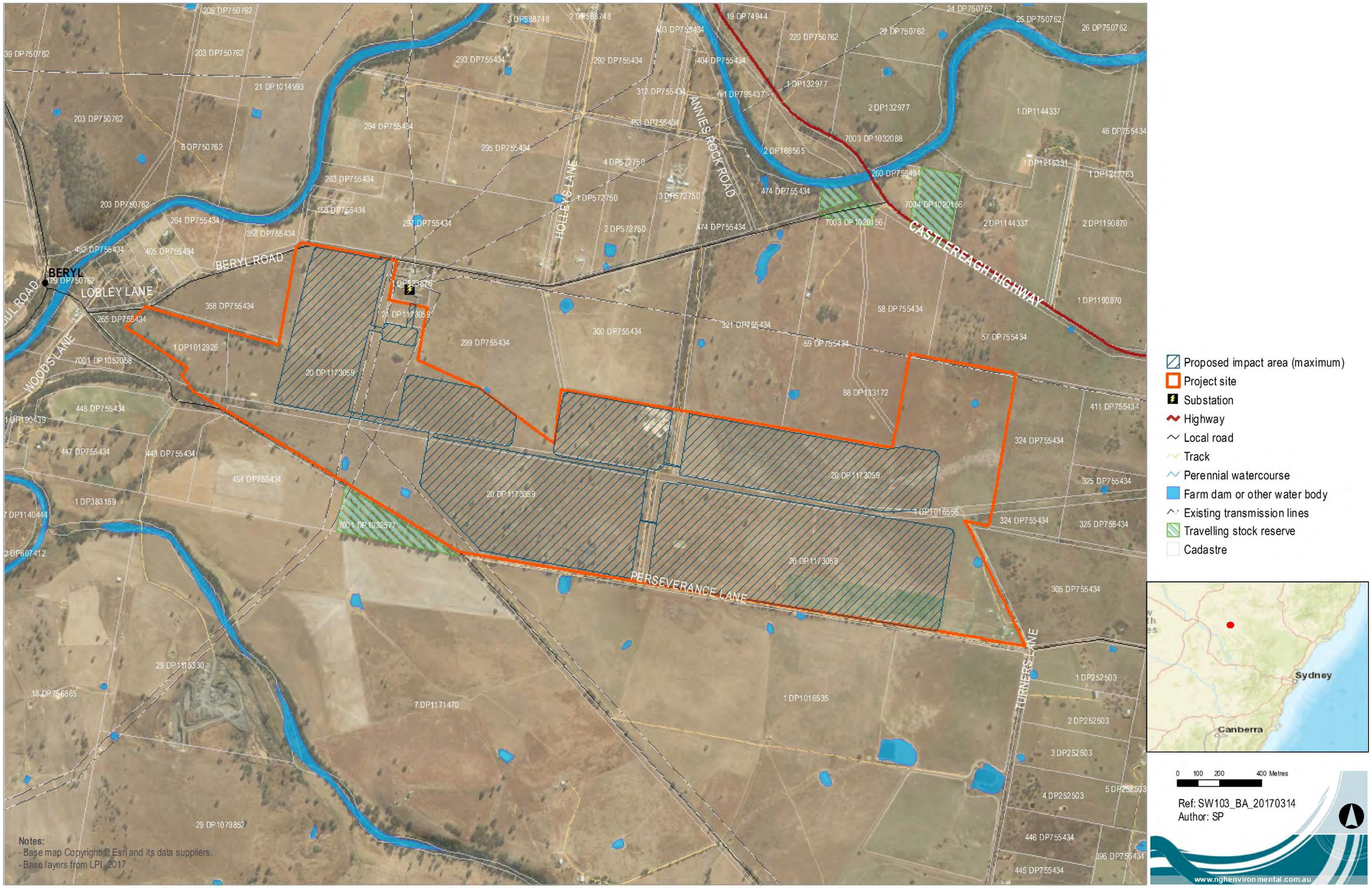

Figure 1-1 Site context

1.2 STUDY AIMS

This Biodiversity Assessment Report (BAR) has been prepared by NGH Environmental on behalf of First Solar (Australia) Pty Ltd.

The aim of this BAR is to address the requirements of the Framework for Biodiversity Assessment (FBA), developed for Major Projects, and to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) as well as the requirements of OEH and relevant guidance documents (refer Section 1.5). The SEAR's and OEH requirements are included below.

Secretary's Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: **Biodiversity –** including an assessment of the likely biodiversity impacts of the development, (including but not limited to the impacts on Box Gum Woodland endangered ecological community, *Euphrasia arguta, Prasophyllum sp. Wybong*, Bluegrass (*Dichanthium setosum*), Pink Donkey Orchid (*Diuris tricolor*), Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*), and Silky Swainson-pea (*Swainsona sericea*)), having regard to the NSW *Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment*, unless otherwise agreed by the Department;	**Sections 5 -8.**

OEH Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: **Biodiversity –** 1. Biodiversity impacts related to the proposed Beryl Solar Farm are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995. 2. Impacts on the species and ecological communities listed in Attachment B* will require further consideration and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment. *Species listed in Attachment B of the OEH Environmental Assessment Requirements include the Regent Honeyeater (*Anthochaera phrygia*), Bluegrass (*Dichanthium setosum*) and *Euphrasia arguta*.	**Sections 5 -8.**

1.3 REPORT STRUCTURE

This BAR follows the reporting requirements of Sections 1 and 2 of the FBA, including the following:

Section 1

- Identification of biodiversity values subject to the proposed major development (The Proposal) – Chapter 2 (Landscape Features), Chapter 3 (Native Vegetation), Chapter 4 (Threatened Species)

Section 2

- Impacts of the proposal on biodiversity as part of an application for approval to undertake a Major Proposal under the NSW planning legislation - Chapter 6 (Avoid and Minimise Impacts), Chapter 7 (Impact Summary).

1.4 DEFINITIONS

Beryl Solar Farm Project (the 'Project Site')

This refers to all infrastructure and activities required to construct, operate and decommission the proposed solar farm, and includes works outside of the main development site (described below), such as offsite grid connections.

The development site

This refers to the main site containing most operational infrastructure in addition to the broader area within which infrastructure would be located. This includes the solar array, operation and maintenance facilities, new substation, new cabling including proposed easement for the transmission line, temporary construction facilities, access tracks and parking. This area is approximately 206 hectares (Figure 1-2).

The development site is the impact area assessed in this BAR. For the impact assessment, GIS mapping calculated the areas within the site that would be affected by the array, access tracks and electricity easements, using the outer perimeter of infrastructure. It is noted that, being spaced to allow inter panel access, pile driven and mounted above the ground, the solar array modules will not require the removal of vegetation beneath them. However, as the panels will modify that vegetation through shading, for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed for simplicity and to provide a 'worst case' assessment.

Assessment circles

Two landscape assessment circles (the inner and outer assessment circles) have been used in the assessment. They are centred over the area of greatest impact and take into account both cover and condition of vegetation. The inner assessment circle: outer assessment circle ratio is 1:10, as per the requirements of the FBA, Appendix 4. The area of the inner and outer assessment circles for this assessment are 200 ha and 2,000 ha respectively.

1.5 SOURCES OF INFORMATION USED

The following information sources were used in the preparation of this report:

- Aerial maps, proposal layers and environmental layers provided by First Solar (Australia) Pty Ltd, local council (Mid-Western Regional Council) and OEH.

- Australian Government's Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2 (2002).
- Department of Environment and Climate Change NSW (DECC) (2007). Threatened species assessment guidelines. The assessment of significance
- Proposed Beryl Solar Array Environmental Impact Assessment: Fauna Survey Results. Kerle Environmental (2016)
- Flora survey results – advice email and data sheets. Florasearch (2016).
- Environment Australia (2001) A Directory of Important Wetlands in Australia. 3rd Edition. Environment Australia, Canberra.
- NSW OEH's BioBanking credit calculator (BCC)
- NSW OEH's Threatened Species Database http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
- OEH Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedSpeciesApp/
- Office of Environment and Heritage (OEH) (2007). Mitchell Landscapes with per cent cleared estimates.
- Office of Environment and Heritage (OEH) (2014). Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Proposals. Published by Office of Environment and Heritage for the NSW Government.
- State of NSW and Office of Environment and Heritage (2014). NSW Biodiversity Offsets Policy for Major Proposals. Published by Office of Environment and Heritage for the NSW Government.

1.6 OEH CONSULTATION

The proposal was referred to OEH as part of the request for the SEAR's and the OEH recommendations are included in Section 1.2 above.

Additionally, OEH were consulted regarding the substitution of two "dummy" plots (DG5x and DG6x) in a low condition zone (refer to Section 3.1.3). The dummy plots were a replication of the two highest value plots (DG1 and DG3, see table 3-3). The use of dummy plots for this low condition area was seen as acceptable (Ziggy Andersons, OEH, pers. com. 14/02/17).

OEH were also consulted regarding the suitability of the survey timing to confirm that the surveys conducted were adequate for detecting the presence of Ausfled's Wattle (*Acacia ausfeldii*) and the *Prasophyllum* sp 'Wybong'. The BCC identified October as the end of the survey period for these species. Targeted surveys for these species were undertaken at the beginning (first week) of November. The consultation with OEH confirmed that the November timing was suitable (Steven Cox, OEH, pers. comm. 05/03/17).

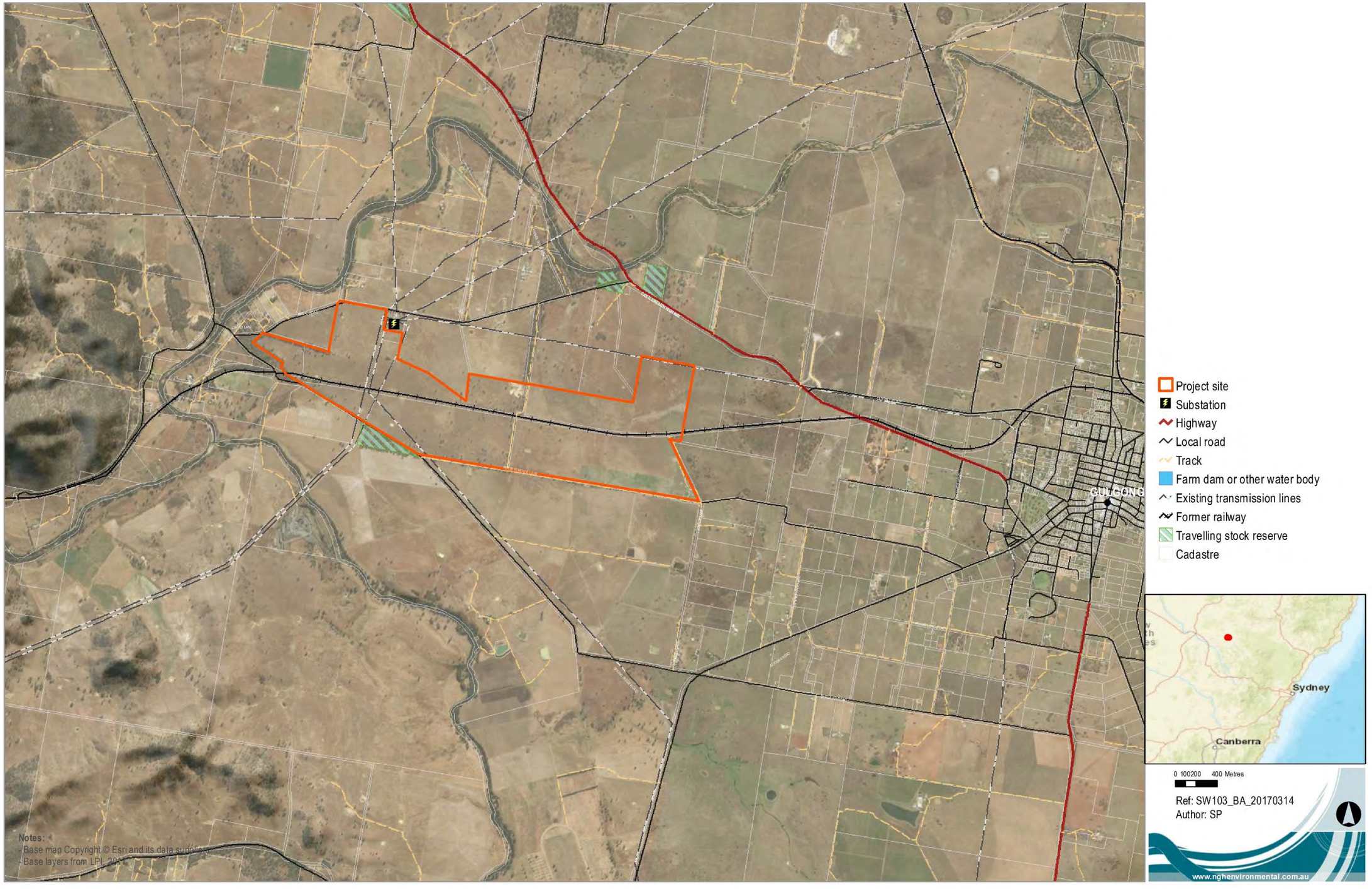

Figure 1-2 Site Map

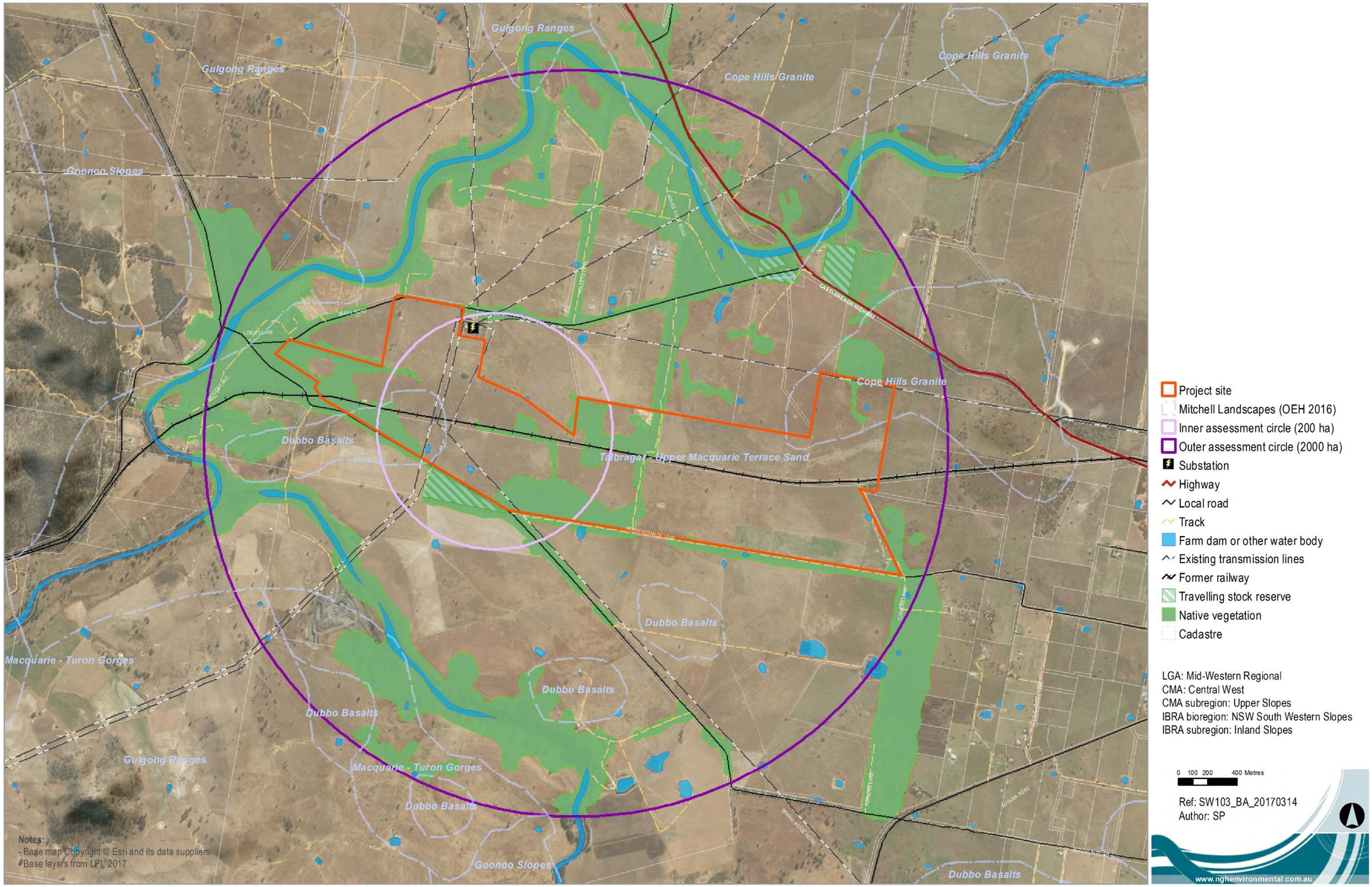

Figure 1-3 Location Map

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGIONS

Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities. The project is located within the South Western Slopes Bioregion and the Inland Slopes Subregion (IBRA v.7 2012).

The bioregion lies wholly in the eastern part of the Lachlan Fold Belt which consists of a complex series of north to north-westerly trending folded bodies of Cambrian to Early Carboniferous sedimentary and volcanic rocks. Granites are common and mostly located in large scale up-folded bodies of rock. Granite landscapes occur either as central basins surrounded by steep hills formed on contact metamorphic rocks, or as high blocky plateau features with rock outcrops and tors (OEH, 2017a).

The site is located within the far north-eastern portion of the South Western Slopes Bioregion. Within this part of the Bioregion, the vegetation types are varied and include woodlands and open woodlands of White Box *(Eucalyptus albens*) which are dominant in the higher rainfall eastern hill country, which give way to vegetation communities dominated by Grey Box (*Eucalyptus microcarpa*) and White Cypress pine (*Callitris glaucophylla*) to the west and north.

Other tree species characteristic of the bioregion include Red Stringybark (*Eucalyptus macrorhyncha*) on higher slopes, with Black Cypress Pine (*Callitris endlicheri*), Kurrajong (*Brachychiton populneus*), Red Ironbark (*Eucalyptus sideroxylon*), White Gum (*Eucalyptus rossii*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*) occupying the lower slopes. Valley flats are dominated by Rough-barked Apple (Angophora floribunda), with River She-oak (*Casuarina cunninghamiana*) found along eastern streams and River Red Gum (*Eucalyptus camaldulensis*) lining the larger central and western streams.

The dominant IBRA subregion affected by the project is the Inland Slopes Subregion. This was entered in the BCC for the project.

