

Sundown Solar Farm

Biodiversity Development Assessment Report

Prepared for Sundown Solar Pty Ltd

June 2023

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Executive Summary

ES1 Introduction

Sundown Solar Pty Ltd (Sundown Solar) proposes to develop the Sundown Solar Farm (the project), which is a large-scale solar photovoltaic (PV) electricity generation facility and associated battery energy storage system (BESS).

The project is located within the New South Wales (NSW) Government-declared New England Renewable Energy Zone (REZ). The project will complement nearby operational renewable energy generation assets and will contribute to the overall storage capacity and reliability of the National Electricity Market (NEM). The project will also support State and Commonwealth emission commitments by facilitating renewable energy input into the grid network.

The project comprises the following key components:

- construction and operation of a large-scale solar farm with a generation capacity of approximately 360 MW (AC)
- construction and operation of a BESS with up to four-hour storage capacity of approximately 150 MW (AC).

The electricity generated onsite will contribute to and connect to the national electricity grid via a new onsite substation connected to the existing Transgrid 330 kilovolt (kV) transmission line that traverses the site.

The electricity generated from the project will be sold to one or more registered energy retailing organisations, large energy users (governmental or private) or to the National Electricity Market that is operated by the Australian Energy Market Operator (AEMO).

ES1.1 Project location

The project is located at Spring Mountain, approximately 30 kilometres (km) east of Inverell in the Inverell Shire Council local government area (LGA), and in the New England Tablelands region of northern NSW. The key industry within the LGA is agriculture, and as such the landscape features large areas that have been cleared for grazing and/or cultivation.

The project will be located on three privately owned lots, Lot 148 DP 753299 (Glen Eisle), Lot 141 DP 753305 (Spring Mountain) and Lot 1, DP 1064358 (Newstead). These lots are zoned RU1 – Primary Production under the *Inverell Shire Local Environmental Plan 2012* (Inverell LEP) and have a well-established history of agricultural use. The lots on which the project will be located are currently used for farming, including cultivation of a number of crop species and cattle grazing.

The project will be accessed via the Gwydir Highway which connects Walgett to Grafton. The local roads providing direct access to the site (Spring Mountain Road and Sturmans Road) are terminating roads and predominantly provide access to rural properties. An intersection upgrade at the Gwydir Highway turn-off onto Spring Mountain Road and upgrades along Spring Mountain Road and Sturmans Road will be required to accommodate B-double trucks during construction of the project.

Several new and upgraded watercourse crossings will be required across the project to facilitate vehicle access during construction and operation. Watercourse crossings will typically be implemented as either bed level or culvert crossings, with crossing upgrades proposed along Sturmans Road and Spring Mountain Road where there are existing bridges at Kings Creek and Swan Brook respectively.

ES1.2 Assessment requirements

Sundown Solar is seeking development consent under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is classified as State significant development (SSD) and requires the approval of the NSW Minister for Planning.

Secretary's Environmental Assessment Requirements (SEARs) for the Sundown Solar Farm Project were issued on 14 August 2020 (SSD-8911). The SEARs require that a biodiversity assessment is undertaken in accordance with Section 7.9 of the NSW *Biodiversity Conservation Act 2016* (BC Act), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR will inform an Environmental Impact Statement (EIS) being prepared to support the application for development consent.

In addition to requiring approval from the NSW Minister for Planning, the project has been declared a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Commonwealth Minister for the Environment and Water. The Minister for the Environment and Water has accredited the NSW planning process for the assessment of the project and so the project will be assessed under the Assessment Bilateral Agreement made between the Commonwealth Government and the State of NSW. Supplementary SEARs were issued on 4 October 2022 for the assessment of Commonwealth Matters of National Environmental Significance (MNES).

A single EIS has been prepared to address the requirements set out by the NSW Department of Planning and Environment (DPE) and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

ES1.3 Biodiversity assessment scope and objectives

This BDAR aims to address the SEARs and supplementary SEARs and assesses the project in accordance with the BAM on matters relating to terrestrial biodiversity.

The specific objectives of this BDAR are to:

- describe biodiversity values of the project disturbance footprint
- assess the likelihood that threatened species and communities (threatened biodiversity) listed under the BC Act and EPBC Act could occur in the disturbance footprint and be impacted by the project
- document the strategies implemented to avoid and/or minimise impacts of the project on threatened biodiversity
- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented
- identify offset credit requirements of the project.

This BDAR also describes aquatic habitat values and includes an assessment of potential impacts on aquatic biodiversity values listed under the NSW *Fisheries Management Act 1994* (FM Act).

For the purposes of this BDAR, the project disturbance footprint encompasses: all project components described within this BDAR; construction space including temporary laydown areas; the area of land that will be directly disturbed for the access road and Gwydir Highway intersection upgrades; and land within a 10 metre (m) set back from the edge of infrastructure, in which edge impacts from the operation of the project are considered.

ES2 Assessment methodology

The assessment of biodiversity values within the proposed disturbance footprint has been undertaken in accordance with Stage 1 of the BAM and includes identification and assessment of landscape features, native vegetation, threatened species, and potential prescribed impacts. Identification and assessment of paddock trees was undertaken in accordance with the 'Scattered trees assessment' streamlined assessment module of the BAM.

Desktop assessments were undertaken to gain an understanding of the likely biodiversity values within the locality of the project including vegetation types, threatened species and threatened ecological communities (TECs). This BDAR draws on government publications, databases and spatial datasets, as well as relevant environmental studies completed for other projects in the locality.

Field studies undertaken for this BDAR commenced in February 2021 and include vegetation surveys, scattered tree survey and mapping, detailed habitat assessments as well as seasonal targeted surveys for 'candidate' threatened species (ie species credit species). 'Predicted' threatened species (ie ecosystem credit species) do not require targeted survey as they are predicted to occur by habitat surrogates.

Native vegetation was mapped, stratified and assessed in the field via ground-truthing validation surveys and systematic plot sampling consistent with the methods prescribed in Section 4 of the BAM. Identification of threatened ecological communities were undertaken in accordance with the directions provided by BC Act Final Determinations, EPBC Act Listing Advices and relevant supporting identification and policy guidelines.

Ecosystem and candidate species assessment follows the prescriptions in Section 5 of the BAM. Habitat suitability for threatened species was first assessed in the field to identify habitat constraints listed for each relevant species in the Threatened Biodiversity Data Collection (TBDC) and then further assessed for quality of habitat and presence of microhabitats. For potential candidate species where suitable habitat is present, presence was determined via targeted surveys undertaken in accordance with published survey guidelines.

As the project will involve watercourse crossings at fourth-order waterways, aquatic values were also assessed with due consideration of the Department of Primary Industries *Policy and guidelines for fish habitat conservation and management*. This involved desktop assessment supported by field assessment of aquatic habitat values along Kings Creek and Swan Brook.

ES3 Biodiversity values

ES3.1 Native vegetation

Four plant community types (PCT) described in the BioNet Vegetation Classification database are identified in the disturbance footprint:

- River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion (PCT 84), which occurs in association with Kings Creek and Swan Brook
- Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510), which occurs broadly on the flats around Kings Creek and its tributaries
- Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion (PCT 571), which was recorded as small woodland patches along ephemeral, upstream sections of creek gullies
- White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion (PCT 590), which was recorded on gentle slopes and ridgelines.

Native vegetation comprises approximately 30% of the disturbance footprint, with most of the vegetation representing cultivation. Native vegetation occurs in both woodland and derived grassland form. Considering the active use of land within the disturbance footprint for agriculture, much of the native vegetation mapped is represented by native pastures derived from woodland clearing. The condition of the derived native grassland areas is variable and is influenced by disturbance history and current agricultural management.

Table ES1 Vegetation within the disturbance footprint

Vegetation type	Area (ha)		Subtotals (ha)
	Woodland	Derived native grassland	
River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion (PCT 84)	0.04	0	0.04
Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510)	0.59	129.70	130.29
Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion (PCT 571)	0.17	0	0.17
White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion (PCT 590)	1.72	86.79	88.51
Non-native vegetation			501.25
Cleared			8.15
Waterbody			0.83
Totals (ha)	2.52	216.49	729.24

ES3.2 Threatened ecological communities – Box Gum Woodland

One TEC listed as critically endangered under the BC Act was identified within the disturbance footprint:

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.

This community is also critically endangered under the EPBC Act. Under the EPBC Act, this TEC is named ‘White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland’. In this BDAR, both the EPBC Act and BC Act listed community are referred to as ‘Box Gum Woodland’.

Box Gum Woodland is a grassy woodland occurring on the tablelands or western slopes of NSW, that contains (or once contained) a canopy characterised by either White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) or Blakely’s Red Gum (*Eucalyptus blakelyi*). The community structure can range from open grassy woodland to forest but also includes modified remnants where the trees have been removed and only the grassy ground layer and some herbs remain, ie derived native grassland or shrubland.

Under the BC Act, degraded sites are still included as part of the Box Gum Woodland TEC where there is potential for assisted natural regeneration of the tree layer or the understorey, eg by removing grazing and/or weeds, and as such highly modified native pastures can still form part of the TEC. Under the EPBC Act, modified remnants must also meet minimum condition thresholds, namely a predominantly native understorey with a high diversity of native plant species. This means that highly modified remnants may conform to Box Gum Woodland TEC under the BC Act but may not meet the condition thresholds to be included as the TEC under the EPBC Act.

ES3.2.1 Occurrence within disturbance footprint

Three of the four PCTs identified within the disturbance footprint conform to the BC Act listing for Box Gum Woodland. A portion of the occurrence of these PCTs also conform to the EPBC Act listing for Box Gum Woodland and includes woodland patches with a predominantly native understorey, as well as derived native grassland areas that retain sufficient species richness to meet the condition thresholds. Woodland patches represented by a canopy of characteristic trees over cultivated or largely exotic understorey do not meet the condition thresholds to be included as part of the EPBC Act-listed TEC.

Box Gum Woodland within the disturbance footprint is mostly represented by derived native grassland with only small areas of remnant woodland present. A large proportion of the derived native grassland is highly modified native pasture with a long history of agricultural management. Some areas are almost entirely dominated by few native grass species with a small assemblage of native forbs.

Table ES2 **Extent of Box Gum Woodland within the disturbance footprint**

Plant Community Type	Area (ha)	
	BC Act	EPBC Act
Woodland		
Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510)	0.59	0.28
Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion (PCT 571)	0.17	0
White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion (PCT 590)	1.72	0.20
Derived native grassland		
Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510)	129.7	28.94
White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion (PCT 590)	86.79	0.06
Subtotal (woodland)	2.48	0.48
Subtotal (derived native grassland)	216.49	29.00
Total	218.97	29.48

ES3.3 Habitat values

The disturbance footprint is comprised of paddocks at various stages of cropping and grazing. Some paddocks are currently cropped and contain little other than the planted crop species. Other paddocks contain native derived grassland or improved pasture and are being used to graze cattle. The quality of the habitat present in each paddock is largely representative of the recent land use history and cropping cycle. Most paddocks contain some scattered trees, a mix of predominantly White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*) and Rough-barked Apple (*Angophora floribunda*).

The grassland in the paddocks provides limited habitat features for fauna species, except for potential foraging for seed eating birds or birds of prey, but does provide potential habitat for threatened flora species.

The scattered trees within the paddocks are often large and hollow bearing, providing habitat for a range of fauna species such as reptiles and birds. The trees are mostly too spread out to provide viable habitat for hollow-dependent mammals, but may provide temporary shelter for larger mammals such as koalas.

Outside of the disturbance footprint but within the buffer zones for some threatened species, there are patches of grassy woodland. These generally consist of a canopy layer, with a highly disturbed ground and midstorey. The more isolated patches within the centre of the study area have very few habitat features at ground level, often with no fallen timber or shrub layer. These patches would provide some habitat for reptiles and birds. The larger and better-connected patches of woodland around the margins of the site are more structurally intact and would also provide some habitat for mammal species and ground-dwelling birds.

Hollow bearing trees were recorded throughout the study area. The hollow resource recorded is estimated to be approximately 588 hollows of various sizes from 240 trees. Hollows provide potential habitat for various hollow dependent species, such as bats, possums, gliders, owls, parrots, raptors, reptiles and some frog species. Several non-threatened bird species were observed nesting in hollows during habitat assessments, including Nankeen Kestrels, Galahs and Little Corellas.

The disturbance footprint avoids the majority of mapped waterways in the study area. There are three small creeks that run through the disturbance footprint: Kateys Creek, Jessie Creek and one unnamed creek. These areas were assessed over multiple site visits and were not observed to contain permanent flow; however, they do provide some habitat for frogs in wet conditions. The low-lying areas surrounding the three creeks were observed to have limited disturbance and high-quality grassland, which would provide higher quality habitat for threatened flora species. The creek lines may also provide movement corridors for mammal species such as the Spotted-tail Quoll (*Dasyurus maculatus*), although vegetation cover is limited. There are several farm dams within the study area that may provide some habitat for frogs, birds, or invertebrates.

A fourth order stream (Kings Creek) runs across the northern edge of the study area. This watercourse contains habitat suitable for frogs, turtles and fish, with a mix of pools and fast flowing areas, and rocky and vegetated banks. It is lined by gallery forest consisting mostly of River Oak, providing habitat for a number of threatened birds, mammals, and reptiles.

A high-level multi-cell box culvert system at the Swan Brook crossing on Spring Mountain Road was inspected for active microbat roosts. None were detected. Except for a low-level bridge at Kings Creek (western end of Sturmans Road) and a small box culvert at an unnamed 2nd order watercourse crossing (also along Sturmans Road), all existing watercourse crossings are generally bed level crossings and do not provide roosting habitat for microbats. There are several sheds and artificial structures within the study area that may provide roosting habitat for bats.

The habitat in the access road component of the disturbance footprint is largely limited to disturbed grassland within the road corridor. There are some small patches of woodland and scattered trees within the road corridor, but no habitat features such as rocks or fallen timber, and no understorey layer. The disturbance footprint is primarily contained within the boundaries of the existing road, which will be compacted and gravelled to a width of 8.7 m.

ES3.4 Threatened species

Eight threatened species were recorded within or near the disturbance footprint:

- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Diamond Firetail (*Stagonopleura guttata*)
- Dusky Woodswallow (*Artamus cyanopterus*)
- Little Lorikeet (*Glossopsitta pusilla*)

- Scarlet Robin (*Petroica boodang*)
- Little Eagle (*Hieraaetus morphnoides*)
- Bluegrass (*Dichanthium setosum*)
- Austral Toadflax (*Thesium australe*).

The six threatened bird species recorded are predicted species and are accordingly assessed for ecosystem credits along with a list of other predicted species associated with the PCTs recorded in the disturbance footprint. It is noted that although Little Eagle is a dual credit species, no breeding was detected during seasonal surveys. Little Eagle is only assessed for ecosystem credits for predicted impacts on foraging habitat and further assessment for species credit is not required.

Bluegrass and Austral Toadflax are candidate species for the purposes of application of the BAM, and species polygons have been prepared to assess these species for species credits.

Presence is assumed for one candidate species, Eastern Pygmy-possum (*Cercartetus nanus*).

ES3.4.1 Bluegrass and Austral Toadflax

Bluegrass and Austral Toadflax were identified during field survey and were mainly recorded within derived native grassland; however, these species were also recorded in localised areas within cultivation paddocks in between cultivation events (ie after harvest and before ploughing, or in paddocks where cultivation activities ceased for several years due to drought). The occurrences of Bluegrass and Austral Toadflax recorded are patchily distributed and are largely concentrated in the vicinity of watercourses, fencelines and roadsides, possibly where there is less frequent cultivation or less intense/regular disturbance, or where the ground cover is better protected from other agricultural activities by fence infrastructure.

In total, 246 Bluegrass records were identified in the general study area representing over 3,700 plants; and 552 Austral Toadflax records in the study area representing over 20,000 plants. Of these, one record (approximately 1 plant) and 50 records (approximately 1,267 plants) of Bluegrass and Austral Toadflax respectively are located within the disturbance footprint.

Bluegrass and Austral Toadflax are assessed by area. Species polygons were prepared for Bluegrass and Austral Toadflax to measure the area of suitable habitat within the disturbance footprint. Assumptions applied to the preparation of the species polygons are described in this BDAR. In total the species polygon for each species is 182.32 ha and 186.73 ha respectively, reflecting the large areas of derived native grassland within the disturbance footprint. The species polygons also includes small areas of cultivated land.

i Prescribed impacts on non-native threatened species habitat

The preparation of species polygons for Bluegrass and Austral Toadflax considers that the project impacts on cultivated land (ie non-native vegetation) where threatened species have been recorded will result in prescribed impacts on threatened species. In accordance with Section 8.6 of the BAM, the retirement of biodiversity credits may be used with other conservation measures to mitigate prescribed impacts of a development on threatened species. As such the species polygons for Bluegrass and Austral Toadflax include cultivated land within 30 m of a known threatened species record. These areas have been assigned a PCT reflecting the vegetation that would have occurred historically so that these areas can be entered into the BAM calculator (BAM-C).

ES3.4.2 Eastern Pygmy-possum

Eastern Pygmy-possum is associated with woodland habitats. Although spotlighting surveys were completed in woodland areas surrounding the disturbance footprint, information within the Threatened Biodiversity Data Collection (TBDC) notes that the species is especially difficult to detect using this method. For this reason, the species is assumed to be present within woodland habitats.

Eastern Pygmy-possum is also assessed by area and the species polygon captures all potential woodland habitat within the disturbance footprint.

ES3.5 Matters of National Environmental Significance

The following Matters of National Environmental Significance (MNES) are known to occur, or have potential to occur and to be impacted by the project:

- Box Gum Woodland
- Bluegrass
- Austral Toadflax
- Regent Honeyeater
- Swift Parrot
- Painted Honeyeater.

Box Gum Woodland is addressed by the BAM as native vegetation requiring further assessment for ecosystem credits. Likewise, Regent Honeyeater, Swift Parrot and Painted Honeyeater are addressed by the BAM as predicted species that are further assessed for ecosystem credits (for foraging habitat).

Regent Honeyeater and Swift Parrot are dual credit species that require assessment for species credits only if a development proposes to clear native vegetation on land mapped as important habitat areas for these species. The project will not require vegetation clearing on land mapped as important habitat areas for Regent Honeyeater and Swift Parrot and therefore, no species credits are required to be assessed by the BAM.

Bluegrass and Austral Toadflax are addressed by the BAM as threatened candidate species that are further assessed for species credits.

ES3.6 Aquatic habitat values

Aquatic environments within the study area comprise:

- several small existing farm dams that would have supported past agricultural use
- first- to fourth- order watercourses. The main watercourses that intersect the disturbance footprint are Jessie Creek, Kateys Creek, Kings Creek and Swan Brook.

Farm dams recorded include a combination of online and offline waterbodies. None of the farm dams observed contained well-established fringing aquatic vegetation or wetland habitat with vegetation representing flooded grassland.

Kings Creek and Swan Brook are the only waterways that were observed to have permanent flow. The second and third order tributaries (Kateys Creek, Jessie creek and an unnamed second order stream) were dry during site inspections in May and August 2021 but were flowing after significant rainfall towards the end of 2021. All watercourses are degraded and impacted by agricultural land use in the surrounding area.

Kings Creek and Swan Brook are surrounded by agricultural land and are accessed by livestock at some sections. At times of high rainfall, the water flow can be rapid. Kings Creek contains some rock and gravel cover along the creek bed in sections, but these features are not well-established and there is little vegetation cover in the form of emergent or submergent macrophytes or overhanging bank vegetation.

The value of aquatic habitats for threatened aquatic species are limited to marginal habitat for Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) and Eel-tailed Catfish (*Tandanus tandanus*) within Kings Creek and Swan Brook. Both species are unlikely to occur in the downstream sections of Kateys Creek and Jessie Creek, considering the lack of deep pools, still water and ephemeral nature of these watercourses. The lack of aquatic vegetation, snags or rocks further reduces the suitability of the habitats within the downstream sections of Kateys Creek and Jessie Creek.

Kings Creek and Swan Brook would be classified as a Class 1 major key fish habitat, as they are permanently flowing waterways and provide potential (albeit marginal) habitat for threatened fish species or populations. Kateys Creek would be classified as a Class 3 minimal key fish habitat, as it has intermittent flow, forms pools of water following a rain event and is connected to a Class 1 waterway (ie flows into Kings Creek). Second order streams (such as Jessie Creek) and farm dams are excluded from classification as key fish habitat for the purposes of the application of the FM Act.

ES4 Avoidance and minimisation

Avoidance and minimisation strategies implemented by the project are driven by the following key biodiversity values identified:

- Box Gum Woodland
- habitat for Bluegrass and Austral Toadflax
- mature trees with hollows suitable for fauna use, including predicted threatened species.

Box Gum Woodland is critically endangered and is included in the current list of entities at risk of serious and irreversible impacts (SAIL) due to:

- overclearing (>90%) ie reduction in geographic extent (Principle 1)
- continuing impacts from land use affecting quality of remaining extents and patch size (Principle 2).

The project concept design assessed in this BDAR is a result of the prioritisation of the avoidance of Box Gum Woodland but is also substantially influenced by the following design principles identified early in the design optimisation process:

- protect waterways and vegetated corridors:
 - achieve adequate setbacks from riparian corridors and waterways
 - limit vegetation removal required to upgrade waterway crossings as far as practicable;
- avoid areas of higher quality vegetation as far as practicable
 - avoid woodland vegetation as far as practicable

- preferentially use lower quality derived grassland over better quality derived native grassland
- optimise use of existing cultivated areas;
- avoid known occurrences of threatened candidate species where practicable; and
- access route selection – opt for the route with lower risks to biodiversity.

These design principles were applied where possible to achieve the best outcome for biodiversity balanced with other design and environmental constraints. Key avoidance and minimisation measures achieved during the development of the concept design are outlined below.

Table ES3 Avoidance and minimisation measures

Item	Description of measure
1	<p>Most of the woodland patches and derived native grassland areas have been avoided, recognising that most of the native woodland identified in the study area aligns with Box Gum Woodland, which is an SAII entity and is critically endangered under both BC Act and EPBC Act.</p> <p>A decision was made to exclude several eastern paddocks on the Newstead property from the project to avoid impacts on Box Gum Woodland including associated derived native grasslands. These paddocks are ideally suited to solar development based on topography and proximity to the existing powerline connection. These paddocks were included in earlier iterations of the project design.</p> <p>The exclusion of these areas from the project reduces the generation capacity of the project by 33 MW_{dc} but avoids over 177 hectares (ha) of derived native grassland, more than 30 ha of woodland and at least 63 hollow-bearing trees, representing habitat for:</p> <ul style="list-style-type: none"> • Box Gum Woodland; • known records of Bluegrass (69 records, 1650 individuals) and Austral Toadflax (1 record, 1 individual); • threatened woodland fauna known to occur in the study area; and • hollow-dependent fauna. <p>The derived native grassland avoided by the project represents relatively better-quality grassland compared with derived native grassland in the western paddocks on the Newstead property and compared with the derived native grassland on the Glen Eisle property.</p>
2	<p>The project avoids 502 records representing over 18,700 plants of Austral Toadflax from the disturbance footprint. This represents avoidance of approximately 94% of all the plants recorded since 2018.</p> <p>The avoidance of individuals involved moving PV panels out of areas away from certain sections of first order watercourses that were considered for development. These areas were initially considered for development to maximise the generation capacity, since the first order watercourses in these sections are dry most of the time and does not contain wetland or riparian vegetation (derived native grassland not noticeably differentiated from surrounding grassland).</p>
3	<p>The project avoids 245 records representing over 3,700 plants of Bluegrass from the disturbance footprint. This represents avoidance of almost all of the plants recorded since 2018.</p>
4	<p>The project avoids 206 of 240 (approximately 86%) hollow bearing trees recorded in the study area.</p>
5	<p>Two access road options were considered at early design phase:</p> <ul style="list-style-type: none"> • Spring Mountain/Sturmans Road; and • an alternate route via a private road west of Spring Mountain Road. <p>The Spring Mountain Road/Sturmans Road option was selected over the alternative private road access for several reasons, including:</p> <ul style="list-style-type: none"> • less disturbance required to upgrade Spring Mountain Road/Sturmans Road; • avoidance of better-quality roadside grassland vegetation; and • avoidance of over 62 Bluegrass plants and 1098 Austral Toadflax plants occurring along the private access road. <p>That is, the access route option selected requires less road upgrades and supports fewer threatened flora records in roadside vegetation (see Figure 6.1).</p>

Table ES3 **Avoidance and minimisation measures**

Item	Description of measure
6	The disturbance footprint minimises disturbance of existing watercourses and associated riparian corridors and minimises the number of new watercourse crossings required.
7	The disturbance footprint includes 10 m indirect impact zone from the edge of infrastructure to accommodate vegetation management works, and foot and vehicle traffic. No vegetation removal is proposed within the indirect impact zone but there is potential for edge impacts where project infrastructure interfaces with retained vegetation. The indirect impact zone will be fully offset but options to minimise impacts in this space during construction and operation of the project will be fully explored and implemented where possible. The indirect impact zone will be managed and will act as a buffer between the operational areas and retained vegetation outside of the project disturbance footprint.
8	The disturbance footprint is set back from most woodland patches by between 10–20 m. This is in addition to the 10 m indirect impact zone identified (item 7 above).
9	The PV modules will be installed via driven piling methods, which minimises the degree of ground disturbance required over other construction methods that involve concrete foundations.

ES5 Impact assessment

ES5.1 Approach to impact assessment

The impact of the project on biodiversity is expected to involve:

- direct clearing of native vegetation and threatened species habitat (including scattered trees) for the construction of the project
- uncertain impacts from shading of native understorey vegetation by a network of PV panels
- temporary impacts caused by the establishment of construction laydown areas
- indirect impacts where the project interfaces with and potentially interacts with retained vegetation and habitat
- prescribed impacts on threatened species due to clearing of non-native vegetation.

This BDAR takes a conservative approach to the impact assessment by capturing all the predicted impacts within the disturbance footprint, within which full loss of biodiversity values is assumed. The areas of impact assessed as direct impacts in the BDAR therefore:

- Account for uncertain shading impacts on the quality and condition of the understorey vegetation beneath PV panel infrastructure and assumes complete loss of vegetation integrity values even though vegetation under the panels will not be cleared and may even benefit from cessation of agricultural activities. The uncertain impacts from shading is the largest contributor to the disturbance footprint.
- Account for temporary impacts on grassland vegetation by assuming permanent and complete loss of vegetation integrity values in construction laydown areas where tools, materials, equipment, and vehicles are stored temporarily when they are not in use.
- Mitigate indirect impacts predicted to affect grassland vegetation/habitat within 10 m of infrastructure components by assuming complete loss of vegetation integrity values.

- Mitigate prescribed impacts on threatened species by assigning vegetation integrity values to habitat in non-native vegetation.

ES5.2 Direct impacts

The direct impacts on biodiversity are summarised below:

- woodland clearing (2.52 ha):
 - this includes 2.48 ha of Box Gum Woodland TEC (BC Act) of which 0.48 ha represents Box Gum Woodland TEC (EPBC Act)
 - this also represents 2.52 ha of suitable habitat for Eastern Pygmy-possum for which presence is assumed;
- derived native grassland clearing (216.49 ha):
 - this represents clearing of 216.49 ha of Box Gum Woodland derived grassland (BC Act) of which 29 ha is Box Gum Woodland derived grassland (EPBC Act). The majority (approximately 93%) of the derived native grassland clearing is low condition grassland that does not exceed offset thresholds set by the BAM
 - this includes 182.32 ha of suitable habitat for Bluegrass. The species polygon prepared to measure the area of suitable habitat for Bluegrass is conservative as it exceeds the area of suitable habitat occupied by the species. The species polygon for Bluegrass is also mostly represented by low condition grassland
 - this includes 186.73 ha of suitable habitat for Austral Toadflax. The species polygon prepared to measure the area of suitable habitat for Austral Toadflax is conservative as it exceeds the area of suitable habitat occupied by the species. The species polygon for Austral Toadflax is also mostly represented by low condition grassland;
- clearing of 34 of 240 hollow-bearing trees recorded that provides hollow bearing resources for fauna
- clearing of 51 scattered trees, of which 18 are hollow-bearing and represent a subset of the above 34 hollow-bearing trees that will be impacted.

A credit requirement was assessed for all of the above impacts and, in relation to vegetation clearing, assumes complete loss of vegetation integrity values (ie setting composition, structure and function scores for all areas of direct impact to zero in estimating future vegetation integrity following the construction of the project).

ES5.3 Indirect impacts

The project disturbance footprint includes a 10 m set back from the edge of infrastructure where indirect impacts on biodiversity may occur, including:

- erosion and sedimentation
- weed introduction and spread
- disturbance from increased noise and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour).

The indirect impact zone has been assessed for ecosystem credits. This is a conservative approach that assumes 100% loss of biodiversity values. In practice, the 10 m setback will be managed for vehicle access and bushfire risks and will not necessitate complete clearance of native vegetation or threatened species habitat. The management of this 10 m setback will include measures to mitigate the impacts of the project on adjacent retained biodiversity values outside of the disturbance footprint, including weed management activities and erosion and run-off controls.

ES5.4 Prescribed impacts

One prescribed impact has been identified, being the impact to non-native vegetation representing habitat for Bluegrass and Austral Toadflax. Prescribed impacts on Bluegrass and Austral Toadflax have been assessed in this BDAR and include consideration of the nature, extent and duration of the impacts.

The likely consequence of the impacts on Bluegrass and Austral Toadflax as a result of disturbance of non-native vegetation is loss of poor-quality habitat where permanent removal of vegetation will occur. However, it is noted that under a business-as-usual scenario, Bluegrass and Austral Toadflax have, and will likely continue to be periodically disturbed/removed as a result of agricultural practices.

Actions to mitigate prescribed impacts on Bluegrass and Austral Toadflax include assessment of species credits and exploring and implementing options to further minimise removal of plants at detailed design. To minimise long term impacts on Bluegrass and Austral Toadflax recorded where temporary laydown areas will be located, construction laydown areas will be rehabilitated following completion of construction works if they are not required for operational purposes and this will include removal of any materials brought into site such as gravel.

ES5.5 Serious and Irreversible Impacts (SAII)

Box Gum Woodland is included in the current list of entities at risk of an SAI (Principles 1 and 2) that is likely to be impacted by the project. Additional information regarding the project impacts on Box Gum Woodland has been provided in the BDAR in accordance Section 9.1.1 of the BAM.

Actions to avoid and minimise impacts on Box Gum Woodland was prioritised in concept design and resulted in the exclusion of over 177 ha of derived native grassland and more than 30 ha of woodland from the disturbance footprint. The excluded land is well suited to solar development based on topography and proximity to the existing powerline connection and represents a generation capacity of 33 MW (DC).

ES5.6 Impacts on MNES

The clearing of native vegetation will have impacts for MNES. It will lead to a reduction in the occurrence of threatened ecological communities, and a reduction of habitat for threatened flora and fauna species. The clearing may directly remove recorded occurrences of threatened flora species. The removal of hollow-bearing trees and scattered trees represents a reduction in foraging, roosting and potential breeding habitat for woodland-dependent species such as threatened birds and mammals.

The potential indirect impacts as a result of the project are largely related to edge effects, with a potential reduction in habitat quality in surrounding retained vegetation, as well as disruption to threatened species during construction from increased noise and dust. The indirect impacts are expected to be minor if the mitigation measures outlined in this BDAR are implemented.

Significant impact assessments were undertaken in accordance with the EPBC Act Significant impact guidelines for:

- Box Gum Woodland
- Bluegrass

- Austral Toadflax
- Regent Honeyeater
- Swift Parrot
- Painted Honeyeater.

The significant impact assessments concluded that the project has the potential to result in a significant impact to three MNES:

- Box Gum Woodland
- Bluegrass
- Austral Toadflax.

ES5.7 Assessment under the FM Act

Several new and upgraded watercourse crossings will be required across the project to facilitate vehicle access during construction and operation.

Watercourse crossings will typically be implemented as either bed level or culvert crossings, with crossing upgrades proposed along the Sturmans Road and Spring Mountain Road crossings where there are existing bridges.

The location, form and site-specific design of all crossings will be confirmed and developed as part of future detailed design. However, it is noted that the number of required watercourse crossings has been minimised during preliminary design to reduce the potential for watercourse impacts and will be further considered during detailed design.

It is expected that adverse impacts to watercourses and riparian corridors will be avoided and/or minimised because:

- the disturbance footprint preserves the Department of Industries recommended vegetated riparian zone widths
- where instream works are proposed (ie construction or upgrade of watercourse crossings), these works will be designed and constructed to be consistent with relevant guidelines:
 - *Guidelines for watercourse crossings on waterfront land*
 - *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings.*

It is noted that consultation between Sundown Solar and DPI Fisheries has occurred in July 2022 with respect to the proposed new crossing over Kings Creek that would replace an existing informal and low-level bridge structure, and that a new box culvert crossing is supported by DPI Fisheries provided appropriate design consideration for fish passage is incorporated.

As potential habitat for threatened fish occurs in Kings Creek and Swan Brook, assessments of significance have been prepared for Southern Purple Spotted Gudgeon and Eel-tailed Catfish in accordance with Section 220ZZ of the FM Act. These assessments indicate that no significant impact on these species is likely to occur as a result of the project due to the marginal value of the aquatic habitats, the limited disturbance works expected in association with construction/upgrade of the crossings and the limited duration of the works.

ES6 Credit requirements and proposed offset approach

The project will require ecosystem and species credits to be retired to offset the predicted impacts on biodiversity. The credit obligation includes:

- 260 ecosystem credits to offset impacts to 18.21 ha of native vegetation
- 45 ecosystem credits to offset impacts to 51 scattered trees
- 975 species credits to offset impacts to 182.32 ha of suitable habitat for Bluegrass
- 733 species credits to offset impacts to 186.73 ha of suitable habitat for Austral Toadflax
- 65 species credits to offset impacts to 2.52 ha of suitable habitat for Eastern Pygmy-possum.

Impacts on 207.21 ha of native vegetation do not require offset as the offset thresholds set out in Section 9.2.1 of the BAM are not met.

Sundown Solar will offset the residual impacts on biodiversity via conservation mechanisms established under the NSW Biodiversity Offset Scheme (BOS). The mechanisms by which the project can meet its offsetting obligations include:

- retiring like-for-like credits from an established stewardship site
- payment directly into the Biodiversity Conservation Trust Fund (BCF).

Sundown Solar's preferred approach to offsetting the residual impacts of the project is to set up stewardship sites to generate like-for-like credits for the project. This option has the potential to provide the best biodiversity outcome if a suitable offset site can be identified near the project. This approach would deliver a net benefit locally and is likely to return like-for-like credits that are a close match (if not identical) to the credits generated by the project compared with sourcing credits on the credit market or discharging offsetting obligations through the BCF.

However, it is recognised that this option still has a potential to leave a shortfall in credits and therefore, it is likely that an offset strategy for the project would incorporate more than one offsetting mechanism to ensure that the credit obligations of the project are able to be fully met. Sundown Solar is looking to commence enquiries regarding available like-for-like credits on the credit market to supplement credits that could potentially be generated locally.

A payment to the Biodiversity Conservation Trust would only be considered to meet the residual credit requirements if a suitable number and type of biodiversity credits cannot be secured from stewardship sites owned by Sundown Solar and/or other third parties.

The Australian Government has endorsed the NSW Biodiversity Offset Scheme (BOS) under the EPBC Act Condition-setting Policy to streamline benefits for all NSW proponents that use the BOS. The Australian Government supports the use of the Biodiversity Assessment Method as the underpinning methodology for calculating biodiversity credit requirements. Amendments to the NSW *Biodiversity Conservation Regulation 2017* in 2019 aligns the BOS offset rules to Australian Government requirements by restricting the application of the offset variation rules to NSW only listed entities. Under the Amending Agreement Bilateral between the Commonwealth and the State of NSW, payment into the NSW Biodiversity Conservation Trust is an accepted offset for MNES provided that the eligibility criteria are met.

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1 Introduction

Sundown Solar Pty Ltd (Sundown Solar) proposes to develop the Sundown Solar Farm (the project), which is a large-scale solar photovoltaic (PV) electricity generation facility and associated battery energy storage system (BESS).

EMM Consulting Pty Limited (EMM) has prepared an environmental impact statement (EIS) on behalf of Sundown Solar to support an application for development consent under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is classified as State significant development (SSD) and requires the approval of the NSW Minister for Planning.

This Biodiversity Development Assessment Report (BDAR) has been prepared to inform the EIS.

In addition to requiring approval from the NSW Minister for Planning, the project has been deemed a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Commonwealth Minister for the Environment and Water. The Minister for the Environment and Water has accredited the NSW planning process for the assessment of the project. Therefore, a single EIS has been prepared to address the requirements set out by the NSW Department of Planning and Environment (DPE) and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

1.1 Background

1.1.1 Project description

The project is located within the New South Wales (NSW) Government-declared New England Renewable Energy Zone (REZ). The project will complement nearby operational renewable energy generation assets; White Rock Wind Farm (Stage 1), White Rock Solar Farm and Sapphire Wind Farm, as well as the approved but not yet developed assets: White Rock Wind Farm (Stage 2), Sapphire Solar Farm and Glen Innes Wind Farm. The project will contribute to the overall storage capacity and reliability of the National Electricity Market (NEM) and will also support State and Commonwealth emission commitments by facilitating renewable energy input into the grid network.

The project comprises the following key components:

- construction and operation of a large-scale solar farm with a generation capacity of approximately 360 MW (AC)
- construction and operation of a BESS with up to four-hour storage capacity of approximately 150 MW (AC).

The electricity generated onsite will contribute to and connect to the national electricity grid via a new onsite substation connected to the existing Transgrid 330 kilovolt (kV) transmission line that traverses the site.

The electricity generated from the project will be sold to one or more registered energy retailing organisations, large energy users (governmental or private) or to the National Electricity Market that is operated by the Australian Energy Market Operator (AEMO).

A detailed description of the project is provided in the EIS.

1.1.2 Site location

The project is located at Spring Mountain, approximately 30 kilometres (km) east of Inverell in the Inverell Shire Council local government area (LGA), and in the New England Tablelands region of northern NSW (Figure 1.1). The key industry in the LGA is agriculture, primarily cropping. As such, the locality surrounding the project site contains a variety of landscapes within an agricultural setting, much of which has been cleared for grazing and/or cultivation.

The project will be located on three privately owned lots, namely Lot 148 DP 753299 (Glen Eisle), Lot 141 DP 753305 (Spring Valley) and Lot 1, DP 1064358 (Newstead) (Figure 1.2). These lots are zoned RU1 – Primary Production under the *Inverell Shire Local Environmental Plan 2012* (Inverell LEP) and have a well-established history of agricultural use. The lots on which the project will be located are currently used for farming, including cultivation of a number of crop species (such as oats, barley, sorghum and soybeans) and cattle grazing.

The project will be accessed via the Gwydir Highway which connects Walgett to Grafton. The local roads providing direct access to the site (Spring Mountain Road and Sturmans Road) are terminating roads and predominantly provide access to rural properties (Figure 1.3).

i Historical and current land use

The progressive establishment of cropping areas across the three lots span at least six decades, with expansion of cropping areas occurring mainly across the lower slopes and floodplains on the Glen Eisle and Newstead properties, and in the narrow floodplain areas of the Spring Valley property. By 1985, most of the clearing for cropping and grassland production was completed, with relatively few areas of cultivation expansion observed after this time.

Much of the contemporary agriculture on these lots represents continued use of these lands with repeat cultivation and rotational grazing forming the main activities. Spring Valley has been consistently cultivated for over 40 years and continues to be cultivated. Soybean (*Glycine max*) was harvested in May/early June 2021 and cultivation for the next cropping season commenced in October 2021, with sowing activities taking place around April 2022.

Glen Eisle has been consistently cultivated since the 1960s and was cultivated up to 2018, when cropping was ceased due to drought. During this time, paddocks were sown to pasture with a seed mix that included Russian Vetch (also commercially referred to as Namoi Woolly Pod Vetch, *Vicia villosa*), White Clover (*Trifolium repens*), ryegrasses (*Lolium* spp.), medics (*Medicago* spp.) and Paspalum (*Paspalum dilatatum*). Cultivation recommenced in 2021, with crash grazing and cultivation activities commencing in October and sowing for winter crops commencing in early 2022.

The Newstead property has also been consistently cultivated for at least the last 40 years. In 2021 the property produced sorghum (*Sorghum* sp.) and Lucerne (*Medicago sativa*). After harvest, these paddocks were cultivated again for the next cropping season. Areas of pasture were sown with a mix of oats (*Avena* spp.), barley (*Hordeum* spp.) and Namoi Woolly Pod Vetch for cattle-grazing. Large areas of native pasture occur in the eastern paddocks on Newstead include Plains Grass (*Austrostipa aristiglumis*), which grew tall and thick in the warm months of late 2021. These paddocks were burnt in late summer/autumn of 2022 to control Plains Grass; burning has also been used historically for Plains Grass control.

1.1.3 Project components

The project components associated with the construction and operation of the project, include:

- infrastructure:
 - a network of approximately 660,000 panels and associated mounting infrastructure
 - a 150 MW battery energy storage system (BESS)
 - 330 kV substation connected to the existing onsite 330 kV overhead powerline
 - electrical collection and conversion systems, including inverter and transformer units, switchyard and control room
 - underground and aboveground cables
 - a management hub, including demountable offices and amenities and equipment sheds
 - security fencing
 - parking areas
 - lighting
 - firefighting infrastructure
- onsite creek crossings and internal access roads
- temporary laydown areas (during construction and decommissioning)
- access road upgrades along Spring Mountain Road and Sturmans Road to accommodate construction traffic. This will include widening of the access roads to 8.7 m, with the upgraded road to be compacted and gravelled
- intersection upgrade at the Gwydir Highway turn-off onto Spring Mountain Road. This will include the installation of a basic left turn (BAL) treatment and a channelised right turn (CHR) treatment.

1.1.4 Disturbance footprint

The disturbance footprint includes:

- all components described in Section 1.1.3
- area of land that will be directly disturbed for the access road and Gwydir Highway intersection upgrades
- construction space, including temporary laydown areas
- 10 m buffer from the edge of infrastructure components within which the project may have an indirect impact, where vegetation will not be cleared but will be managed for access and bushfire asset protection.

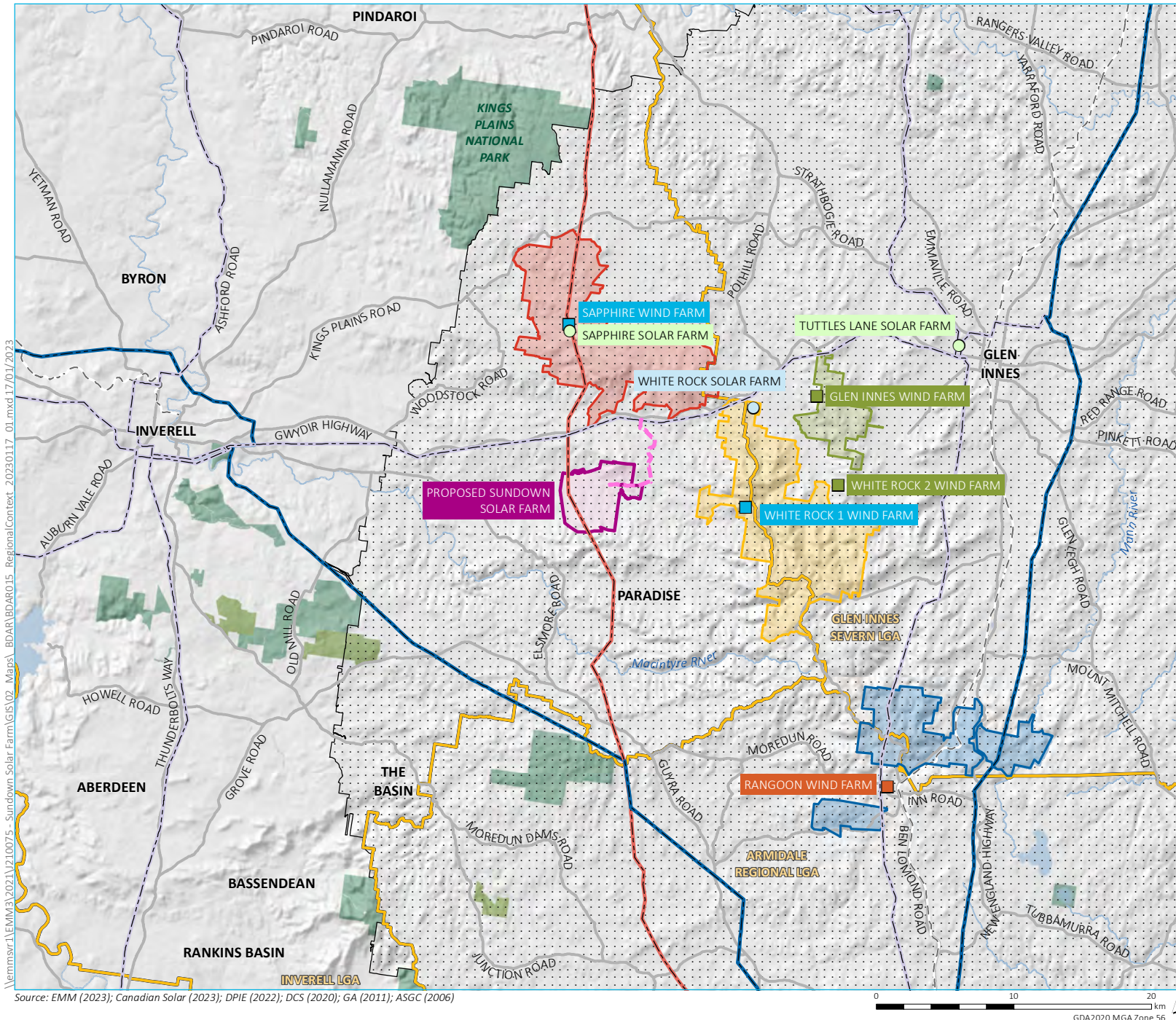
The disturbance footprint is shown in Figure 1.3.

1.2 Key terminology

The following terminology has been adopted throughout the BDAR (Table 1.1).

Table 1.1 Key terms used in this BDAR

Term	Definition
The project	The Sundown Solar Farm. This refers to all elements that comprise the project for which approval is sought.
Study area	The area of land that was surveyed for ecological values. This includes the disturbance footprint and additional adjacent areas to provide context for impacts.
Buffer area	The area of land within 1,500 m buffer zone for the disturbance footprint encompassing the solar farm and BESS, and 500 m buffer zone for the disturbance footprint encompassing the access road from Gwydir Highway. Buffer areas are selected in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020a).
Locality	Includes the disturbance footprint and the area of land within a 25 km buffer surrounding the disturbance footprint. This area was used during the database search.
Disturbance footprint	As described in Section 1.1.4 and shown in Figure 1.3. This is the 'subject land' as defined in the BAM (DPIE 2020a).



- KEY**
- Proposed Sundown Solar Farm
 - Access road
 - New England Renewable Energy Zone
 - Surrounding renewable development
 - Glen Innes Wind Farm
 - Rangoon Wind Farm
 - Sapphire Wind and Solar Farm
 - White Rock Wind and Solar Farm
 - Solar development
 - Operational
 - Approved
 - Wind development
 - Operational
 - Approved
 - In planning
 - Existing environment
 - Rail line
 - Major road
 - River
 - Named waterbody
 - NPWS reserve
 - State forest
 - Local government area
 - Electricity transmission line
 - 66 kV
 - 132 kV
 - 330 kV

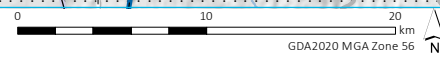
Regional context

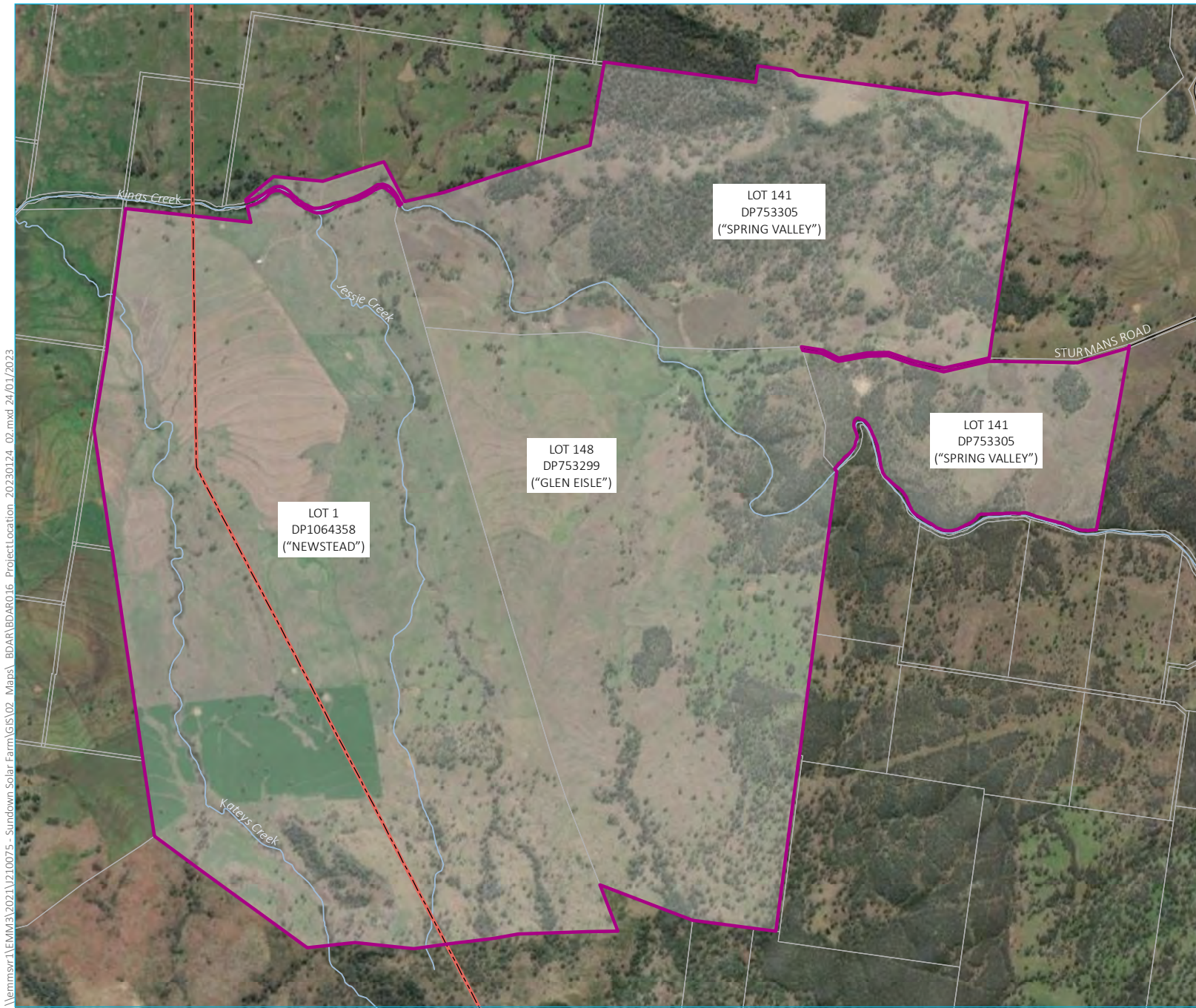
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 1.1



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Source: EMM (2023); Canadian Solar (2023); DPIE (2022); DCS (2020); GA (2011); ASGC (2006)

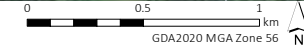




- KEY**
- Proposed Sundown Solar Farm
 - Minor road
 - Named watercourse
 - Cadastral boundary
 - Existing overhead transmission line
 - Armidale to Dumaresq (330 kV)

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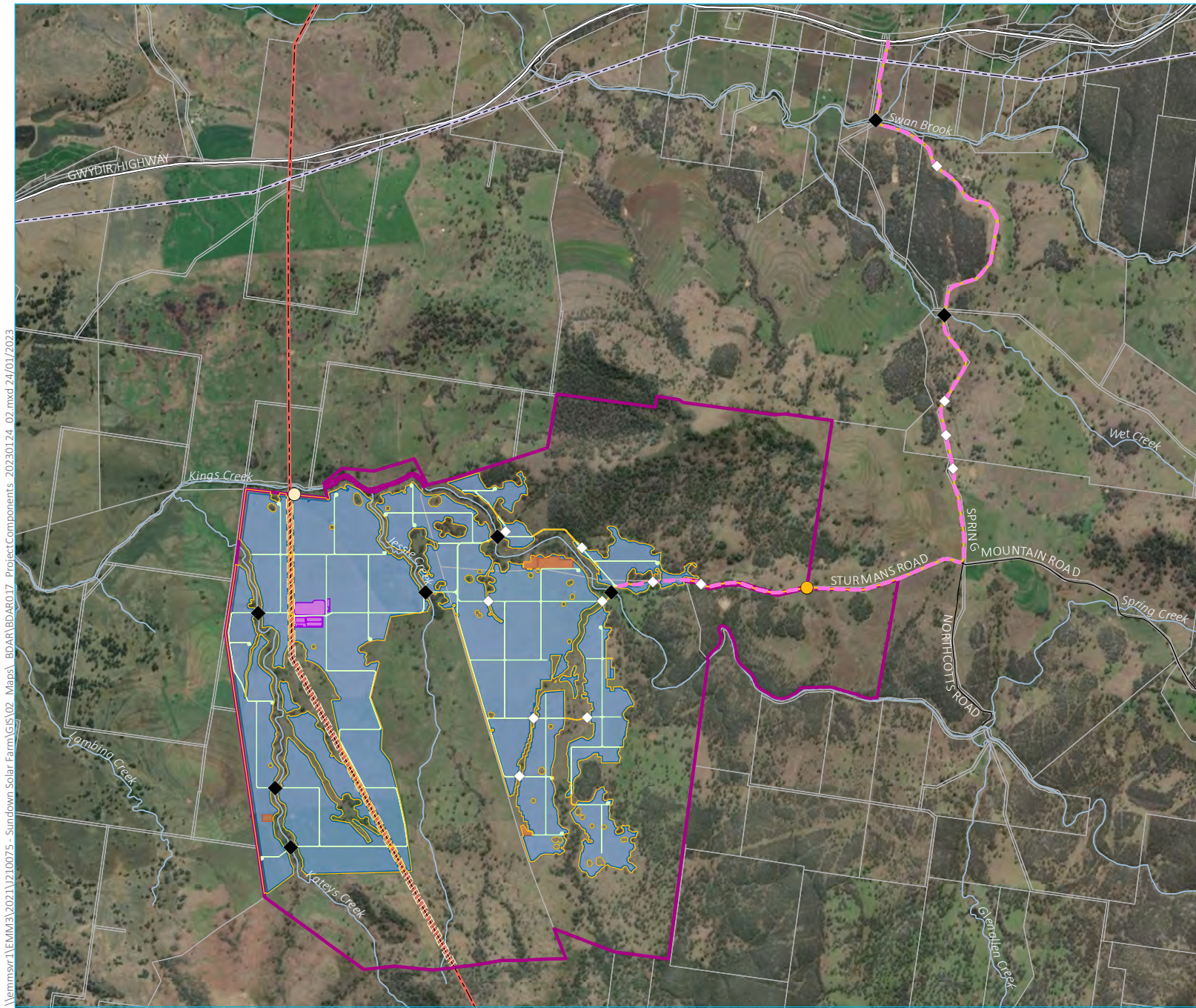
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017)



Project location

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 1.2





- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Named watercourse
 - Cadastral boundary
 - Existing overhead transmission line
 - Armidale to Dumaresq (330 kV)
 - Glen Innes to Inverell (132 kV)
 - Project component
 - Access road
 - 330 kV OHL easment (60 m)
 - Internal access road
 - BESS/switchroom/substation
 - Construction and laydown
 - Potential PV area
 - Emergency access/egress point
 - Primary
 - Secondary
 - Potential water crossing
 - ◆ Named watercourse
 - ◇ Drainage line

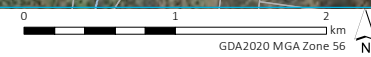
Project components

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 1.3



\\lemmsvr1\EMM3\2021\1210075 - Sundown Solar Farm\GIS\02_Maps\BDAR\BDAR017_ProjectComponents_20230124_02.mxd 24/01/2023

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017)



1.3 Assessment requirements

1.3.1 Secretary's Environmental Assessment Requirements (SEARs)

This BDAR considers and addresses the relevant biodiversity Secretary's Environmental Assessment Requirements (SEARs) for the Sundown Solar Farm Project (14 August 2020), as well as relevant government assessment requirements, guidelines and policies. The requirements of the SEARs relevant to this BDAR are outlined in Table 1.2. This report meets the minimum information requirements for BDARs as set out in Appendix K of the BAM (DPIE 2020a) (see Appendix A).

Table 1.2 Secretary's Environmental Assessment Requirements (SSD-8911)

Requirement – Biodiversity	Section addressed
An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the <i>Biodiversity Conservation Act 2016</i> (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless BCD and DPIE determine the proposed development is not likely to have any significant impacts on biodiversity values.	This report
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.	Chapter 6
If an offset is required, details of the measures proposed to address the offset obligation.	Chapter 7

1.3.2 Supplementary SEARs

The project is deemed a 'controlled action' under the EPBC Act and will be assessed under the Assessment Bilateral Agreement made between the Commonwealth Government and the State of NSW. This BDAR considers and addresses the Supplementary SEARs (4 October 2022), which outline the requirements for assessing Commonwealth Matters of National Environmental Significance (MNES).

The requirements of the supplementary SEARs are reproduced in Appendix B.

1.3.3 Agency consultation

Consultation with Biodiversity and Conservation Division (BCD) North East Branch was undertaken during the preparation of this BDAR and commenced in late March 2022.

Consultation items and outcomes are summarised in Table 1.3. Specific technical points addressed as a result of BCD consultation are indicated in the relevant sections of this BDAR.

Table 1.3 Consultation with BCD

Item	Outcome
Land categorisation in the absence of a published Native Regulatory Vegetation map	EMM prepared an assessment of category 1 land mapping for the study area on behalf of the landowners, based on the criteria in the <i>Local Land Services Act 2013</i> , the <i>Local Land Services Regulation 2014</i> and using the agricultural land use history of the site. BCD provided a formal response to this assessment. Based on their response and advice, category 1 land mapping was not considered in the preparation of this BDAR and assessment of the disturbance footprint does not exclude areas based on NVR mapping.

Table 1.3 Consultation with BCD

Item	Outcome
Plant Community Types (PCTs) draft mapping, zone identification and mapping of critically endangered and endangered ecological communities (CEECs and EECs)	EMM provided a draft PCT map to BCD for initial review and commentary. EMM received written guidance from BCD in relation to the identification of threatened ecological communities. The PCT mapping utilised in this BDAR incorporates edits made in response to BCD review comments.
Species polygons and assessment of threatened species occurring in non-native habitat (ie prescribed impacts)	Approach to construction of species polygons, and assessment of prescribed impacts on threatened species occurring in cultivated areas were discussed. The detailed explanation of the assessment approach taken for species polygons is captured in subsequent chapters in this BDAR.
Assessment of serious and irreversible impacts (SAIIs)	The assessment of SAIIs was discussed and informed EMM’s development of avoid and minimise strategies.
Approach to assessment of indirect impacts	The disturbance footprint includes a 10 m indirect impact zone within which complete loss is assumed and will be fully offset. This approach was discussed with BCD.

1.4 Purpose of this report

This BDAR assesses the project in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020a) and addresses matters relating to terrestrial biodiversity.

The specific objectives of this assessment are to:

- describe biodiversity values of the disturbance footprint
- assess the likelihood that threatened species and communities (threatened biodiversity) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) could occur in the disturbance footprint
- document the strategies implemented to avoid and/or minimise impacts of the project on threatened biodiversity
- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented
- identify credit requirements of the project.

This BDAR also describes aquatic habitat values and includes an assessment of potential impacts on aquatic biodiversity values listed under the NSW *Fisheries Management Act 1994* (FM Act).

1.5 Information sources

1.5.1 Publications and databases

In order to provide context for the project, information about flora and fauna species, populations, communities and habitats from the locality (generally within 25 km) was obtained from the following publications and databases:

- NSW BioNet (DPE 2022e) for:
 - Atlas of NSW Wildlife for threatened species records
 - threatened species profiles
 - threatened biodiversity data collection (TBDC)
 - Vegetation Classification database for information on PCTs;
- Commonwealth DCCEEW Protected Matters Search Tool (PMST) (DCCEEW 2023) for Matters of National Environmental Significance (MNES) likely to occur within the study area
- Commonwealth DCCEEW Species Profile and Threats Database (DCCEEW 2022b)
- Interactive Flying-fox web viewer (DCCEEW 2021)
- New South Wales Flora Online (PlantNET) (Royal Botanic Gardens and Domain Trust 2022)
- Register of Areas of Outstanding Biodiversity Value (AOBV) (DPE 2022a)
- NSW WeedWise (DPI 2022b)
- Fisheries Spatial Data Portal (DPI 2022a), for information on:
 - key fish habitat mapping
 - freshwater fish community status
 - freshwater threatened species distributions.

