

# Stringybark Solar Farm Biodiversity Development Assessment Report

**Stringybark Solar Farm Pty Ltd**



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Template 2.8.1

## Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Stringybark Solar Farm Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed development of the Stringybark Solar Farm located at 597 Gara Road, Metz (the Development Site) in the Armidale Dumaresq Local Government Area (LGA).

This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2016 (BAM) established under Section 6.7 of the NSW *Biodiversity Conservation Act* (BC Act) 2016.

The Development Site covers an area of 95 ha and is situated on a beef and lamb agricultural enterprise, which contains limited native biodiversity. The Development Site is adjacent to the Armidale Waste Facility to the north, paddocks to the east and west, and by Gara Road to the south. The Development Site has been subject to past native vegetation clearing typical of the New England region.

Based on the field assessment by ELA ecologists, no definable Plant Community Types (PCTs) were observed within the Development Site, as the entire development footprint is poor condition grasslands. Nearby to the development footprint, three PCTs occur:

- 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland
- 568 Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Region
- 1331 Yellow Box - Broad-leaved Stringybark shrubby open forest of the New England Tableland Bioregion

Vegetation within the development site is likely a derivative of PCT 568 & PCT510 given the landscape position and remnant vegetation surrounding the development site. PCT 568 is not listed under either NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). PCT510 can comply with the listing for Yellow Box White Box Blakely's Red Gum Woodland, which the vegetation has been precautionarily assigned to in the credit calculator.

Within the Development Site the condition of native vegetation is heavily degraded. The majority of vegetation within the Development Site is comprised of native grasslands with very low native species diversity. There is evidence of previous enrichment of the ground layer across the development site, with plough marks across paddocks and exotic pasture grasses (such as *Paspalum dilatatum* and *Dactylus glomerata*) prevalent. At the time of survey, the ground layer condition was significantly degraded due to ongoing drought and persistent grazing pressure from cattle and sheep.

Fauna habitat was significantly degraded within the development site, and consists only of low condition grasslands. As such no fauna species were considered likely to occur.

One threatened flora species, *Dichanthium setosum* (Bluegrass) has been recorded within the development site, in two discrete patches. No threatened fauna species have been recorded within the Development Site.

Development works associated with this BDAR assessment will require the disturbance and modification of grasslands to facilitate development of a solar farm. Connection points between the solar farm and the sub-station area have been drafted to avoid all impacts to woodland vegetation.

This report outlines the measures taken to avoid and minimise impacts to native vegetation present within the Development Site and methodologies to minimise impacts during construction and operation of the development. No Serious and Irreversible Impacts (SII) are likely to result from the construction of the solar farm.

Following consideration of all the above aspects, the residual unavoidable impacts of the project were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit Calculator (BAMC). This is based on the clearing of all vegetation within the development site, which is a conservative estimation given the likely outcomes of a solar farm development, which will allow grassland communities to persist in the future. The BAMC calculated based on a worst case scenario, is precautionary in nature, and that no ecosystem credits are required to offset the unavoidable impacts to native vegetation present on the development site. Based on the assumed presence of the species credits identified above, three (3) species credits would be required for impacts to threatened species habitat.



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## Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DNG	Derived Native Grassland
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FM Act	NSW Fisheries Management Act 1994
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW Water Management Act 2000



## 1. Stage 1: Biodiversity assessment

### 1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Alex Pursche (BAAS17021), who is an Accredited Person under the NSW Biodiversity Conservation Act 2016 (BC Act). The contents of this BDAR complies with the minimum requirements outlined in the BAM.

#### 1.1.1 General description of the development site

The development site is located across two private properties, which includes portions of Lot 3 DP1206469, Lot 3 DP786950, and Lot 13 DP822753. The development site is predominately cleared of remnant native vegetation, with only poor condition grasslands remaining. The only remaining woodland vegetation is situated within the proposed substation site, consisting of scattered *Eucalyptus calliginosa* (Broad-leaved Stringybark). The property consists of rolling hills ranging from 900 to 1030 m above sea level with no sharp changes in topography. The majority of the site is covered in basalt clays with some emergent granite outcrops along ridgelines. The condition of the site was relatively poor due to the ongoing lack of rainfall and historic landuse, with evidence of erosion in gully areas. An example of the current site condition is shown in Photograph 1. This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2).



**Photograph 1** Current site condition within the array area

### 1.1.2 Development site footprint

The proposed solar farm would consist of Photovoltaic (PV) panels, which would have a combined capacity of approximately 30 megawatts (MW). The final size being dependent on a combination of factors:

- Environmental Impact Assessment;
- Solar Design Assessment;
- Grid availability; and
- Power Purchase Agreement.

This BDAR has been applied in a way that gives a degree of flexibility to the size constructed and assessed the greater footprint of the project.

PV panels produce Direct Current (DC) electricity which would be converted to Alternating Current (AC) at a number of central inverters, which would likely have a capacity of around 2-2.5MW each. Each inverter and its associated electrical infrastructure would likely be housed in a unit with the appearance and size of a 20ft sea container and would be on concrete foundations. This arrangement would result in a number of solar 'blocks' or individual arrays the nominal size of each inverter, combining to make up the solar farm. Although individual blocks would not necessarily be visible, nor the same shape, each block would contain the same number of panels. There would be circuit breakers placed on each string of the DC circuit (coming from each block) allowing individual blocks to be isolated. At this point AC power would be stepped up to a Medium Voltage (MV) to transport power to the onsite substation.

Grid connection would be a 'T-Connection' into the 66kV lines that run west to east adjacent to the site. A T-Connection is a direct connection into the line. Connection would involve the construction of an onsite modular substation close to the connection point. The substation would contain transformers that would step up the electrical output of the inverters (likely between 22 and 33kV) to transmission voltage at 66KV, as well as switch gear located on the solar farm side of the transformers. The switch gear would enable the solar farm to be isolated and provide protection to both the transmission system and solar farm in case of fault. The substation(s) may include communications' equipment as well as parking spaces. The exact point or points of connection and footprint of the substation(s) is currently the focus of a feasibility study with the grid operator, however it is assumed that the combined footprint of the substation areas would not be more than 1.5 ha.

The development site footprint has undergone several iterations with the view to reduce, where possible, the impacts to biodiversity, whilst maintaining a functional solar farm. The development site footprint was initially proposed during an initial assessment in November 2018. This initial footprint was reviewed prior to formal field assessments as part of this BDAR. A revised footprint (Development Footprint) was proposed and this was the subject of the field assessments. Following field assessment, the footprint was further refined to provide a final footprint for the project. The progression of the development site footprint, as well as the final footprint proposed within this BDAR is shown on Figure 4.

### 1.1.3 Entry intersection upgrade at Gara Road

The design requirements for the intersection upgrade at Gara Road (Photograph 2) have not been provided, but will be required to be designed into the project prior to construction. This has not been



factored into this final biodiversity assessment as the upgrade of the intersection may not require any impacts to biodiversity.

Should additional clearing of vegetation or threatened species habitat be required, an increase in the credit requirement commensurate to the area of clearing would be necessary.



**Photograph 2** Approximate location of solar farm entry point off Gara Road.

#### 1.1.4 Intersection upgrade at Gara Road and Grafton Road

The design requirements for the intersection upgrade at Gara Road and Grafton Road (Photographs 3 & 4) have not been provided, but will be required to be designed into the project prior to construction. This has not been factored into this final biodiversity assessment. Depending on the nature of the required upgrade to the intersection, there may be no impacts to biodiversity should the existing intersection be sufficient. Given the proximity of high quality vegetation around the intersection, any widening of the road in this location will impact on Box Gum Woodland as listed under the BC Act and EPBC Act.

Should additional clearing of vegetation or threatened species habitat be required, an increase in the credit requirement commensurate to the area of clearing would be necessary. It is understood that through traffic management impacts to biodiversity can be completely avoided at this intersection.





**Photograph 3 Gara Road and Grafton Road Intersection**



**Photograph 4 Box Gum Woodland nearby to the Gara Road and Grafton Road intersection**

#### 1.1.5 Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification
- Bionet Atlas
- Threatened Biodiversity Data Collection
- Species Profile and Threats Database (Department of the Environment and Energy).



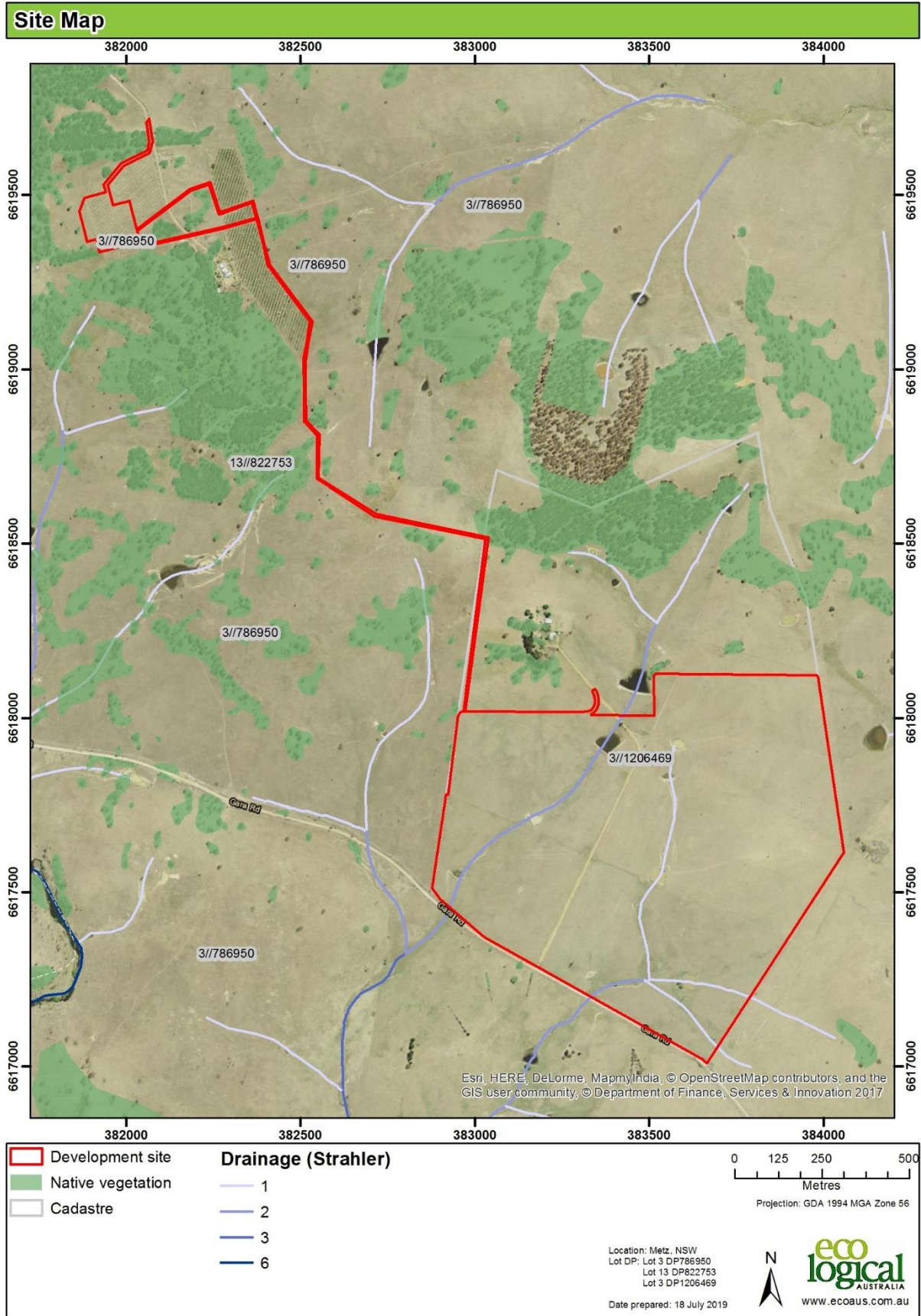


Figure 1: Site Map



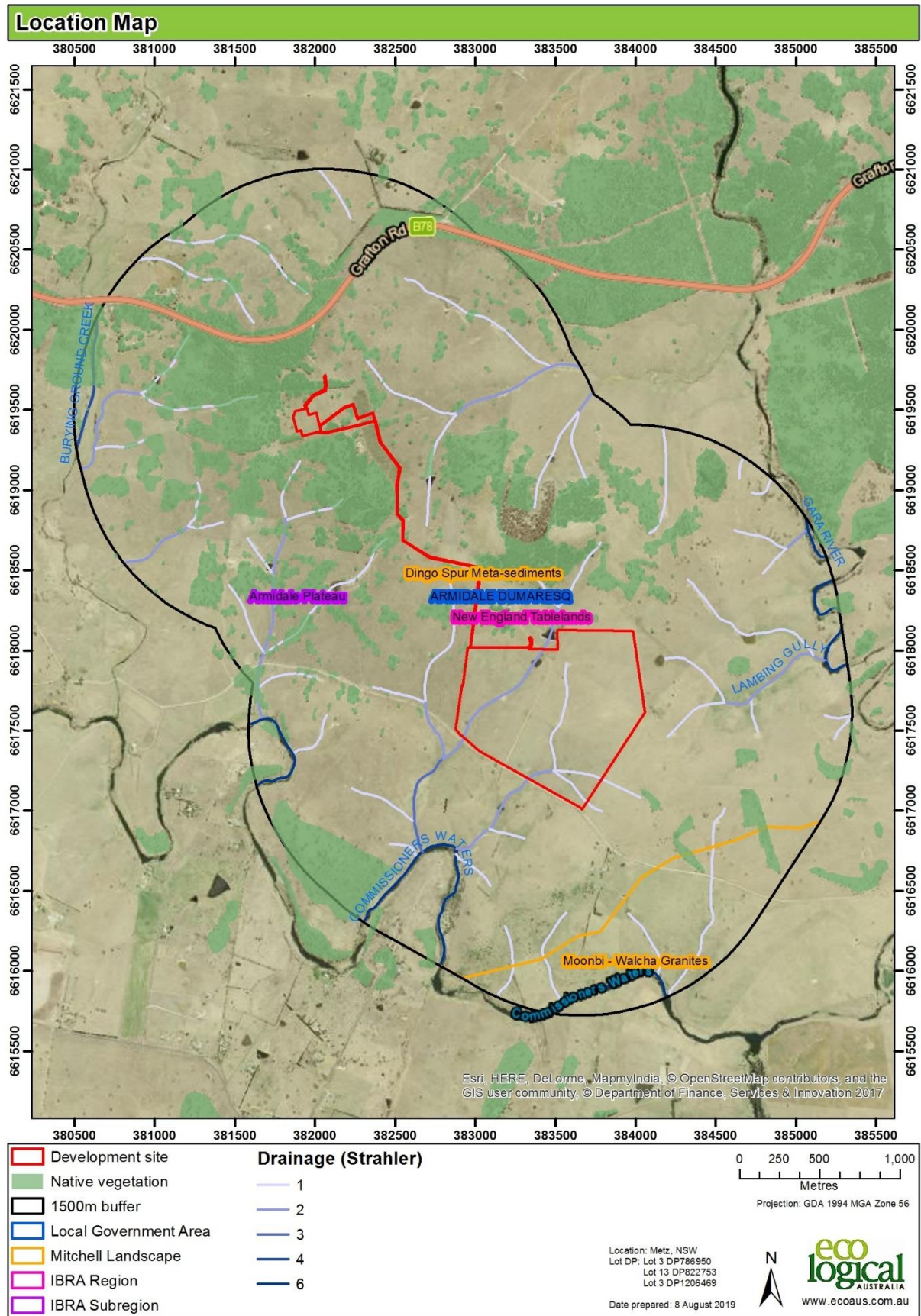


Figure 2: Location Map



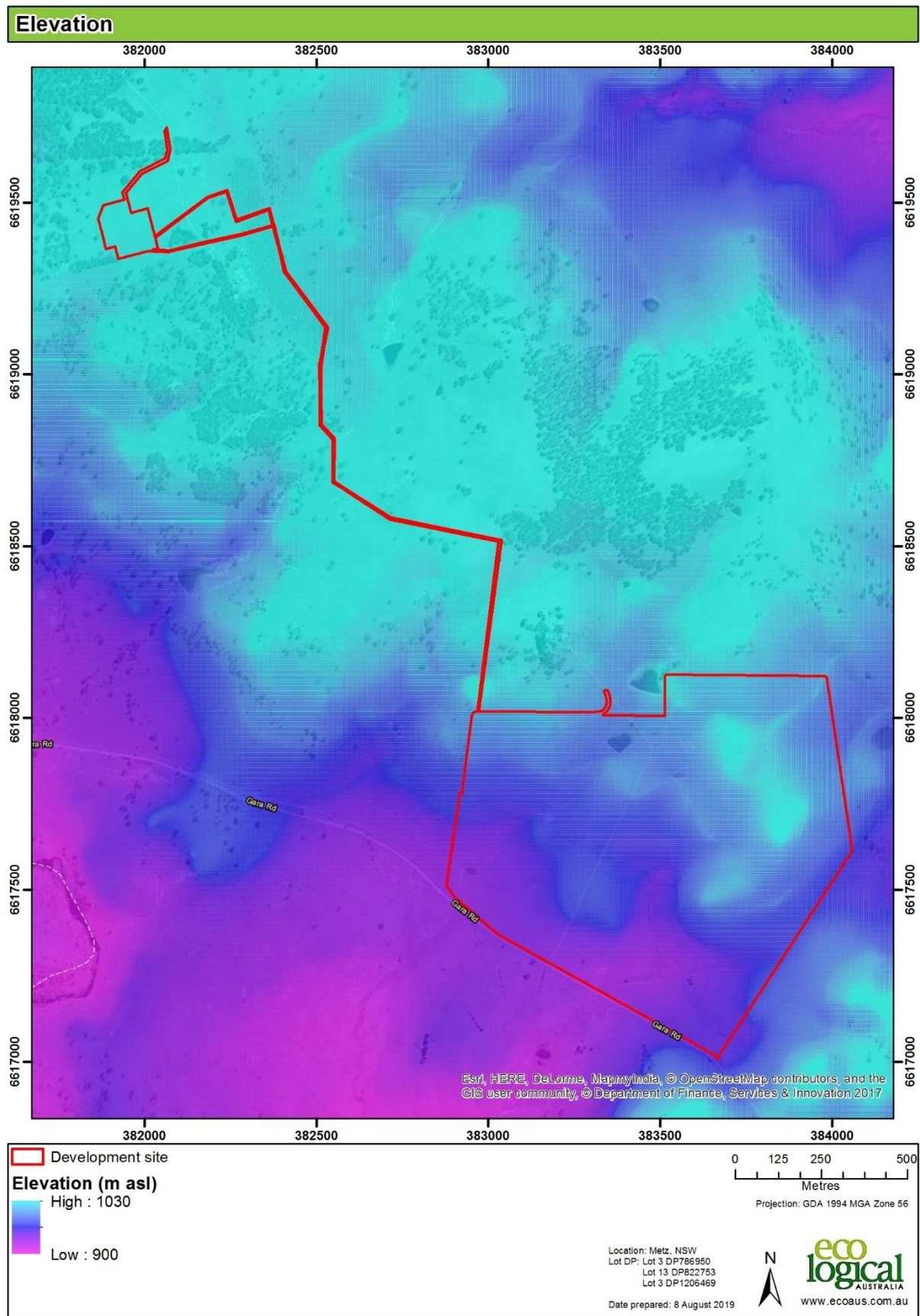


Figure 3 Site elevation







## 1.2 Legislative context

Table 1: Legislative context

Name	Relevance to the project	Report Section
<b>Commonwealth</b>		
<b><i>Environmental Protection and Biodiversity Conservation Act 1999</i></b>	Matters of national Environmental Significance have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES.	2.5
<b>NSW</b>		
<b><i>Environmental Planning and Assessment Act 1979</i></b>	The proposed development requires consent under the (Armidale Dumaresq Local Environmental Plan (LEP) and is to be assessed under Part 4 of the EP&A Act.	n/a
<b><i>Biodiversity Conservation Act 2016</i></b>	The proposed development exceeds the BAM threshold and requires submission of a Biodiversity Development Assessment Report.	
<b><i>Fisheries Management Act 1994</i></b>	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.	n/a
<b><i>Local Land Services Amendment Act 2016</i></b>	The LLS Act does not apply this development.	n/a
<b><i>Water Management Act 2000</i></b>	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.	n/a
<b>Planning Instruments</b>		
<b><i>SEPP 44 – Koala Habitat Protection</i></b>	The proposed development does not impact on core koala habitat as defined by SEPP 44.	n/a
<b><i>Armidale Dumaresq Local Environment Plan</i></b>	The subject site is zoned RU1 Primary Production under the Armidale Dumaresq LEP.	n/a
<b><i>Armidale Dumaresq Development Control Plan (DCP)</i></b>	The Armidale Dumaresq DCP does not contains provisions relating to native vegetation.	n/a

## 1.3 Landscape features

### 1.3.1 IBRA regions and subregions

The development site falls within the IBRA region and subregions as outlined in Table 2.

