

28 June 2021

Our ref: 15721

Mr Javier Canon
Senior Policy Officer
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Dear Javier,

Stubbo Solar Farm (SSD-10452) BDAR – Addendum report

Eco Logical Australia (ELA) were engaged by UPC\AC Renewables to prepare a Biodiversity Development Assessment Report (BDAR) for the Stubbo Solar Farm (the Project). The project includes the development of a Solar Farm near Stubbo, NSW, including panel arrays, substations, inverter units, and all associated infrastructure required to supply 400MW to the NSW energy grid.

The exhibition of the Environmental Impact Statement (EIS), including the BDAR, concluded on 19 February 2021. The Biodiversity, Conservation and Science Directorate (BCS) of the Department of Planning, Industry and Environment (DPIE) undertook a review of the Stubbo Solar Farm BDAR.

Two recommendations were made, relating to:

1. Category 1-exempt land
2. Exclusion of *Euphrasia arguta* from candidate species list

ELA prepared a response to submissions letter with additional information relating to the above recommendations. BCS have reviewed ELA's response, and following further discussion with DPIE and ELA, have recommended reclassification of some areas of the site to Category 2 Land. Attached below is the updated assessment of the reclassified areas of the development site including revised vegetation mapping and credit calculations. This information forms an addendum to the original BDAR for the Stubbo Solar Farm.

The project also includes upgrades to Blue Springs Road, which were assessed in a standalone BDAR Addendum following submission of the EIS. A summary of the overall project impacts including both the Stubbo Solar Farm and Blue Springs Road Upgrade is provided.

Yours sincerely,



Tom Schmidt
Senior Ecologist - BAM Accredited Assessor

Revised assessment for areas of Category 2 – Regulated Land

1. Methods

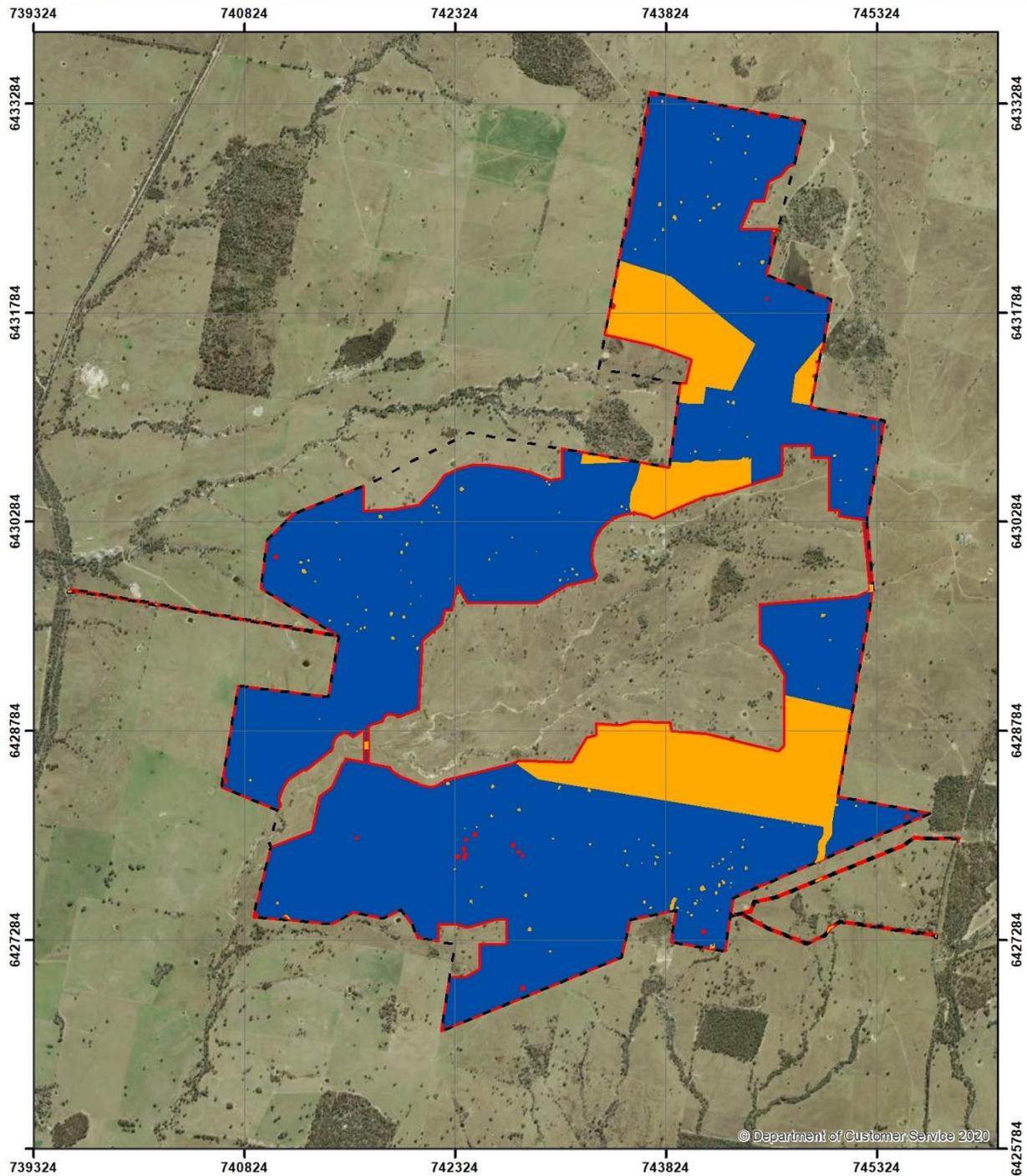
Category 2 Land within the development site is presented on Figure 1. The areas for reassessment are represented by the paddock shaped areas of Category 2 Land. Areas of Category 2 Land that represent scattered paddock trees surrounded by areas of Category 1 Land are not subject to this revised assessment.