2.2 NSW LANDSCAPE REGIONS (MITCHELL LANDSCAPES)

Five Mitchell Landscapes occur within outer assessment circle area as follows (in order of dominance):

- The Talbragar – Upper Macquarie Terrace Sand Landscape. This occurs across the majority of the proposal site area, and is the dominant landscape within the assessment circles. The per cent cleared estimate for this landscape is currently 93% (OEH 2007).
- The Dubbo Basalts Landscape. This occurs as a series of smaller landscape patches in the southern part of the outer assessment circle area, with part of one small patch extending into the western portion of the proposal site. The per cent cleared estimate for this landscape is currently 97% (OEH 2007).
- The Gulgong Ranges Landscape. This occurs as two moderate sized patches across the northern portion of the assessment area and one moderate to large patch across the southwestern portion of the outer assessment circle area, although no parts of this landscape unit occur within the proposal site itself. The per cent cleared estimate for this landscape is currently 71% (OEH 2007).
- The Cope Hills Granite Landscape. This occurs as two small to medium sized patches across the northern portion of the outer assessment circle area, although no parts of this landscape

unit occur within the proposal site itself. The per cent cleared estimate for this landscape is currently 83% (OEH 2007).

- The Macquarie – Turon Gorges Landscape. This occurs as a relatively small patch in the southern part of the outer assessment circle area, with no parts of this patch extending into the proposal site itself. The per cent cleared estimate for this landscape is currently 68% (OEH 2007).

The Mitchell Landscape descriptions are provided in (Table 2-1) below, and their distribution at the development site shown in Figure 1-3.

Table 2-1 Description of the Mitchell Landscape relevant to the proposal (DECC 2002)

Mitchell Landscape
Talbragar – Upper Macquarie Terrace Sand (87,558.3 ha)
Sandy Quaternary alluvial sediments on the floodplains and terraces of the Talbragar River, general elevation 350 to 500m, local relief 30 to 40m. Red-brown and red-yellow earthy sands with some yellow texture-contrast soils on the valley margins. River Red Gum (*Eucalyptus camaldulensis*) along the channels, Yellow Box (*Eucalyptus melliodora*) and Rough-barked Apple (*Angophora floribunda*) with White Cypress Pine (*Callitris glaucophylla*) on the plain.
Dubbo Basalts (20,375.3 ha)
Slightly elevated plains and low hills on flat lying Tertiary basalt and trachyte flows, roughly parallel to the present course of the Talbragar and Macquarie Rivers. General elevation 300 to 330m, local relief 10m. Shallow stony red-brown clay loam and clay, self-mulching and with moderate fertility. Open White Box *(Eucalyptus albens*), Yellow Box *(Eucalyptus melliodora*) and Rough-barked Apple (*Angophora floribunda*) with diverse grasses.
Gulgong Ranges (182,977 ha)
Strike ridges with steep slopes and long debris aprons on complexly folded steep dipping Silurian lithic sandstone, quartzite and phyllite, Devonian sandstone, siltstone, shale, rhyolite and dacite. General elevation 550 to 980m, local relief 350m. Shallow stony red and yellow texture-contrast soils with stony uniform loams on steep slopes. Large areas of dense Black Cypress pine (*Callitris endlicheri*) on slopes, Red Stringybark (*Eucalyptus macrorhyncha*) and White Gum (*Eucalyptus rossii*) on ridges. Blakely's Red Gum (*Eucalyptus blakelyii*), Narrow-leaved Peppermint (*Eucalyptus radiata*) and White Box (*Eucalyptus albens*) on lower slopes grading to Yellow Box (*Eucalyptus melliodora*).
Cope Hills Granite (58,611.6 ha)
Undulating and rolling hills on Carboniferous granite and granodiorite, general elevation 500 to 740m, local relief 150m. Gritty gradational red earth and red texture-contrast soils. Forest of Yellow Box (*Eucalyptus melliodora*), Blakely's Red Gum (*Eucalyptus blakelyi*), Red Stringybark (*Eucalyptus macrorhyncha*), Apple Box (*Eucalyptus bridgesiana*), Mountain Gum (*Eucalyptus dalrympleana*) and Black Cypress Pine (*Callitris endlicheri*).
Macquarie – Turon Gorges (32,337.2 ha)
Steep sided, deep gorge tract with incised meanders of the Macquarie and Turon Rivers below extensive tablelands of the Ophir-Hargraves Plateau landscape. Incised across the structural grain of north-south trending tightly folded Devonian dacite, crystal tuff, quartzite and slates. General elevation 500 to 700m, local relief to 150m. Shallow stony soils on semi-stable scree slopes and yellow texture-contrast soils on lower angle slopes. Open woodland of Yellow Box *(Eucalyptus melliodora*), Red Box *(Eucalyptus polyanthemos*) and Blakely's Red Gum *(Eucalyptus blakelyi*) on lower areas, Red Stringybark *(Eucalyptus macrorhyncha*), Broad-leaved Peppermint *(Eucalyptus dives*) and Candlebark (*Eucalyptus rubida*), on higher slopes. River She-oak (*Casuarina cunninghamiana*) dominates the channel.

The dominant Mitchell Landscape affected by the proposal is Talbragar – Upper Macquarie Terrace Sand and this was entered into the BCC for the proposal.

2.3 NATIVE VEGETATION EXTENT

Using GIS, an inner and outer assessment circle with the ratio of 1:10 was established. A 2,000 ha outer assessment circle and 200 ha inner assessment was established over the proposal site and centred over the area of native vegetation that is impacted most by the proposal.

The total area of native vegetation mapped within the outer assessment circle is 551.5 ha (Refer to Figure 1-3).

As the natural vegetation that would have occurred at the site was woodland, the native vegetation mapping used over-storey vegetation cover as a surrogate for native vegetation cover. This is considered a conservative calculation as this method would include non-native vegetation that may still provide some habitat value. The local area's native vegetation is derived from grassy woodlands, including derived grasslands.

2.4 CLEARED AREAS

Cleared areas in the project area are primarily used for agriculture or grazing and provide very little in terms of fauna habitat. These areas may provide suitable foraging habitat for raptors, woodland birds and macropods, as well as introduced species such as cats, foxes and rabbits. Approximately 77.64 ha (about 35%) of the proposal area is cleared land (i.e. non-native, pasture-improved vegetation and the existing possible quarry site).

2.5 RIVERS AND STREAMS

Cudgegong River lies approximately 750 m to the south of the site, and Wialdra Creek is situated approximately 150 m to the north of the site.

No rivers or permanent steams are present within the site. Two small ephemeral drainage lines are located within the north-eastern and south-western portions of the site. The former is a predominantly 2nd order stream draining north into Wialdra Creek (approx. 1.35 km north of the site boundary), and the latter is a 1st order stream draining west into Cudgegong River (approx. 900 m west of the site boundary). Both of these drainage lines were predominantly dry at the time of the survey.

2.6 WETLANDS

There are numerous man made dams occurring within the project area and on immediately surrounding lands. These artificial wetlands may provide potential habitat for waterbirds and amphibians, although in general, the habitat value of these dams is considered to be of low quality due to sparse aquatic vegetation and often turbid water quality.

There are no Nationally Important Wetlands within the locality, and the closest Wetlands of International Importance (Ramsar Wetlands) to the project area are the Macquarie Marshes, situated approximately 250 km northwest of the site.

2.7 STATE OR REGIONALLY SIGNIFICANT BIODIVERSITY LINKS

State significant biodiversity links, regionally significance biodiversity links, very large area biodiversity links, large area biodiversity links or local area biodiversity links are defined in the FBA. To date, no biodiversity corridor plans have been approved by the Chief Executive of the OEH.

Under the FBA criteria, no state or regionally significant biodiversity links occur within the project area or within the inner and outer assessment circles.

2.8 LANDSCAPE VALUE SCORE COMPONENTS

A BCC assessment was completed for this project. The proposal ID for the assessment is 0035/2017/4165MP Version 1 and the assessment type was selected as 'Major Project'. This section summarises the values entered into the Landscape values section of the BCC assessment.

2.8.1 Method applied

The proposal conforms to the definition of a *site-based development* according to the FBA; a development other than a linear shaped development, or a multiple fragmentation impact development. As a result, the site based landscape assessment methodology, in accordance with Appendix 4 of the FBA for a Major Project, has been used in the assessment.

2.8.2 Percent native vegetation cover in the landscape

The following steps were completed in accordance with Appendix 4 of the FBA. They were completed based on the development site as of February 2017.

Assessing percent current extent of native vegetation cover in the inner and outer assessment circles

Using a GIS an inner and outer assessment circle with the ratio of 1:10, was established and centred on the area of native vegetation that is most impacted by the proposal.

- The total area of the inner assessment circle is 200 ha.
- The total area of the outer assessment circle, including the study area, is 2000 ha.
- Current native vegetation cover within the inner assessment circle is 48.33 ha, or 24.2% (rounded to 24%).
- Current native vegetation cover within the outer assessment circle is 508.39 ha, or 25.4% (rounded to 25%).

Assessing percent future extent of native vegetation cover

Using the same inner and outer assessment circles:

- Future native vegetation cover in the inner assessment circle is approximately 8.3% and entered into the calculator as being within the 6-10% band width,
- Future native vegetation cover in the outer assessment circle is 22.48%, rounding this gives a native vegetation cover of 24%

2.8.3 Connectivity value

A connecting link is when native vegetation on the site adjoins native vegetation surrounding the site and the native vegetation:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is separated by a distance of <100 m (or <30 m for non-woody ecosystems), and
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

State or regional biodiversity links may also occur as defined in the defining criteria from FBA table 10 below.

Table 2-2 Extract from the FBA Table 10: Connectivity value scores for site based development

Category of connecting link	Defining criteria	Score
State significant biodiversity link	An area identified as being part of a state significant biodiversity link in a plan approved by the Chief Executive, OEH OR A riparian buffer 50 m either side of a 6th order stream or greater OR A riparian buffer 50 m around an important wetland or an estuarine area	12
Regionally significant biodiversity link	An area identified as being part of a regionally significant biodiversity link and in a plan approved by the Chief Executive, OEH OR A riparian buffer 20 m either side of a 4th or 5th order stream	9

There are no state or regional significant biodiversity links within the outer assessment circle and as such, none would be impacted by the proposal.

Connectivity value

The development would not impact on any connecting links or state or regional biodiversity links. A north-south lane way is located in the central portion on the project site. The development footprint now avoids most vegetation associated with this lane way. Reflecting this, a connectivity value class width of >5-30 m was entered into the BCC for the before development value and >5-30 m was entered into the BCC for the after development corridor width.

For the woody vegetation types, the before development overstorey condition was entered as PFC at Benchmark condition, and the after development overstorey condition was also entered as PFC at Benchmark condition. For the mid storey / ground cover condition, a PFC at <50%, was entered for both the before and after development values.

2.8.4 Area to Perimeter ratio

As the development is a site based development and not a linear shaped development or a multiple fragmentation development, the area to perimeter ratio for the project is not required to be assessed.

2.8.5 Patch size

The moderate to good vegetation at the site is connected to adjacent native vegetation (primarily to the north and west). The extent of this native vegetation is estimated at over 1,000 ha in total area. A patch size of 1,001 hectares has been entered into the BCC as 1,000 ha is the maximum value considered by the BCC.

2.8.6 Landscape Value Score

Entering the data documented above into the BCC returned a landscape value score of 14.20.

3 NATIVE VEGETATION

3.1 PLANT COMMUNITY TYPES

3.1.1 Vegetation communities

One distinct Plant Community Types (PCTs) was observed in the development site; *Rough-barked Apple – red gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions* (PCT281)

Cleared areas that were dominated by non-indigenous vegetation are not considered to provide habitat for native species and thus has not been included in the BCC calculations.

Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions (PCT281)

Within the project area, the Plant Community Type (PCT) 281 occurs as small patches of good condition woodland in the western and central parts of the site, and areas of low condition woodland across the majority of the central parts of the site. Low condition derived grasslands occur across the majority of the central and north-eastern parts of the site and mixed condition derived ephemeral wetland vegetation also occurs across the other parts of the north-eastern portion of the site (Figure 3-1). The low condition derived grasslands and mixed condition derived ephemeral wetland vegetation are also considered part of PCT 281 as they are derived from this woodland community, even though these areas are generally devoid of trees, and have a proportionately low percentage of native groundcover. These low condition areas represent highly degraded pasture, and it is considered likely that most of these areas have been cultivated and possibly cropped in the past. As such, they are not regarded as constituting the EEC based on these areas not meeting the NSW Biometric vegetation condition benchmarks.

The proposed solar farm will impact on 130.06 ha of this community; some of which is in moderate to good condition (18.88 ha); the remainder is in low condition (111.8 ha). Some (17.13 ha) of this vegetation is listed as an Endangered Ecological Community (EEC) under the TSC (*White Box Yellow Box Blakely's Red Gum Woodland; Box Gum Woodland)*; 0.99 ha of moderate to good condition EEC and 16.14 ha of low condition EEC that occurs within the development footprint. It is noted that the solar array panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.

Additionally, 4.43 ha of Critically Endangered Ecological Community (CEEC) listed under the EPBC Act (listed as *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland*) occurs west of the development footprint (equivalent to Zone 1). It would not be impacted by the development.

The dominant tree species in the community where it occurs within the development site consisted of the Rough-barked Apple (*Angophora floribunda*), although this species is mixed/co-dominant with Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum *(E. blakelyi*) in woodland patches immediately surrounding the site. This suggests the Yellow Box and Blakely's Red Gum have historically been selectively removed (for the timber/firewood) from the whole property, including the north-south laneways.

The understorey vegetation included a relatively sparse midstorey vegetation layer comprised primarily of younger/regrowth Rough-barked Apple, Yellow Box and Blakely's Red Gum, with very few native shrubs observed across the site. The groundcover vegetation characteristics included patches of native perennial

grasses, particularly across the western half of the site, whilst the majority of the eastern half of the site was dominated by exotic pastures.

Two threatened flora species were found to be present within the study area but located outside of the development impact footprint, these being the Pine Donkey Orchid (*Diuris tricolor*) and Silky Swainson-pea (*Swainsona sericea*). Both occur at the western end of the rail corridor. *Diuris tricolor* also occurs at two other locations at the far western end of the southern patch of the Zone 1 vegetation.

Table 3-1 Summary of the Rough-barked Apple – Red Gum – Yellow Box Woodland in the proposal area.

Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions		
Vegetation formation	Grassy woodlands	
Vegetation class	Western Slopes Grassy Woodlands	
Vegetation type	**Plant Community Type (PCT) ID**	281
	Biometric Vegetation Type ID	CW111
	Common Community Name	Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions
Approximate extent within proposal	This vegetation community occurs throughout the project area of which 147.93 ha is situated within the development impact footprint (of which 116.11 ha occurs as derived grassland in predominantly low condition).	
Condition	Predominantly Low Condition, with some small patches of Moderate to good Condition (in central and westerns parts of the site).	
Survey Effort	15 biometric plots were completed in total for PCT within the project area.	
Conservation Status	**This vegetation community is listed as an endangered ecological community (EEC) under the TSC Act and a critically endangered ecological community (CEEC) under the EPBC Act known as White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland.** Only 17.13 ha of the community within the development footprint meets the definitions of the TSC Act listed EEC. A total of 4.43 ha of CEEC occurs in the west of the development footprint (equivalent to Zone 1), and would not be impacted by the development.	
Estimate of percent cleared	75%	
Threatened plant species habitat	Within the disturbed remnant patches, this community provides habitat for threatened flora species, including, Ausfeld's Wattle (*Acacia ausfeldii*) Euphrasia arguta (*Euphrasia arguta*) Narrow Goodenia (*Goodenia macbarronii*) Prasophyllum sp. Wybong (*Prasophyllum sp. Wybong*) Silky Swainson-pea (*Swainsona sericea*).	
Fauna Habitat	This vegetation community provides numerous habitat types for fauna. Canopy trees provide foraging and nesting/resting for birds and arboreal fauna. The mid-storey (where present) provides foraging and nesting for smaller birds, as well as refuge for small-medium sized mammals and reptiles. Ground cover plants, logs and fallen leaves provide shelter and foraging	

Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	
	for terrestrial fauna as well. Where hollow-bearing trees are present, it may provide daytime resting habitat for bats and mammals, and roosting habitat for birds.
Example	 Figure 3-1 Example of moderate/good condition Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions in the project area.

Cleared areas (exotic dominated pasture)

A large portion of the site supports highly disturbed or modified vegetation, including areas of exotic dominated derived grassland that have been cleared of trees (Zone 4), as well as a large area of sown pastures in the western part of the site and are typically grazed on a (semi) regular basis (Figure 3-2 and Figure 3-3). The groundcover in this area is mainly exotic with common grazing species including (but not limited to) Barley Grass (**Hordeum leporinum*), Ryegrass species (**Lolium sp*), Brome species (**Bromus sp*), numerous Clover species (**Trifolium sp*), Paspalum (**Paspalum dilatatum*), Sheep Sorrel (**Acetosella vulgaris*), Delicate Hairgrass (**Aira elegantissima*), and numerous Fescue species (**Vulpia sp*). Numerous weed species are also present in these areas including (but not limited to) Capeweed (**Arctotheca calendula*), Smooth Catsear (**Hypochaeris glabra*), Flatweed (**Hypochaeris radicata*), and Stagger Weed (**Stachys arvensis*).

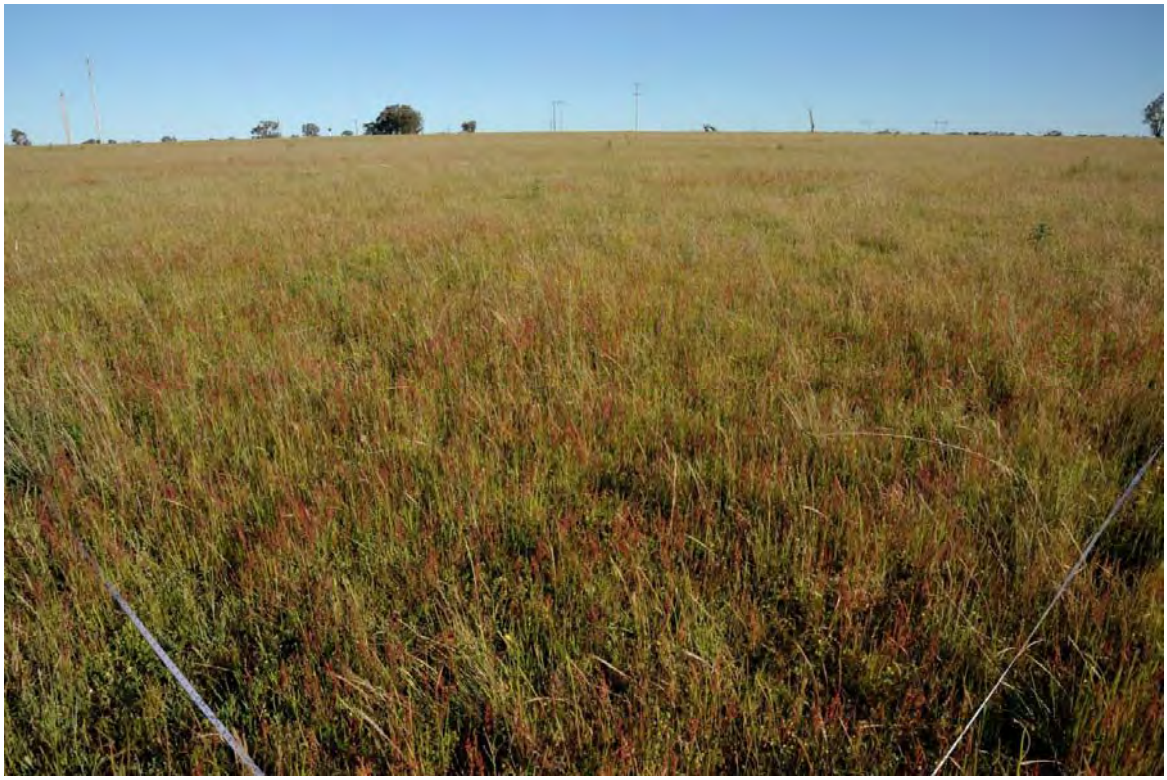

Figure 3-2 An example of exotic-dominated vegetation within the project area

3.1.2 Endangered Ecological Communities

White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as an EEC under the TSC Act and is listed as a CEEC under the EPBC Act (discussed further in Section 5).