The development site occurs wholly within the New England Tablelands Bioregion. The New England Tableland Bioregion has an area of 3,004,202 ha of which 2,860,758 ha or 95.23 per cent lies within NSW. This bioregion is one of the smaller bioregions in NSW, occupying 3.57 per cent of the state.

This bioregion lies between the North Coast and Nandewar bioregions in north-east NSW, extending north just into Queensland. In NSW, the bioregional boundary extends from north of Tenterfield to south of Walcha and includes towns such as Armidale and Guyra, with Inverell just outside the boundary. The

bioregion includes parts of the MacIntyre, Clarence, Gwydir, Macleay, Namoi and Manning River catchments.

The development site occurs wholly within the Armidale Plateau IBRA subregion. The geology within this subregion is typified by fine grained Permo-Carboniferous sedimentary rocks, granites and multiple Tertiary basalt flows. Characteristic landforms within this region include undulating to hilly plateaus up to 1100 m above sea level. The landscape is stepped across basalt flows and broad valleys, steepening to the east at the head of Great Escarpment gorges.

Vegetation within this subregion includes *E. viminalis* open forest and woodland with *Eucalyptus pauciflora* and *Eucalyptus stellulata* on basalt. Regionally, cold air drainage influence inverts the tree patterns in wide valleys. *Eucalyptus caliginosa*, *E. melliodora*, *E. blakelyi*, *A. floribunda*, and *E. bridgesiana* occurs on sedimentary rocks. *Eucalyptus laevopinea* occurs on dry aspects, and *E. blakelyi*, *E. melliodora*, and *E. bridgesiana* occur on moist, well-drained slopes. *Eucalyptus novo-anglica* occurs concurrently with *E. viminalis* on flats.

**Table 2: IBRA regions**

IBRA regions and subregions	Area within development site
Region: New England Tablelands	100%
Subregion: Armidale Plateau	100%

### 1.3.2 Native vegetation extent

The extent of native vegetation within the development site and buffer is outlined in Table 3.

**Table 3: Native vegetation extent**

Area within the development site (ha)	Area within the 1,500 m buffer area (ha)
0.0	324

There are differences between the mapped vegetation extent and the aerial imagery for the following reasons:

- Recently cleared land north of the Development Site within the adjacent Armidale Waste Management Facility has not been mapped as native vegetation

### 1.3.3 Rivers and streams

The development site does not contain any rivers or streams. There are several unnamed drainage lines within the paddocks that are mapped as 1<sup>st</sup> and 2<sup>nd</sup> order streams (Figure 2).

### 1.3.4 Wetlands

The development site does not contain any wetlands.

### 1.3.5 Connectivity features

The development site does not contain any connectivity features.

### 1.3.6 Areas of geological significance and soil hazard features

The development site does not contain areas of geological significance and soil hazard features.

### 1.3.7 Site context

#### 1.3.7.1 Method applied

The site based method has been applied to this development.

#### 1.3.7.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps using increments of 5% at a scale of 2500:1. The results of this analysis are shown in Table 4.

**Table 4: Percent native vegetation cover in the landscape**

Area within the development site (ha)	Cover within the 1,500 m buffer area (%)
0.00	324 ha vegetation out of 2249 ha (14%)

#### 1.3.7.3 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. Due to connectivity with adjacent areas of remnant vegetation, the patch size for this assessment has been calculated as 101 ha.

## 1.4 Native vegetation

### 1.4.1 Survey effort

Preliminary vegetation mapping was undertaken by Alex Pursche on 6 November 2018. The purpose of the initial vegetation mapping survey was to broadly identify the extent and type of PCTs present within the initial investigation area. The preliminary vegetation mapping was used to refine the development site boundary to avoid areas of high biodiversity value within the investigation area.

Vegetation integrity surveys were undertaken within the development site by ELA ecologists Alex Pursche and David Allworth from April 2 – April 5 2019. Vegetation surveys were conducted concurrently with the surveys for the nearby proposed Olive Grove Solar Farm, and plot data has been used across both projects where appropriate.

A total of 12 full-floristic vegetation plots were surveyed to identify PCTs and TECs on the development site (Table 5). A total of 12 vegetation integrity plots were undertaken on the development site in accordance with the BAM (Table 6).

All field data collected at full-floristic and vegetation integrity plots is included in Appendix B.

**Table 5: Full-floristic PCT identification plots**

PCT ID	PCT Name	Number of plots surveyed
510	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	4
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	8

Table 6: Vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area (ha)	Plots required	Plots surveyed
1	510	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	Poor condition grassland	45.23	4	4
2	568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Poor condition grassland	46.63	5	7
Dams, roads, sheds, and planted vegetation			Cleared land	3.00	0	0
<b>Total</b>				<b>94.73</b>	<b>10</b>	<b>12</b>

#### 1.4.2 Plant Community Types present

The development site is almost entirely occupied by native/exotic grasslands. The location of panel array areas is exclusively poor condition grasslands that are dominated by the exotic *Paspalum dilatatum* (Paspalum), *Setaria pumila* (Pale Pigeon Grass), and *Plantago lanceolata* (Lamb's Tongue). Native ground covers present include *Poa siberiana* (Snow Grass), *Sporobolus creber* (Slender Rats Tail Grass), and *Bothriocloa macra* (Red Grass).

Plant community type mapping relied on those woodland and forest PCTs which were present outside the development site. The most common PCT present locally is PCT 568 Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion, which occurs on hillslopes and ridges within the Armidale Region. Other PCTs present locally include:

- 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland
- 734 Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tableland Bioregion
- 1331 Yellow Box - Broad-leaved Stringybark shrubby open forest of the New England Tableland Bioregion

Vegetation within the panel array component of the development site is degraded such to a point that it is unlikely to recover into anything resembling any of the above listed PCTs. For the purposes of this assessment, elevation modelling for the site has been used to differentiate the PCTs present within grasslands areas. At higher elevations above 950m, it has been allocated to PCT568 for vegetation integrity assessment, which is consistent with remnant vegetation locally. At elevations lower than 950m, PCT510 has been allocated, which is representative of vegetation occurring in lower lying areas. Due to the degraded condition of the site, there is no 'on-ground' differentiation of the grassland components of these PCTs present.

ELA notes that in accordance with the Vegetation Information System database, neither PCT510 or PCT568 occur as derived communities. An example of the remnant patches of *E. caliginosa* and proximity to array areas is shown in Photograph 5.





**Photograph 5** Panel array areas of Stringybark Solar Farm, with remnant patches of *Eucalyptus caliginosa*

Outside of the panel array area, the substation and connection line options cross open grasslands between remnant patches of PCT568, as well as cleared land and planted vegetation around the homestead area. The Substation is located in a small clearing with modified grasslands. There are no areas of woodland within the development site.

**Table 7: Plant Community Types**

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared
510 (Poor condition grassland)	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	New England grassy Woodlands	Grassy Woodlands	45.23	79%
568 (Poor condition grassland)	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	46.63	59%

### 1.4.3 Threatened Ecological Communities

PCT510 can occur as a listed Threatened Ecological Community (TES) under either the NSW BC Act as *White box yellow box Blakely's red gum woodland* or the Commonwealth EPBC Act as *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Together these TECs are

referred to as 'Box Gum Woodland'. Under the BC Act, PCT510 is considered an EEC when it contains a portion of the required assemblage of species under Section 3 of the Final Determination for this TEC. Poor condition grasslands within the development site contain several species which are listed as characteristic species including *B. macra*, *Dichelachne micrantha*, *P. siberiana*, and *Rumex brownii*. There are no trees, logs, stumps, or regeneration, and the site is currently heavily grazed by sheep. Under section 10 of the Final Determination, only patches of the TEC that would respond to assisted natural regeneration, where the seed bank is at least partially intact are considered to be the TEC. When considering this limiting component of the TEC listing, it is unlikely that the development site would respond to assisted natural regeneration given the extremely low cover and diversity of characteristic species. As a precautionary measure, vegetation zone 1 has been selected as a TEC in the BAM Calculator, however the assessor notes that this is a conservative decision as the site is sufficiently degraded to not likely meet the minimum requirements.

Under the EPBC Act, the Critically Endangered Ecological Community (CEEC) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box – Gum Grassy Woodland and Derived Grassland) is characterised by a species-rich understorey, and the dominance (or prior dominance) of *Eucalyptus albens*, *Eucalyptus melliodora*, or *Eucalyptus Blakelyi*. The requirement for listing under the EPBC Act is more defined than the NSW listing, requiring a minimum number of native species, native vegetation cover, or structural elements to be considered. An assessment of the vegetation within the development site was undertaken against the listing for Box – Gum Grassy Woodland and Derived Grassland using the flow chart on Page 5 of the *EPBC Act Policy Statement 3.5 White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands* (DEH, 2006). Plot data collected within areas of PCT510 indicates that the percentage of native groundcover is patchy and there are isolated patches that contain more than 50% perennial ground cover. Localised areas that do contain sufficient perennial native ground cover, are smaller than 0.1 ha, contain less than 12 native non-grass species, do not have trees or hollows, and do not contain any regeneration. As such the Commonwealth listed TEC is not present. A summary of the TECs and their status within the development site is summarised in Table 8.

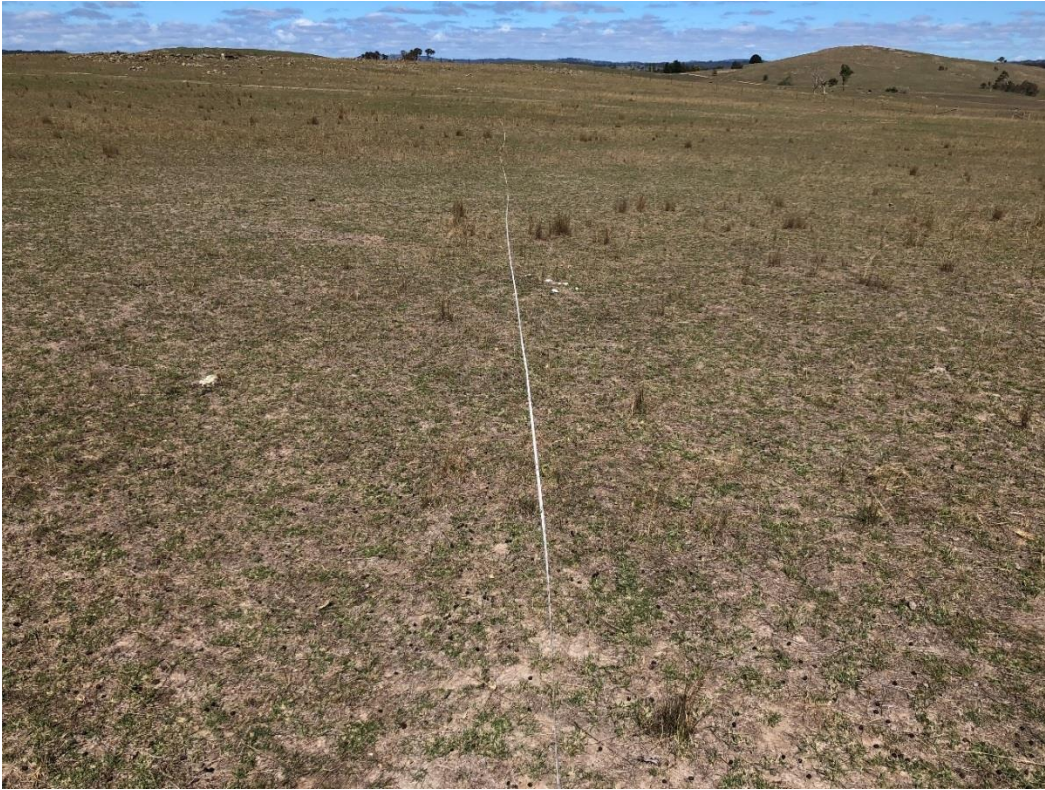
**Table 8: Threatened Ecological Communities**

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
510 (Poor condition grassland)	Unlikely to be the EEC, but conservatively selected as the TEC in the BAMC	White box yellow box Blakely's red gum woodland	45.23	No, does not meet minimum condition requirements	n/a	n/a
568 (Poor condition grassland)	Not listed	n/a	n/a	Not listed	n/a	n/a

**Table 9: PCT selection justification**

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
510 (Poor condition grassland)	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	The PCT occurs at similar elevations to the west of the development site in better condition	No indicative species identified within the development site
568 (Poor condition grassland)	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	PCT occurs widely immediately adjacent to the development site	No indicative species identified within the development site





**Photograph 6 PCT510 Poor condition grassland**



**Photograph 7 PCT568 Poor condition grassland**

#### 1.4.4 Vegetation integrity assessment

A vegetation integrity assessment using the BAMC was undertaken and the results are outlined in Table 10.

**Table 10: Vegetation integrity**

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	510 (g)	Poor condition grassland	45.23	23.4	7.4	13.5	13.3
2	568 (g)	Poor condition grassland	48.03	21.1	7.4	4	8.5