Revised vegetation mapping for areas of Category 2 Land was developed using existing plot data, aerial imagery and site photographs. Areas of Category 2 Land within the development site are characterised by cleared, open farmland with sparse paddock trees occurring variously in small groups or as isolated trees. As such, two vegetation zones were identified based on the ecological features of the area; Open Woodland and Grassland. The Open Woodland zone included all trees, and where trees were within 100 m of each other they were included in the same patch. Isolated trees (>100 m from any other tree) were mapped individually as part of the Open Woodland zone. The Grassland zone included all areas where trees were absent.

Following the mapping revisions, an updated assessment of candidate species was undertaken.

The BAM-Calculator case was updated using the revised assessment data to provide an updated impact summary and calculation of the total number of ecosystem and species credits required for the development.

Category 1 and Category 2 Land Stubbo Solar Farm



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0 250 500 1,000
Metres

Datum/Projection:
GDA 1994 MGA Zone 55
Location: Stubbo, NSW
Date Prepared: 15/06/2021

Legend

- Development Site
- Study Area
- Category 1 Land
- Category 2 Land



Figure 1: Category 1 and Category 2 Land at the Stubbo Solar Farm site

2. Results

2.1. Existing environment

2.1.1. Plant Community Types present and threatened ecological communities

One PCT was identified within the reassessed Category 2 Land areas of the development site, development site, PCT 281 *Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion* (Table 1). Within the revised assessment area PCT 281 was recorded in two broad condition states (vegetation zones) and mapped as Open Woodland and Grassland (Table 4 and Table 5; Figure 2). The selection of the PCTs occurring on the development site was based on a quantitative analysis of full-floristic plot data and PCT descriptions in the VIS, with justification for the selection provided in Table 3.

PCT 281 within the development site conforms to the NSW BC Act listed CEEC *White Box Yellow Box Blakely's Red Gum Woodland* (Table 2; Figure 3). Although the vegetation condition is low, disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact (NSW Scientific Committee 2011). Given this definition and the presence of some native species within both zones of this PCT, all areas of PCT 281 are conservatively assessed as representing the State-listed TEC. PCT 281 within the revised assessment area does not meet the condition thresholds for EPBC Act listed CEEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* due to the degraded understorey not containing sufficient cover or diversity of native species.

Table 1: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area	Percent cleared	TEC
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	202.4 ha	67	Yes

Table 2: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
281	Critically Endangered	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern	202.4	Critically Endangered	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	0

PCT ID		BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)	
		Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions					

Table 3: PCT selection justification

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	IBRA Region and Subregion Species	<i>Angophora floribunda</i> (Rough-barked Apple), <i>Eucalyptus blakelyi</i> (Blakely's Red Gum), <i>E. melliodora</i> (Yellow Box) – dominant canopy species. Surrounding areas with more intact vegetation represent this PCT.