1.5.2 Other relevant reports

This biodiversity assessment has been prepared with reference to the following other technical reports, prepared in earlier stages of this project or for other similar projects in the region:

- Flora and fauna assessment of Glen Innes Wind Farm (Kevin Mills & Associates 2007)
- Ecological assessment of Sapphire Wind Farm (Eco Logical Australia 2011)
- Biodiversity assessment of Sapphire Solar Farm (Eco Logical Australia 2018a)
- Ecological assessment of White Rock Wind Farm (RPS 2011)
- Biodiversity Assessment Report White Rock Solar Farm (NGH Environmental 2016)
- Preliminary ecological assessment of Sundown Solar Farm (Eco Logical Australia 2018c)
- Evaluation of threatened flora seasonal detectability for Sundown Solar Farm (Eco Logical Australia 2018b).

1.5.3 Spatial data

Spatial data encompassing the study area, including the disturbance footprint, was obtained from Sundown Solar. Base map data was obtained from Department of Finance, Services and Innovation (DFS) NSW databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from the Department of Primary Industries (DPI).

The following spatial datasets were reviewed in the development of this report:

- Mitchell Landscapes Version V3.1 (OEH 2017b)
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DoEE 2018)
- State Vegetation Type Map: Border Rivers Gwydir/Namoi Region Version 2.0 – VIS_ID 4467 (DPE 2015)
- NSW State Vegetation Type Map vC1.1.M1 (DPE 2022g)
- Directory of important wetlands in Australia (DIWA) (DAWE 2022b)
- Australian Ramsar Wetlands (DAWE 2022a)
- LiDAR derived contours (client supplied).

Mapping undertaken during the site assessment was conducted using a hand-held GPS unit, mobile tablet computers running ArcGIS Field Maps™ and Survey123 for ArcGIS™ and aerial photo interpretation. Accuracy is subject to accuracy of GPS devices, generally ± 5 m. Mapping has been produced using a Geographic Information System (GIS; ArcGIS 10.8.1).

Spatial data relevant to this BDAR is provided to DPE following lodgement of the BDAR. All spatial data is provided in GDA2020, MGA Zone 56J.

1.5.4 Imagery

Imagery relied upon in this BAM assessment include those sourced from:

- SIX Maps Viewer (Department of Customer Service – Spatial Services)
- ESRI – map service layer (Esri, Maxar, Earthstar Geographics, and the GIS User Community)
- Bing Aerial (client supplied imagery).

The Bing Aerial imagery was validated against digital elevation model (DEM) outputs and ground-truthed datasets with focus on projection and extant vegetation cover.

1.6 Declarations

Certification under clause 6.15 Biodiversity Conservation Act 2016

I, Cecilia Phu, certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020a) and Clause 6.15 of the BC Act.

Conflict of interest

As per the Accredited BAM Assessor Code of Conduct, BAM Accredited Assessors must not act in circumstances where there is actual, perceived, or potential conflict of interest. I declare that I have considered the circumstances and there is no actual, perceived, or potential conflict of interest. This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

1.7 BAM Contributors

This BDAR was prepared by Cecilia Phu (BAAS 17058) and Ireni Clarke in accordance with BAM 2020 (DPIE 2020a). The BAM credit calculations were performed by Cecilia Phu (BAM-C application version 1.4.0.00; BAM data version 56).

A technical review of the report and credit calculations was undertaken by Eugene Dodd (accredited assessor number BAAS 17009). Staff qualifications are presented in Table 1.4.

Table 1.4 Project contributors

Name	Qualifications	Experience	Role
Cecilia Phu	BSc (Hons) BAM accredited assessor (BAAS 17058)	15 years	Project lead Field surveys (Vegetation mapping, BAM plots, targeted flora searches, habitat assessment) BDAR lead author
Ireni Clarke	BSc (Adv)(Hons)	4 years	Field surveys (Vegetation mapping, BAM plots, targeted fauna surveys) BDAR contributing author
Paul Rossington	BSc (Biology), Master of Wildlife Management BAM accredited assessor (BAAS 18065)	18 years	Field surveys (targeted flora searches) Technical director
Eugene Dodd	MRes (Ecology and Environmental Management) BSc Hons (Marine Biology) BAM accredited assessor (BAAS 17009)	14 years	Technical review
Ben Lewis (Lewis Ecological Surveys)	B.A.Sc (Hons)(Ecology)	26 years	Field surveys (harp trapping)
Amy Rowles (Corymbia Ecology)	BSc (Hons)(Ecology)	26 years	Ultrasonic bat call analysis
Simone Popp (Tate Animal Training Enterprises)	BSc	12 years	Field surveys (detection dogs)
Claire Chiotti (Tate Animal Training Enterprises)	BAnimSc	18 years	Field surveys (detection dogs)
Isaac Mammot (Sclerophyll Flora Surveys and Research Pty Ltd)	B.Sc (Plant Biology/Zoology), B.A (Economics) BAM accredited assessor (BAAS 18008)	22 years	Field surveys (BAM plots)
Luke O'Brien	BESM BSc (Hons) BAM accredited assessor (BAAS 22017)	7 years	Field surveys (BAM plots)

Table 1.4 **Project contributors**

Name	Qualifications	Experience	Role
Jason Brown	BSc. BAM accredited assessor (BAAS 21017) Chartered Environmentalist (CEnv)	17 Years	Field surveys (targeted fauna survey)
Ryl Parker	BEnvSc (Hons), BA BAM accredited assessor (BAAS 22010)	5 years	Field surveys (targeted flora survey)
Bianca Seal	BSc PgDipGIS	4 years	Field surveys (targeted flora survey)
Erica-Danae Goldsmith	BSc. (Zoology)	1 year	Field assistant (BAM plots, targeted flora survey, targeted fauna survey, habitat assessments)
Jennifer Lindsay	BEnvSc	2 years	Field assistant (targeted flora survey)

2 Legislative context

2.1 Commonwealth legislation

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- world heritage properties
- places listed on the National Heritage Register
- Ramsar wetlands of international significance
- threatened flora and fauna species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a ‘controlled action’ and can only proceed with the approval of the Commonwealth Minister for the Environment and Water. An action that may potentially have a significant impact on a MNES is to be referred to DCCEEW for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act and a decision made as to whether or not to grant approval.

The project has been referred to the Commonwealth Minister for the Environment and Water and determined to be a controlled action on 29 August 2022 (EPBC 2022/09249). The project will be assessed under the assessment bilateral agreement with New South Wales. The Assistant Secretary and delegate for the Minister for the Environment and Water determined that the following controlling provisions apply:

- listed threatened species and communities (Sections 18 and 18A of the EPBC Act).

Supplementary SEARs were issued by a delegate for the NSW Planning Secretary on 4 October 2022, which outline the requirements for assessing MNES.

An assessment of the project against the EPBC Act is provided in Chapter 8.

2.2 State legislation

2.2.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning and Environment (DPE).

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs). EPIs relevant to the natural environment are outlined further below.

i State Environmental Planning Policy (Planning Systems) 2021

Under Section 4.36 of the EP&A Act, a development is State significant if it is declared to be SSD by any State Environmental Planning Policy (SEPP).

The project is declared to be SSD by *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). Section 2.6(1) of the Planning Systems SEPP states:

- (1) Development is declared to be State significant development for the purposes of the Act if –
 - (a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act
 - (b) the development is specified in Schedule 1 or 2.

The project meets clause 2.6(1)(a) as it is not permissible without development consent. The project also meets clause 2.6(1)(b), as it is 'electricity generating works' that have a capital investment of more than \$30 million as specified in Schedule 1 of the Planning Systems SEPP. Therefore, the project meets the requirements of Clause 2.6(1) and is SSD that requires development consent, in accordance with Part 4, Division 4.7 of the EP&A Act.

ii State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 3 (Koala Habitat Protection 2020) and Chapter 4 (Koala Habitat Protection 2021) of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) together aim to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. In nine metropolitan Sydney local government areas (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA Koala Habitat Protection 2021 applies to all land use zones. Outside of these areas Koala Habitat Protection 2020 continues to apply to all land zoned RU1, RU2, and RU3.

The project is located within the Inverell local government area and is zoned RU1 (Primary production). However, consideration of the Koala Habitat Protection 2020 provisions of the Biodiversity and Conservation SEPP is not triggered as the policy only applies to local developments where a development application is made, and does not apply to major projects. Nonetheless, consideration has been given to the potential occurrence and impacts upon the koala within this BDAR.

2.3 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the Biodiversity Conservation Regulation 2017 (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the Biodiversity Assessment Method (BAM, DPIE 2020a) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements. For major projects, use of the BAM is mandatory, unless a BDAR waiver is granted.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to proposed development area
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

This biodiversity assessment has been undertaken in accordance with the requirements of the BAM.

2.4 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in Section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve key fish habitat (KFH). These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. KFH is defined in Section 3.2.1 and 3.2.2 of the *Policy and Guidelines for Fish Conservation and Management* (DPI 2013).

The impact of the project on threatened aquatic species, populations, communities, habitats and KFH have been assessed in Section 5.5 and Section 9.2.

2.5 Biosecurity Act 2015

The primary objective of the Biosecurity Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

All plants in NSW are regulated by a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

The Biosecurity Act places restrictions on the trade and movement of plants that harm the NSW environment, economy and community. Those plants are called 'priority weeds' and the restrictions on trade and movement apply to all parts of the plant including cuts, cultivars and hybrids. Priority weeds are any weeds identified in a local strategic plan that has been approved by the Minister under Division 2 of Part 4 of the *Local Land Services Act 2013*.

'State priority weeds' must not be sold anywhere in NSW. People that buy or sell state priority weeds in NSW are committing an offence under the Biosecurity Act that carries large penalties. The following legal instruments apply:

- Prohibited Matter – A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. The definition of 'dealing' is broad and includes having, buying, selling, moving, growing and disposal.
- Control Order – Requires all parts of the plant to be destroyed until eradicated.

- Mandatory Measure (Prohibition on Dealings) – Must not be imported into the State or sold.

'Regional priority weeds' should not be sold or moved in certain Local Land Services regions of NSW.

The Northern Tablelands Regional Strategic Weed Management Plan (LLS 2017) supports the *Local Land Services Act 2013* and implements the NSW weed reforms, Biosecurity Strategy and Invasive Species Plan in relation to weeds for the Northern Tablelands region.

The provisions of the Biosecurity Act are discussed further in Section 9.1.

2.6 Water Management Act 2000

Division 6 of the *Water Management Act 2000* (WM Act) requires consideration of aquifer interference activities.

The NSW Aquifer Interference Policy (NOW 2012) requires an assessment of potential impacts on groundwater users, including groundwater dependent ecosystems.

A separate assessment of potential groundwater impacts has been addressed in the water assessment for the project (refer to Appendix J of the EIS). This assessment indicates that whilst the project will require excavation below existing surface levels to establish suitable foundation conditions for infrastructure and for the installation of underground services, excavations will be shallow (up to a maximum of a few m in depth) and localised. By comparison, existing groundwater levels based on available data from registered bores are estimated to be at least 11 m below ground level, and potentially much deeper.

Groundwater is unlikely to be intercepted for the project and therefore it does not represent an aquifer interference activity. No further assessment of groundwater impacts is required for groundwater dependent ecosystems in this BDAR.

Stage 1 – Biodiversity assessment

3 Landscape features

The identification of landscape features was undertaken in accordance with Section 3 of the BAM (DPIE 2020a), and results are summarised within this chapter.

The project has been assessed as two separate cases in the BAM-C:

- site-based component: the PV array areas, substations, laydown areas etc, with a 1,500 m buffer applied
- linear-based component: the access road with a 500m buffer applied either side of the centre line.

The landscape features described in the following sections are summarised in Table 3.1 and shown in Figure 3.1 and Figure 3.2.

Table 3.1 Landscape features

Landscape feature	Site-based component	Linear-based component
Method applied for site context components	Site-based (1,500 m buffered assessment area).	Linear-based (500 m buffered assessment area).
Interim Biogeographic regionalisation of Australia (IBRA) bioregion	New England Tablelands.	New England Tablelands.
IBRA subregion	Glen Innes-Guyra Basalts.	Glen Innes-Guyra Basalts.
BioNet NSW landscapes (formerly Mitchell landscapes)	<ul style="list-style-type: none"> • Glen Innes-Guyra Basalts (main landscape). • Inverell Plateau Granites. 	<ul style="list-style-type: none"> • Glen Innes-Guyra Basalts (main landscape). • Inverell Plateau Granites. • Dumaresq Channels.
Rivers, streams and estuaries	<p>The following streams have been identified within the buffer of the site-based component:</p> <ul style="list-style-type: none"> • Kings Creek (4th order). • Kateys Creek (3rd order). • Lambing Creek (3rd order). • Jessie Creek (2nd order). • Black Washer Gully (2nd order). • Several unnamed creeks (1st, 2nd and 3rd order). 	<p>The following streams have been identified within the buffer of the linear-based component:</p> <ul style="list-style-type: none"> • Kings Creek (4th order). • Swan Brook (4th order). • Chinamans Gully (3rd order). • Wet Creek (3rd order). • Several unnamed creeks (1st, 2nd and 3rd order).
Wetlands	No nationally important wetlands within the disturbance footprint.	No nationally important wetlands within the disturbance footprint.
Connectivity of different areas of habitat	Remnant vegetation in the locality is highly fragmented. Wooded vegetation within the disturbance footprint generally occurs in isolated patches, surrounded by agricultural land.	Remnant vegetation in the locality is highly fragmented. Wooded vegetation within the disturbance footprint generally occurs in isolated patches, surrounded by agricultural land.
Areas of geological significance and soil hazard	No areas of geological significance within the disturbance footprint. Acid sulfate soils are unlikely to be present in the vicinity of the project.	No areas of geological significance within the disturbance footprint. Acid sulfate soils are unlikely to be present in the vicinity of the project.
Areas of outstanding biodiversity value	No areas of outstanding biodiversity value within the disturbance footprint.	No areas of outstanding biodiversity value within the disturbance footprint.
Percent native vegetation cover	67%	52%

3.1 Landscape features

3.1.1 Bioregions and landscapes

The project occurs in the New England Tablelands IBRA region, within the Glen Innes-Guyra Basalts subregion.

The disturbance footprint occurs across three Bionet NSW Landscapes (formerly Mitchell Landscapes):

- Glen Innes – Guyra Basalts (Gsb)
- Inverell Plateau Granites (Ing)
- Dumaresq Channels (Duc).

3.1.2 Rivers, streams, estuaries and wetlands

The study area is located in the catchment of the MacIntyre River, within the Border Rivers catchment area of the Murray Darling Basin. The Border Rivers Catchment covers 49,500 square kilometres (km²) across northern NSW and Queensland, bordered by the Great Dividing Range to the east, the Gwydir Catchment to the south, and the Moonie and Condamine-Balonne Catchments to the north. The NSW portion of the Border Rivers catchment covers 24,500 km² (DPE 2022b).

The disturbance footprint avoids most mapped watercourses. The streams that pass within or adjacent to the study area are outlined in Table 3.2. All streams that intersect with the site-based component buffer of the project are tributaries of Kings Creek. In the linear-based component buffer the intersected streams flow into both Kings Creek and Swan Brook. Impacts to waterways are considered in Section 9.2.

Table 3.2 Watercourses in the study area

Strahler stream order	Site-based component	Linear-based component
Fourth order	Kings Creek	Kings Creek
		Swan Brook
Third order	Kateys Creek	Chinaman's Gully
	Lambing Creek	Wet Creek
	Unnamed x 4	Unnamed x 1
Second order	Jessie Creek	Wet Creek
	Black Washer Gully	Unnamed x 4
	Lambing Creek	
	Unnamed x 16	
First order	Unnamed x 67	Unnamed x 17

The stream substratum along Kings Creek consists of rocky sections, cobble, pebble, and sandy sections, with some in-stream vegetation. The riparian zone of Kings Creek is mostly vegetated, with some cleared sections. The smaller streams within the disturbance footprint (Kateys Creek, Jessie Creek, unnamed creeks) are largely lacking rocky features, with their substratum consisting of gravel sections and flooded grassland. The riparian zones of these creeks are largely unvegetated.

The locality does not contain any nationally important wetlands, local wetlands, or Ramsar wetlands. The nearest mapped important wetland is Little Llangothlin Lagoon, 41 km southeast of the project area (DAWE 2022a; b).

3.1.3 Connectivity

The locality of the study area consists of highly fragmented native vegetation, often occurring in isolated patches surrounded by a matrix of agricultural land. This is consistent with the vegetation within the disturbance footprint.

Areas of remnant vegetation to the east and south of the study area are connected to a larger patch of native woodland that extends west towards Lake Copeton and includes Mt Topper and Clive State Forests. Vegetation within the study area is connected to this area via narrow and somewhat fragmented corridors, largely along drainage lines or watercourses (Figure 3.1, native vegetation is also visible in Figure 4.1).

3.1.4 Areas of geological significance

There are no areas of geological significance within the study area. There are elevated ridgelines to the east and south of the disturbance footprint, including the Spring Mountain Area to the east with a peak of 1,399 m. There are no cliff lines or mapped caves associated with these ridgelines.

3.1.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value (AOBV) within the study area.

3.2 Assessment of site context

The site context has been assessed in accordance with Section 3.2 of the BAM (DPIE 2020a) for site-based and linear-based developments.

Regional mapping data was used as a starting basis for estimating native vegetation extent (DPE 2022g). Regional mapping was reviewed against aerial imagery and updated in areas of inconsistency. In areas of grassland where no ground validation studies were undertaken as part of this BDAR, native vegetation mapping was conservatively extended into areas of grassland likely to have a native component. Only areas clearly shown to be cultivation based on the aerial imagery were excluded from the native vegetation extent. In areas where vegetation mapping was validated by ground-truthing and plot surveys within the study area (as documented in Chapter 4), this information was used to determine native vegetation extent instead of the regional mapping data.

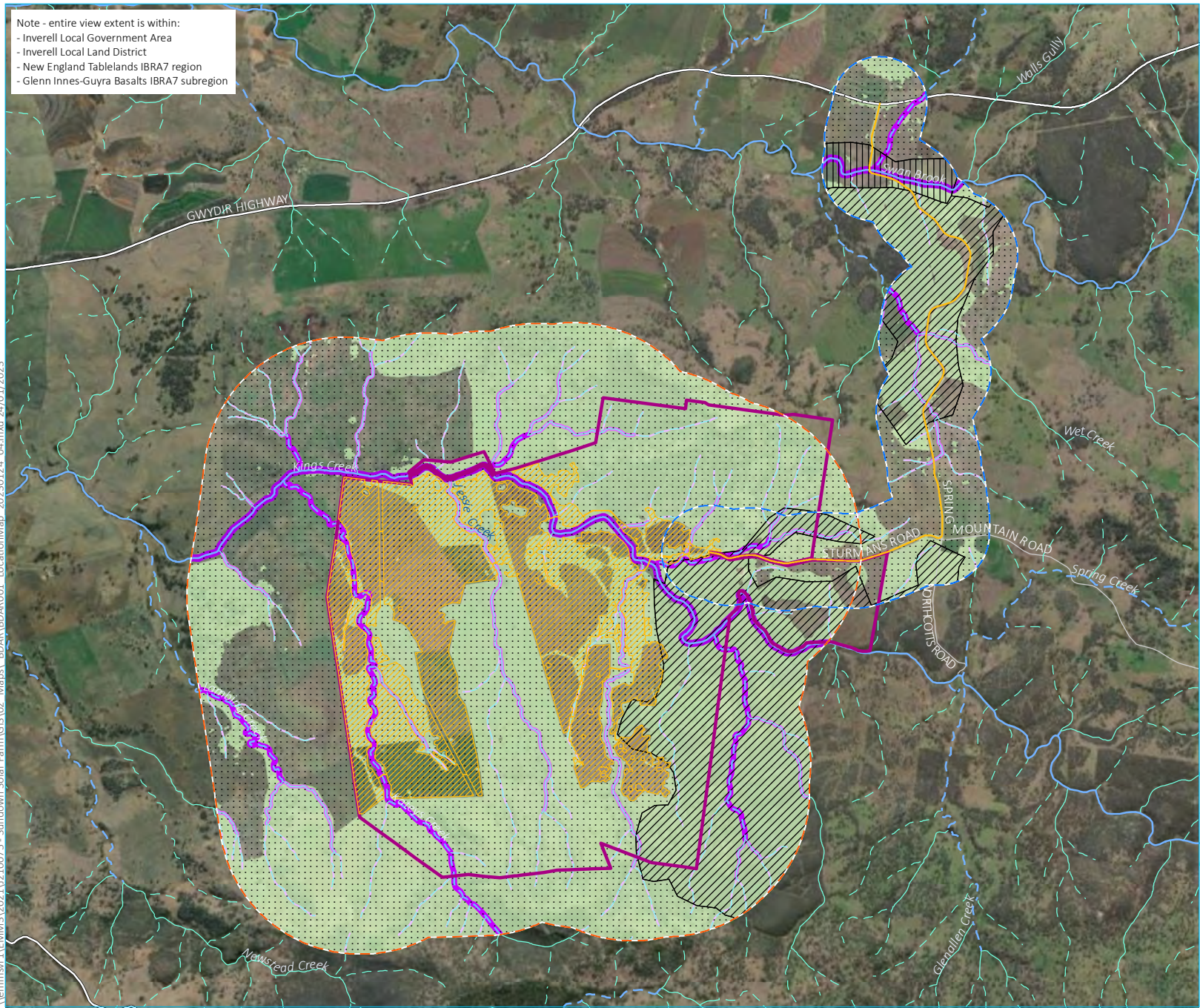
Native vegetation extent is shown in Figure 3.1. Percentage native cover was assessed as 67% for the site-based component and 52% for the linear-based component of the project (Table 3.3).

Patch size was assumed to be >100 ha for every vegetation zone as a conservative approach to threatened species assessment. This enabled the BAM-C to filter in the maximum number of candidate species for consideration. Candidate threatened species are assessed in Chapter 5.

Table 3.3 Percentage of native vegetation cover

Component	Native vegetation in buffer area (ha)	Buffer area (ha)	Approximate percentage of native vegetation in buffer area
Site-based component 1,500 m buffer	2704	4057	66.7%
Linear-based component 500 m buffer	464	890	52.2%

Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion



- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Extent of native vegetation
 - Buffer areas
 - 1,500 m buffer
 - 500 m buffer
 - Strahler stream order
 - 1st order
 - 2nd order
 - 3rd order
 - 4th order
 - Riparian buffer
 - 10 m
 - 20 m
 - 30 m
 - 40 m
 - Mitchell landscape (v3.1)
 - Dumaresq Channels
 - Glenn Innes - Guyra Basalts
 - Inverell Plateau Granites

Location map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.1

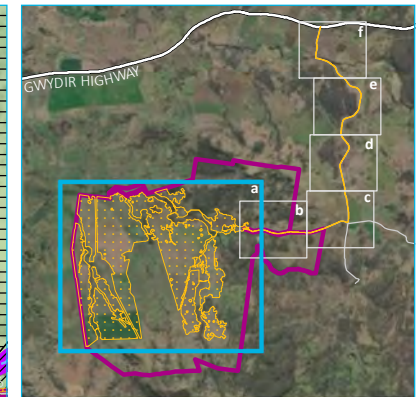


Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021); DPE (2015); OEH (2017)



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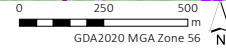
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Cadastral boundary
 - Extent of native vegetation
- Strahler stream order**
- 1st order
 - 2nd order
 - 3rd order
 - 4th order
- Riparian buffer**
- 10 m
 - 20 m
 - 30 m
 - 40 m
- Mitchell landscape (v3.1)**
- Glenn Innes - Guyra Basalts
 - Inverell Plateau Granites

Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion

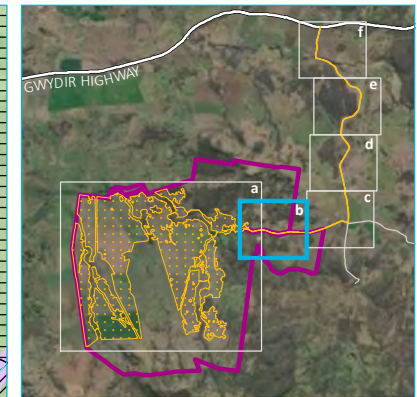
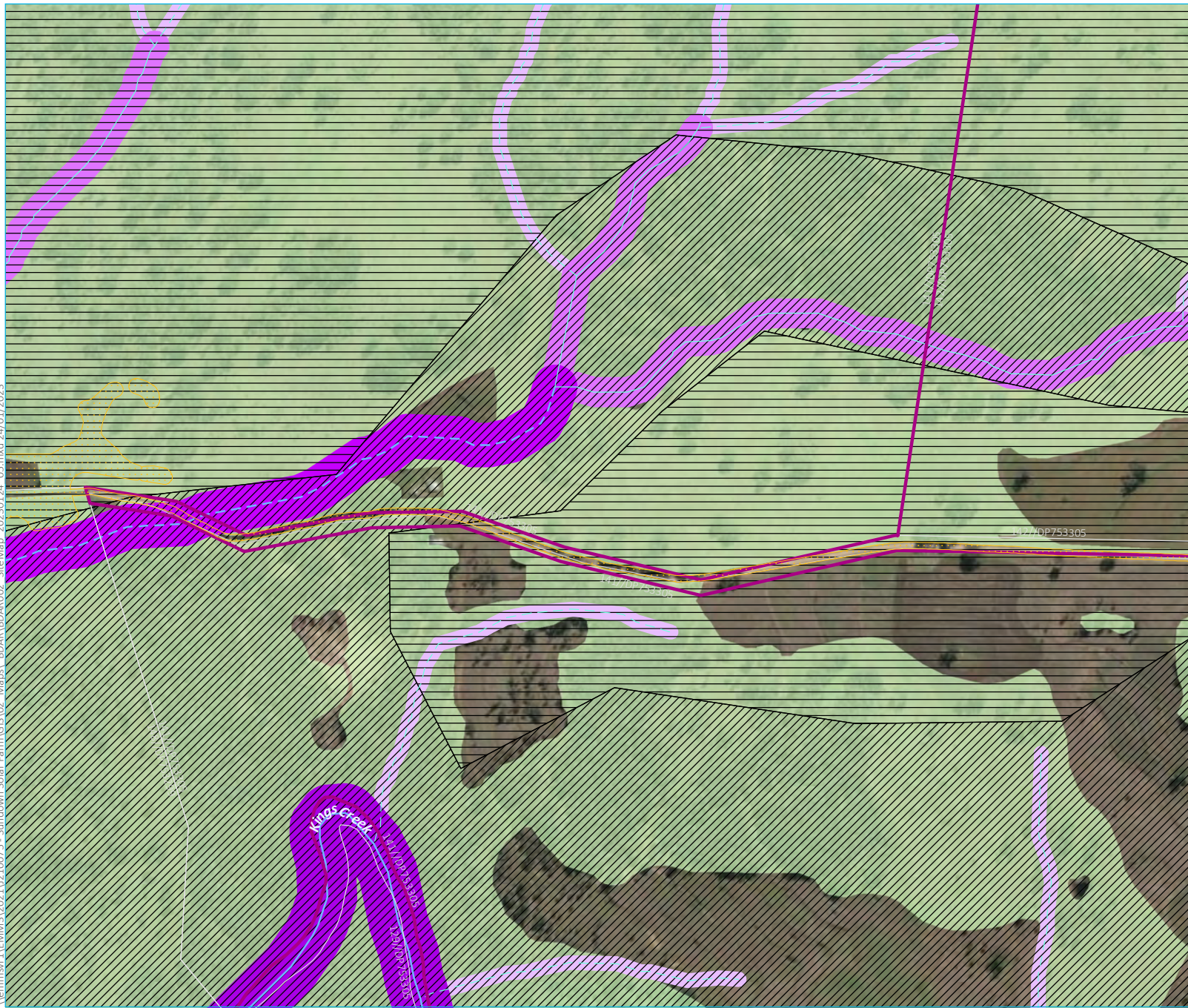
Site map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.2a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021); DPE (2015); OEH (2017)



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KEY

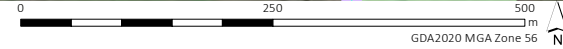
- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road
- Minor road
- Cadastral boundary
- Extent of native vegetation
- Strahler stream order
 - 1st order
 - 2nd order
 - 3rd order
 - 4th order
- Riparian buffer
 - 10 m
 - 20 m
 - 30 m
 - 40 m
- Mitchell landscape (v3.1)
 - Glenn Innes - Guyra Basalts
 - Inverell Plateau Granites

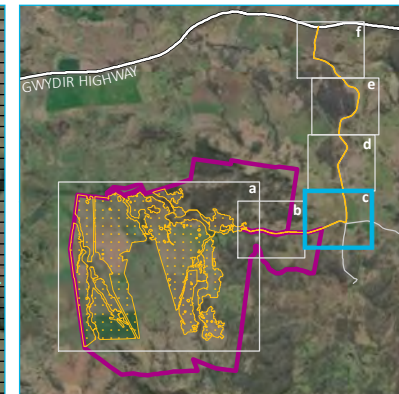
Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion

Site map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.2b

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021); DPE (2015); OEH (2017)





KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road
- Minor road
- Cadastral boundary
- Extent of native vegetation
- Strahler stream order
- 1st order
- Riparian buffer
- 10 m
- Mitchell landscape (v3.1)
- Glenn Innes - Guyra Basalts
- Inverell Plateau Granites

Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion

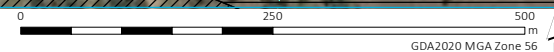
Site map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.2c



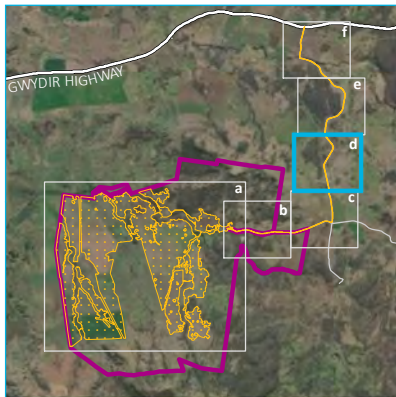
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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021); DPE (2015); OEH (2017)



GDA2020 MGA Zone 56

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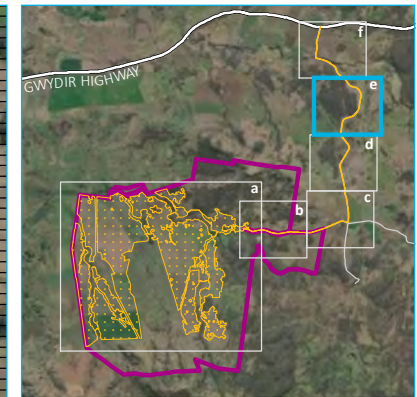
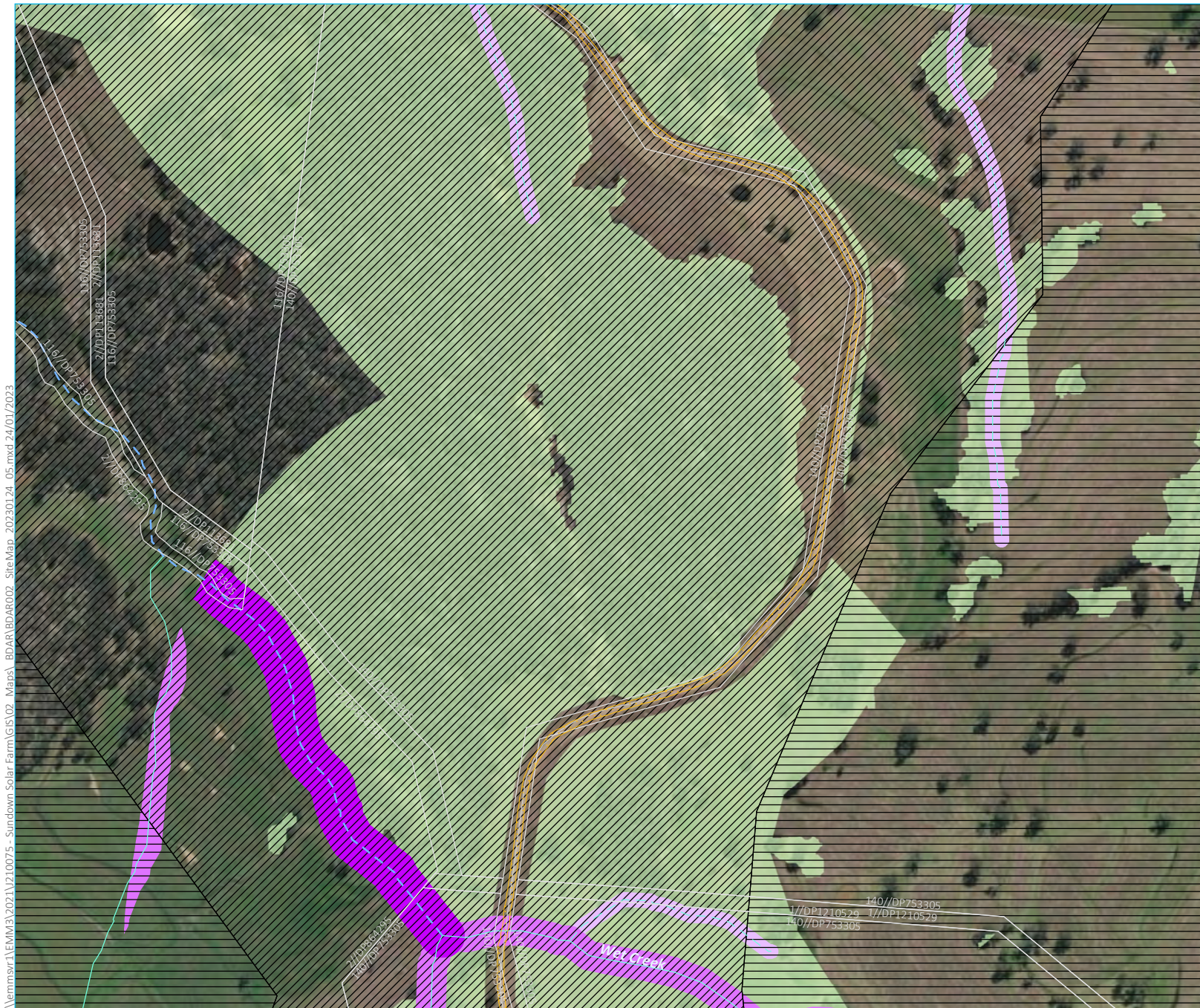
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Cadastral boundary
 - Extent of native vegetation
- Strahler stream order**
- 1st order
 - 2nd order
- Riparian buffer**
- 10 m
 - 20 m
- Mitchell landscape (v3.1)**
- Glenn Innes - Guyra Basalts
 - Inverell Plateau Granites

Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion

Site map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.2d





KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road
- Minor road
- Cadastral boundary
- Extent of native vegetation
- Strahler stream order
 - 1st order
 - 2nd order
 - 3rd order
- Riparian buffer
 - 10 m
 - 20 m
 - 30 m
- Mitchell landscape (v3.1)
 - Glenn Innes - Guyra Basalts
 - Inverell Plateau Granites

Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion

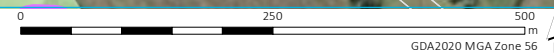
Site map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.2e

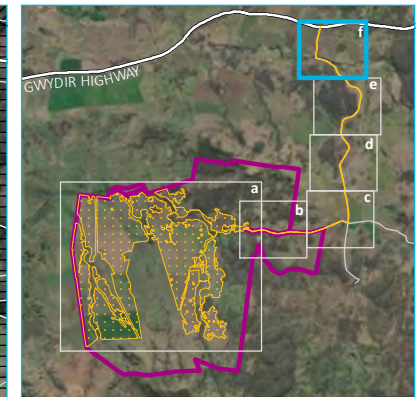
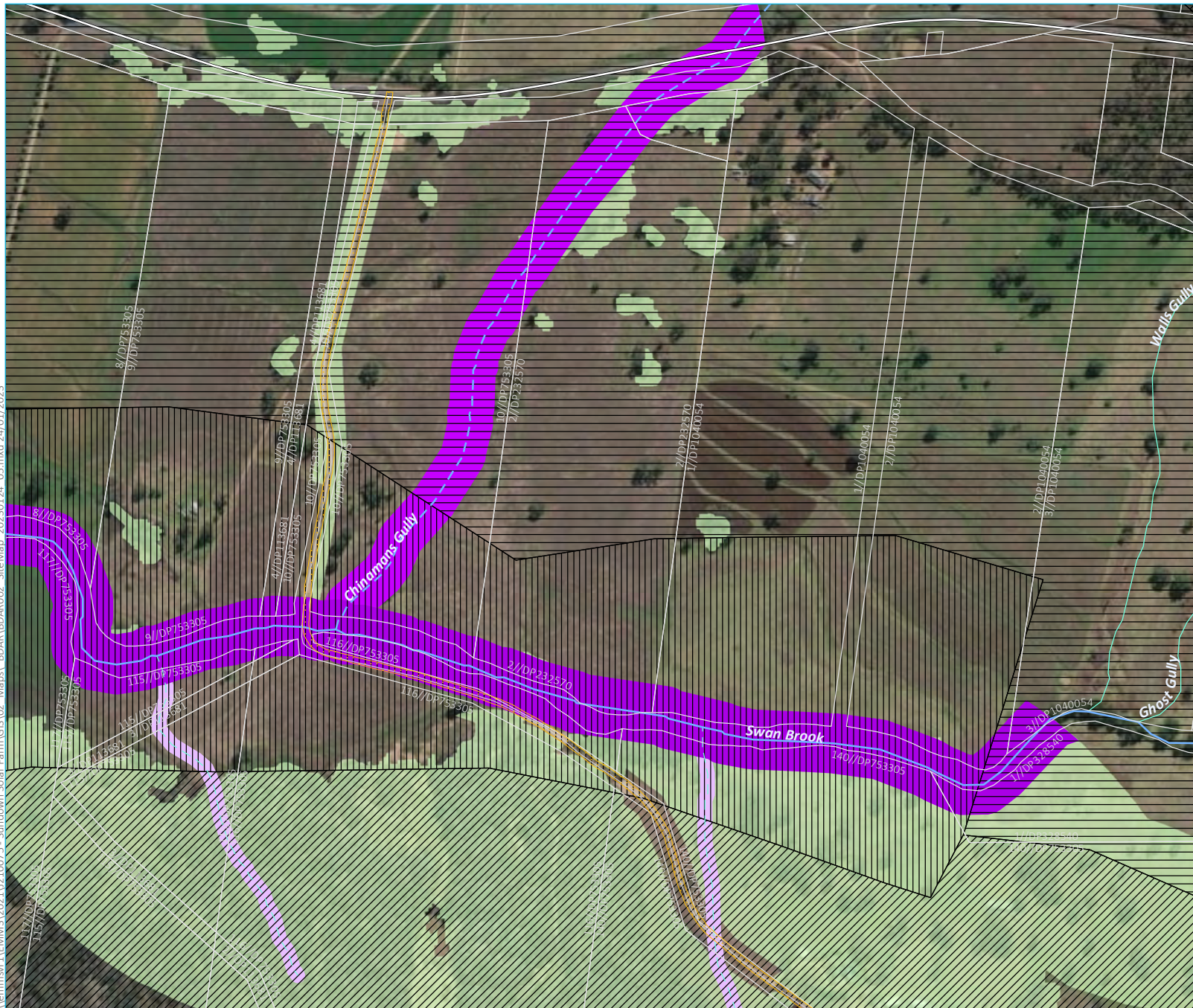


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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021); DPE (2015); OEH (2017)



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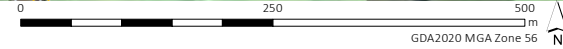
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Cadastral boundary
 - Extent of native vegetation
- Strahler stream order**
- 1st order
 - 2nd order
 - 3rd order
 - 4th order
- Riparian buffer**
- 10 m
 - 30 m
 - 40 m
- Mitchell landscape (v3.1)**
- Dumaresq Channels
 - Glenn Innes - Guyra Basalts
 - Inverell Plateau Granites

Note - entire view extent is within:
 - Inverell Local Government Area
 - Inverell Local Land District
 - New England Tablelands IBRA7 region
 - Glenn Innes-Guyra Basalts IBRA7 subregion

Site map

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 3.2f

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021); DPE (2015); OEH (2017)



4 Native vegetation

An assessment of native vegetation within the disturbance footprint was undertaken in accordance with Section 4 of the BAM (DPIE 2020a), and is summarised within this chapter.

4.1 Background review

A review of desktop information was undertaken to obtain a broad understanding of the regional vegetation types within the locality of the study area. This included a review of the following data sources and reference literature:

- State Vegetation Type Map: Border Rivers Gwydir/Namoi Region v2.0 – VIS_ID 4467 (DPE 2015)
- NSW State Vegetation Type Map vC1.1.M1 (DPE 2022g)
- *Flora and fauna assessment of Glen Innes Wind Farm* (Kevin Mills & Associates 2007)
- *Ecological assessment of Sapphire Wind Farm* (Eco Logical Australia 2011)
- *Biodiversity assessment of Sapphire Solar Farm* (Eco Logical Australia 2018a)
- *Ecological assessment of White Rock Wind Farm* (RPS 2011)
- *Biodiversity Assessment Report White Rock Solar Farm* (NGH Environmental 2016).

Preliminary vegetation studies of the study area were also undertaken in 2018 by Eco Logical Australia on behalf of CWP Renewables (Eco Logical Australia 2018c). The preliminary assessment involved early ground-truthing surveys and the development of a preliminary plant community type (PCT) map.

Five PCTs were identified by Eco Logical Australia (2018c) occurring as woodland across their investigation area. Eco Logical Australia (2018c) also recorded derived native grassland that complies with the definition of native grassland under Part 5A of the *Local Land Services Act 2013* (LLS Act) but did not assign the derived native grassland to PCTs.

Many of the PCTs identified by Eco Logical Australia (2018c) are consistent with the Final Determination for *White Box Yellow Box Blakely's Red Gum Woodland*, which is listed as an Endangered Ecological Community (EEC) under the BC Act and as a Critically Endangered Ecological Community (CEEC) under the EPBC Act.

4.2 Methods

4.2.1 Field survey dates and tasks

Vegetation surveys were conducted on the dates outlined in Table 4.1.

Table 4.1 Vegetation surveys

Dates	Surveys completed
25 to 26 May 2021	Vegetation mapping, BAM plots
25 to 27 August 2021	Vegetation mapping
15 to 18 October 2021	Vegetation mapping, BAM plots
7 to 8 December 2021	Vegetation mapping, BAM plots

Table 4.1 **Vegetation surveys**

Dates	Surveys completed
26 April to 1 May 2022	BAM plots
5 to 6 October 2022	Vegetation mapping, BAM plots

4.2.2 **Vegetation mapping and stratification**

Existing vegetation maps relevant to the study area and the buffer area were reviewed, particularly that of Ecological Australia (2018c) as it is the most recent ground-truthed dataset. These datasets were used as a basis for subsequent vegetation validation and mapping surveys, with classification and linework updated where required as informed by a combination of aerial photograph interpretation and ground-truthing in the field.

Systematic visual inspection of 2-dimensional digital aerial imagery was undertaken using a Geographic Information System (GIS; ArcGIS 10.5). Aerial imagery, along with existing mapping layers, were examined at scales of between 1:2,000 and 1:4,000.

Vegetation validation and mapping surveys were undertaken across the study area over repeat visits (refer to Table 4.1 above). Vegetation was mapped in the field using GPS-enabled tablet computers using ArcGIS Field Maps™ and involved the following survey techniques:

- random meander surveys on foot to ground-truth PCT boundaries and collect rapid data (or vegetation validation) points
- rapid data point assessments to collect information on dominant floristic composition and structure and other relevant observations such as landscape position and soil type. Rapid data points were collected randomly over a large spatial scale and were used as a fast and reliable way of describing vegetation patterns and documenting ecotones
- systematic plot-based floristic vegetation survey (ie ‘BAM plots’) consistent with Section 4.2.1 of the BAM (DPIE 2020a) to facilitate identification of the most likely PCTs as described in the BioNet Vegetation Classification database (DPE 2022f).

Vegetation mapping undertaken during the field studies was conducted using hand-held GPS units, and mobile tablet computers running ArcGIS Field Maps™ and Survey123 for ArcGIS™. Accuracy is subject to accuracy of GPS devices, generally ± 5 m. The vegetation mapping dataset has been produced using a Geographic Information System (GIS; ArcGIS 10.8.1).

PCTs were stratified into vegetation zones based on broad condition states. As a guide, the following descriptions in Table 4.2 were used to identify vegetation zones for each PCT.

Table 4.2 **Descriptions of broad condition states**

Condition class	Description
Woodland_intact	Woodland or open forest that is largely intact with all strata present and minimal disturbance. Patches are typically at least 5 ha.
Woodland_moderate	Open woodland, woodland or open forest with some elements of understorey strata missing, immature or otherwise modified. Understorey is largely native but can contain a high proportion of exotic ground cover species. Also includes small woodland patches (typically under 5 ha).

Table 4.2 Descriptions of broad condition states

Condition class	Description
Woodland_poor	Tree stratum present over a largely non-native understorey, including weeds, lawn, cultivation or clearing.
Derived native grassland (DNG)_moderate	Tree stratum and shrub stratum missing. Native vegetation restricted to groundcover, sometimes with scattered trees. Groundcover is dominated by perennial native grass species but also contains a high proportion of exotic groundcover species. Not species rich in terms of native ground cover forbs and herbs but meets EPBC Act listing for derived native grassland.
Derived native grassland (DNG)_low	Tree stratum and shrub stratum missing. Native vegetation restricted to groundcover, sometimes with scattered trees. Groundcover is dominated by perennial native grass species but also contains a high proportion of exotic groundcover species. Does not meet EPBC Act listing for derived native grassland.
Non-native	Tree stratum and shrub stratum missing. Groundcover is dominated by exotic species, including crop species. Can contain occasional native ground cover species.

It can be difficult to assign derived native grassland types to a PCT where there is more than one PCT present. In undertaking this exercise for the study area, various indicators were used in an attempt to delineate between derived native grassland of different PCTs, including the location and species of scattered canopy trees, and information relating to PCT association/relationship with landscape position (eg proximity to Kings Creek, and contour and elevation data).

4.2.3 Vegetation integrity assessment

Following the stratification of vegetation zones within the study area, native vegetation integrity was assessed using data obtained via a series of plots, as per the methodology outlined in Section 4.2.1, 4.3.3 and 4.3.4 of the BAM (DPIE 2020a). Plot data was collected from the study area across four separate survey events (Table 4.1).

At each plot location the following was undertaken:

- one 20 x 20 m plot, for assessment of composition and structure
- one 20 x 50 m plots for assessment of function, including a series of five 1 x 1 m plots to assess average leaf litter cover.

The assessment of composition and structure, based on a 20 x 20 m plot, recorded species name, stratum, growth form, cover and abundance rating for each species present within the plot. Cover (foliage cover) was estimated for all species rooted in or overhanging the plot, and recorded using decimals (if less than 1%, rounded to whole number (1–5%) or estimated to the nearest 5% (5–100%). Abundance was counted (up to 20) and estimated above 20, and recorded using the following intervals: 1, 2, 3, 4, 5, 10, 20, 50, 100, 500, 1,000, 1,500, 2,000 etc.

The assessment of function recorded the number of large trees, the presence of tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs, as well as leaf litter cover within the 20 x 50 m plot and five 1 x 1 m subplots.

The minimum number of plots and transects per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). The survey effort completed for each vegetation zone is detailed in Section 4.3.4.

Datasheets are provided in Appendix C while compiled plot data is provided in Appendix D.

Surveys for flora and vegetation communities were completed under the authority of Scientific License (SL100409). A list of flora species was compiled for each plot and PCT. Records of all flora species will be submitted to BCS for incorporation into the Atlas of NSW Wildlife.

4.2.4 Identification of Box Gum Woodland

Candidate threatened ecological communities (TECs) were initially identified through review of the TEC associations in the BioNet Vegetation Classification database for PCTs recorded in the study area. The TECs recorded and predicted to occur in the locality based on searches of the EPBC Act Protected Matters Search Tool (PMST) and the BioNet threatened biodiversity profile search tool, were also considered.

Several of the PCTs mapped within or near the study area are classified in the BioNet Vegetation Classification (DPE 2022f) as being associated “wholly” or “partially” with the following critically endangered ecological community (CEEC) listed under the BC Act and EPBC Act:

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.

Under the EPBC Act, this TEC is named ‘White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland’. In this BDAR, both the EPBC Act and BC Act listed community are referred to as ‘Box Gum Woodland’.

The identification of this CEEC within the study area was assessed against the NSW Threatened Species Scientific Committee Final Determination made under Part 4 of the BC Act (NSW TSSC 2020) and supporting identification guidelines (NSW DECC 2007; OEH 2020). The identification of this TEC within the study area was also assessed against the Listing Advice prepared under the EPBC Act (TSSC 2006) as well as the EPBC Act Policy Statement 3.5 and its associated information sheets (DEH 2006). Spatial identification of Box Gum Woodland was made with consideration of the *BCD North East Branch Guidance Material – Principles for Mapping the Extent of Woodland CEECs and EECs* (BCD unpublished).

i BC Act criteria for Box Gum Woodland

Box Gum Woodland is described under the BC Act as a grassy woodland occurring on the tablelands or western slopes of NSW, that contains (or once contained) a canopy characterised by either White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) or Blakely’s Red Gum (*Eucalyptus blakelyi*).

The BC Act listing for the CEEC notes that the community structure can range from open grassy woodland to forest and that intact stands are rare. As such, the listing also includes modified sites:

- where the main tree species are present but the ground layer is predominantly composed of exotic species
- where the trees have been removed and only the grassy ground layer and some herbs remain, ie derived native grassland or shrubland.

The following points were taken into consideration in identifying Box Gum Woodland in the study area:

- degraded sites will form part of the CEEC where there is potential for assisted natural regeneration of the tree layer or the understorey, eg by removing grazing and/or weeds (NSW DECC 2007). This means that highly weedy sites can still conform to the CEEC
- whilst an assemblage of characteristic species is described for the community, the BC Act listing notes that the community is highly variable across its range and that not all the characteristic species are present at every site and many sites may also contain species not listed as a characteristic species.

ii EPBC Act criteria for Box Gum Woodland

Box Gum Woodland is similarly described under the EPBC Act. However, modified remnants must also meet minimum condition thresholds, namely a predominantly native understorey with a high diversity of native plant species.

The following criteria were applied in identifying EPBC Act-listed Box Gum Woodland in the study area and are taken from the EPBC Act Policy Statement 3.5 (DEH 2006):

- White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*), Blakely's Red Gum (*Eucalyptus blakelyi*), Western Grey Box (*Eucalyptus macrocarpa*) or Coastal Grey Box (*Eucalyptus moluccana*) must be the most common overstorey species
- the patch¹ must have a predominantly native understorey (ie more than 50% of the perennial ground layer must comprise native species)
- be part of a patch 0.1 ha or greater in size
- contain 12 or more native understorey species (excluding grasses), including one or more identified important species
- be 2 ha or greater in size
 - a) have natural regeneration² of the dominant overstorey eucalypts
 - b) have an average of 20 or more mature³ trees per hectare.

4.2.5 Scattered tree mapping

A tree survey was undertaken to identify scattered trees within the disturbance footprint that are proposed to be cleared, for the purposes of applying the 'Scattered trees assessment' streamlined assessment module (Appendix B, DPIE 2020a).

Scattered trees were identified where they met the definitions of scattered trees as prescribed within Appendix B of the BAM (DPIE 2020a). Within the disturbance footprint, this comprised trees with the following attributes:

- species listed in the tree growth form group
- DBH \geq 5 cm
- separated from another living tree that has a DBH \geq 5 cm by more than 50 m
- completely separated from another living tree by either exotic plants (ie crop and/or introduced pasture species) or bare ground (ie ripped earth readying for sowing).

¹ The larger of: 5 or more trees that are no greater than 75 m from each other, or the area over which the understorey is predominantly native.

² Mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

³ Trees with a circumference of at least 125 cm at 130 cm above the ground.

Data collected as part of the scattered tree survey included tree species, diameter at breast height (DBH) in centimetres (cm), presence of hollows and notes on faunal use of the trees. Although the 'Scattered trees assessment' streamlined assessment module assesses living trees, stags (ie non-living trees) were also conservatively included in the scattered tree assessment since stags can also provide hollow resources and habitat for fauna. Stags were classified as '*Eucalyptus* sp.' in the BAM-C.

Each tree was assigned to one of three tree classes as defined in Appendix B of the BAM (DPIE 2020a). Class 1 trees have a DBH <20 cm. Class 2 and 3 trees have a DBH ≥20 cm.

It is noted that the scattered tree assessment module cannot be applied on native vegetation that would comprise category 2 lands under Native Vegetation Regulatory Map under the *Local Land Services Act 2013* (LLS Act). It also cannot be applied to trees that constitute a threatened species, or to trees that are being used by a candidate threatened species.

4.2.6 Limitations and assumptions

i Regional vegetation maps

In reviewing the regional vegetation mapping datasets, the following limitations are noted:

- some PCT distributions have been mapped with high overall accuracy, whilst others have limited accuracy due to limited survey data
- there may be PCT attribution errors (DPE 2022g, this will be corrected as better information becomes available)
- eastern NSW PCT classification topologies differ from central and western NSW classification topologies
- some PCTs mapped as part of earlier regional coverages have since been discontinued
- some PCTs approved in BioNet have not been mapped due to technical issues
- spatial and data gaps and discontinuities may occur at the edges of former regional coverages.

ii Vegetation ground-truthing surveys

The vegetation mapping dataset produced for this BDAR extends to the boundary of the Glen Eisle, Newstead and Spring Valley properties, as well as the easement of the access road up to the boundary of surrounding properties. However, the focus of the vegetation validation and mapping surveys was on the developable portions of the study area. As such, the accuracy of the vegetation mapping produced for this BDAR is highest in relation to the disturbance footprint and decreases with distance from the disturbance footprint limits. The periphery of the Spring Valley, Glen Eisle and Newstead properties (mainly large areas to the north, east and south of the disturbance footprint) includes extrapolated vegetation mapping.

iii Revised Plant Community Types in eastern NSW (revised PCTs)

It is noted that revised PCTs in eastern NSW were publicly released on 24 June 2022 and were formally applied to the BAM-C on 14 April 2023. This BDAR and BAM-C case commenced prior to the launch of the revised PCTs and as such the existing PCTs will continue to be applied to this BDAR under transitional arrangements in place for in-progress cases ⁴.

⁴ Refer to website: [New vegetation integrity benchmarks and plant community types](#)

iv Application of Version 1.1 benchmark data

On 1 February 2023, the BAM-C was updated to include Version 1.2 benchmarks. A transitional period of six (6) months apply during which in-progress assessments can continue to apply (the previous) Version 1.1 benchmarks. This BDAR and BAM-C case commenced prior to the Version 1.2 benchmark update and as such continues to apply Version 1.1 benchmarks to the BAM-C case under transitional arrangements.

Eligibility to apply the Version 1.1 benchmarks under transitional arrangements have been met:

- case was commenced prior to 1 February 2023 when the BAM-C was updated with Version 1.2 benchmarks
- all benchmarks in the entire case have been modified to Version 1.1 benchmarks
- the BAM-C assessment is finalised prior to 2 August 2023
- the certified BDAR is submitted prior to 16 August 2023
- the application of Version 1.1 benchmarks in the BDAR have been documented.

This BDAR is eligible to apply Version 1.1 benchmarks under the transitional arrangements. Supporting documentation is provided in Appendix D.

v Vegetation integrity plot survey

Iterative revisions to the project design were progressed alongside field surveys and the development of the PCT and vegetation zone mapping. This has influenced the final survey effort and whether the minimum number of plots were achieved for each vegetation zone.

The following are noted:

- Some plots applied to the BAM-C are located outside of the disturbance footprint due to iterative changes to the project design as informed by emerging information from the field studies.
- Areas of the Glen Eisle and Newstead properties have been cultivated over the period of survey and so some plots sampled in native vegetation zones (ie native pasture) are now located in cultivation/cropfield. These plots no longer represent the on-ground vegetation and are not used in the BAM assessment.
- Avoidance of woodland is a key project design consideration and so plot sampling was concentrated in derived grassland zones. This has resulted in the following:
 - One woodland vegetation zone (510_WDL_mod) that could not be avoided in the final disturbance footprint does not have plot data. The area of this zone is very small (ie 0.02 ha). This zone was combined with zone 510_WDL_intact (0.17 ha) and assessed as one zone with an area totalling 0.19 ha. This is a conservative approach as the lower condition zone was combined with (and consequently assessed as) a higher condition zone.
 - A second woodland zone (571_WDL_poor) that could not be avoided in the final disturbance footprint also does not have plot data. Plot 29 (571_WDL_mod) was applied to this zone. This is a conservative approach as plot data from a higher condition zone is applied to a lower condition zone.

- Some grassland zones contain scattered trees. In undertaking plot surveys in these zones, an attempt was made to include tree data in at least one replicate plot to reflect this. As a conservative approach, where a grassland zone with scattered trees is not represented by any tree data in the replicate plot dataset, at least one plot was edited to include tree data. This approach was undertaken in consultation with BCD. For details, see notes in Appendix D.
- A number of zones contain hollow-bearing trees. In undertaking plot surveys in these zones, an attempt was made to include hollow-bearing trees in at least one replicate plot to reflect this. As a conservative approach, where a vegetation zone containing hollow-bearing trees is not represented by any hollow data in the replicate plot dataset, at least one plot was edited to include hollow data. This approach was undertaken in consultation with BCD. For details, see notes in Appendix D.

vi Cultivation zones – credit assessment of prescribed impacts on non-native threatened species habitat

Impacts on threatened species occurring in non-native vegetation is a prescribed impact. In accordance with Section 8.6 of the BAM (DPIE 2020a), the retirement of biodiversity credits may be used with other conservation measures to mitigate prescribed impacts of a proposal on threatened species.

Threatened species records exist in non-native (ie cultivation, exotic) vegetation within the disturbance footprint (see Section 5.4). As such vegetation zones have been identified over areas of cultivated land and are included in the BAM-C to assess for species credits.

The cultivation vegetation zones include cultivated land within 30 m of a known threatened species record. The cultivation zones were then designated a PCT that would have likely occurred historically, and the zones were then entered into the BAM-C. As no vegetation integrity plot surveys were conducted in cultivation areas, plot data was created for input into the BAM-C. For details on how data was generated for these zones, see notes in Appendix D.

This approach has been undertaken in consultation with BCD.

vii Species identification

A small number of plots were completed after flowering period for some species. As a result, some species were not identifiable to species level. In these circumstances a conservative approach was taken and species that were recorded to genus level were recorded as native with the relevant growth form assigned.

4.3 Results

4.3.1 General description

The study area occurs on a gently undulating landform featuring remnant grassy woodland and large areas of grassland. The highest part of the study area (above 800 m above sea level) occurs in the south and drops down to around 700 m at Kings Creek to the north.

A large proportion of the study area has been cultivated and grazed since at least the 1960s and this is supported by historical aerial imagery and the presence of well-established contour banks across much of the landscape. In the active farming parts of the study area, extant areas of woodland and open forest are retained as narrow, disconnected patches along creek lines, as scattered trees across large areas of pasture, and as regenerating woodland in the east. The hills and slopes generally support larger areas of grassy open woodlands. These areas have also been grazed or pasture-improved but less actively so.

The grassy woodland on the hills and slopes is dominated by White Box (*Eucalyptus albens*), with north-south second- and third-order drainage lines supporting White Box-dominated grassy woodlands upstream (ie towards the south) and Ribbon Gum (*E. viminalis*)-Rough-barked Apple (*Angophora floribunda*) open forests further downstream (ie towards the north). On the floodplain of Kings Creek, the White Box-dominated grassy woodlands transition to grassy box woodlands dominated by Blakely’s Red Gum (*E. blakelyi*) and Yellow Box (*E. melliodora*). A gallery forest of River Oak (*Casuarina cunninghamiana*) line Kings Creek.

The condition of the pastures with respect to native components is variable but ranges between completely non-native grasses in cultivated areas to improved pastures dominated by a few native grass species. Grassy understorey along north-south creek lines have not been as intensively improved or grazed compared with other areas of the study area and most sections of creek line are fenced. Where native pastures retain a dominance of native species cover, they are referred to in this BDAR as ‘derived native grassland’.

4.3.2 Flora species

A total of 250 plant species were recorded cumulatively across the study area, comprising 170 native species and 80 introduced (ie non-native) species. Most of the species observed are typical of grassy woodland environments, with the assemblage most represented by species in the Poaceae (grass), Asteraceae (daisy) and Fabaceae (pea) families.

Of the 80 introduced species, 12 species are high-threat weeds for the purpose of application of the BAM, with one high-threat weed classed as manageable (ie Moth Vine, *Araujia sericifera*).