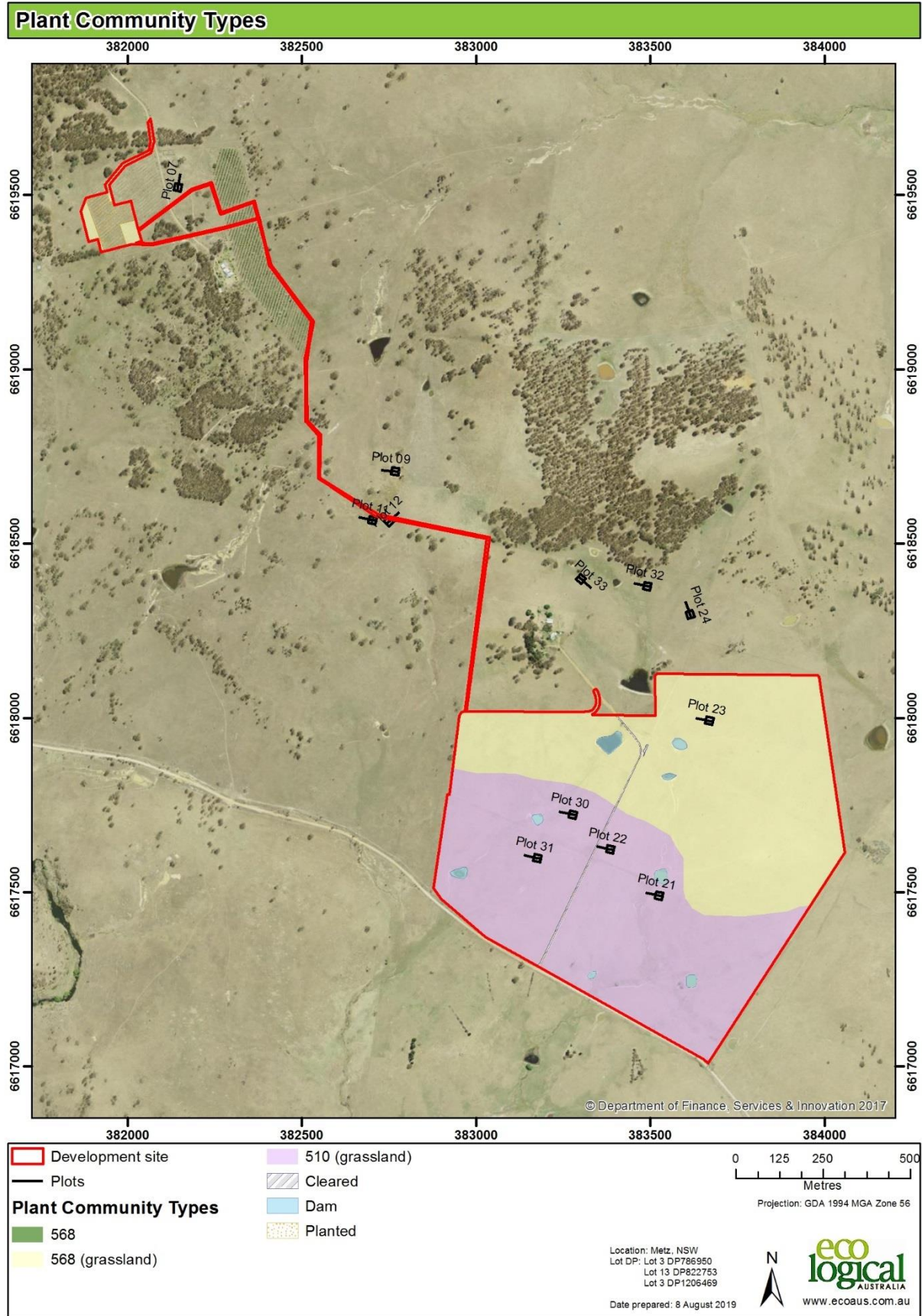


Figure 5: Plant Community Types and native vegetation extent

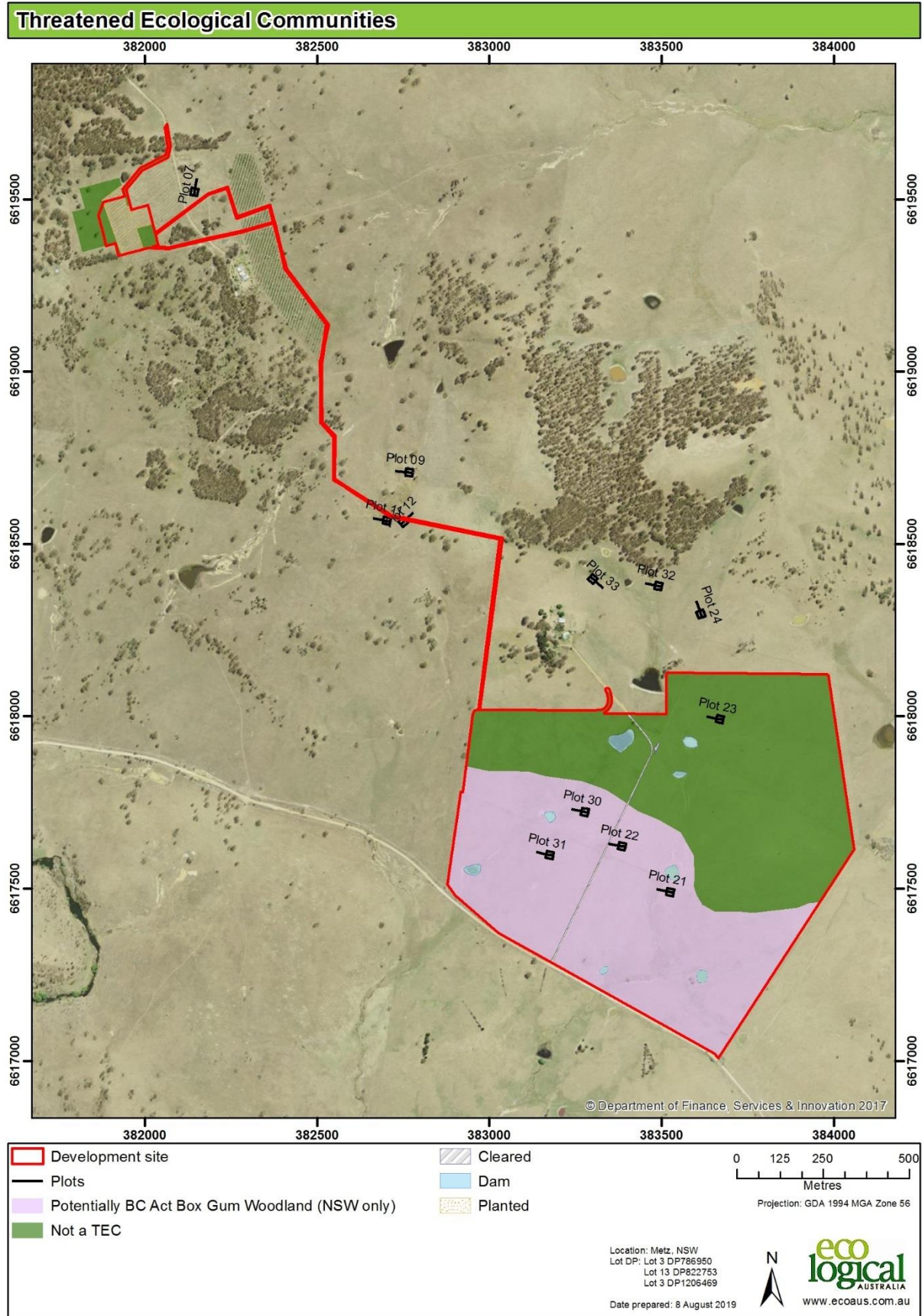


Figure 6: Threatened Ecological Communities



## 1.5 Threatened species

### 1.5.1 Fauna habitats

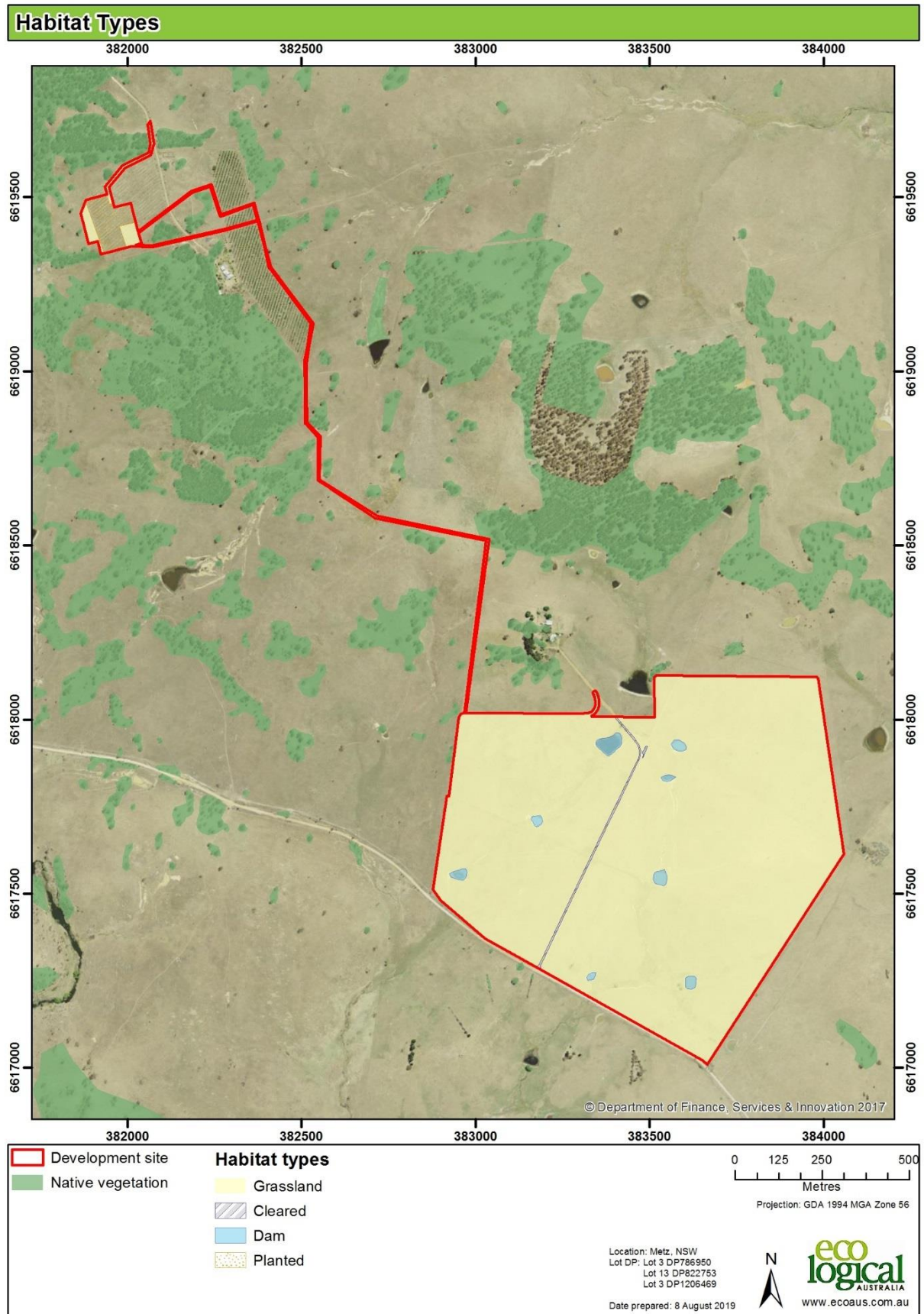
Fauna habitats within the development site are typical of a predominately cleared grazing farmland, with the available habitat features considerably degraded. The following habitat features are present within the development site:

- Woodland habitats consisting of four scattered paddock trees at the substation site
- Grassland habitats consisting of low condition native and exotic pastures
- Farm dams with no emergent vegetation

Within the development site the following habitat features are not present:

- vegetated wetland areas
- hollow-bearing trees within 200m of riparian zone
- suitable hollows for breeding owls
- fallen timber or logs
- cliffs, rocky areas, overhangs, escarpments, outcrops, or crevices
- old mines or tunnels within 2km
- Flying-fox camps
- Stick nests
- Important habitat for Regent Honeyeaters or Swift Parrots

A map of the habitat types available within the development site is shown in the figure below.



**Figure 7 Habitat types****1.5.2 Ecosystem credit species**

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 11.

In accordance with Section 3.1.1.3 of the BAM, predicted species have been omitted from vegetation zones with vegetation integrity scores < 15 of EECs, and vegetation scores < 20 for vegetation that is not an EEC.

**Table 11 Predicted ecosystem credit species**

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status
<i>Anthochaera phrygia</i>	Regent Honeyeater	Foraging habitat only	n/a	High sensitivity to potential gain	Critically endangered	Critically endangered
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	n/a	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Chthonicola sagittata</i>	Speckled Warbler	n/a	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Circus assimilis</i>	Spotted harrier	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	n/a	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Daphoenositta chrysoptera</i>	Varied Sittella	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	n/a	n/a	High sensitivity to potential gain	Vulnerable	Endangered
<i>Glossopsitta pusilla</i>	Little Lorikeet	n/a	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Grantiella picta</i>	Painted Honeyeater	Mistletoes present at a density of greater than five mistletoes per hectare	n/a	Moderate sensitivity to potential gain	Vulnerable	Vulnerable



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Hieraaetus morphnoides</i>	Little Eagle	Foraging habitat only	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Lathamus discolor</i>	Swift Parrot	Foraging habitat only	n/a	Moderate sensitivity to potential gain	Endangered	Critically Endangered
<i>Lophoictinia isura</i>	Square-tailed Kite	Foraging habitat only	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Neophema pulchella</i>	Turquoise Parrot	n/a	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Ninox connivens</i>	Barking Owl	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Ninox strenua</i>	Powerful Owl	Foraging habitat only	within 5 km buffer of Macleay Gorges subregion	High sensitivity to potential gain	Vulnerable	Not listed
<i>Petroica boodang</i>	Scarlet Robin	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Petroica phoenicea</i>	Flame Robin	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Phascolarctos cinereus</i>	Koala	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Vulnerable
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Vulnerable

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	n/a	n/a	High sensitivity to potential gain	Vulnerable	Not listed
<i>Stagonopleura guttata</i>	Diamond Firetail	n/a	n/a	Moderate sensitivity to potential gain	Vulnerable	Not listed
<i>Tyto novaehollandiae</i>	Masked Owl	Foraging habitat only	n/a	High sensitivity to potential gain	Vulnerable	Not listed

Ecosystem credit species which have been excluded from the assessment and relevant justification is included in Table 12. No other ecosystem credit species have been removed from the BAMC.

**Table 12: Justification for exclusion of predicted ecosystem credit species**

Species	Common Name	Justification for exclusion of species
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	The species feeds exclusively on Casuarina and Allocasuarina fruits, both of which are absent from the development site.
<i>Ninox strenua</i>	Powerful Owl	The development site is not within 5km of the Macleay Gorges IBRA sub-region
<i>Phascolarctos cinereus</i>	Koala	The species is not known to feed on <i>Eucalyptus caliginosa</i> , which is the only canopy species present within the development site

## 1.6 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 13..

Based on an assessment of habitat constraints, geographic limitations, and site degradation, the following flora species have been considered for further assessment:

- *Dichanthium setosum*

All other species have been excluded from assessment as described in the tables below.

Table 13 Candidate threatened fauna species credits

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Adelotus brevis</i> - endangered population	Tusked Frog population in the Nandewar and New England Tableland Bioregions	No data provided in TSPD	No data provided in TSPD	Very high sensitivity to potential gain	EP		Coast and adjacent ranges from central Qld to southern NSW. Now very rare in the New England Tableland and North West Slopes area. They remain more common in lower elevation coastal areas.	Rainforests, wet forests and flooded grassland and pasture. Usually found near creeks, ditches and ponds.	Call while hidden amongst vegetation or debris.	Given the species is a limited population any impacts from development could be serious and irreversible.	Not important	4.7 km south of the development site at Blue Hole Picnic Area in Oxley Wild National Park	<u>Excluded.</u> The habitat requirements of the species does not occur within the development site. As such the site is considered to be too degraded for this species.
<i>Anthochaera phrygia</i>	Regent Honeyeater (Breeding habitat)	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	CE	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).	Two of three known key breeding areas are in NSW: the Capertee Valley and Bundarra-Barraba region. The species breeds between July and January and usually nests in horizontal branches or forks in tall mature eucalypts and Sheoaks. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes.	The species is a dual credit species, mapped important areas are a species credit, these areas do not require survey and any impact from development could be potentially serious and irreversible. Ecosystem credit areas are unlikely to be potential serious and irreversible impacts.	Not important	1.2 km to the east of the development site along Gara River from 2000.	<u>Excluded.</u> there are no areas of important habitat mapped for this species on the development site.



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Burhinus grallarius</i>	Bush Stone-curlew	Fallen/standing dead timber including logs		High sensitivity to potential gain	E		In NSW, found sporadically in coastal areas, and west of the divide throughout the sheep-wheat belt.	In NSW, it occurs in lowland grassy woodland and open forest.	It forages nocturnally in irrigated paddocks, grasslands, woodlands, domestic gardens, saltmarsh, mangroves, and playing fields. Feeds on a wide variety of invertebrates, seeds, small fruit, crustaceans, molluscs, frogs, lizards, snakes and mice. It roosts during the day in or near woodland remnants amongst fallen timber or ground litter. The nest site is typically in or near the edge of open grassy woodland or within a cleared paddock, and the breeding season is between spring and early summer.	Species is mainly found in western slopes and plains and the Riverina, smaller numbers on Central and North Coast with increasing numbers in Tweed Valley. It may be easier to detect during breeding season, possibly calls all year, but it is unclear how well it responds to playback. The species was allocated to a species credit as experts determined that it can not be predicted to occur at a site based on vegetation surrogates but can be detected reliably from survey.	Important	11 km NW of the development site.	<u>Excluded</u> , as there are no fallen dead timber on the gorund within the development site. The site is considered too degraded for this species.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo (breeding)	<u>Breeding:</u> Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. <u>Foraging:</u> Presence of Allocasuarina and casuarina species		Very high sensitivity to potential gain	V		In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina.	Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	Feeds almost exclusively on the seeds of several species of she-oak ( <i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	Note that the species may need larger patches and more intact landscapes for breeding.	Important	11 km NW	<u>Excluded.</u> Only four trees within the development site, none of which contain hollows.
<i>Cercartetus nanus</i>	Eastern Pygmy Possum			High sensitivity to potential gain	V		In NSW it extents from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes.	Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes. Also eats soft fruits and insects. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, <i>Pseudocheirus peregrinus</i> (Ringtail Possum) dreys or thickets of vegetation. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. Frequently spends time in torpor especially in winter.		Not important	33 km east in Oxley Wild National Park	<u>Excluded,</u> as the site does not contain any Banksia or Callistemon species suitable for feeding. Any habitat available (such as stumps or holes in the ground) are isolated by hundreds of meters across low condition grassland. As such the species is excluded as the site it too degraded.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Cliffs. Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels		Very high sensitivity to potential gain	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	"Roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces. It also possibly roosts in the hollows of trees. The species is thought to require roosting habitat that is adjacent to higher fertility sites which are used for foraging. This species probably forages for small, flying insects below the forest canopy.	The species is a full species credit because it can not be reliably predicted to occur on a site based on vegetation and other landscape features (either foraging or breeding). Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings.	Not important	97 km north of the development site	<u>Excluded</u> as the development site does not contain suitable breeding or foraging habitat. This species has been excluded from further assessment.



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle (breeding)			High sensitivity to potential gain	V		Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia.	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	The breeding season extends from June to January (or sometimes February) in southern Australia. Breeding habitat is usually close to water, but may occur up to a kilometre away. Nests are mainly located in tall open forest or woodland, but sometimes in other habitats such as dense forest, closed scrub or in remnant trees on cleared land. The White-bellied Sea-Eagle feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal.	The species is highly selective in nesting locations. Breeding habitat is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period.	Important	13 km to the south of the development site	<u>Excluded</u> , there are no stick nests present within the development site.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Hieraaetus morphnoides</i>	Little Eagle (breeding)			Moderate sensitivity to potential gain	V		Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment.	Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	Paddock trees can provide important breeding habitat (there are examples of nest trees in ACT). Breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy.	Important	Records in adjacent Waste Management Facility	<u>Excluded</u> , there are no stick nests present within the development site.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake			High sensitivity to potential gain	V		In NSW, it occurs from the coast to the western side of the Great Divide as far south as Tuggerah. Historically recorded west to Mungindi and Quambone on the Darling Riverine Plains, across the North West Slopes, and the New England Tablelands.	Dry eucalypt forests and woodlands, cypress forest, rainforest and moist eucalypt forest.	<p>The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows.</p> <p>In drier environments, it appears to favour habitats close to riparian areas.</p> <p>Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees.</p> <p>The main prey is tree frogs although lizards and small mammals are also taken.</p> <p>The Pale-headed Snake is well-adapted to climbing trees.</p>	Survey should be undertaken 1-2 days after rainfall and on humid nights. Average offspring is 4.7, but females breed only every second or third year or less frequently.	Important	No records from the New England Tablelands IBRA region	<u>Excluded.</u> The site is does not contain the foraging resources for this species, and any sheltering sites are significantly separated. As such the site is considered too degraded for the species.



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Lathamus discolor</i>	Swift Parrot (breeding)			Moderate sensitivity to potential gain	E	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.	Box-ironbark forests and woodlands.	Favoured feed trees include winter flowering species such as <i>Eucalyptus robusta</i> (Swamp Mahogany), <i>Corymbia maculata</i> (Spotted Gum), <i>C. gummifera</i> (Red Bloodwood), <i>E. sideroxylon</i> (Mugga Ironbark), and <i>E. albens</i> (White Box). Commonly used lerp infested trees include <i>E. microcarpa</i> (Inland Grey Box), <i>E. moluccana</i> (Grey Box) and <i>E. pilularis</i> (Blackbutt). Following winter they return to Tasmania where they breed from September to January.	Only present in non-breeding season; present in northern NSW for a shorter period than southern NSW. The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do NOT require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts.	Important	6km to the west of the development site	<u>Excluded.</u> there are no areas of important habitat mapped for this species on the Development Site.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Litoria subglandulosa</i>	Glandular Frog			Very high sensitivity to potential gain	V		Occurs on the eastern escarpment of the Great Dividing Range from the “The Flags” near Walcha north to Girraween National Park.	Along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps	Breeding occurs in summer, and possibly in spring.	Detection by male calling is most effective in spring, outside of this time males may call for very short periods at dusk and detection is very difficult. Surveys need to be undertaken within set distance from permanent waterbodies and at specified temperatures. Whilst there is no quantitative evidence on the impacts of chytrid on the species is it implied from repeat surveys and significant range reduction.	Not important	3.3 km south of the development site near Gara River	<u>Excluded</u> . The habitat features present are too degraded for this species.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Lophoictinia isura</i>	Square-tailed Kite (breeding)			Moderate sensitivity to potential gain	V		In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast.	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	It is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100km2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites.	Not important	5.1 km west of the development site	<u>Excluded</u> , there are no stick nests present within the development site.



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat (breeding)	<u>Breeding habitat:</u> Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500		Very high sensitivity to potential gain	V		In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga.	Rainforest, wet and dry sclerophyll forest, open woodland, paperbark forests and open grassland.	It forages above and below the tree canopy on small insects, especially moths. The bats congregate at the same maternity roosts each year to give birth and rear young. In the southern part of the species' range this occurs during spring. Maternity roosts may be located in caves, abandoned mines, concrete bunkers and lava tubes. Over-wintering roosts used outside the breeding period include cooler caves, old mines, and stormwater channels, under bridges and occasionally buildings.	Any impacts on breeding habitat could be considered potentially serious and irreversible. This species is retained as dual credit because foraging habitat is broad ranging but breeding habitat is highly specific. Potential breeding habitat is caves, tunnels, mines or other structures known or suspected to be used by <i>M. schreibersii oceanensis</i> .	Not important	Records in adjacent tip site	<u>Excluded</u> , there are no suitable habitat features for this species, as such the site is considered too degraded.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Myotis macropus</i>	Southern Myotis	Hollow bearing trees; within 200m of riparian zone/other; Bridges, caves or artificial structures within 200m of riparian zone		High sensitivity to potential gain	V		In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers.	Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage  Forage over streams and pools catching insects and small fish by raking their feet across the water surface.  In NSW females have one young each year usually in November or December.	The species was allocated to species credit because it is dependent on waterways with pools of 3m wide or greater for foraging (which will be protected under legislation), habitat surrounding waterways is used for breeding and roosting.	Important	15km north of the development site from 1997	<u>Excluded:</u> There are no woodland or forest vegetation types within the development site that are within suitable proximity to water
<i>Ninox connivens</i>	Barking Owl (breeding)			High sensitivity to potential gain	V		Wide but sparse distribution in NSW, avoiding the most central arid regions. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests.	Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	It roosts in dense shaded foliage in large trees. Nesting occurs in hollows in large, old eucalypts, either living or dead. The nesting season is during mid-winter and spring, but may vary between pairs and from year to year. The Barking Owl preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but also takes birds, invertebrates and terrestrial mammals.	Breeding can be identified by suitable habitat AND 1. presence of male and female or 2. calling to each other (duetting) or 3. find nest or 4. existing breeding habitat identified. Uses paddock trees to extend foraging area from intact woodland.	Important	16km north of the Development Site from 1990	<u>Excluded.</u> There are no hollow-bearing trees with a sufficient hollow for the species to breed.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Ninox strenua</i>	Powerful Owl (breeding)		Within 5km buffer of Macleay Gorges subregion	High sensitivity to potential gain	V		In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains.	Woodland, open sclerophyll forest, tall open wet forest and rainforest.	It roosts by day in dense vegetation comprising species such as <i>Syncarpia glomulifera</i> (Turpentine), <i>Allocasuarina littoralis</i> (Black She-oak), <i>Acacia melanoxylon</i> (Blackwood), <i>Angophora floribunda</i> (Rough-barked Apple), <i>Exocarpus cupressiformis</i> (Cherry Ballart) and eucalypt species. The main prey items are medium-sized arboreal marsupials. Powerful Owls nest in large tree hollows in large eucalypts that are at least 150 years old. Nesting occurs from late autumn to mid-winter.	The species can breed and forage in very small patches of vegetation, although this is hugely variable across their range. Breeding can be identified by suitable habitat AND 1. presence of male and female or 2. calling to each other (duetting) or 3. find nest or 4. existing breeding habitat identified. Note that this species does not respond as well to call-play-back and could require stagwatching and other evidence of nesting.	Not important	12.5 km west of the development site from 2016	<u>Excluded</u> . The development site is more than 5km from the Macleay Gorges subregion

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Petaurus norfolcensis</i>	Squirrel Glider			High sensitivity to potential gain	V		Widely though sparsely distributed on both sides of the Great Dividing Range in eastern Australia, from northern Qld to western Victoria.	Mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	Survey year round but sites with bipinnate acacia, autumn winter flowering trees and shrubs such as <i>Eucalyptus robusta</i> and <i>Banksia</i> sp ( <i>integrifolia</i> etc) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	Important	7.8 km west of the development site from 1995	<u>Excluded.</u> Species relies on forest and woodland vegetation which are both absent from the assessment area..