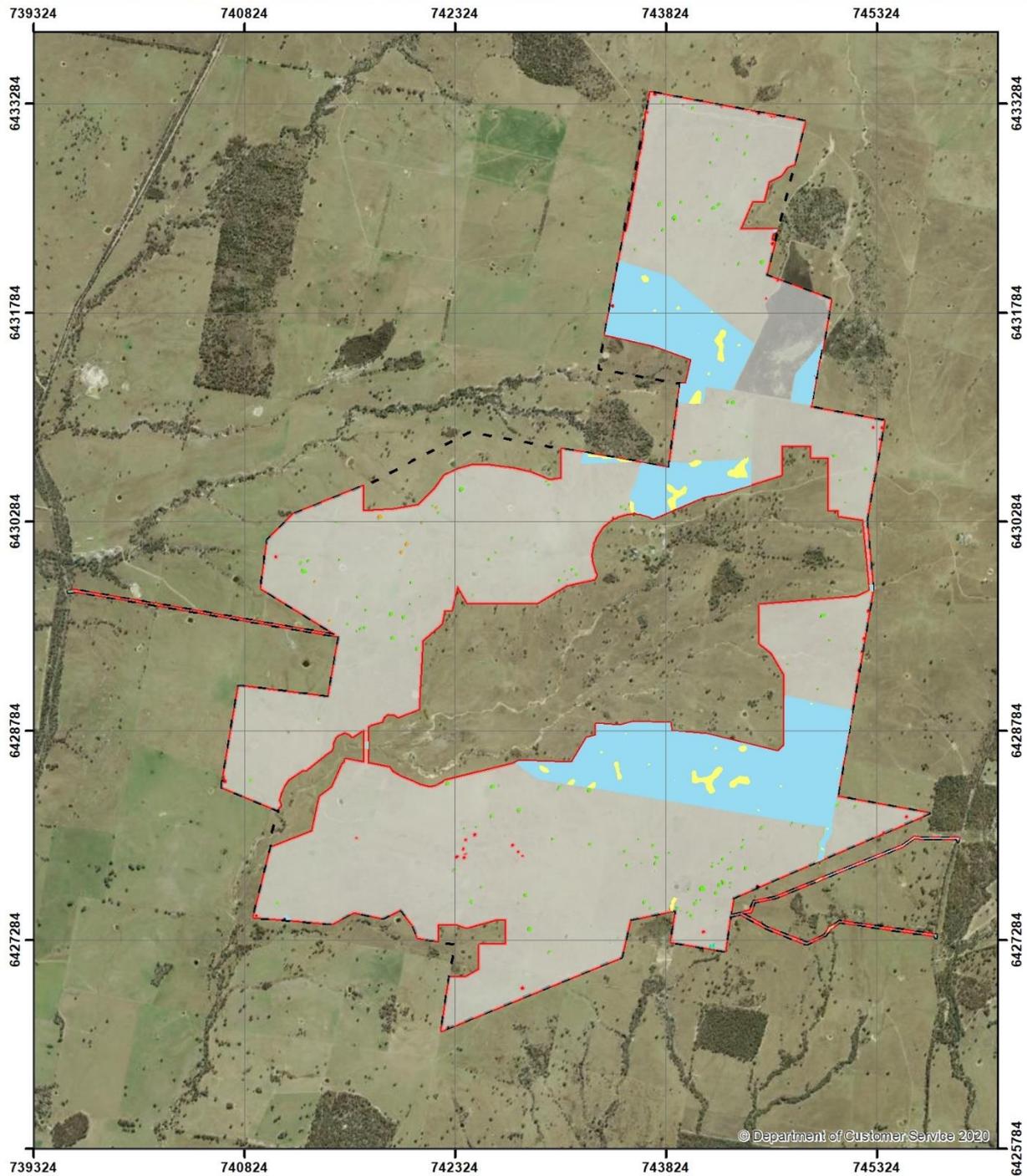
Table 4: PCT281 Open Woodland

PCT 281 Open Woodland			
Vegetation formation/class/structure	Western Slopes Grassy Woodlands / Grassy Woodlands / Woodland		
Conservation status	BC Act: CEEC. EPBC Act: Not listed due to not meeting condition thresholds.		
	<p>This zone occurs across the site as scattered individual remnant trees and some small clumps of trees within modified, mixed native and exotic pasture.</p> <p>The mid-storey is absent. Canopy regeneration is absent.</p> <p>The groundcover contains a mix of exotic pasture species with fallen timber in some patches.</p> <p>The groundcover is significantly degraded.</p>		
	Characteristic canopy trees	<i>Angophora floribunda</i> (Rough-barked Apple), <i>Eucalyptus blakelyi</i> (Blakely's Red Gum), <i>E. melliodora</i> (Yellow Box)	
Characteristic mid-storey	Absent		
Characteristic groundcovers	<i>Austrostipa</i> spp., <i>Eragrostis</i> sp., <i>Aristida</i> sp.,		
Exotic species	<i>Arctotheca calendula</i> , <i>Echium plantagineum</i> , <i>Lolium</i> sp., <i>Medicago</i> sp. and <i>Trifolium</i> spp		
Condition	Low		
Variation and disturbance	<p>This zone is characterised by remnant canopy with a highly degraded understorey that contains a mixture of exotic and native species.</p> <p>This zone includes isolated trees within paddock and small groups of trees</p>		
% cleared in NSW	67		
No. sites sampled	3. Plots 2, 19, and 29.		
Threatened flora species	Not present. This zone is considered too degraded for threatened flora to occur.		
Fauna habitats	Hollow bearing trees, flowering eucalypts. Fallen logs are present in some patches.		
Composition	Structure	Function	Vegetation Integrity Score
51.7	37.6	54.5	47.3

Table 5: PCT 281 Grassland

PCT 281 Grassland				
Vegetation formation/class/structure	Western Slopes Grassy Woodlands / Grassy Woodlands / Woodland			
Conservation status	BC Act: CEEC EPBC Act: Not listed due to not meeting condition thresholds.			
		<p>This zone is characterised by mixed native and exotic pasture/grassland with no trees or shrubs.</p> <p>This zone has had significant and ongoing disturbance from agriculture including clearing, cropping, pasture improvement and grazing.</p> <p>The vegetation condition is very low.</p>		
Characteristic canopy trees	Absent			
Characteristic mid-storey	Absent			
Characteristic groundcovers	<i>Aristida ramosa</i> , <i>Austrostipa</i> spp., <i>Arundanella nepalensis</i> , <i>Calotis lappulacaea</i> , <i>Cheilanthes</i> sp, <i>Wahlenbergia</i> spp.			
Exotic species	<i>Arctotheca calendula</i> , <i>Lolium</i> sp, <i>Trifolium</i> spp. <i>Acetosella vulgaris</i> , <i>Hypochaeris radicata</i>			
Condition	Very low			
Variation and disturbance	Variation depending on time since pasture improvement or past cropping. High levels of disturbance from historic and ongoing farming activities such as pasture improvement, cropping and grazing.			
% cleared in NSW	67			
No. sites sampled	5. Plots 4, 18, 23, 28, and RPS16. RPS16 plot was duplicated in calculator to meet required plots for area of zone. This plot was selected for duplication as it had the highest cover and diversity of native species.			
Threatened flora species	Not present. This zone is considered too degraded for threatened flora to occur.			
Fauna habitats	No significant fauna habitat features.			
Composition	Structure	Function	Vegetation Integrity Score	
68.5	57.1	0.1	7.6	