The community occurs across the majority of the western half of the site, and includes areas of moderate to good and low condition woodland (identified as Zones 1, 2 and 3). These areas of the TSC-listed EEC are characterised by areas where the overstorey (treed) vegetation is at the benchmark cover value and with some native groundcover (rated as moderate/good condition), as well as areas where there is overstorey (treed) vegetation at or above 25% of the lower benchmark cover value but has groundcover vegetation dominated by exotics. A total of 17.13 ha of this EEC occurs within the development footprint. Zones 4 and 5 do not meet the criteria for the EEC or CEEC.

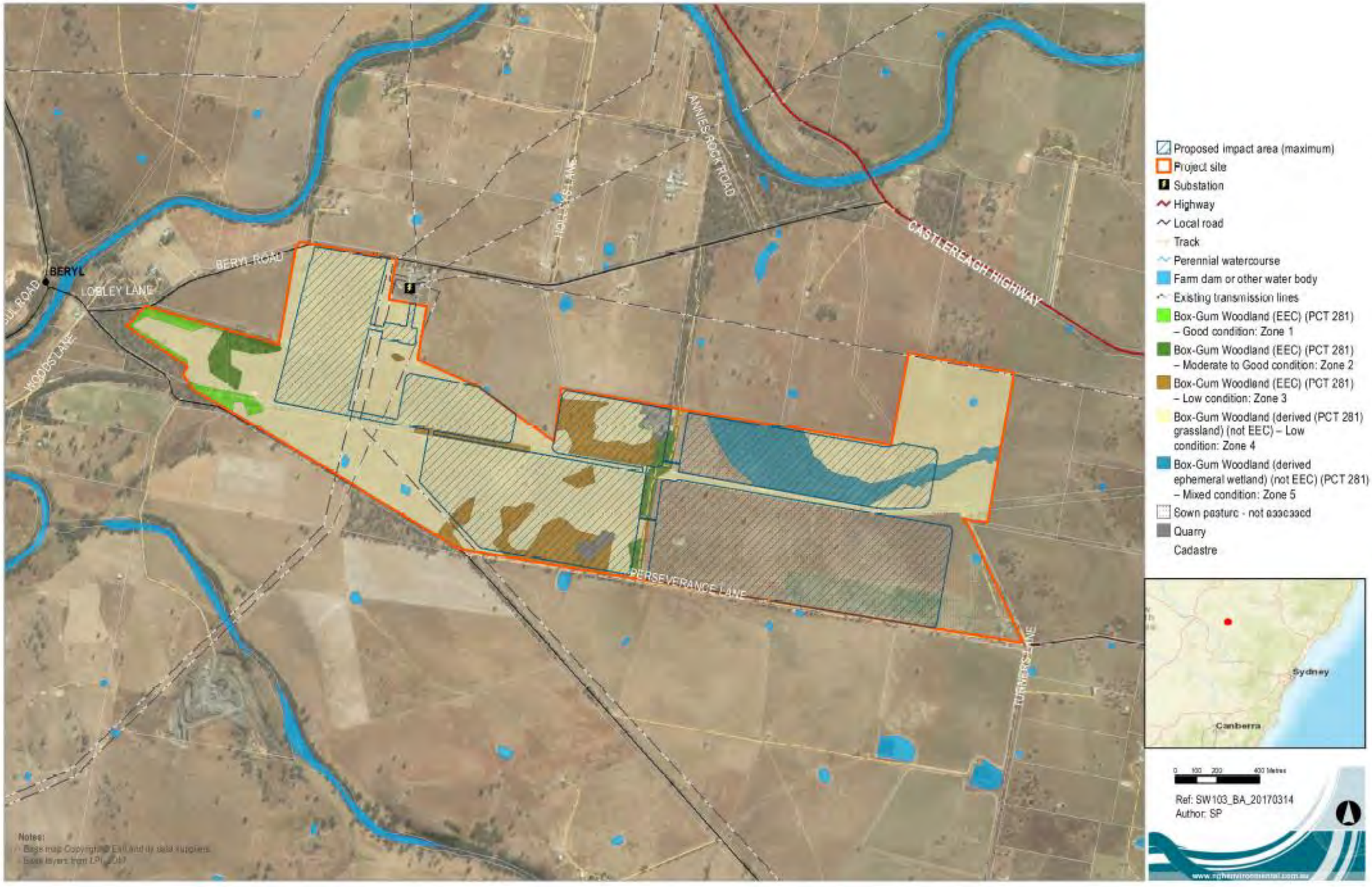

Figure 3-3 Vegetation Zones and PCTs within the project area

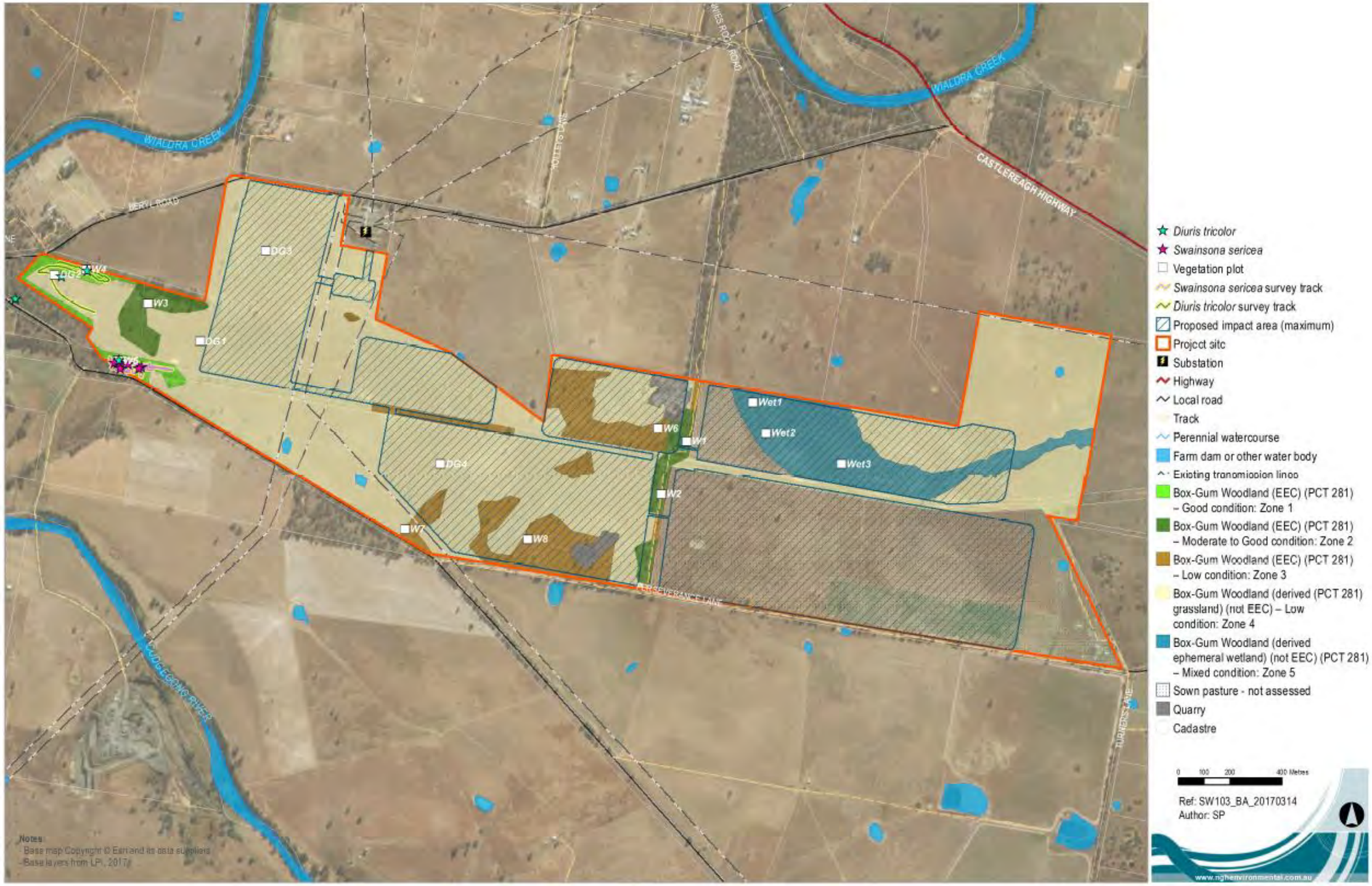

Figure 3-4 Plot and transect locations relative to Vegetation Zones, PCTs and Condition Class in the project area

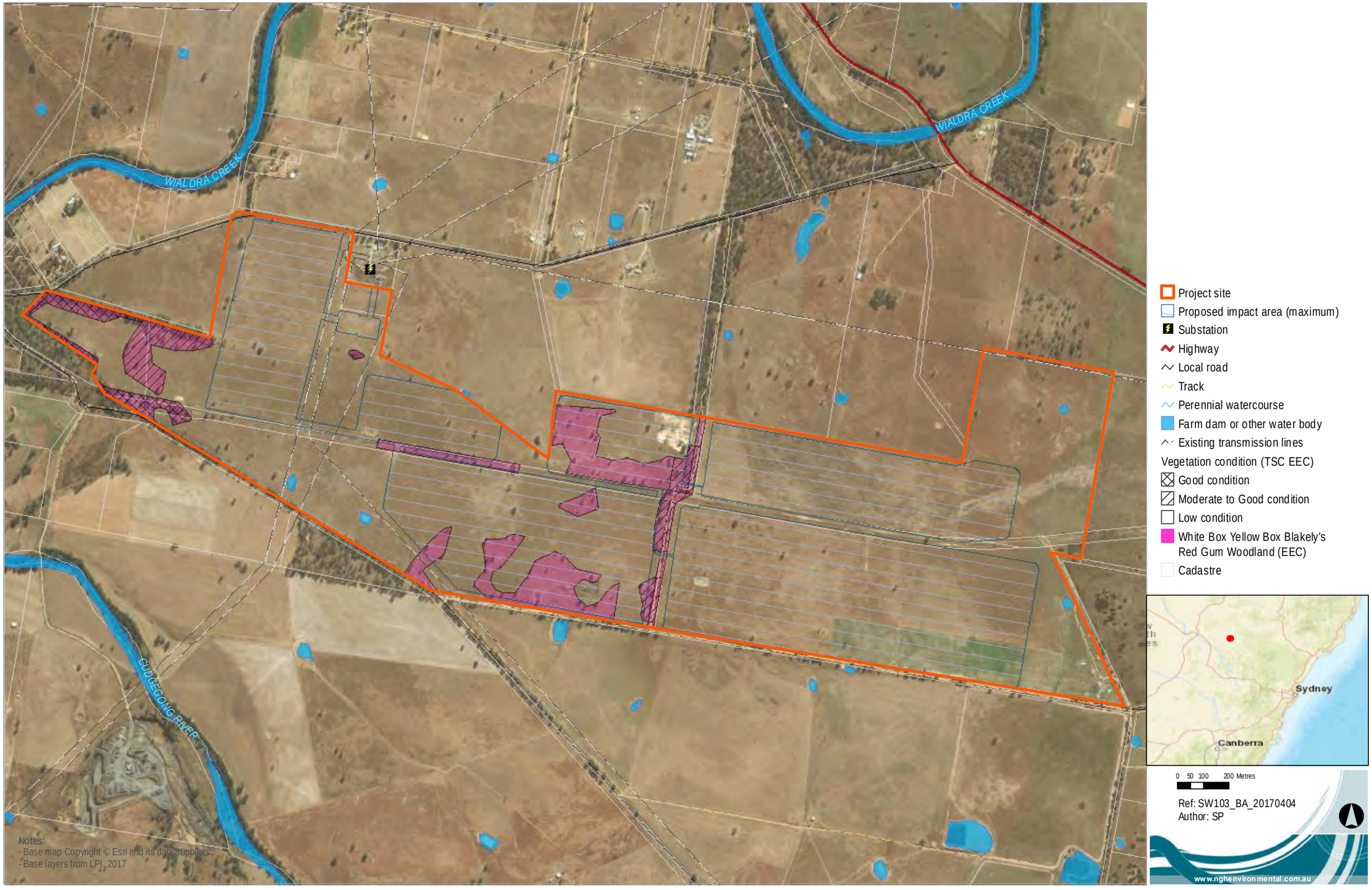

Figure 3-5 Map of NSW TSC Act EECs

3.1.3 Vegetation zones in the BCC

The vegetation zones that would be impacted by the proposal, as entered into the BCC, their condition class, number of biometric plots undertaken within them and their current site value score, as determined by the BCC, are as shown in Figure 3-3, and Figure 3-4, and described in the table below.

Table 3-2 Vegetation zones within the proposal.

Zone ID	Vegetation zones	Condition class	EEC status?	Area (ha) within development footprint	Survey effort (number of plots completed)	Site value score (current)
1	**PCT #281** **BVT #CW111** Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Moderate - good	Yes	0	2	66.67
2	**PCT #281** **BVT #CW111** Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Moderate - Good	Yes	0.99	3	67.33
3	**PCT #281** **BVT #CW111** Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Low	Yes	16.14	3	47.33
4	**PCT #281** **BVT #CW111** Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Low	No	95.04	3 (+2)	10.00
5	**PCT #281** **BVT #CW111** Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	Moderate - good	No	17.89	3	20.67

Notes:

- Threatened species subzones / management zones were entered equivalent to the vegetation zones. No additional polygons were mapped.
- Note, the development footprint now excludes Zone 1, hence the impact area has been reduced to zero.
- Vegetation Zone 4 has a site value score of <17 and will therefore not generate credits. Further, Zone 4 required five vegetation plots as although a low condition zone, it had to be entered into the BCC as a moderate to good condition zone (the BCC cannot accept two low condition zones for the same PCT). Three plots were conducted in this area as required for a low condition zone of its size. Given the large area of this zone, its relatively homogenous values, two "dummy" plots (DG5x and DG6x) were entered into BCC to meet the minimum required plot number for a moderate to good condition zone of its size. The dummy plots were a replication of the two highest value plots (DG1 and DG3, see table 3-3). This decision was discussed with OEH (Ziggy Andersons, OEH, pers. com. 14/02/17) and the use of dummy plots for this low condition area to meet the requirements of the BCC was seen as acceptable.

3.1.4 Site values (plot data entered into BCC)

The following plot data were collected in early November 2016 for the vegetation zones listed in Table 3-2. A total of 15 plots were completed across Zones 1 to 5 and were entered into the database, however as noted above, two dummy plots were created for vegetation Zone 4 to meet the minimum plot requirement of five plots under the BCC. The locations of each survey plot is shown in Figure 3-4.

Table 3-3 Plot data

Zone 1: PCT #281 – CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
W4	24	0	26	18	2	20	40	0	0.33	0	730526	6418108	55H
W5	46	6	0	34	2	14	24	0	1	12	730648	6417759	55H

Zone 2: PCT #281 – CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
W1	15	16.5	0	4	0	4	66	1	1	104	732836	6417451	55H
W2	30	36	16	6	0	0	62	2	1	10	732738	6417245	55H
W3	22	35	0	6	0	6	82	3	0	86	730763	6417978	55H

Zone 3: PCT #281 – CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
W6	9	7	0	6	0	4	90	0	0	6	732725	6417500	55H
W7	11	12	0	12	0	10	72	0	0.33	27	731751	6417110	55H
W8	18	16	0	36	0	0	28	0	1	0	732224	6417072	55H

Zone 4: PCT #281 – CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
DG1	8	0	0	34	0	0	64	0	0	0	730965	6417833	55H
DG3	8	0	0	24	0	0	74	0	0	0	731216	6418178	55H
DG4	5	0	0	4	0	4	92	0	0	0	731888	6417363	55H
DG5x	8	0	0	34	0	0	64	0	0	0	731380	6417760	55H
DG6x	8	0	0	24	0	0	74	0	0	0	731210	6148180	55H

Zone 5: PCT #281 – CW111 Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
Wet1	19	0	0	10	0	38	44	0	0	0	733089	6417599	55H
Wet2	17	0	0	22	0	30	46	0	0	0	733140	6417481	55H
Wet3	22	0	0	20	0	22	48	0	0	0	733429	6417363	55H

4 THREATENED SPECIES

4.1 GEOGRAPHIC/HABITAT FEATURES

Potential habitat for the Pink-tailed Legless Lizard was identified at the development site, within the area of Transect 2a which contained loose and partially embedded surface rocks. A large number of loose or partially embedded rocks were turned and inspected for presence of the species, although none were found. Additionally, the quality of the rocky habitat for the species was also considered to be low, with the loose surface rocks regarded as being generally too small for the species preferences. This area would now be avoided by the development footprint. As such, the proposal is regarded as not impacting on this habitat feature.

Other geographic/habitat features for species that were generated by the BCC (such as the Large-eared Pied Bat, Brush-tailed Rock Wallaby, and Booroolong Frog) were not present. Specifically, the site did not contain escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels, was not located within 1 km of rock outcrops or cliff-lines, and was not located within 100m of a stream or creek banks (that would support habitat for the Booroolong Frog).

4.2 ECOSYSTEM CREDIT SPECIES

The following species are all species predicted by the BCC to occur, based on the data entered for the landscape assessment and vegetation zones in the assessment. These constitute all species which will generate ecosystem credits in the credit calculations.