4.3.3 Plant community types

Four PCTs are identified in the disturbance footprint. The vegetation mapping is broadly consistent with the preliminary mapping produced by Eco Logical Australia (2018c) but includes refinements in linework and stratification. The PCTs identified are described in the following tables and shown on Figure 4.1 and Figure 4.2.

Table 4.3 PCT 84 – River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Attribute	Description
PCT ID	84
Common name	River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
Vegetation formation, class	Forested Wetlands, Eastern Riverine Forests

Table 4.3 PCT 84 – River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

Attribute	Description
Description	<p>PCT 84 is found along Kings Creek, primarily forming a narrow gallery forest on both the northern and southern banks of the creek. It is dominated by a canopy of River Oak (<i>Casuarina cunninghamiana</i> ssp. <i>cunninghamiana</i>) with an open understorey of mixed native and introduced grasses, sedges and forbs. Rough-barked Apple (<i>Angophora floribunda</i>) occurs in very low frequencies.</p> <p>The ground layer is dominated by Reedgrass (<i>Arundinella nepalensis</i>) and Stiff Flat-sedge (<i>Cyperus vaginatus</i>). Other grass and sedge species recorded includes Tall Sedge (<i>Carex appressa</i>), Water Couch (<i>Paspalum distichum</i>), Prairie Grass (<i>Bromus catharticus</i>), Cocksfoot (<i>Dactylis glomerata</i>), <i>Lachnagrostis filiformis</i> and Slender Bamboo Grass (<i>Austrostipa verticillata</i>).</p> <p>Several native and introduced forb species were recorded, including Chicory (<i>Cichorium intybus</i>), Turnip Weed (<i>Rapistrum rugosum</i>), White Clover (<i>Trifolium repens</i>), Watercress (<i>Rorippa nasturtium-aquaticum</i>), <i>Geranium solanderi</i> ssp. <i>solanderi</i>, Giant Nettle (<i>Urtica dioica</i>), St Barnabys Thistle (<i>Centaurea solstitialis</i>), Knotweed Goosefoot (<i>Einadia polygonoides</i>), <i>Dichondra</i> spp., Red-flowered Mallow (<i>Modiola caroliniana</i>), <i>Epilobium billardierianum</i> ssp. <i>billardierianum</i>, Purpletop (<i>Verbena bonariensis</i>) and Blue Trumpet (<i>Brunoniella australis</i>).</p> <p>There is also a moderate but patchy occurrence of Blackberry (<i>Rubus anglocandicans</i>).</p>
Extent within disturbance footprint	0.04 ha (woodland)
Survey effort	Plot 18
Condition description	PCT 84 is characteristically variable in condition and floristic composition across its extent within the study area. As PCT occurs adjacent to pasture and cultivation it is generally weed-affected. As it is accessed by stock, the creek banks show evidence of trampling and grazing. This type of disturbance is typical of many occurrences of this community.
Justification of evidence and species used to identify the PCT	<p>PCT 84 is a very good fit for the described PCT in the BioNet Vegetation Classification database (DPE 2022f), being a forested wetland riparian community dominated by River Oak. PCT 84 occurs adjacent to woodland vegetation dominated by Yellow Box (<i>Eucalyptus melliodora</i>) and Blakely's Red Gum (<i>Eucalyptus blakelyi</i>) and as such may support the occasional occurrence of the latter tree species, which are also described for PCT 84 in the BioNet Vegetation Classification database (DPE 2022f).</p> <p>Although PCT 84 is not described by the BioNet Vegetation Classification database (DPE 2022f) as occurring within the Glen Innes-Guyra Basalts sub-bioregion, there are no approved legacy PCTs available for consideration within the Glen Innes-Guyra sub-bioregion that feature a River Oak canopy.</p> <p>The revised plant community types in eastern NSW (revised PCTs) include PCT 4080, which has a strong relationship with the legacy PCT 84 and is described as occurring within the Glen Innes-Guyra Basalts sub-bioregion. However this new PCT 4080 is not yet available in the BAM-C for selection.</p>
Status	PCT 84 does not align with any TECs.
Estimate of percent cleared value of PCT	40%



Photograph 4.1 PCT 84 along Kings Creek

Table 4.4 PCT 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion

Attribute	Description
PCT ID	510
Common name	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion
Vegetation formation, class	Grassy Woodlands, New England Grassy Woodlands
Description	<p>PCT 510 is a grassy woodland community dominated by Yellow Box and Blakely's Red Gum, with occasional occurrences of Rough-barked Apple, and less frequently small trees Kurrajong (<i>Brachychiton populneus</i>) and Native Olive. It also occurs as derived native grassland, where the canopy component has been removed. Within the disturbance footprint, it occurs generally on the flats around Kings Creek and its tributaries.</p> <p>PCT 510 has an open understorey with a sparse shrub layer featuring Tree Violet (<i>Melicytus dentatus</i>) and <i>Olearia elliptica</i>, with a sparse low shrub layer of Native Raspberry (<i>Rubus parvifolius</i>), Slender Rice Flower (<i>Pimelea linifolia</i>) and Rice Flower (<i>P. curviflora</i>).</p> <p>The ground layer is variable but dominated by mixed grasses and forbs, including introduced pasture species. The most frequently recorded species include: Speargrass (<i>Austrostipa scabra</i>), Kangaroo Grass (<i>Themeda triandra</i>), Plains Grass (<i>Austrostipa aristiglumis</i>), Spiny-headed Mat-rush (<i>Lomandra longifolia</i>), Queensland Bluegrass (<i>Dichanthium sericeum</i>), Windmill Grass (<i>Chloris truncata</i>), Prairie Grass, Perennial Ryegrass (<i>Lolium perenne</i>) and White Clover.</p> <p>Other ground species recorded include: Tufted Bluebell (<i>Wahlenbergia communis</i>), Clustered Everlasting (<i>Chrysocephalum semipapposum</i>), Drumsticks (<i>Pycnosorus globosus</i>), Kidney Weed (<i>Dichondra repens</i>), Redgrass (<i>Bothriochloa macra</i>), Barbed Wire Grass (<i>Cymbopogon refractus</i>), Weeping Grass (<i>Microlaena stipoides</i>), Wallaby Grass (<i>Rytidosperma racemosum</i>), Common Fringe-sedge (<i>Fimbristylis dichotoma</i>), Yellow Burr-daisy, Shade Plantain, Turnip Weed, Burr-Medic (<i>Medicago polymorpha</i>), Flaxleaf Fleabane (<i>Conyza bonariensis</i>) and Lucerne (<i>Medicago sativa</i>).</p>
Extent within disturbance footprint	0.59 ha (woodland) 129.70 (derived native grassland)
Survey effort	Woodland: Plot 25, 26 DNG (moderate): Plot 10, 12, 13, 14 DNG (low): Plot 17, 21, 22, 23, 24, 48
Condition description	<p>PCT 510 occurs in the low-lying areas within the study area, near Kings Creek and its tributaries, which are heavily used for cultivation and pasture. Remnant woodland within the disturbance footprint occur as small patches surrounded by cultivation or derived native grassland. The areas of derived native grassland typically represent improved native pasture used for cattle-grazing and include a number of annual and perennial pasture species and weeds.</p> <p>Less improved areas of derived native grassland are dominated by mixed native grasses including Speargrass (<i>Austrostipa scabra</i>), Kangaroo Grass, Red Grass, Wallaby grasses (<i>Rytidosperma</i> spp.) and Windmill Grass but also include introduced grasses such as Goose Grass (<i>Eleusine tristachya</i>), Prairie Grass and Wimmera Grass (<i>Lolium rigidum</i>), as well as White Clover, Lucerne and Hop Clover (<i>Trifolium campestre</i>). These areas are intensively grazed.</p> <p>The most heavily modified derived native grassland areas are dominated by exotic species including White Clover, African Lovegrass (<i>Eragrostis curvula</i>), Plains Grass, Flaxleaf Fleabane and Paspalum with a lower proportion of native grasses and forbs.</p>

Table 4.4 PCT 510 – Blakely’s Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion

Attribute	Description
Justification of evidence and species used to identify the PCT	<p>PCT 510 is the closest fit for the described PCT in the BioNet Vegetation Classification database (DPE 2022f), being a grassy woodland community dominated by Yellow Box and Blakely’s Red Gum, occurring on undulating landscapes at intermediate to high altitudes (approximately 710–750 m asl).</p> <p>Although PCT 510 is not described by the BioNet Vegetation Classification database (DPE 2022f) as occurring within the Glen Innes-Guyra Basalts sub-bioregion, there are no approved legacy PCTs with a Grassy Woodland formation available for consideration within the Glen Innes-Guyra sub-bioregion.</p> <p>Other candidate PCTs considered include: PCT 704 and PCT 118. These PCTs are also not described as occurring within the Glen Innes-Guyra Basalts sub-bioregion (despite the New England Tableland Bioregion being included in the common name for PCT 704). These two PCTs were ruled out as they are associated with a classification confidence level of 5-Very Low compared with 2-High for PCT 510.</p> <p>The revised plant community types in eastern NSW (revised PCTs) include suitable matches PCT 3363, 3396 and 3398, which are all described as occurring within the Glen Innes-Guyra Basalts sub-bioregion. Of these PCT 3363 is likely to be the best fit based on distributional information and floristics; however, it is not yet available in the BAM-C for selection.</p>
Status	<p>BC Act – Box Gum Woodland CEEC</p> <p>EPBC Act – Box Gum Woodland CEEC (part)</p>
Estimate of percent cleared value of PCT	79%





Photograph 4.2 PCT 510: woodland (first photograph), derived native grassland in moderate (second photograph) and poor (third photograph) condition states

Table 4.5 PCT 571 – Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion

Attribute	Description
PCT ID	571
Common name	Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
Vegetation formation, class	Grassy Woodlands, New England Grassy Woodlands
Description	<p>PCT 571 is a tall grassy woodland that was predominantly recorded in the study area along ephemeral, upstream sections of creek gullies. It transitions into PCT 510 downstream towards Kings Creek. Within the disturbance footprint, it is limited to the edge of small patches occupying narrow gullies and drainages.</p> <p>The canopy is characterised by Ribbon Gum (<i>Eucalyptus viminalis</i>), White Box (<i>E. albens</i>), Rough-barked Apple and Blakely’s Red Gum, with occasional occurrences of the small tree, Native Olive (<i>Notelaea microcarpa</i>). The shrub layer is sparsely vegetated and includes Hickory Wattle (<i>Acacia implexa</i>), Sticky Hop-bush (<i>Dodonaea viscosa</i>), Tree Violet and Native Blackthorn (<i>Bursaria spinosa</i>).</p> <p>The ground layer is dominated by native and introduced grasses and includes Red Grass, Paspalum (<i>Paspalum dilatatum</i>), Reedgrass, Paddock Lovegrass (<i>Eragrostis leptostachya</i>), Wallaby grasses (<i>Rytidosperma</i> spp.), Slender Bamboo Grass, Prairie Grass, Plains Grass, Purple Wiregrass (<i>Aristida ramosa</i>) and Speargrass (<i>Austrostipa scabra</i>).</p> <p>Other ground layer species recorded include Fluke Bogrush (<i>Schoenus apogon</i>), Stiff Flat-sedge, <i>Geranium solanderi</i>, Tufted Bluebell, Climbing Saltbush (<i>Einadia nutans</i>), Shade Plantain, <i>Lespedeza juncea</i> and Smooth Darling Pea (<i>Swainsona galegifolia</i>).</p>
Extent within disturbance footprint	0.17 ha (woodland)
Survey effort	Plot 29
Condition description	The remnant woodland patches of PCT 571 within the disturbance footprint are small and surrounded by cultivation. The ground cover contains four high threat weeds that are classed as not manageable; Fireweed (<i>Senecio madagascariensis</i>), Paspalum, Sweet Briar (<i>Rosa rubiginosa</i>) and Cobbler’s Pegs (<i>Bidens pilosa</i>). However, these occur in relatively low abundance.
Justification of evidence and species used to identify the PCT	<p>PCT 571 is a good fit for the described PCT in the BioNet Vegetation Classification database (DPE 2022f), being a tall grassy woodland community dominated by Ribbon Gum, Yellow Box, Rough-barked Apple and Blakely’s Red Gum. It occurs in drainages and gullies on basalt-derived soils.</p> <p>Although PCT 571 is not described by the BioNet Vegetation Classification database (DPE 2022f) as occurring within the Glen Innes-Guyra Basalts sub-bioregion, there are no approved legacy PCTs with a Grassy Woodland formation available for consideration within the Glen Innes-Guyra sub-bioregion.</p> <p>Other candidate PCTs considered include: PCT 704, PCT 510 (which is closely related to PCT 571), PCT 921 and PCT 1099. These PCTs are also not described as occurring within the Glen Innes-Guyra Basalts sub-bioregion. The database profile for PCT 704, 921 and 1099 were data-poor and were ruled out on the basis of low classification confidence level. PCT 571 was selected over PCT 510 due to the distinct co-dominance of Ribbon Gum in the overstorey. PCT 571 is known to grade into PCT 510 in many parts of its distribution.</p> <p>The revised plant community types in eastern NSW (revised PCTs) include PCT 3344, which has a strong relationship with the legacy PCT 571 and is described as occurring within the Glen Innes-Guyra Basalts sub-bioregion. However, this new PCT 3344 is not yet available in the BAM-C for selection.</p>

Table 4.5 PCT 571 – Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion

Attribute	Description
Status	BC Act – Box Gum Woodland CEEC EPBC Act – Box Gum Woodland CEEC
Estimate of percent cleared value of PCT	78%



Photograph 4.3 PCT 571 woodland patches along dry creeklines

Table 4.6 PCT 590 – White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

Attribute	Description
PCT ID	590
Common name	White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
Vegetation formation, class	Grassy Woodlands, Western Slopes Grassy Woodlands
Description	<p>PCT 590 is a grassy woodland characterised by a White Box overstorey with little midstorey and a grassy ground layer. It is a widespread community that occupies the slopes and ridgelines in elevated parts of the study area and occurs mainly on basalt soils. It also occurs as derived native grassland, where the canopy component has been removed.</p> <p>Where a canopy persists, it is dominated by White Box with occasional occurrences of Rough-barked Apple and Native Olive. White Box and Rough-barked Apple also occur as scattered trees in a grassland matrix where the overstorey has been cleared for agriculture.</p> <p>The midstorey is typically open and includes scattered occurrences of Native Blackthorn and Hickory Wattle. A sub-shrub layer of Rice Flower species (<i>Pimelea</i> spp.) and Amulla (<i>Eremophila debilis</i>) are also present.</p> <p>The ground layer is highly variable and is influenced by land use and management practices. Commonly recorded native grasses include: <i>Bothriochloa</i> spp., Purple Wiregrass, Plains Grass, Speargrass (<i>Austrostipa scabra</i>), Queensland Bluegrass, Kangaroo Grass, Barbed Wire Grass. Commonly recorded herbs and forb species include: <i>Geranium solanderi</i>, Common Woodruff (<i>Asperula conferta</i>), Kidney Weed, Cotton Fireweed (<i>Senecio quadridentatus</i>), Drumsticks, Bear’s Ears (<i>Cymbonotus lawsonianus</i>), Fuzzweed (<i>Vittadinia cuneata</i>), Swamp Dock (<i>Rumex brownii</i>), Tufted Bluebell, Austral Bugle (<i>Ajuga australis</i>), <i>Oxalis exilis</i> and <i>Lepedeza juncea</i>.</p> <p>Pasture species were commonly throughout PCT 590 and include perennial species White Clover, Paspalum, Kikuyu Grass (<i>Cenchrus clandestinus</i>), Ryegrass (<i>Lolium</i> spp.) and Lucerne, as well as annuals to short term perennials such as Prairie Grass, Hop Clover, Burr Medic and Russian Vetch (<i>Vicia villosa</i>). Pasture weeds that were also commonly recorded include St Barnabys Thistle, Spear Thistle (<i>Cirsium vulgare</i>), Catsear (<i>Hypochaeris radicata</i>), Flaxleaf Fleabane, Turnip Weed, Lamb’s Tongue (<i>Plantago lanceolata</i>), White Horehound (<i>Marrubium vulgare</i>), Slender Celery (<i>Cyclosporum leptophyllum</i>), Purpletop and Veined Verbena (<i>Verbena rigida</i>).</p>
Extent within disturbance footprint	<p>1.72 ha (woodland)</p> <p>86.79 ha (derived native grassland)</p>
Survey effort	<p>Woodland: Plot 34, 35, 36, 37</p> <p>DNG (moderate): Plot 5, 15, 32, 45, 46</p> <p>DNG (low): Plot 3, 33, 47</p> <p>DNG (very low): Plot 16, 40, 41, 42, 43, 44</p>

Table 4.6 PCT 590 – White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

Attribute	Description
Condition description	<p>Within the Newstead, Glen Eisle and Spring Valley properties, most of the remnant woodland and derived native grassland occur outside of the disturbance footprint. Within the disturbance footprint, the occurrences of PCT 590 are largely pasture improved and grazed, and/or are retained around cultivation. Remnant woodland patches also occur as stands of trees along the Sturmans Road and Spring Valley Road. As such, most areas of PCT 590 within the disturbance footprint are affected by introduced pasture species and weeds, including one or more high-threat species such as Cobbler’s Pegs, Fireweed, Kikuyu Grass, Coolatai Grass (<i>Hyparrhenia hirta</i>), African Lovegrass and Sweet Briar.</p> <p>One of the key factors influencing grassland condition within the study area appears to be land management practices. Whilst all areas are weed-affected, areas that are subject to low intensity grazing and/or have not been intensively improved have the higher native species richness compared with areas that are more frequently grazed and/or have been intensively improved.</p> <p>Paddocks that have been least modified through grazing or pasture improvement support a mix of native grass species and forbs but the abundance of native species may be reduced from woodland examples. Recorded species that are not typically found in more modified paddocks include wallaby grasses (<i>Rytidosperma</i> spp.), Clustered Everlasting, Many-flowered Mat-rush (<i>Lomandra multiflora</i>), <i>Swainsona</i> spp., Yellow Burr-daisy (<i>Calotis lappulacea</i>), Native Carrot (<i>Daucus glochidiatus</i>), <i>Epilobium billardierianum</i>, Nodding Chocolate Lily (<i>Dichopogon fimbriatus</i>).</p> <p>Paddocks that have been most heavily improved are typically dominated by few native grass species (often one or more of the following: Plains Grass, Speargrass and Purple Wiregrass) with a mostly exotic assemblage comprising a mix of exotic grasses (<i>Paspalum</i>, Kikuyu, African Lovegrass or Coolatai Grass), perennial weeds such as Lamb’s Tongue, Chilean Whitlow Wort (<i>Paronychia brasiliensis</i>) and Purpletop, and annual weeds and pasture species (eg White Clover, Burr-Medic and Russian Vetch, St Barnabys Thistle, Flaxleaf Fleabane and Turnip Weed).</p> <p>The grassland paddocks along the western boundary of the Newstead property are surrounded by active cultivation and are distinguished from adjacent derived native grassland paddocks in that they are almost solely dominated by Plains Grass and Speargrass (<i>Aurololoma scabra</i>) and are particularly species-poor in comparison.</p>
Justification of evidence and species used to identify the PCT	<p>The occurrences of White Box grassy woodland within the study area is considered the best fit for PCT 590 described in the BioNet Vegetation Classification database (DPE 2022f). PCT 590 is a grassy woodland occurring on basalt soils on slopes and crests of low undulating hills and is dominated by White Box. It is characterised by understorey species like Rice Flower, Queensland Bluegrass, Common Woodruff, Purple Wiregrass, Lobed Bluegrass (<i>Bothriochloa biloba</i>), Austral Bugle, Plains Grass, Amulla, Verbena (<i>Verbena gaudichaudii</i>), which have been recorded in occurrences of PCT 590 within the study area.</p> <p>Although PCT 590 is not described by the BioNet Vegetation Classification database (DPE 2022f) as occurring within the Glen Innes-Guyra Basalts sub-bioregion, there are no approved legacy PCTs with a Grassy Woodland formation available for consideration within the Glen Innes-Guyra sub-bioregion. PCT 590 is mainly described for the Nandewar Bioregion. The project is located in the western portion of the New England Tableland Bioregion approaching the Nandewar Bioregion.</p> <p>Other potential PCTs considered include PCT 266 and PCT 1383. PCT 266 is similar floristically and can occur on a variety of lithologies but was eliminated on the basis of distribution as it is described primarily for the NSW Western Slopes Bioregion, which is more distant compared with the Nandewar Bioregion within which PCT 590 is described. PCT 1383 is also similar floristically but occurs on mainly on creek flats and alluvial plains on sedimentary substrates. It is also rated with a classification confidence level of 4-Low.</p> <p>There are a number of revised PCTs representing White Box grassy woodland communities within the Glen Innes-Guyra Basalts sub-bioregion that are suitable candidate matches. This includes PCT 3395, which is not yet available for selection in the BAM-C.</p>
Status	<p>BC Act – Box Gum Woodland CEEC</p> <p>EPBC Act – Box Gum Woodland CEEC (part)</p>

Table 4.6 PCT 590 – White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

Attribute	Description
Estimate of percent cleared value of PCT	87%







Photograph 4.4 PCT 590: woodland and derived native grassland in different condition states. From top to bottom, condition states shown are: woodland, woodland, DNG (moderate), DNG (moderate), DNG (low), DNG (very low)

Table 4.7 Non-native vegetation

Attribute	Description
PCT ID	Not applicable
Common name	Cultivation, exotic, cropping
Description	<p>Actively farmed areas on the Newstead, Glen Eisle and Spring Valley properties are used for cropping and cattle grazing.</p> <p>Paddocks are cultivated at different times; the soil is ripped several times over a season to prepare it for sowing.</p> <p>Some paddocks are sown for pasture; species include oats (<i>Avena</i> sp.), barley (<i>Hordeum</i> sp.), White Clover, ryegrasses (<i>Lolium</i> spp.), Prairie Grass and Russian Vetch.</p> <p>Other paddocks are regularly cropped. Crop species include sorghum, lucerne and soybeans.</p> <p>Along Sturmans Road and Spring Valley Road, exotic roadside verges are typically vegetated with African Lovegrass, Kikuyu, Paspalum or Coolatai Grass.</p>
Extent within disturbance footprint	501.25 ha







Photograph 4.5 From top: topsoil ripping for cultivation, exotic pasture, lucerne, sorghum at harvest

4.3.4 Vegetation zones

The vegetation zones identified and assessed in the BAM-C are summarised in Table 4.8. Vegetation zones are mapped in Figure 4.1 and Figure 4.2. It is noted again that the site-based and linear-based components of the project are assessed separately as two BAM-C cases. Vegetation integrity scores for each vegetation zone are presented in subsequent sections of this BDAR in the relevant locations.

Table 4.8 **Vegetation zones**

Vegetation zone ID	PCT ID	Condition	Area (ha)	Patch size class	No. plots required	No. plots completed	Plot IDs	Vegetation integrity (VI) score
084_WDL_poor	84	Woodland_poor	0.04 (site)	>100 ha	1 (site)	1	Plot 18	44.4
510_WDL_intact	510	Woodland_intact	0.19 ¹ (site) 0.09 (linear)	>100 ha	1 (site) 1 (linear)	1	Plot 25	66
510_WDL_poor	510	Woodland_poor	0.30 (site) 0.01 (linear)	>100 ha	1 (site) 1 (linear)	1	Plot 26	44.7
510_DNG_MOD	510	DNG_moderate	28.94 (site)	>100 ha	4 (site)	4	Plot 10, 12, 13, 14	13.8
510_DNG_LOW	510	DNG_low	100.75 (site) 0.01 (linear)	>100 ha	6 (site) 1 (linear)	6	Plot 17, 21, 22, 23, 24, 48	9.3
571_WDL_poor	571	Woodland_poor	0.17 (site)	>100 ha	1 (site)	1	Plot 29 ²	84.3
590_WDL_mod	590	Woodland_moderate	0.20 (site)	>100 ha	1 (site)	2	Plot 34, 37	65.4
590_WDL_poor	590	Woodland_poor	1.50 (site) 0.02 (linear)	>100 ha	1 (site) 1 (linear)	2	Plot 35, 36	43.2
590_DNG_MOD	590	DNG_moderate	0.05 (site) 0.01 (linear)	>100 ha	1 (site) 1 (linear)	5	Plot 5, 15, 32, 45, 46	20.3
590_DNG_LOW	590	DNG_low	15.57 (site) 0.06 (linear)	>100 ha	3 (site) 1 (linear)	3	Plot 3, 33, 47	18.1
590_DNG_V_LOW	590	DNG_very_low	71.10 (site)	>100 ha	5 (site)	6	Plot 16, 40, 41, 42, 43, 44	9.2
PCT510_cultivation	510	Cultivation	2.05 (site)	>100 ha	2 (site)	0	n/a ³	0.1
PCT571_cultivation	571	Cultivation	0.09 (site)	>100 ha	1 (site)	0	n/a ³	0.1
PCT590_cultivation	590	Cultivation	4.27 (site)	>100 ha	2 (site)	0	n/a ³	0.1

1. Represents a combined zone: 510_WDL_mod (0.02 ha) and 510_WDL_intact (0.17 ha).

2. Sampled In 571_WDL_mod, applied to 571_WDL_poor in absence of plot data for the latter zone.

3. Plot data was created for input into the BAM-C for the purposes of calculating credits for prescribed impacts on threatened flora species. For details on how import data was generated, see notes in Appendix D.

4.3.5 Threatened ecological communities

Table 4.9 outlines the vegetation zones within the disturbance footprint that align with the BC Act and EPBC Act criteria for the Box Gum Woodland CEEC. The BC and EPBC Act listed communities are shown in Figure 4.3. All the vegetation zones associated with the EPBC Act-listed Box Gum Woodland also conforms to the BC Act listing for Box Gum Woodland; however, the converse is not true. That is, only a subset of vegetation zones conforming to the BC Act listing for Box Gum Woodland also meets condition criteria for listing under the EPBC Act.

Note that the 510_DNG_MOD vegetation zone meets the condition thresholds for EPBC listing on species richness only. It is a highly grazed area that occurs around cultivation near Kings Creek, with the expression of native forb and grass species indicating the area is under considerable stress (stunted growth forms, early flowering). Based on the BAM vegetation integrity plots, the zone has a low VI score that does not trigger an offset requirement, but has sufficient species richness to be included in the EPBC listed TEC.

Table 4.9 Box Gum Woodland within the disturbance footprint

TEC name	Profile ID (from TBDC)	BC Act status	EPBC Act status	Associated vegetation zones within the disturbance footprint		Area within disturbance footprint (ha)
				Zone name	VI score	
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	10837	CE		510_WDL_intact	66	Total 218.97 2.48 (WDL) 216.49 (DNG)
				510_WDL_poor	44.7	
				510_DNG_MOD	13.8	
				510_DNG_LOW	9.3	
				571_WDL_poor	84.3	
				590_WDL_mod	65.4	
				590_WDL_poor	43.2	
				590_DNG_MOD	20.3	
				590_DNG_LOW	18.1	
590_DNG_V_LOW	9.2					
White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland	20392		CE	510_WDL_intact	66	Total 29.48 0.48 (WDL) 29.00 (DNG)
				510_DNG_MOD	13.8	
				590_WDL_mod	65.4	
				590_DNG_MOD	20.3	

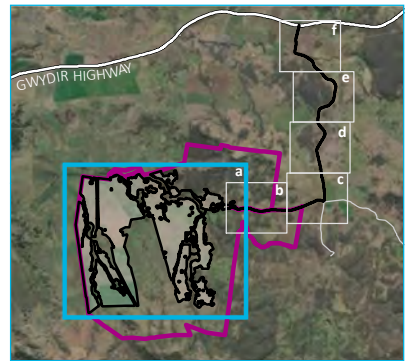
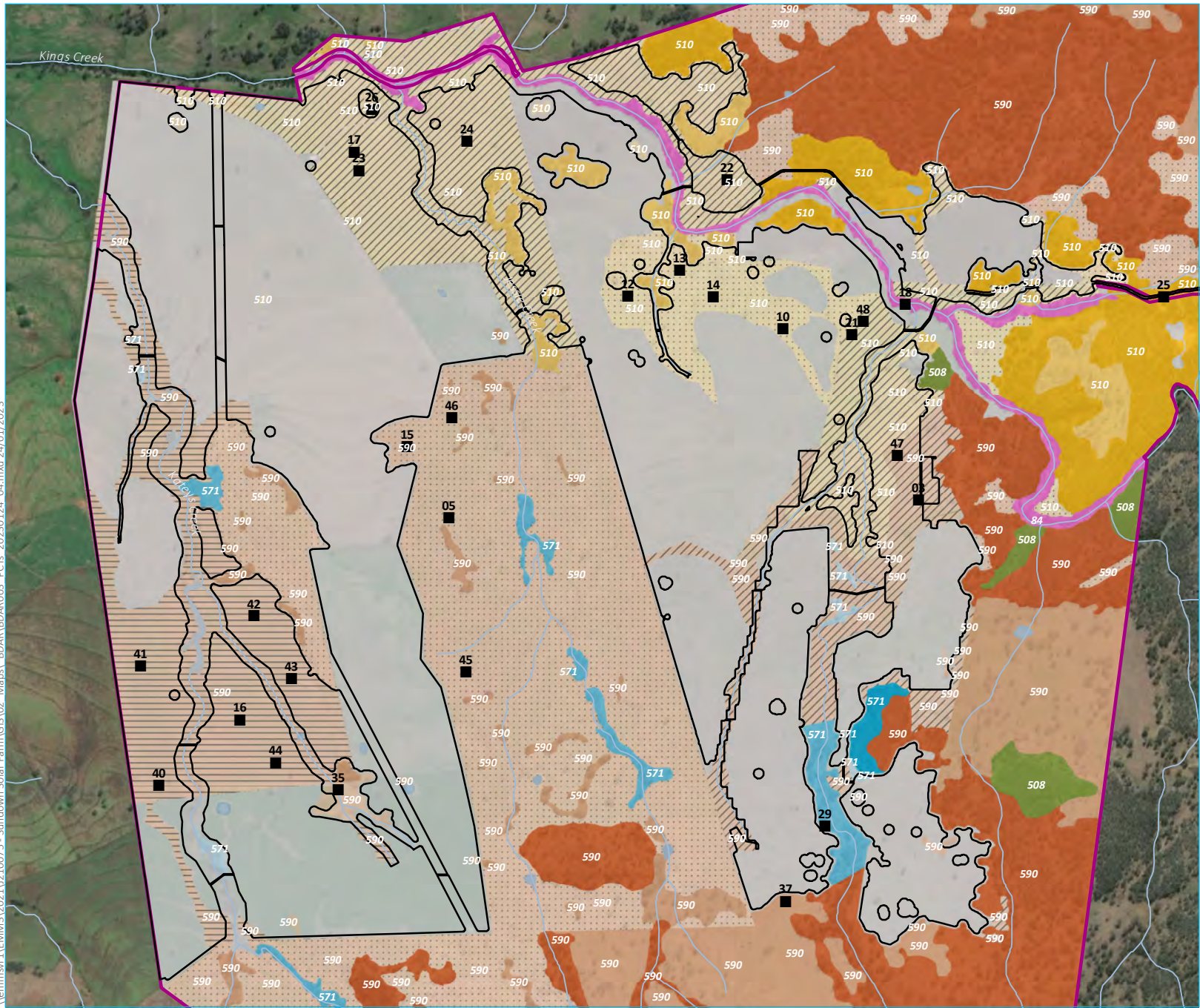
4.3.6 Scattered tree assessment

Within the disturbance footprint, scattered trees were identified principally in cultivated and exotic pasture in accordance with Appendix B of the BAM (DPIE 2020a). A map of the scattered trees identified in the disturbance footprint is shown in Figure 4.4. The results of the scattered tree survey are summarised in Table 4.10.

Scattered trees identified as Class 1 are considered to have negligible biodiversity value and no further assessment or offset is required for these trees. Offset requirements for Class 2 and 3 scattered trees are discussed in Section 7.1.

Table 4.10 Scattered tree assessment results

PCT	Species	DBHOB category	Hollow bearing?	Tree class	Number of trees	Evidence of threatened species use	Assess further	
510	<i>Angophora floribunda</i>	>=50	No	Class 3	1	No	Yes	
	<i>Eucalyptus blakelyi</i>	>=50	No	Class 3	1	No	Yes	
			Yes	Class 3	8	No	Yes	
	<i>Eucalyptus melliodora</i>	>=50	No	Class 3	2	No	Yes	
	<i>Eucalyptus</i> sp. (Stag)	>=50	Yes	Class 3	1	No	Yes	
571	<i>Eucalyptus viminalis</i>	>=50	Yes	Class 3	1	No	Yes	
590	<i>Angophora floribunda</i>	>=50	No	Class 3	6	No	Yes	
	<i>Eucalyptus albens</i>	>=20 and <50	No	Class 2	1	No	Yes	
			>=50	No	Class 3	21	No	Yes
			Yes	Class 3	7	No	Yes	
	<i>Eucalyptus</i> sp. (Stag)	>=20 and <50	No	Class 2	1	No	Yes	
>=50			Yes	Class 3	1	No	Yes	

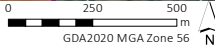


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - BAM plot
 - Waterbody
 - Cleared / exotic / cultivation
 - PCT 84 | River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandawar Bioregion
 - Woodland (poor)
 - PCT 508 | Blakely's Red Gum - Stringybark - Rough-barked Apple open forest of the Nandawar Bioregion and western New England Tableland Bioregion
 - Woodland (intact)
 - PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
 - Woodland (intact)
 - Woodland (moderate)
 - Woodland (poor)
 - DNG (moderate)
 - DNG (low)
 - PCT 571 | Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
 - Woodland (intact)
 - Woodland (moderate)
 - Woodland (poor)
 - PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandawar Bioregion
 - Woodland (intact)
 - Woodland (moderate)
 - Woodland (poor)
 - DNG (moderate)
 - DNG (low)
 - DNG (very low)

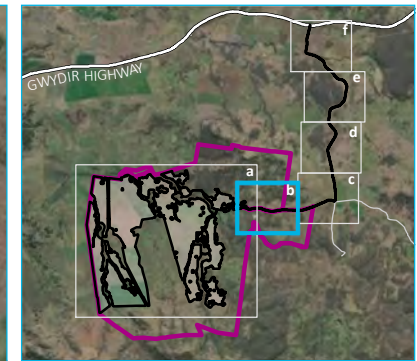
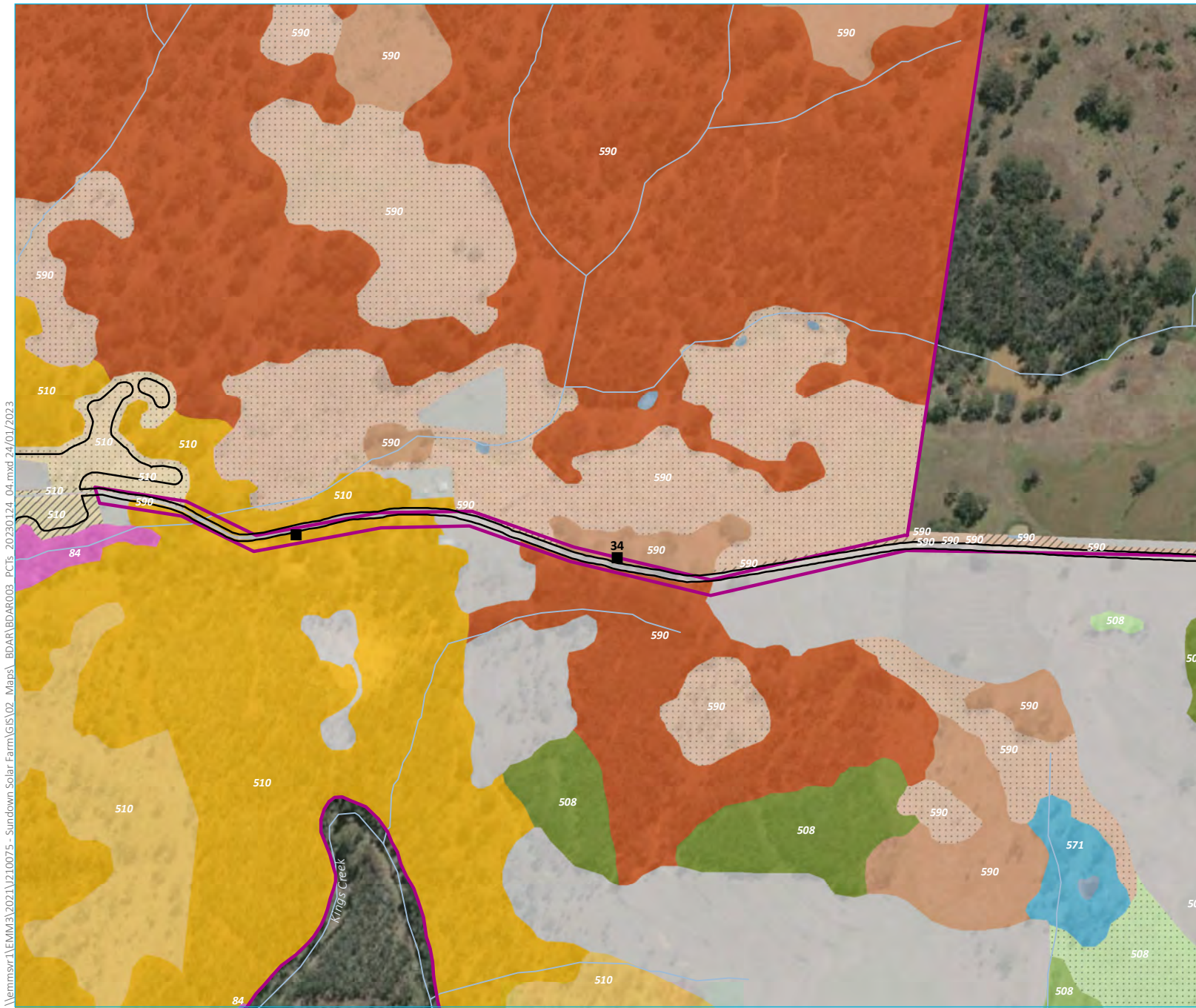
Plant community types and
vegetation zones within the
study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.1a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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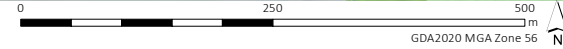


KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- BAM plot
- Waterbody
- Cleared / exotic / cultivation
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- Woodland (poor)
- PCT 508 | Blakely's Red Gum - Stringybark - Rough-barked Apple open forest of the Nandewar Bioregion and western New England Tableland Bioregion
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- PCT 571 | Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
- Woodland (moderate)
- PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
- Woodland (intact)
- Woodland (moderate)
- Woodland (poor)
- DNG (moderate)
- DNG (low)

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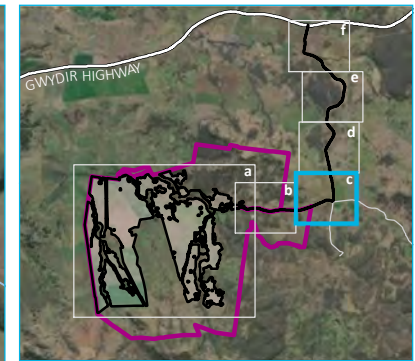
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



Plant community types and vegetation zones within the study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.1b





KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- BAM plot
- Cleared / exotic / cultivation

PCT 508 | Blakely's Red Gum - Stringybark - Rough-barked Apple open forest of the Nandewar Bioregion and western New England Tableland Bioregion

- Woodland (intact)
- Woodland (moderate)

PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

- Woodland (poor)
- DNG (low)

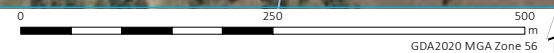
Plant community types and
vegetation zones within the
study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.1c



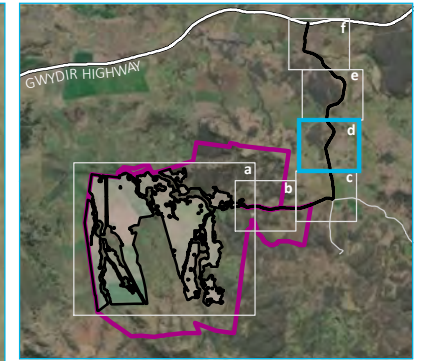
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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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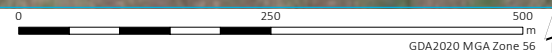


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Waterbody
 - Cleared / exotic / cultivation
 - Woodland (poor)
 - DNG (low)
- PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Plant community types and
vegetation zones within the
study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.1d

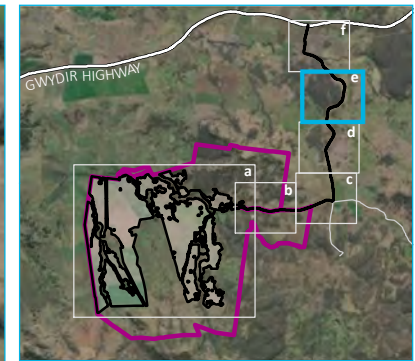
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- Cleared / exotic / cultivation

PCT 508 | Blakely's Red Gum - Stringybark - Rough-barked Apple open forest of the Nandewar Bioregion and western New England Tableland Bioregion

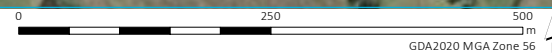
DNG (moderate)

PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

Woodland (poor)

DNG (low)

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



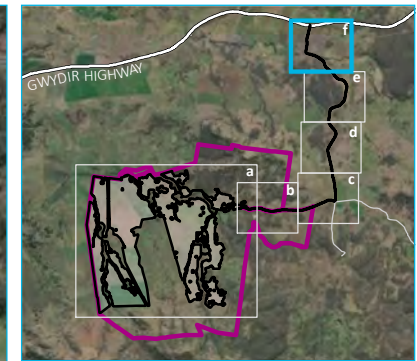
GDA2020 MGA Zone 56

Plant community types and
vegetation zones within the
study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.1e



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KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- BAM plot
- Waterbody
- Cleared / exotic / cultivation

PCT 84 | River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

- Woodland (poor)
- PCT 505 | Black Cypress Pine - Tumbledown Red Gum - Narrow-leaved Ironbark - Stringybark She Oak open forest on acid volcanics of the western New England Tableland Bioregion
- Woodland (intact)
- PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- Woodland (moderate)
- PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
- Woodland (poor)
- DNG (moderate)
- DNG (low)

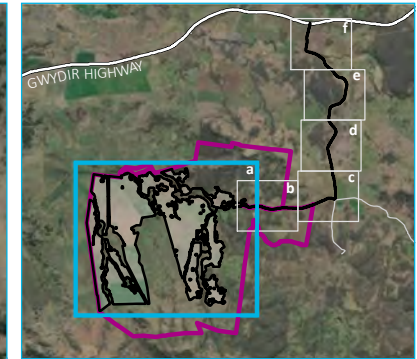
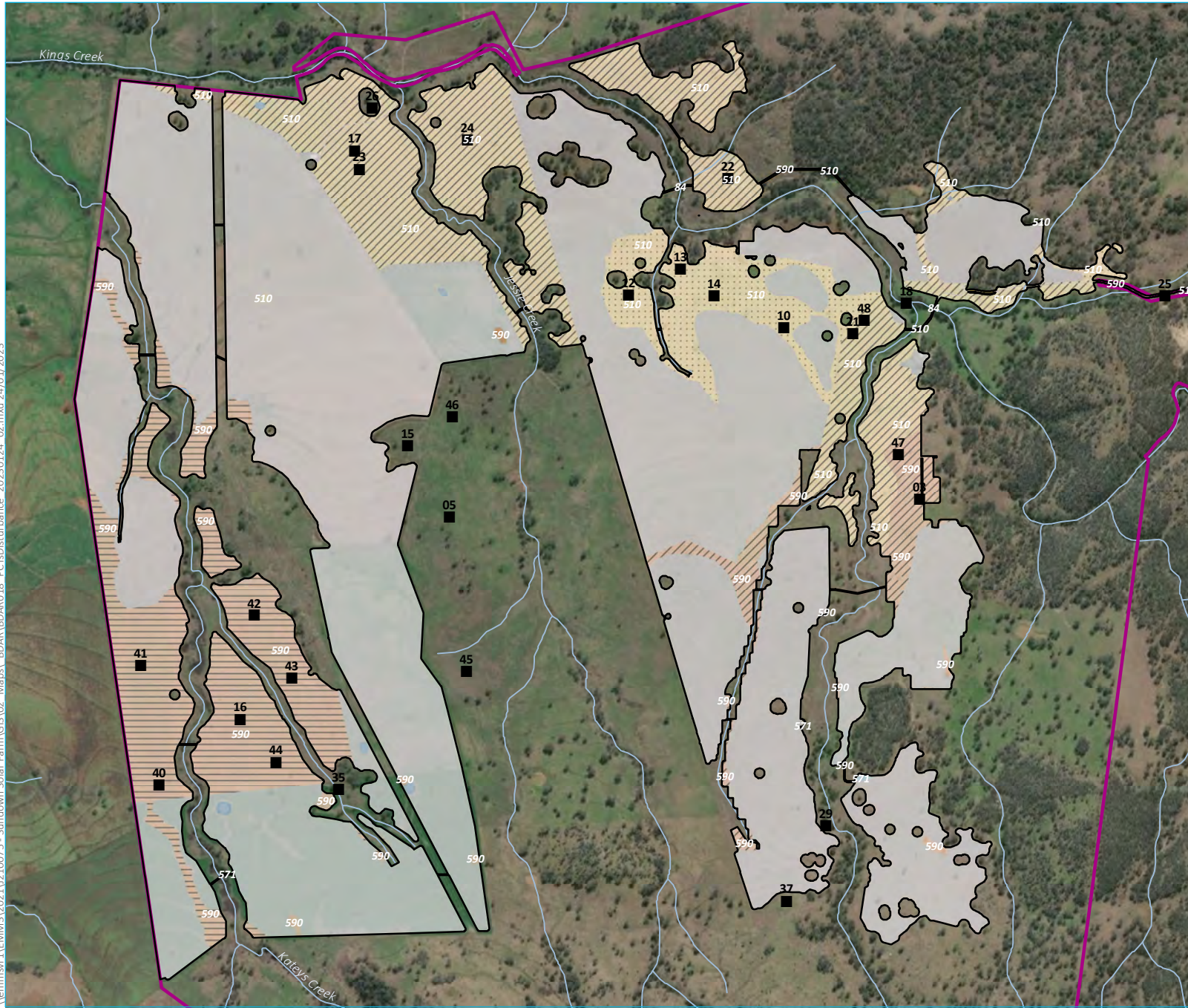
Plant community types and vegetation zones within the study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.1f



Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)

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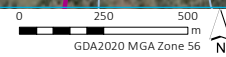


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - BAM plot
 - Waterbody
 - Cleared / exotic / cultivation
 - PCT 84 | River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion
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 - Woodland (moderate)
 - Woodland (poor)
 - DNG (moderate)
 - DNG (low)
 - PCT 571 | Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
 - Woodland (moderate)
 - Woodland (poor)
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 - Woodland (moderate)
 - Woodland (poor)
 - DNG (moderate)
 - DNG (low)
 - DNG (very low)

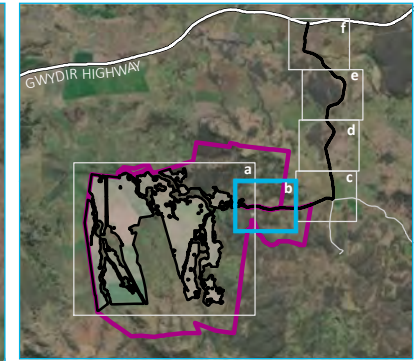
Plant community types and vegetation zones within the disturbance footprint

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.2a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- BAM plot
- Cleared / exotic / cultivation

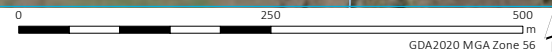
PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

- Woodland (intact)
- DNG (moderate)
- DNG (low)

PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

- Woodland (intact)
- Woodland (moderate)
- DNG (low)

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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Plant community types and
vegetation zones within the
disturbance footprint

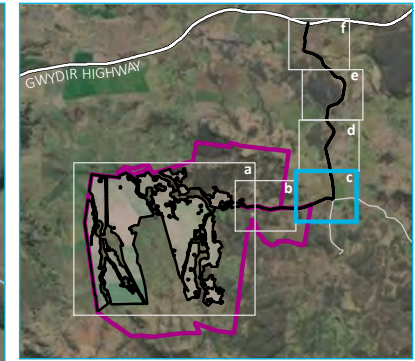
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.2b



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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- BAM plot
- Cleared / exotic / cultivation
- PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
- Woodland (poor)
- DNG (low)

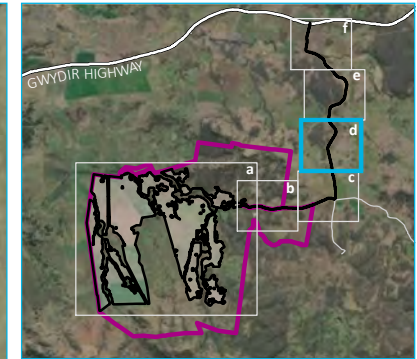
Plant community types and vegetation zones within the disturbance footprint

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.2c



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GDA2020 MGA Zone 56

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- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Cleared / exotic / cultivation
 - PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
 - Woodland (poor)

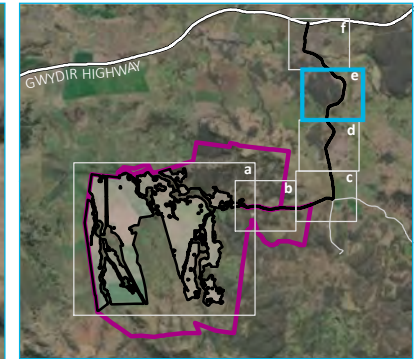
Plant community types and
vegetation zones within the
disturbance footprint

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.2d



Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)

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KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Major road (refer to inset)
- Minor road (refer to inset)
- Watercourse/drainage line
- Cleared / exotic / cultivation

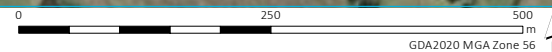
PCT 508 | Blakely's Red Gum - Stringybark - Rough-barked Apple open forest of the Nandewar Bioregion and western New England Tableland Bioregion

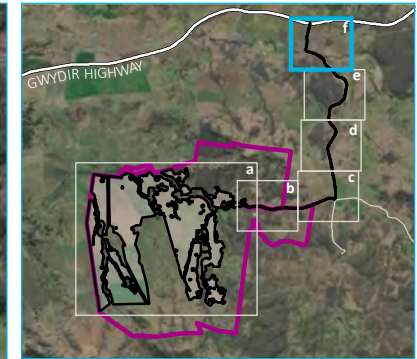
- DNG (moderate)
- PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
- Woodland (poor)
- DNG (low)

Plant community types and vegetation zones within the disturbance footprint

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.2e

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)





- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
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 - BAM plot
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- PCT 590 | White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
- Woodland (poor)
 - DNG (moderate)

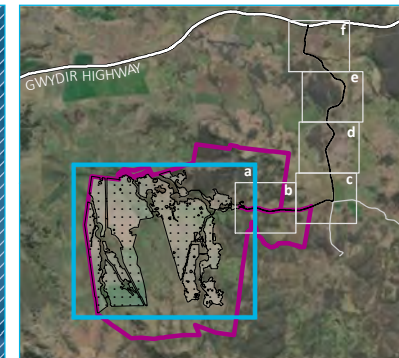
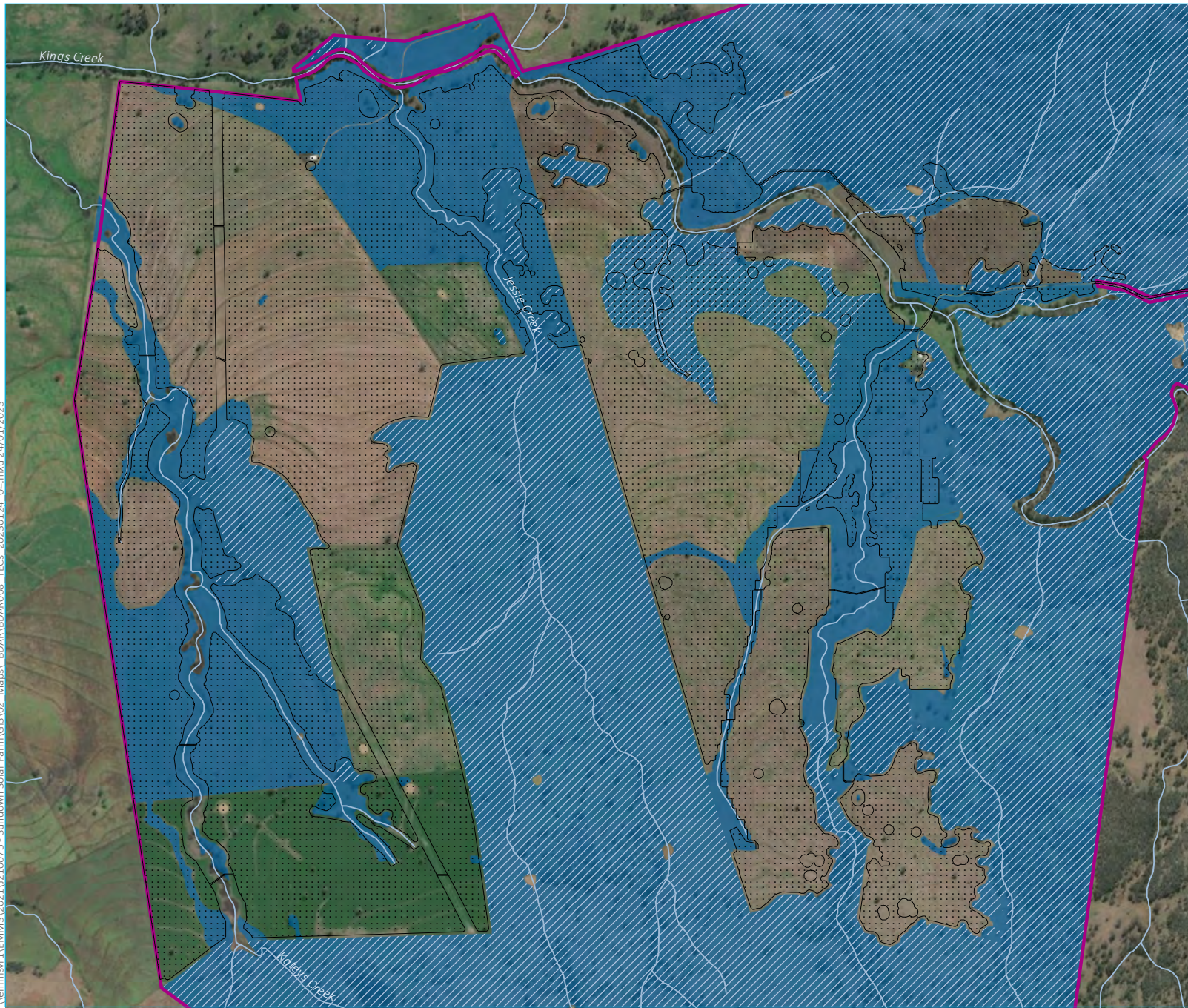
Plant community types and vegetation zones within the disturbance footprint

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.2f



\\lemmsvr1\EMM3\2021\1210075 - Sundown Solar Farm\GIS\02 Maps\ BDAR\BDAR018_PCT\Disturbance_20230124_02.mxd 24/01/2023

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



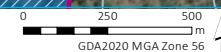
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Critically endangered ecological community (BC Act)
 - Critically endangered ecological community (EPBC Act)

Threatened ecological communities
within the study area

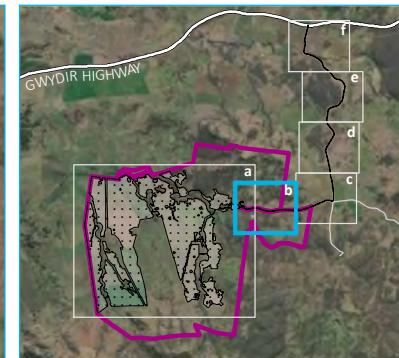
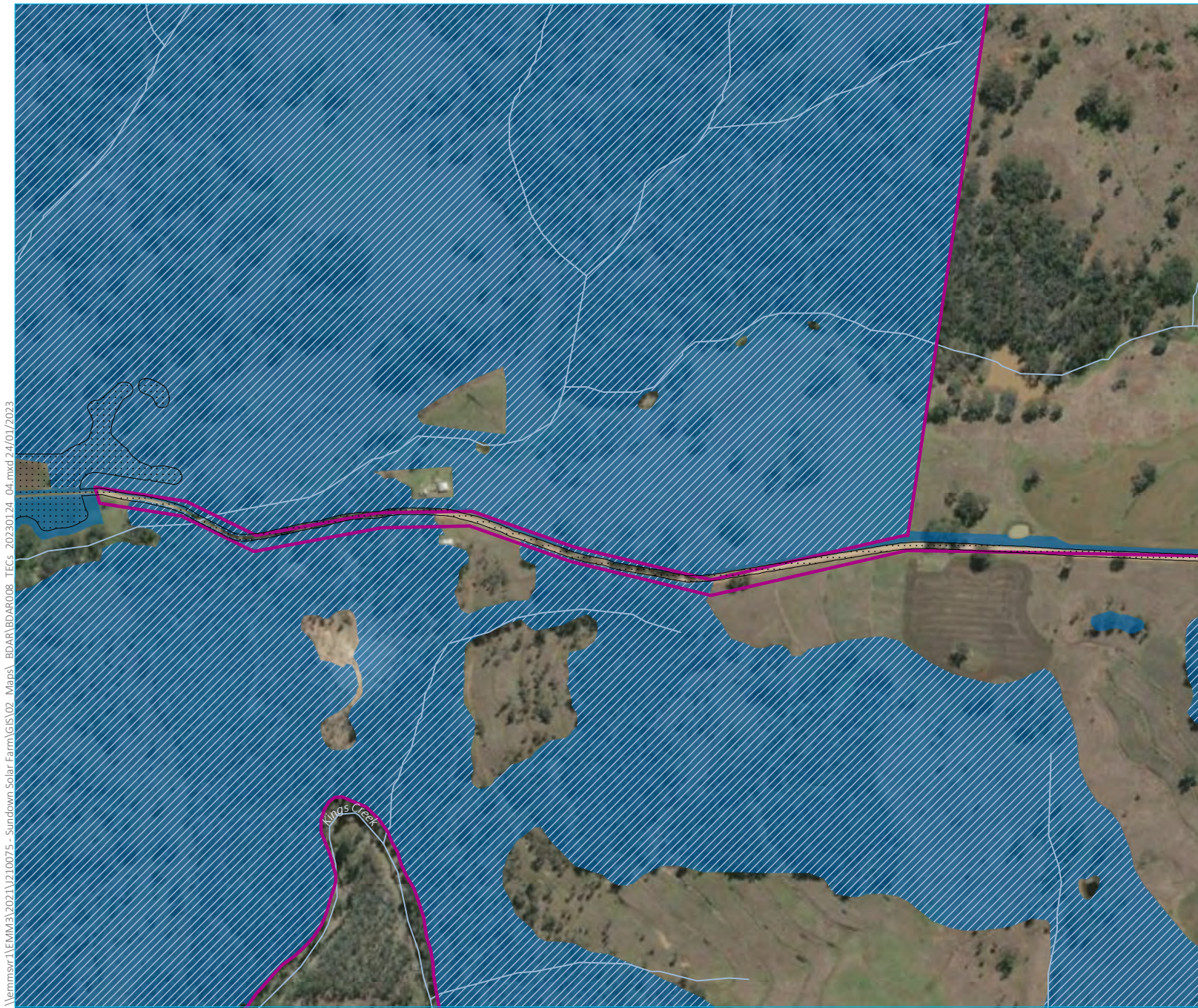
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.3a



Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Critically endangered ecological community (BC Act)
 - Critically endangered ecological community (EPBC Act)

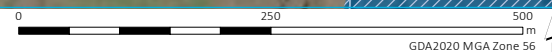
Threatened ecological communities within the study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.3b

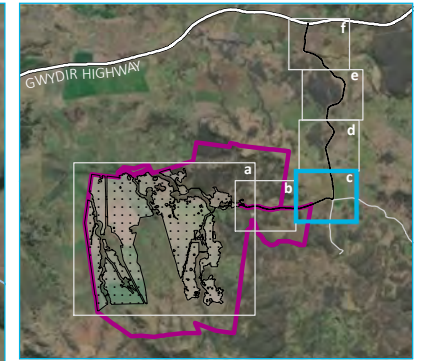


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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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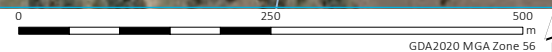
KEY

-  Proposed Sundown Solar Farm
-  Disturbance footprint
-  Major road (refer to inset)
-  Minor road (refer to inset)
-  Watercourse/drainage line
-  Critically endangered ecological community (BC Act)
-  Critically endangered ecological community (EPBC Act)

Threatened ecological communities within the study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.3c