Plant Community Types and Vegetation Zones Stubbo Solar Farm

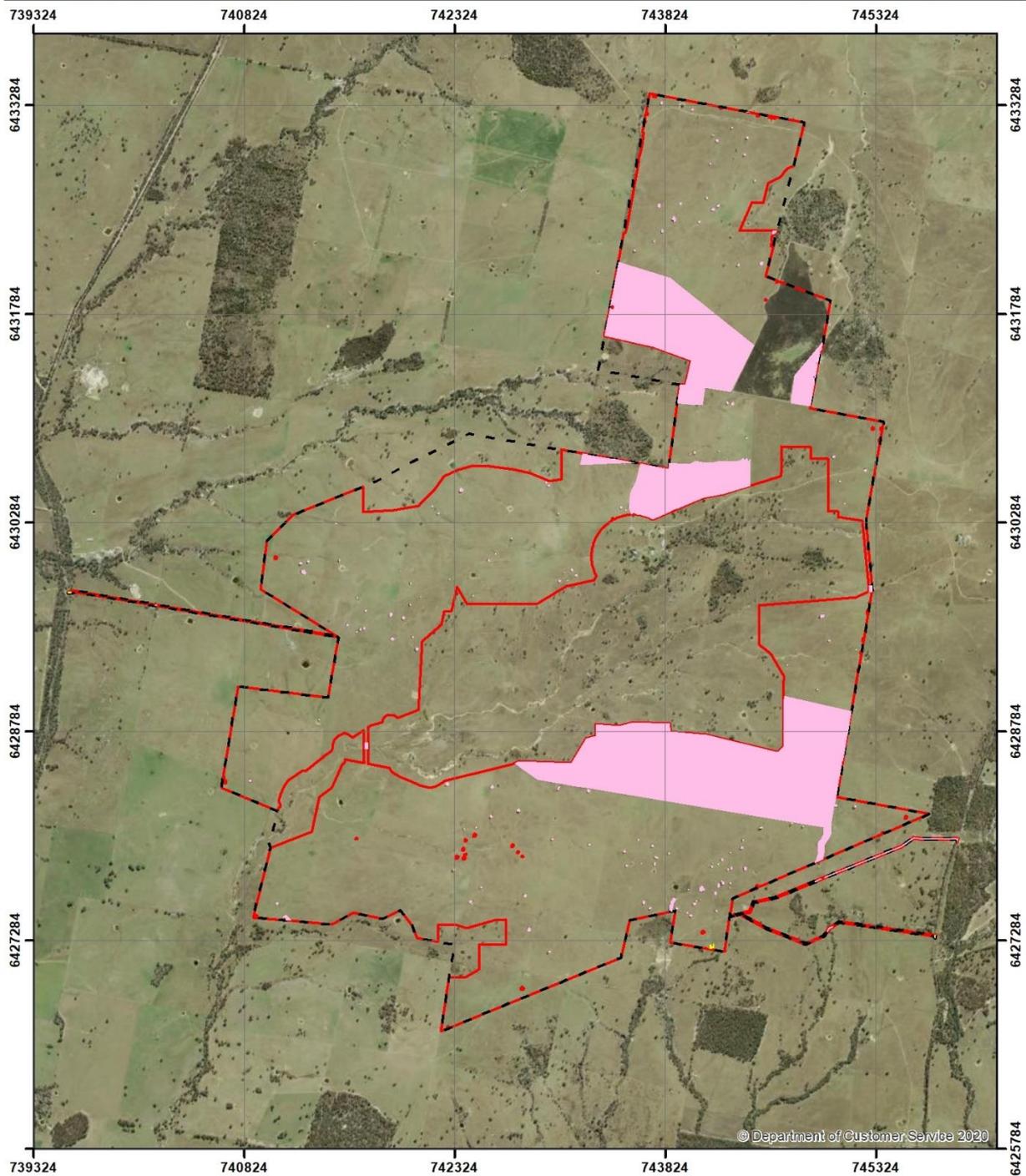


Legend		0 250 500 1,000 Metres Datum/Projection: GDA 1994 MGA Zone 55 Location: Stubbo, NSW Date Prepared: 28/06/2021
[Red Outline] Development Site [Dashed Line] Study [Grey Box] Category 1 Land	Plant Community Types and Vegetation Zones [Light Blue Box] PCT 281: Grassland [Yellow Box] PCT 281: Open Woodland [Green Box] PCT 281: Low (Paddock trees) [Cyan Box] PCT 281 Moderate-good [Orange Box] PCT 1770: Low	



Figure 2: Plant Community Types and Vegetation Zones

Threatened Ecological Communities **Stubbo Solar Farm**



Legend		0 250 500 1,000 Metres	
Development Site	Threatened Ecological Communities	Datum/Projection: GDA 1994 MGA Zone 55	
Study Area	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (NSW BC Act)	Location: Stubbo, NSW	
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (BC Act and EPBC Act)	Date Prepared: 28/06/2021	

Figure 3: Threatened Ecological Communities

2.1.2. 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 6 which provides a revised assessment for the Category 2 Land area.

Candidate species were identified through operation of the BAM Credit Calculator in accordance with the BAM. Barking Owl was manually added to the list of candidate species as it was recorded in proximity to the development site.

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

- Koala (*Phascolarctos cinereus*)
- Pink-tailed Worm Lizard (*Aprasia parapulchella*)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- Superb Parrot (*Polytelis swainsonii*)
- Barking Owl (*Ninox connivens*)

All other species have been excluded from assessment as described in Table 6.

Following targeted surveys within the development site as part of the original BDAR, Koala, Pink-tailed worm Lizard, White-bellied Sea-Eagle and Superb Parrot were not present. Barking Owl (Breeding) was assumed present. The species polygon for Barking Owl (Figure 4) includes woodland native vegetation within the development site except for patches that were known to not contain trees with hollows larger than 20cm in diameter (habitat constraint). Not all patches/trees were subject to a detailed hollow survey, therefore the species polygon is a conservative estimate.

Table 6: Candidate species credit species assessment for reassessment of Category 2 Land areas

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
<i>Acacia ausfeldii</i>	Ausfeld's Wattle	Footslopes and other low rises on sandstone.	n/a	High	Vulnerable	Not listed	East of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South Western Slopes bioregion, as well as the Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions.	Eucalypt woodland in sandy soil; often in remnant roadside patches of woodland.	Associated species include <i>Eucalyptus albens</i> , <i>E. blakelyi</i> and <i>Callitris</i> spp., with an understorey dominated by <i>Cassinia</i> spp. and grasses. Likely to have a dormant soil seedbank from which germination is stimulated by fire. Established plants are likely to be killed by fire. Flowers from August to October.	No	8km east of site.	No. Habitat too degraded. Ongoing agricultural disturbance including clearing, cropping, pasture improvement and grazing have resulted in unsuitable habitat.
<i>Dichanthium setosum</i>	Bluegrass	n/a	n/a	High	Vulnerable	Vulnerable	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>Leptorhynchus 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.	No	45km south west of site	No. Microhabitat not present -incorrect soil type. Development site does not contain heavy basaltic black soils or red-brown loams with clay subsoil. Habitat too degraded.
<i>Euphrasia arguta</i>		n/a	n/a	High	Critically Endangered	Critically Endangered	In NSW, recently recorded only from Nundle area of the north western slopes and tablelands, from near the Hastings River and from the Barrington Tops.	Eucalypt forest with a mixed grass and shrub understorey, disturbed areas, along roadsides.	Annual habit and has been observed to die off over the winter months, with active growth and flowering occurring between January and April. As with other species of <i>Euphrasia</i> , this species is semi-parasitic and attaches to the roots of other associated plants.	No	50km south east of study area (record >100 years old).	No. Habitat too degraded. Ongoing agricultural disturbance including clearing, cropping, pasture improvement and grazing have resulted in unsuitable habitat.
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	n/a	East of Binalong, south and east of Boorowa.	High	Endangered	Endangered	Four sites in NSW: at Boorowa, Captains Flat, Ilford and Delegate. Also experimentally introduced at Bowring Cemetery NSW.	Natural Temperate Grassland, grassy woodland, and Box-Gum woodland.	Flowers in October at Boorowa and Ilford, and December at Captains Flat and Delegate. Flowers are followed by fleshy seed capsules in summer. Plants retreat into subterranean tubers after fruiting, so are not visible above-ground.	No	100km east of development site.	No. Geographic limitation.
<i>Swainsona sericea</i>	Silky Swainson-pea	n/a	n/a	High	Vulnerable	Not listed	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 <i>Eucalyptus pauciflora</i> (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 <i>Callitris</i> spp. Regenerates from seed after fire.	No	6km south east of development site.	No. Habitat too degraded. Ongoing agricultural disturbance including clearing, cropping, pasture improvement and grazing have resulted in unsuitable habitat.