Table 4-1 Ecosystem credit species predicted to occur

Common name	Scientific name	TS offset multiplier
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis subsp. gularis*	1.3
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus subsp. victoriae*	2.0
Bush Stone-curlew	*Burhinus grallarius*	2.6
Diamond Firetail	*Stagonopleura guttata*	1.3
Flame Robin	*Petroica phoenicea*	1.3
Gang-gang Cockatoo	*Callocephalon fimbriatum*	2.0
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis subsp. temporalis*	1.3
Little Eagle	*Hieraaetus morphnoides*	1.4
Little Lorikeet	*Glossopsitta pusilla*	1.8
Little Pied Bat	*Chalinolobus picatus*	2.1
Little Whip Snake	*Suta flagellum*	2.3
Masked Owl	*Tyto novaehollandiae*	3.0

Common name	Scientific name	TS offset multiplier
Painted Honeyeater	*Grantiella picta*	1.3
Powerful Owl	*Ninox strenua*	3.0
Scarlet Robin	*Petroica boodang*	1.3
Speckled Warbler	*Chthonicola sagittata*	2.6
Spotted Harrier	*Circus assimilis*	1.4
Spotted-tailed Quoll	*Dasyurus maculatus*	2.6
Square-tailed Kite	*Lophoictinia isura*	1.4
Swift Parrot	*Lathamus discolor*	1.3
Turquoise Parrot	*Neophema pulchella*	1.8
Varied Sittella	*Daphoenositta chrysoptera*	1.3
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	2.2

4.3 SPECIES CREDIT SPECIES PRESENT

4.3.1 Candidate species

The following species were returned by the BCC as requiring survey. Table 4-3 summarises whether each species was detected during surveys and furthermore, if they are expected to be impacted by the proposal and therefore are required to be offset. Details regarding targeted surveys undertaken is provided further below.

Table 4-2 Threatened species requiring survey

Common name	Scientific name	Surveys	Present/presumed present	Affected by the proposal
Ausfeld's Wattle	*Acacia ausfeldii*	Not detected during targeted surveys	No	Unlikely – not recorded within the development site during targeted surveys
Brush-tailed Phascogale	*Phascogale tapoatafa*	Not detected during spotlighting.	No	Unlikely – not recorded within the site during surveys, and habitat regarded as unsuitable for the species.
Euphrasia arguta	*Euphrasia arguta*	Not detected during vegetation plot/transect surveys	No	Unlikely – site does not contain suitable habitat for this species
Narrow Goodenia	*Goodenia macbarronii*	In view of the above the Scientific Committee is of the opinion that *Goodenia macbarronii* Carolin is no longer eligible to be listed as a Vulnerable species in Part 1 of Schedule 2 of the Act. Proposed Gazettal date: 04/07/08. This species is not considered further.		
Koala	*Phascolarctos cinereus*	Not detected during spotlighting or during habitat tree surveys	No	Unlikely – not recorded within the site during surveys, and habitat generally unsuitable within the development envelope. More favourable habitat is located outside of the site, and no obvious movement corridor present.
Pine Donkey-orchid	*Diuris tricolor*	Detected during surveys but outside of development envelope	No	Unlikely - development site is located outside of area where species occurs
Prasophyllum sp. Wybong	*Prasophyllum sp. Wybong*	Not detected during targeted survey	No	Unlikely – not recorded in development site during targeted survey.
Regent Honeyeater	*Anthochaera phrygia*	Not detected during diurnal bird surveys	No	Unlikely – not recorded within the development envelope, and nearest record is 15 km from the site.
Silky Swainson-pea	*Swainsona sericea*	Detected during targeted surveys but outside of the development site	No	Unlikely - development site is located outside of area where species occurs
Squirrel Glider	*Petaurus norfolcensis*	Not detected during spotlighting.	No	Unlikely – site does not contain suitable habitat for this species

4.3.2 Targeted survey methodologies

The following section sets out the methodologies and results of targeted surveys undertaken that underpin the biodiversity assessment of the development site. This information is used in the BCC assessment and particularly, to support the decisions regarding candidate species that would be affected by the proposal.

Flora and fauna field surveys were undertaken from the 1st to the 4th of November 2016 to ensure that the majority of species likely to be occurring within the development site could be detected, and in accordance with the threatened species survey timing matrix produced by the BCC. This includes flowering times of threatened flora, and known activity periods of threatened fauna. The exception is Ausfelds Wattle which is required to be surveyed from August to October inclusive, and the Prasophyllum which is to be surveyed in October only. The suitability of the surveys for these species is discussed further below.

Aims

The aims of the site surveys were as follows:

1. Determine vegetation communities present within the project area, their condition and extent.
2. Identify potential EECs within the project area and determine their condition and extent.
3. Conduct targeted searches for threatened flora and fauna species predicted to occur in the project area.
4. Assess the availability and extent of flora and fauna habitat, particularly threatened species habitat, such as hollow-bearing trees.

Random meander and targeted searches for threatened flora species

Targeted searches were conducted in parts of the study area considered potentially suitable for the targeted species. These were patches of remnant woodland with areas of ground cover containing a representation of native flora. The majority of the study area, comprising improved pasture and intensively grazed pastures in low condition, was not targeted. The searches were conducted by systematically traversing the area with linear transects approximately 10 m apart.

Fauna habitat assessment

An assessment of habitat types available and their quality and suitability as threatened species habitat was conducted across the project area. Factors such as arboreal resources, ground-layer resources, vegetation structure/types, as well as connectivity and disturbance were noted. All trees within the project area were inspected for hollows and general habitat values, including signs of use by fauna such as the presence of scratches/scats. An opportunistic record of fauna species observed during the fauna assessments was also taken.

Targeted fauna surveys

Sites for more detailed fauna survey were selected to cover the patches of remnant native vegetation that had potential to provide threatened species habitat. The western half of the property which supports predominantly cleared sown pasture was surveyed opportunistically for fauna. A detailed summary of the specific survey methods employed, including survey effort is provided below. The location of the fauna survey transects is provided in Figure 4-2.

VERTEBRATE FAUNA SURVEY METHODS

Brush-tailed Phascogale

This species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter, but may also inhabit heath, swamps, rainforest and wet sclerophyll forest. It appears to preferentially forage in rough barked trees of 25 cm DBH or greater.

Nocturnal spotlighting surveys were carried out on foot at survey transects 1 and 2 and survey site 3 (a & b) with two spotlights, including one 50W and one 100W. The site location, date and timing/duration of the spotlighting is defined in Table 4-4, and included a total of 2.5 hours of spotlighting within the treed areas of the site, as briefly summarised below:

- **Transect 1 (a & b):** 1/11/2016; 2100 – 2200 hrs. Clear cold evening. Both the north and south sections of the TSR laneway were surveyed.
- **Transect 2 (a & b):** 2/11/2016; 2100 – 2200 hrs EDST. Clear cold evening. One spotlight moving through transects around the edge of the property beginning in the rail corridor (Transect 2b) and ending on the rocky knoll (south of Transect Site 2a).
- **Survey Site 3 (a & b):** 2/11/2016; 2030 – 2100 hrs EDST Clear cold evening. One spotlight slowly moving across the property Commenced at Site 3b Paddock trees:, including Site 3a.

This level of survey effort is generally in keeping with the NSW *Threatened Species Survey and Assessment Guidelines* (DEC, 2004) which requires 2 x 1 hour of spotlighting up to 200 hectares of stratification unit on two separate nights. The woodland (treed parts of the site) comprise about 32 ha, and were subject to more than 2 hours of spotlighting over two nights.

The locations of the survey transects and survey sites above are the same as those described in Table 4-3 (for the avifaunal surveys) and shown in Figure 4-2.

Koala

The dominant overstorey species in the woodland areas within the proposed development site included the Blakely's Red Gum, Yellow Box and Rough-barked Apple. None of these species are listed as feed tree species under Schedule 2 of State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection, however the Blakely's Red Gum and Yellow Box are identified as secondary food tree species in the Central West Koala Management Area (KMA) on the NSW Government (OEH) website.

During the fauna habitat assessment, described above and which included an inspection of all trees within the development envelope, included an inspection of trees for signs of fauna use, including the presence of scratch marks or scats on or at the base of trees. No signs of use by koalas was observed. Additionally, the 2.5 hours of nocturnal spotlighting surveys described above for the Brush-tailed Phascogale, similarly did not observe any koalas.

Pink-tailed Legless Lizard

This species is known to inhabit areas of rocky outcrops or scattered partly buried rock, with a preference for scattered and partly embedded surface rocks of about 0.15 m to 0.6 m (approximate of irregular diameter) in size. During the site habitat assessment, a small area of approximately 2 ha of scattered surface rocks was noted in the eastern portion of the site, near survey transect 2a. Active searches for the species was undertaken by turning over these rocks (where possible, based on overall size and degree of embeddedness), and inspecting them for signs of the species, including either directly observing individuals, or skin sloughs left behind by individuals. Approximately 50 rocks were turned over for this inspection (which represents about the total number of potentially suitable rocks able to be effectively turned over within the area).

Regent Honeyeater

In relation to avifauna, only the Regent Honeyeater required targeted surveys. During the survey investigations, diurnal bird surveys (comprising primarily 30 minute surveys) were undertaken across the fauna survey transects described in Table 4-3, for a combined total of 4 hours of timed surveys across the four survey transects (1a, 1b, 2a and 2b). In addition to this, 2 x 15 minute avifaunal surveys (on the morning and evening of 2/11/2016) were conducted within identified clumps of trees at survey site 3a, involving a general meander through this area (as shown in Figure 4-2), and an additional 105 minute survey and 60 minute survey was conducted across/throughout the area identified as survey site 3b on the mornings of 3/11/2016 and 4/11/2016 respectively. These avifaunal surveys gave a total survey effort of 7.25 hours.

The surveys were conducted at both dawn and dusk when the Regent Honeyeater is most active. The survey locations were selected to cover available/potential Regent Honeyeater habitat within the project area, which was restricted to woodland patches as well as isolated trees in paddocks (Figure 4-2). In addition to this, opportunistic records of bird species observed during fauna assessments, vegetation surveys and hollow-bearing tree assessments were recorded, and a total species list compiled.

These bird surveys were used to identify the presence of threatened species predicted to occur in the project area and the threatened species requiring survey through the BCC.

Squirrel Glider

The survey methods for this species included the nocturnal spotlighting surveys as described above for the Brush-tailed Phascogale, which included a total of 2.5 hours of nocturnal surveys over 2 nights. This level of survey effort is generally in keeping with the NSW *Threatened Species Survey and Assessment Guidelines* (DEC, 2004) which requires 2 x 1 hour of spotlighting up to 200 hectares of stratification unit on two separate nights. The woodland (treed parts of the site) comprise about 32 ha, and were subject to more than 2 hours of spotlighting over two nights. The locations of the survey transects and survey sites above are the same as those described in Table 4-3 (for the avifaunal surveys) and shown in Figure 4-2.

Table 4-3 Avifauna survey transect details

Transect/Survey Site No.	Date/Time/Duration	Direction	Transect starting location (AMG 55H)
T1(a)	1/11/2016 2 x half-hour surveys 1 x morning and 1 x evening	North	732827 E 6417409 N
T1 (b)	1/11/2016 2 x half-hour surveys 1 x morning and 1 x evening	South	732746 E 6417396 N
T2 (a)	2/11/2016 2 x half-hour surveys 1 x morning and 1 x evening	West	730908 E 6417991 N
T2 (b)	2/11/2016 2 x half-hour surveys 1 x morning and 1 x evening	East	730611 E 6417773 N
S3 (a)	2/11/2016 2 x 15 minute timed surveys 1 x morning and 1 x evening No transect established – observations were made from within the identified clump of trees	N/A	731543 E 6417913 N
S3 (b)	3/11/2016 0715-0900 hrs 4/11/2016 0700-0800 hrs	N/A	N/A – transect not established at this site; general meanders were undertaken as described below. 3/11/16 - From western end of rail corridor, east along embankment then north through paddock with sand mine 4/11/16 - South of rail corridor, west of TSR laneway –

OPPORTUNISTIC RECORDS

An opportunistic record of fauna species observed during the fauna assessments was also taken. A list of all species recorded at the site, including flora and fauna species recorded by either targeted or opportunistic surveys is included at Appendix C.

Weather conditions during the field surveys

Table 4-4 Weather conditions during the field surveys, recorded at Gulgong (courtesy Bureau of Meteorology).

Date	Temperature min (°C)	Temperature max (°C)	Rain (mm)	Max wind speed (km/h)
01/11/16	4.0	21.1	0	Calm
02/11/16	6.2	22.4	0	13
03/11/16	6.6	25.2	0	9
04/11/16	7.5	26.6	0	9

4.3.3 Previous surveys conducted in the local area

It is unclear whether dedicated biodiversity surveys have been previously undertaken within the locality, however evidence from the Atlas of Living Australia indicates that occasional opportunistic surveys are undertaken and the results provided to the relevant government agencies. None of the candidate species have been previously recorded within the development envelope.

4.3.4 Targeted survey results

Three threatened species listed under the NSW TSC Act were detected during the survey (Figure 4-1), including:

- Dusky Woodswallow *Artamus cyanopterus cyanopterus* – Vulnerable (TSC Act)
- Silky Swainson-pea *Swainsona sericea* – Vulnerable (TSC Act)
- Pine Donkey Orchid *Diuris tricolor* – Vulnerable (TSC Act)

The Silky Swainson-pea and Pine Donkey Orchid are species credit species, whilst the Dusky Woodswallow is neither an ecosystem or species credit species.

The results of targeted surveys for the other candidate species requiring survey are detailed below along with a discussion regarding habitat suitability, likely presence and potential impacts.

Ausfeld's Wattle

This species was not detected at the site during the flora surveys at the site, which were conducted at the end of the recommended survey period. This species is a conspicuous medium sized shrub or small tree to 2-4 m in height that grows in eucalypt woodland in sandy soil often in remnant roadside patches. This species can be distinguished on the basis of its foliage, although the differences between it and *A. verniciflua* are small (Tame 1992). Using foliage characters means that survey effectively could happen at any time of the year. As such, there is a high level of confidence that had it been present, it would have been detected during the flora surveys. This assessment is therefore confidence that *A. ausfeldii* is absent from the site.

Euphrasia arguta

This species was not detected during the targeted flora surveys at the site. The species is only currently known from a few montane sites near Nundle and historic records suggest it prefers alluvial soils in river valleys, of which there is none present at the site. The species is considered unlikely to occur at the.

Narrow Goodenia

This species was not detected during the targeted flora surveys at the site. The NSW Scientific Committee made a Final Determination to remove the species from the Schedules of the TSC Act.

Prasophyllum sp. Wybong

This species is recognised at the Commonwealth level as being synonymous with *Prasophyllum petilum.* The species was not detected during the targeted flora surveys at the site. Whilst the field surveys were conducted just after the recommended survey period, the field botanist did observe *Prasophyllum petilum* in Ilford Cemetery on 21 October 2016, and noted '*Five inflorescences in full bloom – many others still in bud*.' This indicated that flowering at Ilford would have gone well into November, as peak flowering had not arrived by 21 October. Given this, the survey timing at Beryl (of 1-4 November) was regarded as suitable for this species in 2016, noting that although flowering times for both sites are likely to be similar, Beryl (424 m) is at a much lower altitude than Ilford (816 m at the cemetery). This would likely result in a slight difference to the flowering times by about a week, with Beryl likely to flower a bit earlier. Even so, it is believed that there would still have been open flowers at Beryl at the time of the survey.

This species is very sensitive to grazing, therefore being unlikely to survive on regularly managed farmland. It typically only survives in ungrazed areas (such as cemeteries) or lightly grazed areas (some Travelling Stock Reserves and Routes). It is considered highly unlikely to be present at the site.

Pine Donkey Orchid

This species was detected during the targeted flora surveys at the site, with a total of two plants recorded within the good condition woodland (Zone 1) in the far western portion of the project site, but outside of the development footprint, and a further two plants found in woodland just outside of the proposal site but within the leased area of land. The remaining parts of the site are considered generally unsuitable for this species and targeted surveys did not detect it in these areas. The recorded location of the species is outside of the proposed development footprint and measures have been recommended in Section 6 to protect individuals at this location. As such, the species has not been entered into the BCC as being impacted by the development.

Silky Swainson-pea

This species was detected during the targeted flora surveys at the site, with a total of 38 plants recorded within the good condition woodland (Zone 1) in the far western portion of the site. The other parts of the site are considered generally unsuitable for this species and targeted surveys did not detect it in these areas. The recorded location of the species is outside of the proposed development footprint and measures have been recommended in Section 6 to protect individuals at this location. As such, the species has not been entered into the BCC as being impacted by the development.

Brush-tailed Phascogale

No Brush-tailed Phascogales or signs of Brush-tailed Phascogales were detected during the survey. The species also has not been previously recorded within 20km of the site. This species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter, as well as heath, swamps, rainforest and wet sclerophyll forest. It typically nests and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span. The site is considered to provide only marginal habitat for the species, being an open woodland rather than dry sclerophyll forest habitat, with existing trees considered to be too sparse across the property. Given this and the lack of previous records nearby, it is considered unlikely that the species would be present at the site.

Koala

No Koalas or signs of Koalas were detected during the survey despite extensive searches for signs of koalas (i.e. scratches/scats on or at base of trees). Koalas have been previously recorded only occasionally in the locality, with two records approximately 9 and 15 km to the east of the site. The areas of moderate to good condition woodland support secondary Koala food tree species for the Central West region (OEH), however, they do not support the particular tree species listed in Schedule 2 of the Koala SEPP. As such, the site is not considered to support either 'Core' or 'Potential' Koala habitat under the Koala SEPP. Furthermore, the Mid Western Regional Council LGA is not listed under Schedule 1 of SEPP 44 (for LGA's within which the SEPP applies).

Given the lack of observations of signs of Koalas despite extensive searches, it is considered unlikely that the site would support a resident population of Koalas, although the occasional presence of a Koala at the site cannot be completely discounted. Given the retention of treed corridors across the south of the site, as well as the presence of treed corridors along Wialdra Creek and Cudgegong River to the west, north and south of the site, broader connectivity and movement potential for Koalas would not be lost as a consequence of the development.

Given the above factors, the proposal is not regarded as being likely to impact on Koalas.

Pink-tailed Legless Lizard

This species was not detected during targeted surveys at the site. A small area of scattered surface rocks was noted in the eastern portion of the site, which was considered to be of marginal suitability for the species based on the overall small size of loose surface rocks, as well as the high degree of embeddedness of larger rocks. Despite active searches for the species by turning rocks, as described previously, the species was not located at the site. The species has not been previously recorded within 20 km of the site. Based on the lack of detection during survey, the low suitability of habitat and lack of previous records, it considered unlikely that the species would be present at the site.

Regent Honeyeater

This species was not detected during the targeted avifauna surveys at the site. The avifauna surveys included a combined 8.5 hours of timed (0.5 hr) diurnal (morning and evening) surveys across two days, as well as a 1.75 hr morning survey and 1 hr evening survey on the third survey day. The surveys were conducted within the recommended seasons for this species in the BCC.

This species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak, particularly, woodlands that have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The species is patchily distributed in NSW with only three known breeding sites remaining, none of which occur near the project area.

The site is generally regarded as providing unsuitable for the species, with low canopy cover and no mistletoes. The species has been previously recorded approximately 15km east of the site in more dense woodland and forest areas. The species is considered more likely to move along corridors and prioritise the larger patches.