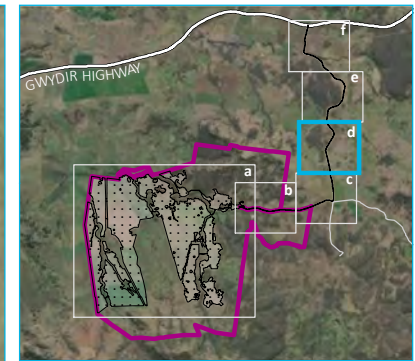
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56



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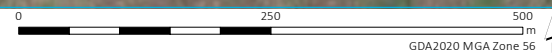


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Critically endangered ecological community (BC Act)
 - Critically endangered ecological community (EPBC Act)

Threatened ecological communities
within the study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.3d

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



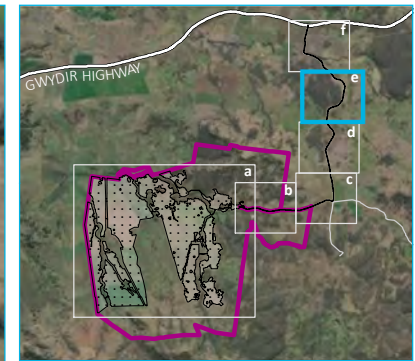
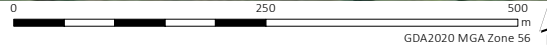
GDA2020 MGA Zone 56



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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



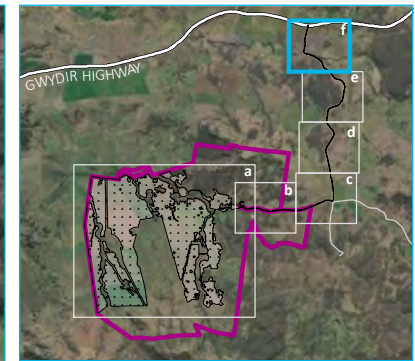
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Critically endangered ecological community (BC Act)
 - Critically endangered ecological community (EPBC Act)

Threatened ecological communities within the study area

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.3e



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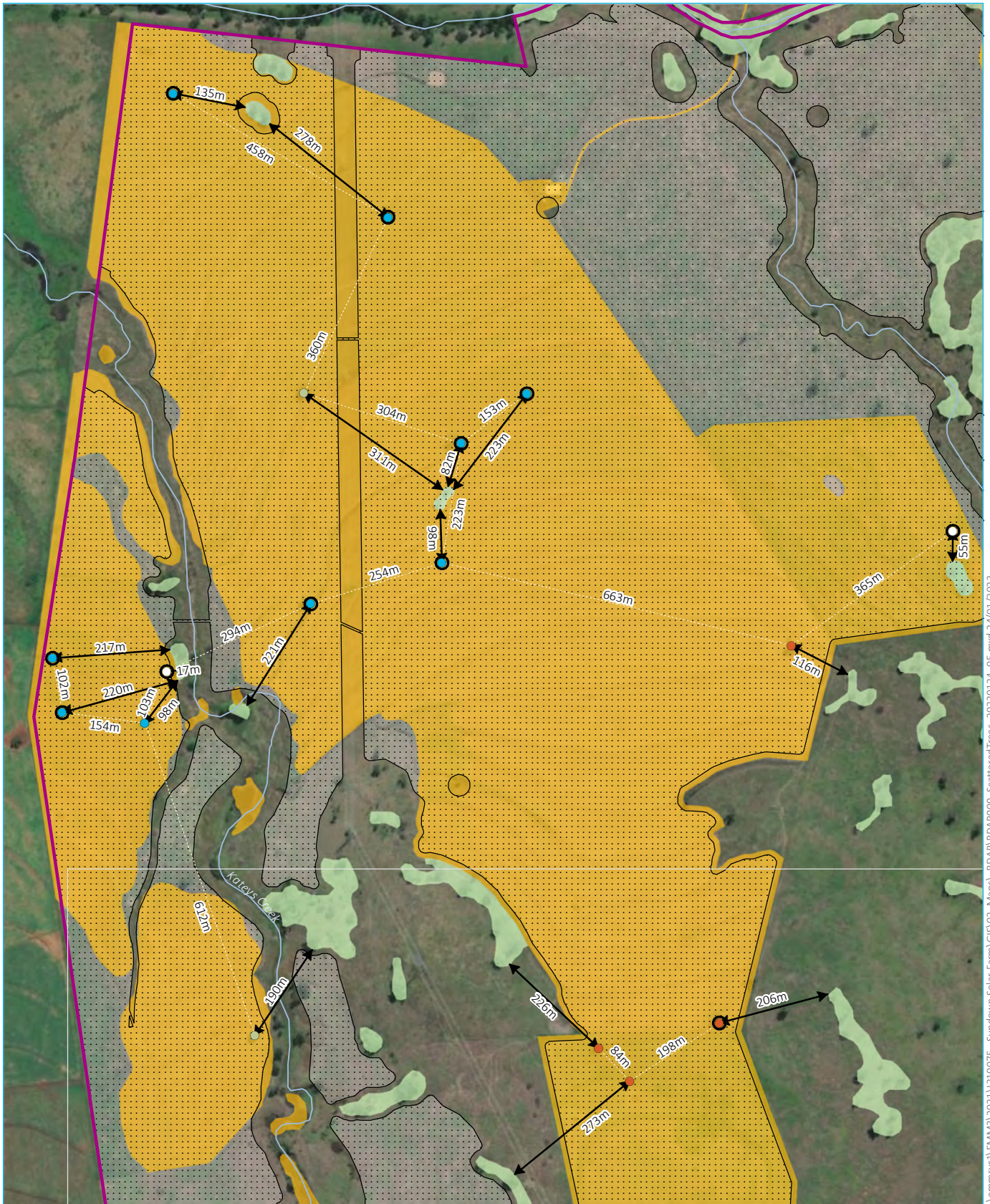


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road (refer to inset)
 - Minor road (refer to inset)
 - Watercourse/drainage line
 - Critically endangered ecological community (BC Act)
 - Critically endangered ecological community (EPBC Act)

Threatened ecological communities within the study area

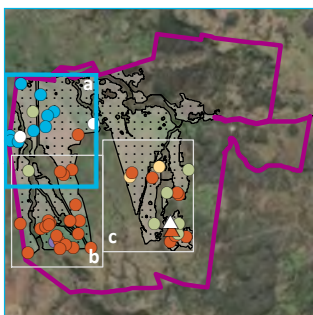
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.3f

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



Source: EMM (2023, 2022, 2021); Canadian Solar (2022); DFSI (2017); GA (2011)

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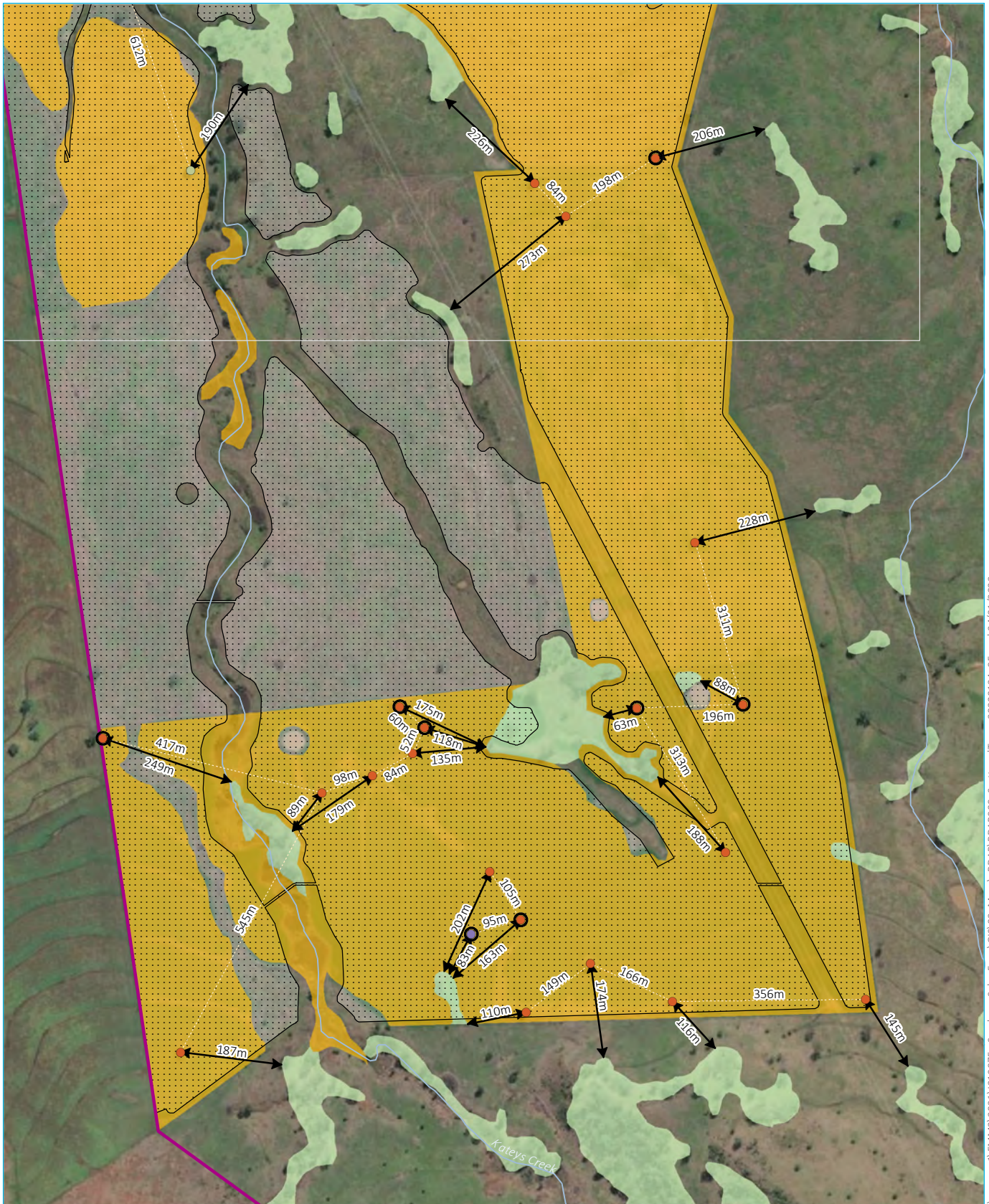
KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Named watercourse
- Scattered tree to scattered tree distance measure
- Scattered tree to woodland distance measure
- Woodland
- Cultivation, exotic and cleared vegetation zones
- Hollow-bearing tree
- Tree class 3 (≥ 50 cm DBH)
 - Stag
 - Angophora floribunda*
 - Eucalyptus albens*
 - Eucalyptus blakelyi*

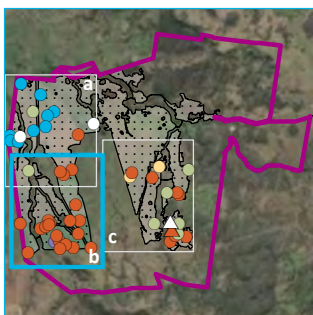
Scattered tree mapping

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.4a





Source: EMM (2023, 2022, 2021); Canadian Solar (2022); DFSI (2017); GA (2011)



KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Named watercourse
- Scattered tree to scattered tree distance measure
- Scattered tree to woodland distance measure
- Woodland
- Cultivation, exotic and cleared vegetation zones
- Hollow-bearing tree

Tree class 3 (≥ 50 cm DBH)

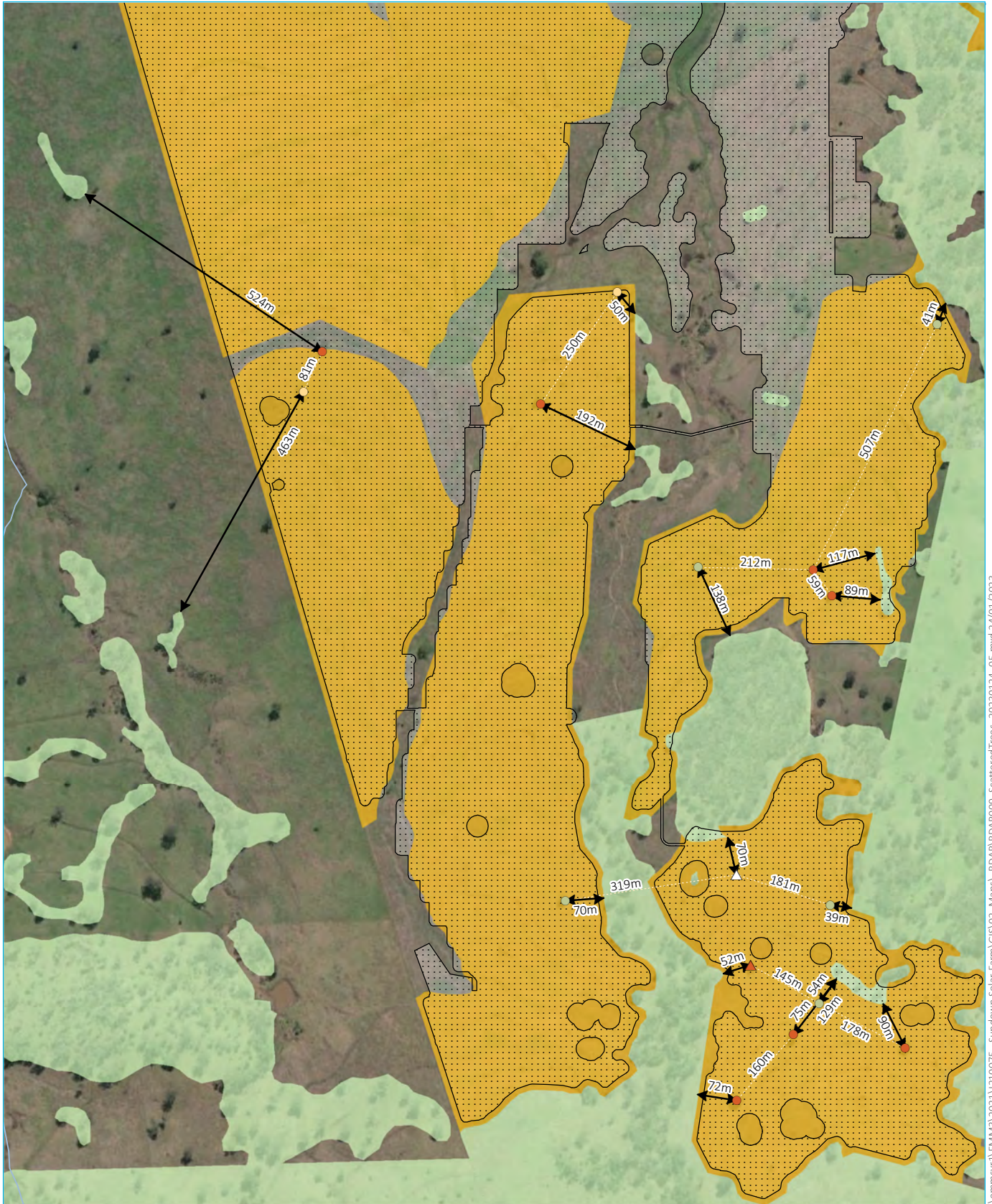
- Angophora floribunda*
- Eucalyptus albens*
- Eucalyptus viminalis*

Scattered tree mapping

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.4b

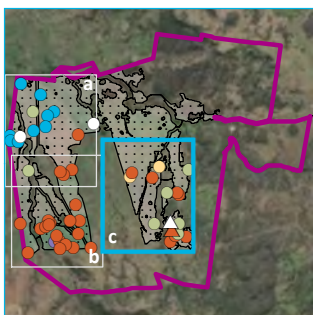


\\emmsvr1\EMMS\2021\210075 - Sundown Solar Farm\GIS\02_Maps\BDA\009_ScatteredTrees_20230124_05.mxd 24/01/2023



\\lemmsvr1\EMMS\2021\210075 - Sundown Solar Farm\GIS\02_Maps\BDA\BDA009_ScatteredTrees_20230124_05.mxd 24/01/2023

Source: EMM (2023, 2022, 2021); Canadian Solar (2022); DFSI (2017); GA (2011)



KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Named watercourse
- Scattered tree to scattered tree distance measure
- Scattered tree to woodland distance measure
- Woodland
- Cultivation, exotic and cleared vegetation zones

- Tree class 2 (≥ 20 cm and < 50 cm DBH)
- △ Stag
- ▲ *Eucalyptus albens*
- Tree class 3 (≥ 50 cm DBH)
- *Angophora floribunda*
- *Eucalyptus albens*
- *Eucalyptus melliodora*

Scattered tree mapping

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 4.4c



5 Threatened species

Sections 5.1 to 5.4 relate to the assessment of terrestrial threatened species. Section 5.5 provides a desktop and aquatic habitat assessment for aquatic threatened species.

5.1 Threatened species assessment process

The presence of threatened species within the study area was assessed according to Section 5.2 of the BAM (DPIE 2020a). The following steps were undertaken:

- Step 1: Identify which threatened species need to be considered for assessment. This was completed based on review of the following data sources:
 - species predicted by the Biodiversity Assessment Method Calculator (BAM-C) (these are species that are associated with the PCTs recorded in the study area; the species distribution is within the IBRA subregion of the study area; the study area is within any specific geographic limitations for a species; and the study area meets the species' requirements for vegetation class and patch size)
 - threatened species that have been previously recorded in the locality
 - species predicted to occur by the EPBC Act Protected Matters Search Tool (PMST).
- Step 2: Assess habitat constraints listed for each species in the Threatened Biodiversity Data Collection (TBDC) based on field assessment of habitat constraints present (see Section 5.4.4iv) and eliminate species that are vagrant in the IBRA subregion. This step results in a list of ecosystem credit species to be assessed for impacts in Stage 2 of the BDAR referred to as 'predicted species' (Section 5.3, Table 5.1); and a list of candidate species credit species that require further assessment under Step 3 to 6 below (Section 5.4.1).
- Step 3: Further assess habitat for candidate species credit species. After a field assessment of the habitat present in the study area (outlined in Section 5.4.4iv), the likelihood of each threatened species occurring on the study area is assessed, based on the quality of habitat and the presence of microhabitats required by each species. Species without suitable habitat do not require further assessment. The Step 3 assessments are outlined in Table 5.2.
- Step 4: Determine the presence of candidate species through targeted surveys, assumption of presence, or expert reports. Survey methods and outcomes are summarised in Table 5.3 (see Section 5.4.2), with details of survey methodology in Section 5.4.4.
- Step 5: Define a species polygon for threatened species present in the study area. Species polygons are summarised in Table 5.3, with more details in Section 5.4.3.
- Step 6: Determine the habitat condition within the species polygon (for species assessed by area) (Section 5.4.3).

The site-based component and linear-based component of the disturbance footprint are both in the same IBRA subregion, comprised of largely the same Mitchell landscape types and similar habitat features (see Chapter 3). Unless otherwise stated, this chapter addresses both components collectively. Although the components were assessed separately in the BAM-C, the study area was treated as one continuous area when assessing habitat and planning targeted surveys. Differences between the assessments of each component will be stated where relevant.

5.2 Habitat description

The disturbance footprint is comprised of paddocks at various stages of cropping and grazing. Some paddocks are currently cropped and contain little other than the planted crop species. Other paddocks contain native derived grassland or improved pasture and are being used to graze cattle. The quality of the habitat present in each paddock is largely representative of the recent land use history and cropping cycle. Most paddocks contain some scattered trees, a mix of predominantly White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*) and Rough-barked Apple (*Angophora floribunda*).

The grassland in the paddocks provides limited habitat features for fauna species, except for potential foraging for seed eating birds or birds of prey but does provide potential habitat for threatened flora species.

The scattered trees within the paddocks are often large and hollow bearing, providing habitat for a range of fauna species such as reptiles and birds. The trees are mostly too spread out to provide viable habitat for hollow-dependent mammals, but may provide temporary shelter for larger mammals such as koalas.

Outside of the disturbance footprint but within the buffer zones for some threatened species, there are patches of grassy woodland. These generally consist of a canopy layer, with a highly disturbed ground and midstorey. The more isolated patches within the centre of the study area have very few habitat features at ground level, often with no fallen timber or shrub layer. These patches would provide some habitat for reptiles and birds. The larger and better-connected patches of woodland around the margins of the site are more structurally intact and would also provide some habitat for mammal species and ground-dwelling birds.

Hollow bearing trees were recorded throughout the study area. The hollow resource recorded is estimated to be approximately 588 hollows of various sizes from 240 trees (Appendix G). These provide potential habitat for various hollow dependent species, such as bats, possums, gliders, owls, parrots, raptors, reptiles and some frog species. Several non-threatened bird species were observed nesting in hollows during habitat assessments, including Nankeen Kestrels, Galahs and Little Corellas. There are several sheds and artificial structures within the study area that may provide roosting habitat for bats.

The disturbance footprint avoids the majority of mapped waterways in the study area. There are three small creeks that run through the disturbance footprint: Kateys Creek, Jessie Creek and one unnamed creek. These areas were assessed over multiple site visits and were not observed to contain permanent flow; however, they do provide some habitat for frogs in wet conditions. The low-lying areas surrounding the three creeks were observed to have limited disturbance and high-quality grassland, which would provide higher quality habitat for threatened flora species. The creek lines may also provide movement corridors for mammal species such as the Spotted-tail Quoll (*Dasyurus maculatus*), although vegetation cover is limited. There are several farm dams within the study area that may provide some habitat for frogs, birds, or invertebrates.

A fourth order stream (Kings Creek) runs across the northern edge of the study area. This watercourse contains habitat suitable for frogs, turtles and fish, with a mix of pools and fast flowing areas, and rocky and vegetated banks. It is lined by gallery forest consisting mostly of River Oak, providing habitat for a number of threatened birds, mammals, and reptiles. Aquatic habitat is addressed in more detail in Section 5.5.

A high-level multi-cell box culvert system at the Swan Brook crossing on Spring Mountain Road was inspected for active microbat roosts. None were detected. Except for a low-level bridge at Kings Creek (western end of Sturmans Road) and a small box culvert at an unnamed 2nd order watercourse crossing (also along Sturmans Road), all existing watercourse crossings are generally bed level crossings and do not provide roosting habitat for microbats.

The habitat in the access road component of the disturbance footprint is largely limited to disturbed grassland within the road corridor. There are some small patches of woodland and scattered trees within the road corridor, but no habitat features such as rocks or fallen timber, and no understorey layer. The disturbance footprint is primarily contained within the boundaries of the existing road, which will be compacted and gravelled to a width of 8.7 m.

5.3 Ecosystem credit species

Ecosystem credits species are threatened species that can be reliably predicted to use an area of land based on habitat surrogates. For the purposes of the BAM (DPIE 2020a), ecosystem credit species are deemed to be offset through the habitat surrogates (PCTs) in which they occur.

A list of ecosystem credit species predicted to occur within the study area is provided in Table 5.1. The potential for these species to occur within the disturbance footprint was assessed in accordance with Section 5.2.2 of the BAM (DPIE 2020a).

Unless otherwise stated, the assessments in Table 5.1 address the site-based component and the linear-based component collectively, as there are minimal qualitative differences in habitat between the two portions of the site. Where there are differences in the assessment between the two components, this is stated in the table.

Some threatened species are listed as both ecosystem credit species and species credit species. In these cases, those species will also be addressed in Section 5.4.

All ecosystem credit species have been excluded from cultivation vegetation zones, as they are introduced into this assessment for the purpose of calculating credits for prescribed impacts on candidate species recorded within non-native vegetation (refer to discussion in Section 4.2.6vi).

Table 5.1 Assessment of ecosystem credit species within the disturbance footprint

Scientific name	Common name	Sensitivity to gain	Habitat/geographic constraint from the TBDC	Justification for exclusion (Step 2)
<i>Anthochaera phrygia</i>	Regent Honeyeater (Foraging)	High	n/a	The species forages in the canopies of a small number of small number of eucalypts. Since derived grassland zones contain scattered paddock trees, the species has been retained in every vegetation zone. Not excluded.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	Moderate	n/a	Not excluded. Recorded incidentally in the study area.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (Foraging)	High	Presence of <i>Allocasuarina</i> and <i>Casuarina</i> species.	Although no <i>Allocasuarina</i> and <i>Casuarina</i> species occur in PCT 510 and PCT 590 zones, there are <i>Casuarina</i> species present in nearby PCT 84 (which is not an associated PCT for this species). A conservative approach is taken. Not excluded.
<i>Chthonicola sagittata</i>	Speckled Warbler	High	n/a	Not excluded.
<i>Circus assimilis</i>	Spotted Harrier	Moderate	n/a	Not excluded.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	High	n/a	Not excluded. Recorded incidentally in the study area.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Moderate	n/a	Not excluded.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	High	n/a	Not excluded.

Table 5.1 Assessment of ecosystem credit species within the disturbance footprint

Scientific name	Common name	Sensitivity to gain	Habitat/geographic constraint from the TBDC	Justification for exclusion (Step 2)
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Moderate	Swamps: shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300 m of these swamps. Waterbodies: shallow lakes, lake margins and estuaries within 300 m of these waterbodies.	This species is associated with PCT 84, which only occurs in the site-based component of the study area, and not within the linear-based component. It has been excluded from zone 84_WDL_poor as habitat constraints are not present, ie swamp habitats or shallow lakes, lake margins and estuaries within 300 m.
<i>Falco subniger</i>	Black Falcon	Moderate	n/a	This species is associated with PCT 84, which only occurs in the site-based component of the study area, and not within the linear-based component. Not excluded.
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	High	n/a	Not excluded.
<i>Glossopsitta pusilla</i>	Little Lorikeet	High	n/a	Not excluded. Recorded incidentally in the study area.
<i>Grantiella picta</i>	Painted Honeyeater	Moderate	Mistletoes present at a density of greater than five mistletoes per hectare.	Not excluded.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Foraging)	High	Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Not excluded.
<i>Hieraaetus morphnoides</i>	Little Eagle (Foraging)	Moderate	n/a	Not excluded. Recorded incidentally in the study area.
<i>Hirundapus caudacutus</i>	White-throated Needletail	High	n/a	Not excluded.
<i>Lathamus discolor</i>	Swift Parrot (Foraging)	Moderate	n/a	Not excluded.
<i>Lophoictinia isura</i>	Square-tailed Kite (Foraging)	Moderate	n/a	Not excluded.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	Moderate	n/a	Not excluded.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Moderate	n/a	Not excluded.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Foraging)	High	n/a	Not excluded.
<i>Neophema pulchella</i>	Turquoise Parrot	High	n/a	Not excluded.

Table 5.1 Assessment of ecosystem credit species within the disturbance footprint

Scientific name	Common name	Sensitivity to gain	Habitat/geographic constraint from the TBDC	Justification for exclusion (Step 2)
<i>Ninox connivens</i>	Barking Owl (Foraging)	High	n/a	Not excluded.
<i>Petroica boodang</i>	Scarlet Robin	Moderate	n/a	Not excluded. Recorded incidentally in the study area.
<i>Petroica phoenicea</i>	Flame Robin	Moderate	n/a	Not excluded.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Foraging)	High	n/a	Not excluded.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	High	n/a	Not excluded.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	High	n/a	Not excluded.
<i>Stagonopleura guttata</i>	Diamond Firetail	Moderate	n/a	Not excluded. Recorded incidentally in the study area.
<i>Tyto novaehollandiae</i>	Masked Owl (Foraging)	High	n/a	Not excluded.

5.4 Species credit species

5.4.1 Candidate species assessment (Steps 1–3)

Candidate species that were considered for further assessment are shown in Table 5.2. An assessment of the geographic and landscape constraints has been provided for each species, with a justification provided where species have been excluded, in accordance with Steps 1 to 3 (Section 5.2) of the BAM (DPIE 2020a).

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Adelotus brevis</i> – endangered population	Tusked Frog population in the Nandewar and New England Tableland Bioregions	Nandewar and New England Tableland Bioregions	Yes	Yes	Yes	The disturbance footprint is within the geographic constraints for the species, and there is suitable habitat of slow-moving streams with vegetated banks present.	Very high	EP	-
<i>Anthochaera phrygia</i>	Regent Honeyeater (breeding)	As per Important Habitat Map	No	n/a	No	The disturbance footprint is outside the geographic constraint for this species (mapped important areas).	High	CE	CE
<i>Burhinus grallarius</i>	Bush Stone-curlew	Fallen/standing dead timber including logs.	Yes	Yes	Yes	The disturbance footprint contains some suitable woodland habitat with fallen timber.	High	E	-
<i>Callistemon pungens</i>	<i>Callistemon pungens</i>	n/a	n/a	Yes	Yes	Suitable riparian and woodland habitats occur within the disturbance footprint.	High	-	V
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (breeding)	Hollow bearing trees: Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground.	Yes	Yes	Yes	There are large hollows within the disturbance footprint, and the species is associated with the vegetation communities present.	High	V	V
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	n/a	n/a	Yes	Yes	The disturbance footprint contains small areas of marginal woodland habitat for this species.	High	V	-

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Chiloglottis platyptera</i>	Barrington Tops Ant Orchid	n/a	n/a	Yes	Yes	This species is associated with the vegetation communities present in the disturbance footprint, and there is suitable eucalypt habitat with a grassy understorey.	Moderate	V	-
<i>Dichanthium setosum</i>	Bluegrass	n/a	n/a	Yes	Yes	Species has previously been recorded within the disturbance footprint and there is suitable habitat present.	High	V	V
<i>Diuris pedunculata</i>	Small Snake Orchid	n/a	n/a	Yes	Yes	This species has been recorded in the area and suitable grassy granite habitat is present within the disturbance footprint.	Moderate	E	E
<i>Eucalyptus magnificata</i>	Northern Blue Box	n/a	n/a	Yes	Yes	This species is associated with the vegetation communities in the disturbance footprint, and there is suitable grassy open forest habitat present.	High	E	-
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	n/a	n/a	Yes	Yes	This species is associated with the vegetation communities in the disturbance footprint, and there is suitable grassy woodland habitat present.	High	V	V

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (breeding)	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines	Yes	Yes	Yes	Although the potential habitat for this species is limited as the nearby watercourses do not contain large expanses of water, the species is associated with the vegetation communities present within the disturbance footprint.	High	V	-
<i>Hieraaetus morphnoides</i>	Little Eagle (breeding)	Nest trees - live (occasionally dead) large old trees within vegetation.	Yes	Yes	Yes	The species is associated with the vegetation communities within the disturbance footprint, and there are suitable large old trees present.	Moderate	V	-
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	n/a	n/a	Yes	Yes	There is suitable habitat for this species along creeklines within the disturbance footprint, and in woodland areas.	High	V	-
<i>Lathamus discolor</i>	Swift Parrot (breeding)	As per Important Habitat Map	No	n/a	No	The disturbance footprint is outside the geographic constraint for this species (mapped important areas).	Moderate	E	CE
<i>Litoria booroolongensis</i>	Booroolong Frog	n/a	n/a	Site-based: Yes Linear-based: No	Yes No	There is some rocky stream habitat within the disturbance footprint of the site-based component that would be suitable for this species. There is no suitable rocky stream habitat within the disturbance footprint of the access road that would be suitable for this species.	High	E	E

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Lophoictinia isura</i>	Square-tailed Kite (breeding)	Nest trees.	Yes	Yes	Yes	There is suitable dry woodland habitat for this species present within the disturbance footprint, as well as trees that would be suitable for nesting.	Moderate	V	-
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (breeding)	Breeding: 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	No	n/a	No	The required habitat constraints for breeding are absent from the disturbance footprint.	High	V	-
<i>Myotis macropus</i>	Southern Myotis	Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site.	Yes	Yes	Yes	The disturbance footprint contains suitable riparian habitat with pools greater than 3m wide.	High	V	-
<i>Ninox connivens</i>	Barking Owl (breeding)	Hollow bearing trees: Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	Yes	Yes	Yes	There is suitable woodland habitat within the disturbance footprint, with hollows suitable for nesting.	High	V	-

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Petauroides volans</i>	Southern Greater Glider	Hollow bearing trees	Yes	No	No	The disturbance footprint contains very small areas of suboptimal woodland habitat. This species generally prefers taller eucalypt forest than what is present at the site, with a higher density of large tree hollows. The species is sensitive to fragmentation and to logging of tree hollows as it has poor ability to disperse among fragmented patches through cleared areas and also has a low reproductive output (DCCEEW 2022a). These factors in combination indicates that the viability of the species in small patches is likely to be very low. Existing records of the species occur approximately 50 km to the east, in larger forested patches. No glider species were recorded during any nocturnal surveys in the study area.	High	E	E

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Phascolarctos cinereus</i>	Koala (breeding)	Presence of koala use trees, according to DPE (2022d).	Yes	Yes	Yes	The study area contains suitable habitat for koalas, with all vegetation zones containing at least one Koala Use Tree, as per the BAM guidelines for Koalas (DPE 2022d). More details are provided in Section 5.4.4vd. Koalas have been recorded in the region but are likely to be at low densities.	High	E	E
<i>Picris evae</i>	Hawkweed	n/a	n/a	Yes	Yes	Species is associated with the vegetation communities present in the disturbance footprint, and there is suitable habitat in the open eucalypt forest and paddocks. Known from the area.	High	V	V
<i>Prasophyllum sp. Wybong</i>	<i>Prasophyllum sp. Wybong</i>	n/a	n/a	Yes	Yes	There is suitable grassland and eucalypt woodland habitat within the disturbance footprint, and the species is known from the Inverell area.	Moderate	-	CE
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Breeding camps	No	n/a	No	The required habitat constraints for this species are absent, as there are no breeding camps near the disturbance footprint. The closest camp for Grey-headed Flying-fox is near Inverell and has not been active since 2013 (DCCEEW 2021).	High	V	V

Table 5.2 Candidate species credit species assessment

Scientific name	Common name	Habitat/geographic constraint from the TBDC	Habitat/geographic constraint present in the disturbance footprint? (Step 2)	Suitable microhabitats present and habitat not degraded? (Step 3)	Candidate species?	Justification	Sensitivity to gain class	BC Act status ¹	EPBC Act status ¹
<i>Rutidosia heterogama</i>	Heath Wrinklewort	n/a	n/a	Yes	Yes	Species is associated with the vegetation communities present in the disturbance footprint.	High	V	V
<i>Swainsona sericea</i>	Silky Swainson-pea	n/a	n/a	Yes	Yes	There is suitable grassland and eucalypt woodland habitat within the disturbance footprint, and the species has been recorded in the region.	High	V	-
<i>Thesium australe</i>	Austral Toadflax	n/a	n/a	Yes	Yes	Species has previously been recorded within the disturbance footprint and there is suitable habitat present.	Moderate	V	V
<i>Tyto novaehollandiae</i>	Masked Owl	Hollow bearing trees: living or dead trees with hollows greater than 20 cm diameter.	Yes	Yes	Yes	Species is associated with the vegetation communities in the disturbance footprint, and there are hollow bearing trees present that would be suitable for breeding.	High	V	-

1. V = vulnerable, E = endangered, CE = critically endangered, EP = endangered population

5.4.2 Presence of candidate species requiring further assessment (Step 4)

The species requiring further assessment under the BAM (after completing Steps 2 and 3) are listed in Table 5.3. The species were considered to have potential of occurring within the study area, and their presence was assessed through completion of targeted surveys.

Table 5.3 contains a summary of the surveys completed. Details of survey methods and effort are provided in Section 5.4.4.

Table 5.3 Assessment of candidate species presence within the disturbance footprint

Scientific name	Common name	Present in the disturbance footprint (Step 4)	Survey method	Timing of survey undertaken	Unit of measure
<i>Adelotus brevis</i> – endangered population	Tusked Frog population in the Nandewar and New England Tableland Bioregions	No (surveyed)	Aural-visual surveys	October, December	Area
<i>Burhinus grallarius</i>	Bush Stone-curlew	No (surveyed)	Spotlighting transects, flushing surveys	August, October, December	Area
<i>Callistemon pungens</i>	-	No (surveyed)	Targeted flora surveys	October, February	Count
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (breeding)	No (surveyed)	Hollow surveys	August	Area
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Yes (assume present)	Spotlighting transects, but species not targeted specifically	n/a	Area
<i>Chiloglottis platyptera</i>	Barrington Tops Ant Orchid	No (surveyed)	Targeted flora surveys	October	Area
<i>Dichanthium setosum</i>	Bluegrass	Yes (surveyed)	Targeted flora surveys	October ¹ , February	Area
<i>Diuris pedunculata</i>	Small Snake Orchid	No (surveyed)	Targeted flora surveys	October	Area
<i>Eucalyptus magnificata</i>	Northern Blue Box	No (surveyed)	Targeted flora surveys	October, February, May, August	Count
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	No (surveyed)	Targeted flora surveys	October, February, May, August	Count
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (breeding)	No (surveyed)	Nest surveys	August, October	Area
<i>Hieraaetus morphnoides</i>	Little Eagle (breeding)	No (surveyed)	Nest surveys	August, October	Area
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	No (surveyed)	Spotlighting transects	October ¹ , December	Area
<i>Litoria booroolongensis</i>	Booroolong Frog	No (surveyed)	Aural-visual surveys	October, December	Area
<i>Lophoictinia isura</i>	Square-tailed Kite (breeding)	No (surveyed)	Nest surveys	October	Area
<i>Myotis macropus</i>	Southern Myotis	No (surveyed)	Anabats, harp trapping	October, February, March	Area

Table 5.3 Assessment of candidate species presence within the disturbance footprint

Scientific name	Common name	Present in the disturbance footprint (Step 4)	Survey method	Timing of survey undertaken	Unit of measure
<i>Ninox connivens</i>	Barking Owl (breeding)	No (surveyed)	Hollow surveys, stag watching	August	Area
<i>Phascolarctos cinereus</i>	Koala (breeding)	No (surveyed)	Detection dog surveys	December, February	Area
<i>Picris evae</i>	Hawkweed	No (surveyed)	Targeted flora surveys	February	Area
<i>Prasophyllum</i> sp. <i>Wybong</i>	-	No (surveyed)	Targeted flora surveys	October	Area
<i>Rutidosis heterogama</i>	Heath Wrinklewort	No (surveyed)	Targeted flora surveys	October, February	Area
<i>Swainsona sericea</i>	Silky Swainson-pea	No (surveyed)	Targeted flora surveys	October	Area
<i>Thesium australe</i>	Austral Toadflax	Yes (surveyed)	Targeted flora surveys	October ¹ , February	Area
<i>Tyto novaehollandiae</i>	Masked Owl (breeding)	No (surveyed)	Hollow surveys, stag watching	August	Area

Notes: 1. Survey month outside of specified months. Explanation provided in Section 5.4.4.

5.4.3 Species polygons (Steps 5–6)

i Threatened flora

Two threatened species were recorded within the disturbance footprint: Bluegrass (*Dichanthium setosum*) and Austral Toadflax (*Thesium australe*). Both species are associated with grassy understorey habitats and were recorded in 2018, 2021 and 2022. There are 246 Bluegrass records in the study area representing over 3,700 plants; and 552 Austral Toadflax records in the study area representing over 20,000 plants. Of these, one record (approximately 1 plant) and 50 records (approximately 1,267 plants) of Bluegrass and Austral Toadflax respectively are located within the disturbance footprint.

The records shown in Figure 5.1 and Figure 5.2 represent the cumulative occurrences detected across all these years to provide an indication of the extent of occurrence within the study area.

Bluegrass and Austral Toadflax have a scattered, clumpy distribution within the disturbance footprint. Both species can tolerate a degree of disturbance, having been recorded in grazed, nutrient-enriched, and roadside habitats within the study area. Both species have also been recorded in previously cultivated areas that have been left for a period between cultivation events. No plants were recorded in areas that were being actively cultivated at the time of survey.

The occurrences of Bluegrass and Austral Toadflax identified during this study are largely concentrated around watercourses or roadsides, possibly where there is less frequent cultivation or less intense/regular disturbance, or where the ground cover is better protected from other agricultural activities by fence infrastructure (Figure 5.1 and Figure 5.2) or by virtue of being located on watercourse banks. Whilst some threatened flora records were identified in cultivated areas, the following are noted:

- On the Spring Valley property, the areas of cultivation where the threatened plants were identified are still relatively proximate to Kings Creek. The occurrences of the threatened plants are concentrated at the margins of cultivations adjoining derived native grassland. Plants were recorded between cultivation events.
- On the Glen Eisle property, cultivation activities ceased for several years due to drought. A small number of scattered plants were recorded in these paddocks before cultivation recommenced in 2021/2022. Notwithstanding this, it is noted that 'strongholds' for these plants are still located outside of cultivated areas, with many plants recorded along the watercourse in the same season.

It is difficult to predict the area of suitable habitat within the disturbance footprint considering the patchy distribution of both species and their presence in areas that have been previously cultivated. It is reasonable to expect that most of the cultivated areas, especially the central paddock portions located away from derived native grassland margins around watercourses, are unlikely to provide suitable habitat for Bluegrass and Austral Toadflax and that the occurrence of these species in such cultivated areas are highly localised. Likewise, discrete areas of derived native grassland at a distance from watercourses that do not contain known records are also less likely to provide suitable habitat for Bluegrass and Austral Toadflax compared with areas more proximate to watercourses.

In creating species polygons for Bluegrass and Austral Toadflax, the following rules were applied with due consideration of all the above (this approach was undertaken in consultation with BCD):

- For each native vegetation zone, all discrete polygons comprising that vegetation zone were selected for inclusion in the species polygon where the polygon contains at least one record. For example, if two polygons that comprise vegetation zone 510_DNG_MOD are separated by 500 m and only one polygon contains Bluegrass, only that polygon would be included in the Bluegrass species polygon. However, this also means that if a large polygon contains only one record located at one end, the whole polygon would still be included in the species polygon because the habitat is connected.

- ‘Cultivation vegetation zones’ are created for inclusion in species polygons as explained earlier in Section 4.2.6vi. The purpose of this is to calculate a credit requirement for ‘prescribed impacts’ on Bluegrass and Austral Toadflax. The cultivation vegetation zones are taken to be cultivated land or exotic pasture within 30 m of a known threatened species record. Each polygon comprising the cultivation zone is assigned a PCT that would have likely occurred historically to allow these cultivation zones to be included in the BAM-C.
- Cleared areas were excluded from the species polygons.

The species polygon for Bluegrass is shown in Figure 5.1. The species polygon for Austral Toadflax is shown in Figure 5.2.

The areas included in each respective species polygon is summarised in Table 5.4.

Table 5.4 Habitat condition within the species polygon for Bluegrass and Austral Toadflax

Vegetation zone included in polygon	Vegetation integrity score	Area within species polygon (ha) <i>Site-based component</i>	Area within species polygon (ha) <i>Linear-based component</i>
Bluegrass			
510_WDL_intact	66	0.02	
510_DNG_MOD	13.8	27.84	
510_DNG_LOW	9.3	66.82	
590_DNG_MOD	20.3		0.01
590_DNG_LOW	18.1	15.47	0.01
590_DNG_V_LOW	9.2	70.56	
510_cultivation	0.1	1.43	
590_cultivation	0.1	0.16	
Austral Toadflax			
510_WDL_intact	66	0.02	0.04
510_DNG_MOD	13.8	27.84	
510_DNG_LOW	9.3	67.22	
590_DNG_LOW	18.1	15.51	
590_DNG_V_LOW	9.2	70.56	
510_cultivation	0.1	1.63	
590_cultivation	0.1	3.91	

ii Eastern Pygmy-possum

The Eastern Pygmy-possum is a small (15 to 43 grams) marsupial found in south-eastern Australia, from Southern Queensland to Tasmania. It is an agile climber that is largely nocturnal, feeding primarily on nectar and pollen from banksias, eucalypts and bottlebrushes. It also feeds on insects. Eastern Pygmy-possums are found in a broad range of habitats, from rainforest to woodland and heath. They prefer areas with a rich shrub understorey, though can be found in grassy woodlands (OEH 2001).

The species was not targeted during field surveys, as it was assumed that no suitable woodland habitat would be included in the disturbance footprint. After further design of the disturbance footprint, small areas of mapped woodland have been included. Although spotlighting surveys were completed in woodland areas surrounding the disturbance footprint, it is not believed that these surveys are suitable to target Eastern Pygmy-possum, as the species is especially difficult to detect using this method (as noted in the TBDC).

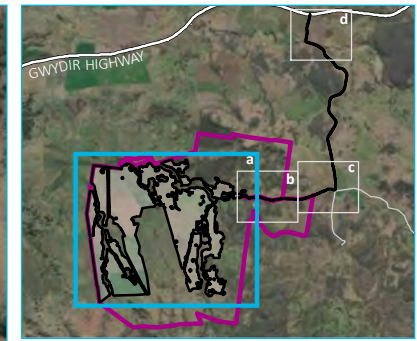
Very few nocturnal species were recorded during the spotlighting effort, with one Brushtail Possum being the only native mammal sighting. It is not believed that the habitat in the disturbance footprint is optimal for this species due to the lack of a dense shrub layer. Regardless, the species has been conservatively assumed to be present in the mapped areas of woodland habitat. Areas of derived native grassland have been excluded from the species polygon, as well as isolated patches of woodland that are poorly connected to larger more intact patches.

The species polygon for Eastern Pygmy-possum is shown in Figure 5.3. The areas included in each respective species polygon is summarised in Table 5.5.

Table 5.5 Habitat condition within the species polygon for Eastern Pygmy-possum

Vegetation zone included in polygon	Vegetation integrity score	Area within species polygon (ha) <i>Site-based component</i>	Area within species polygon (ha) <i>Linear-based component</i>
084_WDL_poor	44.4	0.04	
510_WDL_intact	66	0.19	0.09
510_WDL_poor	44.7	0.30	0.01
571_WDL_poor	84.3	0.17	
590_WDL_mod	65.4	0.20	
590_WDL_poor	43.2	1.50	0.02

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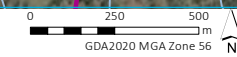


- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Bluegrass (*Dichanthium setosum*) record
 - Bluegrass (*Dichanthium setosum*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

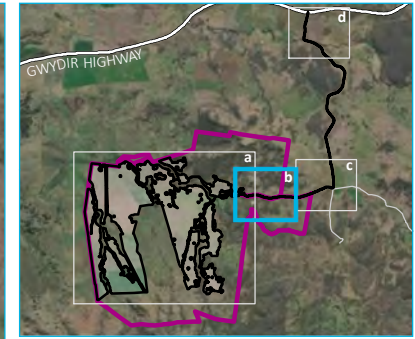
Bluegrass species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.1a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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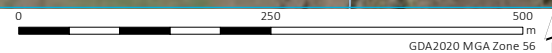


- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Bluegrass (*Dichanthium setosum*) record
 - Bluegrass (*Dichanthium setosum*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

Bluegrass species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.1b

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



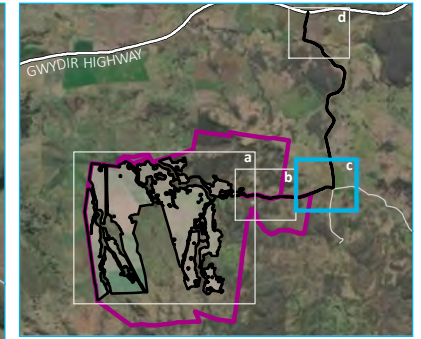
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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



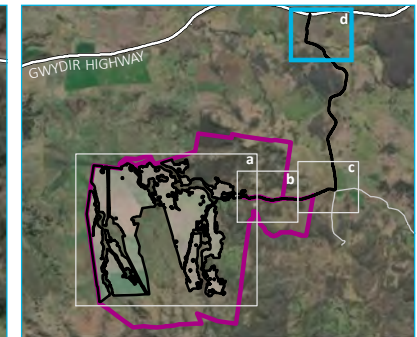
- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Bluegrass (*Dichanthium setosum*) record
 - Bluegrass (*Dichanthium setosum*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

Bluegrass species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.1c



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- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Bluegrass (*Dichanthium setosum*) record
 - Bluegrass (*Dichanthium setosum*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

Bluegrass species polygon

Sundown Solar Farm
 Biodiversity Development Assessment Report
 Figure 5.1d

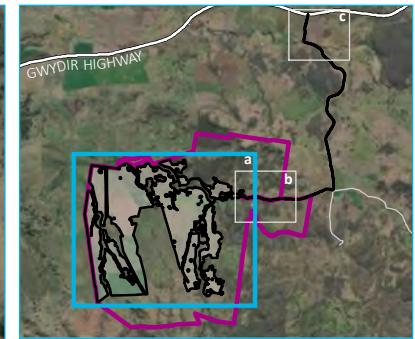
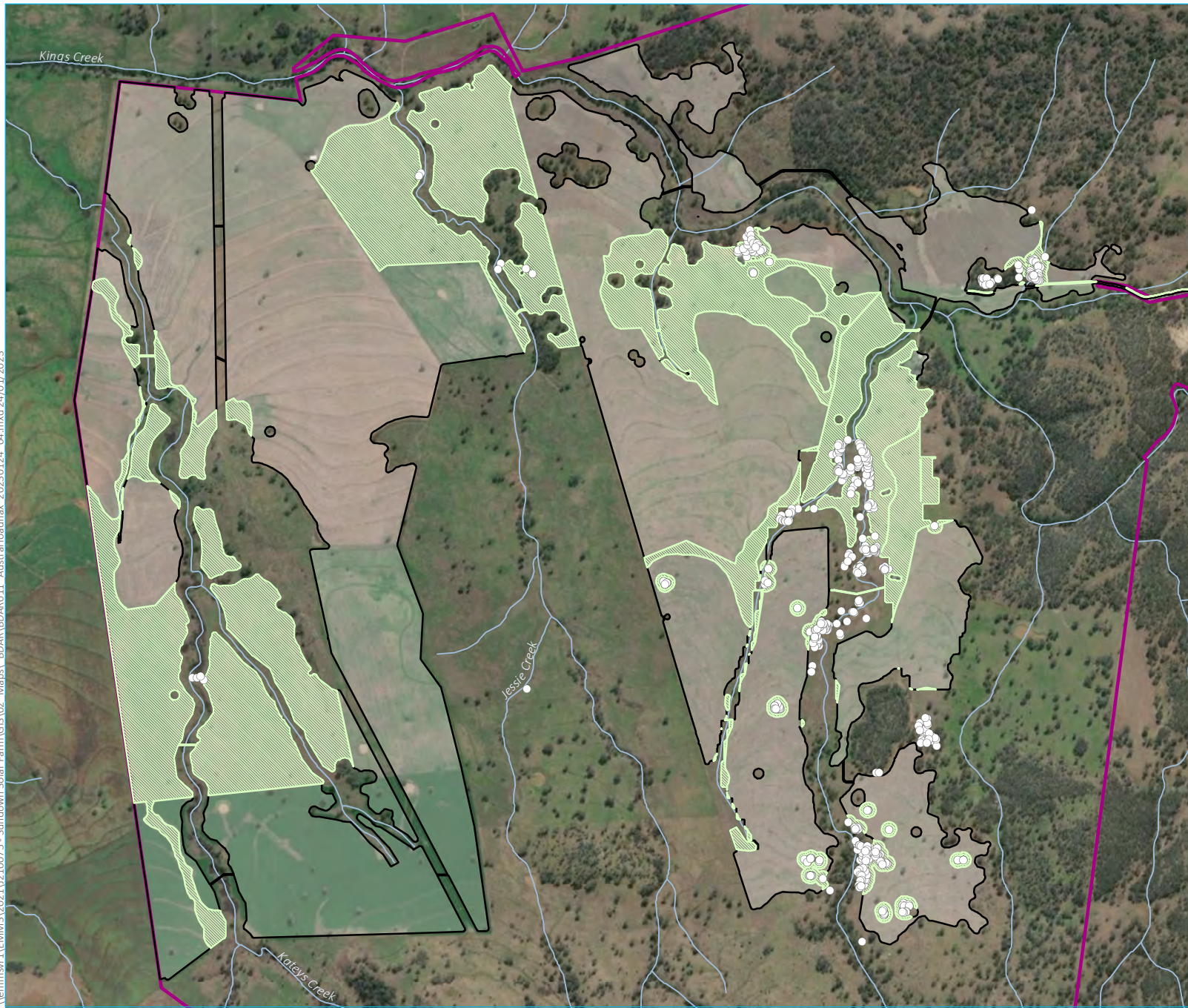


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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)

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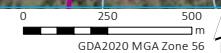


- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Austral toadflax (*Thesium australe*) record
 - Austral toadflax (*Thesium australe*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

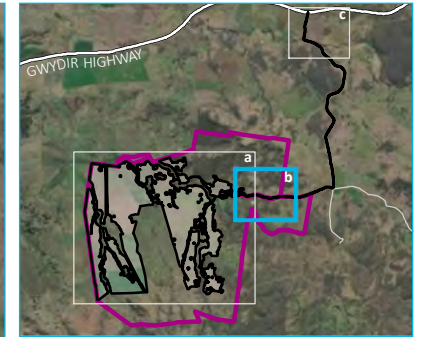
Austral Toadflax species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.2a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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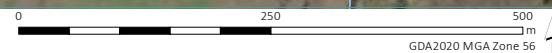
KEY

- Proposed Sundown Solar Farm
- Disturbance footprint
- Austral toadflax (*Thesium australe*) record
- Austral toadflax (*Thesium australe*) species polygon
- Major road
- Minor road
- Watercourse/drainage line

Austral Toadflax species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.2b

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



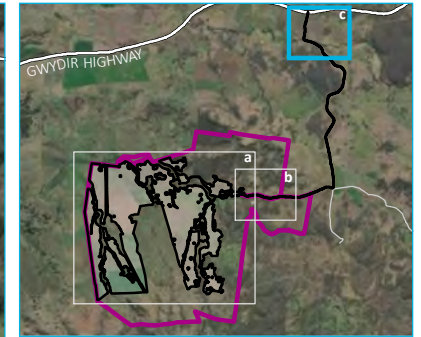
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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



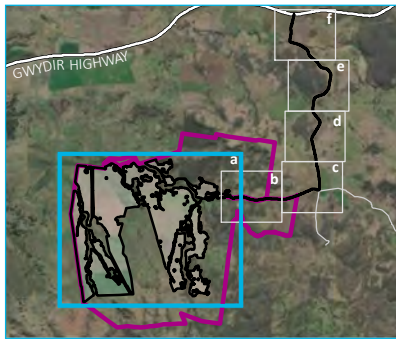
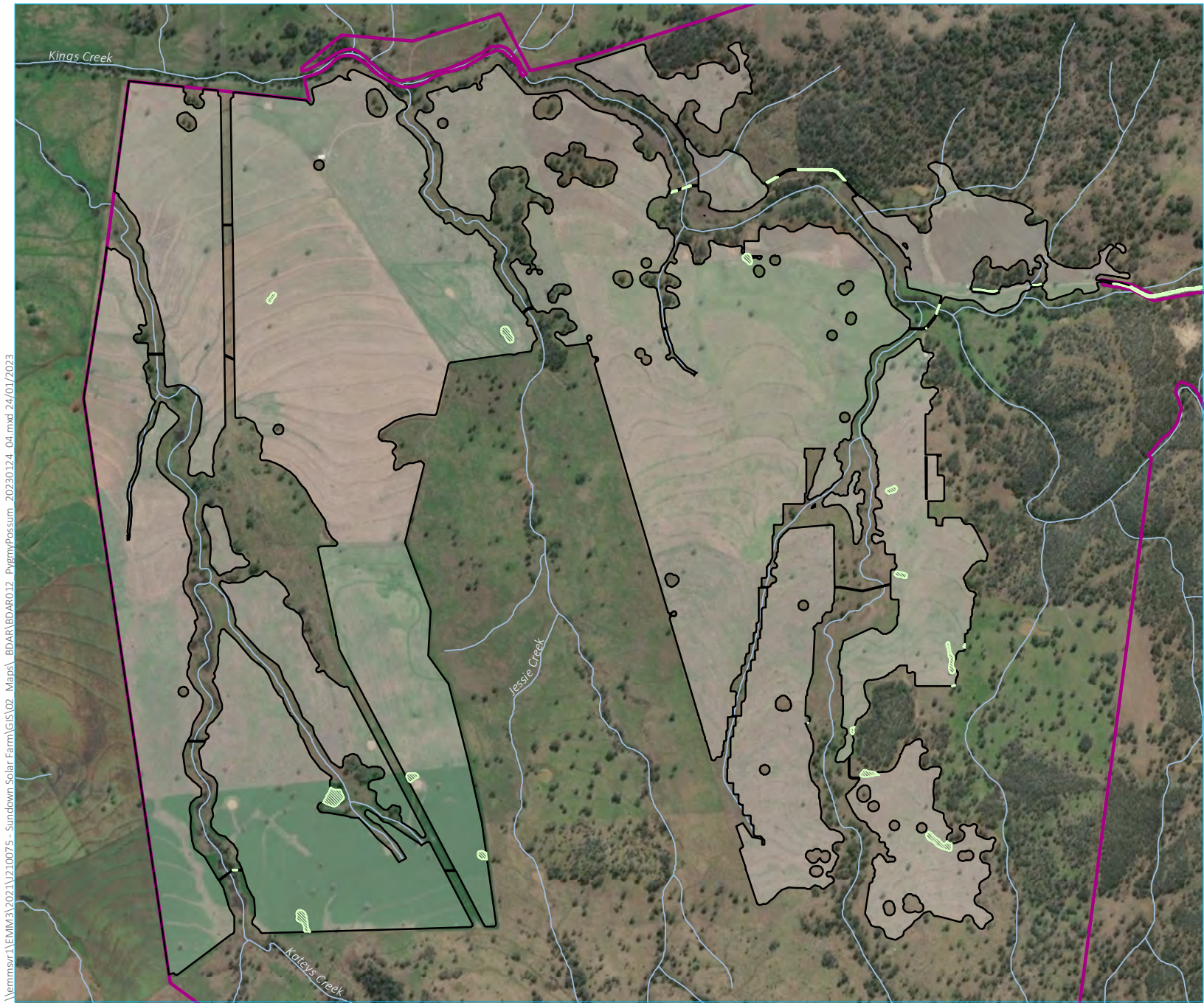
- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Austral toadflax (*Thesium australe*) record
 - Major road
 - Minor road
 - Watercourse/drainage line

Austral Toadflax species polygon

Sundown Solar Farm
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Figure 5.2c



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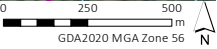
- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Eastern Pygmy-possum (*Cercartetus nanus*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

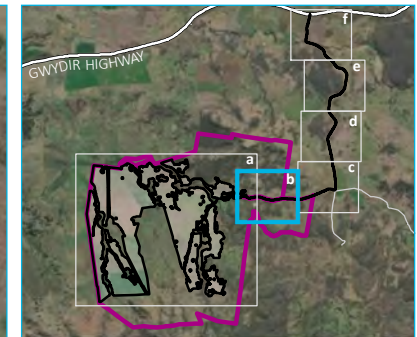
Eastern Pygmy-possum
species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.3a

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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)

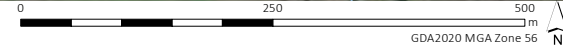




- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Eastern Pygmy-possum (*Cercartetus nanus*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

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Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)

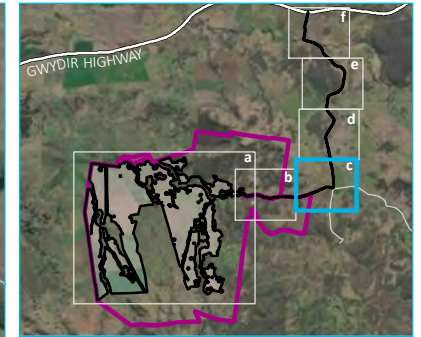








GDA2020 MGA Zone 56

Eastern Pygmy-possum species polygon
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.3b



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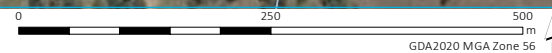


- KEY**
-  Proposed Sundown Solar Farm
 -  Disturbance footprint
 -  Eastern Pygmy-possum (*Cercartetus nanus*) species polygon
 -  Major road
 -  Minor road
 -  Watercourse/drainage line

Eastern Pygmy-possum species polygon

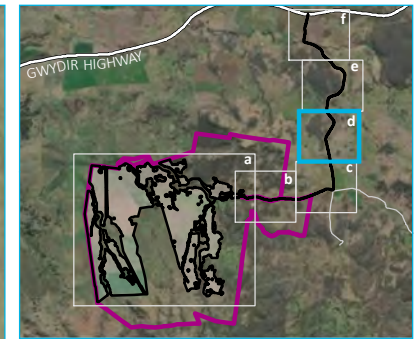
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.3c







Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56





- KEY
-  Proposed Sundown Solar Farm
 -  Disturbance footprint
 -  Eastern Pygmy-possum (*Cercartetus nanus*) species polygon
 -  Major road
 -  Minor road
 -  Watercourse/drainage line

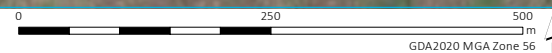
Eastern Pygmy-possum
species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.3d



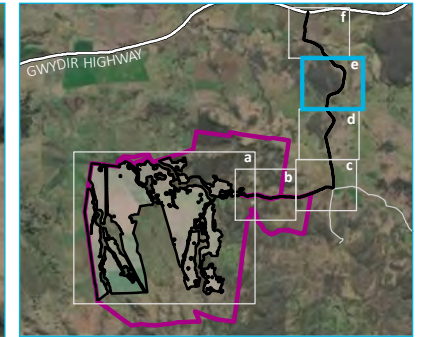
\\lemmsvr1\EMM3\2021\1210075 - Sundown Solar Farm\GIS\02 Maps\ BDAR\BDAR012_PygmyPossum_20230124_04.mxd 24/01/2023







Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56

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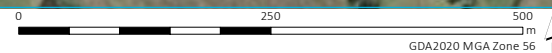


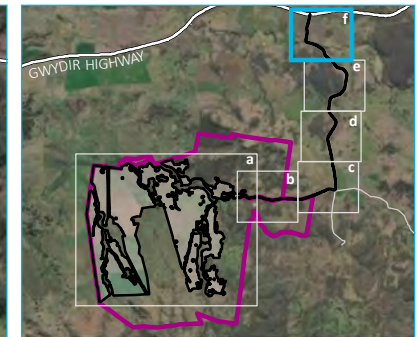
- KEY
-  Proposed Sundown Solar Farm
 -  Disturbance footprint
 -  Eastern Pygmy-possum (*Cercartetus nanus*) species polygon
 -  Major road
 -  Minor road
 -  Watercourse/drainage line

Eastern Pygmy-possum species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.3e

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)





- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Eastern Pygmy-possum (*Cercartetus nanus*) species polygon
 - Major road
 - Minor road
 - Watercourse/drainage line

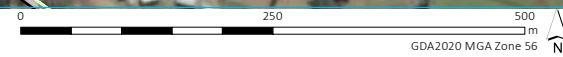
Eastern Pygmy-possum
species polygon

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.3f



\\lemmsvr1\EMM3\2021\1210075 - Sundown Solar Farm\GIS\02_Maps\BDAR\BDAR012_PygmyPossum_20230124_04.mxd 24/01/2023

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56

5.4.4 Candidate species survey methods

i Approach to targeted species surveys

Field surveys were conducted on the dates outlined in Table 5.6. Weather data for the below dates is provided in Appendix E.