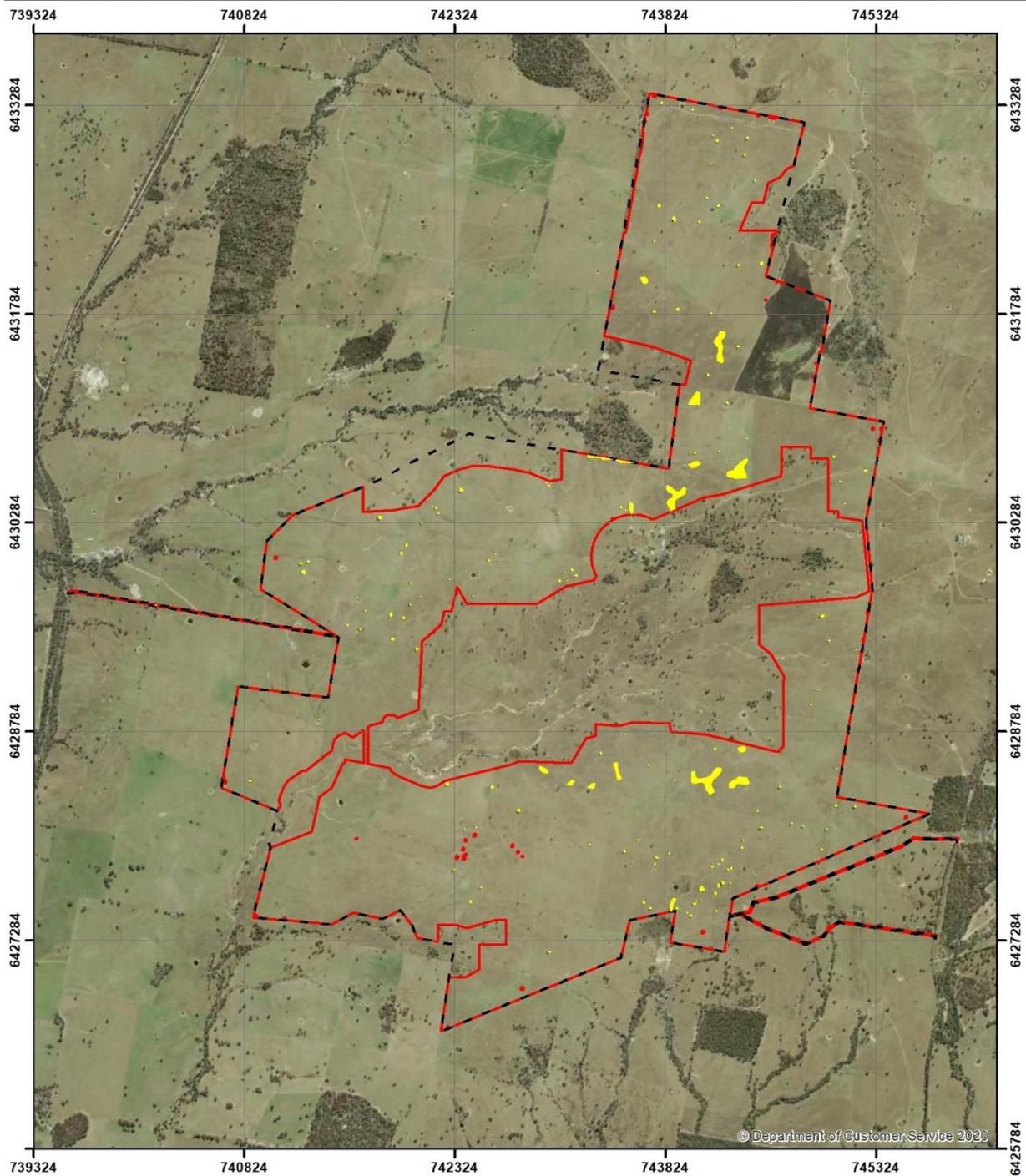
Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
<i>Anthochaera phrygia</i>	Regent Honeyeater	As per mapped areas	n/a	High	Critically Endangered	Critically Endangered	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.	No	7km south east of development site.	No. Development site is not within mapped important area.
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	Rocky areas or within 50m of rocky areas	n/a	High	Vulnerable	Vulnerable	In NSW, only known from the Central and Southern Tablelands, and the South Western Slopes.	Sloping, open woodland areas with predominantly native grassy groundlayers, rocky outcrops or scattered, partially-buried rocks.	Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays 2 eggs inside the ant nests during summer; the young first appear in March.	No	35km east of development site.	Yes. Species not recorded in targeted surveys as per original BDAR.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	n/a	High	Vulnerable	Not listed	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.	Yes	700m north west of development site.	Yes. No large stick nests recorded within development site as per original BDAR.
<i>Lathamus discolor</i>	Swift Parrot	As per mapped areas	n/a	Moderate	Endangered	Critically Endangered	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> , <i>Corymbia maculata</i> , <i>C. gummifera</i> , <i>E. sideroxylon</i> , and <i>E. albens</i> . Commonly used lerp infested trees include <i>E. microcarpa</i> , <i>E. moluccana</i> and <i>E. pilularis</i> . Following winter they return to Tasmania where they breed from September to January.	Yes	11km east of development site.	No. Development site is not within mapped important area.
<i>Litoria booroolongensis</i>	Booroolong Frog	n/a	n/a	High	Endangered	Endangered	Restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. Several populations have recently been recorded in the Namoi catchment.	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses.	Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing pools	No	90km south of development site.	No. No permanent streams are present. Habitat is too degraded.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
<i>Petaurus norfolcensis</i>	Squirrel Gliders	n/a	n/a	High	Vulnerable	Not listed	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 <i>Acacia</i> gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	Yes	10km north east of development site.	No. Habitat too degraded. Widely scattered paddock trees generally separated by greater than 50m.
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	n/a	n/a	High	Vulnerable	Not listed	In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide.	Dry sclerophyll open forest, heath, swamps, rainforest and wet sclerophyll forest.	Agile climber foraging preferentially in rough barked trees. Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. Nest and shelter in tree hollows and use many different hollows over a short time span. Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.	Yes	120km east of development site.	No. Habitat too degraded. Also, no records within 100km of site - species generally occurs east of the Great Dividing Range.
<i>Phascolarctos cinereus</i>	Koala	Areas identified via survey as important habitat	n/a	High	Vulnerable	Vulnerable	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.	Yes	8km south of the development site.	Yes. Species not recorded in targeted surveys as per original BDAR.
<i>Polytelis swainsonii</i>	Superb Parrot	Hollow bearing trees: Living or dead <i>E. blakelyi</i> , <i>E. melliodora</i> , <i>E. albens</i> , <i>E. camaldulensis</i> , <i>E. microcarpa</i> , <i>E. polyanthemos</i> , <i>E. mannifera</i> , <i>E. intertexta</i> with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.	n/a	Moderate	Vulnerable	Vulnerable	In NSW, occurs on inland slopes of the Great Divide and on adjacent plains, especially along the major river-systems.	Box-gum woodland, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	Yes	35km south of the development site.	Yes. Species not recorded in targeted surveys as per original BDAR.