Biodiversity Development Assessment Report   Stringybark Solar Farm Pty Ltd													
Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	n/a other; Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines		Very high sensitivity to potential gain	E	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit.	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. Highly territorial and have strong site fidelity with an average home range size of about 15 ha. Breeding is likely to be continuous, at least in the southern populations, with no apparent seasonal trends in births.	Systematic faecal pellet surveys and time lapse cameras should be considered as appropriate methods of survey. Largest populations are on public land with smaller but important populations (for genetic variability and metapopulation dynamics) are located on private land.	Not important	4.5 km south of the Development site in Gara Gorge	<u>Excluded</u> . There is no suitable habitat for this species within, or nearby to the development site. As such the site is too degraded for this species.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?	
<i>Phascolarctos cinereus</i>	Koala (breeding)			High sensitivity to potential gain	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests.	Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.  Inactive for most of the day, feeding and moving mostly at night.  Spend most of their time in trees, but will descend and traverse open ground to move between trees.  Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.  Females breed at two years of age, with mating occurring between September and February.		Important' habitat is defined by the density of koalas and quality of habitat determined by on-site survey - contact OEH for more information.	Important	0.5 km north west of the development site from 1991	<u>Excluded</u> . There is no evidence of the species on the site, let alone a breeding population. As such the site is determined to be too degraded for Koala breeding habitat.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (breeding)			High sensitivity to potential gain	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and a single young is born in October or November. Can travel up to 50 km from the camp to forage. Feed on the nectar and pollen of <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Banksia</i> species, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.	This species is retained as dual credit because foraging habitat is broad ranging but breeding camps are localised and, if impacted, must be offset by protecting and enhancing another breeding camp (breeding camps will need to be identified by survey, as per OEH Guidelines). The initial search for camps should encompass any recorded camps and roosting habitat likely to occur on the subject land. If a camp is located the survey only needs to take place in the camp (that is the area occupied by the target species) to identify breeding females.	Not important	11.3 km west of the Development Site from 2008	<u>Excluded</u> , there are no camps within or nearby to the development site.



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD	Paddock trees	Nearest record in BioNet	Further assessment?
<i>Tyto noceahollandiae</i>	Masked Owl (breeding)			High sensitivity to potential gain	V		Recorded over approximately 90% of NSW, excluding the most arid north-western corner. Most abundant on the coast but extends to the western plains.	Dry eucalypt forests and woodlands from sea level to 1100 m.	Often hunts along the edges of forests, including roadsides.  The typical diet consists of tree-dwelling and ground mammals, especially rats.  Pairs have a large home-range of 500 to 1000 hectares.  Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Patch size selected is based on that fact that the species will use areas that are quite small, especially as foraging habitat but also as roosting habitat and occasionally as breeding habitat. In Tas and Vic Masked owls have been recording nesting in paddock trees.  Note that the species has been found to nest in caves in Tasmania (and maybe the Nullabor?) but there is no evidence to suggest that this occurs in NSW. Dead stags are especially popular for roosting/breeding habitat and are a limited resource due to natural attrition.	Important	No records	<u>Excluded</u> . There are no hollow-bearing trees with a sufficient hollow for the species to breed.

Table 14 Candidate threatened flora species credits

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD Notes	Nearest record in BioNet	Further assessment?
<i>Bertya ingramii</i>	Narrow-leaved Bertya	Within 20m of cliffs, escarpments, or rocky areas	No data provided in TSPD	n/a	E	E	Occurs only on the New England Tablelands of NSW.	Among rocks or in thin soils close to cliff-edges in dry woodland with she-oaks, wattles and tea-trees.		An easily identifiable and detectable species all year round	5 km south east of the development site in Gara Gorge	<u>Excluded</u> , none of the development site is within 20m of cliffs, escarpments, or rocky areas.
<i>Boronia granitica</i>	Granite Boronia	Rocky areas, appropriate vegetation within 50m of granite outcrops or slabs	No data provided in TSPD	High sensitivity to potential gain	V	E	Scattered localities on the New England Tablelands and North West Slopes north from the Armidale area to the Stanthorpe district in southern Qld.	On granitic soils amongst rock outcrops, often in rock crevices, and in forests and woodlands on granite scree and shallow soils.	Important site characteristics include low precipitation and high levels of solar radiation. The largely barren substrate (e.g. granite) may help to control too frequent fire, thus allowing maturity and seed set.	Distinctive all year round.	42 km north west of the development site from 1995	<u>Excluded</u> , none of the development site is within 50m of granite outcrops or slabs.
<i>Callitris oblonga</i>	Pygmy Cypress Pine	No data provided in TSPD	East of Chandler River	High sensitivity to potential gain	V	V	The subspecies parva occurs in northern NSW on the eastern edge of the New England Tablelands and the subspecies corangensis is only known from the Corang River catchment.	In sand along watercourses in shrubland and open woodland in granite country; also drier sites, including exposed ridges.	Plants are naturally killed by flood-waters, but seed germinates readily and mature plants are quickly replaced. A fast-growing species, which is killed by fire.	Note that the 2018 review agreed that this species should no longer be listed as SAIL under principle 3, but to align BioNet with the SAIL guidance document it has been left as SAIL until the SAIL guidance is updated and this change approved.	37km km east of the development site from 1986	<u>Excluded</u> , the development site is not east of the Chandler River
<i>Chiloglottis platyptera</i>	Barrington Tops Ant Orchid	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	V	n/a	Eastern edge of the New England Tablelands, from Ben Halls Gap to east of Tenterfield, and also in the Barrington Tops area.	Tall open eucalypt forest with a grassy understorey, and rainforest edges	It generally occurs in rich brown loam soils.	No data provided in TSPD	41 km south of the Development Site from 1997	<u>Excluded</u> . This species is only known from a few discrete populations in Barrington Tops, Oxley Wild Rivers and Ben Halls Gap National Parks, Tomalla Nature Reserve, Nundle, Riamukka and Butterleaf State Forests. The current condition of the site is in a significantly different condition state to the remnant forests where the species is known to occur. This species has been excluded from assessment as it is in the opinion of the assessor that the site is too degraded.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD Notes	Nearest record in BioNet	Further assessment?
<i>Dichanthium setosum</i>	Bluegrass	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	V	V	In NSW, found on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes.	Cleared woodland, grassy roadside remnants and highly disturbed pasture, on heavy basaltic black soils and red-brown loams with clay subsoil.	Associated species include <i>Eucalyptus albens</i> , <i>Eucalyptus melanophloia</i> , <i>Eucalyptus melliodora</i> , <i>Eucalyptus viminalis</i> , <i>Myoporum debile</i> , <i>Aristida ramosa</i> , <i>Themeda triandra</i> , <i>Poa sieberiana</i> , <i>Bothriochloa ambigua</i> , <i>Medicago minima</i> , <i>Leptorhynchos squamatus</i> , <i>Lomandra</i> aff. <i>longifolia</i> , <i>Ajuga australis</i> , <i>Calotis hispidula</i> and <i>Austrodanthonia</i> , <i>Dichopogon</i> , <i>Brachyscome</i> , <i>Vittadinia</i> , <i>Wahlenbergia</i> and <i>Psoralea</i> species. Flowering time is mostly in summer.	Survey: seed head required for ID. Flowering occurs 3 - 4 weeks after rainfall. References: unpublished UNE thesis.	6.5 km NW of the development site. CHECK SAMPLES	<u>Included</u> . Due to the variety of habitats this species occurs in, and its resilience to grazing and disturbance, this species is included for the assessment.
<i>Diuris pedunculata</i>	Small Snake Orchid	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	E	E	Confined to north east NSW, now mainly found on the New England Tablelands, around Armidale, Uralla, Guyra and Ebor.	Grassy slopes or flats, on peaty soils in moist areas, on shale and trap soils, on fine granite, and among boulders.	It flowers during August-October.	General: Taxonomic status is under review. Current populations are <i>D. pallens</i> (found at altitude above 800 m). <i>D. pedunculata</i> found on lowlands around Richmond/Windsor - unsure if any extant exist.	37 km NW of development site from 1979	<u>Excluded</u> : The taxonomy of this species is currently under review, with the species found only below elevations of 800m on lowlands around Richmond and Windsor. The nearest historic record of this species is 37km to the NW of the site, and this record would more likely be <i>D. pallens</i> . This species is known from elevations from 50 - 900m. When considering the altitude of the development site (all above 1000m), the lack of nearby records (nearest 37km to the NW), and the agricultural disturbance history and current site degradation, this species has been excluded from further assessment.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD Notes	Nearest record in BioNet	Further assessment?
<i>Eucalyptus magnificata</i>	Northern Blue Box	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	E	n/a	Known in NSW from two widely separate areas on the New England Tablelands, around Hillgrove east of Armidale and in the Glen Innes and Tenterfield region.	Grassy open forest or woodland on shallow, sandy or loamy soils. Occurs on moderately hilly sites and at the edge of gorges.		General: Older records of <i>E. magnificata</i> are most likely <i>E. conica</i>	11 km east of the development site. Numerous records locally	<u>Excluded:</u> Only four trees occur within the development site which are all <i>E. caliginosa</i>
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	V	V	New England Tablelands from Nundle to north of Tenterfield.	Dry grassy woodland, on shallow soils of slopes and ridges.		Survey: Easily confused with <i>E. acaciiformis</i> and <i>E. radiata</i> . References: Hunter Mapping data. General: This species is frequently planted well outside range.	1.9 km east of the Development Site. Numerous local records. The Environmental Impact Statement for the neighbouring Waste Facility identified several plants within the TSR to the north west of the development site.	<u>Excluded:</u> Only four trees occur within the development site which are all <i>E. caliginosa</i>
<i>Haloragis exalata subsp. velutina</i>	Tall Velvet Sea-berry	No data provided in TSPD	No data provided in TSPD	Moderate sensitivity to potential gain	V	V	North coast of NSW and south-eastern Qld.	Damp places near watercourses, and woodland on the steep rocky slopes of gorges.		General: Unsure of seedbank persistence.	3.8 km south of the development site from 2013 from Oxley Wild National Park near Gara Gorge	<u>Excluded:</u> The species is known to occur along streams and damp areas in grassy woodlands. The species is known from remnant vegetation within the Oxley Wild National Park near Gara Gorge. The current condition of the site is in a significantly different condition state to the remnant forests where the species is known to occur. This species has been excluded from assessment as it is in the opinion of the assessor that the site is too degraded.
<i>Picris evae</i>	Hawkweed	No data provided in TSPD	No data provided in TSPD	High sensitivity to potential gain	V	V	In NSW, north from the Inverell area, in the north-western slopes and plains regions. Recorded from Elsmore (16 km east of Inverell), Oxley Park (Tamworth) and Dangar Falls in the Oxley Wild Rivers National Park.	Eucalyptus forest and Dichanthium grassland, roadsides and paddocks.	The flowering and fruiting period is mainly October to January, with a few plants collected in flower or fruit until May.	Survey: Fruit and bracts required for ID. Survey 2 months after soaking rain.	12.8 km SW of the development site in Dangars Gorge, Oxley Wild National Park	<u>Excluded:</u> This species has been excluded from assessment as it is in the opinion of the assessor that the site is too degraded.



Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	TSPD Notes	Nearest record in BioNet	Further assessment?
<i>Swainsona sericea</i>	Silky Swainson-pea			High sensitivity to potential gain	V	n/a	In NSW, recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. Also an isolated record from the far north-west of NSW.	Natural Temperate Grassland and Eucalyptus pauciflora (Snow Gum) Woodland on the Monaro, and Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Sometimes found in association with cypress-pines Callitris spp. Regenerates from seed after fire.	Survey: Flowers Oct & Nov on Monaro and earlier (Sep & Oct) in the Riverina. General: Dispersal not well known, selection of category based on expert assumptions based on other life history characteristics.	23.3 km NW of the development site in Duval Nature Reserve	<u>Excluded</u> : This species is known from Duval Nature Reserve, 23 km west of the development site. Other records of the species are scattered across the New England Tablelands. The current condition of the site is in a significantly different condition state to the remnant forests where the species is known to occur. This species has been excluded from assessment as it is in the opinion of the assessor that the site is too degraded.
<i>Thesium australe</i>	Austral Toadflax			Moderate sensitivity to potential gain	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands.	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Often found in association with <i>Themeda australis</i> (Kangaroo Grass). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. Flowers in spring.	References: Recovery plan 1992; Hunter, J.T. 2015. General: Species may be perennial below ground and ephemeral above ground.	10.5 km SW of development site from 1936	<u>Excluded</u> : Unlikely. This species has been excluded from assessment as it is in the opinion of the assessor that the site is too degraded.

### 1.6.1 Targeted surveys

Targeted surveys for species credit species were undertaken at the development site on the dates outlined in Table 15. The location of targeted surveys are shown on Figure 8, with the results of the surveys shown as on **Error! Reference source not found.**. Target surveys were undertaken primarily for threatened plants.

Given the current degraded condition of the site the likelihood of many threatened species was diminished.

Due to the variability in site condition, flora surveys were targeted at areas of highest likelihood of detection of threatened species. Surveys were broadly undertaken in accordance with the *NSW guide to surveying threatened plants* (OEH, 2016).

Within the area shown on Figure 8, a total of 67,842 m of survey have been undertaken across the development site (and adjacent areas). This is significantly in excess of the required survey distance for threatened flora as shown on Table 3 of the *NSW guide to surveying threatened plants* (OEH, 2016).

Surveys were conducted concurrently with surveys for the nearby Olive Grove Solar Farm.

**Table 15: Targeted surveys for threatened species**

Date	Surveyors	Target species
25 February 2019	Ronnie Hill and Eliza Biggs	<i>D. setosum</i>
26 February 2019	Ronnie Hill and Eliza Biggs	<i>D. setosum</i>
27 February 2019	Ronnie Hill and Eliza Biggs	<i>D. setosum</i>
28 February 2019	Ronnie Hill and Eliza Biggs	<i>D. setosum</i>

Weather conditions during the targeted surveys are outlined in Table 16.

**Table 16: Weather conditions**

Task	Date	Rainfall (mm)	Minimum temperature 0C	Maximum temperature 0C
Preliminary PCT mapping	6 November 2018	0	13.8	33.4
Threatened flora surveys	25 February 2019	0	11.0	5.0
	26 February 2019	0	9.5	2.8
	27 February 2019	0	9.4	4.2
	28 February 2019	0	10.1	3.8
Vegetation integrity surveys	2 April 2019	0	8.5	17.6
	3 April 2019	0.4	9.5	21.4
	4 April 2019	0	10.3	21.1

Threatened species surveys did not identify any threatened fauna species. The most commonly encountered species included *Cracticus tibicen* (Australian Magpie), *Psephotus haematonotus* (Red-

rumped Parrot), and *Cracticus nigrogularis* (Pied Butcherbird). *Manorina melanocephala* (Noisy Miner) was often observed within forest areas outside of the development site.

Threatened flora surveys identified several *D. setosum* in the western portion of the development site in two clumps (approximately 10 and 30 plants respectively) as shown in Figure 9. No other threatened flora were identified during surveys.

Following completion of targeted surveys, the species credit species included in the assessment are outlined in Table 17.

**Table 17: Species credit species included in the assessment**

Species	Common Name	Species presence	Geographic limitations	Number of individuals / Habitat (ha)	Biodiversity Risk Weighting
<i>Petaurus norfolcensis</i>	Squirrel Glider	Assumed	n/a	0.05 ha	
<i>Dichanthium setosum</i>	Bluegrass	Survey	n/a	0.51 ha	2

Species polygons were calculated for species assumed or known to be present within the development site. The mapping of species polygons was conducted by integrating fauna habitat data collected across the development site, or with species polygon guidance from the BAM, with the species requirements as described within the TSPD. A summary of the species polygon mapping methodologies is described in Table 18.