Given the above, the species is regarded as being unlikely to be present at the site on a regular basis, and is therefore considered unlikely to be impacted by the proposal.

Squirrel Glider

This species was not detected during the fauna surveys at the site. The fauna surveys included a combined 2.5 hours of nocturnal spotlighting over two evenings within woodland areas. This species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range, and typically prefers mixed species stands with a shrub or Acacia midstorey, which are absent from the development site. The species also requires abundant tree hollows for refuge and nest sites. These resources are limited within the development site to scattered paddock trees. Nearest records of the species include a collection of about 10 records in forests near Bungaba, more than 25km to the northeast of the site. This species is therefore considered unlikely to be present at the site and would not be impacted by the proposal.

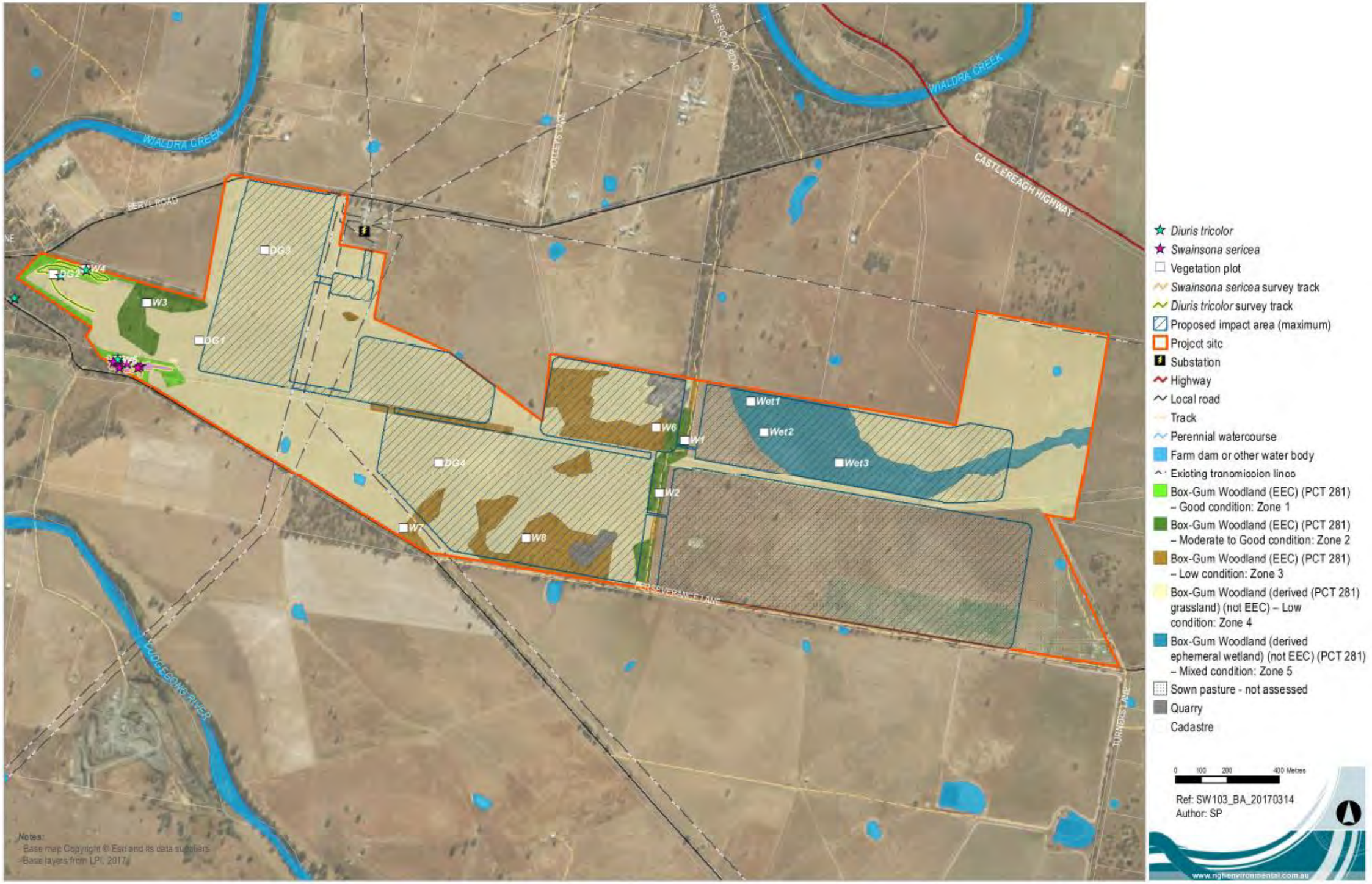

Figure 4-1 Flora survey locations and recorded threatened flora species.

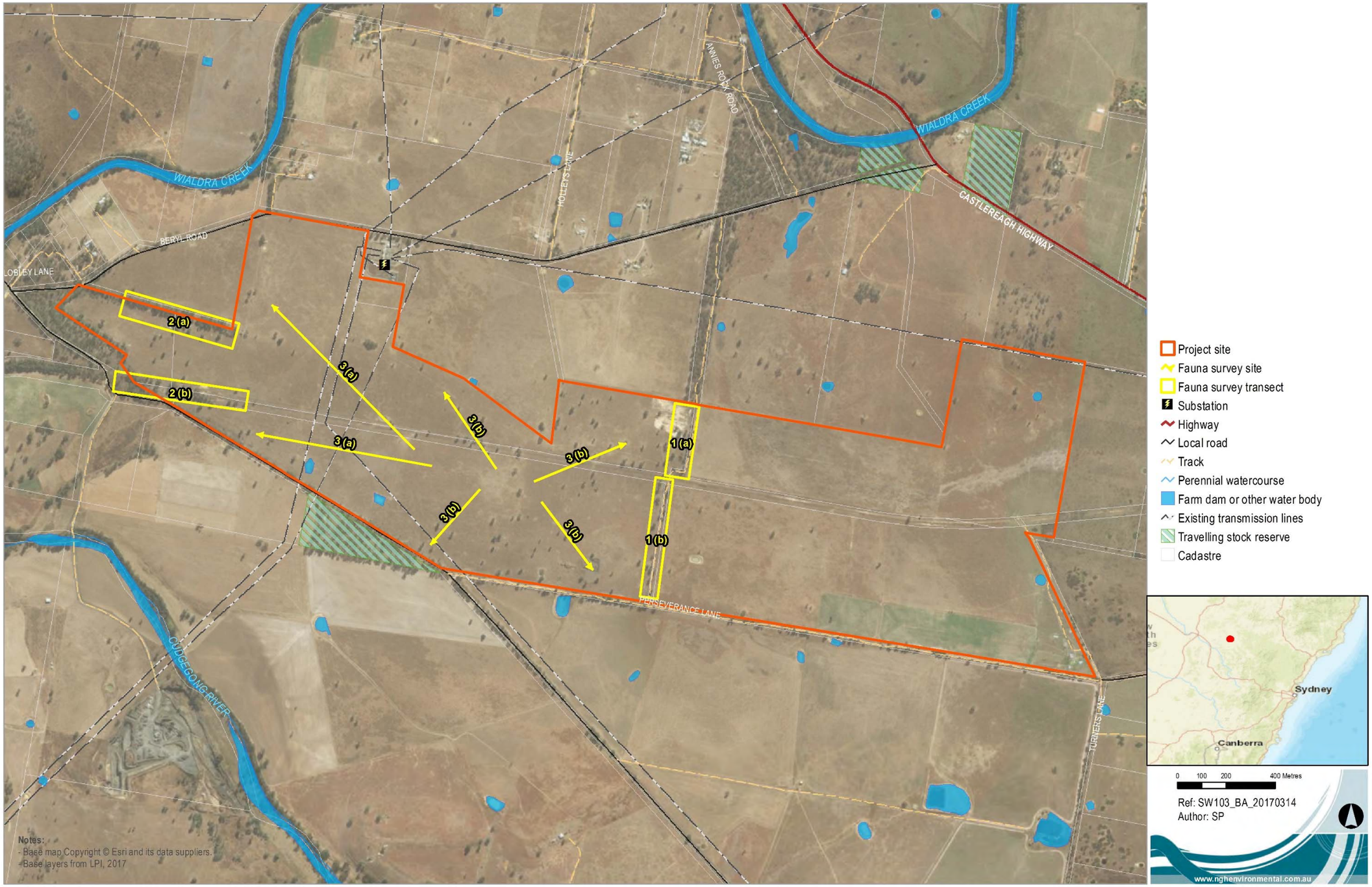

Figure 4-2 Fauna survey effort

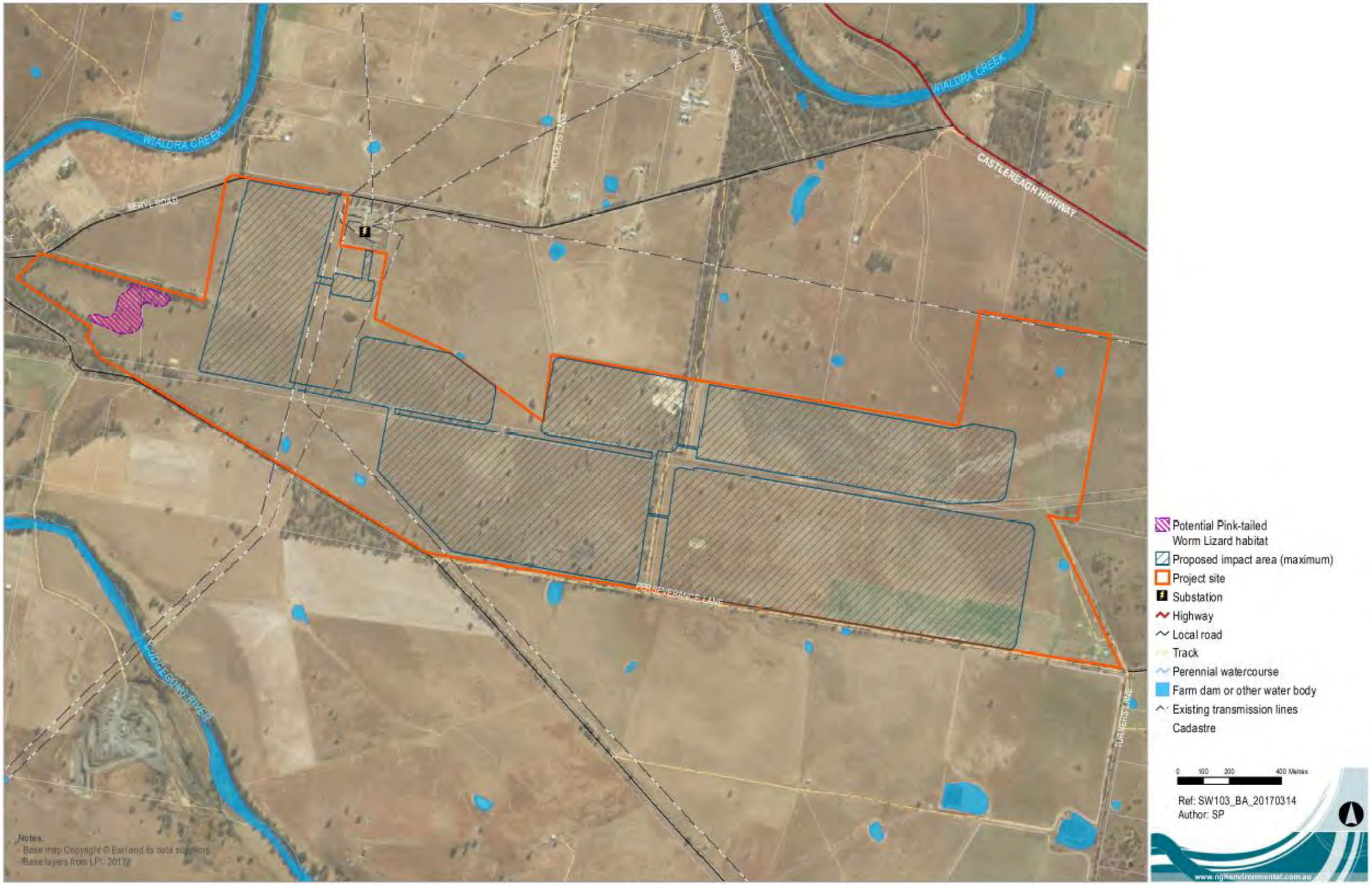

Figure 4-3 Fauna geographic / habitat features within the site.

4.4 SUMMARY OF SPECIES CREDIT SPECIES

In summary, applying the above information to the BCC assessment. The following data (Table 4-5) were entered into the BCC.

Table 4-5 Summary of Species Credit Species assessed in the BCC.

Common name	Scientific name	Impacted by development?	ID method	Loss (ha)	Survey date
Ausfeld's Wattle	*Acacia ausfeldii*	No	Survey	0.00	1/11/2016
Brush-tailed Phascogale	*Phascogale tapoatafa*	No	Survey	0.00	1/11/2016
Euphrasia arguta	*Euphrasia arguta*	No	Survey	0.00	1/11/2016
Koala	*Phascolarctos cinereus*	No	Survey	0.00	1/11/2016
Narrow Goodenia	*Goodenia macbarronii*	No	Survey	0.00	1/11/2016
Pine Donkey Orchid	*Diuris tricolor*	No	Survey	0.00	1/11/2016
Prasophyllum sp. Wybong	*Prasophyllum sp. Wybong*	No	Survey	0.00	1/11/2016
Regent Honeyeater	*Anthochaera phrygia*	No	Survey	0.00	1/11/2016
Silky Swainson-pea	*Swainsona sericea*	No	Survey	0.00	1/11/2016
Squirrel Glider	*Petaurus norfolcensis*	No	Survey	0.00	1/11/2016

5 EPBC MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 10 January 2016 (10km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site. Relevant to biodiversity matters these include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

The potential for these MNES to occur at the site are discussed below. A copy of the search results in attached at Appendix D.

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Four wetlands of international importance were returned from the protected matters report. The nearest of these (approximately 250 km from the development site) is the Macquarie Marshes. All other wetlands returned from the search are over 500km away. There is no apparent connectivity between the development site and the Macquarie Marshes.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Four threatened ecological communities were returned from the protected matters report. One of these, the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC occurs within the development site. Based on the EPBC listing criteria, 4.43 ha of the CEEC occurs west of the development footprint (equivalent to Zone 1). It would not be impacted by the development (Figure 6-1). A referral to the Commonwealth is therefore not considered to be warranted in relation to a potential impact on the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland EEC.

The other three EEC's are not present within or near the proposal site.

5.3 THREATENED SPECIES

Twenty-nine threatened species were returned from the protected matters report. None of the listed species are considered to have the potential to utilise the habitats at the development site, based on either or both an assessment of the habitat conditions present at the site, or a lack of existing records in the database within close proximity (i.e. less than 15 km) to the site. A referral to the Commonwealth is therefore not considered to be warranted in relation to threatened species.

5.4 MIGRATORY SPECIES

Eight listed migratory species were returned from the protected matters report. None of these species are considered likely to occur at the site on a regular basis or rely on the habitats present. A referral to the Commonwealth is therefore not considered to be warranted in relation to migratory species.

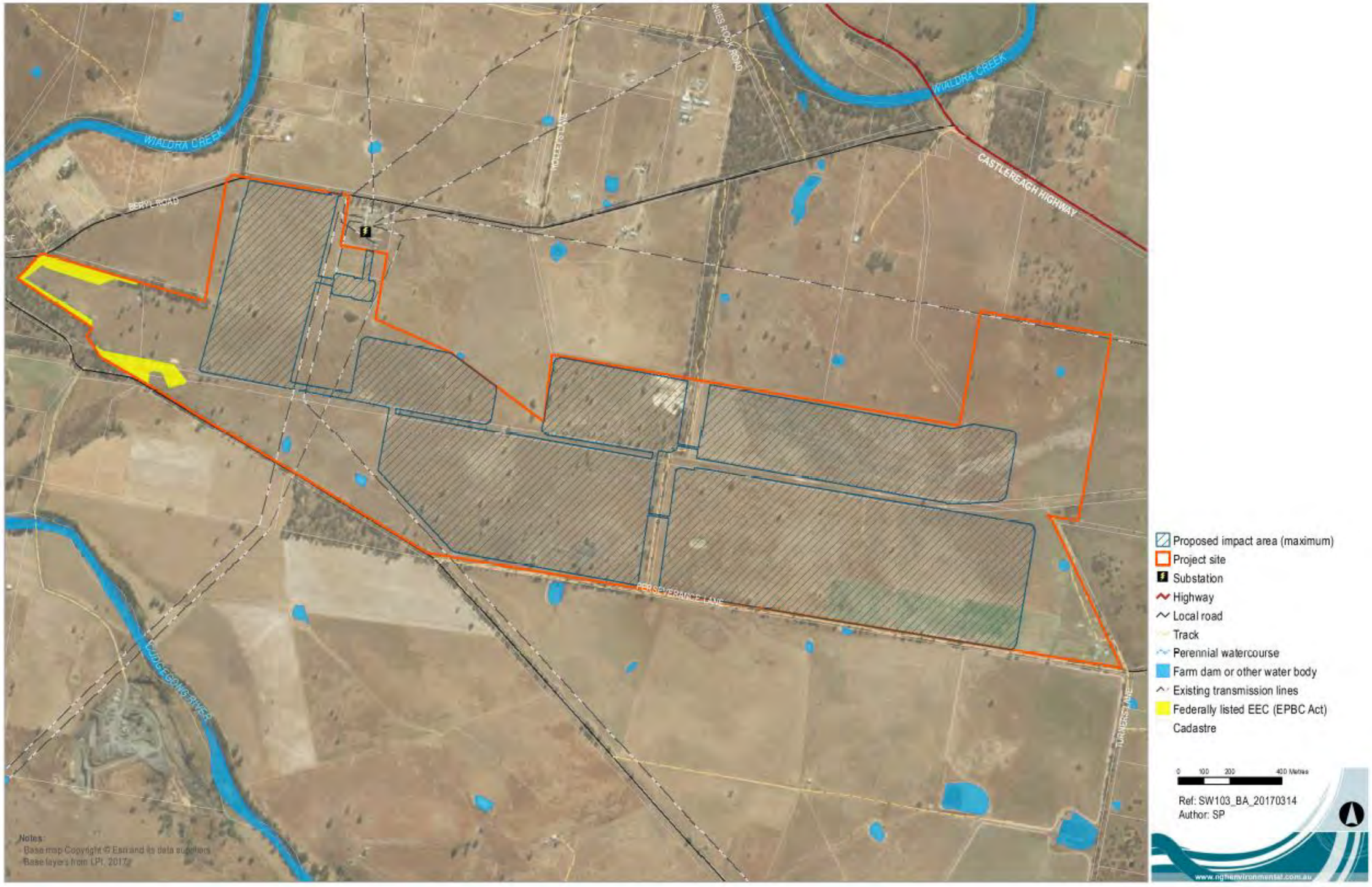

Figure 5-1 Mapped location of EPBC-listed Box Gum Woodland (CEEC)

6 AVOID AND MINIMISE IMPACTS

6.1 DIRECT IMPACTS

6.1.1 Site selection and planning phase

A preliminary constraints analysis was conducted by NGH Environmental (2016) which informed the site layout design. This analysis included identification of low, moderate and high environmental constraints, as summarised below. From this assessment, a development footprint was established which was designed to minimise impacts on the Zone 1 EEC/CEEC vegetation in the far-west of the project site, including avoidance of the small woodland patches in the west of the site which have the potential to support listed threatened species such as the Silky Swainson-pea and Pine Donkey Orchid.