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act	EPBC Act	Distribution	Habitat	Ecology	Paddock trees use	Nearest record in BioNet	Further assessment?
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Other: Breeding camps	n/a	High	Vulnerable	Vulnerable	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.	No	22km south of the development site.	No. No breeding camps present. Nearest camp is at Mudgee, 35km south of development site.
<i>Miniopterus orianae oceanensis</i>	Eastern Bentwing-bat	Caves: 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	n/a	High	Vulnerable	Not listed	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, monsoon 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.	No	7km east of study area.	No. No caves, tunnels, mines or other structures potentially used for breeding are present.
<i>Ninox connivens</i>	Barking Owl	Hollow bearing trees. Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	n/a	High	Vulnerable	Not listed	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.	Yes	Recorded incidentally 500m south of study area	Yes. Species assumed present within Open Woodland zone. Graassland zone doesn't not contain trees required for breeding.

S

Species Polygon - Barking Owl **Stubbo Solar Farm**



Legend		<p>Datum/Projection: GDA 1994 MGA Zone 55 Location: Stubbo, NSW Date Prepared: 28/06/2021</p>
Development Site Study Area	Species Polygon Barking Owl	

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Figure 4: Barking Owl Species Polygon

2.2. Assessment of Impacts

The following section provides a summary of the impacts of the proposed Stubbo Solar Farm development (excluding Blue Springs Road Upgrade) following the revised assessment.

2.2.1. Direct impacts

The direct impacts of the proposed development are associated with clearing of native vegetation and threatened species habitat that cannot be avoided. These impacts will occur during construction.

The direct impacts of the development on:

- native vegetation are outlined in Table 7
- threatened ecological communities are outlined in Table 8
- threatened species and threatened species habitat is outlined in Table 9.

Table 7: Direct impacts to native vegetation

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	Clearing of 206.17 ha
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	Western Slopes Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	Clearing of 0.24 ha

Table 8: Direct impacts on threatened ecological communities

PCT ID	BC Act		EPBC Act			
	Listing status	Name	Direct impact (ha)	Listing status	Name	Direct impact (ha)
281	Critically Endangered	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Clearing of 206.17 ha	Critically Endangered	White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Clearing of 0.17 ha

Table 9: 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>Ninox connivens</i>	Barking Owl	Clearing of 13.2 ha	V	-

2.2.2. Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) for one TEC as outlined in Table 10 (Figure 5). An updated impact assessment and detailed consideration of whether impacts on the candidate TEC are serious and irreversible is included in Table 12. The proposed impacts are not considered to be a SAII on the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland TEC as the impacts are to areas in low condition; higher quality areas will be retained within the study area and locality; and the impacts will be offset using Biodiversity Offset Scheme under the BC Act which will deliver like for like offsets in NSW.