Targeted flora survey was completed by Eco Logical Australia in 2018 as part of a preliminary assessment for the project (Eco Logical Australia 2018c). Targeted flora survey methods deployed in the Eco Logical Australia (2018c) study included parallel transects and cell surveys (not dissimilar to the two-phase grid-based survey method). With due reference to survey currency (the 2018 survey effort is approaching its 5 year expiry), the February 2018 targeted surveys for threatened flora were not included in the survey effort undertaken for this BDAR, although regard was given to the resultant survey findings in the assessment of impacts on candidate flora species.

Targeted surveys undertaken for the project and this BDAR commenced in February 2021 and were completed by Eco Logical Australia. The survey data were provided to EMM at the commencement of EMM's involvement in the project in 2021. Given the proximity and similarities in habitat between the site-based and linear-based assessment areas, the targeted survey efforts were planned by looking at the whole disturbance footprint for the project collectively. Additionally, land access was only available within the road corridor of the linear-based assessment area. The small areas of woodland habitat within the road corridor were surveyed but were too small to warrant standard survey techniques or transects. Targeted flora parallel transects were completed within the entirety of the road corridor.

Table 5.6 Summary of threatened species surveys completed

Dates	Target species/group	Surveys completed
21 to 25 February 2021	Summer flora species	Targeted flora surveys (completed by Eco Logical Australia, focussing mainly on the Newstead property)
25 to 27 August 2021	<ul style="list-style-type: none"> • Large forest owls • Glossy Black-cockatoo • Raptors nest sites (habitat) 	Habitat assessment, hollow and nest surveys, stag watching
19 to 23 October 2021	<ul style="list-style-type: none"> • Frogs (Booroolong and Tusked) • Raptor nest sites (survey) • Microbats 	Spotlighting, Frog transects, Anabat surveys, nest surveys
19 to 26 October 2021	Spring flora species	Targeted flora surveys
7 to 8 December 2021	Koala	Detection dogs (cut short due to weather conditions)
12 to 16 December 2021	<ul style="list-style-type: none"> • Frogs (Booroolong and Tusked) • Bush Stone-curlew • Pale-headed Snake 	Spotlighting, frog transects, call playback
7 to 10 February 2022	Summer flora species	Targeted flora surveys (completion of survey effort on Spring Valley and Glen Eisle properties)
9 to 10 February 2022	Koala	Detection dogs
20 to 23 February 2022	Southern Myotis	Harp trapping (cut short due to weather conditions)
12 to 16 March 2022	Southern Myotis	Harp trapping

ii Data capture

Survey locations and tracks, as well as habitat points and species records, were recorded using hand-held GPS units, mobile tablet computers running ArcGIS Field Maps™ and Survey123 for ArcGIS™. Accuracy is subject to accuracy of GPS devices, generally ± 5 m. Mapping has been produced using a Geographic Information System (GIS; ArcGIS 10.8.1).

iii Targeted flora surveys

Targeted flora surveys were undertaken using a combination of a two-phase grid-based survey technique and parallel transect surveys (DPIE 2020c). The study area was surveyed over three key survey events (February 2021, 2022; and October 2022) and satisfies the survey timing requirements for each target flora species (Table 5.7). The survey effort is summarised in Table 5.8.

Two species were surveyed in October outside of their specified survey months (Bluegrass and Austral Toadflax) but were also surveyed within their specified survey months (ie February). Bluegrass and Austral Toadflax were flowering early in October 2022 and were readily detected; as such they were opportunistically surveyed along with other spring target flora species.

Table 5.7 Targeted flora survey timing

Scientific name	Common name	Specified survey months	Months surveyed
<i>Callistemon pungens</i>	-	September to February	October, February (2021, 2022)
<i>Chiloglottis platyptera</i>	Barrington Tops Ant Orchid	October	October
<i>Dichanthium setosum</i>	Bluegrass	November to May	October ¹ , February (2021, 2022)
<i>Diuris pedunculata</i>	Small Snake Orchid	September to October	October
<i>Eucalyptus magnificata</i>	Northern Blue Box	Year round	October, February (2021, 2022)
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	Year round	October, February (2021, 2022)
<i>Picris evae</i>	Hawkweed	November to February	February (2021, 2022)
<i>Prasophyllum</i> sp. Wybong	-	September to October	October
<i>Rutidosis heterogama</i>	Heath Wrinklewort	Year round	October, February (2021, 2022)
<i>Swainsona sericea</i>	Silky Swainson-pea	September to November	October
<i>Thesium australe</i>	Austral Toadflax	November to February	October ¹ , February (2021, 2022)

Notes: 1. Undertaken outside specified survey months

Table 5.8 Targeted flora survey effort

Survey event	Number of days	Number of observers
February 2021	5	4
October 2021	8	4
February 2022	4	3

Parallel transect surveys (DPIE 2020c) were used in vegetation zones less than 50 ha, and in higher quality habitat where there was a higher likelihood of target species occurring. This method involved ecologists walking parallel transects 10 m apart, systematically searching for target species. The species and number of plants were recorded when a target species was found. Other useful information such as reproductive phase was also recorded.

The two-phase grid-based survey technique (DPIE 2020c) was used as a practical method of survey to consistently survey vegetation zones greater than 50 ha or large areas of poorer quality habitats. This was mainly deployed in large areas of derived native grassland. Ecologists systematically searched for target species within a 40 m diameter area located at each intersection of a 100 m grid. Survey locations were pre-loaded into georeferenced maps accessed in the field using the Avenza Maps application (Avenza Systems Inc).

When a target species was found, further detailed searches to increase the intensity of survey effort were carried out in the area to map the population extent. The parallel transect method was used to systematically survey in an area where a threatened plant was encountered, with searches continuing until no more plants were recorded.

Examination of threatened flora occurrences recorded by Eco Logical in 2018 and 2021 indicated that the threatened flora populations identified in the study area occurred broadly along watercourses and roadsides, possibly where the understorey is less cultivated or where it is better protected from other agricultural activities by fence infrastructure etc. as discussed in Section 5.4.3i. The linear nature of watercourses and roadsides makes it suitable for survey using the parallel transect method, with the length of the water course and/or roadside surveyed until no more plants were recorded.

The targeted flora survey effort is shown in Figure 5.4. Areas that were being actively cultivated (ie ripping and site preparation taking place) at the time of survey or only recently harvested of crops were not subject to systematic targeted survey. It is noted that some survey tracks are not able to be included on the figure due to a GPS unit malfunction for one observer in the October 2022 survey event.

Two threatened flora species were recorded throughout the study area across all three properties and along the access route: Bluegrass and Austral Toadflax. No other threatened species was recorded. The following observations/findings are noted:

- Eco Logical Australia (2018c) recorded Silky Swainson-pea (*Swainsona sericea*) on the Newstead property. These records were re-surveyed in 2021 and samples collected. Based on identification of the hairs, these samples were determined to be Knead Swainson-pea (*Swainsona reticulata*). All other Swainson-pea plants sampled in the October 2021 survey event were not determined to be Silky Swainson-pea based on the lack of medi-fixed hairs. Portable field microscopes were utilised to check plants on the spot.
- Individuals from the genus *Callistemon* was observed during October 2021 surveys but were in early stages of flowering and the species could not be determined. During a subsequent visit in December 2021, flowering was sufficiently advanced to identify to species. Based on flower characteristics, the plants were determined to be *Callistemon sieberi* (cream-coloured flowers and not red) and *C. viminalis* (red-flowered, presence of staminal rings), and not *Callistemon pungens*.
- Surveys for ground orchids during October 2021 recorded non-threatened species Purple Donkey Orchid (*Diuris punctata*) and Midget Greenhood (*Pterostylis mutica*). However, Small Snake Orchid (*Diuris pedunculata*) and *Prasophyllum* sp. Wybong were not detected.
- Following targeted survey for Bluegrass (*Dichanthium setosum*), samples of bluegrass were sent to the Australian National Herbarium for identification due to the known occurrence of Queensland Bluegrass (*Dichanthium sericeum*) and *Dichanthium setosum* x *sericeum* hybrids within the study area. The latter two species are not listed as threatened species. Emailed correspondence from the Australian National Herbarium is included in Appendix F.

iv Habitat assessment

The study area was traversed on foot to identify presence of habitat constraints, assess habitat condition across the study area, and identify presence of microhabitats suitable for the candidate species. All relevant habitat features were recorded, such as aquatic habitat components, nesting habitat, fallen timber, presence of flowering species, quality of woodland patches, and hollows.

All trees within the study area were checked for the presence of hollows and stick nests, and every hollow and nest was recorded. The trees were inspected using binoculars and each hollow was categorised into the following sizes: small: <5 cm; medium: 5–20 cm; and large: >20 cm.

A high-level multi-cell box culvert system at the Swan Brook crossing on Spring Mountain Road was inspected for evidence of active microbat roosts.

The results of the habitat assessment informed the targeted surveys for the species that depend on specific habitat features. Hollow data is provided in Appendix G.

v Targeted fauna surveys

Thirteen listed fauna species were assessed as requiring targeted survey. Details of the survey methods used to target each group are outlined in the sections below.

a Diurnal birds

Area searches for all diurnal birds were carried out during the habitat assessments. The diurnal birds with potential to occur in the study area generate species credits for breeding activity only.

The hollow surveys described above were completed in August during the breeding season of the Glossy Black Cockatoo. Any hollows over 15 cm were observed to determine if they were being used by Glossy Black-Cockatoos. No Glossy Black-Cockatoos were observed during diurnal surveys, no chewed cones were found as evidence of feeding activity, and no hollows were observed being used by the species.

During the habitat assessment, all stick nests within the study area were recorded. Three stick nests of a suitable size for the three target raptor species were recorded, and were observed from a distance for 30 minutes for evidence of breeding activity. The first survey in August was within the survey season of the White-bellied Sea-eagle and the Little Eagle. All suitable nests were revisited in October and observed for a following 30 minutes, within the survey season of all species. No target species were recorded during August and October surveys during breeding season, and no breeding behaviour was observed.

The survey effort for diurnal birds is outlined In Figure 5.5 and summarised in Table 5.9.

No threatened candidate diurnal bird species are considered present for breeding habitat and will not generate species credits.

Several ecosystem credit species (predicted species) were recorded during diurnal bird surveys or incidentally and will be assessed for ecosystem credits:

- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Diamond Firetail (*Stagonopleura guttata*)
- Dusky Woodswallow (*Artamus cyanopterus*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Scarlet Robin (*Petroica boodang*)

- Little Eagle (*Hieraaetus morphnoides*), recorded within the study area in April 2022 (outside of breeding season).

Table 5.9 Diurnal bird survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Glossy Black Cockatoo (breeding)	No guidelines for this species. Guidelines for the Kangaroo Island subspecies of Glossy Black Cockatoo (DEWHA 2010) suggest for areas <50 ha: <ul style="list-style-type: none"> • 5 hours area-based searches on one day (sufficient to find signs of feeding and breeding). 	The disturbance footprint contains only 2.52 ha of wooded vegetation (made up of small discrete patches), so surrounding areas of woody vegetation were surveyed, as well as all paddock trees within the study area.	<ul style="list-style-type: none"> • 19.5 hours of area searches over three days (during breeding season), with a team of two people. • Whole study area surveyed for suitable breeding hollows. • All potential hollows observed during breeding season to check for nesting activity.
White-bellied Sea Eagle (breeding) Little Eagle (breeding) Square-tailed Kite (breeding)	No guidelines for these species. The guidelines for the Tasmanian Wedge-tailed Eagle (DEWHA 2010) suggest the following for areas <50 ha: <ul style="list-style-type: none"> • 5 hours area-based searches. • 20 hours of targeted searches over 10 days for signs of feeding or nests. 	The disturbance footprint contains only 2.52 ha of wooded vegetation (made up of small discrete patches), so surrounding areas of woody vegetation were surveyed, as well as all paddock trees within the study area.	<ul style="list-style-type: none"> • 19.5 hours of area searches over three days, with a team of two people. • Whole study area surveyed for stick nests. • Potential stick nests revisited multiple times during breeding season to check for nesting activity.

b Nocturnal birds

During diurnal habitat surveys, hollows were assessed for suitability as owl breeding habitat, and inspected for evidence of breeding, such as owl pellets or scats. Both Barking Owls and Masked Owls require hollows over 20 cm in diameter. Suitable hollows were revisited at dusk and observed from a distance for a period of 30 minutes for any evidence of use by owls. All hollows were observed within 2 hours after sunset. No owls were recorded within the disturbance footprint during any nocturnal surveys, no breeding activity was observed, and no indirect evidence of owls was recorded. One Barn Owl (*Tyto alba*) was flushed from a hollow outside the disturbance footprint during daytime habitat surveys. It was the only owl species recorded in the study area.

Hollow surveys covered an area up to 100 m from the disturbance footprint to take into account the buffer required for species polygons. For some hollows along the access road where land access was prohibited, potential breeding hollows were observed from the road edge using binoculars.

The Bush Stone-curlew was surveyed via a series of spotlighting transects targeting multiple species. Transects targeted woodland areas surrounding the disturbance footprint. No bush stone curlews were recorded, and none were flushed during diurnal habitat surveys across the study area.

Nocturnal bird survey effort is shown in Figure 5.5 and summarised in Table 5.10.

No threatened nocturnal birds were recorded during targeted surveys and will not generate species credits.

Table 5.10 Nocturnal bird survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Bush Stone-curlew	DEC (2004) does not specify survey effort, but suggests daytime habitat searches and flushing, spotlighting and call playback for Bush Stone-curlew.	The disturbance footprint contains only 2.52 ha of wooded vegetation (made up of small discrete patches), so surrounding areas of woody vegetation were surveyed.	<ul style="list-style-type: none"> • 4 hours of spotlighting over 4 nights. • 19.5 hours of diurnal flushing surveys (during habitat assessment and diurnal bird surveys). • Incidental surveys during other spotlighting surveys: <ul style="list-style-type: none"> – 52 hours nocturnal frog surveys.
Barking Owl (breeding) Masked Owl (breeding)	DEC (2004) suggests call playback, but this should not be undertaken during the breeding season so as not to disturb breeding owls (both target species are listed for breeding credits). DEC (2004) guidelines also recommend daytime habitat searches (for hollows and pellets) and stag watching (observe each hollow for 30 minutes prior to sunset and 60 minutes after sunset).	The disturbance footprint contains only 2.52 ha of wooded vegetation (made up of small discrete patches), so surrounding areas of woody vegetation were surveyed, as well as all paddock trees within the study area.	<ul style="list-style-type: none"> • Whole study area surveyed for suitable breeding hollows and pellets. • All potential hollows observed from a distance for 30 minutes, within 2 hours of sunset. • Incidental surveys during other spotlighting surveys: <ul style="list-style-type: none"> – 4 hours spotlighting transects. – 52 hours nocturnal frog surveys. – 15 hours between stag watching locations.

c Arboreal mammals

The one arboreal mammal with potential of occurring in the study area is the Eastern Pygmy-possum. After initial habitat assessments and vegetation mapping, the disturbance footprint was designed to avoid areas of woodland habitat and surveys were not specifically designed to target this species. The final design now incorporates 2.52 ha of woodland habitat along the access road.

The woodland habitat within the study area is not optimal for the Eastern Pygmy-possum due to the lack of a dense shrub layer. The study area is outside the known range of the Eastern Pygmy-possum, which is only known from more densely forested areas to the east. Paddock trees do not represent important habitat for the species.

Spotlighting surveys were carried out to target nocturnal mammal species in the areas of woodland surrounding the disturbance footprint. 500 m transects were undertaken by two observers (1,000 m total transect), with 25 m between transects. Observers moved at a speed of 10 m per minute (ie 50 minutes for a 500 m transect). Due to the limited potential wooded habitat within the site, in some cases longer transects were completed in order to reach more suitable habitat.

The survey effort summarised in Table 5.11 is shown in Figure 5.6. During all spotlighting transects and incidental spotlighting efforts, a total of one Brush-tailed Possum (*Trichosurus vulpecula*) was observed. No other arboreal mammal species were recorded during spotlighting surveys, and no species credits will be generated.

Although no Eastern Pygmy-possums were recorded during spotlighting surveys, the species is very difficult to detect via spotlighting (as noted in the TBDC). The spotlighting effort is not believed to be sufficient to determine the presence of the species in the disturbance footprint. Eastern Pygmy-possum will be assumed present in suitable areas of woodland.

Table 5.11 Arboreal mammals survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Eastern Pygmy-possum	DEC (2004) suggests 2 x 1 km transects for up to 50 ha of habitat, on two separate nights.	The disturbance footprint contains only 2.31 ha of wooded habitat associated with these species (made up of small discrete patches), so surrounding areas of woody vegetation were surveyed where accessible.	<ul style="list-style-type: none"> • 4 hours of spotlighting over 4 nights. • Incidental surveys during other spotlighting surveys: <ul style="list-style-type: none"> – 52 hours nocturnal frog surveys. – 15 hours spotlighting between stag watching locations.

d Koalas

Habitat assessment

The habitat assessment and targeted surveys for koala were completed before the release of new guidelines specific to koala were released in June 2022 (DPE 2022d). The new guidelines have a more conservative approach to 'suitable habitat', stipulating that suitable habitat for the koala is any PCT that is associated with koala in the TBDC, which also has at least one koala use tree present. The presence of a koala use tree in any vegetation zone of a PCT leads to the inclusion of the whole mapped PCT as suitable koala habitat.

All PCTs mapped within the disturbance footprint are associated with the koala, and all contain at least one of the listed koala use trees specific to the region, recorded within vegetation plots or during hollow bearing tree assessments (Table 5.12). All vegetation zones within the disturbance footprint are hence considered suitable koala habitat under the DPE (2022d) guidelines. The vegetation zones of suitable koala habitat are all continuous (separated by less than 500 m).

Table 5.12 Assessment of suitable koala habitat within the disturbance footprint

PCT	PCT associated with koalas in TBDC?	Koala use trees present?	Woodland extent within disturbance footprint (ha)	DNG extent within disturbance footprint (ha)
PCT 84 – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Yes	Present	0.04	-
PCT 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion	Yes	Present	0.59	129.70
PCT 571 – Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	Yes	Present	0.17	-

Table 5.12 Assessment of suitable koala habitat within the disturbance footprint

PCT	PCT associated with koalas in TBDC?	Koala use trees present?	Woodland extent within disturbance footprint (ha)	DNG extent within disturbance footprint (ha)
PCT 590 – White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	Yes	Present	1.72	86.79
Total			2.52	216.49

Much of the disturbance footprint comprises derived native grassland or cultivated paddocks with sparse scattered trees; the cumulative area of woodland within the disturbance footprint is very small. Based on habitat assessments at the time of survey, only the woodland areas within and surrounding the site were considered to be suitable koala habitat, due to the poor habitat quality between patches of woodland (no habitat features such as a shrub layer or fallen timber, generally large distances between scattered trees). To target the most likely koala habitat, the survey effort focused on the woodland areas within the study area.

The survey 115r project completed is summarised in Table 5.13 and is shown in Figure 5.6. No koalas were recorded during targeted surveys and will not generate species credits.

Table 5.13 Koala survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Koala	<p>DEC (2004) suggests spotlighting and call playback, with no indication of suggested effort.</p> <p>The new DPE guidelines (DPE 2022d) recommend:</p> <ul style="list-style-type: none"> • SAT or detection dogs; and • Spotlighting or acoustic detection. <p>For every 5 ha suitable habitat, the new guidelines recommend:</p> <ul style="list-style-type: none"> • three 200 m detection dog transects; and • two 200 m spotlighting transects, repeated twice. 	<p>2.52 ha wooded areas.</p> <p>216.49 ha derived native grassland.</p> <p>The wooded habitat within the disturbance footprint is made up of small discrete patches, so surrounding areas of woody vegetation were surveyed where accessible.</p>	<p>Surveys were undertaken before the release of the new DPE (2022d) guidelines. Effort included:</p> <ul style="list-style-type: none"> • 4 hours of spotlighting over 4 nights (4.2km cumulative length of transects). • All accessible woodland habitat surveyed by detection dogs over four days (see Appendix H for report). • Incidental surveys during other spotlighting surveys. • 52 hours nocturnal frog surveys. • 15 hours spotlighting between stag watching locations.

Survey techniques

Spotlighting surveys were carried out to target nocturnal mammal species. All animals observed were recorded. 500 m transects were undertaken by two observers (1,000 m total transect), with 25 m between transects. Observers moved at a speed of 10 m per minute (ie 50 minutes for a 500 m transect). Due to the limited potential wooded habitat within the study area, longer transects were completed in some areas in order to reach more suitable habitat (Figure 5.6).

The study area was also surveyed for the presence of koalas using koala detection dogs. Each site was surveyed by a koala detection dog until sign of presence was detected (at which point they moved on) or the accessible areas of the site had been searched thoroughly. At each site, the following information was collected:

- date range of surveys
- track logs of the dog and the dog handler via Garmin GPS devices
- location of evidence of target species provided in a geospatial pdf map
- information on habitat/tree species at location of scat or animal
- approximate age of koala scat.

The koala detection dog surveys were completed by Tate Animal Training Enterprises, their report is provided in Appendix H. Surveys in December 2021 were cut short by wet weather, so a second survey was completed in February 2022. The qualifications of the detection dog handlers are outlined below in Table 5.14, as per the DPE (2022d) requirements. The conditions during each survey effort are outlined in Table 5.15 as per the requirements in DPE (2022d) guidelines.

Table 5.14 **Credentials of detection dog handlers**

Handler	Experience
Simone Popp BSc	<ul style="list-style-type: none"> • 12 years experience handling dogs and caring for koalas. • 5 years experience of koala feed tree collection for zoos and conservation organisations. • Since 2021, conducted detection dog surveys for koalas for NPWS, Mid Coast Council and Part Macquarie Hastings Council.
Claire Chiotti bAnimSc	<ul style="list-style-type: none"> • 18 years animal training and handling experience. • 5 years experience training and handling koala detection dogs for NPWS, DPI, Mid Coast Council and various ecological consultancies.

Table 5.15 **Conditions on each day of targeted koala survey**

Date	Start and finish time	Survey method	Rainfall for 72 hours prior to survey (mm)	Rainfall (mm)	Temperature (min-max)	Relative humidity (%)	Mean wind speed (km/h)
8/12/2021	7.00 am–4.00 pm	Detection dogs	0.6	21	16.5–25.9	77	12
9/12/2021	7.00 am–12.00 pm	Detection dogs	21.6	12.4	14.6–28.2	66	12
13/12/2021	9.00 pm–1.00 am	Spotlighting	0.8	0	13.1–26.5	54	8
14/12/2021	10.00 pm–1.00 am	Spotlighting	0	0	13.9–27.8	41	10
15/12/2021	9.00 pm–1.00 am	Spotlighting	0	0	11.9–30.6	40	8

Table 5.15 Conditions on each day of targeted koala survey

Date	Start and finish time	Survey method	Rainfall for 72 hours prior to survey (mm)	Rainfall (mm)	Temperature (min-max)	Relative humidity (%)	Mean wind speed (km/h)
16/12/2021	10.00 pm–1.00 am	Spotlighting	0	0	15.8 – no data	54	11
9/2/2022	7.00 am–4.00 pm	Detection dogs	0	0	11.7–28	53.5	11
10/2/2022	7.00 am–4.00 pm	Detection dogs	0	0	12.6–31.5	45	11

e Microchiropteran bats

Surveys for microchiropteran bats (microbats) were carried out using a combination of acoustic detectors and harp trapping. Acoustic detectors were set out to record the presence of microbat species within suitable habitat for Southern Myotis. Each detector was placed out for a minimum of four nights, and calls were analysed by an expert with experience in bat call analysis (Appendix I.1).

The acoustic detection surveys identified calls that were characteristic of either Southern Myotis or a species of the genus *Nyctophilus*. It was not possible to distinguish these bats based on calls alone, so a subsequent harp trapping survey was undertaken. Harp trapping was carried out over eight nights, in February and March 2022 (Appendix I.2). Several Lesser Long-eared Bats (*Nyctophilus geoffroyi*) were captured during the survey effort, likely explaining the calls detected in the acoustic detection surveys.

Survey locations for microbats are outlined in Figure 5.6. Southern Myotis was not recorded during targeted surveys and will not generate species credits.

Table 5.16 Microbat survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Southern Myotis	Per 2.5km riparian length (OEH 2018): <ul style="list-style-type: none"> • 16 harp trap nights (over at least four nights); or • 16 anabat nights (over at least four nights). 	4.7 km of Kings Creek within 200m of disturbance footprint.	<ul style="list-style-type: none"> • 36 anabat nights (9 locations over 4 nights). • 35 harp trapping nights (11 locations over 2–4 nights).

f Amphibians

Aural visual surveys were conducted following the DPIE (2020b) guidelines, with 120 minutes spent on each 500 m transect, with observers conducting 5 minutes of aural surveys and 5 minutes of visual surveys for every 50 m stretch of the transect. All frog species observed during the surveys were recorded.

The aquatic habitat within the study area was assessed for the habitat requirements of both target species. Booroolong Frogs inhabit permanent streams with cobble sections and fringing riparian vegetation cover. Some sections of Kings Creek contained potential habitat for this species.

Buffer = 50 m from top of bank.

Tusked frog inhabits still or very slow flowing sections of permanent streams or pools. This habitat mainly occurs along Kings Creek, but the survey area was conservatively extended along Kateys Creek (3rd order stream on the western edge of the study area) and the (unnamed) 2nd order stream on the eastern side of the study area, as these waterways had sufficient flow in their lower sections at the time of survey. Jessie’s Creek (2nd order) did not have sufficient flow to be considered potential habitat for Tusked Frog.

Buffer = 500 m from top of bank.

Seven transects were surveyed along the three waterways with suitable habitat. Surveys along each transect were repeated four times, over nine nights during October and December 2021.

The survey locations for frogs are shown in Figure 5.7. No threatened frogs were recorded during targeted surveys and will not generate species credits.

Table 5.17 Amphibian survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Tusked frog	1 x 500 m (120 minutes) transect per 1000m of suitable habitat, repeated over 4 days (DPIE 2020b).	5,500 m of King’s Creek within 500 m of disturbance footprint. 600 m of suitable habitat on eastern creekline. Approximately 1,000 m of suitable habitat on Kateys Creek. 7,100 m total of suitable habitat.	<ul style="list-style-type: none"> 7 x 500 m transects, repeated four times each: <ul style="list-style-type: none"> 5 transects along Kings Creek, 1 on Kateys Creek, 1 on eastern creekline.
Booroolong Frog	As above	Approx 750 m of Kings Creek within 50 m of disturbance footprint.	As above.

g Reptiles

The Pale-headed Snake was surveyed via a series of spotlighting transects targeting multiple species. Transects targeted woodland areas surrounding the disturbance footprint, and paddock trees within the study area. Pale-headed Snakes are a highly cryptic species, often hiding in tree hollows or sheltering in loose bark on tree trunks.

Five hundred (500) m transects were undertaken by two observers (1,000 m total transect), with 25 m between transects. Observers moved at a speed of 10 m per minute (ie 50 minutes for a 500 m transect). Due to the limited potential wooded habitat within the site, in some cases longer transects were completed in order to reach more suitable habitat. Observers searched in loose bark and any accessible hollows while conducting spotlighting transects.

Opportunistic spotlighting for reptile species was also carried out during and between frog transects in wooded areas along waterways.

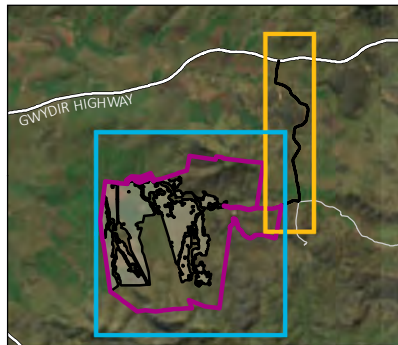
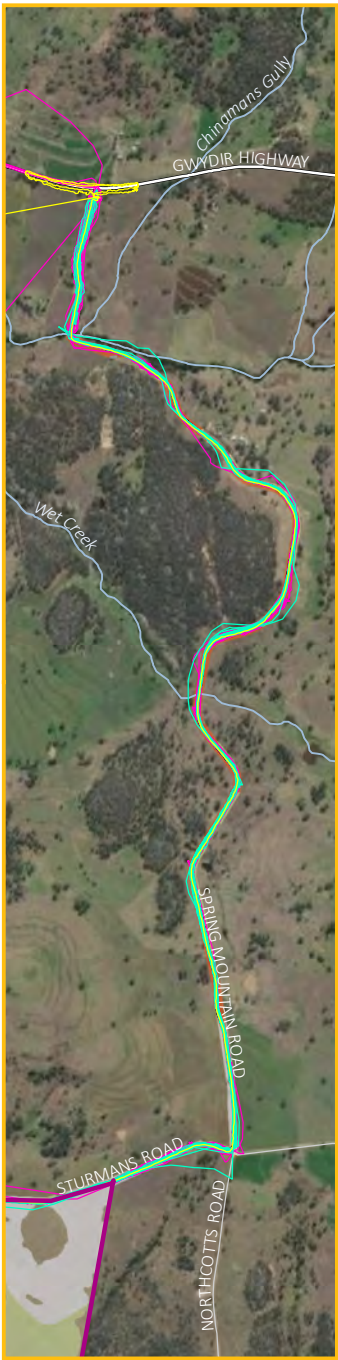
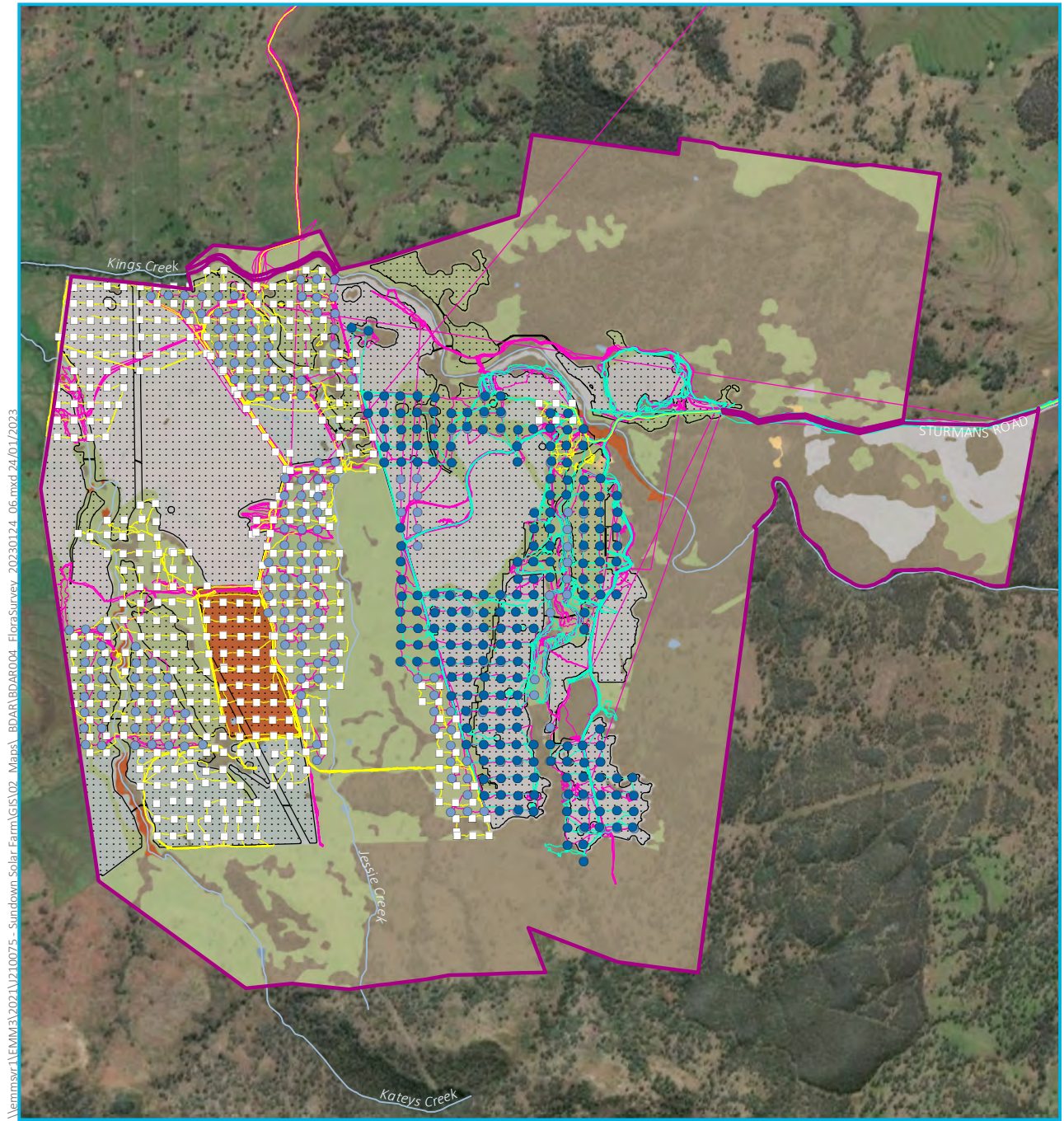
Targeted surveys were completed in December 2021 before the recent publication of reptile survey guidelines by DPE in November 2022 (DPE 2022h). The survey effort undertaken was therefore based on the previous DEC (2004) survey guidelines.

Additional surveys were conducted earlier in October 2021. Although outside of the survey season for the species observers looked for reptiles during other nocturnal survey efforts regardless due to the cryptic nature of the species. The survey effort requirements were all met during the December surveys.

The reptile survey effort is outlined in Figure 5.7. No threatened reptiles were recorded during targeted surveys and will not generate species credits.

Table 5.18 Reptile survey guidelines and effort

Target species	Survey guidelines	Areas for survey	Survey effort completed
Pale-headed Snake	30 minute spotlighting and habitat searches per 100 ha of suitable habitat, repeated on two nights (DEC 2004).	The disturbance footprint contains only 2.52 ha of wooded vegetation (made up of small discrete patches), so surrounding areas of woody vegetation were surveyed, as well as paddock trees within the study area.	<ul style="list-style-type: none"> • 4 hours of spotlighting over 4 nights (6 transect locations, 4.2 km cumulative length of transects). • Incidental surveys during other spotlighting surveys: <ul style="list-style-type: none"> – 52 hours nocturnal frog surveys; and – 15 hours spotlighting between stag watching locations.



- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Named watercourse
 - Flora survey effort (points)
 - February 2021 (ELA)
 - October 2021 (EMM)
 - February 2022 (EMM)
 - Flora survey effort (transects)
 - February 2021 (ELA)
 - October 2021 (EMM)
 - February 2022 (EMM)
 - Vegetation zone
 - Woodland
 - Derived native grassland (DNG)
 - Cleared
 - Cultivation
 - Exotic
 - Waterbody

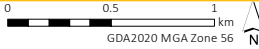
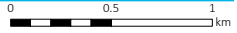
Flora survey methods

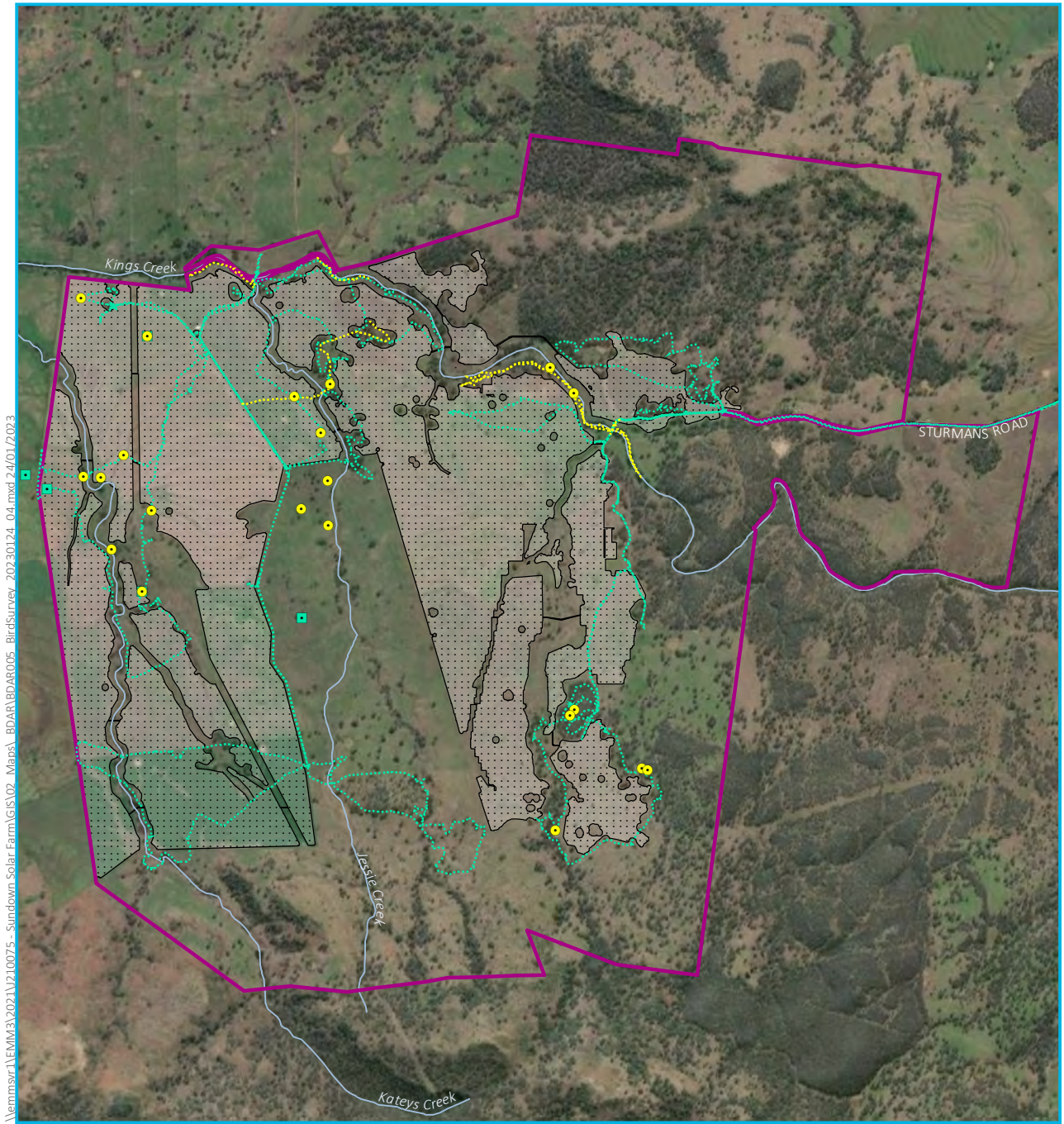
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.4



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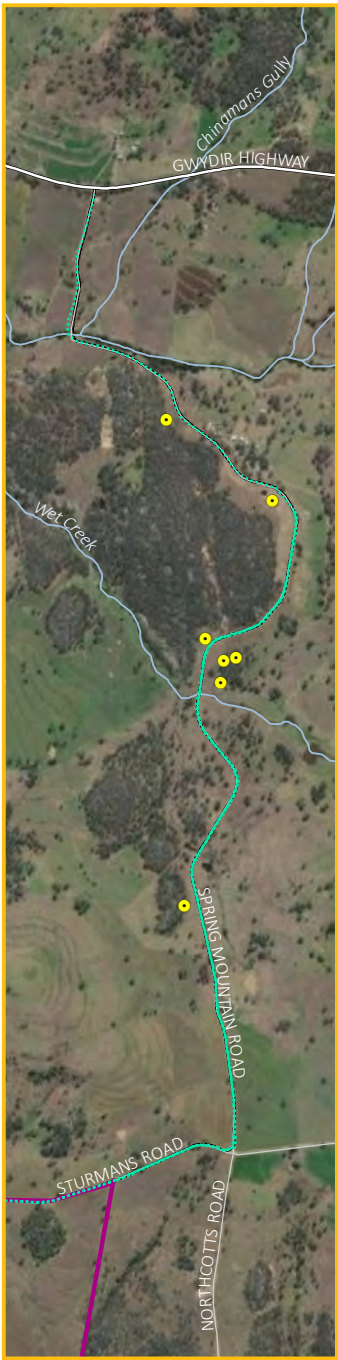
Source: EMM (2022, 2021, 2023); Canadian Solar (2021, 2023); ELA (2021); ESRI (2023); DFSI (2017); GA (2011)



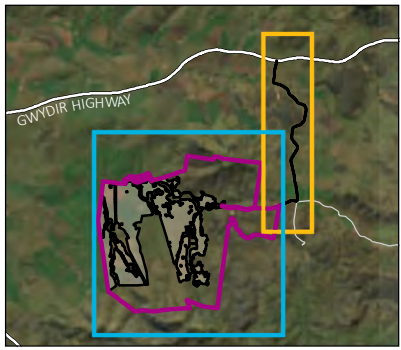


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Source: EMM (2023, 2022, 2021); Canadian Solar (2021, 2023); ESRI (2023); DFSI (2017); GA (2011)



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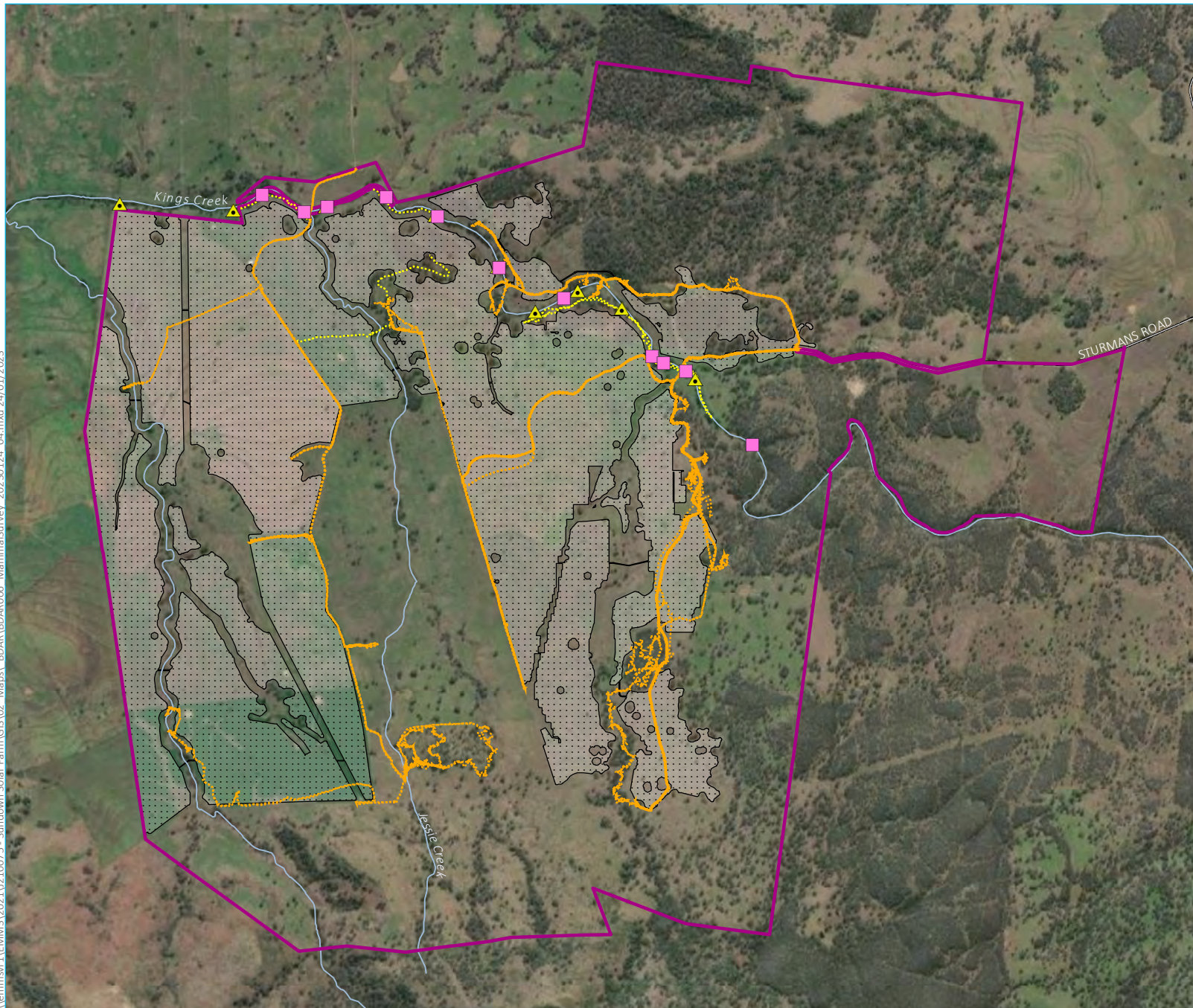
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Named watercourse
- Bird survey effort**
- Stick nests observed for raptor activity
 - Hollows observed for owl activity
 - Diurnal bird survey
 - Spotlighting survey

Bird surveys

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.5



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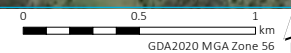
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Named watercourse
 - Mammal survey effort**
 - Harp trapping location
 - ▲ Anabat location
 - Koala detection dog survey
 - Spotlighting survey

Mammal surveys
(koalas and microbats)

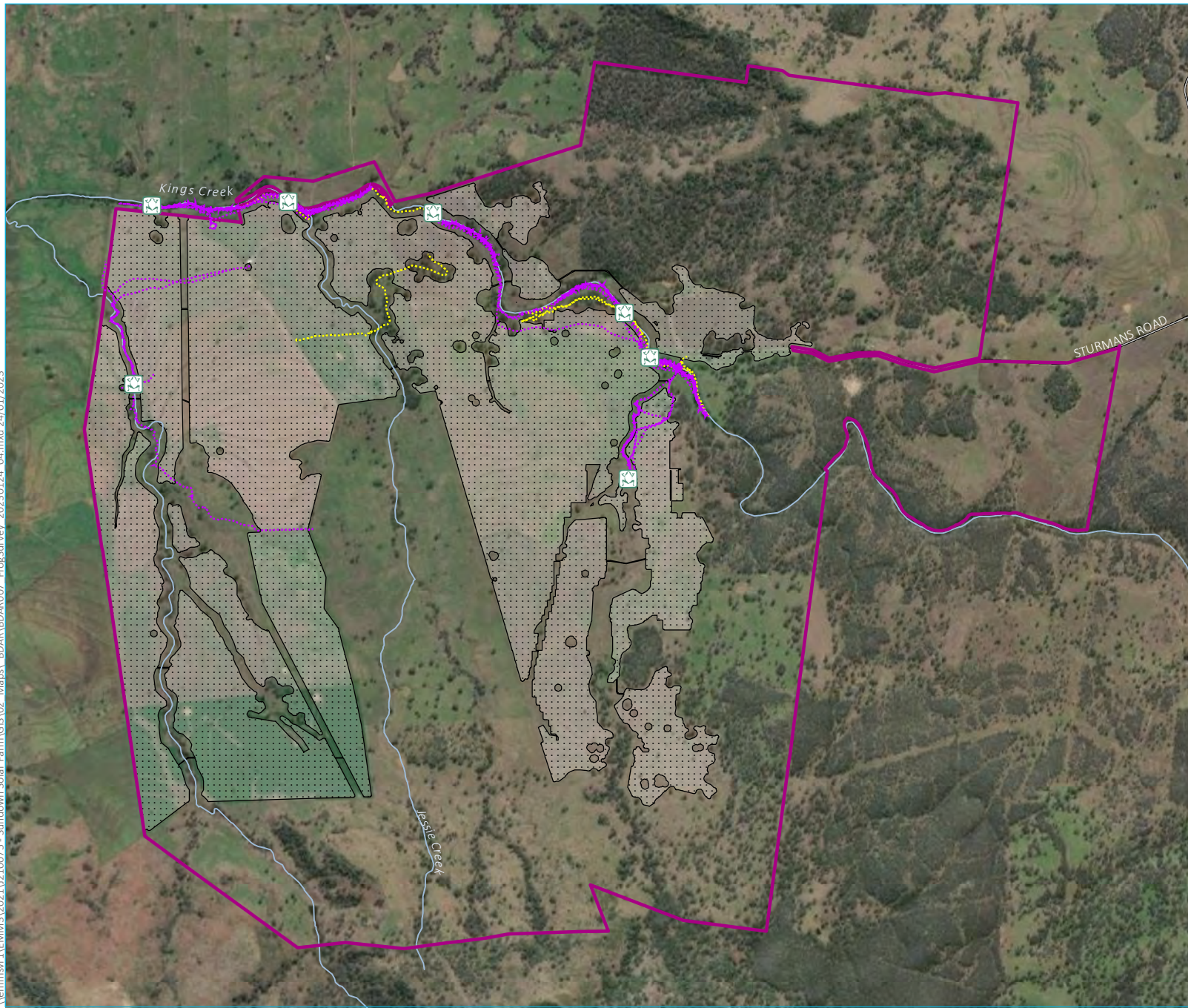
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.6



Source: EMM (2023, 2022, 2021); Canadian Solar (2023, 2021); ESRI (2023); DFSI (2017); GA (2011)



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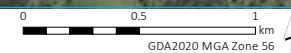
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Named watercourse
 - Mammal survey effort**
 - Frog transect starting point
 - Frog transect survey
 - Spotlighting survey

Amphibian and reptile surveys

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 5.7



Source: EMM (2023, 2022, 2021); Canadian Solar (2023, 2021); ESRI (2023); DFSI (2017); GA (2011)



5.5 Aquatic habitat

Aquatic environments within the study area comprise:

- several small existing farm dams that would have supported past agricultural use
- first- to fourth- order watercourses. The main watercourses that intersect the disturbance footprint are Jessie Creek, Kateys Creek, Kings Creek and Swan Brook.

5.5.1 Desktop review

A desktop review of background information was undertaken and included the following resources:

- Key fish habitat mapping – key fish habitats have been defined in NSW by DPI and include habitats that are important for the maintenance of fish populations, the survival of threatened aquatic species, and the sustainability of fishing industries (DPI 2021).
- Fish community status map of NSW – represents the overall condition of fish communities based on a number of NSW DPI Fisheries datasets (DPI 2015a).
- Threatened fish distributions – indicative distribution maps for threatened aquatic species in NSW, modelled using records from the last 20 years (DPI 2016–2021).
- Commonwealth Protected Matters Search Tool (PMST) (DCCEEW 2023) for threatened fish that are MNES.

The results of the desktop assessment are summarised in Table 5.19.

Table 5.19 Aquatic desktop assessment

Data source	Jessie Creek (2 nd order)	Kateys Creek (3 rd order)	Kings Creek (4 th order)	Swan Brook (4 th order)
Freshwater fish community status	Not classified	Not classified	Poor	Poor
Key fish habitat	No	Yes	Yes	Yes
Threatened fish distributions	None	Southern Purple Spotted Gudgeon (<i>Mogurnda adspersa</i>)	Southern Purple Spotted Gudgeon (<i>Mogurnda adspersa</i>) Murray-Darling Basin population of Eel Tailed Catfish – (<i>Tandanus tandanus</i>)	Southern Purple Spotted Gudgeon (<i>Mogurnda adspersa</i>) Murray-Darling Basin population of Eel Tailed Catfish – (<i>Tandanus tandanus</i>)
Threatened aquatic communities	None	None	None	None

5.5.2 Field observations

Aquatic habitat was inspected by EMM as part of habitat assessments for the study area.

Farm dams recorded include a combination of online and offline waterbodies. None of the farm dams observed contained well-established fringing aquatic vegetation or wetland habitat (for example, see Photograph 5.1) with vegetation representing flooded grassland.



Photograph 5.1 Farm dam on the Glen Eisle property

Kings Creek and Swan Brook are the only waterways that were observed to have permanent flow. The second and third order tributaries (Kateys Creek, Jessie creek and an unnamed second order stream) were dry during site inspections in May and August 2021 but were flowing after significant rainfall towards the end of 2021. Swan Brook could only be accessed at the crossing along Spring Mountain Road.

Kings Creek was thus the focus of aquatic habitat assessments. It is a degraded waterway, impacted by agricultural land use in the surrounding area. The majority of the creek frontage within the study area is lined intermittently by a narrow gallery forest of River Oak over a grassy understorey.

Stream characteristics observed for different waterways are summarised in Table 5.20.

Table 5.20 Characteristics of key waterways within the study areas

Kings Creek	Jessie Creek	Kateys Creek	Swan Brook
Surrounding land use is agricultural.	Surrounding land use is agricultural.	Surrounding land use is agricultural.	Surrounding land use is agricultural.
Permanent flow.	Ephemeral, intermittent flow.	Ephemeral, intermittent flow.	Permanent flow.

Table 5.20 **Characteristics of key waterways within the study areas**

Kings Creek	Jessie Creek	Kateys Creek	Swan Brook
Presence of some gravel and sandy substrates in some sections. Presence of some cobble sections and shallow areas with rocky beds, creating riffles. Silty in sections.	Silty substrate. No gravels or cobbles.	Silty substrate.	Substrate unknown.
Deeper pools downstream of riffles, in some sections, creating a sequence of riffles and pools, and areas of fast and slow currents.	Lacks deep pools, slow moving water.	Lacks deep pools, slow moving water.	Presence of deeper pools unknown.
Corridor of riparian vegetation present, over-water shading in places.	Lack of riparian vegetation in the downstream sections. Sparse riparian vegetation at the top of banks upstream.	Lack of riparian vegetation in the downstream sections. Sparse riparian vegetation at the top of banks upstream.	Corridor of riparian vegetation present, over-water shading in places.
Aquatic vegetation largely absent. Lack of trailing or over-water vegetation.	Aquatic vegetation largely absent. Lack of trailing or over-water vegetation.	Aquatic vegetation largely absent. Lack of trailing or over-water vegetation.	Aquatic vegetation largely absent at the Spring Mountain Road crossing. Lack of trailing or over-water vegetation.
Water quality: discoloured, turbid.	Water quality: discoloured, turbid.	Water quality: discoloured, turbid.	Water quality: discoloured, turbid.
Some instream woody debris, including snags and old cattle fencing.	Lacks instream woody debris.	Lacks instream woody debris.	Presence of instream habitat such as snags is unknown.

Photographs illustrating the nature and condition of waterways within the study area are shown below.



Photograph 5.2 Downstream section of Kateys Creek (looking north-east)



Photograph 5.3 Downstream sections of Jessie Creek (looking south)



Photograph 5.4 Kings Creek (looking downstream)



Photograph 5.5 Section of Kings Creek lacking a vegetated riparian corridor

5.5.3 Habitat assessment

The Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) prefers slow flowing or still water, with cover from rocks, snags and aquatic vegetation being important habitat features (DPI 2023b). The species may use Kings Creek or Swan Brook provided there are no obstructions to access up and downstream but the habitats are likely to be of marginal value.

The Eel-tailed Catfish (*Tandanus tandanus*) forms an endangered population in the Murray-Darling Basin. This species is known to inhabit a diverse range of freshwater environments but prefers clear, sluggish or still waters and relies on good cover of gravel and cobbles as well as emergent and submergent vegetation for breeding (Duncan *et al.* 2017; DPI 2023a). Although the species is considered conservatively to have potential to use Kings Creek and Swan Brook, the habitat values of these waterways are likely to be marginal.

Both species are unlikely to occur in the downstream sections of Kateys Creek and Jessie Creek, considering the lack of deep pools, still water and ephemeral nature of these watercourses. The lack of aquatic vegetation, snags or rocks further reduces the suitability of the habitats within the downstream sections of Kateys Creek and Jessie Creek.

Kings Creek and Swan Brook would be classified as a Class 1 major key fish habitat, as they are permanently flowing waterways and provide potential habitat for threatened fish species or populations. Kateys Creek would be classified as a Class 3 minimal key fish habitat, as it has intermittent flow, forms pools of water following a rain event and is connected to a Class 1 waterway (ie flows into Kings Creek). Second order streams (such as Jessie Creek) and farm dams are excluded from classification as key fish habitat for the purposes of the application of the FM Act (DPI 2013).

Stage 2 – Impact assessment

6 Impact assessment

6.1 Avoidance and minimisation of impacts

The BAM requires projects to outline the strategies and actions that may have been taken to avoid or minimise impacts on biodiversity values during proposal planning (DPIE 2020a), including efforts to minimise prescribed impacts identified.

The study area has a long history of agricultural use, which has had a substantial influence on the current condition of the land. Although cropping and stock grazing continues to be undertaken in the study area, the site nevertheless continues to support grassy woodland and derived native grassland vegetation.

Avoidance and minimisation strategies presented in the following section are driven by the following key biodiversity values identified in the study area, which include:

- Box Gum Woodland, which is listed under the BC Act and is also an SAI entity (see Section 6.5)
- mature trees with hollows suitable for fauna use
- habitat for Bluegrass and Austral Toadflax (listed as Vulnerable under the BC Act and EPBC Act).

It is recognised that Box Gum Woodland is critically endangered and is a potential SAI entity due to:

- overclearing (>90%) ie reduction in geographic extent (Principle 1)
- continuing impacts from land use affecting quality of remaining extents and patch size (Principle 2).

Furthermore, Box Gum Woodland is known to provide functional habitat for a suite of fauna species (including threatened species), including hollow-dependent fauna. The decline in Box Gum Woodland and derived native grassland has led to a decline in associated fauna assemblages (DECCW 2011).

6.1.1 Avoidance and minimisation approach

Field investigations have been carried out in parallel with the development of the project design. As part of this process, the project design has been substantially influenced by the biodiversity constraints. The design principles identified early in the project design process included the following:

- protect waterways and vegetated corridors:
 - achieve adequate setbacks from riparian corridors and waterways
 - limit vegetation removal required to upgrade waterway crossings as far as practicable
- avoid areas of higher quality vegetation as far as practicable
 - avoid woodland vegetation as far as practicable
 - preferentially use lower quality derived grassland over better quality derived native grassland
 - optimise use of existing cultivated areas
- avoid known occurrences of threatened candidate species where practicable
- access route selection – opt for the route with lower risks to biodiversity.

These design principles were applied where possible to achieve the best outcome for biodiversity but needed to be considered in concert with other design and environmental constraints. Key avoidance and minimisation measures achieved during the development of the concept design are outlined in Table 6.1.