After the first calculation of offset requirements, the layout was further scrutinised in terms of 'credit drivers'. The layout was further adapted:

- To remove all impacts on Zone 1 EEC/CEEC vegetation
- To reduce impacts on Zone 2 and 3 EEC, where they occur near the north-south laneway in the centre of the site. A 30m buffer either side of the fenced lane way was mapped and the development footprint excluded from this buffer.

The final design footprint is detailed in Figure 6-1. It allows for areas of better quality vegetation at the western corner of the project site (as well areas along the south-western boundary) to be avoided. These have been highlighted as potential offset / revegetation sites. They would contribute to local landscape connectivity.

6.1.2 Construction phase

The construction phase of the proposal has the potential to impact a number of biodiversity values of the site through habitat clearance and modification of habitat, refer to Table 6-1 below.

Table 6-1 Potential impacts to biodiversity during the construction phase

Impact	Frequency	Intensity	Duration	Consequence
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, compound sites, stockpile sites, access tracks)	Regular/ Permanent	High	Construction phase	• Direct loss of native flora and fauna habitat. • Potential clearing of habitat outside of the development footprint. • Introduction and spread of noxious weeds and pathogens. • Injury and mortality to fauna during clearing of fauna habitat. • Disturbance to fallen timber, dead wood and bush rock.

A range of mitigation measures will be implemented to ensure that impacts on biodiversity during the construction phase are avoided where possible, and minimised where they cannot be avoided. The mitigation measures that would be employed during the construction phase are provided below.

Mitigation measures have considered methods of clearing, clearing operations, timing of construction and other measures that would minimise impacts of the project on biodiversity values.

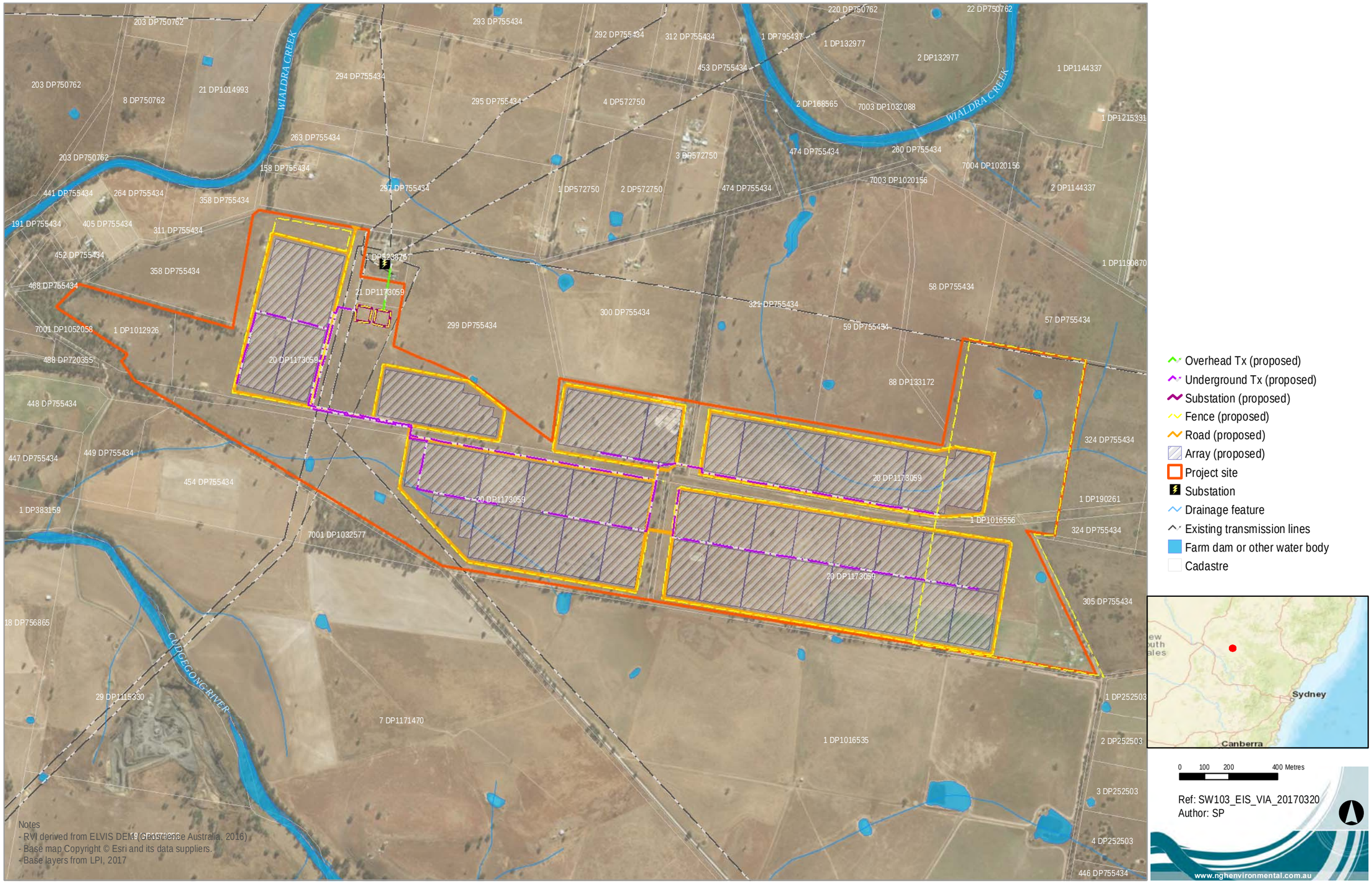

Figure 6-1 Final proposed development and operational footprint

Table 6-2 Measures proposed to avoid and minimise direct impacts of the project during the construction phase

Impact	Consequence	Measures to be implemented	Timing	Outcome
Removal or degradation of threatened and/or migratory species habitat	• Impacts to hollow dependant fauna	• Clearing of Hollow-bearing trees within the development site avoided between June and January, to avoid the breeding season of hollow-dependant fauna including the Superb Parrot as well as the Large-eared Pit Bat and Corben's Long-eared Bat, which whilst considered unlikely to occur within the site, nevertheless may have some small potential as occurring within the site from time to time. The nominated clearing period above will also help to avoid the core hibernation period for the two bat species. • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur.	Construction phase	Impacts to threatened hollow dependent species are minimised.
	• Direct loss of native flora and fauna habitat • Injury and mortality to fauna during clearing of fauna habitat. • Disturbance to fallen timber, dead wood and bush rock • Introduction and spread of noxious weeds and pathogens	• Preparation of a Flora and Fauna Management Plan (FFMP) that would incorporate protocols for: o Protection of native vegetation to be retained (including EEC) o Best practice removal and disposal of vegetation o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. Where possible, fallen timber with hollows is to be collected and placed into adjacent suitable habitats outside the development footprint. o The relocation of displaced fauna during clearing o Weed management, particularly noxious weeds o Pathogen management o Unexpected threatened species finds o Rehabilitation/stabilisation of disturbed areas	Pre-construction phase Construction phase	Minimise the impacts of habitat removal on native flora and fauna. Prevent spread of Noxious Weeds and pathogens.

Impact	Consequence	Measures to be implemented	Timing	Outcome
		• The FFMP would form part of the Beryl Solar Farm Construction Environmental Management Plan (CEMP).		
• **Habitat clearance**	• Potential over clearing and/or damage of habitat outside of the development site.	• Stockpiling materials and equipment and parking vehicles will be avoided within the dripline (extent of foliage cover) of any native tree that originates from outside of the development site. • Prior to the commencement of work, a physical vegetation clearing boundary at the approved clearing limit is to be clearly demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.	Construction phase	Prevention of over-clearing

6.1.3 Operational phase

The operational phase of the project has potential to result in direct impact to biodiversity values. Direct impacts are as follows:

Table 6-3 Operational impacts on biodiversity values

Impact	Frequency	Intensity	Duration	Consequence
Existence of permanent solar infrastructure	Constant	Moderate	Operational phase	• Collision risk to birds and microbats to exterior barbed-wire fencing.
Shading by solar array infrastructure	Variable throughout the day and season	Moderate	Operational phase	• Potential to modify the growing characteristics of the existing ground cover through reduced sunlight exposure and evapotranspiration rates. As a worst case, areas of bare ground may develop and lead to erosion and sedimentation requiring additional planting or other control measures.

Measures to avoid and minimise impacts that may occur during the operational phase would be implemented as part of the project. Where practical, measures to avoid impacts on biodiversity during operation have been identified. Where impacts are unavoidable measures to minimise impacts would be implemented. Table 6-4 outlines the mitigation measures that would be implemented during operation, or to ensure the operational phase avoids and minimises impacts on biodiversity to the greatest extent possible.

Section 7 outlines the requirements for biodiversity offsets for those direct impacts that cannot be avoided as a result of the project.

Table 6-4 Measures proposed to avoid and minimise direct impacts of the project during the operational phase

Impact	Consequence	Measures to be implemented	Timing	Outcome	Responsibility
Existence of permanent solar infrastructure	• Collision risks to birds and microbats on solar infrastructure and barbed wire fencing	• Use non barbed-wire on exterior fencing where possible.	Operational phase	Minimise impacts to fauna and flora as a result of infrastructure.	Solar Farm Operator
Shading by solar array infrastructure	• Potential to modify the growing characteristics of the existing ground cover through reduced sunlight exposure and evapotranspiration rates.	• A groundcover management plan would be developed and implemented to ensure the existing ground cover is maintained during operation of the solar farm.	Operational phase	Retention of existing ground cover	Solar Farm Operator
Appropriate landscaping	• Increase the quality of habitat for native flora and fauna species	• Where possible, landscape plantings will be comprised of local indigenous species with the objective of increasing the diversity of the existing vegetation. Planting locations would be designed to improve the connectivity between patches in the landscape where consistent with landscaping outcomes.	Operational phase	Increase/improve native species diversity and connectivity.	Solar Farm Operator

6.2 INDIRECT IMPACTS

Vegetation and habitat removal are considered *direct impacts* of the project.

Indirect impacts could occur as a consequence of the proposal, and can include impacts such as soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. A number of indirect impacts to biodiversity during construction and operation have been identified in Table 6-5 below.

6.2.1 Site selection and planning phase

During the detailed design phase of the proposal, the layout of the solar farm will be further refined to avoid as much vegetation clearing as possible. This, in turn, minimises potential indirect impacts resulting from the clearing. This is consistent with the principles of avoiding and minimising biodiversity impacts, as outlined under the Framework for Biodiversity Assessment.

6.2.2 Construction phase

The construction phase of the project can have a number of indirect impacts on biodiversity values. Indirect impacts are outlined in Table 6-5 below.

Table 6-5 Indirect impacts on biodiversity during the construction phase.

Impact	Frequency	Intensity	Duration	Consequence
Accidental spills and contamination from construction activities (including compound sites)	Rare	Moderate	Construction phase	Pollution of aquatic habitats.
Earthworks	Regular	Moderate	Construction phase	Erosion and sedimentation of aquatic habitats.
Noise	Regular	Low	Construction phase	Construction machinery and activities may disturb local fauna.
Dust generation	Regular	Low	Construction phase	Inhibit the function of plant species and communities, waterways.
Light spills during night works	Rare	Low	Construction phase	Night works may alter fauna activities/movements.
General construction activities	Regular	Moderate	Construction phase	Feral pest, weed and/or pathogen encroachment into areas adjoining the development site.
Increased Vehicle Traffic	Regular	Low	Operational phase	Increase potential for fauna mortality through vehicle strike.

Table 6-6 Measures proposed to avoid and minimise indirect impacts of the project during the construction phase

Impact	Measures to be implemented	Timing	Outcome	Responsibility
Accidental spills and contamination from construction activities	• Carry out refuelling of plant and equipment, chemical storage and decanting at least 50 m away from aquatic habitats in impervious bunds. • Ensure that dry and wet spill kits are readily available.	Construction phase	Prevent/minimise pollution of ephemeral waterways and dams, and sensitive adjacent habitat.	Contractor
Earthworks	• The draft Erosion and Sediment Control Plan would be finalised in conjunction with the final design and will be implemented.	Construction phase	Prevent/minimise erosion and sedimentation of ephemeral waterways and dams, and sensitive adjacent habitat.	Contractor
Noise pollution	• Avoid night works as much as possible, and avoid altogether where in close proximity to woodland habitats on adjacent properties.	Construction phase	Prevent disturbance to local fauna at the habitat corridor location.	Contractor
Dust generation	• The Construction Environmental Management Plan will include measures to prevent dust spreading to nearby habitats.	Construction phase	Prevent dust inhibiting the function of plant species and habitats adjacent to the development site.	Contractor
Light spill	• Avoid nightworks. • If night work is unavoidable, ensure any floodlights are directed away from adjacent off site vegetation.	Construction phase	Prevent disturbance to local fauna.	Contractor
General construction activities	• Weed and hygiene protocols will be prepared and implemented as part of the CEMP for the proposal.	Construction phase	Prevent feral pest, weed and/or pathogen encroachment into vegetation adjoining project area.	Proponent Contractor
Increased Vehicle Traffic	• Awareness training during site inductions, enforcement of site speed limits.	Operational phase	Minimise fauna strikes.	Proponent Contractor

6.2.3 Operational phase

The operational phase of the proposal can have a number of indirect impacts on biodiversity values. Indirect impacts are outlined in Table 6-7 below.

Table 6-7 Indirect impact on biodiversity during the operational phase.

Impact	Frequency	Intensity	Duration	Consequence
Light spill	Occasional	Low	Operational phase	Alter movements of fauna through the landscape
Weed encroachment	Regular	Moderate	Operational phase	Ingress of weeds along the boundary of the development
Increased Vehicle Traffic	Regular	Low	Operational phase	Increase potential for fauna mortality through vehicle strike
Solar Array Microclimate	Regular	Moderate	Operational phase	Alter movement of fauna within site and through the landscape, potential shelter habitat for pest species
Mobilisation of sediments	Irregular	Moderate	Operational phase	Sedimentation of adjacent waterways/aquatic habitats

Table 6-8 Measures proposed to avoid and minimise indirect impacts of the proposal during the operational phase

Impact	Consequence	Measures to be implemented	Timing	Outcome	Responsibility
Light spill	Alter movements of fauna through the landscape	• Direct lights away from adjacent habitat.	Operational phase	Minimise impacts to fauna movements and activity	Solar Farm Operator
Weed encroachment	Ingress of weeds along the boundary of the project area	• Weed management protocols will be prepared and implemented.	Operational phase	Prevent spread of weeds	Solar Farm Operator
Increased Vehicle Traffic	Increase potential for fauna mortality through vehicle strike	• Awareness training during site inductions regarding enforcing site speed limits.	Operational phase	Minimise fauna strikes	Solar Farm Operator
Fences	Alter movement of fauna within site and through the landscape	• Ensure that fences enclose operational areas only and do not block fauna movement along adjacent habitats.	Operational phase	Ensure no restriction of fauna movement	Solar Farm Operator
Mobilisation of sediments	Sedimentation of downstream habitats	• A groundcover management plan would be developed and implemented to ensure a stable ground cover during operation of the solar farm, minimising erosion and adverse water quality/aquatic habitat impacts.	Pre-construction phase	No degradation to adjacent waterways	Solar Farm Operator

6.3 CUMULATIVE IMPACTS

The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61 per cent of the native vegetation in NSW has been cleared or highly modified since European settlement (NSW Scientific Committee 2001), and the removal of vegetation for this proposal is contributing to this process. The cumulative impact of similar renewable energy projects, particularly where EECs are involved, can be considerable given that many poorly-conserved vegetation communities have a substantial portion of their extents represented on private land where the majority of renewable energy projects are proposed. Small losses of such communities, which may be insignificant at a project level, may accumulate over time to cause a significant reduction in the extent of remnant patches.

Cumulative impacts are considered best addressed by avoiding and minimising. Where avoidance is not possible, the impacts of each contributing proposal is assessed according to approved methodologies such as the FBA. Long term mechanisms like offsetting through the FBA, are structured to address these ongoing impacts.

The BCC generated a combined total of 684 ecosystem credit points for impacts to 17.13 ha of moderate to good and low condition EEC. Additionally, the project would impact 112.93 ha of non-EEC vegetation. It is noted that the solar array panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.

A Biodiversity Offset Strategy (BOS) is considered to be required as part of the approval of the proposal. The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Proposals, and will be achieved by:

(a) acquiring or retiring credits under the BioBanking scheme in the TSC Act;
(b) making payments into an offset fund that has been established by the NSW Government; or
(c) providing suitable supplementary measures.

A Biodiversity Offset Strategy (BOS) will therefore consider means to provide for the long term management of native vegetation, to offset the impacts of this project.

7 IMPACT SUMMARY

7.1 AREAS NOT REQUIRING ASSESSMENT

Areas without native vegetation or aquatic features do not need to be assessed further. At the development site these include treeless paddock areas with an understory of exotic pasture grasses or previously disturbed sites that have been colonised by exotic species with little to no native component. Furthermore, areas without any vegetation such as roads, existing infrastructure and other developments (such as the possible old quarry site) do not require further assessment. Essentially, for the project site this means all areas within the project area that are not an EEC. The total area of land within the project area not requiring further assessment is approximately 193.75 ha.

7.2 AREAS NOT REQUIRING AN OFFSET

7.2.1 Impacts on native vegetation

Offsets are not required where the project would impact on PCTs that:

a) Have a site value score of <17; or
b) EEC where it has a site value score of <17 (as per NSW Biodiversity Offsets Policy for Major Projects: Practice Note)
c) Are not identified as CEEC or EEC.

Based on the above, the areas of the site mapped as Zones 2 and 3 will require offsetting. It is noted that:

- Impacts have been reduced to 0 ha in Zone 1 and therefore this zone no longer generates credits and has been deleted from the assessment – no offsets generated.
- No credits are returned for the low condition EEC in Zone 4– no offsets generated.
- Being neither EEC nor threatened species habitat, in accordance with the FBA methodology, offsets are not required for Zone 5– no offsets generated.