**Table 18 Species polygon rationale**

Species name	Common name	Species credit type	Species polygon methodology	Area within development site
<i>Dichanthium setosum</i>	Bluegrass	Area	All grassland within 30m of the occurrence of the species	0.50 ha

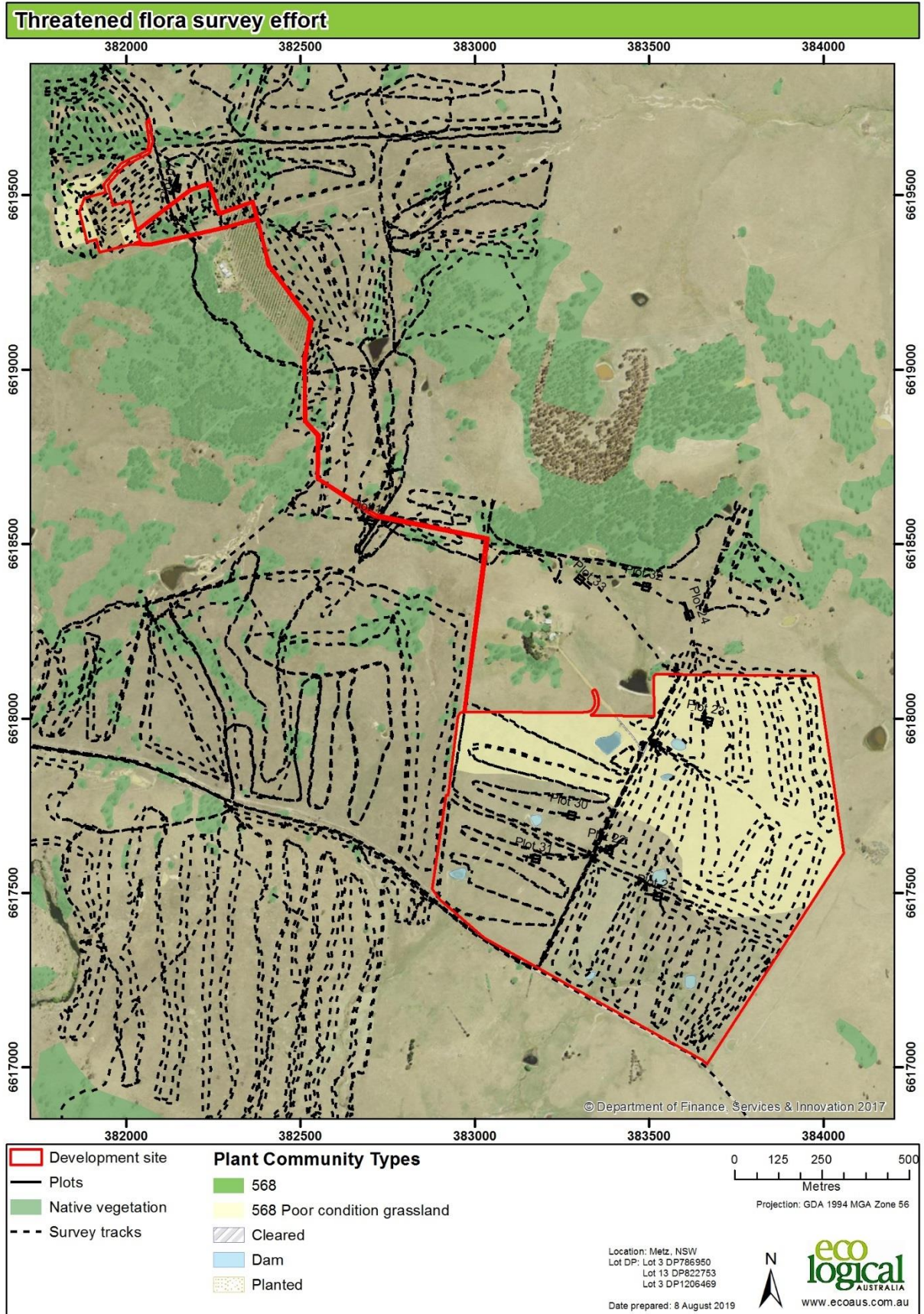


Figure 8: Targeted surveys



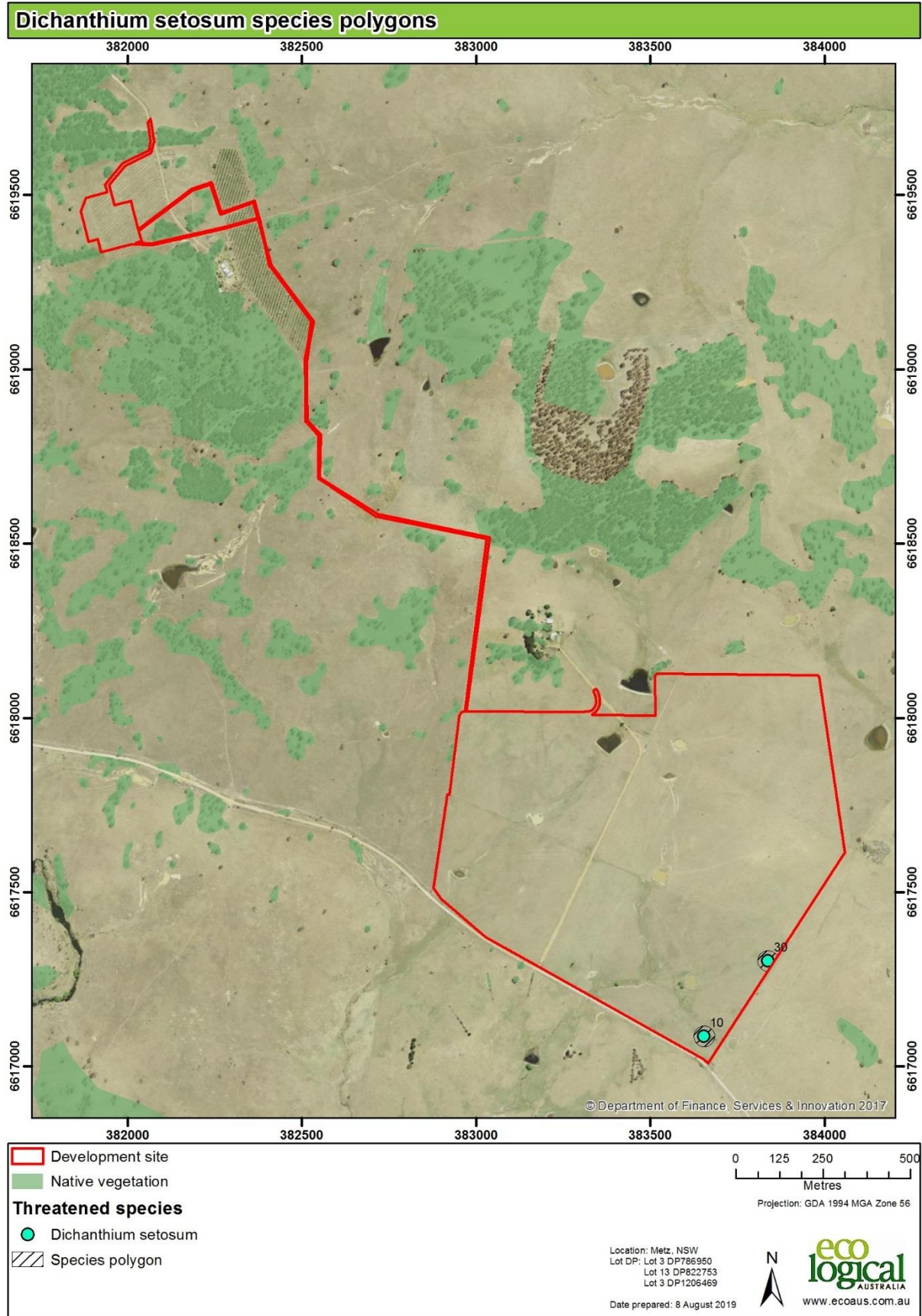


Figure 9 Threatened flora records

## 2. Stage 2: Impact assessment (biodiversity values)

The assessment below has assumed that there will be total loss of biodiversity values within the development site. This is a conservative position, as the direct impacts of the solar farm are restricted to removal of canopy vegetation only, with indirect shading of the existing low condition ground layer. The final development is unlikely to reduce all vegetation integrity to '0', however for the purposes of this assessment, all values are presented as such to avoid any uncertainties in the impacts of the development as assessed by the determining authority (Council).

### 2.1 Avoiding impacts

#### 2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located in a way which avoids and minimises impacts as outlined in Table 19.

**Table 19: Locating a project to avoid and minimise impacts on vegetation and habitat**

Approach	How addressed	Justification
<b>locating the project in areas where there are no biodiversity values</b>	All areas of cleared land and low condition vegetation have been utilised	The placement of the Development Site footprint has centred around the area of lowest biodiversity value within the development boundary, avoiding more established woodland areas.
<b>locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition</b>	All areas of vegetation on the periphery of the cleared land that suffers from edge effects and disturbance from past clearing activities and current grazing pressures have been utilised.	The placement of the Development Site footprint has centred around the area of lowest biodiversity value (cleared paddock) within the Development Site boundary whilst also encompassing moderate condition periphery vegetation.
<b>locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species</b>	The Development Site has not been able to completely avoid impacts to areas providing species habitat and EEC vegetation.	The placement of the Development Site footprint has centred around the area of lowest biodiversity value (cleared paddock) and aimed to minimise impacts to EEC and species habitat by avoiding higher quality remaining vegetation surrounding the Development Site
<b>locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained</b>	Development footprint has been centred around the area of least biodiversity impact with the aim to conserve connectivity values surrounding the Development Site.	Connectivity will be retained around the periphery of the proposal.

Regarding measures to avoid and minimise impacts during site selection and planning phase, the suitability of the Development Site has been selected with consideration given to limiting the amount of intact vegetation to be removed with the placement of the facilities occurring within the cleared and

highly disturbed paddock containing no/ or low biodiversity values and extending out into the disturbed, fragmented portions of native vegetation with the aim being to retain the outer periphery of intact, less disturbed vegetation present along the boundary of the Development Site.

### 2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 20.

**Table 20: Designing a project to avoid and minimise impacts on vegetation and habitat**

Approach	How addressed	Justification
<b>reducing the clearing footprint of the project</b>	In designing the development, the aim was to conserve the more intact vegetation whilst centring development in the most cleared portion of the study area.	The design has minimised vegetation clearing through strategic placement.
<b>locating ancillary facilities in areas where there are no biodiversity values</b>	The design has endeavoured to locate ancillary facilities within the western cleared/disturbed portion of the Development Site and along roads designed in the final footprint.	The placement of ancillary facilities has been designed to minimise impacts to biodiversity values by locating them in areas of no biodiversity values (cleared paddock).
<b>locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)</b>	The design has endeavoured to locate ancillary facilities in areas of vegetation on the periphery of the cleared land that suffers from edge effects and disturbance from past clearing activities and current disturbance pressures.	The placement of ancillary facilities has been designed to minimise impacts to biodiversity values by locating them in areas of lower biodiversity value (cleared paddock) within the Development Site boundary whilst also encompassing moderate condition periphery vegetation.
<b>locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)</b>	It has not been possible to completely avoid impacts to areas providing species habitat and EEC vegetation. The placement of the Development Site has minimised impacts as far as practicable to the EEC vegetation whilst maximising extent necessary for development.	The placement of ancillary facilities has been designed to work in and around areas of cleared land. No clearing of species habitat or EEC will occur solely for ancillary facilities.
<b>providing structures to enable species and genetic material to move across barriers or hostile gaps</b>	The development site will not increase any hostile gaps or barriers.	Corridor movement will be retained for species around the periphery of the site.
<b>making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.</b>	Proponent to retain all remaining vegetation outside of the Development Site footprint.	The proponent will demarcate all areas outside the Development Site boundary to be retained

Approach	How addressed	Justification
Efforts to avoid and minimise impacts through design must be documented and justified	In designing the development, the aim was to conserve the more intact periphery vegetation to the west and south whilst centring development in the most cleared portion of the study area.	The design has minimised vegetation clearing through strategic placement.

### 2.1.3 Prescribed biodiversity impacts

The development site does not have any prescribed biodiversity impacts as identified in Table 21.

**Table 21: Prescribed biodiversity impacts**

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
impacts of development on the habitat of threatened species or ecological communities associated with: <ul style="list-style-type: none"> <li>karst, caves, crevices, cliffs and other geological features of significance, or</li> <li>rocks, or</li> <li>human made structures, or</li> <li>non-native vegetation</li> </ul>	n/a	n/a
impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	n/a	n/a
impacts of development on movement of threatened species that maintains their lifecycle	n/a	n/a
impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)	n/a	n/a
impacts of wind turbine strikes on protected animals	n/a	n/a
impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	n/a	n/a



## 2.2 Assessment of Impacts

### 2.2.1 Direct impacts

The direct impacts of the development on:

- native vegetation are outlined in Table 22
- threatened ecological communities are outlined in Table 23
- threatened species and threatened species habitat is outlined in Table 24
- prescribed biodiversity impacts is outlined in Section 2.2.2

Direct impacts including the final project footprint (construction and operation) are shown on Figure 11.

**Table 22: Direct impacts to native vegetation**

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
510 (Poor condition grassland)	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	New England Grassy Woodlands	Grassy Woodlands	45.23
568 (Poor condition grassland)	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	48.03

**Table 23: Direct impacts on threatened ecological communities**

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
510 (Poor condition grassland)	EEC (precautionary allocation)	White Box Yellow Box Blakely's Red Gum Woodland	45.23	Not listed – doesn't meet condition criteria	n/a	n/a
568 (Low condition grassland)	not listed	n/a	n/a	not listed	n/a	n/a

**Table 24: Direct impacts on threatened species and threatened species habitat**

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
<i>Dichanthium setosum</i>	Bluegrass	0.5 ha	Vulnerable	Vulnerable

### 2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 25. As indicated at the beginning of this section, the assessor has assumed that all vegetation integrity will be lost within the development footprint. This is unlikely to be the actual impacts of the proposal, as the only direct impacts will be from the installation of the panels and substation infrastructure. Whilst areas under the panels will be subject to shading, there is unlikely to be a total loss of biodiversity.

**Table 25: Change in vegetation integrity**

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	510	Poor condition grassland	45.23	13.3	0	-13.3
2	568	Poor condition grassland	48.03	8.5	0	-8.5

### 2.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 26. Indirect impact zones are shown on Figure 12.

**Table 26: Indirect impacts**

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
<b>sedimentation and contaminated and/or nutrient rich run-off</b>	Construction	Runoff during construction works	10 m from Development Site boundary	During heavy rainfall or storm events	During rainfall events	Short-term impacts
<b>noise, dust or light spill</b>	Construction	Noise and dust created from machinery (no night works proposed therefore no light spill)	Noise and dust likely to carry further than 10 m from Development boundary	Daily, during construction works Nightly during operation of development	Sporadic throughout construction period	Short-term impacts
<b>inadvertent impacts on adjacent habitat or vegetation</b>	Construction	Damage to adjacent habitat or vegetation	10 m from Development Site boundary	Daily, during construction works	Throughout construction period	Short-term impacts
<b>transport of weeds and pathogens from the site to adjacent vegetation</b>	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Short-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
<b>vehicle strike</b>	Construction / operation	Potential for native fauna to be struck by working machinery and moving vehicles	Within Development Site	Daily, during construction works	During working hours for construction	During working hours for construction
<b>rubbish dumping</b>	Construction / operation	Illegal dumping by construction crews	Potential for rubbish to spread via wind into adjacent vegetation	Potential to occur at any time throughout construction or operational phases	During working hours for construction Potential at any point during operation of the development	During working hours for construction Potential at any point during operation of the development
<b>wood collection</b>	Construction / operation	Removal of wood in vegetation adjacent to the Development Site	Throughout adjacent vegetation	Potential to occur at any time throughout construction or operational phases	During working hours for construction Potential at any point during operation of the development	During working hours for construction Potential at any point during operation of the development
<b>bush rock removal and disturbance</b>	Construction / operation	No bush rock present	N/A	N/A	N/A	N/A
<b>increase in predatory species populations</b>	Construction / operation	Potential for an increase in predatory species in the locality through disturbance to vegetation	Throughout adjacent vegetation	Likely to occur gradually after disturbance to habitat and vegetation takes place	For a period after clearing works take place	At any point once clearing and disturbance to habitat take place
<b>increase in pest animal populations</b>	Construction / operation	Potential for an increase in pest animal populations in the locality through disturbance to vegetation	Throughout adjacent vegetation	Likely to occur gradually after disturbance to habitat and vegetation takes place	For a period after clearing works take place	At any point once clearing and disturbance to habitat take place
<b>increased risk of fire</b>	Construction / operation	Potential for fire to spark during	Throughout adjacent vegetation	Potential to occur at any time	During working	During working

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
		construction works especially any electrical or machinery works  Potential for fire to occur from residences of the development		throughout construction or operational phases	hours for construction  Potential at any point during operation of the development	hours for construction  Potential at any point during operation of the development
<b>disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.</b>	Construction / operation	Potential for increased disturbance during construction phase, especially due to noise and dust.	Throughout retained vegetation	Potential to occur at any time throughout construction phase	During working hours for construction	During working hours for construction

#### 2.2.4 Prescribed biodiversity impacts

The development does not have any prescribed biodiversity impacts.

#### 2.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 27.



Table 27: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	Moderate	Minor	Pre-clearance survey of trees to be removed and identification of habitat trees Supervision of qualified ecologist during tree removal in accordance with best practise methods	Relocation of fauna in a sensitive manner	Not required	Not required
timing works to avoid critical life cycle events such as breeding or nursing	Moderate	Minor	Avoid clearing works in August to October during breeding/nesting period	Impacts to fauna during nesting/nursing avoided	Construction	Site manager
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Major	Minor	Pre-clearance survey of trees to be removed and identification of habitat trees Supervision of qualified ecologist/licensed wildlife handler during tree removal in accordance with best practise methods	Any fauna utilising habitat within the Development Site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	Prior to construction	Site ecologist
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Moderate	Minor	Any trees removed that have small hollows/hollow trunks/fissures should be retained as ground fauna habitat and/or used as replacement hollows and attached to trees within the Development Site/Lot	Replacement of habitat features removed	Not required	Not required

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Moderate	Minor	During the construction period, fencing and signage will be placed around those areas of vegetation to be maintained to prevent any accidental construction damage and provide a permanent barrier between the Development Site and retained areas.  The type of fencing during construction may be of a temporary nature and scale that is robust enough to withstand damage during this phase of work	Vegetation to be retained outside of the Development Site boundary will not be disturbed	Construction	Site manager
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Appropriate controls will be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into waterways  Ensure all works within proximity to the drainage lines have adequate sediment and erosion controls  Commence revegetation as soon as practicable to minimise the risks of erosion	Erosion and sedimentation will be controlled	Construction	Site manager
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009) Monday to Friday 7.00am to 6.00pm Saturday 8.00am to 1.00pm No work on Sunday or public holidays	Noise impacts associated with the development will be managed in accordance with guidelines	Construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Minor	Negligible	Construction works will occur only during daylight hours and night lights will not be used  Lights associated with operation of the development should be directional to avoid shining into adjacent retained vegetation	Light impacts will be avoided as all works will occur during daylight hours  Light spill into adjacent vegetation is reduced	Construction	Site manager
adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented during construction works to limit dust on-site  Commence revegetation as soon as practicable to minimise areas likely to create dust	Mitigate dust created during construction activities	Construction	Site manager
programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting	Moderate	Minor	Timing of construction works should be planned to occur outside of the winter/spring breeding season.	Impacts to fauna during nesting/nursing avoided	Construction	Site manager
temporary fencing to protect significant environmental features such as riparian zones	Moderate	Minor	All machinery to be cleaned prior to entering and exiting the Development Site to minimise transport of weed seeds to retained areas  Weeds present within the Development Site listed under the NSW <i>Biosecurity Act 2015</i> should be managed.	Prevent spread of weeds or pathogens	Construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Minor	Negligible	<p>All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as:</p> <ul style="list-style-type: none"> <li>Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds)</li> <li>What to do in case of environmental emergency (chemical spills, fire, injured fauna)</li> <li>Key contacts in case of environmental emergency</li> </ul>	All staff entering the Development Site are fully aware of all environmental aspects relating to the development and know what to do in case of any environmental emergencies	Construction	Site manager
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	<p>Strategy to be developed and implemented as part of the development may include:</p> <ul style="list-style-type: none"> <li>restrictions on contractor pets onsite</li> <li>rubish disposal guidance</li> <li>prohibition of wood collection</li> <li>prohibition on lighting of fires</li> </ul> <p>any disturbance to vegetation outside Development Site footprint</p>	Strategy to protect vegetation and habitat adjacent to development	Construction	Site manager
development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Minor	Negligible	Use suitable ground cover species in any revegetation areas.	Suitable species used to stabilise disturbed ground.	Construction	Site manager



Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Minor	Negligible	No action proposed in adjacent areas.	n/a	n/a	n/a

### 2.2.6 Serious and Irreversible Impacts (SAIL)

The development has candidate Serious and Irreversible Impacts (SAIL) values as outlined in Table 28. Detailed consideration of whether impacts on candidate species are serious and irreversible is included in Table 29.