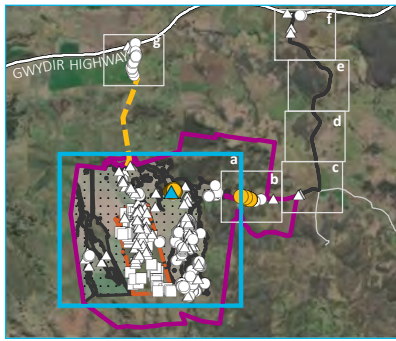
Table 6.1 **Avoidance and minimisation measures**

Item	Description of avoidance and minimisation measure
1	<p>Most of the woodland patches and derived native grassland areas have been avoided, recognising that most of the native woodland identified in the study area aligns with Box Gum Woodland, which is an SAII entity and is critically endangered under both BC Act and EPBC Act.</p> <p>A decision was made to exclude several eastern paddocks on the Newstead property from the project to avoid impacts on Box Gum Woodland including associated derived native grasslands (see paddocks labelled as “Newstead – Eastern Paddocks” on Figure 6.1). These paddocks are ideally suited to solar development based on topography and proximity to the existing powerline connection. These paddocks were included in earlier iterations of the project design.</p> <p>The exclusion of these areas from the project reduces the generation capacity of the project by approximately 33 MW_{dc} but avoids over 177 ha of derived native grassland, more than 30 ha of woodland and at least 63 hollow-bearing trees, representing habitat for:</p> <ul style="list-style-type: none"> • Box Gum Woodland CEEC; • known records of Bluegrass (69 records, 1650 individuals) and Austral Toadflax (1 record, 1 individual); • threatened woodland fauna known to occur in the study area (ecosystem credit species, see Section 5.4.4va); and • hollow-dependent fauna. <p>The derived native grassland avoided by the project represents relatively better-quality grassland compared with derived native grassland in the western paddocks on the Newstead property and compared with the derived native grassland on the Glen Eisle property, ie avoids 590_DNG_MOD (vegetation integrity score = 20.1) preferentially over 590_DNG_LOW (vegetation integrity score = 17.8) and 590_DNG_V_LOW (vegetation integrity score = 9.1).</p>
2	<p>The project avoids 502 records representing over 18,700 plants of Austral Toadflax from the disturbance footprint. This represents avoidance of approximately 94% of all the plants recorded since 2018.</p> <p>The avoidance of individuals involved moving PV panels out of areas and away from certain sections of first order watercourses that were considered for development. These areas were initially considered for development to maximise the generation capacity, since the first order watercourses in these sections are dry most of the time and do not contain wetland or riparian vegetation (derived native grassland not noticeably differentiated from surrounding grassland).</p>
3	<p>The project also avoids 245 records representing over 3,700 plants of Bluegrass from the disturbance footprint. This represents avoidance of almost all of the plants recorded since 2018.</p>
4	<p>The project also avoids 206 of 240 (approximately 86%) hollow bearing trees recorded in the study area.</p>
5	<p>Two access road options were considered at early design phase:</p> <ul style="list-style-type: none"> • Spring Mountain/Sturmans Road; and • an alternate route via a private road west of Spring Mountain Road. <p>The Spring Mountain Road/Sturmans Road option was selected over the alternative private road access for several reasons, including:</p> <ul style="list-style-type: none"> • less disturbance required to upgrade Spring Mountain Road/Sturmans Road; • avoidance of better-quality roadside grassland vegetation; and • avoidance of over 62 Bluegrass plants and 1098 Austral Toadflax plants occurring along the private access road. <p>That is, the access route option selected requires less road upgrades and impacts fewer threatened flora records in roadside vegetation (see Figure 6.1).</p>
6	<p>The disturbance footprint minimises disturbance of existing watercourses and associated riparian corridors and minimises the number of new watercourse crossings required.</p>

Table 6.1 **Avoidance and minimisation measures**

Item	Description of avoidance and minimisation measure
7	<p>The disturbance footprint includes 10 m indirect impact zone from the edge of infrastructure to accommodate vegetation management works, and foot and vehicle traffic. No vegetation removal is proposed within the indirect impact zone but there is potential for edge impacts where project infrastructure interfaces with retained vegetation.</p> <p>The indirect impact zone will be fully offset but options to minimise impacts in this space during construction and operation of the project will be fully explored and implemented where possible. The indirect impact zone will be managed and will act as a buffer between the operational areas and retained vegetation outside of the project disturbance footprint.</p>
8	<p>The disturbance footprint is set back from most woodland patches by between 10–20 m. This is in addition to the 10 m indirect impact zone identified (item 7 above).</p>
9	<p>The PV modules will be installed via driven piling methods, which minimises the degree of ground disturbance required over other construction methods that involve concrete foundations.</p>

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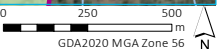


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Alternative private road access option
 - Newstead - Eastern Paddocks
 - Hollow-bearing tree (Newstead - Eastern Paddocks)
 - Major road
 - Minor road
 - Watercourse/drainage line
 - Box Gum Woodland
- Avoided records**
- Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)
- Impacted records**
- Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)

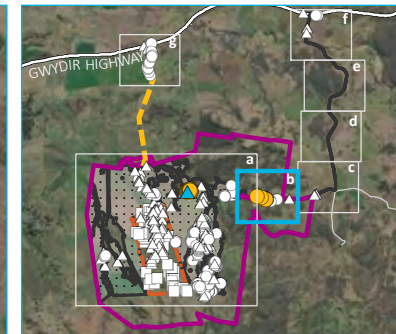
Avoidance and minimisation strategy

Sundown Solar Farm
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Figure 6.1a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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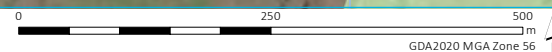


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Alternative private road access option
 - Newstead - Eastern Paddocks
 - Hollow-bearing tree (Newstead - Eastern Paddocks)
 - Major road
 - Minor road
 - Watercourse/drainage line
 - Box Gum Woodland
- Avoided records**
- △ Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)
- Impacted records**
- ▲ Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)

Avoidance and minimisation strategy

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 6.1b

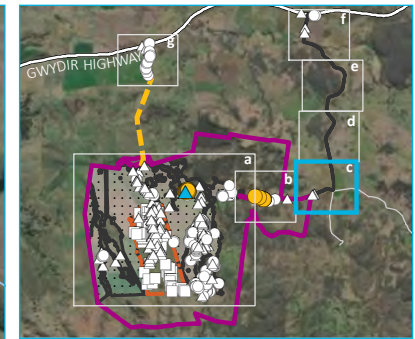
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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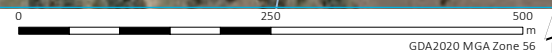
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Alternative private road access option
 - Newstead - Eastern Paddocks
 - Hollow-bearing tree (Newstead - Eastern Paddocks)
 - Major road
 - Minor road
 - Watercourse/drainage line
 - Box Gum Woodland
 - Avoided records**
 - △ Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)
 - Impacted records**
 - ▲ Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)

Avoidance and
minimisation strategy

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 6.1c

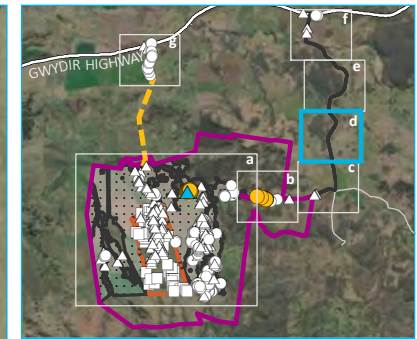


Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56

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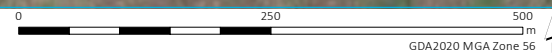


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Alternative private road access option
 - Newstead - Eastern Paddocks
 - Hollow-bearing tree (Newstead - Eastern Paddocks)
 - Major road
 - Minor road
 - Watercourse/drainage line
 - Box Gum Woodland
- Avoided records**
- △ Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)
- Impacted records**
- ▲ Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)

Avoidance and minimisation strategy

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 6.1d

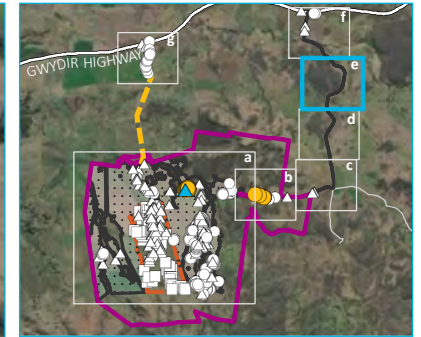
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56



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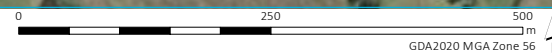


- KEY**
- Proposed Sundown Solar Farm
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- Bluegrass (*Dichanthium setosum*)
 - Austral toadflax (*Thesium australe*)

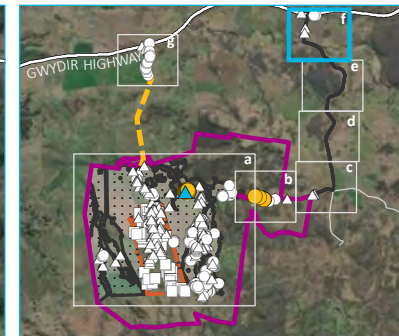
Avoidance and minimisation strategy

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 6.1e

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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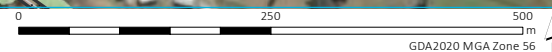


- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
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 - Hollow-bearing tree (Newstead - Eastern Paddocks)
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- Avoided records**
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Avoidance and minimisation strategy

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 6.1f

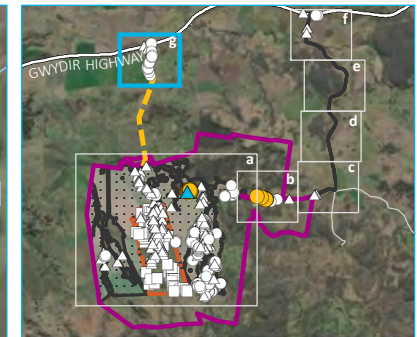
Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56



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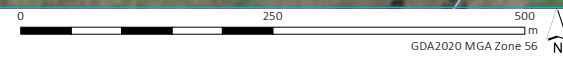
- KEY**
- Proposed Sundown Solar Farm
 - Disturbance footprint
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Avoidance and
minimisation strategy

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 6.1g



Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



6.2 Potential direct and indirect impacts

The impact of the project on biodiversity is expected to involve:

- direct clearing of native vegetation and threatened species habitat (including scattered trees) for the construction of the project
- uncertain impacts from shading of native understorey vegetation by a network of PV panels
- temporary impacts caused by the establishment of construction laydown areas
- indirect impacts where the project interfaces with and potentially interacts with retained vegetation and habitat
- prescribed impacts on threatened species due to clearing of non-native vegetation.

This BDAR takes a conservative approach to the impact assessment by capturing all the predicted impacts within the disturbance footprint, within which full loss of biodiversity values is assumed. The areas of impact assessed as direct impacts in the BDAR therefore:

- Account for uncertain shading impacts on the quality and condition of the understorey vegetation beneath PV panel infrastructure and assumes complete loss of vegetation integrity values even though vegetation under the panels will not be cleared and may even benefit from cessation of agricultural activities. The uncertain impacts from shading is the largest contributor to the disturbance footprint.
- Account for temporary impacts on grassland vegetation by assuming permanent and complete loss of vegetation integrity values in construction laydown areas where tools, materials, equipment, and vehicles are stored temporarily when they are not in use.
- Mitigate indirect impacts predicted to affect grassland vegetation/habitat within 10 m of infrastructure components by assuming complete loss of vegetation integrity values.
- Mitigate prescribed impacts on threatened species by assigning vegetation integrity values to habitat in non-native vegetation.

The following sections describe the direct and indirect impacts in more detail.

6.2.1 Direct impacts

The direct impacts of the project will mainly be associated with clearing works to construct the project. The construction of the project will require upgrades to Spring Mountain Road and Sturmans Road, upgrades to watercourse crossings, installation of infrastructure including PV modules and mounting infrastructure, BESS and substation, and establishment of temporary laydown areas.

The direct impacts of the project during operation of the project will primarily be uncertain impacts from shading of grassland understorey by PV panels.

The direct impacts on biodiversity are summarised below:

- woodland clearing (2.52 ha):
 - this includes 2.48 ha of Box Gum Woodland TEC (BC Act) of which 0.48 ha represents Box Gum Woodland TEC (EPBC Act)

- this also represents 2.52 ha of suitable habitat for Eastern Pygmy-possum for which presence is assumed
- derived native grassland clearing (216.49 ha):
 - this represents clearing of 216.49 ha of Box Gum Woodland derived grassland (BC Act) of which 29 ha is Box Gum Woodland derived grassland (EPBC Act). The majority (approximately 93%) of the derived native grassland clearing is low condition grassland that does not exceed offset thresholds set by the BAM
 - this includes 182.32 ha of suitable habitat for Bluegrass. The species polygon prepared to measure the area of suitable habitat for Bluegrass is conservative as it exceeds the area of suitable habitat occupied by the species. The species polygon for Bluegrass is also mostly represented by low condition grassland
 - this includes 186.73 ha of suitable habitat for Austral Toadflax. The species polygon prepared to measure the area of suitable habitat for Austral Toadflax is conservative as it exceeds the area of suitable habitat occupied by the species. The species polygon for Austral Toadflax is also mostly represented by low condition grassland
- clearing of 34 of 240 hollow-bearing trees recorded that provides hollow bearing resources for fauna
- clearing of 51 scattered trees, of which 18 are hollow-bearing and represent a subset of the above 34 hollow-bearing trees that will be impacted.

A credit requirement was assessed for all of the above impacts and, in relation to vegetation clearing, assumes complete loss of vegetation integrity values (ie setting composition, structure and function scores for all areas of direct impact to zero in estimating future vegetation integrity following the construction of the project).

6.2.2 Indirect impacts

Indirect impacts that could occur because of the project include:

- increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour)
- increase in weeds and pathogens, resulting in degradation of retained native vegetation and habitat
- increase in predatory and pest animal species, resulting in increased predation and competition and a consequent reduction in populations
- potential inadvertent disturbance of retained habitats
- removal of habitat resources for threatened fauna
- displacement of threatened fauna
- runoff, scouring, erosion and sedimentation impacts to retained native vegetation and watercourses.

Section 8.2 of BAM (DPIE 2020a) requires the assessment of indirect impacts on native vegetation, threatened ecological communities and threatened species habitats.

The project disturbance footprint includes a 10 m set back from the edge of infrastructure where indirect impacts on biodiversity may occur, including:

- erosion and sedimentation
- weed introduction and spread
- disturbance from increased noise and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour).

The indirect impact zone has been assessed for ecosystem credits. This is a conservative approach that assumes 100% loss of biodiversity values. In practice, the 10 m setback will be managed for vehicle access and bushfire risks and will not necessitate complete clearance of native vegetation or threatened species habitat. The management of this 10 m setback will include measures to mitigate the impacts of the project on adjacent retained biodiversity values outside of the disturbance footprint, including weed management activities and erosion and run-off controls.

i Erosion and sedimentation

Construction of the project may lead to erosion and sedimentation, which may affect water quality in the catchment and downstream receiving habitats. During the project, sediment may be mobilised and transported by surface water during rainfall events, and potentially discharging into watercourses and drainage lines and potentially reducing water quality in downstream aquatic habitats in Kings Creek or Swan Brook, both of which eventually discharge into the Macintyre River. Increased suspended sediments can reduce light penetration into the water column, reducing photosynthesis of aquatic macrophytes, and decreasing dissolved oxygen levels.

Erosion and sediment control measures will be implemented during the project. Strict controls will be put in place to ensure sediment does not runoff into watercourses.

ii Weed introduction and spread

The project has the potential to facilitate dispersal of weed species. As the disturbance footprint contains high threat weeds and additional exotic species, weed spread has the potential to occur across the disturbance footprint. Uncontrolled movement of vehicles, equipment and personnel within the disturbance footprint is the key vector of transmission, in particular vehicles and equipment sourced from regions beyond the disturbance footprint, which may also introduce new species. Many weed species thrive on ground disturbance and will rapidly colonise disturbed areas in advance of native species recolonisation.

Increased pest flora abundance has adverse impacts on native vegetation and biodiversity, as well as potential negative economic effects on local land uses.

Weed impacts will be mitigated during the construction and operational phases of the project will include measures such weed containment and disposal protocols.

iii Noise and dust

Noise may adversely affect fauna by interfering with communication (eg territorial bird song), masking the sound of predators and prey, causing avoidance reactions and displacement from habitat. Noise will be generated during construction of the project through the use of plant equipment and vehicles.

Increased dust from vegetation clearing and vehicle movements during construction has the potential to temporarily and locally impact flora and fauna values in the vicinity of the subject land. Excess generation of dust and subsequent deposition on leaves can impair plant photosynthesis and productivity (also resulting in reduced habitat quality for fauna) and impact on respiratory systems of fauna.

Potential noise and dust impacts will be temporary as they will only be evident during vegetation clearing. Dust levels will be monitored and when needed dust suppression implemented such as wetting down dirt roads or reducing vehicle speeds.

6.3 Prescribed impacts

6.3.1 Identification of prescribed impacts

Prescribed impacts are identified in Table 6.2. Only one prescribed impact has been identified, being the impact to non-native vegetation representing habitat for Bluegrass and Austral Toadflax.

Prescribed impacts on Bluegrass and Austral Toadflax have been considered further in Section 6.3.2.

Table 6.2 Identification of prescribed impacts

Feature	Present on site	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of report where prescribed impact is addressed
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No	n/a	The proposed development does not contain geologically significant features, rocky areas that represent habitat for threatened species or ecological communities.	n/a	n/a
Human-made structures	Yes	Bridge crossing at Swan Brook (high level multi-cell box culvert system); and farm infrastructure, including sheds and silos on the Newstead property and a residential dwelling and associated sheds on the Glen Eisle property.	Demolition of potential roosting sites for microbats.	None identified	Although no prescribed impacts are identified, some general mitigation measures are included in Section 6.4 (Mitigation and management measures) in relation to demolition activities.
Non-native vegetation	Yes	Cultivation, exotic grassland created for pasture.	Removal of habitat for threatened flora species.	Bluegrass Austral Toadflax	Section 6.3.2 Assessment of prescribed impacts. Section 7.1 Impacts requiring offset.

Table 6.2 Identification of prescribed impacts

Feature	Present on site	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of report where prescribed impact is addressed
Habitat connectivity	Yes	Riparian corridor along Kings Creek.	<p>Removal of small areas of riparian vegetation for internal road crossings at two locations on along Kings Creek (Newstead property).</p> <p>The removal of this vegetation is likely to have a low impact on the connectivity of the riparian corridor as the crossings will comprise bed level crossings and be very small (approximately 5 m wide). This is unlikely to change the movement corridor values of the riparian corridor.</p>	<p>None identified.</p> <p>Koala movement disturbance footprint and wider study area has been considered as per Koala guidance (see Box 1, DPE 2022d). Koala was not detected during surveys and are expected to occur in the locality in low densities. The project proposes to establish new waterway crossings as well as upgrade existing crossings. The crossings will typically be implemented as either bed level or culvert crossings and will preserve riparian corridors. Disturbance of the riparian corridor will be limited and is unlikely to change habitat connectivity values within the study area.</p> <p>Considering this, the project is unlikely to have a prescribed impact on Koala with respect to habitat connectivity.</p>	n/a
Water bodies, water quality and hydrological processes	Yes	1 st , 2 nd , 3 rd order waterways within panel area and farm dams.	Removal of aquatic habitat in the form of farm dams. Creek crossings for internal access roads.	None identified.	n/a
Wind turbine development	No	n/a	No wind farm proposed in the study area.	n/a	n/a

Table 6.2 Identification of prescribed impacts

Feature	Present on site	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of report where prescribed impact is addressed
Vehicle strikes	Yes	Internal access roads and road upgrades along Spring Mountain Road and Sturmans Road.	Increased traffic during construction of the project, increasing risk of vehicle strike on native ground fauna.	None identified. Risk of vehicle strikes on koalas were considered as per Koala guidance (see Box 1, DPE 2022d). Koala was not detected during surveys and are expected to occur in the locality in low densities. Traffic volumes are also only expected to increase during construction and is expected to drop after construction is completed. Considering this, the project is unlikely to have a prescribed impact on Koala with respect to vehicle strikes.	Although no prescribed impacts are identified, mitigation measures are included in Section 6.4 (Mitigation and management measures) in relation to speed limits to mitigate risk of vehicle strikes.

6.3.2 Assessment of identified prescribed impacts

i Non-native vegetation

a Nature

Two threatened flora species recorded within non-native vegetation within the disturbance footprint, Bluegrass and Austral Toadflax.

The non-native vegetation where Bluegrass and Austral Toadflax were recorded represents grassland understorey in paddocks that are subject to regular cultivation activities. The threatened species were recorded outside of cultivation activities (ie in the period after harvest and before the next ploughing event). Bluegrass and Austral Toadflax were also recorded in previously cultivated paddocks where cropping was paused for several years due to drought.

The project will impact on non-native vegetation that provides habitat for Bluegrass and Austral Toadflax. The impact will comprise disturbance of non-native vegetation in the PV areas where PV panels will be installed and in an area on the Spring Valley property where construction laydown will be located.

In the PV areas, the disturbance will largely be associated with potential long-term shading impacts (for which this BDAR conservatively assumes complete loss of habitat) but will also include ground disturbance from driving in piles for the PV mounts during construction. The construction laydown areas may require gravelling of the ground surfaces.

b Extent

The extent of impact on non-native vegetation is estimated to be 1.59 ha for Bluegrass and 5.54 ha for Austral Toadflax, mostly occurring on the Glen Eisle and Spring Valley properties around the margins of paddocks approaching riparian corridors or banks of watercourses, or fencelines.

c Duration

The duration of impacts associated with the construction phase of the project will be for the period of construction (estimated to be 14 months). The construction laydown areas are temporary and will be removed from site at the end of the construction.

The duration of impacts at operation phase of the project will be for the life of the project (ie up to 35 years after construction).

d Consequences

The likely consequence of the impacts on Bluegrass and Austral Toadflax as a result of disturbance of non-native vegetation is loss of poor-quality habitat where permanent removal of vegetation will occur. However, it is noted that under a business-as-usual scenario, Bluegrass and Austral Toadflax have, and will likely continue to be periodically disturbed/removed as a result of agricultural practices.

In relation to long-term shading impacts, the consequence is not certain but could include eventual loss of habitat due to reduced suitability of microsite conditions; however, habitat conditions could improve from cessation of cultivation activities. As a conservative approach, this BDAR assumes complete loss of habitat from shading by PV panels will occur.

ii Actions to mitigate prescribed impacts

Refer to items E.01 and E.04 of Table 6.3.

6.4 Mitigation and management

Mitigation and management measures to address are identified in Table 6.3.

Table 6.3 Mitigation and management measures

Reference	Mitigation measure	Timing	Responsibility	Intended outcome
E.01	Options to further minimise impacts during construction and operation of the project will be fully explored and implemented where possible. This includes: <ul style="list-style-type: none"> • minimising removal of hollow-bearing trees within the approved disturbance footprint; • minimising removal of known occurrences of threatened plants, Bluegrass and Austral Toadflax within the approved disturbance footprint, especially where proximate to core occurrences along watercourses; and • minimising removal of tree resources along the Spring Mountain Road/Sturmans Road access route. 	Detailed design	Contractor	Biodiversity impact minimisation. Minimise impacts on MNES species including Bluegrass and Austral Toadflax.
E.02	A Site Plan will be included in a Construction Environmental Management Plan (CEMP) and will include: <ul style="list-style-type: none"> • the extent of approved disturbance; • any relevant sensitive areas; and • stockpile, material laydown areas, and site compounds. This Site Plan is to be placed in an accessible location to be viewed by all site personnel (site office for example).	Pre-construction	Contractor	General protection measure.
E.03	All occurrences of threatened flora will be identified on the Site Plan and delineated in the field as 'no-go' zones. Threatened flora that are to be retained will be flagged with high visibility tape, or the limits of the occurrence clearly demarcated with high visibility tape or fencing. All contractors will be provided with an environmental induction prior to starting work on site, which includes communications about sensitive areas and no-go zones.	Pre-construction	Contractor	Protection of known occurrences of Bluegrass and Austral Toadflax.
E.04	The construction laydown areas will be rehabilitated following completion of construction works if they are not required for operational purposes and will include removal of any materials brought into site such as gravel.	Post-construction	Contractor	Minimisation of long-term impacts on Bluegrass and Austral Toadflax habitat.

Table 6.3 Mitigation and management measures

Reference	Mitigation measure	Timing	Responsibility	Intended outcome
E.05	<p>The Construction Environmental Management Plan (CEMP) and any operational management plan will include provisions for the appropriate management of the 10 m indirect impact area, including:</p> <ul style="list-style-type: none"> • protocols for bushfire asset management • management of weeds and run-off into adjacent off-project areas. 	<p>Pre-construction Construction Operation</p>	<p>Contractor Operator</p>	<p>Minimisation of indirect/edge impacts on adjacent retained biodiversity values.</p>
E.06	<p>Sediment controls to be implemented during construction in accordance with a sediment and erosion control plan, including installation of fencing and sediments traps in any areas where works will occur in proximity to low lying vegetation or streams.</p>	<p>Pre-construction Construction</p>	<p>Contractor</p>	<p>Protection of waterways and aquatic habitats adjacent to the project. Protection of adjacent grassland habitat for Bluegrass and Austral Toadflax.</p>
E.07	<p>The Construction Traffic Management Plan (CTMP) is to include construction speed limits to minimise risk of vehicle strike during construction phase of projects when there is expected to be an increase in traffic movements.</p>	<p>Construction</p>	<p>Contractor</p>	<p>Mitigate risk of prescribed impact (ie vehicle strike) on threatened species during construction.</p>
E.08	<p>Pre-clearance inspection to be conducted by a suitably qualified ecologist to:</p> <ul style="list-style-type: none"> • inspect hollows prior to tree clearing • inspect buildings prior to demolition • remove any individuals if found • relocate animals to suitable habitat in adjacent vegetation outside of the disturbance footprint • any animals injured during clearing works should be taken to a veterinarian or wildlife clinic. 	<p>Pre-construction</p>	<p>Contractor Qualified ecologist or wildlife carer</p>	<p>Prescribed impact: Mitigate risk of prescribed impact (ie human-made structures) on threatened species as a result of demolition works. General impact: Mitigate injury to potential fauna species inhabiting hollows.</p>

Table 6.3 Mitigation and management measures

Reference	Mitigation measure	Timing	Responsibility	Intended outcome
E.09	<p>Implement a Biodiversity Management Plan (BMP) for retained vegetation adjacent to the disturbance footprint that includes (but is not limited to):</p> <ul style="list-style-type: none"> • protocols to control and manage weeds that may be exacerbated, spread or otherwise affected by the construction and operation of the project • protocols to monitor the vegetation condition and habitat values of any such retained vegetation • provisions for corrective actions should a decline in vegetation or habitat condition be detected. 	<p>Pre-construction Construction Operation Decommissioning</p>	<p>Contractor Operator Qualified ecologist</p>	<p>Protection of biodiversity values adjacent to the project.</p>
E.10	<p>The Biodiversity Management Plan (BMP) shall include prescriptions for the protection and ongoing management of the habitat of retained occurrences of Bluegrass and Austral Toadflax that are surrounded by the approved disturbance footprint.</p>	<p>Pre-construction Construction Operation Decommissioning</p>	<p>Operator</p>	<p>Mitigation of project impacts on candidate species Bluegrass and Austral Toadflax. Mitigation of project impacts on MNES Bluegrass and Austral Toadflax.</p>

6.5 Serious and Irreversible Impacts

An impact is to be regarded as a serious and irreversible impact (SAIL) if it is likely to contribute significantly to the risk of a threatened species (including endangered populations) or an ecological community becoming extinct based on the following 4 principles:

- Principle 1: The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
- Principle 2: The impact will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
- Principle 3: The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
- Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity, and therefore its members are not replaceable.

Candidate SAIL entities for the project are discussed in the following sections against the relevant principles for the listing of the SAIL entity, based on information from the Threatened Biodiversity Data Collection (TBDC). No assessment of any other threatened entities at risk of an SAIL has been requested by the decision-maker in the SEARs.

6.5.1 Threatened species

Section 9.1.2 of BAM (DPIE 2020a) requires additional information to be provided for threatened species that are also listed as candidate entities for SAIL. No threatened species are present that are included in the current list of entities at risk of an SAIL and none are likely to be at risk of an SAIL in accordance with the 4 principles of the BC Regulation.

6.5.2 Threatened ecological communities

Box Gum Woodland is included in the current list of entities at risk of an SAIL (Principles 1 and 2) that is likely to be impacted by the project. For this reason, additional impact assessment provisions for TECs at risk of an SAIL as per Section 9.1.1 of BAM (DPIE 2020a) apply.

The following sections provide further information regarding the impacts on Box Gum Woodland CEEC. Table 6.4 provides information on the current status of the TEC and Table 6.5 provides additional impact assessment.

i Actions to avoid and minimise direct and indirect impacts

Refer to item 1 in Table 6.1.

The conceptual design sought to avoid as much woodland CEEC as practicable. Follow several design iterations it was clear that after woodland, the areas containing the highest values for CEEC were captured by the eastern paddocks on the Newstead property, which contains the better quality derived native grassland compared with adjacent paddocks.

The quality of the derived grassland in the eastern paddocks is affected by grazing and pasture improvement activities but does not appear to have the intense cultivation history of other paddocks, having been maintained largely as native pasture for a long time with periodic burns to control Plains Grass growth.

The eastern paddocks are excluded from the conceptual design, which avoids over 177 ha of derived native grassland CEEC and more than 30 ha of woodland CEEC within the study area.

ii Current status (excluding impacts of the project)

Table 6.4 Current status of White Box Yellow Box Blakely’s Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Current total geographic extent (ha) of the threatened ecological community (TEC) in NSW.	White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland has undergone a very large reduction in geographic distribution. The best estimate of the extent of occurrence (EOO) is 702,800 km ² , based on a minimum convex polygon enclosing likely occurrences of the community. The best estimate of the area of occupancy (AOO) is 151,100 km ² .	(NSW TSSC 2020)	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted above may underestimate the true values.
Estimated reduction in geographic extent of the TEC since 1970.	Approximately greater than 90% reduction in pre-1750 distribution. According to the NSW TSSC (2020): <ul style="list-style-type: none"> The TSSC (2006) estimated that less than 5% of the original distribution remained, however the extent to which remaining examples continue to support characteristic biota, their interactions and function is unknown. The very large historical decline in geographic distribution is corroborated by other sources although there is some uncertainty surrounding the current extent of the community and its pre-1750 distribution. Considering the evidence for historical, recent and contemporary clearing in combination, it is very likely that the reduction in the distribution of White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland exceeds 90% when averaged across the entire range of the community. 	(TSSC 2006; NSW TSSC 2020)	No estimate of vegetation extent as at 1970 is available.

Table 6.4 Current status of White Box Yellow Box Blakely's Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Extent of reduction in ecological function, describing the degree of environmental degradation or disruption to biotic processes.	<p>The Threatened Biodiversity Profile description (OEH 2022b) lists the following threats affecting the ecological function of the TEC:</p> <ul style="list-style-type: none"> • habitat loss, degradation and fragmentation from agricultural, forestry, mining, infrastructure and residential development; • degradation by over grazing and trampling by introduced and native herbivores resulting in losses of plant species and structural diversity (simplification of the understorey and ground layer and suppression of overstorey regeneration), erosion and other soil changes (eg loss of cryptogams, increased nutrient status); • degradation of remnants by non-native plant species, including noxious weeds, exotic pasture species and environmental weeds, including garden escapes, olives and pines; • degradation of remnants by feral pest animals resulting in the loss or modification of habitat and predation of native fauna that are part of the White Box Yellow Box Blakely's Red Gum Woodland TEC; • removal of native ground layer in box-gum woodland remnants where trees have been partially or fully removed; and • altered fire regimes. <p>These threats affect the ecological function of the TEC at varying levels lead to different states of the TEC. The extent to which this reflects a permanent or temporary loss depends on the mechanism and severity of disturbance as well as any measures that are undertaken to reverse decline. As such, the extent of reduction in ecological function is unknown.</p>	(TSSC 2006; OEH 2022b)	Data on the extent of reduction is not available.
Evidence of restricted geographic distribution based on the TEC's geographic range in NSW:			
Extent of occurrence (ha).	702,800 km ²	(NSW TSSC 2020)	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted above may underestimate the true values.

Table 6.4 Current status of White Box Yellow Box Blakely’s Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Area of occupancy (ha).	151,100 km ²	(NSW TSSC 2020)	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted above may underestimate the true values.
Number of threat-defined locations.	<p>The BAM (DPIE 2020a) defines threat-defined locations in terms of threatened species but does not mention TECs. According to the Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria (Bland <i>et al.</i> 2017), a threat-defined location is:</p> <ul style="list-style-type: none"> • A geographically or ecologically distinct area in which a single threatening event can rapidly affect all occurrences of an ecosystem type. <p>The IUCN definition is similar to that included in the BAM and is considered to encompass the intent of the requirements of BAM for TECs.</p> <p>The most serious plausible threat to the TEC is land clearing, particularly for agriculture, including the intensification of agricultural activity through conversion of land use from grazing of native pastures to improved pastures or cropping. In line with the approach suggested by the IUCN (Bland, Keith <i>et al.</i> 2017), broad interpretation of threat-defined locations identifies two jurisdictional zones with different regulatory controls on land clearing:</p> <ul style="list-style-type: none"> • the leasehold Western Division of New South Wales; and • the freehold Central Division and Eastern Division of New South Wales. <p>An alternative interpretation of threat-defined locations based on biogeographical regions (bioregions) would produce an estimate of six threat-defined locations.</p>	(Bland, Keith <i>et al.</i> 2017; DPIE 2020a; NSW TSSC 2020)	Data is not strictly defined by the BAM. Assumptions have been made from additional data sources.

Table 6.5 Impact assessment of White Box Yellow Box Blakely’s Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Impact on the geographic extent of the TEC (Principles 1 and 3)			
Area of TEC to be impacted by the proposal (ha).	<p>The project would impact on:</p> <ul style="list-style-type: none"> • 2.48 ha of woodland • 216.49 ha of derived native grassland, comprising: <ul style="list-style-type: none"> – 187.49 ha of low to very low condition grassland – 29.00 ha of moderate condition grassland. <p>This includes direct impacts as well as indirect impacts within 10 m of infrastructure.</p>	-	-
Area of TEC to be impacted by the proposal as a % of the current geographic extent in NSW (%).	<p>The best estimate of the extent of occurrence (EOO) is 702,800 km².</p> <p>The project would impact on 0.00031% of its current extent.</p>	(NSW TSSC 2020)	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted above may underestimate the true values.
Direct/indirect impacts likely as a result of the proposal to contribute to loss of flora/fauna species characteristic of the TEC.	<p>The project would result in the direct removal of 218.97 ha of the TEC, which is 0.00031% of its current extent.</p> <p>Indirect impacts to the TEC include weed introduction and spread and erosion and sedimentation. Retained areas of the TEC outside the subject land will be avoided. Weed management and erosion mitigation measures in accordance with Table 6.3 will also be developed and implemented in retained areas of the community within the indirect impact areas.</p>	-	-

Table 6.5 Impact assessment of White Box Yellow Box Blakely’s Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Impacts likely to contribute to further environmental degradation or disruption of biotic processes (Principle 2)			
Remaining extent of isolated areas of TEC (ha).	<p>Within the buffer area (1500m from the site-based component and 500m from the linear-based component) there is a total of 1,298 ha of the TEC remaining.</p> <p>This area is made up of 305 separate fragments, ranging from <0.01 ha to 543 ha. 90% of the total area is comprised of 15 larger fragments, with the remaining 290 small fragments accounting for just 10% of the area.</p>	<p>EMM vegetation mapping (see Figure 4.1)</p> <p>Regional mapping (DPE 2015) was used for buffer areas not covered by the above.</p>	<p>Limitations of regional vegetation datasets are outlined in Section 4.2.6i.</p> <p>For areas covered by the regional mapping dataset, only mapped areas of PCTs that are associated with the TEC were included in the calculations. This conservatively does not include any grassland areas, which are all mapped as non-native in the regional mapping datasets, but which if ground-truthed would likely also form part of the TEC if found to comprise native vegetation.</p>
Average distance between remaining remnants – remnant is retained (m).	<p>The average distance between areas of the TEC, without the proposed clearing for the project, is 57.7 m.</p>	As above.	As above.
Average distance between remaining remnants – remnant is removed (m).	<p>The average distance between areas of the TEC, after the proposed clearing goes ahead, would be 53.9 m.</p> <p>The reduction in separation distance caused by the proposed clearing works is likely due to the nature of the clearing within the disturbance footprint, which involves the removal of existing fragments rather than further fragmentation of existing patches.</p> <p>The removal of already isolated patches within the disturbance footprint, which on average have a higher separation distance than those in the surrounding buffer area, would bring the average separation distance down.</p>	As above.	As above.

Table 6.5 Impact assessment of White Box Yellow Box Blakely’s Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
<p>Estimated maximum dispersal distance of species associated with the TEC (km).</p>	<p>According to Corlett (2009), typical maximum dispersal distances for different dispersal mechanisms are as follows:</p> <ul style="list-style-type: none"> • no specialised mechanism 0–10 m • Ant dispersal 0–10 m • wind (large-winged fruits) 10–100 m • rodents 10–100 m • small to medium-sized forest birds and arboreal mammals 100 m–1 km • Flying-foxes (large seeds) 100 m–1 km • large and open-country birds 1 km–10 km • wind (small plumed seeds) 1 km–10 km • terrestrial mammals 1 km–10 km • wind (tiny seeds/spores, and very small plumed seeds) > 10 km • Flying-foxes (small seeds) > 10 km. <p>Eucalypts have very limited seed dispersal capabilities, likely in the 0–10 m range or 10–100 m range for any given event and species and are considered capable of migrating across landscapes only in the order of ~71–142 m in 71 years (Booth 2017).</p> <p>Several shrub species characteristic of the TEC occurs and are likely to be wind dispersed (as indicated by pappus on achenes of <i>Olearia</i> and <i>Cassinia</i>). Seeds from <i>Acacia</i> spp. are likely to be dispersed by insects.</p> <p>Three of the characteristic grass species of the TEC in the genera <i>Aristida</i> and <i>Austrostipa</i> are likely to be animal-dispersed and capable of dispersing between 1 and 10 km. The three grasses in the genera <i>Chloris</i>, <i>Bothriochloa</i> and <i>Rytidosperma</i> are likely wind-dispersed, as are most species of forbs in the family Asteraceae. The wind-dispersed grasses are likely to be capable of dispersing between 1 and 10 km. and very small plumed seeds of many species of in the Asteraceae (daisy family) are likely to be capable of dispersing more than 10 km. Many of the forb and grass species that make up the ground layer of the TEC are likely to have no specialised dispersal mechanism or to be ant-dispersed and only capable of dispersal to distances of less than 10 m.</p>	<p>(Corlett 2009; Booth 2017)</p>	<p>-</p>

Table 6.5 Impact assessment of White Box Yellow Box Blakely’s Red Gum Woodland CEEC

Criteria	Data/ information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information																								
Area to perimeter ratio of remaining remnants (ratio).	<p>The current area to perimeter ratio of remaining remnant of the TEC in the buffer area is 60.24. Taking into account the proposed clearing for the project, the ratio would become 60.39. This slight change in ratio indicates very little change to connectivity and fragmentation in the buffer area based on this metric.</p> <p>The nature of the clearing within the disturbance footprint involves the removal of already isolated patches, rather than the fragmentation of larger patches. Where larger patches are impacted, the area to be cleared is at the edge of the patch.</p> <p>Proportionally, the project will slightly reduce the perimeter (and edge effects) of the remaining areas of the TEC. This trend is likely due to the nature of the TEC mapped within the disturbance footprint, which includes some very small patches of mapped TEC, with a low area to perimeter ratio.</p>	<p>EMM vegetation mapping (see Figure 4.1).</p> <p>Regional mapping (DPE 2015) was used for buffer areas not covered by the above.</p>	<p>Limitations of regional vegetation datasets are outlined in Section 4.2.6i.</p> <p>For areas covered by the regional mapping dataset, only mapped areas of PCTs that are associated with the TEC were included in the calculations. This conservatively does not include any grassland areas, which are all mapped as non-native in the regional mapping datasets, but which if ground-truthed would likely also form part of the TEC if found to comprise native vegetation.</p>																								
Vegetation integrity analysis.	<table border="1"> <thead> <tr> <th colspan="2">Associated vegetation zones within the disturbance footprint</th> </tr> <tr> <th>Zone name</th> <th>VI score</th> </tr> </thead> <tbody> <tr> <td>510_WDL_intact</td> <td>66</td> </tr> <tr> <td>510_WDL_poor</td> <td>44.7</td> </tr> <tr> <td>510_DNG_MOD</td> <td>13.8</td> </tr> <tr> <td>510_DNG_LOW</td> <td>9.3</td> </tr> <tr> <td>571_WDL_poor</td> <td>84.3</td> </tr> <tr> <td>590_WDL_mod</td> <td>65.4</td> </tr> <tr> <td>590_WDL_poor</td> <td>43.2</td> </tr> <tr> <td>590_DNG_MOD</td> <td>20.3</td> </tr> <tr> <td>590_DNG_LOW</td> <td>18.1</td> </tr> <tr> <td>590_DNG_V_LOW</td> <td>9.2</td> </tr> </tbody> </table>	Associated vegetation zones within the disturbance footprint		Zone name	VI score	510_WDL_intact	66	510_WDL_poor	44.7	510_DNG_MOD	13.8	510_DNG_LOW	9.3	571_WDL_poor	84.3	590_WDL_mod	65.4	590_WDL_poor	43.2	590_DNG_MOD	20.3	590_DNG_LOW	18.1	590_DNG_V_LOW	9.2	-	-
Associated vegetation zones within the disturbance footprint																											
Zone name	VI score																										
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590_WDL_poor	43.2																										
590_DNG_MOD	20.3																										
590_DNG_LOW	18.1																										
590_DNG_V_LOW	9.2																										

7 Impact summary

7.1 Impacts not requiring offsets

In accordance with Section 9.2.1 of BAM (DPIE 2020a), impacts to vegetation zones and threatened species habitat do not require offsets where:

- a vegetation zone representative of a critically endangered or endangered ecological community has a vegetation integrity score less than 15
- a vegetation zone representative of a vulnerable ecological community and/or threatened species habitat has a vegetation integrity score less than 17
- a vegetation zone that is not listed has a vegetation integrity score less than 20.

Table 7.1 provides a summary of the vegetation zones that do not trigger the above thresholds and therefore does not require ecosystem credits.

Table 7.1 Summary of impacts not requiring ecosystem credits

Vegetation zone ID	PCT ID	Condition	Area (ha)	Change in vegetation integrity score	Potential SAIL	Credits required
510_DNG_MOD	510	DNG_moderate	28.94 (site)	-13.8	True	0
510_DNG_LOW	510	DNG_low	100.75 (site) 0.01 (linear)	-9.3	True	0
590_DNG_V_LOW	590	DNG_V_low	71.10 (site)	-9.2	True	0
PCT510_cultivation	510	Cultivation	2.05 (site)	-0.1	False	0
PCT571_cultivation	571	Cultivation	0.09 (site)	-0.1	False	0
PCT590_cultivation	590	Cultivation	4.27 (site)	-0.1	False	0

Areas not requiring assessment in accordance with Section 9.3 of BAM (DPIE 2020a) include:

- existing roads
- cleared and highly disturbed land
- watercourses.

7.2 Impacts requiring offset

i Impacts on native vegetation

A summary of ecosystem credits required for all vegetation zones, including changes in vegetation integrity score, is provided in Table 7.2.

A total of 260 ecosystem credits are required to offset the residual impact of the project. Credit reports are provided in Appendix J.

Table 7.2 Summary of impacts requiring ecosystem credits

Vegetation zone ID	PCT ID	Condition	Area (ha)	Future vegetation integrity score	Change in vegetation integrity score	Potential SAI	Credits required
084_WDL_poor	84	Woodland_poor	0.04 (site)	0	-44.4	False	1
510_WDL_intact	510	Woodland_intact	0.19 (site) 0.09 (linear)	0	-66	True	8 (site) 4 (linear)
510_WDL_poor	510	Woodland_poor	0.30 (site) 0.01 (linear)	0	-44.7	True	8 (site) 1 (linear)
571_WDL_poor	571	Woodland_poor	0.17 (site)	0	-84.3	True	10
590_WDL_mod	590	Woodland_moderate	0.20 (site)	0	-65.4	True	8
590_WDL_poor	590	Woodland_poor	1.50 (site) 0.02 (linear)	0	-43.2	True	40 (site) 1 (linear)
590_DNG_MOD	590	DNG_moderate	0.05 (site) 0.01 (linear)	0	-20.3	True	1 (site) 1 (linear)
590_DNG_LOW	590	DNG_low	15.57 (site) 0.06 (linear)	0	-18.1	True	176 (site) 1 (linear)
Total			18.21				260

ii **Impacts on scattered trees**

A summary of ecosystem credits required for all scattered trees assessed is provided in Table 7.3.

A total of 45 ecosystem credits are required to offset the residual impacts of the project. Credit reports are provided in Appendix J.

Table 7.3 Summary of scattered trees requiring ecosystem credits

PCT	Number of trees	HBT Cr	No HBT Cr	Credits
510-Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion	13	9	4	13
571-Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	1	1	0	1
590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	37	8	23	31
Total	51			45

iii **Impacts to threatened species**

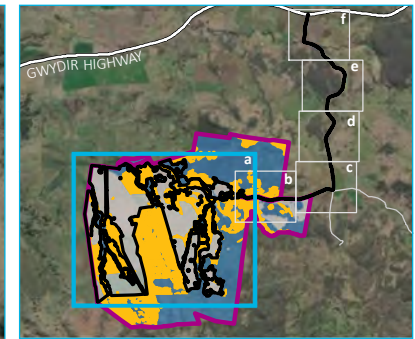
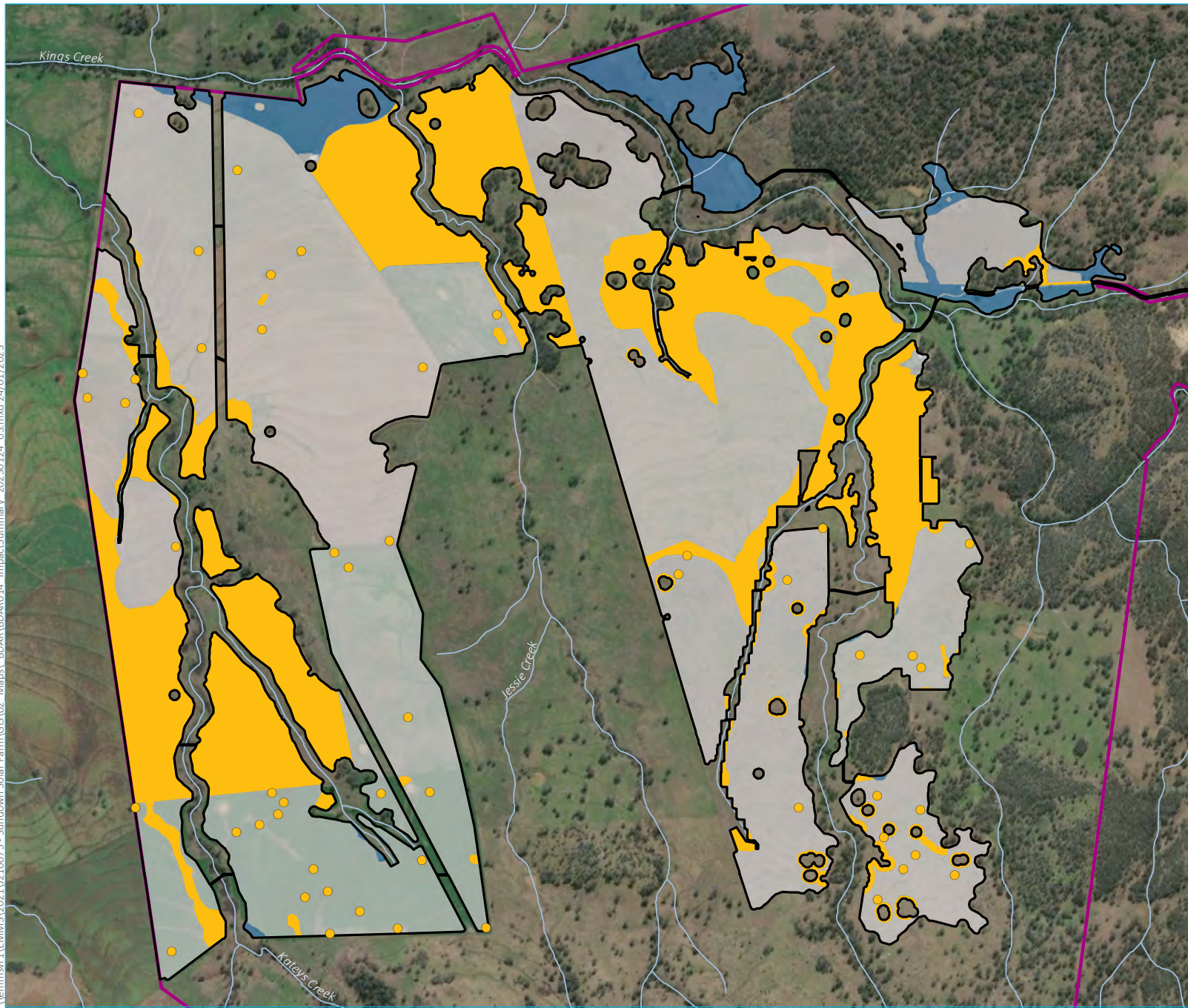
A summary of the species credits required for all vegetation zones occupied by the threatened species, including changes in vegetation integrity score, are provided in Table 7.4. This includes credits generated on non-native (ie cultivated) land representing prescribed impacts to threatened species.

A total of 1,773 species credits are required to offset the residual impacts of the project. Credit reports are provided in Appendix J.

Table 7.4 Summary of impacts requiring species credits

Vegetation zone name	Habitat condition (VI) loss	Area (ha)	Potential SAI	Biodiversity Risk Weighting	Species credits
Bluegrass			False	2.00	975
510_WDL_intact	-66	0.02 (site)	-	-	1 (site)
510_DNG_MOD	-13.8	27.84 (site)	-	-	192 (site)
510_DNG_LOW	-9.3	66.82 (site)	-	-	312 (site)
590_DNG_MOD	-20.3	0.01 (linear)	-	-	1 (linear)
590_DNG_LOW	-18.1	15.47 (site) 0.01 (linear)	-	-	140 (site) 1 (linear)
590_DNG_V_LOW	-9.2	70.56 (site)	-	-	326
510_cultivation	-0.1	1.43 (site)	-	-	1
590_cultivation	-0.1	0.16 (site)	-	-	1
Austral Toadflax			False	1.50	733
510_WDL_intact	-66	0.02 (site) 0.04 (linear)	-	-	1 (site) 1 (linear)
510_DNG_MOD	-13.8	27.84 (site)	-	-	144 (site)
510_DNG_LOW	-9.3	67.22 (site)	-	-	236 (site)
590_DNG_LOW	-18.1	15.51 (site)	-	-	105 (site)
590_DNG_V_LOW	-9.2	70.56 (site)	-	-	244 (site)
510_cultivation	-0.1	1.63 (site)	-	-	1 (site)
590_cultivation	-0.1	3.91 (site)	-	-	1 (site)
Eastern Pygmy-possum			False	2.00	65
084_WDL_poor	-44.4	0.02 (site)	-	-	1 (site)
510_WDL_intact	-66	0.19 (site) 0.09 (linear)	-	-	6 (site) 3 (linear)
510_WDL_poor	-44.7	0.30 (site) 0.01 (linear)	-	-	7 (site) 1 (linear)
571_WDL_poor	-84.3	0.17 (site)	-	-	7 (site)
590_WDL_mod	-65.4	0.20 (site)	-	-	7 (site)
590_WDL_poor	-43.2	1.50 (site) 0.02 (linear)	-	-	32 (site) 1 (linear)
TOTAL					1,773

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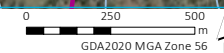


- KEY
- Proposed Sundown Solar Farm
 - Disturbance footprint
 - Major road
 - Minor road
 - Watercourse/drainage line
 - Impact not requiring assessment
 - Impact not requiring offset
 - Impacts requiring offset
 - Scattered tree
 - Vegetation zones that generate credits; species polygons

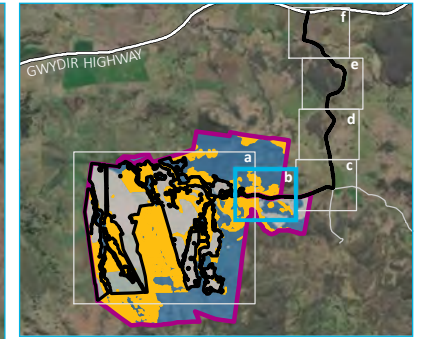
Impact summary

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 7.1a

Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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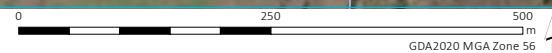
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Impact summary

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 7.1b

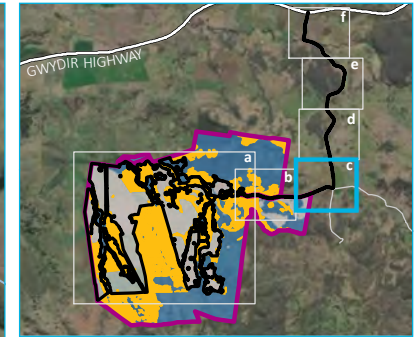


Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



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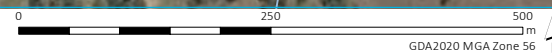


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Impact summary

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 7.1c

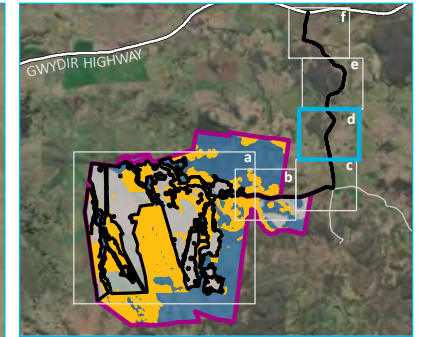
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GDA2020 MGA Zone 56



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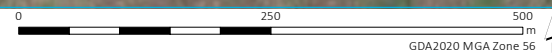
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Impact summary

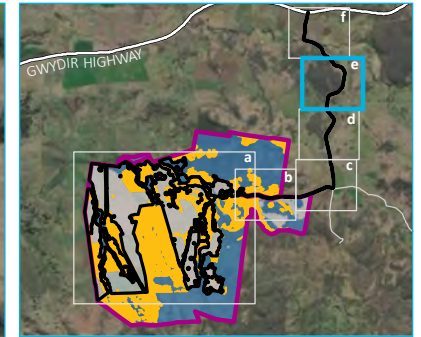
Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 7.1d



Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)

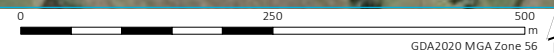


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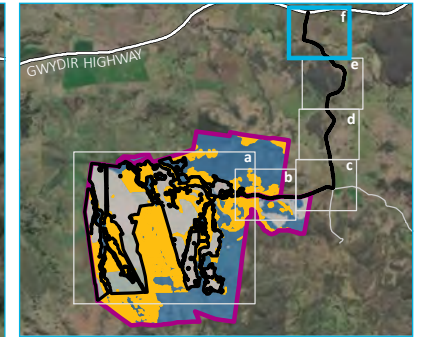
GDA2020 MGA Zone 56

Impact summary

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 7.1e



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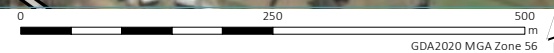
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Impact summary

Sundown Solar Farm
Biodiversity Development Assessment Report
Figure 7.1f



Source: EMM (2023); Canadian Solar (2023); ESRI (2023); DFSI (2017, 2021)



GDA2020 MGA Zone 56

7.3 Conservation measures proposed to offset impacts of development

7.3.1 Options available to meet offset obligations

Sundown Solar will offset the residual impacts on biodiversity via conservation mechanisms established under the NSW Biodiversity Offset Scheme (BOS). The BOS offset rules are established by the *Biodiversity Conservation Regulation 2017*; the mechanisms available to the project to meet offset obligations include:

- retiring like-for-like credits from an established stewardship site
- payment directly into the Biodiversity Conservation Trust Fund (BCF).

7.3.2 Preferred offset approach

Sundown Solar's preferred approach to offsetting the residual impacts of the project is to set up stewardship sites to generate like-for-like credits for the project. This option has the potential to provide the best biodiversity outcome if a suitable offset site can be identified near the project. This approach would deliver a net benefit locally and is likely to return like-for-like credits that are a close match (if not identical) to the credits generated by the project compared with sourcing credits on the credit market or discharging offsetting obligations through the BCF.

However, it is recognised that this option still has a potential to leave a shortfall in credits and therefore, it is likely that an offset strategy for the project would incorporate more than one offsetting mechanism to ensure that the credit obligations of the project are able to be fully met. Sundown Solar is looking to commence enquiries regarding available like-for-like credits on the credit market to supplement credits that could potentially be generated locally.

A payment to the Biodiversity Conservation Trust would only be considered to meet the residual credit requirements if a suitable number and type of biodiversity credits cannot be secured from stewardship sites owned by Sundown Solar and/or other third parties. Under the Amending Agreement Bilateral between the Commonwealth and the State of NSW, payment into the NSW Biodiversity Conservation Trust is an accepted offset for MNES provided that the eligibility criteria are met.

Application to apply the 'variation to trading rules' is not preferred and would only be considered after all reasonable steps to seek like-for-like credits are undertaken (OEH 2017a) and suitable credits still could not be sourced. However, it is noted that offsetting by applying a variation to the credit trading rules is not accepted by DCCEEW for addressing significant impacts on MNES (in this instance, for Box Gum Woodland, Bluegrass and Austral Toadflax).

7.3.3 Staged offsetting

As credit acquisition (either through establishing a BSA over existing landholdings or sourcing from market) can take time, opportunities to incorporate longer lead-in times into the project's program can be advantageous to allow credits to be acquired before they must be retired.

Opportunities to stage the credit retirement are available to state significant projects and would be based on a staged development schedule that would enable a partial retirement of the credit obligation at construction commencement (and hence relieve pressure on fulfilling the credit obligations prior to construction commencement).

There is no proposal to stage the project and therefore, staged credit retirement is not being considered at the present time.

8 Assessment of EPBC Act

This chapter provides an assessment of the project's impacts on species and communities listed under the EPBC Act, also referred to as Matters of National Environmental Significance (MNES).

An EPBC Act referral was submitted for this project, and on 29 August 2022 the project was declared a controlled action, to be assessed under the bilateral agreement with New South Wales. Impacts of the project will therefore be assessed, mitigated and offset under the BAM.

On 4 October 2022, supplementary NSW Planning Secretary's environmental assessment requirements (supplementary SEARs) were issued for the project, outlining the additional requirements for assessing impacts on MNES. The SEARs identify listed threatened species and communities as the EPBC Act controlling provision for the project, and lists species and communities that the minister considers likely to be significantly impacted by the project. The requirements of the supplementary SEARs are addressed in this chapter, and Appendix B shows where each requirement has been addressed.

The MNES that will potentially be impacted by the project include one threatened ecological community, two threatened flora species and three threatened bird species.

The remainder of the chapter outlines the expected impacts of the project, assesses the likelihood of MNES occurring at the site, steps through the avoidance and mitigation measures taken to reduce impacts, and assesses the residual impacts for each MNES. The end of the chapter contains a proposed approach to offsetting the impacts to MNES that cannot be avoided or mitigated.

8.1 Project impacts

The impacts of the project are outlined in detail in Chapter 6 of this report. The construction of the project will require upgrades to Spring Mountain Road and Sturmans Road, upgrades to watercourse crossings, and installation of infrastructure including PV modules, BESS and substation, and clearing works to establish a temporary laydown area.

The direct impacts of the project will be associated with clearing works to construct these project components. The project may also lead to uncertain impacts from shading of native understorey vegetation by the PV panels, temporary impacts within construction laydown areas, prescribed impacts to threatened species through the clearing of non-native vegetation, and indirect impacts. The potential indirect impacts are largely related to edge effects, with a potential reduction in habitat quality in surrounding retained vegetation, as well as disruption to threatened species during construction from increased noise and dust. Indirect impacts are outlined in more detail in Section 6.2.2, as well as in the following sections of this chapter. The indirect impacts are expected to be minor if the mitigation measures outlined in Section 6.4, as well as Section 8.3, are implemented.

The impact assessment in this BDAR accounts for all predicted impacts by conservatively capturing all predicted impacts within the disturbance footprint, within which full loss of biodiversity value is assumed. The impacts which have potential to affect MNES entities include:

- clearing of 2.52 ha of native woodland vegetation
- clearing of 216.49 ha of derived native grassland
- clearing of 34 hollow-bearing trees recorded in the disturbance footprint
- clearing of 51 scattered trees (with and without hollows).

The clearing of native vegetation will have impacts for a range of MNES. It will lead to a reduction in the occurrence of threatened ecological communities, and a reduction of habitat for threatened flora and fauna species. The clearing may directly remove recorded occurrences of threatened flora species. The removal of hollow-bearing trees and scattered trees represents a reduction in foraging, roosting and potential breeding habitat for woodland-dependent species such as threatened birds and mammals.

Table 8.1 outlines the nature and extent of the potential impacts from the construction of the project and addresses the requirements of the SEARs as outlined in Appendix B.