7.2.2 Impacts on species and populations

Offsets are not required where the project:

a) Impacts on non-threatened species and populations that do not form part of a CEEC or EEC
b) Impacts on threatened species habitat associated with a PCT within a vegetation zone with a site value score of <17

Non-threatened species or populations, or threatened species habitat with a site value of <17 do not form part of the offset requirement. With regard to the native vegetation at the site, the habitat provided by the derived grassland vegetation in Zones 4 and 5 do not require an offset as the vegetation is not part of a CEEC or EEC and is not regarded as constituting important habitat for any listed threatened species.

Species credit species

As discussed in Section 4.3.4, the following species credit species are considered unlikely to occur within the habitats within the development site:

- Ausfeld's Wattle
- Brush-tailed Phascogale
- Euphrasia arguta
- Narrow Goodenia
- Pine Donkey Orchid
- Pink-tailed Worm Lizard
- Prasophyllum sp. Wybong
- Regent Honeyeater
- Silky Swainson-pea
- Squirrel Glider

Impacts to these species are unlikely and offsets are not required.

Hollow-bearing trees

Hollow-bearing trees provide potential roosting habitat for some species of microbats, parrots, owls and arboreal mammals. Hollow-dependant fauna species within the site (such as possums) are likely to be impacted due to the proposal. However, the overall impact on hollow-dependent fauna in the development site is likely to be low given the lack of observations of any listed threatened hollow-dependant fauna, and the overall low number of common arboreal fauna species observed during the site investigations. Mitigation measures have been recommended to address the clearing risks to resident species (Section 6).

Hollow-bearing trees to be impacted is assessed within the BCC, via the plot data collected for each vegetation zone. This data adds to the value of the habitat to be removed, thereby requiring greater number of credits to be retired. No specific requirement to offset hollows has been identified.

7.3 PCTS AND SPECIES POLYGONS REQUIRING AN OFFSET

7.3.1 Impacts on native vegetation

Offsets are required where the project would impact on any native vegetation that:

a) is identified as a CEEC that is specifically nominated in the SEARs for the Major Project as a CEEC for which an impacts does not require further consideration;
b) is identified as an EEC that has a site value score ≥ 17, unless it is an EEC that is specifically nominated in the SEARs for the project as an EEC for which an impact requires further consideration; or
c) is associated with threatened species habitat and in a vegetation zone that has a site value score ≥ 17.

The project would have a direct impact on one vegetation community listed as an EEC under the TSC Act, and which has generated ecosystem credits and therefore requires offsetting.

It is noted that for the purposes of this assessment, the areas of native derived grassland over which the panels will be installed are regarded as being completely and permanently removed. Whilst it is

acknowledged that the installation of solar panels over native grasslands has, on other projects, enabled the existing grassland community to stay relatively intact, and that upon decommissioning and removal of the solar farm, the grassland may revert back to its pre-construction condition, until further direction is provided by OEH, it must be taken that the solar panel installation will in effect, represent a complete and permanent removal of the grassland habitat, and thereby, require offsetting in accordance with the requirements of the FBA.

Table 7-1 Extent of vegetation communities within the development site that require offsetting

Vegetation Community	Threatened Ecological Community (TSC Act or EPBC Act)?	PCT Id	Biometric vegetation condition	Site value score	Extent of vegetation (ha) impacted in development site
PCT #281 BVT CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	EEC - TSC Act CEEC – EPBC Act	281	Moderate – good	66.67	0
PCT #281 BVT CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	EEC - TSC Act	281	Moderate - good	67.33	0.99
PCT #281 BVT CW111 Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions	EEC - TSC Act	281	low	47.33	16.14
Total Vegetation	-	-	-		**17.13**

7.3.2 Impacts on species and populations

Offsets are required where the project would impact on:

a) Any critically endangered species;
b) A threatened species or population that was not specifically nominated in the SEARs as a species or population for which an impact requires further consideration; or
c) Threatened species habitat associated with a PCT in a vegetation zone with a site value score of ≥17.

Ecosystem Credit Species

The BCC found that 23 threatened ecosystem credit fauna species were predicted to occur within the Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions PCT and thus require offsets, including:

Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis subsp. gularis*
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus subsp. victoriae*
Bush Stone-curlew	*Burhinus grallarius*
Diamond Firetail	*Stagonopleura guttata*
Flame Robin	*Petroica phoenicea*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis subsp. temporalis*
Little Eagle	*Hieraaetus morphnoides*
Little Lorikeet	*Glossopsitta pusilla*
Little Pied Bat	*Chalinolobus picatus*
Little Whip Snake	*Suta flagellum*
Masked Owl	*Tyto novaehollandiae*
Painted Honeyeater	*Grantiella picta*
Powerful Owl	*Ninox strenua*
Scarlet Robin	*Petroica boodang*
Speckled Warbler	*Chthonicola sagittata*
Spotted Harrier	*Circus assimilis*
Spotted-tailed Quoll	*Dasyurus maculatus*
Square-tailed Kite	*Lophoictinia isura*
Swift Parrot	*Lathamus discolor*
Turquoise Parrot	*Neophema pulchella*
Varied Sittella	*Daphoenositta chrysoptera*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*

Four vegetation zones within the Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions had a site value score >17 and requires offsets for the above species.

Species credit species

The BCC found that 10 threatened species credit species were predicted to occur within the Rough-barked Apple – Red Gum – Yellow Box Woodland on alluvial clay to loam soils on valley flats in the NSW SWS and BBS Bioregions PCT, including:

Ausfeld's Wattle	*Acacia ausfeldii*
Brush-tailed Phascogale	*Phascogale tapoatafa*
Euphrasia arguta	*Euphrasia argute*
Koala	*Phascolarctos cinereus*
Narrow Goodenia	*Goodenia macbarronii*
Pine Donkey Orchid	*Diuris tricolor*
Pink-tailed Legless Lizard	*Aprasia parapulchella*
Prasophyllum sp. Wybong	*Prasophyllum sp. Wybong*
Regent Honeyeater	*Anthochaera Phrygia*
Silky Swainson-pea	*Swainsona sericea*
Squirrel Glider	*Petaurus norfolcensis*

None of the above listed threatened flora species were recorded or considered likely to occur within the development site. The Silky Swainson-pea and Pine Donkey Orchid were recorded in habitats outside of the development impact area and would be protected during construction works. Therefore, under the BCC assessment, no flora species require offsets.

Similarly, none of the listed threatened fauna species were recorded during surveys in the project area, and based on the habitat values recorded at the site, none are considered likely to occur on a regular/permanent basis, or rely on the site as important habitat. Therefore, under the BCC assessment, no fauna species require offsets.

7.4 IMPACTS REQUIRING FURTHER CONSIDERATION

7.4.1 Impacts on landscape features

There would be no impacts that will reduce the width of vegetation in the riparian buffer zone bordering significant streams and rivers, important wetlands or estuarine areas. There would be no impacts that will prevent species movement along corridors that have been identified as providing significant biodiversity linkages across the state.

7.4.2 Impacts on native vegetation

Impacts on native vegetation that require further consideration include impacts on:

a) any CEEC, unless the CEEC is specifically excluded by the SEARs
b) an EEC specifically nominated in the SEARS as an EEC that is likely to become extinct or have its viability significantly reduced in the IBRA subregion if it is impacted on by development.

No EECs were specifically nominated in the SEARS as an EEC that is likely to become extinct or have its viability significantly reduced in the IBRA subregion if it is impacted on by development. The Box-Gum Woodland EEC was nominated in the SEARs as requiring assessment under the FBA and this has been addressed in this BAR. Appendix G of the OEH Environmental Assessment Requirements specifically exclude the Box-Gum Woodland EEC from requiring further consideration and as such, the provision of the information required in Section 9.2.5.2 of the FBA is not required.

The Zone 1 vegetation polygon mapped as being in moderate/good condition, meets the listing criteria for the EPBC CEEC. This area of CEEC would not be impacted on by the proposal and no further consideration is required as it would not be impacted by the proposal.

7.4.3 Impacts on threatened species

Further consideration is required where the project would impact:

a) Any critically endangered species;
b) A threatened species or population that is specifically nominated in the SEARS as a species or population that is likely to become extinct or have its viability significantly reduced in the IBRA subregion if it is impacted on by the development; or
c) a threatened species that has not previously been recorded in the IBRA subregion according to records in the NSW Wildlife Atlas.

The SEARs did not identify any threatened species or populations as likely to become extinct or have their viability significantly reduced in the IBRA subregion if impacted on by the proposal. No threatened species were detected that had not previously been recorded in the IBRA subregion according to records in the NSW Wildlife Atlas.

Listed entities with the potential to occur at the site have been described in Section 4. None of these species were recorded at the site, and are considered unlikely to utilise the site on a regular or permanent basis, and the site is regarded as not constituting important habitat for any of these species. Notwithstanding this, specific mitigation measures have been recommended in Section 6 to avoid impacts to these species in the unlikely event that they would occur at the site. No further assessment for any of these species is considered necessary.

7.4.4 Impacts on critical habitat

The project area does not contain any areas that have been declared as critical habitat under either the TSC Act or EPBC Act.

7.4.5 Impacts to EPBC listed entities

As stated in Section, no impacts to any EPBC listed threatened entities are considered likely.

7.5 ECOSYSTEMS AND SPECIES CREDITS

A total of 684 ecosystem credits (from Zones 2 and 3) have been generated for the development site, whilst no species credits were generated (BCC Major Project 0035/2017/4165MP Version 1). The BCC full credit report is provided in Appendix A.

Ecosystem credits

The ecosystem credits required are summarised in Table 7-3. It is noted that:

- Impacts have been reduced to 0 ha in Zone 1 and therefore this zone no longer generates credits and has been deleted from the assessment.
- No credits are returned for the low condition EEC in Zone 4.
- Being neither EEC nor threatened species habitat, in accordance with the FBA methodology, offsets are not required for Zone 5.

The total credit requirement is therefore 684 (from Zones 2 and 3). This can be retired as physical offsets in a range of PCTs as shown in Appendix A. Other options include purchasing this number of credits from the Biobanking credit market.

Species credits

No species credits are required.

Table 7-2 Credit report

Vegetation Management Zone	Biometric veg code / PC type code	Plant community type name	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits required for Threatened species	Threatened Species with highest credit requirements	TS offset multiplier	Ecosystem credits required
2	PCT #281 BVT: CW111	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	0.99	14.20	67.33	3.0	54	Powerful Owl	3.0	54
3	PCT #281 BVT: CW111	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	16.14	14.20	47.33	3.0	0	NA	0.0	630
4	PCT #281 BVT #CW111	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	95.04	14.20	10.00	1.0	1079	Powerful Owl	3.0	0
5[1]	PCT #281 BVT: CW111	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	17.89	14.20	20.67	1.0	341	Powerful Owl	3.0	341

[1] While included in the credit profile, this zone is neither EEC nor threatened species habitat and therefore is not considered to require offsets under the FBA.

8 BIODIVERSITY CREDIT REPORT

The final credit report for the development is provided at Appendix A. The credit extract report produced by the BCC is provided overleaf. The report includes the requirement for 1,025 ecosystem credits, and nil species credits. However, it is noted that under the FBA, only Zones 2 and 3 would require offsets. These zones generate 684 credits.

Limitations that should be understood when interpreting these credit results include:

- Surveys have been used to identify which species would be impacted by the development and offset. However, surveys provide a snap shot and not a definitive answer to the question of whether a species may occur at some time and be impacted. It is accepted that the species determined unlikely to be impacted may at some time use the site. However, the site is not considered important habitat for these species and no areas of impact have been entered for them. This is justified in Section 4.

BioBanking Credit Calculator

Ecosystem credits

NSW GOVERNMENT Office of Environment & Heritage

Proposal ID :	0035/2017/4165MP
Proposal name :	Beryl Solar Farm
Assessor name :	Brooke Marshall
Assessor accreditation number :	0035
Tool version :	v4.0
Report created :	22/03/2017 11:26

Assessment circle name	Landscape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for CE (no diversity)	Credit required for TS	TS with highest credit requirement	Average species loss	Species TS Value	Final credit requirement for management zone
One	14.20	CW111_Moderate/Good_Poor	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Poor	Yes	2	5.69	67.33	0.00	67.33	54	54	Powerful Owl	100.00	3.00	54
One	14.20	CW111_Low	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Low	Yes	3	16.14	47.33	0.00	47.33	630	0		0.00	0.00	630
One	14.20	CW111_Moderate/Good_Derived grassland	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Derived grassland	No	4	97.54	10.00	0.00	10.00	0	1,250	Powerful Owl	0.00	3.00	0
One	14.20	CW111_Moderate/Good_Other	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Other	No	5	17.89	20.67	0.00	20.67	0	341	Powerful Owl	0.00	3.00	341

9 CONCLUSIONS

NGH Environmental has prepared this BAR on behalf of First Solar Pty Ltd for the Beryl Solar Farm near the township of Gulgong, NSW. The purpose of this BAR was to address the requirements of the FBA, developed for Major Projects, and to address the biodiversity matters raised in the SEARs.

In this BAR, biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the requirements in Appendix 4 of the FBA. The assessment identified one threatened species (not listed as a Species Credit species) within the development site and adjacent vegetation, which will be avoided. The project site is derived from Box Gum Woodland EEC vegetation. Areas of better quality EEC have been avoided through successive layout revisions. Mitigation measures which have been outlined in Section 6 will assist to further to reduce the impacts to biodiversity. Residual impacts of the proposal include the generation of 684 ecosystem credits; generated by Zones 2 and 3. This excludes vegetation that is both non-EEC and does not provide threatened species habitat, in accordance with the FBA.

A Biodiversity Offset Strategy (BOS) is considered to be required as part of the approval of the proposal. The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Proposals, and will be achieved by:

(d) acquiring or retiring credits under the BioBanking scheme in the TSC Act;
(e) making payments into an offset fund that has been established by the NSW Government; or
(f) providing suitable supplementary measures.

Regarding offsetting the impacts of this proposal it is noted that:

- The solar array panels will modify not remove vegetation through shading, however for the purpose of this assessment, 100% vegetation removal within the solar arrays has been assumed.
- Areas existing within the project site that include better quality EEC at the western corner of the project site as well low condition EEC along the south-western boundary. These areas would be appropriate offset / revegetation sites. They would contribute to local landscape connectivity.

A BOS is proposed to be developed in consultation with OEH to ensure the actual impacts of the development would be appropriately offset, in accordance with the FBA.

10 REFERENCES

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APPENDIX A CREDIT PROFILE

As of 09/02/2017.

Proposal ID for the assessment: 0045/2017/4165MP Version 2

Assessment type: 'Major Project'.

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 22/03/2017 Time: 11:27:14AM Calculator version: v4.0

Major Project details

Proposal ID:	0035/2017/4165MP
Proposal name:	Beryl Solar Farm
Proposal address:	suite 1, 216 carp st Bega NSW 2550
Proponent name:	First Solar (Australia) Pty Ltd
Proponent address:	Level 3, 16 Spring Street Sydney NSW 2000
Proponent phone:	0290027710
Assessor name:	Brooke Marshall
Assessor address:	1/216 Carp St Bega NSW 2250
Assessor phone:	64928333
Assessor accreditation:	0035

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	130.06	1,025.23
Total	130.06	1,025

CREDIT PROFILES

1. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	395
IBRA sub-region	Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)	Upper Slopes - Central West and any IBRA subregion that adjoins the IBRA subregion in which the development occurs
Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion, (CW103)	
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112)	
Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138)	
Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (CW139)	
Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion, (CW209)	
White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region, (CW211)	
White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion, (CW213)	
White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215)	
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216)	
Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (CW225)	
Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion, (CW226)	
Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (CW231)	
White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion, (CW320)	
Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion, (CW295)	
Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion, (CW285)	
Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280)	
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (CW330)	

2. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	630
IBRA sub-region	Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion, (CW103) Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111) Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138) Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (CW139) Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion, (CW209) White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region, (CW211) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion, (CW213) White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215) White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216) Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (CW225) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion, (CW226) Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (CW231) White Box - Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion, (CW320) Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion, (CW295) Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion, (CW285) Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280) Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (CW330)	Upper Slopes - Central West and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

No species credits are required

APPENDIX B SEARS

The project is considered State Significant Development and requires assessment under Part 4.1 of the EP&A Act. Biodiversity factors are to be assessed in an EIS, as per the Secretary Environmental Assessment Requirements (SEARs) for environmental impact assessment. A Final SEARs was provided by the Department of Planning and Environment on 25 January 2017 (application number SSD8183).

Planning Services
Resource Assessments

Contact: Diana Charteris
Tel: (02) 9274 6331
Email diana.charteris@planning.nsw.gov.au

Our ref: SSD 8183

Mr Tom Best
First Solar (Australia) Pty Ltd
Level 3, 16 Spring Street
SYDNEY NSW 2000

Dear Mr Best

Beryl Solar (SSD 8183)
Environmental Assessment Requirements

I have attached the Environmental Assessment Requirements for the preparation of an Environmental Impact Statement (EIS) for the Beryl Solar Farm.

The requirements are based on the information you have provided to date, and have been prepared in consultation with the relevant government agencies. The agencies comments are attached for your information (see Attachment 2).

Please note that the Department may alter these requirements at any time, and that you must consult further with the Department if you do not lodge a development application and EIS for the project within the next two years.

If your proposal contains any actions that could have a significant impact on matters of National Environmental Significance, then it will also require approval under the Commonwealth's *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act).

This approval is in addition to any approvals required under NSW legislation. If you have any questions about the application of the EPBC Act to your proposal, you should contact the Department of the Environment and Energy in Canberra (02 6274 1111 or www.environment.gov.au).

Please contact the Department at least two weeks before you plan to submit the development application and EIS for the project. This will enable the Department to:

- confirm the applicable fee (see Division 1AA, Part 15 of the *Environmental Planning and Assessment Regulation 2000*); and
- determine the required number of copies of the EIS.

It is important for you to recognise that the Department will review the EIS for the project before putting it on public exhibition. If it fails to adequately address these requirements, you will be required to submit an amended EIS.