**Table 28: Candidate Serious and Irreversible Impacts**

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)	Threshold
White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	1	45.23 ha poor condition grassland vegetation	No specified threshold

**Table 29: Determining whether impacts are serious and irreversible**

Determining whether impacts are serious and irreversible	Assessment
<b>Principle 1</b>	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	Yes, the White Box Yellow Box Blakely's Red Gum Woodland is identified as potentially being SAIL.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There is no threshold for impacts that may trigger a serious and irreversible impact. Therefore, the determination of a serious and irreversible impact is to be assessed on a case-by-case basis
<b>Principle 2</b>	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	Very small population size for ecological communities means communities have very high levels of either environmental degradation or disruption of biotic processes, and interactions have an increased risk of failure to sustain their characteristic native species assemblages
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	No, the ecological community is widespread in NSW.
<b>Principle 3</b>	
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	n/a
<b>Principle 4</b>	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	No

Determining whether impacts are serious and irreversible	Assessment
b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	n/a

Table 30: Evaluation of an impact on a TEC

Impact Assessment Provisions	Assessment
1. the area and condition of the TEC to be impacted directly and indirectly by the proposed development	<p>Direct impacts will comprise of up to 45.233 ha of poor condition grassland vegetation.</p> <p>It is noted that the ground layer within the grassland component of the development is not proposed to be removed (directly impacted) but will rather be shaded and indirectly impacted.</p>
2. the extent and overall condition of the TEC within an area of 1500 metres, and then 5000 metres, surrounding the proposed development footprint.	<p>There are no datasets available within the New England Tablelands Region.</p> <p>As such ELA has drafted a vegetation map of the extant vegetation within 5,000m of the development site and will assess the woodland component only.</p> <p>Based on the prevalence of Box Gum Grassy Woodland locally, it has been assumed that 80% of woodland vegetation observed through API is the EEC (and that 20% is non-threatened stringybark forest which is known to occur locally). The mapping of woodland communities is shown in Figure 10. This assessment also discounts the extent of the grassland component of this EEC, which is likely to occur across a significant portion of the 9,760 ha not mapped as woodland vegetation.</p> <p>Based on this review, the extent of the ecological community within 1,500m of the development site is approximately 326 ha of woodland EEC, and within 5,000m there is approximately 2,663 ha of the woodland EEC. There is potentially more than 7,000 ha of the grassland component of this EEC within 5,000m of the development site.</p>
3. an estimate of the extant area and overall condition of the TEC remaining before and after the impact of the proposed development has been taken into consideration	<p>the extant area of the EEC is difficult to distinguish, as it occurs widely across NSW. Whilst this community is severely reduced and fragmented in the south of NSW, it occurs widely across the New England Tableland and almost all vegetation is representative of this community.</p> <p>The overall condition of the TEC will be largely unchanged after the impact of the proposed development. The grassland component will not be reduced.</p> <p>Better areas of the TEC are located outside the development site, including large, intact areas around Gara Dam.</p>
4. the development proposal's impact on:	

Impact Assessment Provisions	Assessment
a. abiotic factors critical to the long-term survival of the TEC; for example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns; will it alter natural disturbance regimes that the TEC depends upon, e.g. fire, flooding etc.?	The development is a solar farm which will not have any impacts on abiotic factors critical to the long term survival of the TEC.
b. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of under-storey species or harvesting of plants	The development will not impact any functionally important species.
c. the quality and integrity of an occurrence of the TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the TEC	<p>The development will prevent any future tilling and nutrient enrichment within the study area, and will likely lead to an increase in the condition of the TEC ground layer.</p> <p>The development will not reduce the quality or integrity of the TEC as the project has been sited in a location where the TEC is of lowest condition.</p> <p>The development site is unlikely to assist any invasive flora or fauna or introduce any fertilisers or herbicides.</p>
5. direct or indirect fragmentation and isolation of an area of the TEC	The TEC will remain intact outside of the development site.
6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.	The TEC will be offset in accordance with the Biodiversity Offset Scheme under the BC Act which will deliver like for like offsets in NSW.
Conclusion	<p>The current condition of the TEC within the development site is in a state of decline, due to land clearing, agriculture, tilling, nutrient enrichment, grazing, and the interaction of these pressures with the current drought.</p> <p>The TEC is prevalent in the New England Tablelands, in a variety of condition states, with the best occurrences of the TEC being situated outside of the development site.</p> <p>The proposed development is likely to remove less than 0.2% of the woodland remaining within 5,000m of the development site. The proposal will shade/indirectly impact less than 0.09% of the grassland TEC remaining within 5,000m of the development site.</p> <p>When considering the local extent of the TEC, as well as the condition within the development site, the proposed development will not result in serious and irreversible impacts.</p>

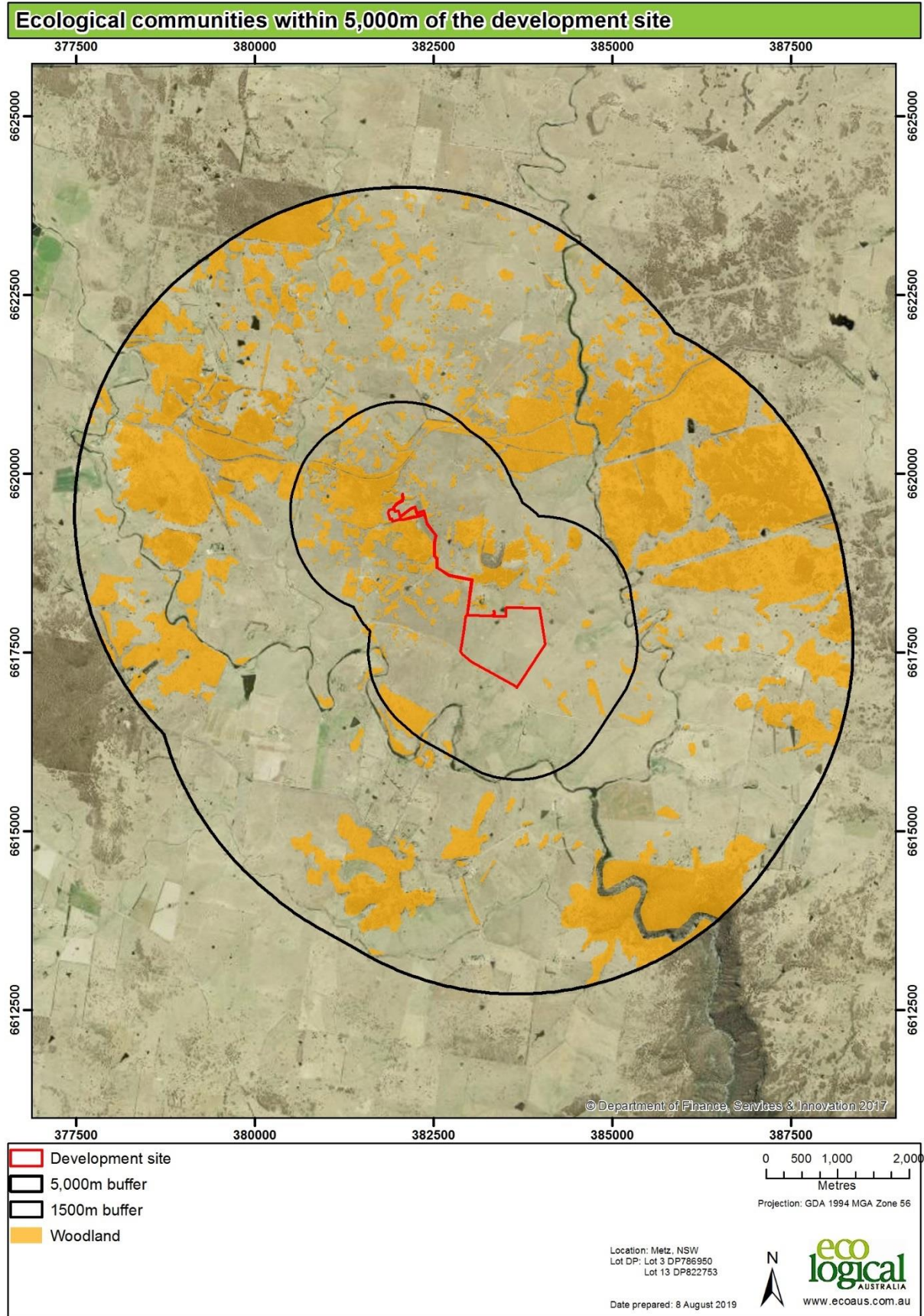


Figure 10 Extent of woodland vegetation within 5,000m of the development site



## 2.3 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 31, Table 32 and Table 33 respectively.

**Table 31: Likelihood criteria**

Likelihood criteria	Description
<b>Almost certain</b> (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
<b>Likely</b> (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
<b>Possible</b> (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
<b>Unlikely</b> (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
<b>Remote</b> (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

**Table 32: Consequence criteria**

Consequence category	Description
<b>Critical</b> (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
<b>Major</b> (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
<b>Moderate</b> (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
<b>Minor</b> (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
<b>Negligible</b> (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 33: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
<b>Critical</b>	Very High	Very High	High	High	Medium
<b>Major</b>	Very High	High	High	Medium	Medium
<b>Moderate</b>	High	Medium	Medium	Medium	Low
<b>Minor</b>	Medium	Medium	Low	Low	Very Low
<b>Negligible</b>	Medium	Low	Low	Very Low	Very Low

Table 34: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
<b>Vegetation clearing</b>	Construction	Low	Very low
<b>sedimentation and contaminated and/or nutrient rich run-off</b>	Construction / operation	Low	Very low
<b>noise, dust or light spill</b>	Construction	Low	Very low
<b>inadvertent impacts on adjacent habitat or vegetation</b>	Construction	Low	Very low
<b>transport of weeds and pathogens from the site to adjacent vegetation</b>	Construction	Medium	Low
<b>vehicle strike</b>	Construction / operation	Low	Very low
<b>trampling of threatened flora species</b>	Construction / operation	Low	Very low
<b>rubbish dumping</b>	Construction / operation	Low	Very low
<b>wood collection</b>	Construction / operation	Low	Very low
<b>bush rock removal and disturbance</b>	Construction / operation	Low	Very low
<b>increase in predatory species populations</b>	Construction / operation	Low	Very low
<b>increase in pest animal populations</b>	Construction / operation	Low	Very low
<b>increased risk of fire</b>	Construction / operation	Low	Very low
<b>disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.</b>	Construction / operation	Low	Very low
<b>sedimentation and contaminated and/or nutrient rich run-off</b>	Construction	Low	Very low

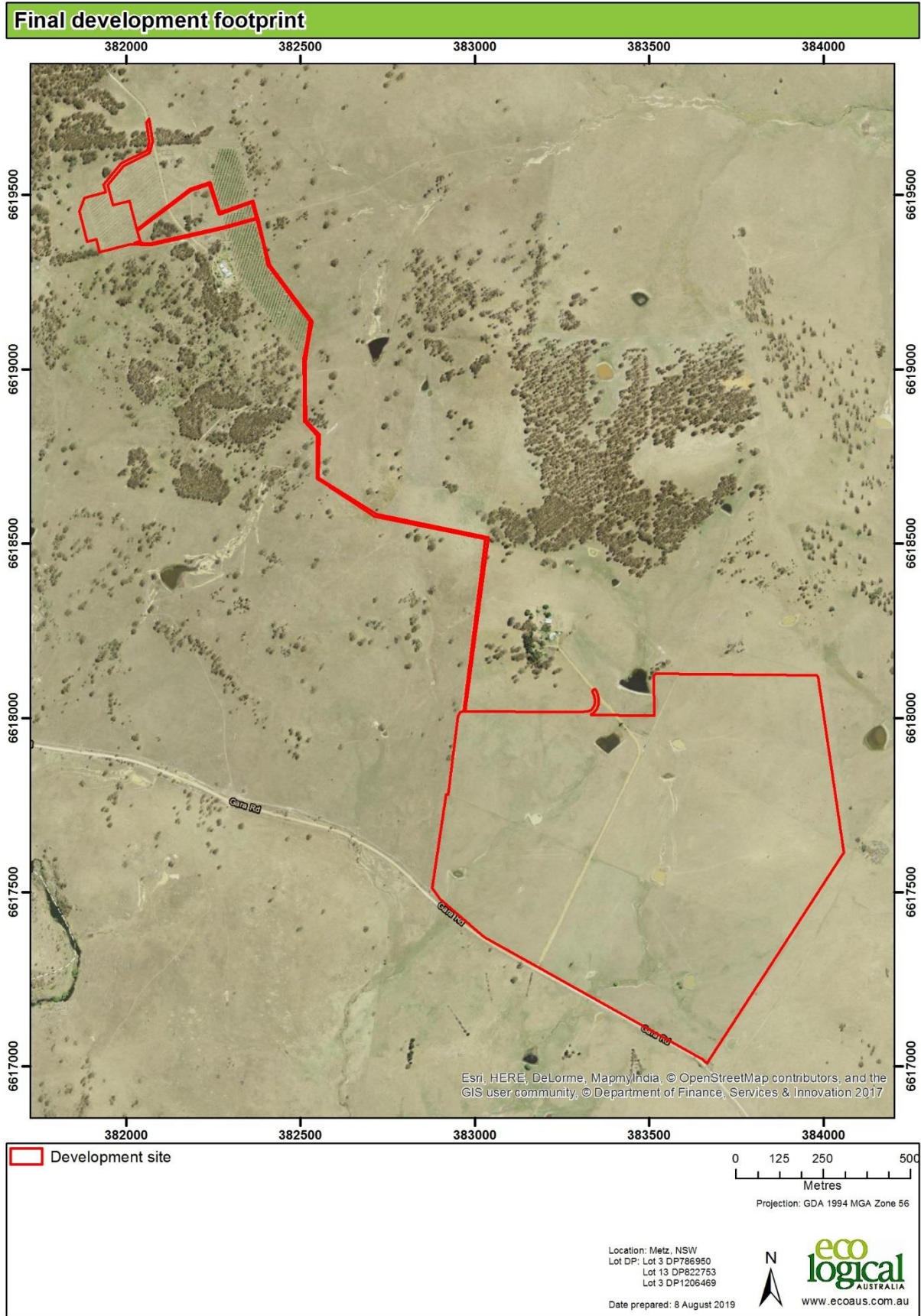


Figure 11: Final project footprint including construction and operation



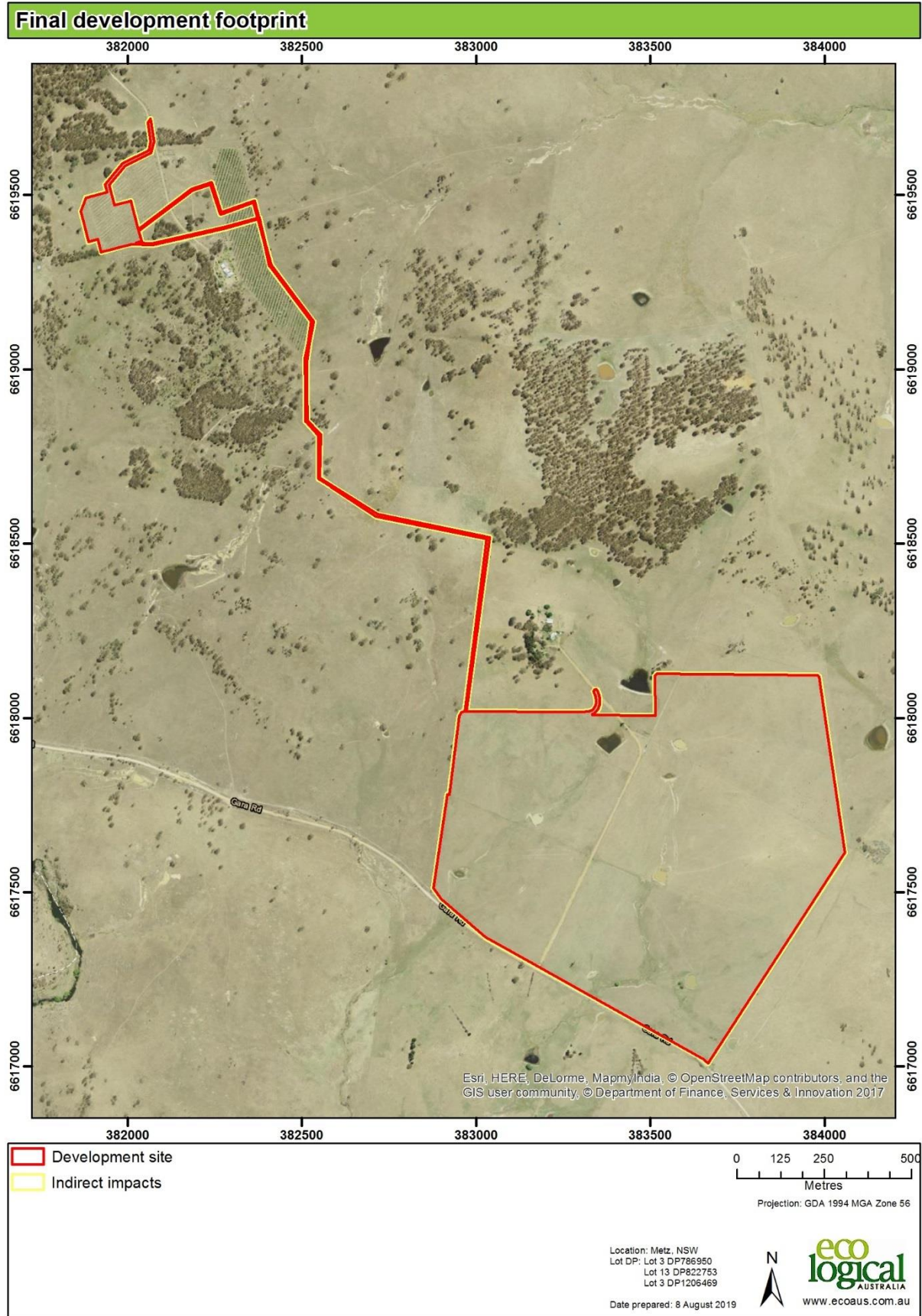


Figure 12: Indirect impact zones

## 2.4 Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

### 2.4.1 Serious and Irreversible Impacts (SAIL)

The development has candidate Serious and Irreversible Impacts (SAIL) values as outlined in Table 28. Detailed consideration of whether impacts on candidate species are serious and irreversible is included in Section 2.2.6.

**Table 35: Serious and Irreversible Impacts Summary**

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)	Summary
White Box Yellow Box Blakely's Red Gum Grassy Woodland	White Box Yellow Box Blakely's Red Gum Grassy Woodland	1	Direct impacts will comprise of up to 45.23 ha of poor condition grassland vegetation.	<b>Not SAIL</b>

### 2.4.2 Impacts requiring offsets

No areas of native vegetation require offsets within this development site. The impacts of the development requiring offset for threatened species and threatened species habitat are outlined in Table 36 and on Figure 13.

**Table 36: Impacts on threatened species and threatened species habitat that require offsets**

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
<i>Petaurus norfolcensis</i>	Squirrel Glider	0.05 ha	Vulnerable	Not listed
<i>Dichanthium setosum</i>	Bluegrass	0.5 ha	Vulnerable	Vulnerable

### 2.4.3 Impacts not requiring offsets

The impacts of the development not requiring offset for native vegetation are outlined in Table 37 and shown on Figure 13. The impacts of the development not requiring offset for threatened species and threatened species habitat is outlined below.

**Table 37: Impacts to native vegetation that do not require offsets**

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)	Rationale
510 Poor condition grassland	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	New England Grassy Woodlands	Grassy Woodlands	45.23	Is a vegetation zone with a current vegetation integrity score <17 where the PCT is associated with threatened species habitat



PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)	Rationale
568 Poor condition grassland	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	46.63 ha	Is a vegetation zone with a current vegetation integrity score <17 where the PCT is associated with threatened species habitat

#### 2.4.4 Areas not requiring assessment

Roads and infrastructure have not been assessed.

#### 2.4.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 38. The number of species credits required for the development are outlined in Table 39. A biodiversity credit report is included in Appendix C:.