Table 8.1 Potential impacts to MNES

Impact	Extent	Consequences for MNES	Timeframe	Is the impact unknown, unpredictable, or irreversible?
Direct impacts				
Clearing of native woodland vegetation	2.52 ha	<ul style="list-style-type: none"> Reduction of breeding and foraging habitat for woodland dependent fauna. Reduction of habitat for threatened flora species. Reduction in area of Box Gum Woodland CEEC. 	Long term	Irreversible
Clearing of derived native grassland	216.49 ha	<ul style="list-style-type: none"> Reduction of foraging habitat for birds and mammals. Reduction of habitat for threatened flora species. Reduction in area of Box Gum Woodland CEEC. 	Long term	Irreversible
Clearing of hollow bearing trees	34 HBTs in the disturbance footprint	<ul style="list-style-type: none"> Loss of breeding and roosting habitat for hollow dependent fauna species. 	Long term	Irreversible
Clearing of scattered paddock trees	51 trees in the disturbance footprint	<ul style="list-style-type: none"> Loss of foraging, roosting and breeding habitat for woodland species. Reduced connectivity between woodland patches. 	Long term	Irreversible
Indirect impacts				
Increased noise, vibration and dust levels	Throughout study area and in the surrounding areas.	<ul style="list-style-type: none"> Disturbance of fauna species. Abandonment of habitat. Changes in behaviour. 	Short term, during construction	Unpredictable

Table 8.1 Potential impacts to MNES

Impact	Extent	Consequences for MNES	Timeframe	Is the impact unknown, unpredictable, or irreversible?
Increase in weeds and pathogens	Throughout disturbance footprint and in immediate surroundings.	<ul style="list-style-type: none"> Degradation of retained native vegetation. Degraded habitat for threatened flora species. Increased competition with threatened flora species. Degradation in the quality of retained Box Gum Woodland CEEC. 	Long term	Unknown
Increase in predatory and pest animal species	Throughout disturbance footprint and in surrounding areas.	<ul style="list-style-type: none"> Increased predation on and competition with threatened fauna species. 	Long term	Unknown
Inadvertent disturbance of retained habitat	Most likely to occur around the edge of the disturbance footprint.	<ul style="list-style-type: none"> Reduced area of habitat for threatened species. Reduction in quality of retained habitat, including Box Gum Woodland CEEC. 	Short term or long term	Unpredictable
Displacement of threatened fauna	Most likely in patches of woodland habitat.	<ul style="list-style-type: none"> Disruption to behaviour of threatened fauna. Stress to threatened fauna. 	Short term or long term	Unpredictable
Runoff, erosion and sedimentation	Along watercourses within the study area, and in areas downhill of the disturbance footprint.	<ul style="list-style-type: none"> Degradation of retained native vegetation. Degradation habitat for threatened flora species. Degradation of habitat for aquatic species. Degradation in the quality of retained Box Gum Woodland CEEC. 	Temporary or long term, depending on subsequent conditions	Unpredictable

8.2 Likelihood of occurrence assessment

A desktop assessment was completed to develop a list of MNES with potential to occur in the study area, as outlined in Step 1 of Section 5.1. As well as species and communities generated by the PMST, EPBC listed entities have been added based on existing species records from the region, and associations with the PCTs recorded within the study area.

A likelihood of occurrence assessment was conducted for all MNES with some potential to occur in the study area. All MNES entities were assessed against the criteria shown in Table 8.2. The full assessment is provided in Appendix K, including justifications as to whether or not species or communities are considered to have potential of occurring in the study area. The outcomes of the assessment are summarised in the sections below and species and communities deemed likely to be impacted are assessed further in Section 8.4.

Table 8.2 Likelihood of occurrence criteria

Likelihood	Description	Further assessment conducted?
Negligible	<ul style="list-style-type: none"> The potential for the species to occur is considered so unlikely as to not be worth considering. 	No
Low	<ul style="list-style-type: none"> Based on data collected during field investigations it was considered that the species was unlikely to occur in the study area or use habitats in the subject site. A species may utilise the subject site on rare occasions. Species is considered vagrant in the bioregion and is thus considered unlikely to occur in the study area. 	No
Moderate	<ul style="list-style-type: none"> The species is known to occur in the bioregion and the study area provides some habitat value for the species. Habitat values are somewhat degraded and considered suboptimal. 	Yes
High	<ul style="list-style-type: none"> The species is known to occur in the bioregion and the study area supports optimal habitat features for the species. 	Yes
Recorded	<ul style="list-style-type: none"> The species has been recorded during current surveys. The species has been recorded in the study area previously and there has not been any change in habitat values since this time. 	Yes

Three TECs were identified as potentially occurring within the study area by the PMST. A single TEC was recorded within the disturbance footprint, White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland.

Twenty-five threatened fauna species and 18 flora species listed under the EPBC Act were predicted to have potential to occur within the study area. Nine of these threatened species were either recorded or considered to have a moderate to high likelihood of occurring within the disturbance footprint, based on targeted survey results and habitat assessments.

The White-throated Needletail is the only species listed as migratory under the EPBC Act that was considered likely to occur within the study area, out of the nine species that were considered. This species is also listed as vulnerable under the EPBC act, so has been addressed along with other threatened species.

The likelihood of occurrence assessments for all MNES entities that were considered are provided in Appendix K.

8.2.1 Potential impacts to MNES

Table 8.3 includes all MNES with a moderate or high likelihood of occurring in the disturbance footprint and outlines the potential impacts to them as a result of the project. The MNES with potential to be impacted are assessed further in Sections 8.3 to 8.5. Those that are unlikely to be impacted by the project are justified below, and not assessed further.

Table 8.3 Impacts to species likely to occur in the disturbance footprint

Scientific name	Common name	EPBC Status ¹	Likelihood of occurrence	Likelihood of impact	Justification	Outcome of significant impact assessment
Communities						
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	Recorded	Direct impact to community	Clearing of woodland and DNG	Potential
Flora						
<i>Dichanthium setosum</i>	Bluegrass	V	Recorded	Direct impact to species	Clearing of species records and habitat	Potential
<i>Thesium australe</i>	Austral Toadflax	V	Recorded	Direct impact to species	Clearing of species records and habitat	Potential
Birds						
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	Moderate	Potential	Clearing of woodland habitat	Unlikely
<i>Grantiella picta</i>	Painted Honeyeater	V	Moderate	Potential	Clearing of woodland habitat	Unlikely
<i>Hirundapus caudacutus</i>	White-throated Needletail	V, Mi	Moderate	Unlikely	Habitat in the study area is unlikely to be used by the species	NA
<i>Lathamus discolor</i>	Swift Parrot	CE	Moderate	Potential	Clearing of woodland habitat	Unlikely
Mammals						
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	E	Moderate	Unlikely	Habitat to be impacted is sub-optimal	NA
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	Moderate	Unlikely	Habitat in the disturbance footprint is unlikely to be used by the species	NA
Reptiles						
<i>Myuchelys bellii</i>	Western Sawshelled Turtle, Bell's Turtle	V	Moderate	Unlikely	Aquatic habitat will not be impacted by the project	NA

Notes: V = vulnerable, E = endangered, CE = critically endangered, Mi = Migratory

8.2.2 MNES unlikely to be impacted by the project

i White-throated Needletail

The White-throated Needletail spends its non-breeding season in Australia, where it is almost exclusively aerial. It forages aerially at heights up to 'cloud level' over most types of habitat. It has been recorded roosting in dense foliage or hollows of trees within forests and woodland (TSSC 2019).

The White-throated Needletail is unlikely to use the 2.52 ha of marginal roosting habitat within the disturbance footprint given that it is almost entirely aerial, and the ability of the species to forage over the study area will not be impacted by the construction of the project.

The White-throated needletail has not been named as a priority species for management interventions following the 2019–2020 bushfires. It is considered to be at an intermediate risk (DCCEEW 2020c), largely due to its pre-fire imperilment rather than the extent of burnt habitat. It is not considered that the 2019–2020 bushfires make the habitat present in the disturbance footprint more crucial to the survival of the species.

It is considered unlikely that the project will have any impact on the White-throated Needletail. The species will generate ecosystem credits under the BAM (Section 5.3) but has not been assessed further in this chapter.

ii Spotted-tailed Quoll

The Spotted-tailed Quoll is primarily forest-dependent, and uses hollow-bearing trees, fallen logs, caves, rocky outcrops and cliff faces as den sites. The species occurs at low densities, with home ranges of several hundred to several thousand hectares in size, moving between den sites every 1–4 days (TSSC 2020).

The habitat present in the study area is not optimal for the Spotted-tailed Quoll, although the species is likely to be present in low densities or to pass through the study area as part of a larger home range. The disturbance footprint provides some foraging habitat for the species but lacks sufficient cover, large fallen logs, or rocky features for den sites. Very few prey species were observed in the study area during field surveys. Any individuals present are more likely to depend on larger and more intact areas of habitat in the surrounding area.

Through detailed design the disturbance footprint has largely been located to sit within derived grassland with scattered trees, avoiding watercourses and intact connected woodland. Connectivity will be maintained along waterways and drainage lines so the project will not impact the species ability to move through the area.

DELWP (2016) identifies the area as a stronghold for the Spotted-tailed Quoll, but it is not listed as an important population in the commonwealth conservation advice for the species (TSSC 2020). The Spotted-tailed Quoll was named as a priority species for management intervention after the 2019-2020 bushfires, largely due to its pre-fire imperilment rather than the extent of burnt habitat (DCCEEW 2020c).

The habitat within the disturbance footprint is considered sub-optimal for the Spotted-tailed Quoll and the areas to be impacted are unlikely to be important to the survival of the species. It is considered unlikely the project will impact on the Spotted-tailed Quoll. The species will generate ecosystem credits under the BAM (Section 5.3) but has not been assessed further in this chapter.

iii Corben's Long-eared Bat

Within NSW, Corben's Long-eared Bat is primarily found within the Pilliga scrub region (TSSC 2015b). The species is not associated with any of the PCTs mapped in the disturbance footprint, however it is known to occur within box woodland habitats.

Surveys for microbats within the study area did not record any individuals of the species. Although some calls that were characteristic of *Nyctophilus* were detected during anabat surveys, only *N. geoffroyi* were captured during the subsequent harp trapping effort. The microbat survey effort is described in Section 5.4.4ve, and shown in Figure 5.6.

The woodland habitat present in the disturbance footprint may provide a small amount of marginal foraging or roosting habitat for the species, but if present, it is more likely to depend on more intact patches of woodland in the surrounding area. Corben's Long-eared Bat was not considered in the immediate assessment of the impacts of the 2019–2020 bushfires carried out by DAWE in 2020 (DCCEEW 2020c).

Given that the project components are largely located within areas of derived native grassland, it is not likely that the construction of the project will impact on any resident populations of Corben's Long-eared Bat. The species has not been assessed further in this chapter.

iv Bell's Turtle

King's Creek is considered to contain some potential habitat for the Bell's Turtle, however the habitat within the study area is considered sub-optimal given the existing disturbance along the creek, and the species is not associated with any of the PCTs mapped within the disturbance footprint (OEH 1997).

The project will have limited direct impacts to aquatic habitat, and indirect impacts such as sedimentation and runoff issues will be reduced through the mitigation measures outlined in Sections 6.4 and 8.3.

Bell's Turtle was named as a priority species for management intervention after the 2019–2020 bushfires (DCCEEW 2020c). The risk-weighting is largely attributable to its pre-fire imperilment. Although the species is being prioritised for post-fire management, the aquatic habitat within the study area is not likely to be impacted by the project. The species has not been assessed further in this chapter.

8.3 Proposed avoidance and mitigation measures

Avoidance and mitigation measures for the project are detailed in Sections 6.1 and 6.4 of this report. Table 8.4 outlines the avoidance and mitigation measures most relevant to the MNES that will be impacted by the project and addresses the requirements of the supplementary SEARs (see Appendix B). Many of the mitigation measures do not have costs attached (eg where avoidance is proposed). Physical mitigation measures will be costed at the detailed design stage of the project. Relevant statutory policies will be considered when designing and implementing the mitigation measures and the relevant Commonwealth and State agencies will be consulted on the mitigation measures.

Table 8.4 Avoidance and mitigation measures for impacts to MNES

Avoidance/mitigation measure	Description	Effectiveness for MNES
Avoidance measures		
Avoidance of woodland and derived native grassland areas.	Most areas of woodland and better quality derived native grassland have been avoided by design, with the disturbance footprint placed in cultivated areas and low-quality grassland. Several eastern paddocks on the Newstead property were excluded from the project that included high quality grassland and woodland (See Table 6.1).	<ul style="list-style-type: none"> Exclusion of eastern paddocks retains 177 ha of DNG (habitat for threatened flora species) and 30 ha of woodland (habitat for threatened fauna species). Retains a larger area of Box Gum Woodland CEEC.
Avoidance of known records of threatened species.	Disturbance footprint was designed to avoid areas with a high density of threatened species records.	<ul style="list-style-type: none"> Retention of 502 records of Austral Toadflax, representing over 18,700 plants and approximately 94% of all the plants recorded at the site since 2018. Retention of 245 records of Bluegrass, representing over 3,700 plants and almost all of the plants recorded since 2018 (99.97%). Protection of highest quality habitat for threatened flora species.
Avoidance of hollow bearing trees.	By avoiding woodland areas during design, hollow bearing trees are also avoided.	<ul style="list-style-type: none"> Retention of potential breeding habitat for woodland dependent birds and bats. The project avoids 206 of 240 hollow bearing trees recorded in the study area (approximately 86%).
Access route selection.	The access route option selected uses an existing road requiring fewer upgrades, and supports fewer threatened flora records.	<ul style="list-style-type: none"> Retention of approximately 62 individuals of Bluegrass and 1098 individuals of Austral Toadflax. Less clearing of potential threatened flora habitat required.
Minimising disturbance to watercourses and riparian corridors.	Disturbance footprint was designed with a buffer distance away from all significant watercourses within the study area. The number of new watercourse crossing has been minimised by selecting routes where existing crossing are in place.	<ul style="list-style-type: none"> Protection of aquatic habitat that may support threatened species. Maintenance of existing water regimes within the site, minimising changes to habitat conditions for threatened species.

Table 8.4 Avoidance and mitigation measures for impacts to MNES

Avoidance/mitigation measure	Description	Effectiveness for MNES
Inclusion of a 10 m indirect impact zone.	The disturbance footprint includes a 10 m indirect impact zone from the edge of infrastructure, to accommodate vegetation management, and foot and vehicle traffic.	<ul style="list-style-type: none"> Act as a buffer between operational areas and retained vegetation outside the disturbance footprint, reducing impacts to retained vegetation. Indirect impact zone will be fully offset despite being only partially impacted.
Disturbance set back from woodland patches.	The disturbance footprint is set back from most woodland patches by between 10–20 m. This is in addition to the 10 m indirect impact zone identified.	<ul style="list-style-type: none"> Act as a buffer between operational areas and retained woodland vegetation outside the disturbance footprint, reducing impacts to retained woodland habitat.
Driven piling installation method.	PV modules will be installed via driven piling methods rather than other construction methods that involve concrete foundations.	<ul style="list-style-type: none"> Reduces impact to vegetation within the disturbance footprint as it requires less vegetation clearing. Allows some grassland habitat to be retained within the PV area, which may continue to be used by threatened species.
Mitigation measures		
Options to further minimise impacts during construction and operation (E.01).	<p>May include:</p> <ul style="list-style-type: none"> minimising removal of hollow bearing trees within the approved disturbance footprint; minimising removal of known occurrences of threatened plants, Bluegrass and Austral Toadflax within the approved disturbance footprint; and minimising removal of tree resources along the Spring Mountain Road/Sturmans Road access route. 	<ul style="list-style-type: none"> Potential further retainment of hollow bearing trees (habitat for woodland dependent fauna species). Potential further retainment of occurrences of Bluegrass and Austral Toadflax. Potential further retainment of trees, representing potential habitat and assisting in maintaining connectivity for the movement of fauna species.
Identification of threatened species occurrences on site plan (E.02 and E.03).	<ul style="list-style-type: none"> Site plan will show extent of approved disturbance. Known records of threatened flora species to be delineated as ‘no-go’ zones on the site plan. Threatened flora to be retained will be delineated with high visibility tape or fencing. 	<ul style="list-style-type: none"> Prevent unnecessary and unapproved damage to occurrences of threatened flora species and their habitat.
Rehabilitation of construction laydown areas (E.04).	The construction laydown areas will be rehabilitated following completion of construction works if they are not required for operational purposes and will include removal of any materials brought into site such as gravel.	<ul style="list-style-type: none"> Prevent unnecessary damage or removal of native vegetation, comprising Box Gum Woodland TEC or habitat for threatened species.

Table 8.4 Avoidance and mitigation measures for impacts to MNES

Avoidance/mitigation measure	Description	Effectiveness for MNES
Appropriate management of 10 m indirect impact area (E.05).	The Construction Environmental Management Plan (CEMP) and any operational management plan will include provisions for the appropriate management of the 10 m indirect impact area, including: <ul style="list-style-type: none"> • protocols for bushfire asset management; and • management of weeds and run-off into adjacent off-project areas. 	<ul style="list-style-type: none"> • Minimisation of edge impacts to adjacent retained vegetation, comprising Box Gum Woodland TEC or habitat for threatened species.
Sediment controls (E.06).	Sediment controls to be implemented during construction in accordance with a sediment and erosion control plan, including installation of fencing and sediments traps in any areas where works will occur in proximity to low lying vegetation or streams.	<ul style="list-style-type: none"> • Preservation of higher quality DNG habitat around waterways – habitat for Bluegrass and Austral Toadflax. • Protection of waterways and aquatic habitats adjacent to the project.
Traffic Management Plan (E.07).	The Construction Traffic Management Plan (CTMP) is to include construction speed limits to minimise risk of vehicle strike during construction phase of projects when there is expected to be an increase in traffic movements.	<ul style="list-style-type: none"> • Reduce risk of vehicle strike on threatened species during construction.
Pre-clearance inspections (E.08).	Pre-clearance inspection to be conducted by a suitably qualified ecologist to: <ul style="list-style-type: none"> • inspect hollows prior to tree clearing; • inspect buildings prior to demolition; • remove any individuals if found; • relocate animals to suitable habitat in adjacent vegetation outside of the disturbance footprint; and • any animals injured during clearing works should be taken to a veterinarian or wildlife clinic. 	<ul style="list-style-type: none"> • Reduce risk of injury to threatened fauna species.
Implementation of a Biodiversity Management Plan (E.09).	Implement a Biodiversity Management Plan (BMP) for retained vegetation adjacent to the disturbance footprint that includes (but is not limited to): <ul style="list-style-type: none"> • requirements to control and manage weeds that may be exacerbated, spread or otherwise affected by the construction and operation of the project • requirements to monitor the vegetation condition and habitat values of any such retained vegetation • provisions for corrective actions should a decline in vegetation or habitat condition be detected. 	<ul style="list-style-type: none"> • Protection of retained vegetation and threatened species habitat adjacent to the project. • Protection of areas of Box Gum Woodland CEEC adjacent to the project.

Table 8.4 **Avoidance and mitigation measures for impacts to MNES**

Avoidance/mitigation measure	Description	Effectiveness for MNES
Protection and management of retained Bluegrass and Austral Toadflax (E.10).	The Biodiversity Management Plan (BMP) shall include prescriptions for the protection and ongoing management of the habitat of retained occurrences of Bluegrass and Austral Toadflax that are surrounded by the approved disturbance footprint.	<ul style="list-style-type: none"> • Reduce the impacts of the project on Bluegrass and Austral Toadflax. • Prevent retained plants from being impacted by the project in the long term.

8.4 Impact assessments for MNES

Species and communities likely to be impacted by the project are addressed in more detail in the following sections. Potential impacts to each MNES entity have been assessed according to the requirements of the supplementary SEARs (Appendix B), and the residual impacts (after the implementation of the avoidance and mitigation measures outlined in the previous section) have been assessed via the *Matters of National Environmental Significance – Significance Impact Guidelines 1.1* (DotE 2013c) to determine if the project is likely to have a ‘significant impact’ on MNES.

Table 8.5 summarises the direct impacts to habitat for MNES.

Table 8.5 Impacts to habitat of MNES

MNES	Potential habitat in disturbance footprint (ha)	Justification
White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland	29.48	Vegetation zones within the disturbance footprint that align with the EPBC Act criteria for the Box Gum Woodland CEEC, as outlined in Section 4.2.4 and 4.3.5, and shown in Figure 4.3.
Bluegrass	182.32	This is the area of the species polygon defined in Section 5.4.3, which takes into account species records, PCT associations, habitat quality and connectivity.
Austral Toadflax	186.73	This is the area of the species polygon defined in Section 5.4.3, which takes into account species records, PCT associations, habitat quality and connectivity.
Regent Honeyeater	2.52 (plus 51 scattered trees which do not have an area value)	All woodland areas within the disturbance footprint (see Figure 4.1).
Swift Parrot	2.52 (plus 51 scattered trees which do not have an area value)	All woodland areas within the disturbance footprint (see Figure 4.1). After recent updates to threatened species PCT associations, the Swift Parrot is associated with all PCTs mapped within the disturbance footprint. The BAM-C shows that the species is only associated with PCTs 510 and 590, as per the previous associations for the species. Woodland areas from all PCTs in the disturbance footprint have been conservatively considered as habitat for Swift Parrot, as they would provide potential foraging habitat for the species.
Painted Honeyeater	2.52 (plus 51 scattered trees which do not have an area value)	All woodland areas within the disturbance footprint (see Figure 4.1).

The significant impact assessments are provided in Appendix M, and concluded that the project has the potential to result in a significant impact to three MNES:

- White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland
- Bluegrass
- Austral Toadflax.

Offsets for the impacts to MNES, calculated under the BAM, are addressed in Section 8.5.

8.4.1 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

i Description, habitat, and distribution

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is a critically endangered ecological community (CEEC) characterised by a species-rich understorey consisting of native tussock grasses, herbs and scattered shrubs, with a canopy dominated by White Box, Yellow Box or Blakely's Red Gum trees (TSSC 2006). The CEEC is addressed in detail in Sections 4.2.4 and 4.3.5 of this report.

The TEC is known to occur in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria (TSSC 2006).

The main threats associated with the TEC include clearing associated with agricultural, horticultural, urban development and mining; as well as grazing pressures, firewood collection, changed fire regimes, use of chemicals, mowing or slashing regimes, weed invasion, climate change and animal pests (DECCW 2011). It tends to occur on moderate to high fertility soils, in areas favoured for agricultural use.

ii Survey

The vegetation in the study area was surveyed and mapped using a combination of meander surveys, rapid data points, and analysis of data from plot-based floristic vegetation surveys (Section 4.2.2). The extent of the EPBC listed TEC was determined by assessing the vegetation present against the condition thresholds provided in the EPBC Act Policy Statement 3.5 (DEH 2006) (Section 4.2.4ii). This methodology is outlined in detail in Section 4.2, including the timing and scope of vegetation surveys.

iii Potential impacts and avoidance measures

Much of the remnant woodland and derived native grassland within the study area comprises box gum woodland listed under the BC Act, with higher condition areas also listed under the EPBC Act (see Figure 4.3).

Impacts to this MNES will be caused by clearing of native vegetation within the disturbance footprint that comprises the CEEC. Avoidance of Box Gum Woodland has been a primary focus throughout the design process (see Section 6.1). Considerable effort has been made to avoid woodland areas, and areas of higher quality derived native grassland. Within the broader study area, the design of the disturbance footprint has focused on cultivated areas and low-quality grasslands. For example, the exclusion of several eastern paddocks on the Newstead property that were originally included in the design (see Figure 6.1) avoided over 177 ha of higher quality derived native grassland and 30 ha of woodland. Avoidance measures are outlined in more detail in Section 6.1.

iv Residual impacts and assessment

After the above avoidance measures were implemented, the current disturbance footprint includes 29.48 ha of the CEEC that will be directly impacted through clearing. Most of this area is derived native grassland (29 ha) but includes a small area of woodland (0.48 ha) (see Section 4.3.5).

The CEEC is unlikely to be affected by indirect impacts if the recommended mitigation measures outlined in Section 6.4 and 8.3 are implemented.

The significance of this residual impact has been assessed according to the MNES Significant Impact Guidelines (DotE 2013c) and concluded that there is potential for the project to have a significant impact on the CEEC. The full assessment is provided in Appendix M.

After the 2019–2020 bushfires, DAWE assessed the immediate impacts of the fires and released a list of threatened ecological communities that were priorities for management intervention (DCCEEW 2020b). It was estimated that less than 10% of the estimated distribution of Box Gum Woodland CEEC was within fire affected areas, and the community was not identified in the list of highest concern, or in the list of priority matters for funding in Tranche 1 of the Wildlife and Habitat Bushfire Recovery Program. Assessments were also done within each affected NRM region. Within the Northern Tablelands region, Box Gum Woodland CEEC was identified as a high priority TEC for recovery activity, because despite being in the least sensitive category to fire, >10% of the local population was within the burn area. Given the assessment by DAWE, it is expected that the 2019-2020 bushfires increase the importance of the area of Box Gum Woodland within the study area to the ongoing survival of the community.

It is noted that the BC Act listed Box Gum Woodland CEEC is an SAIL entity, so the impacts to this community have been assessed in detail in Section 6.5, including consideration within the context of the full extent of the community's range.

8.4.2 Bluegrass

i Description, habitat, and distribution

Bluegrass is a perennial grass less than 1 m tall with mostly hairless leaves and flowers densely hairy and clustered. The species is known to occur within the Border Rivers-Gwydir, Central West, Namoi and Northern Rivers within NSW, as well as the South East and Fitzroy areas within Queensland. It is associated with heavy basaltic black soils and stony red-brown loam, and is often found in disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and pasture (DEWHA 2008).

It is listed as vulnerable under the EPBC Act, with the main threats to the species being heavy grazing by domestic stock, loss of habitat through clearing, frequent fires and invasion by weeds (DEWHA 2008).

ii Survey

The entirety of the disturbance footprint was surveyed on foot as part of targeted flora surveys for multiple threatened species. Surveys for Bluegrass took place in February 2018, February and October 2021, and February 2022. Although October is outside of the survey period for the species, some Bluegrass was recorded. All suitable habitat was surveyed again during February surveys.

The majority of the site was surveyed using the two-phase grid-based survey technique (DPIE 2020c) and parallel transect surveys were used in small vegetation zones and in areas of higher quality habitat. Targeted survey methods are outlined in Section 5.4.4iii, and shown in Figure 5.4.

iii Potential impacts and avoidance measures

The location of Bluegrass records within the study area can be seen in Figure 5.1. The species was predominantly found near waterways in less disturbed areas of grassland and within woodland in the eastern portion of the study area, as well as along the access road. A total of 246 occurrences of Bluegrass were recorded, representing over 3,700 individual plants.

The project has potential to impact this MNES through direct clearing of individuals, and through clearing and degradation of potential habitat.

The majority of occurrences of bluegrass have been avoided through revisions of the disturbance footprint design. In fact, the current disturbance footprint avoids 245 records of the species, avoiding all but one of the plants recorded in the study area since 2018. Areas of higher quality grassland habitat have also been avoided by design. Avoidance measures are outlined in more detail in Sections 6.1 and 8.3.

iv Residual impacts and assessment

Under the BAM, this species is assessed by area, so a species polygon was developed to represent all suitable habitat within the disturbance footprint (see Section 5.4.3). After the avoidance measures mentioned above, a total of 182.32 ha of potential Bluegrass habitat will be cleared, which includes one record of the species. This area is considered relatively small compared to the national extent of the species throughout Queensland and NSW.

Indirect impacts have the potential to affect Bluegrass through degradation of habitat, however if the recommended mitigation measures outlined in Section 6.4 and 8.3 are implemented, the effect is unlikely to be significant.

The significance of this residual impact has been assessed according to the MNES Significant Impact Guidelines (DotE 2013c) and concluded that there is potential for the project to have a significant impact on Bluegrass. The full assessment is provided in Appendix M.

After the 2019–2020 bushfires, DAWE conducted an immediate assessment of the impacts and developed a priority list of flora species requiring urgent management intervention, based on 11 key criteria (DCCEEW 2020a). Bluegrass was not included on the priority list. In the area assessed, only one of 74 Bluegrass records (Australasian Virtual Herbarium) were burnt, representing 1.4% of records. An estimated 5% of the range for Bluegrass was burnt in the fires. It is not anticipated that the 2019–2020 fires made the habitat present in the study area significantly more important for the survival of the species.

8.4.3 Austral Toadflax

i Description, habitat, and distribution

Austral Toadflax is a hairless, yellow-green perennial herb with slender wiry stems to 40 cm high and has tiny white flowers. The species flowers in spring and summer (DotE 2013a). The species is semi-parasitic on the roots of a range of grass species, including Kangaroo Grass. It occurs in subtropical, temperate, and subalpine climates within a range of altitudes and on a variety of soil types and is found in Victoria, the ACT, New South Wales, and Queensland. Within NSW the majority of existing records come from the Nandewar, New England Tablelands and NSW North Coast Bioregions (DCCEEW 2022c).

Austral Toadflax is listed as vulnerable under the EPBC Act. The species is under threat from intensified grazing by livestock, native herbivores and feral herbivores, agricultural development, weed invasion and lack of fire and disturbance, which reduces species diversity in the lower stratum (DotE 2013a).

ii Survey

The entirety of the disturbance footprint was surveyed as part of targeted flora surveys for multiple threatened species. Surveys for Austral Toadflax took place in February of 2018, 2021 and 2022.

The majority of the site was surveyed using the two-phase grid-based survey technique (DPIE 2020c) and parallel transect surveys were used in small vegetation zones and in areas of higher quality habitat. Targeted survey methods are outlined in Section 5.4.4iii, and shown in Figure 5.4.

iii Potential impacts and avoidance measures

Austral Toadflax was recorded within the study area, predominantly near waterways in less disturbed areas of grassland and within woodland in the eastern portion of the study area, as well as along the access road. The location of Austral Toadflax records can be seen in Figure 5.2. A total of 552 occurrences of Austral Toadflax were recorded in the study area, representing over 20,000 individual plants.

The project has potential to impact this MNES through direct clearing of individuals, and through clearing and degradation of potential habitat.

The disturbance footprint has been redesigned throughout the biodiversity assessment process to avoid the majority of Austral Toadflax records. The current design avoids 502 records (of the 552 total), representing over 18,000 individual plants. Areas of higher quality grassland habitat have also been avoided by design. Avoidance measures are outlined in more detail in Sections 6.1 and 8.3.

iv Residual impacts and assessment

Under the BAM, this species is assessed by area, so a species polygon was developed to represent all suitable Austral Toadflax habitat within the disturbance footprint (see Section 5.4.3). After the avoidance measures mentioned above, a total of 186.73 ha of potential Austral Toadflax habitat will be cleared, which includes fifty records of the species. This area is considered relatively small compared to the national extent of the species across south-eastern Australia.

Indirect impacts have the potential to affect Austral Toadflax through degradation of habitat, however if the recommended mitigation measures outlined in Section 6.4 and 8.3 are implemented, the effect is unlikely to be significant.

The significance of this residual impact has been assessed according to the MNES Significant Impact Guidelines (DotE 2013c) and concluded that there is potential for the project to have a significant impact on Austral Toadflax. The full assessment is provided in Appendix M.

After the 2019–2020 bushfires, DAWE conducted an immediate assessment of the impacts and developed a priority list of flora species requiring urgent management intervention, based on 11 key criteria (DCCEEW 2020a). Austral Toadflax was not included on the priority list. In the area assessed, 25 of 198 Austral Toadflax records (Australasian Virtual Herbarium) were burnt, representing 12.6% of records. An estimated 9% of the range for Austral Toadflax was burnt in the fires. It is not anticipated that the 2019–2020 fires made the habitat present in the study area significantly more important for the survival of the species.

8.4.4 Regent Honeyeater

i Description, habitat, and distribution

The Regent Honeyeater is a medium-sized, black and yellow honeyeater that is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest. It is also known to occur within riparian vegetation such as *Casuarina* spp. where it feeds on mistletoe. The species uses a range of other habitats including remnant patches within farmland and urban areas, and roadside reserves.

The species is endemic to mainland south-eastern Australia; extending from south-east Queensland, through NSW and the ACT to central Victoria (DotE 2013b). There are only three known breeding regions remaining within Victoria and NSW. It nests in the canopy of mature trees with rough bark, breeding from August to January (DotE 2013b). Within NSW the species is known to breed at Capertee Valley and the Bundarra-Barraba region (OEH 2010). The species movement patterns are largely influenced by flowering of certain eucalypt species.

Regent Honeyeaters are listed as critically endangered under the EPBC Act. The main threats to the species are clearing, fragmentation, degradation of habitat, competition from other birds, egg and nest predation by native birds and mammals and loss of key foraging resources as a result of inappropriate fire regimes (OEH 2010).

ii Survey

As per the BAM (DPIE 2020a), this species was not required to be surveyed as it generates ecosystem credits for foraging habitat. Assessment for species credits is only triggered if there is any clearing of habitat within mapped important areas (as per Important Habitat Maps released by DPIE). No important areas are mapped over the study area.

No individuals of the species were observed incidentally during the diurnal bird surveys or other diurnal surveys that were conducted, as described in Section 5.4.4.

iii Potential impacts and avoidance measures

The species is associated with PCTs 84, 510, 571 and 590 which are mapped within the study area. Areas of woodland within the study area would constitute suitable foraging habitat for the Regent Honeyeater. Scattered trees would also provide marginal foraging habitat and may assist in movement between larger woodland patches. The site is not considered to provide breeding habitat as it is outside of the known breeding locations for the species. The Regent Honeyeater will be impacted by the clearing of woodland areas and scattered trees, through a reduction in available habitat.

The avoidance of woodland was a primary focus throughout the design process, with the current disturbance footprint placed within the lowest quality grassland areas and areas of cultivation. The design of the project also attempts to maintain existing connectivity between woodland patches. Most of the woodland areas that will be impacted are situated along the edges of larger intact patches. Avoidance measures are outlined in more detail in Sections 6.1 and 8.3.

iv Residual impacts and assessment

The project will result in the clearing of 2.52 ha of woodland that provides potential foraging habitat for the Regent Honeyeater, as well as the removal of 51 scattered paddock trees. Any opportunities to further reduce this impact in later stages of design will be investigated. The area of impact is considered relatively small compared to the national extent of the species across south-eastern Australia.

The species may be impacted by increased noise and dust levels during construction. These impacts will be mitigated by the measures proposed in Sections 6.4 and 8.3, and will be temporary in nature.

The significance of this residual impact has been assessed according to the MNES Significant Impact Guidelines (DotE 2013c) and concluded that it is unlikely the project will have a significant impact on the Regent Honeyeater given the limited extent of clearing required. The full assessment is provided in Appendix M.

The Regent Honeyeater was named as a priority species for management intervention after the 2019–2020 bushfires. The assessments considered a range of contributing factors, such as pre-fire imperilment, overlap of the species distribution and burnt areas, and the physical, behavioural, ecological and life history traits of the species (DCCEEW 2020c). The risk for Regent Honeyeater was largely determined by its pre-fire imperilment. The management interventions that were suggested include controlling native competitors such as Noisy Miners in key locations, as well as planting of food trees and avoiding further clearing of habitat (DCCEEW 2020c). Although a small area of woodland habitat will be impacted by the project, it is considered unlikely that the importance of this area for the survival of the species was increased by the 2019–2020 fires.

8.4.5 Swift Parrot

i Description, habitat, and distribution

The Swift Parrot breeds within Tasmania during spring and summer, after which it migrates to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland in the autumn and winter months. The breeding habitat is restricted to the east and south-east coast of Tasmania, where it breeds in tree-hollows in old-growth or other forest with suitable hollows in proximity to flowering species (TSSC 2015a).

Within NSW the species forages in a range of forests and woodlands throughout the coastal and western slopes regions, such as inland box-ironbark and grassy woodlands, and coastal Swamp Mahogany and Spotted Gum woodland. They generally occur in areas where eucalypts are flowering or where there are abundant lerp infestations (OEH 2000).

Swift Parrots are listed as critically endangered under the EPBC Act. The main threats to the species are habitat loss and fragmentation, changes in spatial and temporal distribution due to climate change, competition for food resources, collisions with human made structures, Psittacine Break and Feather Disease (Pbfd), weed invasion impacting on habitat, high fire frequency and predation by cats (OEH 2000).

ii Survey

As per the BAM (DPIE 2020a), this species was not required to be surveyed as it generates ecosystem credits for foraging habitat. Species credits are only generated within mapped important areas published by DPIE. No important habitat areas are mapped over the study area.

No individuals of the species were observed incidentally during the diurnal bird surveys or other diurnal surveys that were conducted, as described in Section 5.4.4.

iii Potential impacts and avoidance measures

The Swift Parrot is associated with all PCTs mapped within the study area. Woodland areas of these PCTs within the study area would constitute suitable foraging habitat for the species. Scattered trees would also provide marginal foraging habitat and may assist in movement between larger woodland patches. The site is not considered to provide breeding habitat as the species breeds in Tasmania. The Swift Parrot will be impacted by the clearing of woodland areas and scattered trees, through a reduction in available foraging habitat.

The avoidance of woodland was a primary focus throughout the design process, with the current disturbance footprint placed within the lowest quality grassland areas and areas of cultivation. The design of the project also attempts to maintain existing connectivity between woodland patches. Most of the woodland areas that will be impacted are situated along the edges of larger intact patches. Avoidance measures are outlined in more detail in Sections 6.1 and 8.3.

iv Residual impacts and assessment

The project will result in the clearing of 2.52 ha of woodland that provides potential foraging habitat for the Swift Parrot, as well as the removal of 51 scattered paddock trees. Any opportunities to further reduce this impact in later stages of design will be investigated. The area of impact is considered relatively small compared to the national extent of the species across south-eastern Australia.

The species may be impacted by increased noise and dust levels during construction. These impacts will be mitigated by the measures proposed in Sections 6.4 and 8.3, and will be temporary in nature.

The significance of this residual impact has been assessed according to the MNES Significant Impact Guidelines (DotE 2013c) and concluded that it is unlikely the project will have a significant impact on the Swift Parrot given the limited extent of clearing required. The full assessment is provided in Appendix M.

The Swift Parrot was not considered in the immediate assessment of the impacts of the 2019–2020 bushfires carried out by DAWE in 2020 (DCCEEW 2020c). It has a relatively widespread distribution within NSW that extends far beyond the extent of the burn (DPE 2020) so it is not anticipated that the 2019-2020 fires made the habitat present in the study area more important for the survival of the species.

8.4.6 Painted Honeyeater

i Description, habitat, and distribution

The Painted Honeyeater is the most specialised of Australia’s honeyeaters, with a diet consisting of mistletoe fruits, nectar and arthropods. The species occurs within eucalypt forests and woodlands with an abundance of mistletoes, inhabiting a range of habitats including Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. It nests within the foliage of trees, creating a nest out of mistletoe (OEH 2022a).

The Painted Honeyeater is known to occur from south-eastern Australia to north-western Queensland and eastern Northern Territory (DotE 2015). The species is most commonly known from the inland slopes of the Great Dividing Range in NSW, VIC and southern QLD where majority of the breeding occurs. The species breeds between October to March when mistletoe fruits are in abundance.

The Painted Honeyeater is listed as vulnerable under the EPBC Act. The main threats to the species are habitat loss and degradation, habitat infestation by weeds, heavy grazing, removal of key feed species such as mistletoes, inappropriate fire regimes and competition with Noisy Miner (*Manorina melanocephala*)(DotE 2015).

ii Survey

As per the BAM, this species was not required to be surveyed as it generates ecosystem credits for habitat. No individuals of the species were observed incidentally during the diurnal bird surveys or other diurnal surveys that were conducted, as described in Section 5.4.4.

iii Potential impacts and avoidance measures

The Painted Honeyeater is associated with PCTs 84, 510, 571 and 590 which are mapped within the study area. Woodland areas of these PCTs within the study area, as well as scattered trees, would comprise suitable foraging habitat and sub-optimal breeding habitat for the species. Some mistletoes were recorded on site but are not present in high enough numbers to provide optimal habitat for this species. The Painted Honeyeater will be impacted by the clearing of woodland areas and scattered trees, through a reduction in available habitat.

The avoidance of woodland was a primary focus throughout the design process, with the current disturbance footprint placed within the lowest quality grassland areas and areas of cultivation. The design of the project also attempts to maintain existing connectivity between woodland patches. Most of the woodland areas that will be impacted are situated along the edges of larger intact patches. Avoidance measures are outlined in more detail in Sections 6.1 and 8.3.

iv Residual impacts and assessment

The project will result in the clearing of 2.52 ha of woodland that provides potential habitat for the Painted Honeyeater, as well as the removal of 51 scattered paddock trees. Any opportunities to further reduce this impact in later stages of design will be investigated. The area of impact is considered relatively small compared to the widespread distribution of the species across the eastern half of Australia.

The species may be impacted by increased noise and dust levels during construction. These impacts will be mitigated by the measures proposed in Sections 6.4 and 8.3, and will be temporary in nature.

The significance of this residual impact has been assessed according to the MNES Significant Impact Guidelines (DotE 2013c) and concluded that it is unlikely the project will have a significant impact on the Painted Honeyeater given the limited extent of clearing required. The full assessment is provided in Appendix M.

The Painted Honeyeater was not considered in the immediate assessment of the impacts of the 2019–2020 bushfires carried out by DAWE in 2020 (DCCEEW 2020c). It has a widespread distribution within NSW that has limited overlap with the extent of the burn (DPE 2020) so it is not anticipated that the 2019–2020 fires made the habitat present in the study area more important for the survival of the species.

8.5 Offset strategy

The Australian Government has endorsed the NSW Biodiversity Offset Scheme (BOS) under the EPBC Act Condition-setting Policy to streamline benefits for all NSW proponents that use the BOS. The Australian Government supports the use of the Biodiversity Assessment Method as the underpinning methodology for calculating biodiversity credit requirements. Amendments to the NSW Biodiversity Conservation Regulation 2017 in 2019 aligns the BOS offset rules to Australian Government requirements by restricting the application of the offset variation rules to NSW only listed entities. Under the Amending Agreement Bilateral between the Commonwealth and the State of NSW, payment into the NSW Biodiversity Conservation Trust is an accepted offset for MNES provided that the eligibility criteria are met.

Sundown Solar will offset the residual impacts on biodiversity via conservation mechanisms established under the NSW BOS. The proposed approach being considered by Sundown Solar to discharge the offsetting obligations of the project are discussed in Section 7.3.2 and will prioritise acquisition of credits generated from stewardship sites situated locally where available to deliver a local outcome, but will likely include additional mechanisms to ensure that the project's offsetting obligations can be fully met. No variation to the offset trading rules under the BOS will be sought.

The compensation for significant residual impacts on Box Gum Woodland and the threatened species assessed in Section 8.4 above will be addressed by the acquisition and retirement of ecosystem and species credits identified and assessed in accordance with the BAM (DPIE 2020a), for which credit profile reports are provided in Appendix J.

8.5.1 Summary of credit requirements for MNES

i Box Gum Woodland

The credit requirement for impacts on Box Gum Woodland is summarised in the table below. It is noted that vegetation zone 510_DNG_MOD meets the definition of Box Gum Woodland based on the following criteria applied from the EPBC Act Policy Statement 3.5 (DEH 2006):

- presence of characteristic overstorey species, or grassland where the original woodland would have been dominated by characteristic overstorey species
- presence of a predominantly native understorey
- be part of a patch 0.1 ha or greater in size
- contain 12 or more native understorey species (excluding grasses), including one or more identified important species.

The vegetation zone does not have a vegetation integrity score exceeding 15 and so does not trigger an offset requirement under the BAM (DPIE 2020a). The area represented by 510_DNG_MOD is a highly grazed area of derived native pasture that occurs around cultivation near Kings Creek. It appears heavily impacted by agriculture, but survey data indicates that it supports sufficient native species richness to meet the condition thresholds set out in EPBC Act Policy Statement 3.5 (DEH 2006).

Table 8.6 Summary of ecosystem credits for Box Gum Woodland CEEC

Vegetation zone ID	PCT ID	Condition	Area (ha)	Change in vegetation integrity score	Credits required
510_WDL_intact	510	Woodland_intact	0.28	-66	12
510_DNG_MOD	510	DNG_moderate	28.94	-13.8	0
590_WDL_mod	590	Woodland_moderate	0.20	-65.4	8
590_DNG_MOD	590	DNG_moderate	0.06	-20.3	2
Total			29.48		22

Whilst not meeting the condition criteria to be included in the EPBC Act listed Box Gum Woodland CEEC, the project is also required to offset the potential loss of scattered trees associated with the Box Gum Woodland communities. The credit requirement for scattered trees associated with Box Gum Woodland communities is summarised below.

Table 8.7 Summary of ecosystem credits for scattered trees associated with Box Gum Woodland

PCT	Number of trees	HBT Cr	No HBT Cr	Credits
510 – Blakely’s Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion	13	9	4	13
571 – Ribbon Gum – Rough-barked Apple – Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	1	1	0	1
590 – White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	37	8	23	31
Total	51			45

ii Threatened species

Credit requirements for Bluegrass and Austral Toadflax are summarised in the table below. Credit requirements for Swift Parrot, Regent Honeyeater and Painted Honeyeater will be addressed through the retirement of the required ecosystem credits.

Table 8.8 Summary of ecosystem credits for scattered trees associated with Box Gum Woodland

Vegetation zone name	Area (ha)	Species credits
Bluegrass	182.32	973
Austral Toadflax	186.73	730

8.6 Impacts not addressed by the BAM

Species and communities listed under the EPBC Act that are not listed under the BC Act are listed below in Table 8.9, along with an explanation of where they have been addressed in this assessment. Impacts to these species would not be addressed by the BAM. None of the species are predicted to be significantly impacted by the project and so no further assessment is required.

Table 8.9 Potential impacts not addressed by the BAM

Scientific name	Common name	EPBC status	Likelihood of occurrence	Where addressed in this report	Outcome
<i>Callistemon pungens</i>	-	V	Low	<ul style="list-style-type: none"> • Candidate species assessment (Section 5.4.1) • Candidate species outcomes (Section 5.4.2) • Targeted survey methods (Section 5.4.4) • EPBC Act Likelihood of occurrence assessment (Appendix K) 	<p>The study area contains potential habitat for the species.</p> <p>Species was surveyed during targeted surveys in October 2021 and February 2022. It was not recorded on site.</p>
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	Moderate	<ul style="list-style-type: none"> • Ecosystem credit species assessment (Section 5.3) • EPBC Act likelihood of occurrence assessment (Appendix K) • EPBC Act likelihood of impact assessment (Section 8.2.2i) 	<p>The study area contains suitable habitat for the species to fly over or roost, however the species is almost exclusively aerial. Given the limited extent of clearing of woodland habitat associated with the project, no impacts to the species are predicted.</p> <p>Although not listed under the BC Act, the species generates ecosystem credits in the BAM-C, and is included in Table 5.1.</p>
<i>Prasophyllum sp. Wybong</i>	-	CE	Low	<ul style="list-style-type: none"> • Candidate species assessment (Section 5.4.1) • Candidate species outcomes (Section 5.4.2) • Targeted survey methods (Section 5.4.4) • EPBC Act Likelihood of occurrence assessment (Appendix K) 	<p>The study area contains potential habitat for the species.</p> <p>Species was surveyed during targeted surveys in October 2021. It was not recorded on site.</p>

9 Assessment of other relevant biodiversity legislation

9.1 Biosecurity Act 2015

All plants in NSW are regulated with a general biosecurity duty under the Biosecurity Act. There is an obligation for the project to ensure that the biosecurity risks of all weed species recorded on site are prevented, eliminated or minimised, so far as is reasonably practicable.

Three weed species detected in the study area are regional priority weeds for the Northern Tablelands region:

- St Johns Wort (*Hypericum perforatum*)
- Blackberry (*Rubus anglocandicans*, also *R. fruticosus* sp. aggregate)
- Sweet Briar (*Rosa rubiginosa*).

A fourth weed species, Fireweed (*Senecio madagascariensis*) along with Blackberry, are state priority weeds and are listed under the National Weed Strategy as Weeds of National Environmental Significance (WONS). These species are regulated by a prohibition on dealings and cannot be imported into the state, bartered exchanged or offered for sale.

9.2 Fisheries Management Act 1994

Several new and upgraded watercourse crossings will be required across the project to facilitate vehicle access during construction and operation.

Watercourse crossings will typically be implemented as either bed level or culvert crossings, with crossing upgrades proposed along the Sturmans Road and Spring Mountain Road crossings where there are existing bridges:

- Kings Creek at western extension of Sturmans Road – low level bridge
- Swan Brook at Spring Mountain Road – high level multi-cell box culvert system
- Unnamed 2nd order watercourse at Sturmans Road – small box culvert.

The remaining existing watercourse crossings generally comprise bed level crossings.

The location, form and site-specific design of all crossings will be confirmed and developed as part of future detailed design. However, it is noted that the number of required watercourse crossings has been minimised during preliminary design to reduce the potential for watercourse impacts and will be further considered during detailed design.

It is expected that adverse impacts to watercourses and riparian corridors will be avoided and/or minimised because:

- the disturbance footprint preserves the vegetated riparian zone widths recommended by DoI (2018)
- where instream works are proposed (ie construction or upgrade of watercourse crossings), these works will be designed and constructed to be consistent with relevant guidelines:
 - *Guidelines for watercourse crossings on waterfront land* (DPE 2022c)

- *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull et al. 2003).

It is noted that consultation between Sundown and DPI Fisheries has occurred in July 2022 with respect to the proposed new crossing over Kings Creek that would replace an existing informal and low-level bridge structure, and that a new box culvert crossing is supported by DPI Fisheries provided appropriate design consideration for fish passage is incorporated in accordance with Fairfull, S. and Witheridge, G. (2003).

As potential habitat for threatened fish occurs in Kings Creek and Swan Brook, assessments of significance have been prepared for Southern Purple Spotted Gudgeon and Eel-tailed Catfish in accordance with Section 220ZZ of the FM Act (Appendix N). These assessments indicate that no significant impact on these species is likely to occur as a result of the project due the marginal value of the aquatic habitats, the limited disturbance works expected in association with construction/upgrade of the crossings and the limited duration of the works.

10 Conclusion

This BDAR has been prepared in accordance with the BAM (DPIE 2020a), biodiversity-related SEARs issued by DPIE and the supplementary SEARs issued by DCCEEW. Assessment of impacts under the EPBC Act has been completed in Chapter 8 for the purposes of assessment by DCCEEW.

EMM has carried out vegetation surveys and threatened flora and fauna surveys within the study area. These surveys have been carried out in parallel with, and have informed the evolution of, the development design. This process has ensured the avoidance and minimisation of biodiversity constraints as far as practicable. Residual impacts comprise the clearing of native vegetation, including:

- loss of 2.52 ha woodland:
 - this includes 2.48 ha of BC Act listed Box Gum Woodland CEEC, of which 0.48 ha is also listed under the EPBC Act
 - this also represents 2.52 ha of suitable habitat for Eastern Pygmy-possum for which presence is assumed;
- loss of 216.49 ha of derived native grassland:
 - this represents 216.49 ha of BC Act listed Box Gum Woodland derived grassland, of which 29 ha is also listed under the EPBC Act. The majority (approximately 93%) of the derived native grassland to be cleared is low condition and does not meet the offset thresholds set by the BAM
 - this includes 182.32 ha of suitable habitat for Bluegrass, as represented by the species polygon prepared, which exceeds the area occupied by the species
 - this includes 186.73 ha of suitable habitat for Austral Toadflax, as represented by the species polygon prepared, which exceeds the area occupied by the species
- loss of 34 hollow bearing trees, representing habitat resources for fauna
- loss of 51 scattered trees (of which 18 are hollow bearing and represent a subset of the above), representing habitat resources for fauna.

Potential uncertain, temporary, indirect, and prescribed impacts have been included in the disturbance footprint and are hence included in the above area values.

The project requires 260 ecosystem credits to compensate for impacts to native PCTs and ecosystem credit species, as well as 45 ecosystem credits to compensate for the loss of scattered trees. In addition to ecosystem credits, the project also requires 975 species credits for Bluegrass, 733 species credits for Austral Toadflax, and 65 species credits for the Eastern Pygmy-possum. The Eastern Pygmy-possum has been assumed to be present in woodland areas due to the lack adequate survey specifically targeting this species.

Where possible, Sundown Solar will compensate for the residual impacts through the establishment of stewardship sites near the project and generation of like-for-like credits. Any shortfall in credit obligations after this approach is exhausted will likely be met through a payment directly into the Biodiversity Conservation Trust Fund (BCF).

The BDAR has assessed the potential for serious and irreversible impacts (SAIL) to Box Gum Woodland CEEC, in accordance with Section 9.1.1 of the BAM. The avoidance of impacts to this TEC was a primary focus throughout the design process, resulting in the exclusion of over 177 ha of derived native grassland and 30 ha of woodland from the disturbance footprint. Impacts to the CEEC will be further mitigated through the creation of a biodiversity management plan for areas not included in the final design.

The BDAR has also considered impacts to species and communities listed under the EPBC Act. Significant impact assessments concluded that the project has potential to cause significant impacts to Box Gum Woodland, Bluegrass and Austral Toadflax. The project will be assessed in accordance with the bilateral agreement made between the NSW and the Commonwealth under Section 45 of the EPBC Act.

11 References

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Appendix A

BDAR requirements compliance

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
Introduction	Chapters 2 and 3	Information	
		Introduction to the biodiversity assessment including:	–
		<input checked="" type="checkbox"/> brief description of the proposal	Section 1.1
		<input checked="" type="checkbox"/> identification of subject land boundary, including:	Section 1.1
		<input checked="" type="checkbox"/> operational footprint	Section 1.1
		<input checked="" type="checkbox"/> construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1.1
		<input checked="" type="checkbox"/> general description of the subject land	Section 1.1
		<input checked="" type="checkbox"/> sources of information used in the assessment, including reports and spatial data	Section 1.5
		<input checked="" type="checkbox"/> identification and justification for entering the BOS	This is a state significant project, the SEARs requires a BDAR and as such the project automatically enters the BOS if credits are required.
		Maps and tables	
<input checked="" type="checkbox"/> Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 1.3		
Landscape	Sections 3.1 and 3.2, Appendix E	Information	
		Identification of site context components and landscape features, including:	–
		<input checked="" type="checkbox"/> general description of subject land topographic and hydrological setting, geology and soils	Section 3.1
		<input checked="" type="checkbox"/> per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Section 3.2

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Section 3.1
		<input checked="" type="checkbox"/> rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Section 3.1
		<input checked="" type="checkbox"/> wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	Section 3.1
		<input checked="" type="checkbox"/> connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Section 3.1
		<input checked="" type="checkbox"/> karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	Section 3.1
		<input checked="" type="checkbox"/> areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	Section 3.1
		<input checked="" type="checkbox"/> any additional landscape features identified in any SEARs for the proposal	N/A
		<input checked="" type="checkbox"/> NSW (Mitchell) landscape on which the subject land occurs	Section 3.1
		<input checked="" type="checkbox"/> details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	Vegetation mapping described in Section 4.2.2, habitat assessments described in Section 5.4.4iv and outcomes in Section 5.2.
Maps and tables			
		<input checked="" type="checkbox"/> Site Map	Figure 3.2
		<input checked="" type="checkbox"/> Property boundary	
		<input checked="" type="checkbox"/> Boundary of subject land	
		<input checked="" type="checkbox"/> Cadastre of subject land (including labelling of Lot and DP or section plan if relevant)	
		<input checked="" type="checkbox"/> Landscape features identified in BAM Subsection 3.1.3	

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> Location Map	Figure 3.1
		<input checked="" type="checkbox"/> Digital aerial photography at 1:1,000 scale or finer	
		<input checked="" type="checkbox"/> Boundary of subject land	Labelled as 'disturbance footprint', see Section 1.2.
		<input checked="" type="checkbox"/> Assessment area (ie the subject land and either 1500 m buffer area or 500 m buffer for linear development)	
		<input checked="" type="checkbox"/> Landscape features identified in BAM Subsection 3.1.3	
		<input checked="" type="checkbox"/> Additional detail (eg local government area boundaries) relevant at this scale	
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	Figure 3.1, Figure 3.2
		<input checked="" type="checkbox"/> IBRA bioregions and subregions	
		<input checked="" type="checkbox"/> rivers, streams and estuaries	
		<input checked="" type="checkbox"/> wetlands and important wetlands	
		<input checked="" type="checkbox"/> connectivity of different areas of habitat	
		<input checked="" type="checkbox"/> karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features	
		<input checked="" type="checkbox"/> areas of outstanding biodiversity value occurring on the subject land and assessment area	
		<input checked="" type="checkbox"/> any additional landscape features identified in any SEARs for the proposal	
		<input checked="" type="checkbox"/> NSW (Mitchell) landscape on which the subject land occurs	
		Data	
		<input checked="" type="checkbox"/> All report maps as separate jpeg files	

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		Individual digital shape files of:	
		<input checked="" type="checkbox"/> subject land boundary	
		<input checked="" type="checkbox"/> assessment area (ie subject land and 1,500 m buffer area) boundary	
		<input checked="" type="checkbox"/> cadastral boundary of subject land	
		<input checked="" type="checkbox"/> areas of native vegetation cover	
		<input checked="" type="checkbox"/> landscape features	
Native vegetation	Chapter 4, Appendix A and Appendix H	Information	
		<input checked="" type="checkbox"/> Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	Native vegetation within buffer areas and disturbance footprint: Section 3.2, Figure 3.2 Within disturbance footprint: Table ES1, Section 4.3.3
		<input checked="" type="checkbox"/> Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	Section 4.3.3 (Table 4.7)
		<input checked="" type="checkbox"/> Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	Section 4.1
		<input checked="" type="checkbox"/> Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 4.2
		<input checked="" type="checkbox"/> Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	No local benchmark data was proposed.

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		For each PCT within the subject land, describe:	Section 4.3.3 (Table 4.3— Table 4.6)
	<input checked="" type="checkbox"/>	PCT name and ID	As above
	<input checked="" type="checkbox"/>	vegetation class	As above
	<input checked="" type="checkbox"/>	extent (ha) within subject land	As above
	<input checked="" type="checkbox"/>	evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	As above
	<input checked="" type="checkbox"/>	plant species relied upon for identification of the PCT and relative abundance of each species	As above
	<input checked="" type="checkbox"/>	if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Section 4.2.4
	<input checked="" type="checkbox"/>	estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	Section 4.3.3 (Table 4.3— Table 4.6)
		Describe the vegetation integrity assessment of the subject land, including:	Section 4.2
	<input checked="" type="checkbox"/>	identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Section 4.2.1, 4.2.2, 4.2.3
	<input checked="" type="checkbox"/>	description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	Section 4.3.4
	<input checked="" type="checkbox"/>	area (ha) of each vegetation zone	Section 4.3.4
	<input checked="" type="checkbox"/>	assessment of patch size (as described in BAM Subsection 4.3.2)	Section 3.2
	<input checked="" type="checkbox"/>	survey effort (ie number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	Section 4.3.3, 4.3.4
	<input checked="" type="checkbox"/>	use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	As per benchmarks populated into the BAM-C.