Yours sincerely

Clay Preshaw

25/1/17

Clay Preshaw
A/Director
Resource Assessments
(as nominee of the Secretary)

Environmental Assessment Requirements

State Significant Development

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

Application Number	SSD 8183
Proposal	Beryl Solar which includes: • the construction and operation of a solar photovoltaic (PV) generation facility with an estimated capacity of 95 MW; and • associated infrastructure, including a grid connection.
Location	Beryl Road, Beryl (Mid-Western Regional Council)
Applicant	First Solar (Australia) Pty Ltd
Date of Issue	25 January 2017
General Requirements	The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In particular, the EIS must include: • a full description of the development, including: – details of construction, operation and decommissioning; – a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process); – a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development; • a strategic justification of the development focusing on site selection and the suitability of the proposed site; • an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: – a description of the existing environment likely to be affected by the development; – an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; – a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and – a description of the measures that would be implemented to monitor and report on the environmental performance of the development; • a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS; and • the reasons why the development should be approved having regard to the biophysical, economic and social costs and benefits of the development. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of this development. In addition to the matters set out in Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*, the development application must be accompanied by: • a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the *Environmental Planning and Assessment Regulation 2000*); and

	• the consent in writing of the owner of the land (as required in clause 49(1)(b) of the *Environmental Planning and Assessment Regulation 2000)*.
Specific Issues	The EIS must address the following specific issues: • **Biodiversity** – including an assessment of the likely biodiversity impacts of the development, (including but not limited to the impacts on Box Gum Woodland endangered ecological community, *Euphrasia arguta*, *Prasophyllum sp. Wybong*, Bluegrass (*Dichanthium setosum*), Pink Donkey Orchid (*Diuris tricolor*), Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*), and Silky Swainson-pea (*Swainsona sericea*)), having regard to the *NSW Biodiversity Offsets Policy for Major Projects*, and in accordance with the *Framework for Biodiversity Assessment*, unless otherwise agreed by the Department; • **Heritage** – including an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community; • **Land** – including an assessment of the impact of the development on agricultural land and flood prone land, a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing land uses on the site and adjacent land (e.g. operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and risk of weed and pest infestation) during operation and after decommissioning, with reference to the zoning provisions applying to the land; • **Visual** – including an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences, scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners; • **Noise** – including an assessment of the construction noise impacts of the development in accordance with the *Interim Construction Noise Guideline* (ICNG) and operational noise impacts in accordance with the *NSW Industrial Noise Policy* (INP), and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria; • **Transport** – including an assessment of the site access route (including Castlereagh Highway and Beryl Road), site access point, rail safety issues and likely transport impacts of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction, and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required); • **Water** – including: – an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including watercourses (including the Cudgegong River and Wialdra Creek), wetlands, riparian land, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts; – details of water supply arrangements; and – a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004); • **Hazards and Electromagnetic Interference** – an assessment of potential hazards and risks associated with bushfires and the proposed transmission line and substation against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) *Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.* • **Socio-Economic** – including an assessment of the likely impacts on the local community and a consideration of the construction workforce accommodation.

Consultation	In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders. In particular, you must undertake detailed consultation with affected landowners surrounding the development and Mid-Western Regional Council. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.

ATTACHMENT 1

Environmental Planning Instruments, Policies, Guidelines & Plans

Biodiversity	
	Framework for Biodiversity Assessment (OEH)
	NSW Biodiversity Offsets Policy for Major Projects (OEH)
	Threatened Species Assessment Guidelines - Assessment of Significance (OEH)
	Biosecurity Act 2015
	Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI)
	Policy and Guidelines for Fish Habitat Conservation and Management (DPI)
Heritage	
	Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)
	Code of Practice for Archaeological Investigations of Objects in NSW (OEH)
	Guide to investigating, assessing and reporting on aboriginal cultural heritage in NSW (OEH).
	NSW Heritage Manual (OEH)
Land	
	Primefact 1063: Infrastructure proposals on rural land (DPI)
	Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry (ARENA)
	Local Land Services Act 2013
	Australian Soil and Land Survey Handbook (CSIRO)
	Guidelines for Surveying Soil and Land Resources (CSIRO)
	The land and soil capability assessment scheme: second approximation (OEH)
Noise	
	NSW Industrial Noise Policy (EPA)
	Interim Construction Noise Guideline (EPA)
	NSW Road Noise Policy (EPA)
Transport	
	Guide to Traffic Generating Developments (RTA)
	Road Design Guide (RMS) & relevant Austroads Standards
	Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development
Water	
	Managing Urban Stormwater: Soils & Construction (Landcom)
	Floodplain Development Manual (OEH)
	Guidelines for Controlled Activities on Waterfront Land (DPI Water)
	Water Sharing Plans (DPI Water)
	Floodplain Management Plan (DPI Water)
	Guidelines for Watercourse Crossings on Waterfront Land (DPI Water)
Waste	
	Waste Classification Guidelines (EPA)
Electromagnetic Interference	
	ICNIRP Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields
Environmental Planning Instruments	
	State Environmental Planning Policy (State and Regional Development) 2011
	State Environmental Planning Policy (Infrastructure) 2007
	State Environmental Planning Policy (Rural Lands) 2008
	State Environmental Planning Policy No. 44 – Koala Habitat Protection
	State Environmental Planning Policy No. 55 – Remediation of Land
	Mid-Western Regional Local Environmental Plan 2012

APPENDIX C SPECIES LISTS

C.1 FLORA SPECIES RECORDED AT THE SITE

Scientific Name	Common Name
CLASS FILICOPSIDA	
Pteridaceae	
Cheilanthes sieberi	
Marsileaceae	
Marsilea drummondii	Common nardoo
CLASS MAGNOLIOPSIDA	
SUBCLASS MAGNOLIIDAE	
Apiaceae	
Daucus glochidiatus	Native Carrot
Hydrocotyle laxiflora	Stinking Pennywort
Asteraceae	
**Arctotheca calendula*	Capeweed
**Bidens subalternans*	Greater Beggar's Ticks
Calotis cuneifolia	Purple Burr-daisy
Calotis lappulacea	Yellow Burr-daisy
**Carduus pycnocephalus*	Slender Thistle
**Carthamus lanatus*	Saffron Thistle
Cassinia arcuata	Sifton Bush
**Centaurea melitensis*	Maltese Cockspur
**Chondrilla juncea*	Skeleton Weed
Chrysocephalum apiculatum	Common Everlasting
**Cirsium vulgare*	Spear Thistle
**Conyza bonariensis*	Flaxleaf Fleabane
**Conyza* sp.	
Cotula australis	Carrot Weed
Cymbonotus lawsonianus	Bears-ear
Euchiton sphaericus	
Facelis retusa	Annual trampweed
**Gamochaeta americana*	Cudweed
**Hedypnois rhagadioloides* subsp. *cretica*	Cretan Weed
**Hypochaeris glabra*	Smooth Catsear
**Hypochaeris microcephala* var. *albiflora*	White Flatweed
**Hypochaeris radicata*	Flatweed
**Lactuca serriola*	Prickly Lettuce
Myriocephalus rhizocephalus	Woolly-heads
Pseudognaphalium luteoalbum	Jersey Cudweed
Senecio quadridentatus	Cotton Fireweed
**Silybum marianum*	Variegated Thistle
**Soliva sessilis*	Bindyi
**Sonchus asper*	Prickly Sowthistle

Scientific Name	Common Name
**Sonchus oleraceus*	Common Sowthistle
**Taraxacum officinale*	Dandelion
**Tolpis barbata*	Yellow Hawkweed
Triptilodiscus pygmaeus	Common Sunray
Vittadinia muelleri	
Boraginaceae	
**Echium plantagineum*	Paterson's Curse
Brassicaceae	
**Capsella bursa-pastoris*	Shepherd's Purse
**Lepidium bonariense*	
Rorippa laciniata	
Campanulaceae	
Wahlenbergia communis	Tufted Bluebell
Wahlenbergia luteola	
Wahlenbergia planiflora subsp. *planiflora*	Flat Bluebell
Wahlenbergia sp.	
Caryophyllaceae	
**Arenaria leptoclados*	Lesser Thyme-leaved Sandwort
**Cerastium glomeratum*	Mouse-ear Chickweed
**Paronychia brasiliana*	Brazilian Whitlow
**Petrorhagia nanteuilii*	
**Polycarpon tetraphyllum*	Four-leaved Allseed
**Silene gallica*	French Catchfly
**Spergularia rubra*	Sandspurry
Chenopodiaceae	
Einadia nutans	Climbing Saltbush
Maireana microphylla	Small-leaf Bluebush
Clusiaceae	
**Hypericum perforatum*	St. Johns Wort
Convolvulaceae	
Dichondra sp. A	Kidney Weed
Crassulaceae	
Crassula peduncularis	
Crassula sieberiana	Australian Stonecrop
Droseraceae	
Drosera glanduligera	Pimpernel Sundew
Drosera peltata	
Elatinaceae	
Elatine gratioloides	Waterwort
Euphorbiaceae	
Chamaesyce drummondii	Caustic Weed
Fabaceae: Faboideae	
Daviesia genistifolia	Broom Bitter Pea
Desmodium varians	Slender Tick-trefoil
Glycine clandestina	

Scientific Name	Common Name
Glycine tabacina	
**Medicago minima*	Woolly Burr Medic
**Medicago truncatula*	Barrel Medic
Swainsona sericea	Silky Swainson-pea (Vulnerable)
**Trifolium angustifolium*	Narrow-leaved Clover
**Trifolium arvense*	Haresfoot Clover
**Trifolium campestre*	Hop Clover
**Trifolium cernuum*	
**Trifolium dubium*	Yellow Suckling Clover
**Trifolium glomeratum*	Clustered Clover
**Trifolium striatum*	Knotted Clover
**Trifolium subterraneum*	Subterranean Clover
**Trifolium tomentosum*	Woolly Clover
Zornia dyctiocarpa	Zornia
Gentianaceae	
**Centaurium erythraea*	Common Centaury
Geraniaceae	
**Erodium cicutarium*	Common Storksbill
Erodium crinitum	Blue Storksbill
Geranium potentilloides	
Geranium retrorsum	Common Cranesbill
Goodeniaceae	
Goodenia hederacea	Forest Goodenia
Goodenia pinnatifida	
Velleia paradoxa	Spur Velleia
Haloragaceae	
Haloragis heterophylla	Rough Raspwort
Lamiaceae	
**Marrubium vulgare*	White Horehound
**Salvia verbenaca*	Vervain
**Stachys arvensis*	Stagger Weed
Lentibulariaceae	
Utricularia dichotoma	Fairy Aprons
Lobeliaceae	
Pratia concolor	Poison Pratia
Malvaceae	
**Malva parviflora*	Small-flowered Mallow
**Modiola caroliniana*	Red-flowered Mallow
Sida corrugata	Corrugated Sida
Myrsinaceae	
**Anagallis arvensis*	Scarlet Pimpernel
Myrtaceae	
Angophora floribunda	Rough-barked Apple
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus melliodora	Yellow Box

Scientific Name	Common Name
Oxalidaceae	
Oxalis perennans	
Oxalis radicosa	
Oxalis sp.	
Oxalis sp.2	
Plantaginaceae	
**Linaria pelisseriana*	Pelisser's Toadflax
Plantago debilis	
**Plantago lanceolata*	Lamb's Tongues
Polygonaceae	
**Acetosella vulgaris*	Sheep Sorrel
**Polygonum aviculare*	Wireweed
Rumex brownii	Swamp Dock
**Rumex crispus*	Curled Dock
Rumex tenax	Shiny Dock
Portulacaceae	
Portulaca oleracea	Pigweed
Ranunculaceae	
Ranunculus pumilio var. *pumilo*	
Rosaceae	
Acaena echinata	
Rubiaceae	
Asperula conferta	Common Woodruff
Scrophulariaceae	
Limosella australis	Australian Mudwort
Solanaceae	
**Solanum nigrum*	Black-berry Nightshade
Stackhousiaceae	
Stackhousia muricata	Western Stackhousia
Urticaceae	
**Urtica urens*	Small Nettle
SUBCLASS LILIIDAE **Anthericaceae**	
Arthropodium minus	
Tricoryne elatior	Yellow Autumn-lily
Asphodelaceae	
Bulbine bulbosa	Native Leek
Colchicaceae	
Wurmbea dioica	Early Nancy
Commelinaceae	
Commelina cyanea	
Cyperaceae	
Carex inversa	
Cyperus difformis	Dirty Dora
Eleocharis plana	Flat Spike-sedge

Scientific Name	Common Name
Eleocharis pusilla	
Fimbristylis dichotoma	Common Fringe-sedge
Isolepis hookeriana	
Iridaceae	
**Romulea minutiflora*	Small-flowered Onion Grass
**Romulea rosea*	Onion Grass
**Sisyrinchium rosulatum*	Scourweed
Juncaceae	
Juncus bufonius	Toad Rush
**Juncus capitatus*	A Rush
Juncus subglaucus	
Juncus subsecundus	
Lomandraceae	
Lomandra multiflora	Many-flowered Mat-rush
Orchidaceae	
Diuris tricolor	Painted Diuris
Microtis parviflora	Slender Onion Orchid
Microtis unifolia	Common Onion Orchid
Pterostylis bicolor	Black-tip Greenhood
Thelymitra pauciflora type	
Phormiaceae	
Dianella porracea	Riverine Flax-lily
Poaceae	
**Aira elegantissima*	Delicate Hairgrass
Amphibromus nervosus	
Aristida ramosa	Purple Wiregrass
Austrostipa scabra	Speargrass
Austrostipa verticillata	Slender Bamboo Grass
Bothriochloa macra	Red Grass
**Briza maxima*	Giant Shivery Grass
**Briza minor*	Small Shivery Grass
**Bromus catharticus*	Prairie Grass
**Bromus diandrus*	Great Brome
**Bromus hordeaceus*	Soft Brome
**Bromus molliformis*	Soft Brome
Chloris truncata	Windmill Grass
Cynodon dactylon	Couch
Dichelachne micrantha	Shorthair Plumegrass
Eragrostis elongata	Clustered Lovegrass
**Hordeum leporinum*	Barley Grass
**Lolium perenne*	Perennial Ryegrass
**Lolium rigidum*	Wimmera Ryegrass
Microlaena stipoides	Weeping Grass
**Paspalum dilatatum*	Paspalum
**Poa bulbosa*	Bulbosa Poa

Scientific Name	Common Name
Poa sieberiana	
Rytidosperma erianthum	
Rytidosperma sp.	
Rytidosperma sp. 2	
Sporobolus creber	Rat's Tail Grass
Themeda triandra	Kangaroo Grass
**Vulpia bromoides*	Squirrel Tail Fescue
**Vulpia muralis*	
**Vulpia myuros*	Rat's Tail Fescue

C.2 FAUNA SPECIES RECORDED AT THE SITE

Scientific name	Common name	Observation Method
Amphibians		
Litoria peronii	Peron's Tree Frog	
Uperoleia rugosa	Wrinkled Toadlet	
Birds		
Anas superciliosa	Black Duck	
Chenonetta jubata	Wood Duck	
**Columba livia*	Rock Dove	
Ocyphaps lophotes	Crested Pigeon	
Egretta novaehollandiae	White-faced Heron	
Falco cenchroides	Nankeen Kestrel	
Cacatua galerita	Sulphur-crested Cockatoo	
Eolophus roseicapillus	Galah	
Glossopsitta concinna	Musk Lorikeet	
Platycercus eximius	Eastern Rosella	
Psephotus haematonotus	Red-rumped Parrot	
Scythrops novaehollandiae	Channel-billed Cuckoo	
Dacelo novaeguineae	Laughing Kookaburra	
Todiramphus sanctus	Sacred Kingfisher	
Eurystomus orientalis	Dollarbird	
Malurus cyaneus	Superb Fairy-wren	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	
Pardalotus striatus	Striated Pardalote	
Anthochaera carunculata	Red Wattlebird	
Manorina melanocephala	Noisy Miner	
Coracina novaehollandiae	Black-faced Cuckoo-Shrike	
Artamus cyanopterus	Dusky Woodswallow	
Cracticus nigrogularis	Pied Butcherbird	
Cracticus tibicen	Magpie	
Cracticus torquatus	Grey Butcherbird	
Strepera graculina	Pied Currawong	
Rhipidura leucophrys	Willie Wagtail	
Corvus coronoides	Australian Raven	
Grallina cyanoleuca	Magpie-lark	
Corcorax melanorhamphos	White-winged Chough	
Struthidea cinerea	Apostlebird	
Cincloramphus cruralis	Brown Songlark	
Cincloramphus mathewsi	Rufous Songlark	
Petrochelidon ariel	Fairy Martin	
**Sturnus vulgaris*	Common Starling	
Anthus novaeseelandiae	Pipit	
Mammals		
**Lepus europaeus*	Hare	

Macropus giganteus	Eastern Grey Kangaroo	
**Oryctolagus cuniculus*	European Rabbit	
Trichosurus vulpecula	Common Brushtail Possums	
**Vulpes*	European Red Fox	
Microbats		
Austronomus australis	White-striped Free-tail Bat	
Chalinolobus dwyeri ? V	Large-eared Pied Bat	
Chalinolobus gouldii	Gould's Wattled Bat	
Chalinolobus morio	Chocolate Wattled Bat	
Miniopterus/Vespadelus complex ? V	Bentwing Bat / Forest Bat complex	
Mormopterus ridei	Eastern Free-tailed Bat	
Nyctophilus sp	A Long-eared Bat	
Scotorepens greyii	Little Broad-nosed Bat	
Vespadelus darlingtoni	Large Forest Bat	
Vespadelus vulturnus	Little Forest Bat	
Reptiles		
Anomalopus leuckartii	Two-clawed Worm-skink	
Lamprophilus delicata	Delicate Skink	
Tiliqua rugosa	Shingleback	
Tiliqua scincoides	Eastern Blue-tongue	
Pogona barbata	Eastern Bearded Dragon	
Pseudonaja textilis	Eastern Brown Snake	
Pseudechis (prob) porphyriacus	Red-bellied Black Snake	

APPENDIX D EPBC PROTECTED MATTERS SEARCH

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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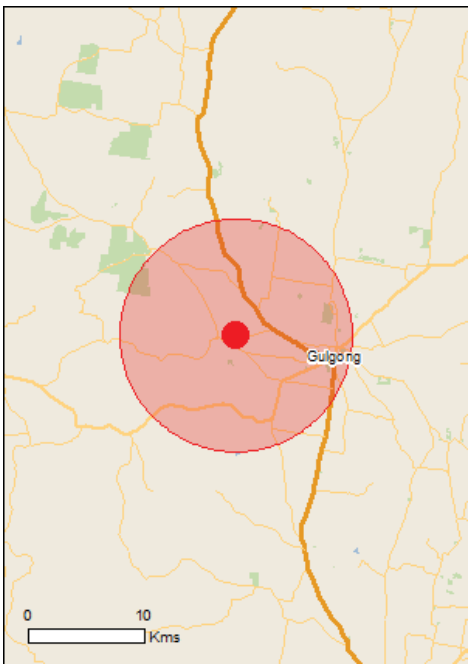

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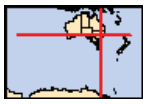

Summary

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:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	29
Listed Migratory Species:	8

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:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	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:	1
Regional Forest Agreements:	None
Invasive Species:	28
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	800 - 900km upstream
Riverland	700 - 800km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	200 - 300km upstream

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
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may 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
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Plants		
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Homoranthus darwinioides [12974]	Vulnerable	Species or species habitat may occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat likely to occur within area
Philotheca ericifolia [64942]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may 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 likely to 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 likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	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 - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia

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		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may 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 may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to 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 habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur

Name	Threatened	Type of Presence within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Yarrobil	NSW

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
Carduelis carduelis European Goldfinch [403]		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
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		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
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		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
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		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		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		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
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk,		Species or species

Name	Status	Type of Presence
Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		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

-32.34881 149.45623

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.

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