**Table 38: Ecosystem credits required**

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
510 Poor condition grassland	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland	Grassy Woodlands	45.23	0
568 Poor condition grassland	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Dry Sclerophyll Forests (Shrub/grass sub-formation)	48	0

**Table 39: Species credit summary**

Species	Common Name	Direct impact	Credits required
<i>Dichanthium setosum</i>	Bluegrass	0.5	3

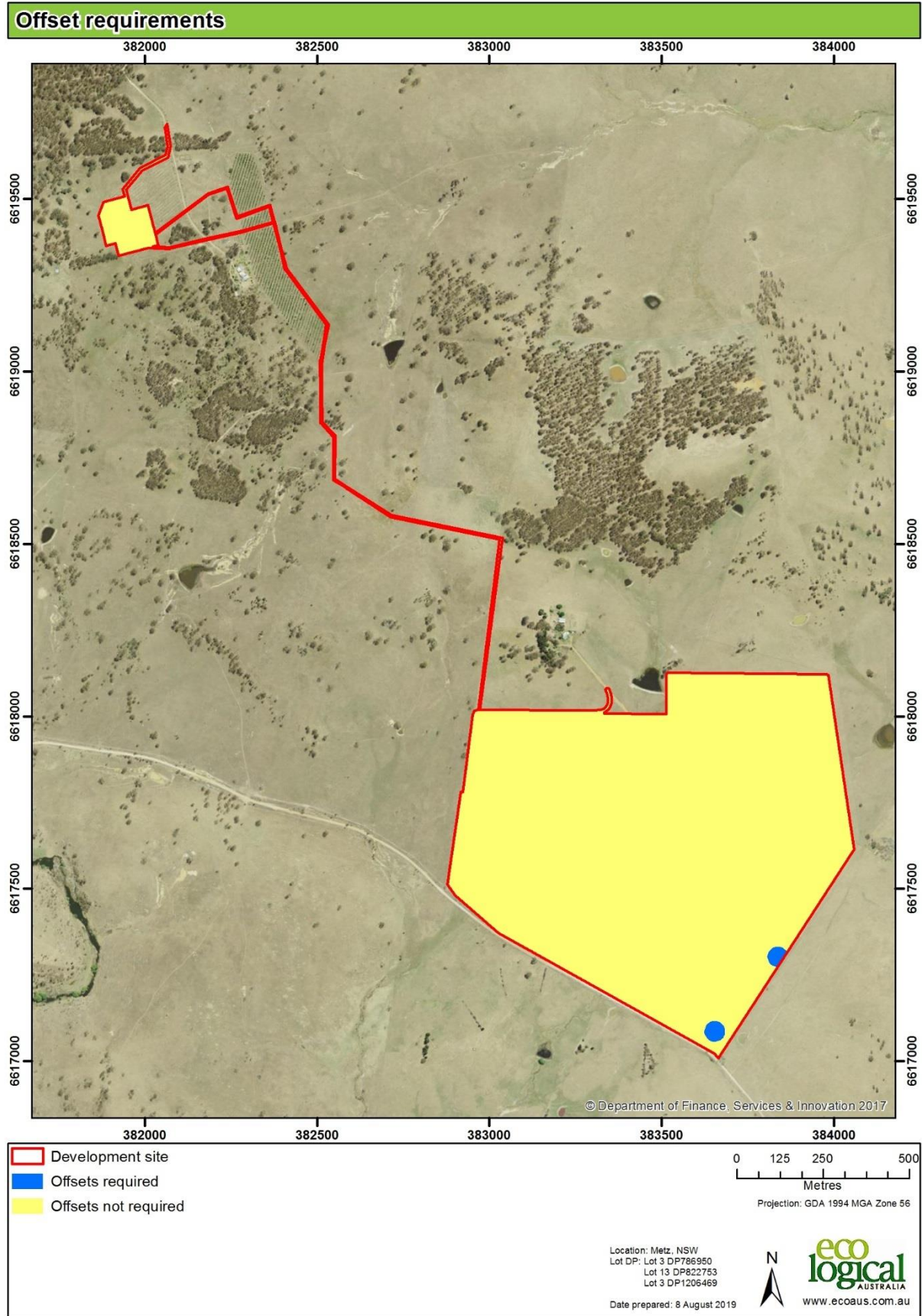


Figure 13: Impacts requiring offset

## 2.5 Consistency with legislation and policy

This section has been drafted to consider the impacts to any protected matters under the Commonwealth EPBC Act.

One threatened ecological community, White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands, which is listed as Critically Endangered under the EPBC Act, is widespread across the New England Tablelands region. This community has significant overlap with the NSW BC Act listed White Box Yellow Box Blakely's Red Gum Woodland, which is known to occur within the development site. The NSW variant of the listed ecological community includes degraded stands of vegetation provided the seed bank is at least partially intact (NSW Scientific Committee). The EPBC Act listed community is intended to apply to only those occurrences of the ecological community which are in better quality condition. As such, the EPBC Act component of the community must contain a diverse understorey (at least 12 native non-grass species) which includes at least one important species (such as *Themeda triandra* or an orchid) in order to indicate a reasonable condition. Larger patches that contain a sufficient frequency of trees, hollows, or regeneration of key species are also considered part of the EPBC Act TEC.

The Commonwealth Threatened Species Scientific Committee (TSSC) in their Advice for the Minister for listing of this community under the EPBC Act identified that the ecological community occurs in an arc along the western slopes of the Great Dividing Range from southern Queensland through NSW to central Victoria, and occupied a pre-European extent of over 5 million ha. Within NSW, the current extent of the community is estimated to be approximately 250,000 ha which is less than 10% of the pre-European extent of the community in NSW. The New England region is one of the least cleared areas of this ecological community, with 34% of the extant vegetation still remaining. Regionally this ecological community is widespread, and many good examples of the community are still in occurrence, particularly within Travelling Stock Routes (TSR's) and within protected nature reserves. There is a good example of the TEC surrounding Gara Dam north-east of the development site.

An example of this TEC has been identified west of the development site, in a scattered tree remnant growing in a paddock. The condition of this patch of TEC varies, with better condition intact vegetation outside of the development site.

Vegetation within the development site contains poor condition grasslands. Whilst there are scattered areas of native grasses at a cover of up to 10 – 20%, the broader condition of the ground layer is heavily degraded by ongoing agricultural practices. A significant portion of the ground layer consists of the exotic *Plantago lanceolata*, *Setaria sp.*, *Paspalum dilatatum*, as well as other agricultural feed species. An example of the current condition of the development site is shown in Photograph 8.





**Photograph 8 Poor condition grassland with stringybark forest in background**

The current condition of the vegetation within the development site does not comply with the EPBC Act TEC, due to a lack of native ground cover, lack of species diversity, and lack of large trees and regeneration. Acknowledging however that the TEC occurs nearby to the development site, an assessment of the impacts of the proposed solar farm have been undertaken in accordance with *Significant Impact Guidelines 1.1* (Department of the Environment) for any impacts to White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands. An assessment has also been undertaken for *Dichanthium setosum* which is listed under the EPBC Act and occurs within the south-western portion of the development site.

### 2.5.1 Significant Impact Criteria – Threatened Ecological Communities

Only one threatened ecological Community occurs nearby to the development site. The assessment of impacts to White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands has been undertaken below:

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

#### ***Reduce the extent of an ecological community?***

The current extent of the ecological community occurs from south-east Queensland to Victoria. Approximately 82,000 ha of the ecological community occurs in the North East NSW CRA Region. The proposed development has avoided all areas of the ecological community locally. Remnants of the



community west of the development will be retained. As such the extent of the ecological community will not be reduced.

***Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?***

The proposed solar farm has been largely located in existing cleared areas to minimise any impacts to woodland or forest vegetation. The proposed development will not fragment or isolate any areas of native vegetation or any areas of TECs.

***Adversely affect habitat critical to the survival of an ecological community?***

Habitat critical to the survival of the TEC includes areas that are necessary for the long-term maintenance of the ecological community, necessary for maintaining genetic diversity, or necessary for the reintroduction of populations or the recovery of the species. The development site consists primarily of low-condition grasslands with the occasional scattered paddock tree. The best areas of the TEC are located outside the development footprint. The proposed development will not adversely affect habitat critical to the survival of the ecological community.

***Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?***

The proposed development site will not affect abiotic factors for the ecological community (such as surface water or groundwater drainage).

***Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?***

The species composition of the TEC locally will be unaffected as none of the ecological community will be removed.

***Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?***

The development is located outside of an area of the ecological community, and will not have any external influences outside of the panel array areas. The proposed solar farm will likely result in a reduction of the mobilisation of fertilisers, as the site will no longer be able to be cultivated to its current extent.

***Interfere with the recovery of an ecological community?***

The proposal will not interfere with the recovery of Box Gum Woodland.

***Conclusion***

As the development site is located away from areas of the listed TEC, the installation and operation of the Stringybark Solar Farm will not significantly impact any MNES.

### **Significant impact criteria – Threatened species**

Only one threatened species occurs within the development site, *Dichanthium setosum*. This species was identified in two clumps, containing 10 and 30 tussocks in each area. The occurrence of *D. setosum* is not considered an important population as the two scattered occurrences are not considered a population that is necessary for the species long-term survival and recovery. The species is widely known across the New England region, and the isolated occurrence on the development site is unlikely to be:

- a key source population either for breeding or dispersal; or
- a population that are necessary for maintaining genetic diversity; and/or
- a population that is near the limit of the species range.

The assessment of impacts to *Dichanthium setosum* has been undertaken below:

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

#### ***Lead to a long-term decrease in the size of an important population of a species?***

The occurrence of the species within the development site is not an important population of the species. The proposed development will not directly reduce the size of an important population.

#### ***Reduce the area of occupancy of an important population?***

The occurrence of the species within the development site is not an important population of the species. The proposed development will not reduce the area of occupancy of an important population.

#### ***Fragment an existing important population into two or more populations?***

The occurrence of the species within the development site is not an important population of the species. The proposed development will not fragment an existing population into two or more populations.

#### ***Adversely affect habitat critical to the survival of a species?***

Habitat critical to the survival of a species are areas that are necessary:

- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

The isolated occurrences of the two clumps of this species are not on land that is considered to be necessary for maintaining genetic diversity and long-term evolutionary development of the species, nor is it proposed to be a location for the reintroduction of the species.

#### ***Disrupt the breeding cycle of an important population?***

The occurrence of the species within the development site is not an important population of the species. The proposed development will not disrupt the breeding cycle of any important populations.

***Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?***

The occurrence of the two clumps within the development site is an isolated occurrence of a species which occurs widely across the New England Tablelands. As such the shading of the two clumps within the development site cannot impact the species to such an extent that the species is likely to decline.

***Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?***

The development will not increase the viability of any invasive species, and as such will not impact the threatened species habitat.

***Introduce disease that may cause the species to decline?***

The development is unlikely to introduce any disease.

***Interfere substantially with the recovery of the species?***

The development will not substantially interfere with the recovery of the species.

***Conclusion***

The impacts to *D. setosum* within the development site are to be limited to two isolated occurrences. The occurrence within the development site is not an important population, and giving consideration to the Significant Impact Criteria, the proposed development is unlikely to significantly impact the species.

### 3. References

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## Appendix A: Definitions

Terminology	Definition
<b>Biodiversity credit report</b>	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
<b>BioNet Atlas</b>	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
<b>Broad condition state:</b>	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
<b>Connectivity</b>	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
<b>Credit Calculator</b>	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
<b>Development</b>	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
<b>Development footprint</b>	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
<b>Development site</b>	An area of land that is subject to a proposed development that is under the EP&A Act.
<b>Ecosystem credits</b>	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
<b>High threat exotic plant cover</b>	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
<b>Hollow bearing tree</b>	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
<b>Important wetland</b>	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
<b>Linear shaped development</b>	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
<b>Local population</b>	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
<b>Local wetland</b>	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
<b>Mitchell landscape</b>	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
<b>Multiple fragmentation impact development</b>	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
<b>Operational Manual</b>	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
<b>Patch size</b>	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or $\leq 30$ m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
<b>Proponent</b>	A person who intends to apply for consent to carry out development or for approval for an activity.
<b>Reference sites</b>	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
<b>Regeneration</b>	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height $< 5$ cm within a vegetation zone.
<b>Remaining impact</b>	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
<b>Retirement of credits</b>	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
<b>Riparian buffer</b>	Riparian buffers applied to water bodies in accordance with the BAM
<b>Sensitive biodiversity values land map</b>	Development within an area identified on the map requires assessment using the BAM.
<b>Site attributes</b>	The matters assessed to determine vegetation integrity. They include: 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 (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
<b>Site-based development</b>	a development other than a linear shaped development, or a multiple fragmentation impact development
<b>Species credits</b>	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
<b>Subject land</b>	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
<b>Threatened Biodiversity Data Collection</b>	Part of the BioNet database, published by OEH and accessible from the BioNet website.
<b>Threatened species</b>	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
<b>Vegetation Benchmarks Database</b>	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
<b>Vegetation zone</b>	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
<b>Wetland</b>	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
<b>Woody native vegetation</b>	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

## Appendix B: Vegetation plot data

**Table 40 Plot location data**

Plot	PCT	Condition	Zone	Easting	Northing	Bearing
Plot 7	568	Poor condition grassland	56	957876	6610468	15
Plot 11	568	Poor condition grassland	56	958369	6609482	280
Plot 12	568	Poor condition grassland	56	958435	6609471	45
Plot 21	510	Poor condition grassland	56	959135	6608360	280
Plot 22	510	Poor condition grassland	56	959002	6608500	280
Plot 23	568	Poor condition grassland	56	959306	6608854	280
Plot 24	568	Poor condition grassland	56	959277	6609166	300
Plot 30	510	Poor condition grassland	56	958899	6608606	280
Plot 31	510	Poor condition grassland	56	958790	6608486	280
Plot 32	568	Poor condition grassland	56	959148	6609251	280
Plot 33	568	Poor condition grassland	56	958970	6609263	110

**Table 41 Composition data**

Plot	PCT	Tree	Shrub	Grass	Forb	Fern	Other
Plot 7	568	0	1	11	4	1	0
Plot 11	568	0	1	11	5	1	0
Plot 12	568	0	1	6	3	0	0
Plot 21	510	0	0	5	3	0	0
Plot 22	510	0	0	8	2	0	0
Plot 23	568	0	0	5	0	0	0
Plot 24	568	0	0	6	1	0	0
Plot 30	510	0	0	9	1	0	0
Plot 31	510	0	0	6	1	0	0
Plot 32	568	0	0	10	1	0	0
Plot 33	568	0	1	5	1	0	0

**Table 42 Structure data**

Plot	PCT	Tree	Shrub	Grass	Forb	Fern	Other
Plot 7	568	0.0	0.2	6.7	0.4	0.1	0.0
Plot 11	568	0.0	0.2	60.4	0.5	0.1	0.0



Plot	PCT	Tree	Shrub	Grass	Forb	Fern	Other
Plot 12	568	0.0	0.1	11.1	1.1	0.0	0.0
Plot 21	510	0.0	0.0	27.0	3.1	0.0	0.0
Plot 22	510	0.0	0.0	8.4	0.6	0.0	0.0
Plot 23	568	0.0	0.0	13.1	0.0	0.0	0.0
Plot 24	568	0.0	0.0	4.7	0.1	0.0	0.0
Plot 30	510	0.0	0.0	19.4	0.1	0.0	0.0
Plot 31	510	0.0	0.0	24.3	0.1	0.0	0.0
Plot 32	568	0.0	0.0	21.7	0.1	0.0	0.0
Plot 33	568	0.0	0.1	25.3	0.1	0.0	0.0

Table 43 Function data

Plot	PCT	Large trees	Hollow-bearing trees	Litter Cover	Fallen Logs	Tree (5 - 10 cm)	Tree (10 - 20 cm)	Tree (20 - 30 cm)	Tree (30 - 50 cm)	Tree (50 - 80 cm)	Regen (dbh <5cm)	High threat exotic
Plot 7	568	0	0	25	0	0	0	0	0	0	0	0.2
Plot 11	568	0	0	8	0	0	0	0	0	0	0	0.2
Plot 12	568	0	0	30	0	0	0	0	0	0	0	0.5
Plot 21	510	0	0	16	0	0	0	0	0	0	0	10.0
Plot 22	510	0	0	15	0	0	0	0	0	0	0	30.0
Plot 23	568	0	0	12	0	0	0	0	0	0	0	10.0
Plot 24	568	0	0	21	0	0	0	0	0	0	0	2.0
Plot 30	510	0	0	16	0	0	0	0	0	0	0	15.2
Plot 31	510	0	0	40	0	0	0	0	0	0	0	3.0
Plot 32	568	0	0	15	0	0	0	0	0	0	0	0.0
Plot 33	568	0	0	6	0	0	0	0	0	0	0	0.5

Family	Species	Common Name	Listing Status	ROTAP	Exotic	High Threat Weed	Growth Form Group	Plot 7		Plot 9		Plot 11		Plot 12		Plot 21		Plot 22		Plot 23		Plot 24		Plot 30		Plot 31		Plot 32		Plot 33													
								S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A	S	C	A						
Myrtaceae	Eucalyptus caliginosa	Broad-leaved Stringybark					Tree (TG)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Ericaceae	Lissanthe strigosa	Peach Heath					Shrub (SG)	m	0.2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Thymelaeaceae	Pimelea spp.		0				Shrub (SG)	0	0	0	g	0.1	20	0	0	0	g	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Auistrostipa scabra	Speargrass					Grass & grasslike (GG)	0	0	0	0	0	g	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Juncaceae	Juncus spp.	A Rush					Grass & grasslike (GG)	g	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Aristida vagans	Threeawn Speargrass					Grass & grasslike (GG)	g	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Poa sieberiana var. hirtella		0				Grass & grasslike (GG)	0	0	0	0	0	g	0.2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Digitaria brownii	Cotton Panic Grass					Grass & grasslike (GG)	g	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Sporobolus caroli	Fairy Grass					Grass & grasslike (GG)	g	0.1	20	0	0	0	0	0	0	0	0	0	g	0.1	5	0	0	0	0	0	0	0	0	0	0											
Poaceae	Sorghum leiocladum	Wild Sorghum					Grass & grasslike (GG)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Elymus spp.		0				Grass & grasslike (GG)	g	0.2	50	0	0	0	0	g	0.5	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
Poaceae	Digitaria breviglumis		0				Grass & grasslike (GG)	0	0	0	0	0	g	0.1	20	0	0	0	0	0	0	0	0	0	g	0.1	5	0	0	0	g	0.2	50	0	0								
Poaceae	Rytidosperma spp.		0				Grass & grasslike (GG)	0	0	0	0	0	g	0.3	50	g	0.1	5	g	0.5	20	g	0.1	5	0	0	0	0	0	0	0	0	0										
Poaceae	Dichelachne micrantha	Shorthair Plumegrass					Grass & grasslike (GG)	0	0	0	0	0	g	0.1	10	g	0.5	20	0	0	g	1	50	0	0	0	0	0	0	0	g	0.1	5	0	0								
Poaceae	Eragrostis spp.	A Lovegrass					Grass & grasslike (GG)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	0.5	100	0	0	0	0	0	0										
Cyperaceae	Fimbristylis spp.		0				Grass & grasslike (GG)	g	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	0.2	100	0	0	0	0	0	0										
Poaceae	Chloris truncata	Windmill Grass					Grass & grasslike (GG)	0	0	0	0	0	0	0	0	0	g	0.5	20	g	0.1	5	0	0	g	1	50	g	0.5	50	0	0	0	0									
Poaceae	Eragrostis spp.	A Lovegrass					Grass & grasslike (GG)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	2	100	g	0.2	100	0	0								
Cyperaceae	Cyperus spp.		0				Grass & grasslike (GG)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	2	500	0	0	0	0									
Poaceae	Poa sieberiana	Snowgrass					Grass & grasslike (GG)	0	0	0	0	0	0	0	0	0	g	20	500	0	0	0	0	g	0.5	5	0	0	0	0	0	0	0	0									
Poaceae	Microlaena stipoides	Weeping Grass					Grass & grasslike (GG)	g	3	100	0	0	0	g	5	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	1	100	0	0								
Juncaceae	Juncus usitatus		0				Grass & grasslike (GG)	g	0.1	20	0	0	g	0.1	10	g	2	500	0	0	g	0.1	5	g	1	50	g	0.1	5	g	0.1	50	g	0.1	100	g	0.1	20	g	0.1	20		
Poaceae	Eragrostis leptostachya	Paddock Lovegrass					Grass & grasslike (GG)	g	0.4	50	g	0.1	1	g	0.5	100	0	0	g	5	100	g	1	50	g	0.1	2	g	5	500	g	0.2	50	g	0.1	10	g	0.2	50				
Poaceae	Bothriochloa macra	Red Grass					Grass & grasslike (GG)	g	2	100	0	0	0	0	0	g	5	10	0	0	g	1	20	g	0.1	5	0	0	g	3	100	0	0	g	5	500	g	5	500				
Poaceae	Cynodon dactylon	Common Couch					Grass & grasslike (GG)	0	0	0	g	50	1000	g	50	500	0	0	0	0	0	0	g	10	100	g	2	50	0	0	0	0	0	0	0	0	0						
Poaceae	Sporobolus creber	Slender Rat's Tail Grass					Grass & grasslike (GG)	g	0.5	100	g	0.1	10	g	2	100	g	3	100	g	1	50	g	5	100	g	1	50	0	0	0	g	5	500	g	10	1000	g	7	500	g	10	1000
Solanaceae	Solanum spp.		0				Forb (FG)	0	0	0	0	0	g	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Asteraceae	Vittadinia spp.	Fuzzweed					Forb (FG)	0	0	0	0	0	g	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Campanulaceae	Wahlenbergia communis	Tufted Bluebell					Forb (FG)	0	0	0	0	0	g	0.1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Campanulaceae	Wahlenbergia stricta	Tall Bluebell					Forb (FG)	0	0	0	0	0	0	0	0	0	g	0.1	2	0	0	0	0	g	0.1	2	0	0	0	0	0	0	0	0	0	0	0	0					
Chenopodiaceae	Dysphania spp.		0				Forb (FG)	0	0	0	g	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Chenopodiaceae	Einadia nutans subsp. nutans	Climbing Saltbush					Forb (FG)	0	0	0	0	0	g	0.1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Asteraceae	Calotis lappulacea	Yellow Burr-daisy					Forb (FG)	g	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Geraniaceae	Geranium solanderi	Native Geranium					Forb (FG)	0	0	0	g	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Portulacaceae	Portulaca oleracea	Pigweed					Forb (FG)	0	0	0	g	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Chenopodiaceae	Einadia hastata	Berry Saltbush					Forb (FG)	0	0	0	g	1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Plantaginaceae	Plantago hispida		0				Forb (FG)	g	0.1	5	g	0.1	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Phyllanthaceae	Phyllanthus virgatus	Wiry Spurge					Forb (FG)	g	0.1	10	0	0	0	0	0	g	0.5	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Polygonaceae	Rumex brownii	Swamp Dock					Forb (FG)	0	0	0	g	0.5	20	g	0.1	20	g	0.5	10	g	1	20	g	0.5	20	0	0	0	0	0	0	g	0.1	3	0	0	0						
Oxalidaceae	Oxalis spp.		0				Forb (FG)	g	0.1	20	g	0.1	50	0	0	g	0.1	20	0	0	0	0	0	0	0	g	0.1	5	g	0.1	1	0	0	g	0.1	1							
Asteraceae	Chrysocephalum apiculatum	Common Everlasting					Forb (FG)	0	0	0	0	0	0	0	0	0	g	2	100	g	0.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Pteridaceae	Cheilanthes sieberi	Rock Fern					Fern (EG)	g	0.1	20	0	0	0	g	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Asteraceae	Cirsium vulgare	Spear Thistle			*			0	0	0	0	0	g	0.1	5	g	0.5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	0.1	3								
Malvaceae	Malva parviflora	Small-flowered Mallow			*			0	0	0	g	0.5	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
Clusiaceae	Hypericum perforatum	St. Johns Wort			*	1		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	g	0.2	50	0	0	0	0	0	0	0	0	0							
Poaceae	Phalaris aquatica	Phalaris			*			g	0.2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Asteraceae	Conyza spp.	A Fleabane			*			0	0	0	g	0.1	1	g	0.1	20	0	0	0	0	0	g	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Fabaceae (Faboideae)	Trifolium spp.	A Clover			*			0	0	0	g	0.1	10	g	0.1	10	0	0	g	3	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Brassicaceae	Lepidium africanum	Common Peppercreess			*			0	0	0	g	5	100	g	0.1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Poaceae	Eleusine tristachya	Goose Grass			*			g	0.1	2	g	2	100	0	0	g	2	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Plantaginaceae	Plantago lanceolata	Lamb's Tongues			*			g	0.1	5	g	0.1	20	g	0.1	3	0	0	g	5	100	g	1	100	0	g	0.5	20	g	0.1	10	0	0	0	0	0	0						
Poaceae	Set																																										