Table 10: Candidate Serious and Irreversible Impacts

Species / Community	Principle	Direct impact individuals / area (ha)	Threshold
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland	Principles 1 and 2	206.17 ha	No listed threshold

Table 11: Determining whether impacts are serious and irreversible

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
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 SAII.
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
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	Yes
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 threshold is identified, and the community is widespread in several bioregions NSW. Further consideration of potential serious and irreversible impacts is outlined in Table 12 below
Principle 3	
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
Principle 4	
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

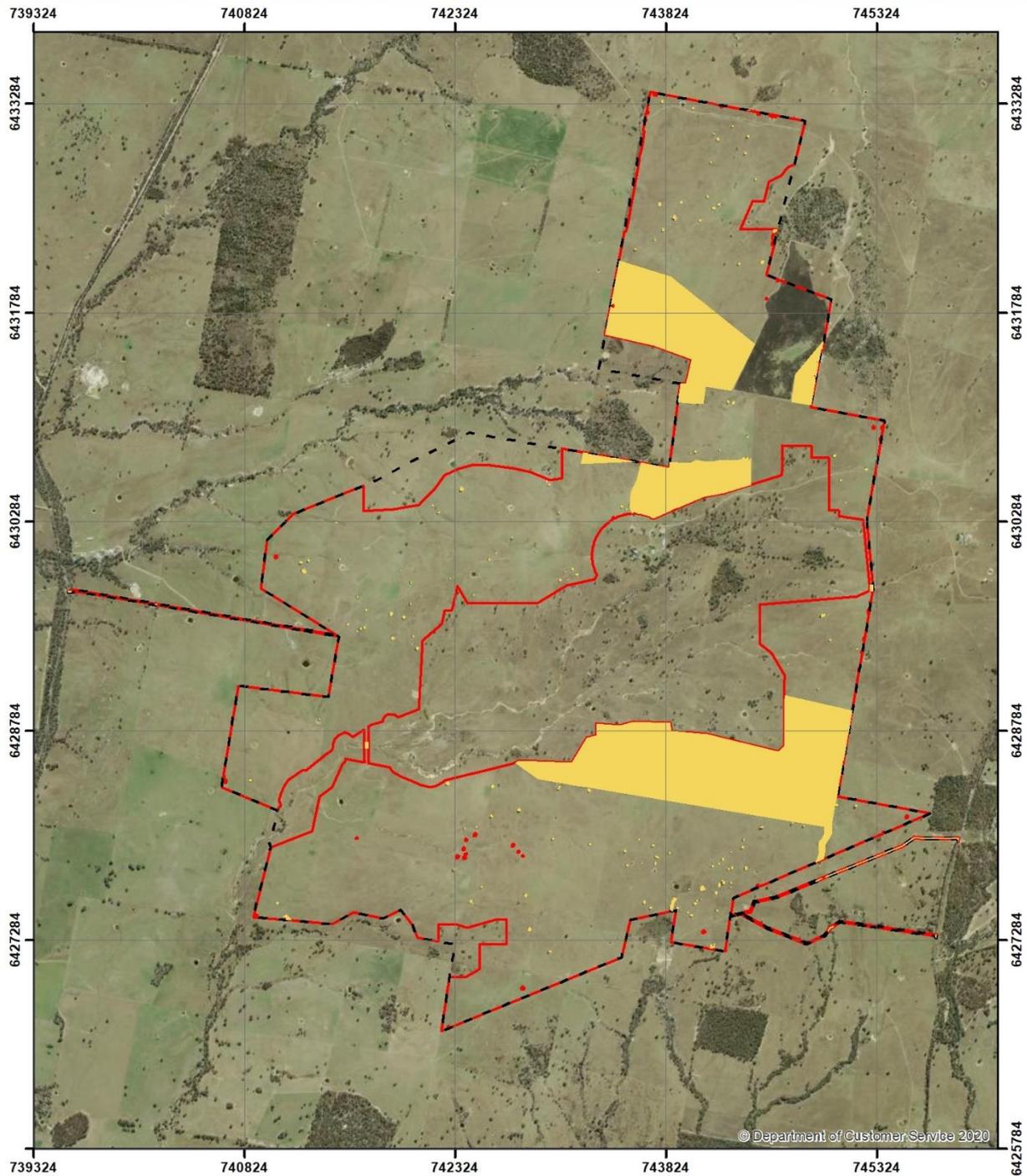
Determining whether impacts are serious and irreversible	Assessment
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.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

Table 12: 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 remove 206.17 ha of the TEC.</p> <p>193 ha represents low condition grassland present as modified, mixed native and exotic pasture.</p> <p>13 ha removal of low condition open woodland or scattered paddock trees among exotic pasture.</p> <p>0.17 ha present as moderate to good quality woodland.</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>In the absence of accurate and detailed mapping of the TEC in the region, an assessment of the extent of the TEC has been made using the vegetation formation layer from the Central Tablelands State Vegetation Type Map (OEH 2017).</p> <p>All areas of the formation 'Grassy Woodland' were plotted and the area calculated. Conservatively assuming that 50% of the area of Grassy Woodland is the TEC, the estimated extent of the TEC extent surrounding the proposed development footprint is:</p> <ul style="list-style-type: none"> • 155 ha of Grassy Woodland within 1500m • 689 ha of Grassy Woodland within 5000 metres <p>These areas represent the estimated extent of woodland zones of the community, and the area of sparse open woodlands, scattered paddock trees and grasslands of the community are likely to be much greater.</p> <p>It is likely that the condition of the TEC within the areas surrounding the development site varies.</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 TEC is difficult to distinguish, as it occurs widely across NSW. It occurs in a variety of condition states and is fragmented over a wide distribution.</p> <p>Higher quality and larger areas of the community have been retained within the EEZ of the development site and also occur in the surrounding landscape.</p> <p>The extant area and overall condition of the community is not likely to be significantly changed as a result of the proposed development due to the low condition of the areas to be impacted.</p>
4. the development proposal's impact on:	
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.?	<p>The development is unlikely to have any impacts on abiotic factors critical to the long term survival of the TEC. This TEC within the development site is already highly disturbed and modified. Solar panels will be mounted above the ground with minimal impacts to surface water flows expected.</p>