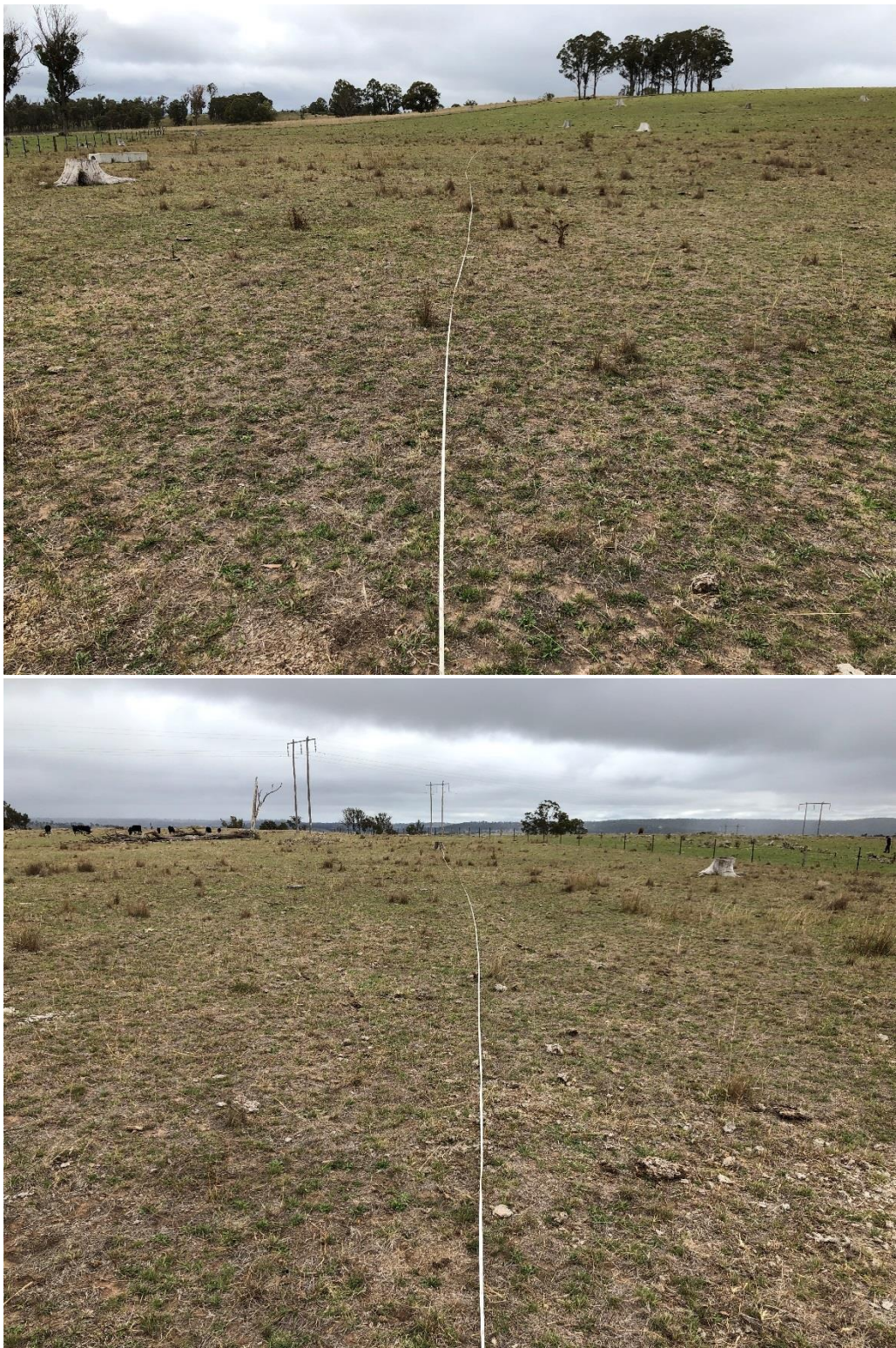
# Appendix C: Floristic plot photograph samples

## 3.1 Plot 7



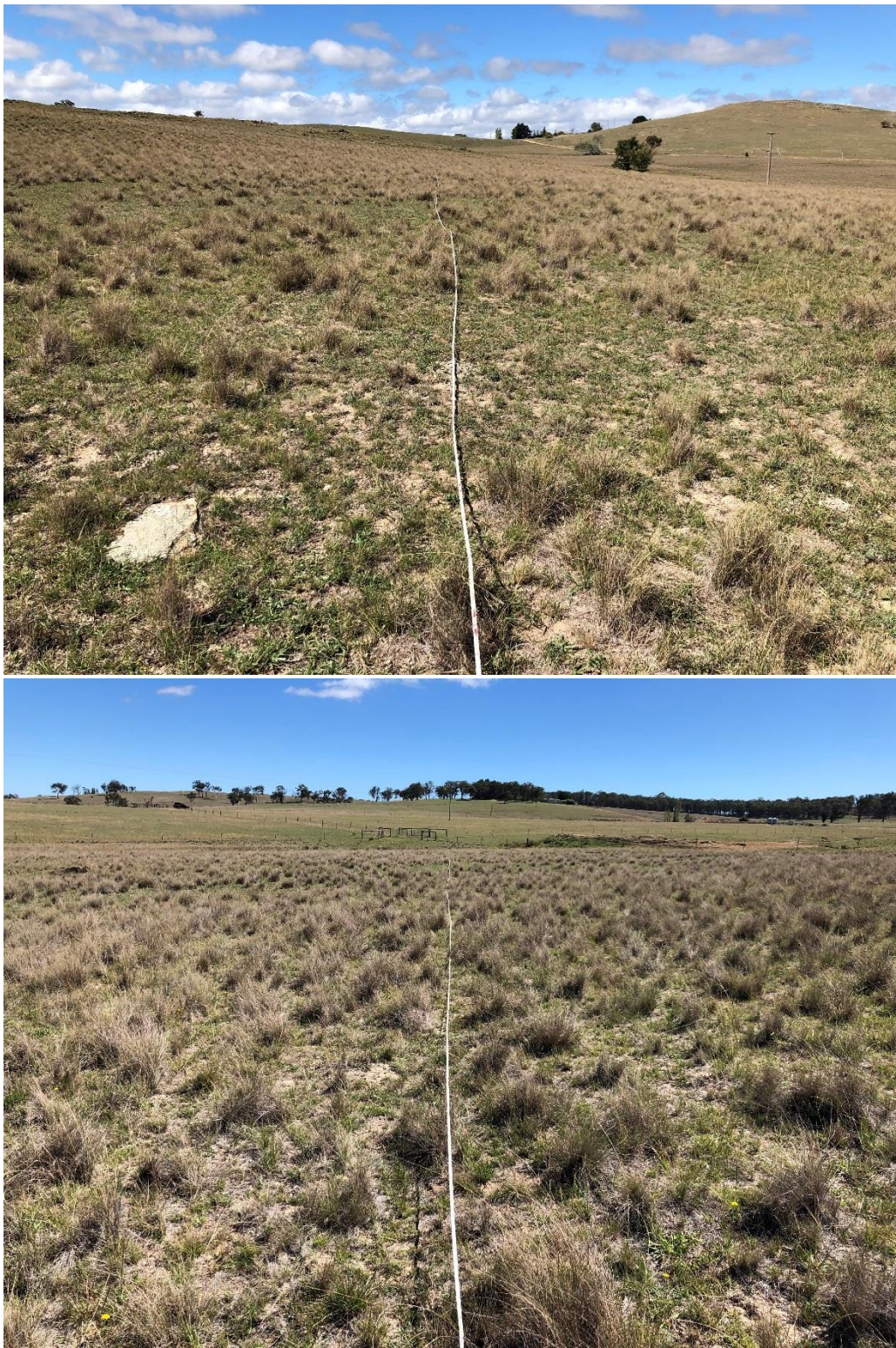


3.2 Plot 12



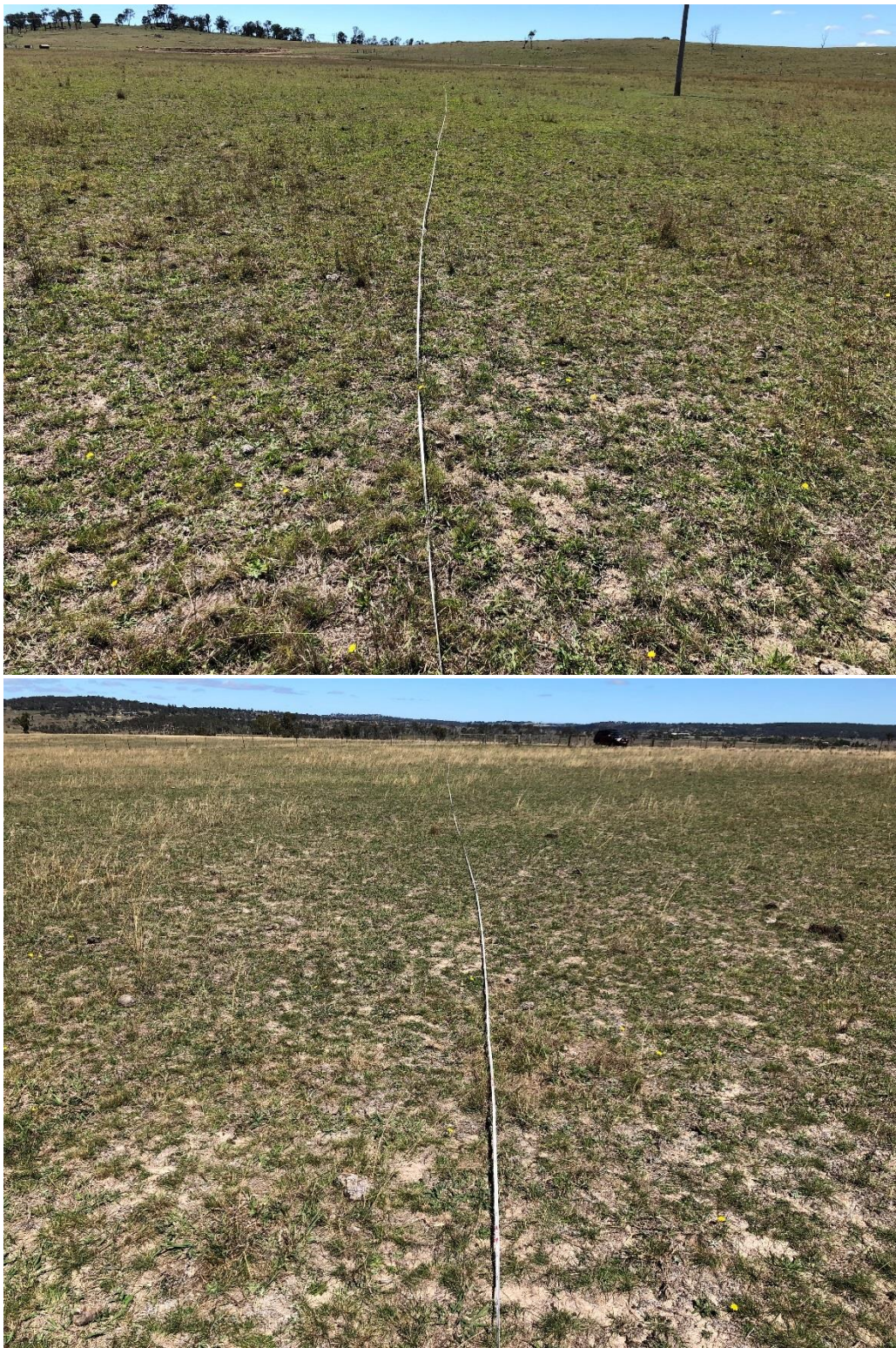


3.3 Plot 21



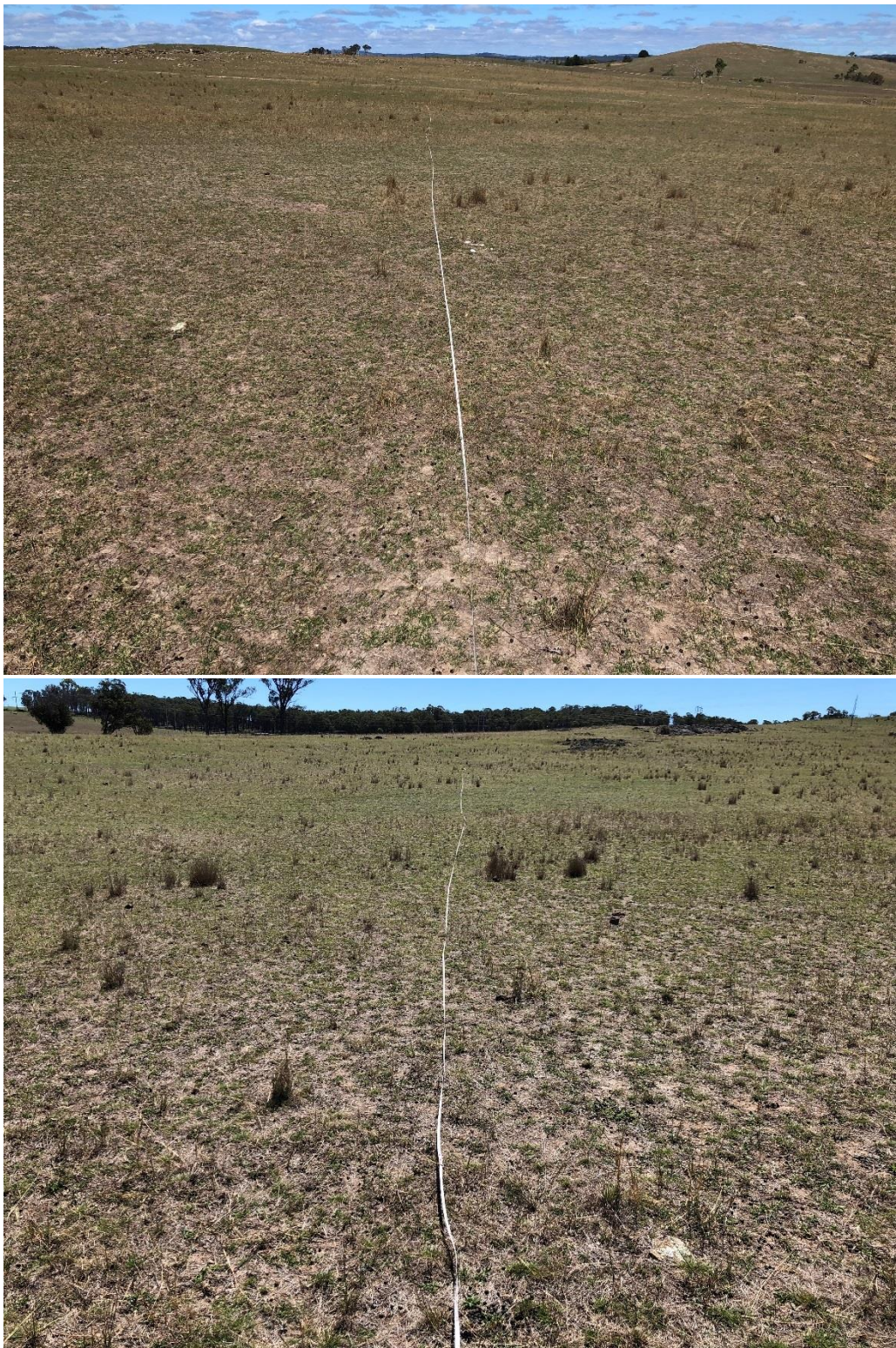


3.4 Plot 22





3.5 Plot 23





3.6 Plot 24



# Appendix D: Biodiversity credit report

# BAM Credit Summary Report

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00016756/BAAS17021/19/00016757	Stringybark Solar Farm	04/07/2019
Assessor Name	Report Created	BAM Data version *
	08/08/2019	12
Assessor Number	BAM Case Status	Date Finalised
	Finalised	08/08/2019
Assessment Revision	Assessment Type	
0	Part 4 Developments (General)	

\* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

## Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAI	Ecosystem credits
<b>Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion</b>								
1	510_Poor_conditi on_grass	13.3	45.2	0.25	High Sensitivity to Potential Gain	2.00	TRUE	0
							<b>Subtotal</b>	<b>0</b>



## BAM Credit Summary Report

Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion							
2	568_Poor_conditi on_grass	8.4	46.6	0.25		1.25	0
						<b>Subtotal</b>	<b>0</b>
						<b>Total</b>	<b>0</b>

### Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAIL	Species credits
<b><i>Dichanthium setosum</i> / Bluegrass ( Flora )</b>						
510_Poor_condition_grass	13.3	0.5	0.25	2	False	3
					<b>Subtotal</b>	<b>3</b>