Impact Assessment Provisions	Assessment
<p>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</p>	<p>The proposed development will impact 206.17 ha of the community including mature trees containing hollows. These areas are generally considered to be in low condition and occur as isolated paddock trees over exotic groundcover.</p> <p>No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development. The harvesting of plants will not occur within the remaining areas of the TEC.</p>
<p>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>	<p>206.17 ha will be directly impacted. The TEC within the development site is already highly disturbed and modified and indirect impacts are not expected to significantly reduce the quality or integrity of any additional areas of the TEC following the implementation of mitigation measures.</p>
<p>5. direct or indirect fragmentation and isolation of an area of the TEC</p>	<p>The TEC within the development site is already highly modified and fragmented. The proposed development will result in minor increases to the fragmentation which already exists within the highly modified farming landscape comprising of widely scattered paddock trees. Better quality and more intact areas of the TEC in the locality have been retained.</p>
<p>6. the measures proposed to contribute to the recovery of the TEC in the IBRA subregion.</p>	<p>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. Additionally, through avoid and minimise, better quality and more intact areas of the TEC in the locality have been retained.</p>

Candidate Serious and Irreversible Impacts **Stubbo Solar Farm**



Legend		Candidate Serious and Irreversible Impacts  White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	0 250 500 1,000 Metres Datum/Projection: GDA 1994 MGA Zone 55 Location: Stubbo, NSW Date Prepared: 28/06/2021
 Development Site  Study Area			



Figure 5: Candidate Serious and Irreversible Impacts

3. Summary of overall project impacts

The overall impact of the proposed development including the Stubbo Solar Farm and the Blue Springs Road Upgrade is summarised below, with the number of ecosystem and species credits required for the development outlined in Table 13 and Table 14.

An updated Biodiversity Credit Report for the Stubbo Solar Farm is attached as Appendix A.

Table 13: Ecosystem credits required

PCT ID	PCT Name	Direct impact Solar Farm	Credits required Solar Farm	Direct impact Blue Road	Credits required Blue Springs Road	Total credits required
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	206.17 ha	354	2.07 ha	89	443
1770	Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South	0.24 ha	2			2
1177	Slaty Gum woodland of the slopes of the southern Brigalow Belt South Bioregion			0.7 ha	19	19
81	Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion			0.9 ha	40	40
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion			0.03 ha	1	1

Table 14: Species credit summary

Species	Common Name	NSW listing status	EPBC Listing status	Direct impact Solar Farm	Credits required Solar Farm	Direct impact Blue Road	Credits required Blue Springs Road	Total credits required
<i>Acacia ausfeldii</i>	Ausfeld's Wattle	Vulnerable	Not listed			3.7 ha	152	152
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Not listed			3.7 ha	152	152
<i>Calyptorhynchus lathami</i>	Glossy Black-cockatoo	Vulnerable	Not listed			3.7 ha	152	152
<i>Crinia sloanei</i>	Sloane's Froglet	Vulnerable	Not listed			3.7 ha	114	114
<i>Diuris tricolor</i>	Pine Donkey Orchid	Vulnerable	Not listed			3.7 ha	114	114
<i>Grevillea wilkinsonii</i>	Tumut Grevillea	Critically Endangered	Endangered			3.7 ha	229	229
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	Vulnerable	Not listed			3.7 ha	152	152

Species	Common Name	NSW listing status	EPBC Listing status	Direct impact Solar Farm	Credits required Solar Farm	Direct impact Blue Springs Road	Credits required Blue Springs Road	Total credits required
<i>Ninox connivens</i>	Barking Owl	Vulnerable	Not listed	13.2 ha	279	3.7 ha	152	431
<i>Ninox strenua</i>	Powerful Owl	Vulnerable	Not listed			3.7 ha	152	152
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Vulnerable	Not listed			3.7 ha	152	152
<i>Polytelis swainsonii</i>	Superb Parrot	Vulnerable	Vulnerable			3.7 ha	152	152
<i>Swainsona recta</i>	Small Purple-pea	Endangered	Endangered			3.7 ha	152	152
<i>Swainsona sericea</i>	Silky Swainson-pea	Vulnerable	Not listed			3.7 ha	152	152
<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable	Not listed			3.7 ha	152	152

4. Conclusion and next steps

This BDAR Addendum report has provided a revised assessment of the potential impacts of the proposed Stubbo Solar Farm in accordance with the BAM for the revised areas of in Category 2 Land, and also provided an overall summary of the impacts of the project including both the Stubbo Solar Farm and Blue Springs Road upgrade.

Species credit calculations assume presence of several species. Further surveys at the relevant season are proposed and will allow this assessment to be refined. UPC\AC may request the Secretary to refine the offset requirements prior to construction commencement following additional targeted survey.

Ecosystem credit calculations are based on the current design as included in the amendment report (worst case scenario). UPC\AC may request the Secretary to refine the offset requirements based on the final detailed design (road upgrades and Solar Farm) prior to construction commencement.

Appendix A – Biodiversity Credit Report Stubbo Solar Farm (17 June 2021)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00022631/BAAS19034/20/00022632	Stubbo_Solar_Farm	10/06/2021
Assessor Name	Report Created	BAM Data version *
Tom Schmidt	27/06/2021	45
Assessor Number	BAM Case Status	Date Finalised
BAAS19034	Finalised	17/06/2021
Assessment Revision	Assessment Type	
4	Major Projects	

* 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	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South											
3	1770_Low	Not a TEC	17.4	17.4	0.24			High Sensitivity to Potential Gain	1.50		2
										Subtotal	2

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

1	281_Low01	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	30.5	30.5	3.6	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	68
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2	281_Mod_good0101	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	76.9	76.9	0.17	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	8
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4	281_Grassl and_low	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	7.6	7.6	193	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	0
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5	281_openwoodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	47.3	47.3	9.4	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	278
										Subtotal	354
										Total	356

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Species credits	
<i>Ninox connivens</i> / Barking Owl (Fauna)									
1770_Low	17.4	17.4	0.2	Vulnerable	Not Listed	2	False	2	
281_Low01	30.5	30.5	3.6	Vulnerable	Not Listed	2	False	55	
281_openwoodland	47.3	47.3	9.4	Vulnerable	Not Listed	2	False	222	
								Subtotal	279