Table A.1 **Assessment of compliance with BDAR minimum information requirements**

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	
	<input checked="" type="checkbox"/>	identify the PCT or vegetation class for which local benchmark data will be applied	N/A
	<input checked="" type="checkbox"/>	identify published sources of local benchmark data (if benchmarks obtained from published sources)	N/A
	<input checked="" type="checkbox"/>	describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	N/A
	<input checked="" type="checkbox"/>	provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	N/A
	<input checked="" type="checkbox"/>	provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A
		Maps and tables	
	<input checked="" type="checkbox"/>	Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 4.1, Figure 4.2
	<input checked="" type="checkbox"/>	Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4.1, Figure 4.2
	<input checked="" type="checkbox"/>	Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 4.1, Figure 4.2
	<input checked="" type="checkbox"/>	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 4.1, Figure 4.2
	<input checked="" type="checkbox"/>	Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 4.3, Table 4.9
	<input checked="" type="checkbox"/>	Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	N/A, patch sizes addressed in Section 3.2
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	Appendix D
	<input checked="" type="checkbox"/>	composition condition score	
	<input checked="" type="checkbox"/>	structure condition score	
	<input checked="" type="checkbox"/>	function condition score	

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> presence of hollow bearing trees	
		Data	
		<input checked="" type="checkbox"/> All report maps as separate jpeg files	
		<input checked="" type="checkbox"/> Plot field data (MS Excel format)	
		<input checked="" type="checkbox"/> Plot field datasheets	
		Digital shape files of:	
		<input checked="" type="checkbox"/> PCT boundaries within subject land	
		<input checked="" type="checkbox"/> TEC boundaries within subject land	
		<input checked="" type="checkbox"/> vegetation zone boundaries within subject land	
		<input checked="" type="checkbox"/> floristic vegetation survey and vegetation integrity plot locations	
Threatened species	Chapter 5	Information	
		Identify ecosystem credit species likely to occur on the subject land, including:	-
		<input checked="" type="checkbox"/> list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	Section 5.3
		<input checked="" type="checkbox"/> justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	Section 5.3
		<input checked="" type="checkbox"/> justification for addition of any ecosystem credit species to the list	N/A, no species added
		Identify species credit species likely to occur on the subject land, including:	-
		<input checked="" type="checkbox"/> list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	Table 5.2
		<input checked="" type="checkbox"/> justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	Table 5.2

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	Table 5.2
		<input checked="" type="checkbox"/> justification for addition of any species credit species to the list	N/A, no species added
		From the list of candidate species credit species, identify:	-
		<input checked="" type="checkbox"/> species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	Table 5.3
		<input checked="" type="checkbox"/> species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))	N/A
		<input checked="" type="checkbox"/> species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.))	Section 5.4.2 (Table 5.3)
		<input checked="" type="checkbox"/> species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	N/A
		Present the outcomes of species credit species assessments from:	-
		<input checked="" type="checkbox"/> threatened species survey (as described in BAM Section 5.2.4)	Summarised in Table 5.3, details in Section 5.4.4
		<input checked="" type="checkbox"/> expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	N/A
		Where survey has been undertaken include detailed information on:	-
		<input checked="" type="checkbox"/> survey method and effort (as described in BAM Section 5.3)	Section 5.4.4
		<input checked="" type="checkbox"/> justification of survey method and effort (eg citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	Section 5.4.4
		<input checked="" type="checkbox"/> timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	Summarised in Table 5.3, details in Section 5.4.4
		<input checked="" type="checkbox"/> survey personnel and relevant experience	Section 1.7

Table A.1 **Assessment of compliance with BDAR minimum information requirements**

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> describe any limitations to surveys and how these were addressed/overcome	Discussed where relevant for each method in each subsection of Section 5.4.4
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	N/A, no expert reports used
		<input checked="" type="checkbox"/> justification of the use of an expert report	N/A
		<input checked="" type="checkbox"/> identify the expert, provide evidence of their expert credentials and departmental approval of expert status	N/A
		<input checked="" type="checkbox"/> all requirements of Box 3 have been addressed in the expert report	N/A
		Where use of local data is proposed (BAM Subsection 1.4.2):	N/A
		<input checked="" type="checkbox"/> identify relevant species	
		<input checked="" type="checkbox"/> identify data to be amended	
		<input checked="" type="checkbox"/> identify source of information for local data, eg published literature, additional survey data, etc.	
		<input checked="" type="checkbox"/> justify use of local data in preference to VIS Classification or TBDC data	
		<input checked="" type="checkbox"/> provide written confirmation from the decision-maker that they support the use of local data	
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	-
		<input checked="" type="checkbox"/> the unit of measure for each species is documented	Table 5.3
		for species assessed by area:	-
		<input checked="" type="checkbox"/> the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	Section 5.4.3

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	Section 5.4.3
		for species assessed by counts of individuals:	N/A, no count species present
		<input checked="" type="checkbox"/> the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	N/A
		<input checked="" type="checkbox"/> the method used to derive this number (ie threatened species survey or expert report) and evidence-based justification for the approach taken	N/A
		<input checked="" type="checkbox"/> the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	N/A
		<input checked="" type="checkbox"/> Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	N/A
Maps and tables			
		<input checked="" type="checkbox"/> Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	Table 5.1
		<input checked="" type="checkbox"/> the ecosystem credit species removed from the list	Table 5.1
		<input checked="" type="checkbox"/> the sensitivity to gain class of each species	Table 5.1
		<input checked="" type="checkbox"/> Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	Table 5.2
		<input checked="" type="checkbox"/> the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	Table 5.2
		<input checked="" type="checkbox"/> the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 5.3

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Presence in Table 5.3 Microhabitats in Table 5.2 Extent of habitat Table 5.4 and Table 5.5 Biodiversity risk weighting in Table 7.4
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	Figure 5.1, Figure 5.2, Figure 5.3
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	
		☒ Survey locations including GPS coordinates of any plots, transects, grids	
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	
		☒ Species polygon map in jpeg format	
		☒ Expert reports and any supporting data used to support conclusions of the expert report	
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	
Prescribed impacts	Chapter 6	Information	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	Section 6.3
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)	Table 6.2
		☒ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2)	Table 6.2
		☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3)	Table 6.2
		☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	Table 6.2

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	Table 6.2
		<input checked="" type="checkbox"/> where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	Table 6.2
		<input checked="" type="checkbox"/> Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Table 6.2
		<input checked="" type="checkbox"/> Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (eg Subsection 6.1.3)	Section 6.3.2
		Where the proposed development is for a wind farm:	N/A
		<input checked="" type="checkbox"/> identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	N/A
		<input checked="" type="checkbox"/> provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	N/A
		<input checked="" type="checkbox"/> predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	N/A
		Where the proposal may result in vehicle strike:	N/A, assessed in Table 6.2
		<input checked="" type="checkbox"/> identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	N/A
Maps and tables			
		<input checked="" type="checkbox"/> Map showing location of any prescribed impact features (ie karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figure 7.1
		<input checked="" type="checkbox"/> Map showing location of potential vehicle strike locations	N/A

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A
		Data	
		<input checked="" type="checkbox"/> Digital shape files of prescribed impact feature locations	
		<input checked="" type="checkbox"/> Prescribed impact features map in jpeg format	
Avoid and minimise impacts	Chapter 7	Information	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	Section 6.1
		<input checked="" type="checkbox"/> modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	Table 6.1
		<input checked="" type="checkbox"/> routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	Table 6.1
		<input checked="" type="checkbox"/> alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Table 6.1
		<input checked="" type="checkbox"/> alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	Table 6.1
		<input checked="" type="checkbox"/> Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	Table 6.1
		<input checked="" type="checkbox"/> Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	Table 6.1
		<input checked="" type="checkbox"/> Detail measures or options considered but not implemented because they are not feasible and/or practical (eg due to site constraints)	N/A

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		Maps and tables	
		<input checked="" type="checkbox"/> Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 6.1
		<input checked="" type="checkbox"/> Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Figure 6.1
		<input checked="" type="checkbox"/> Maps demonstrating indirect impact zones where applicable	N/A, all indirect impact zones included within disturbance footprint (see Section 6.2)
		Data	
		Digital shape files of:	-
		<input checked="" type="checkbox"/> alternative and final proposal footprint	
		<input checked="" type="checkbox"/> direct and indirect impact zones	
		<input checked="" type="checkbox"/> Maps in jpeg format	
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	Information	
		<input checked="" type="checkbox"/> Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Section 6.2.1
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	-
		<input checked="" type="checkbox"/> description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	Section 6.2.2
		<input checked="" type="checkbox"/> documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	Section 6.2.2
		<input checked="" type="checkbox"/> reporting any limitations or assumptions, etc. made during the assessment	Chapter 6

Table A.1 **Assessment of compliance with BDAR minimum information requirements**

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> identification of the threatened entities and their habitat likely to be affected	Section 6.2.2
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	-
		<input checked="" type="checkbox"/> assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	Section 6.3.2
		<input checked="" type="checkbox"/> karst, caves, crevices, cliffs, rocks and other features of geological significance	N/A
		<input checked="" type="checkbox"/> human-made structures	N/A
		<input checked="" type="checkbox"/> non-native vegetation	Section 6.3.2
		<input checked="" type="checkbox"/> connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	N/A
		<input checked="" type="checkbox"/> movement of threatened species that maintains their life cycle	N/A
		<input checked="" type="checkbox"/> water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	N/A
		<input checked="" type="checkbox"/> assessment of the impacts of wind turbine strikes on protected animals	N/A
		<input checked="" type="checkbox"/> assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Table 6.2
		<input checked="" type="checkbox"/> evaluate the consequences of prescribed impacts	Section 6.3.2
		<input checked="" type="checkbox"/> describe impacts that are uncertain	Section 6.2
		<input checked="" type="checkbox"/> document limitations to data, assumptions and predictions	Section 6.3
		Maps and tables	
		<input checked="" type="checkbox"/> Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	N/A, full biodiversity loss assumed in all vegetation zones (Section 6.2)

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		Data	
		n/a	-
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	Information	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	Section 6.4
		<input checked="" type="checkbox"/> techniques, timing, frequency and responsibility	Table 6.3
		<input checked="" type="checkbox"/> identify measures for which there is risk of failure	Table 6.3, item E.09
		<input checked="" type="checkbox"/> evaluate the risk and consequence of any residual impacts	Section 6.2.1, 6.3.2, 6.5.2
		<input checked="" type="checkbox"/> document any adaptive management strategy proposed	Table 6.3, item E.09, E.10
		Identification of measures for mitigating impacts related to:	-
		<input checked="" type="checkbox"/> displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	Table 6.3
		<input checked="" type="checkbox"/> indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	Table 6.3
		<input checked="" type="checkbox"/> mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	Table 6.3
		<input checked="" type="checkbox"/> Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	N/A
		Maps and tables	
		<input checked="" type="checkbox"/> Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 6.3

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		Data	
		n/a	-
Impact summary	Chapter 9	Information	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	Section 6.5
		<input checked="" type="checkbox"/> addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	Section 6.5.2
		<input checked="" type="checkbox"/> for each TEC, report the extent of the TEC in NSW	Table 6.4
		<input checked="" type="checkbox"/> addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	N/A – no species at risk of SAII
		<input checked="" type="checkbox"/> for each threatened species, report the population size in NSW	N/A
		<input checked="" type="checkbox"/> documenting assumptions made and/or limitations to information	Table 6.4, Table 6.5
		<input checked="" type="checkbox"/> documenting all sources of data, information, references used or consulted	Table 6.4, Table 6.5
		<input checked="" type="checkbox"/> clearly justifying why any criteria could not be addressed	N/A
		<input checked="" type="checkbox"/> Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 7.2
		<input checked="" type="checkbox"/> Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 7.1
		<input checked="" type="checkbox"/> Identification of areas not requiring assessment in accordance with BAM Section 9.3	Section 7.1
		Maps and tables	
		<input checked="" type="checkbox"/> Map showing the extent of TECs at risk of an SAII within the subject land	Figure 4.3
		<input checked="" type="checkbox"/> Map showing location of threatened species at risk of an SAII within the subject land	N/A

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		Map showing location of:	-
		<input checked="" type="checkbox"/> impacts requiring offset	Figure 7.1
		<input checked="" type="checkbox"/> impacts not requiring offset	Figure 7.1
		<input checked="" type="checkbox"/> areas not requiring assessment	Figure 7.1
		Data	
		Digital shape files of:	
		<input checked="" type="checkbox"/> extent of TECs at risk of an SAI within the subject land	
		<input checked="" type="checkbox"/> location of threatened species at risk of an SAI within the subject land	
		<input checked="" type="checkbox"/> boundary of impacts requiring offset	
		<input checked="" type="checkbox"/> boundary of impacts not requiring offset	
		<input checked="" type="checkbox"/> boundary of areas not requiring assessment	
		<input checked="" type="checkbox"/> Maps in jpeg format	
Impact summary	Chapter 10	Information	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	
		<input checked="" type="checkbox"/> future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H)	Section 7.2, Table 7.2
		<input checked="" type="checkbox"/> change in vegetation integrity score (BAM Subsection 8.1.1)	Table 7.2
		<input checked="" type="checkbox"/> number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	Table 7.2
		<input checked="" type="checkbox"/> biodiversity risk weighting for each	Table 7.4

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Section reference(s) in the BDAR
		<input checked="" type="checkbox"/> number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	Table 7.4
		Maps and tables	
		<input checked="" type="checkbox"/> Table of PCTs requiring offset and the number of ecosystem credits required	Table 7.2
		<input checked="" type="checkbox"/> Table of threatened species requiring offset and the number of species credits required	Table 7.4
		Data	
		<input checked="" type="checkbox"/> Submitted proposal in the BAM Calculator	
Biodiversity credit report	Chapter 10	Information	
		<input checked="" type="checkbox"/> Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	Appendix J
		<input checked="" type="checkbox"/> BAM credit report in pdf format	Appendix J
		Maps and tables	
		<input checked="" type="checkbox"/> Table of credit class and matching credit profile	Appendix J
		Data	
		<input checked="" type="checkbox"/> BAM credit report in pdf format	Appendix J

Appendix B

Supplementary SEARs

Table B.1 outlines the requirements laid out by the supplementary SEARs for the project, issued on 4 October 2022, and where each requirement has been addressed.

Table B.1 Requirements of the supplementary SEARs

Requirement	Section addressed
General requirements	
Relevant regulations	
5. The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the EPBC Regulations and all matters outlined below in relation to the controlling provisions.	EIS – Chapter 6.1, this BDAR
Project Description	
6. The title of the action, background to the action and current status.	EIS – Chapter 3
7. The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on Matters of National Environmental Significance (MNES).	Chapter 1, EIS – Chapter 3
8. How the action relates to any other actions that have been, or are being taken in the region affected by the action.	N/A
9. How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	EIS – Chapter 3
Impacts	
10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including:	
i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts;	Section 8.1
ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;	Section 8.1
iii. analysis of the significance of the relevant impacts; and	Considered for each impacted MNES in Appendix M Summarised in Section 8.4
iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	Referenced within Section 8.4 where required, data from Stage 1 of report
Avoidance, mitigation and offsetting	
11. For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including:	
i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures,	Section 8.3, summarised for each MNES in Section 8.4
ii. any statutory policy basis for the mitigation measures;	Section 8.3
iii. the cost of the mitigation measures;	Section 8.3

Table B.1 Requirements of the supplementary SEARs

Requirement	Section addressed
iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing;	Section 8.3
v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	Section 8.3
12. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Section 8.5
13. For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any:	
i. conservation advice or recovery plan for the species or community;	Referenced in Section 8.4 and in significant impact assessments (Appendix M)
ii. relevant threat abatement plan for the species or community;	Referenced in Section 8.4 and in significant impact assessments (Appendix M)
iii. wildlife conservation plan for the species; and	Referenced in Section 8.4 and in significant impact assessments (Appendix M)
iv. any strategic assessment.	Referenced in Section 8.4 and in significant impact assessments (Appendix M)
14. In addition to the general requirements described above, specific information is required with respect to each of the determined controlling provisions. These requirements are outlined in paragraphs 15–18.	
Key issues – Biodiversity (threatened species and communities)	
Assessment requirements	
15. The EIS must identify each EPBC Act listed threatened species and community likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	MNES likely to be impacted: Section 8.2.1 Nature, quantum and consequences of impacts: Table 8.1, addressed for each MNES in Section 8.4 MNES not likely to be impacted: Section 8.2.2
16. Further analysis of the impacts of the 2019-2020 bushfires on EPBC Act listed threatened species and communities should be undertaken during the assessment. Further assessment will determine whether the remaining habitat within the proposed action area is of substantially greater importance to the survival of the listed threatened species following the fires and/or whether the population of the species in the area is considered an important population. This information, once obtained, can be considered when determining avoidance, mitigation and offset measures for these species.	Considered for each MNES in Section 8.2.2 and Section 8.4

Table B.1 Requirements of the supplementary SEARs

Requirement	Section addressed
17. For each of the EPBC Act listed threatened species and communities likely to be impacted by the action the EIS must provide a separate:	
i. description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	Considered for each MNES in Section 8.4
ii. details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements;	Considered for each MNES in Section 8.4
iii. description of the relevant impacts of the action having regard to the full national extent of the species or community's range;	Considered for each MNES in Section 8.4, and incorporated into Significant Impact Assessments in Appendix M.
iv. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action;	Section 8.3, and considered for each MNES in Section 8.4
v. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account;	Considered for each MNES in Section 8.4
vi. a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established;	Section 8.5
vii. details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; and	Section 8.5
viii. details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.	Section 8.5
18. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy. https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-environmental-offsets-policy .	Section 8.6
Other approvals and conditions	
19. Information in relation to any other approvals or conditions required must include the information prescribed in Schedule 4 Clause 5 (a) (b) (c) and (d) of the EPBC Regulations.	EIS
Environmental Record of person proposing to take the action	
20. Information in relation to the environmental record of a person proposing to take the action must include details as prescribed in Schedule 4 Clause 6 of the EPBC Regulations.	EIS – Chapter 1
Information Sources	
21. For information given in an EIS, the EIS must state the source of the information, how recent the information is, how the reliability of the information was tested; and what uncertainties (if any) are in the information.	EIS – References

Appendix C

Vegetation integrity assessment field datasheets

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BAM Site – Field Survey Form

Plot ID:	BAM03	Date:	26/05/21	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	349,418	Recorders:	IC, CP		
Zone:	56	Northing:	6,700,055	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	228
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_LOW	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	7
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	81.3
	Forbs:	0.7
	Other:	0.1
High Threat Weed cover:		3

BAM Attribute (1000 m ² plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0	Tree hollow count	0
20 – 29 cm:	0		
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	5	10	10	10
Average litter cover (%):	8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Gently sloped grassland

Plot Disturbance

Grazed, cleared, weeds

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	IC, CP	Plot ID:	BAM03
		Date:	26/05/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Bothriochloa decipiens</i> var. <i>decipiens</i> (Pitted Bluegrass)	40	5000	no	N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> subsp. <i>sericeum</i> (Queensland Bluegrass)	40	5000	no	N
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	1	20	no	N
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	0.1	10	no	N
Grass & grasslike (GG)	<i>Imperata cylindrica</i> (Blady Grass)	0.1	20	no	N
Forb (FG)	<i>Plantago gaudichaudii</i> (Narrow Plantain)	0.1	1	no	N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.1	10	no	N
Forb (FG)	<i>Euchiton involucratus</i> (Star Cudweed)	0.1	2	no	N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.1	10	no	N
Forb (FG)	<i>Oxalis exilis</i>	0.1	10	no	N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	20	no	N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	10	no	N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.1	1	no	N
	<i>Trifolium campestre</i> (Hop Clover)	0.1	40	no	E
	<i>Stylosanthes humilis</i>	0.1	20	no	E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	20	no	E
	<i>Trifolium repens</i> (White Clover)	1	100	no	E
	<i>Vicia</i> spp. (Vetch)	0.1	20	no	E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	2	no	E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	10	no	E
	<i>Paspalum dilatatum</i> (Paspalum)	3	1000	no	HTE
Grass & grasslike (GG)	<i>Setaria</i> spp.	0.1	30	no	N
	<i>Medicago polymorpha</i> (Burr Medic)	0.1	40	no	E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.5	30	no	E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	10	no	E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.1	10	no	E

BAM Site – Field Survey Form

Plot ID:	BAM05	Date:	27/05/21	Project number:	J210075	Plot dimensions:	20 x 50	
Datum:	GDA94	Easting:	347,533	Recorders:	IC, CP			
Zone:	56	Northing:	6,699,983	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	335	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	14
	Forbs:	9
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.1
	Grasses etc.:	42.4
	Forbs:	0.9
	Other:	0.2
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	25	20	15	10	5
Average litter cover (%):	15				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Grassland on top of gentle ridge

Plot Disturbance

Cleared, weedy, sometimes grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	IC, CP	Plot ID:	BAM05
		Date:	27/05/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	2	50	no	N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	1	50	no	N
Grass & grasslike (GG)	<i>Dichelachne micrantha</i> (Shorthair Plumegrass)	5	200	no	N
Grass & grasslike (GG)	<i>Eragrostis leptostachya</i> (Paddock Lovegrass)	1	100	no	N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	0.1	10	no	N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	5	200	no	N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> subsp. <i>sericeum</i> (Queensland Bluegrass)	1	100	no	N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	15	1000	no	N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	5	200	no	N
Grass & grasslike (GG)	<i>Bothriochloa decipiens</i> var. <i>decipiens</i> (Pitted Bluegrass)	2	100	no	N
Grass & grasslike (GG)	<i>Bothriochloa biloba</i> (Lobed Bluegrass)	0.1	20	no	N
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	5	200	no	N
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.1	10	no	N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	50	no	N
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	1	no	N
Forb (FG)	<i>Wahlenbergia</i> spp. (Bluebell)	0.1	1	no	N
Forb (FG)	<i>Mentha saturoioides</i> (Native Pennyroyal)	0.1	50	no	N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	30	no	N
Forb (FG)	<i>Dichondra</i> spp.	0.1	40	no	N
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.1	1	no	N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.1	50	no	N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	20	no	N
Forb (FG)	<i>Sida corrugata</i> (Corrugated Sida)	0.1	3	no	N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	1	no	N
Shrub (SG)	<i>Eremophila debilis</i> (Amulla)	0.1	5	no	N
Grass & grasslike (GG)	<i>Lomandra multiflora</i> subsp. <i>multiflora</i> (Many-flowered Mat-rush)	0.1	4	no	N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.1	1	no	HTE
	<i>Convolvulus arvensis</i> (Field Bindweed)	0.1	2	no	E
	<i>Bromus catharticus</i> (Prairie Grass)	0.1	10	no	E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	20	no	E
	<i>Polygonum aviculare</i> (Wireweed)	0.1	1	no	E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.1	20	no	E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	4	no	E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	10	no	E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.5	40	no	E
	<i>Medicago polymorpha</i> (Burr Medic)	0.5	1000	no	E
	<i>Marrubium vulgare</i> (White Horehound)	0.2	100	no	E
	<i>Eleusine tristachya</i> (Goose Grass)	0.1	20	no	E

BAM Site – Field Survey Form

Plot ID:	BAM10	Date:	17/10/21	Project number:	J210075	Plot dimensions:	20 x 20m	
Datum:	GDA94	Easting:	348,873	Recorders:	EJ, CP			
Zone:	56	Northing:	6,700,742	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	285	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	9
	Forbs:	13
	Ferns:	0
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.1
	Grasses etc.:	30.3
	Forbs:	1.3
	Other:	0.3
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	10	5	10	5
Average litter cover (%):	7				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Previously cultivated. Currently being prepped for summer crops. Cows in paddock , active grazing.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	EJ, CP	Plot ID:	BAM10
		Date:	17/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Trifolium arvense</i> (Haresfoot Clover)	0.1	1		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.1	3		E
	<i>Hordeum hystris</i> (Mediterranean Barley Grass)	0.1	20		E
Grass & grasslike (GG)	<i>Austrostipa aristigulumis</i> (Plains Grass)	0.1	14		N
	<i>Paronychia brasiliana</i> (Chilean Whitlow Wort, Brazilian Whitlow)	0.3	40		E
	<i>Conyza sumatrensis</i> (Tall fleabane)	0.1	20		E
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	5	400		N
Forb (FG)	<i>Swainsona reticulata</i> (Kneed Swainson-pea)	0.1	2		N
	<i>Malva parviflora</i> (Small-flowered Mallow)	0.1	1		E
	<i>Capsella bursa-pastoris</i> (Shepherd's Purse)	0.1	1		E
	<i>Petrorhagia dubia</i>	0.1	5		E
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	5	400		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	0.1	30		N
	<i>Verbena bonariensis</i> (Purpletop)	0.1	1		E
	<i>Cycloperum leptophyllum</i> (Slender Celery)	0.1	100		E
	<i>Trifolium repens</i> (White Clover)	5	500		E
	<i>Lolium rigidum</i> (Wimmera Ryegrass)	5	400		E
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	5	400		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	100		N
	<i>Trifolium campestre</i> (Hop Clover)	1	100		E
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	20		N
Forb (FG)	<i>Crassula sieberiana</i> (Australian Stonecrop)	0.1	50		N
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.1	20		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	4		N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.1	10		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.1	30		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	110		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	20		N
Forb (FG)	<i>Euchiton sphaericus</i> (Star Cudweed)	0.1	30		N
	<i>Hypochaeris radicata</i> (Catsear)	0.1	10		E
	<i>Bromus catharticus</i> (Prairie Grass)	5	400		E
Forb (FG)	<i>Oxalis exilis</i>	0.1	20		N
	<i>Salvia verbenaca</i> (Vervain)	0.1	20		E
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	5	400		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.1	10		N
Shrub (SG)	<i>Pimelea curviflora</i> (Rice Flower)	0.1	3		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	20		N
Forb (FG)	<i>Dichopogon fimbriatus</i> (Nodding Chocolate Lily)	0.1	40		N
	<i>Carthamus lanatus</i> (Saffron Thistle)	0.1	100		HTE
	<i>Polygonum aviculare</i> (Wireweed)	0.1	50		E
	<i>Eleusine tristachya</i> (Goose Grass)	5	400		E
Forb (FG)	<i>Calotis lappulacea</i> (Yellow Burr-daisy)	0.1	2		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	5	400		N

Project name:	J210075				
Recorders:	EJ, CP	Plot ID:	BAM10	Date:	17/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Sporobolus creber</i> (<i>Slender Rat's Tail Grass</i>)	5	400		N
	<i>Cirsium vulgare</i> (<i>Spear Thistle</i>)	0.2	6		E
Other (OG)	<i>Desmodium varians</i> (<i>Slender Tick-trefoil</i>)	0.1	10		N

BAM Site – Field Survey Form

Plot ID:	BAM12	Date:	17/10/21	Project number:	J210075	Plot dimensions:	20 x 20m	
Datum:	GDA94	Easting:	348,251	Recorders:	EJ, CP			
Zone:	56	Northing:	6,700,873	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	5	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	5
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	23
	Forbs:	0.5
	Other:	0.1
High Threat Weed cover:		3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	15	5	15	25	5
Average litter cover (%):	13				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Heavily grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	EJ, CP	Plot ID:	BAM12	Date:	17/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Paspalum dilatatum</i> (Paspalum)	3	100		HTE
	<i>Trifolium repens</i> (White Clover)	10	80		E
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	1	60		N
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	5	20000		E
	<i>Trifolium campestre</i> (Hop Clover)	0.1	100		E
Forb (FG)	<i>Dichopogon fimbriatus</i> (Nodding Chocolate Lily)	0.1	40		N
	<i>Verbena bonariensis</i> (Purpletop)	0.1	1		E
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	5	500		N
	<i>Bromus catharticus</i> (Prairie Grass)	5	500		E
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	5	20000		N
	<i>Polygonum aviculare</i> (Wireweed)	0.1	5		E
	<i>Salvia verbenaca</i> (Vervain)	1	100		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.1	100		E
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	10	500		N
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	2		E
Forb (FG)	<i>Oxalis exilis</i>	0.1	20		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	20		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	60		N
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	30		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	2		N
	<i>Vicia villosa</i> (Russian Vetch)	0.1	60		E
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	2	100		N
	<i>Petrorhagia dubia</i>	0.1	3		E
	<i>Malva parviflora</i> (Small-flowered Mallow)	0.1	1		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	2		E
	<i>Paronychia brasiliana</i> (Chilean Whitlow Wort, Brazilian Whitlow)	0.1	20		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	1	100		E

BAM Site – Field Survey Form

Plot ID:	BAM13	Date:	17/10/21	Project number:	J210075	Plot dimensions:	20 x 20m	
Datum:	GDA94	Easting:	348,460	Recorders:	EJ, CP			
Zone:	56	Northing:	6,700,975	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	125	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	2
	Grasses etc.:	4
	Forbs:	12
	Ferns:	0
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	1.1
	Grasses etc.:	22
	Forbs:	5.9
	Other:	0.3
High Threat Weed cover:		0.6

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	5	5	5	10
Average litter cover (%):	6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Previous grazing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	EJ, CP	Plot ID:	BAM13
		Date:	17/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.1	20		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.1	20		N
Forb (FG)	<i>Chamaesyce drummondii</i> (Caustic Weed)	0.1	1		N
	<i>Gamochaeta</i> spp.	0.5	100		E
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	5	2000		N
	<i>Polygonum aviculare</i> (Wireweed)	0.1	5		E
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	1	75		N
	<i>Trifolium repens</i> (White Clover)	5	30		E
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	10		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	20		E
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.1	1		HTE
Forb (FG)	<i>Oxalis exilis</i>	0.1	20		N
	<i>Paspalum dilatatum</i> (Paspalum)	0.5	40		HTE
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	5	20000		E
Forb (FG)	<i>Swainsona galegifolia</i> (Smooth Darling Pea)	0.1	2		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	100		N
	<i>Salvia verbenaca</i> (Vervain)	0.2	100		E
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	3	300		N
	<i>Medicago polymorpha</i> (Burr Medic)	0.1	100		E
Shrub (SG)	<i>Pimelea curviflora</i> (Rice Flower)	0.1	1		N
	<i>Trifolium campestre</i> (Hop Clover)	0.1	100		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	2	500		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.5	200		E
Forb (FG)	<i>Vittadinia cuneata</i> (A Fuzzweed)	0.1	20		N
Forb (FG)	<i>Swainsona reticulata</i> (Knead Swainson-pea)	0.1	4		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	5	1000		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	13		N
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	10		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.1	20		E
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	2	200		N
	<i>Petrorhagia dubia</i>	0.1	20		E
Shrub (SG)	<i>Eremophila debilis</i> (Amulla)	1	50		N
	<i>Verbena bonariensis</i> (Purpletop)	0.1	2		E
Forb (FG)	<i>Euchiton sphaericus</i> (Star Cudweed)	0.1	20		N
	<i>Bromus catharticus</i> (Prairie Grass)	0.2	20		E
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.1	20		N
Grass & grasslike (GG)	<i>Themeda triandra</i>	10	200		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	1	300		N

BAM Site – Field Survey Form

Plot ID:	BAM14	Date:	17/10/21	Project number:	J210075	Plot dimensions:	20 x 20m	
Datum:	GDA94	Easting:	348,595	Recorders:	EJ, CP			
Zone:	56	Northing:	6,700,869	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	120	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	7
	Forbs:	11
	Ferns:	0
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	32.4
	Forbs:	5
	Other:	0.5
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	5	5	5	5
Average litter cover (%):	5				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Previously grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	EJ, CP	Plot ID:	BAM14	Date:	17/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	25	2000		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	30		N
	<i>Cyclopermum leptophyllum</i> (Slender Celery)	2	10000		E
Forb (FG)	<i>Swainsona reticulata</i> (Knead Swainson-pea)	0.1	2		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.3	60		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	4	600		N
	<i>Trifolium repens</i> (White Clover)	3	100		E
	<i>Carthamus lanatus</i> (Saffron Thistle)	0.1	80		HTE
	<i>Trifolium campestre</i> (Hop Clover)	3	100		E
	<i>Medicago polymorpha</i> (Burr Medic)	3	100		E
	<i>Conyza sumatrensis</i> (Tall fleabane)	0.1	100		E
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	20		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.1	100		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	300		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	0.1	50		N
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	20		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	0.1	20		N
	<i>Paronychia brasiliana</i> (Chilean Whitlow Wort, Brazilian Whitlow)	0.1	50		E
Forb (FG)	<i>Crassula sieberiana</i> (Australian Stoncrop)	0.1	30		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	5		E
	<i>Linaria arvensis</i>	0.1	2		E
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	5	500		N
Forb (FG)	<i>Calotis lappulacea</i> (Yellow Burr-daisy)	0.1	2		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	2	300		N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.1	2		N
Grass & grasslike (GG)	<i>Lomandra multiflora</i> subsp. <i>multiflora</i> (Many-flowered Mat-rush)	0.1	1		N
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.1	20		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	1		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	50		N
	<i>Hypochaeris radicata</i> (Catsear)	0.1	30		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.1	40		E
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.1	40		N

BAM Site – Field Survey Form

Plot ID:	BAM15	Date:	18/10/21	Project number:	J210075	Plot dimensions:	20 x 20	
Datum:	GDA94	Easting:	347,367	Recorders:	CP			
Zone:	56	Northing:	6,700,267	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	313	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	9
	Forbs:	12
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	35.6
	Forbs:	2.2
	Other:	0.2
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	10	5	6	25
Average litter cover (%):	15.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Edge of cultivation. Does not appear to be regularly cultivated. Contains two box trees

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	CP	Plot ID:	BAM15	Date:	18/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.1	10		N
Grass & grasslike (GG)	<i>Austrostipa aristigulumis</i> (Plains Grass)	10	80		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	20	3000		N
Grass & grasslike (GG)	<i>Panicum effusum</i> (Hairy Panic)	1	100		N
	<i>Lolium rigidum</i> (Wimmera Ryegrass)	2	200		E
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	1	100		N
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	1	100		N
Grass & grasslike (GG)	<i>Lomandra multiflora</i> subsp. <i>multiflora</i> (Many-flowered Mat-rush)	0.1	2		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.1	1		HTE
Grass & grasslike (GG)	<i>Themeda triandra</i>	1	100		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	30		E
Forb (FG)	<i>Einadia polygonoides</i> (Knotweed Goosefoot)	0.1	40		N
	<i>Trifolium repens</i> (White Clover)	0.1	10		E
Forb (FG)	<i>Swainsona galegifolia</i> (Smooth Darling Pea)	0.1	4		N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	1	60		N
	<i>Trifolium arvense</i> (Haresfoot Clover)	0.1	20		E
Fern (EG)	<i>Cheilanthes sieberi</i> (Rock Fern)	0.1	50		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	30		N
	<i>Medicago polymorpha</i> (Burr Medic)	0.2	100		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	200		E
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.1	50		N
Forb (FG)	<i>Vittadinia cuneata</i> (A Fuzzweed)	0.1	20		N
	<i>Vicia villosa</i> (Russian Vetch)	0.1	30		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	20		E
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	3		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.1	2		N
Forb (FG)	<i>Calotis lappulacea</i> (Yellow Burr-daisy)	0.2	50		N
	<i>Petrorhagia dubia</i>	0.1	20		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.2	40		E
	<i>Conyza sumatrensis</i> (Tall fleabane)	0.1	20		E
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	2		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	40		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	30		N
Forb (FG)	<i>Dichopogon fimbriatus</i> (Nodding Chocolate Lily)	0.1	20		N
	<i>Medicago sativa</i> (Lucerne)	0.1	20		E
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	0.5	50		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	1	10		N

BAM Site – Field Survey Form

Plot ID:	BAM16	Date:	07/12/21	Project number:	J210075	Plot dimensions:	20x20	
Datum:	GDA94	Easting:	346,693	Recorders:	CP			
Zone:	56	Northing:	6,699,171	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	156	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_V_LOW	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	7
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	6.2
	Forbs:	2.7
	Other:	0.2
High Threat Weed cover:		1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	10	10	5	2	3
Average litter cover (%):	6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Thistles, grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	CP	Plot ID:	BAM16	Date:	07/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	1	50		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	1	60		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	2	40		N
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	2	150		N
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	2	50		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	0.1	20		N
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.1	30		N
Other (OG)	<i>Cassytha pubescens</i> (Downy Dodder-laurel)	0.1	10		N
Forb (FG)	<i>Vittadinia cuneata</i> (A Fuzzweed)	0.2	40		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.1	20		N
Forb (FG)	<i>Euchiton</i> spp. (A Cudweed)	0.1	3		N
Forb (FG)	<i>Chamaesyce drummondii</i> (Caustic Weed)	0.1	2		N
Grass & grasslike (GG)	<i>Sorghum leiocladum</i> (Wild Sorghum)	0.1	20		N
Forb (FG)	<i>Mentha saturoioides</i> (Native Pennyroyal)	0.1	10		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	2		N
	<i>Trifolium repens</i> (White Clover)	1	50		E
	<i>Verbena bonariensis</i> (Purpletop)	0.5	30		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	1	20		E
	<i>Centaurea erythraea</i> (Common Centaury)	0.1	20		E
	<i>Petrorhagia dubia</i>	0.1	20	yes	E
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.2	30		E
	<i>Sonchus oleraceus</i> (Common Sowthistle)	0.1	5		E
	<i>Paspalum dilatatum</i> (Paspalum)	1	20		HTE
	<i>Phalaris aquatica</i> (Phalaris)	0.2	20		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.5	100		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	35	3000		E
	<i>Medicago sativa</i> (Lucerne)	0.3	80		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	10		E
	<i>Trifolium campestre</i> (Hop Clover)	1	60		E

BAM Site – Field Survey Form

Plot ID:	BAM17	Date:	07/12/21	Project number:	J210075	Plot dimensions:	20 x 20	
Datum:	GDA94	Easting:	347,153	Recorders:	CP			
Zone:	56	Northing:	6,701,452	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	101	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_LOW	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	4
	Forbs:	7
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	11.5
	Forbs:	1.8
	Other:	0.2
High Threat Weed cover:		10.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0	Tree hollow count	0
20 – 29 cm:	0		
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	15	5	15	30	5
Average litter cover (%):	14				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Grazing, weeds

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	CP	Plot ID:	BAM17	Date:	07/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Plantago lanceolata</i> (Lamb's Tongues)	10	80		E
	<i>Eragrostis curvula</i> (African Lovegrass)	10	1000		HTE
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.2	50		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.3	50		E
	<i>Bromus catharticus</i> (Prairie Grass)	0.1	10		E
	<i>Trifolium repens</i> (White Clover)	5	200		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.2	100		E
	<i>Paspalum dilatatum</i> (Paspalum)	0.5	20		HTE
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	0.5	100		N
	<i>Lolium rigidum</i> (Wimmera Ryegrass)	0.1	20		E
	<i>Polygonum aviculare</i> (Wireweed)	0.1	20		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	10		E
	<i>Trifolium campestre</i> (Hop Clover)	0.2	50		E
	<i>Petrorhagia dubia</i>	0.1	10		E
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	10		E
	<i>Cirsium vulgare</i> (Spear Thistle)	2	8		E
Forb (FG)	<i>Hydrocotyle laxiflora</i> (Stinking Pennywort)	0.1	10		N
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.1	10		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	50		N
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	5	300		N
Forb (FG)	<i>Swainsona galegifolia</i> (Smooth Darling Pea)	0.2	20		N
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	1	20		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.2	100		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.2	100		N
Grass & grasslike (GG)	<i>Dichelachne micrantha</i> (Shorthair Plumegrass)	5	300		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	1	200		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.1	20		N

BAM Site – Field Survey Form

Plot ID:	BAM18	Date:	27/04/22	Project number:	J210075	Plot dimensions:	
Datum:	GDA94	Easting:	349,366	Recorders:	LO, IM		
Zone:	56	Northing:	6,700,839	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	280
Plant Community Type:	84: River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion				Condition class:	WDL	PCT confidence:
Vegetation Class:	Eastern Riverine Forests				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	60
	Shrubs:	0
	Grasses etc.:	49.4
	Forbs:	1
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m ² plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	6
80 + cm:	1		
50 – 79 cm:	1		
30 – 49 cm:	5		
20 – 29 cm:	2	Tree hollow count	1
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	3	5	20	1	10
Average litter cover (%):	7.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM18
		Date:	27/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Rapistrum rugosum</i> (Turnip Weed)	1	20		E
	<i>Rubus anglocandicans</i> (Blackberry)	2	4		E
	<i>Dactylis glomerata</i> (Cocksfoot)	1	30		E
	<i>Bromus catharticus</i> (Prairie Grass)	1	30		E
Tree (TG)	<i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> (River Oak)	60	14		N
	<i>Urtica dioica</i> (Giant Nettle)	0.3	8		E
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	0.3	20		N
Grass & grasslike (GG)	<i>Cyperus vaginatus</i> (Stiff Flat-sedge)	15	300		N
Grass & grasslike (GG)	<i>Arundinella nepalensis</i> (Reedgrass)	30	300		N
	<i>Verbena bonariensis</i> (Purpletop)	0.2	3		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.2	4		E
	<i>Cichorium intybus</i> (Chicory)	1	10		E
	<i>Modiola caroliniana</i> (Red-flowered Mallow)	0.2	10		E
	<i>Rorippa nasturtium-aquaticum</i> (Watercress)	0.3	20		E
Grass & grasslike (GG)	<i>Paspalum distichum</i> (Water Couch)	1	30		N
Forb (FG)	<i>Dichondra</i> spp.	0.2	20		N
Grass & grasslike (GG)	<i>Carex appressa</i> (Tall Sedge)	3	10		N
	<i>Trifolium repens</i> (White Clover)	1	30		E
Forb (FG)	<i>Epilobium billardierianum</i> subsp. <i>billardierianum</i>	0.2	3		N
Forb (FG)	<i>Einadia polygonoides</i> (Knotweed Goosefoot)	0.2	4		N
Forb (FG)	<i>Brunoniella australis</i> (Blue Trumpet)	0.1	2		N
Grass & grasslike (GG)	<i>Austrostipa verticillata</i> (Slender Bamboo Grass)	0.3	5		N
Grass & grasslike (GG)	<i>Lachnagrostis filiformis</i>	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	BAM21	Date:	27/04/22	Project number:	J210075	Plot dimensions:		
Datum:	GDA94	Easting:	349,151	Recorders:	LO, JM			
Zone:	56	Northing:	6,700,718	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	200	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_LOW	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	11
	Forbs:	6
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	12.2
	Forbs:	1.1
	Other:	0.4
High Threat Weed cover:		1.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	1	2	1	1
Average litter cover (%):	1.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Note: this plot is located at proposed april 2022 BAM21 location. Location data needs to be added as Survey123 crashed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO,IM	Plot ID:	BAM21
		Date:	27/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	1	30		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	2	20		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	5	50		E
	<i>Carthamus lanatus</i> (Saffron Thistle)	0.3	4		HTE
	<i>Trifolium repens</i> (White Clover)	70	1000		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	10	200		E
	<i>Medicago polymorpha</i> (Burr Medic)	1	50		E
	<i>Verbena bonariensis</i> (Purpletop)	0.2	3		E
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	1	30		N
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	5	100		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	1	30		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	0.3	10		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	1	20		N
	<i>Cirsium vulgare</i> (Spear Thistle)	0.3	4		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	1	10		E
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	1	30		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.3	10		N
Other (OG)	<i>Glycine clandestina</i> (Twining glycine)	0.2	4		N
Forb (FG)	<i>Cymbonotus</i> spp.	0.1	1		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.3	20		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	2		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	3		N
	<i>Medicago</i> spp. (A Medic)	0.2	6		E
	<i>Trifolium campestre</i> (Hop Clover)	0.2	20		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.2	6		E
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.2	10		N
	<i>Paspalum dilatatum</i> (Paspalum)	1	20		HTE
	<i>Bromus catharticus</i> (Prairie Grass)	0.3	10		E
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	0.5	10		N
Grass & grasslike (GG)	<i>Eragrostis</i> spp. (A Lovegrass)	1	20		N
	<i>Vulpia bromoides</i> (Squirrel Tail Fesque)	0.3	5		E
Grass & grasslike (GG)	<i>Panicum simile</i> (Two-colour Panic)	0.3	10		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.2	6		N
Forb (FG)	<i>Glossocardia bidens</i> (Cobbler's Tack)	0.1	2		N
	<i>Cyclopermum leptophyllum</i> (Slender Celery)	0.3	20		E
	<i>Setaria parviflora</i>	0.3	10		E

BAM Site – Field Survey Form

Plot ID:	BAM22	Date:	28/04/22	Project number:	J210075	Plot dimensions:		
Datum:	GDA94	Easting:	348,649	Recorders:	LO, IM			
Zone:	56	Northing:	6,701,341	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	308	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_LOW	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	12
	Forbs:	3
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	20.1
	Forbs:	1.2
	Other:	0.3
High Threat Weed cover:		31.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	5	2	1	2
Average litter cover (%):	3				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM22
		Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Trifolium repens</i> (White Clover)	90	2000		E
	<i>Paspalum dilatatum</i> (Paspalum)	30	300		HTE
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	50	200		E
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	5	50		N
Grass & grasslike (GG)	<i>Fimbristylis dichotoma</i> (Common Fringe-sedge)	0.2	3		N
	<i>Eragrostis curvula</i> (African Lovegrass)	1	30		HTE
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	2		E
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	3	10		N
Grass & grasslike (GG)	<i>Setaria</i> spp.	3	150		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	2	50		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.3	20		N
Grass & grasslike (GG)	<i>Panicum</i> spp. (Panicum)	1	30		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	3	50		N
Grass & grasslike (GG)	<i>Bothriochloa biloba</i> (Lobed Bluegrass)	0.5	10		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	1	30		N
	<i>Cirsium vulgare</i> (Spear Thistle)	1	10		E
	<i>Hypochaeris glabra</i> (Smooth Catsear)	0.2	3		E
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	2		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.3	30		E
	<i>Hypochaeris radicata</i> (Catsear)	0.2	4		E
Forb (FG)	<i>Oxalis</i> spp.	0.1	1		N
Grass & grasslike (GG)	<i>Digitaria</i> spp. (A Finger Grass)	1	20		N
Forb (FG)	<i>Solenogyne</i> spp.	0.1	1		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	1	20		N
Grass & grasslike (GG)	<i>Dichelachne micrantha</i> (Shorthair Plumegrass)	0.1	2		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.2	1		HTE
	<i>Xanthium spinosum</i> (Bathurst Burr)	0.2	1		HTE
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	0.3	10		N

BAM Site – Field Survey Form

Plot ID:	BAM23	Date:	30/04/22	Project number:	J210075	Plot dimensions:	20x20, 20x50	
Datum:	GDA94	Easting:	347,173	Recorders:	LO, IM			
Zone:	56	Northing:	6,701,377	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	110	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_LOW	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	4
	Forbs:	8
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	70.6
	Forbs:	2.6
	Other:	0
High Threat Weed cover:		1.6

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	10	10	15	5	10
Average litter cover (%):	10				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM23
		Date:	30/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	70	500	no	N
	<i>Verbena bonariensis</i> (Purpletop)	3	30		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	3	100		E
	<i>Vicia villosa</i> (Russian Vetch)	0.5	10		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	2	50		E
	<i>Trifolium repens</i> (White Clover)	20	500		E
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.3	10		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	1	20		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	5	30		E
Forb (FG)	<i>Euchiton sphaericus</i> (Star Cudweed)	0.2	4		N
	<i>Paspalum dilatatum</i> (Paspalum)	1	30		HTE
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.3	10		E
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	0.2	4		N
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	1	30		E
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	0.2	2		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.2	4		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.3	5		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.2	3		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	0.2	4		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.3	2		N
	<i>Cirsium vulgare</i> (Spear Thistle)	0.2	2		E
	<i>Hyparrhenia hirta</i> (Coolatai Grass)	0.3	10		HTE
	<i>Medicago polymorpha</i> (Burr Medic)	0.5	30		E
Forb (FG)	<i>Haloragis heterophylla</i> (Variable Raspwort)	0.1	1		N
	<i>Xanthium spinosum</i> (Bathurst Burr)	0.3	4		HTE

BAM Site – Field Survey Form

Plot ID:	BAM24	Date:	30/04/22	Project number:	J210075	Plot dimensions:	
Datum:	GDA94	Easting:	347,605	Recorders:	LO, IM		
Zone:	56	Northing:	6,701,494	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	122
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_LOW	PCT confidence:
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	9
	Forbs:	10
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.2
	Grasses etc.:	8.3
	Forbs:	2.6
	Other:	0.4
High Threat Weed cover:		50.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	10	10	5	5	10
Average litter cover (%):	8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM24
		Date:	30/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Bothriochloa biloba</i> (Lobed Bluegrass)	1	30		N
	<i>Verbena bonariensis</i> (Purpletop)	20	200		E
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.5	30		N
Grass & grasslike (GG)	<i>Panicum</i> spp. (Panicum)	1	30		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	2	50		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	1	30		E
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	1	30		N
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	0.5	30		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.5	20		E
	<i>Medicago polymorpha</i> (Burr Medic)	1	50		E
	<i>Trifolium repens</i> (White Clover)	3	200		E
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.2	3		N
Grass & grasslike (GG)	<i>Lomandra filiformis</i> (Wattle Matt-rush)	0.3	4		N
Forb (FG)	<i>Mentha saturoioides</i> (Native Pennyroyal)	0.1	3		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	0.5	20		N
Forb (FG)	<i>Vittadinia cuneata</i> (A Fuzzweed)	0.5	3		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.2	4		N
Shrub (SG)	<i>Pimelea linifolia</i> (Slender Rice Flower)	0.2	4		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	0.3	20		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.5	20		E
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	1	30		N
	<i>Eragrostis curvula</i> (African Lovegrass)	50	200		HTE
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.2	6		N
	<i>Marrubium vulgare</i> (White Horehound)	0.3	4		E
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	1	10		N
	<i>Hypericum perforatum</i> (St. Johns Wort)	0.3	6		HTE
Grass & grasslike (GG)	<i>Themeda triandra</i>	0.5	10		N
Forb (FG)	<i>Cymbonotus</i> spp.	0.1	1		N
Forb (FG)	<i>Calotis lappulacea</i> (Yellow Burr-daisy)	0.1	2		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.2	1		N
Forb (FG)	<i>Dianella revoluta</i> (Blueberry Lily)	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	BAM25	Date:	28/04/22	Project number:	J210075	Plot dimensions:		
Datum:	GDA94	Easting:	350,403	Recorders:	LO, JM			
Zone:	56	Northing:	6,700,869	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	54	
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	WDL	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	1
	Grasses etc.:	13
	Forbs:	16
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	55.3
	Shrubs:	1
	Grasses etc.:	15.9
	Forbs:	7.5
	Other:	0.6
High Threat Weed cover:		0.9

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	10
80 + cm:	1		
50 – 79 cm:	3		
30 – 49 cm:	2		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	5		
< 5 cm:	6		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	10	60	40	15	60
Average litter cover (%):	37				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO,IM	Plot ID:	BAM25
		Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	2	30		N
Forb (FG)	<i>Calotis lappulacea</i> (Yellow Burr-daisy)	1	20		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	2	50		N
Tree (TG)	<i>Eucalyptus melliodora</i> (Yellow Box)	20	3		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	3	50		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	1	30		N
Forb (FG)	<i>Swainsona</i> spp.	0.3	10		N
Tree (TG)	<i>Eucalyptus blakelyi</i> (Blakely's Red Gum)	30	5		N
Forb (FG)	<i>Dichondra</i> sp. A (Kidney Weed)	0.5	100		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.3	50		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	1	50		N
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	1	20		E
Forb (FG)	<i>Hydrocotyle laxiflora</i> (Stinking Pennywort)	0.3	20		N
Forb (FG)	<i>Oxalis</i> spp.	0.1	3		N
Forb (FG)	<i>Desmodium brachypodium</i> (Large Tick-trefoil)	0.2	10		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.2	6		N
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	2	30		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	3	100		N
Forb (FG)	<i>Veronica calycina</i> (Hairy Speedwell)	0.3	10		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	1	20		N
Grass & grasslike (GG)	<i>Eragrostis</i> spp. (A Lovegrass)	1	20		N
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	0.5	30		N
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	1	30		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.5	30		N
	<i>Trifolium repens</i> (White Clover)	0.2	10		E
	<i>Setaria parviflora</i>	0.5	20		E
Grass & grasslike (GG)	<i>Cyperus fulvus</i> (Sticky Sedge)	0.2	2		N
	<i>Hyparrhenia hirta</i> (Coolatai Grass)	0.1	3		HTE
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.3	6		E
Grass & grasslike (GG)	<i>Dichelachne micrantha</i> (Shorthair Plumegrass)	0.3	4		N
	<i>Eleusine tristachya</i> (Goose Grass)	0.2	4		E
	<i>Paspalum dilatatum</i> (Paspalum)	0.3	3		HTE
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.3	2		HTE
	<i>Cirsium vulgare</i> (Spear Thistle)	0.3	3		E
Forb (FG)	<i>Solenogyne</i> spp.	0.1	2		N
	<i>Hypochaeris radicata</i> (Catsear)	0.2	4		E
Forb (FG)	<i>Euchiton sphaericus</i> (Star Cudweed)	0.2	3		N
	<i>Hypochaeris glabra</i> (Smooth Catsear)	0.2	4		E
Grass & grasslike (GG)	<i>Microlaena stipoides</i> (Weeping Grass)	0.3	10		N
Tree (TG)	<i>Notelaea microcarpa</i> (Native Olive)	5	4		N
Grass & grasslike (GG)	<i>Austrostipa verticillata</i> (Slender Bamboo Grass)	1	20		N
Tree (TG)	<i>Brachychiton populneus</i> (Kurrajong)	0.3	6		N
Other (OG)	<i>Amyema miquelii</i> (Box Mistletoe)	0.3	4		N

Project name:	J210075				
Recorders:	LO,IM	Plot ID:	BAM25	Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Bidens pilosa</i> (Cobbler's Pegs)	0.2	4		HTE
	<i>Trifolium campestre</i> (Hop Clover)	0.3	30		E
Grass & grasslike (GG)	<i>Echinopogon</i> spp. (A Hedgehog Grass)	0.1	1		N
Shrub (SG)	<i>Olearia elliptica</i> subsp. <i>elliptica</i>	1	2		N
Forb (FG)	<i>Lagenifera stipitata</i> (Blue Bottle-daisy)	0.1	1		N
Forb (FG)	<i>Ajuga australis</i> (Austral Bugle)	0.2	4		N

BAM Site – Field Survey Form

Plot ID:	BAM26	Date:	29/04/22	Project number:	J210075	Plot dimensions:	20x20, 20x50
Datum:	GDA94	Easting:	347,224	Recorders:	LO, IM		
Zone:	56	Northing:	6,701,624	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	339
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	WDL	PCT confidence:
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	2
	Grasses etc.:	18
	Forbs:	14
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	11
	Shrubs:	3
	Grasses etc.:	20.4
	Forbs:	5.1
	Other:	0.3
High Threat Weed cover:		3.4

BAM Attribute (1000 m ² plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	2
80 + cm:	1		
50 – 79 cm:	3		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	1
10 – 19 cm:	1		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	40	10	10	20	10
Average litter cover (%):	18				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM26
		Date:	29/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	<i>Angophora floribunda</i> (Rough-barked Apple)	10	3		N
Grass & grasslike (GG)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush)	5	30		N
Grass & grasslike (GG)	<i>Themeda triandra</i>	5	30		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	1	20		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	3	50		E
	<i>Xanthium spinosum</i> (Bathurst Burr)	0.2	1		HTE
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	1	50		N
Shrub (SG)	<i>Rubus parvifolius</i> (Native Raspberry)	1	4		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.3	10		N
	<i>Marrubium vulgare</i> (White Horehound)	0.3	4		E
Tree (TG)	<i>Notelaea microcarpa</i> (Native Olive)	1	3		N
	<i>Verbena bonariensis</i> (Purpletop)	1	20		E
Grass & grasslike (GG)	<i>Paspalidium gracile</i> (Slender Panic)	0.1	2		N
	<i>Urtica dioica</i> (Giant Nettle)	0.1	3		E
	<i>Solanum nigrum</i> (Black-berry Nightshade)	0.2	1		E
Forb (FG)	<i>Pomax umbellata</i> (Pomax)	0.2	4		N
	<i>Bidens pilosa</i> (Cobbler's Pegs)	0.2	2		HTE
Grass & grasslike (GG)	<i>Bothriochloa biloba</i> (Lobed Bluegrass)	1	30		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.3	10		N
Forb (FG)	<i>Veronica calycina</i> (Hairy Speedwell)	0.3	10		N
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	0.5	10		N
Forb (FG)	<i>Calotis lappulacea</i> (Yellow Burr-daisy)	1	10		N
Shrub (SG)	<i>Meliclytus dentatus</i> (Tree Violet)	2	3		N
Forb (FG)	<i>Vittadinia cuneata</i> (A Fuzzweed)	0.3	3		N
Forb (FG)	<i>Dianella revoluta</i> (Blueberry Lily)	0.2	4		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	1	30		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	1	30		N
Forb (FG)	<i>Chrysocephalum semipapposum</i> (Clustered Everlasting)	0.3	4		N
Grass & grasslike (GG)	<i>Echinopogon</i> spp. (A Hedgehog Grass)	1	30		N
Grass & grasslike (GG)	<i>Rytidosperma fulvum</i> (Wallaby Grass)	0.1	1		N
Grass & grasslike (GG)	<i>Poa sieberiana</i> var. <i>sieberiana</i> (Snowgrass)	2	20		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> subsp. <i>falcata</i> (Rough Speargrass)	0.5	10		N
Forb (FG)	<i>Oxalis</i> spp.	0.3	10		N
	<i>Pavonia hastata</i>	0.3	3		E
	<i>Paspalum dilatatum</i> (Paspalum)	3	50		HTE
Grass & grasslike (GG)	<i>Austrostipa verticillata</i> (Slender Bamboo Grass)	1	30		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	2		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.5	50		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.2	4		N
Grass & grasslike (GG)	<i>Microlaena stipoides</i> (Weeping Grass)	0.3	20		N
Grass & grasslike (GG)	<i>Panicum</i> spp. (Panicum)	0.2	4		N
Forb (FG)	<i>Desmodium brachypodum</i> (Large Tick-trefoil)	0.2	6		N
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	0.3	10		N

Project name:	J210075				
Recorders:	LO, IM	Plot ID:	BAM26	Date:	29/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Auroloma aristiglumis</i> (Plains Grass)	1	20		N
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.5	10		E
	<i>Trifolium repens</i> (White Clover)	0.3	20		E
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	0.3	10		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	30		E
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	1		N
Forb (FG)	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	0.2	3		N
	<i>Rubus anglocandicans</i> (Blackberry)	0.3	2		E

BAM Site – Field Survey Form

Plot ID:	BAM29	Date:	27/04/22	Project number:	J210075	Plot dimensions:	20x20, 50x20	
Datum:	GDA94	Easting:	349,043	Recorders:	LO, IM			
Zone:	56	Northing:	6,698,745	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	322	
Plant Community Type:	571: Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion				Condition class:	WDL	PCT confidence:	
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	5
	Shrubs:	5
	Grasses etc.:	10
	Forbs:	12
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	56
	Shrubs:	4
	Grasses etc.:	80
	Forbs:	5.5
	Other:	0.4
High Threat Weed cover:		6.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	6
80 + cm:	1		
50 – 79 cm:	2		
30 – 49 cm:	0	Tree hollow count	0
20 – 29 cm:	1		
10 – 19 cm:	2		
5 – 9 cm:	0		
< 5 cm:	11		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	15	5	5	5
Average litter cover (%):	12				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Parallel to creek

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM29
		Date:	27/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	<i>Acacia implexa</i> (Hickory Wattle)	2	6	no	N
Tree (TG)	<i>Notelaea microcarpa</i> (Native Olive)	3	8		N
Shrub (SG)	<i>Dodonaea viscosa</i> (Sticky Hop-bush)	1	4		N
Shrub (SG)	<i>Acacia</i> spp. (Wattle)	0.3	1		N
	<i>Cirsium vulgare</i> (Spear Thistle)	0.5	6		E
Grass & grasslike (GG)	<i>Arundinella nepalensis</i> (Reedgrass)	3	30		N
	<i>Paspalum dilatatum</i> (Paspalum)	2	20		HTE
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	70	1000		N
	<i>Senecio madagascariensis</i> (Fireweed)	3	30		HTE
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	3	30		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.3	10		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	1	5		E
	<i>Rosa rubiginosa</i> (Sweet Briar)	1	5		HTE
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	2	50		N
	<i>Medicago polymorpha</i> (Burr Medic)	0.2	5		E
	<i>Trifolium repens</i> (White Clover)	2	50		E
Forb (FG)	<i>Brunonia australis</i> (Blue Pincushion)	0.2	10		N
Forb (FG)	<i>Solenogyne</i> spp.	0.2	2		N
Tree (TG)	<i>Angophora floribunda</i> (Rough-barked Apple)	10	1		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.3	10		N
Other (OG)	<i>Desmodium</i> spp. (Tick-trefoil)	0.2	2		N
	<i>Rubus anglocandicans</i> (Blackberry)	0.5	5		E
	<i>Bidens pilosa</i> (Cobbler's Pegs)	0.5	10		HTE
	<i>Verbascum virgatum</i> (Twiggy Mullein)	0.1	1		E
Shrub (SG)	<i>Meliccytus</i> spp.	0.5	2		N
	<i>Bromus catharticus</i> (Prairie Grass)	1	30		E
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.2	10		N
Forb (FG)	<i>Swainsona galegifolia</i> (Smooth Darling Pea)	0.2	4		N
Forb (FG)	<i>Goodenia</i> spp.	0.2	4		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> subsp. <i>falcata</i> (Rough Speargrass)	0.2	4		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.2	6		N
	<i>Solanum nigrum</i> (Black-berry Nightshade)	0.2	1		E
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	0.5	20		N
	<i>Vicia</i> spp. (Vetch)	0.3	4		E
Grass & grasslike (GG)	<i>Schoenus apogon</i> (Fluke Bogrush)	0.2	10		N
	<i>Hypochaeris glabra</i> (Smooth Catsear)	0.3	4		E
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.2	4		N
Forb (FG)	<i>Einadia polygonoides</i> (Knotweed Goosefoot)	0.2	3		N
Tree (TG)	<i>Eucalyptus viminalis</i> (Ribbon Gum)	20	2		N
	<i>Lactuca</i> spp.	0.2	4		E
Forb (FG)	<i>Lepidium</i> spp. (A Peppergrass)	0.2	4		N
	<i>Verbena bonariensis</i> (Purpletop)	0.3	6		E
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.3	10		N

Project name:	J210075				
Recorders:	LO, IM	Plot ID:	BAM29	Date:	27/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	<i>Bursaria spinosa</i> (Native Blackthorn)	0.2	2		N
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.3	4		E
Tree (TG)	<i>Eucalyptus albens</i> (White Box)	20	1		N
Tree (TG)	<i>Eucalyptus blakelyi</i> (Blakely's Red Gum)	3	1		N
Grass & grasslike (GG)	<i>Eragrostis leptostachya</i> (Paddock Lovegrass)	2	30		N
Grass & grasslike (GG)	<i>Austrostipa verticillata</i> (Slender Bamboo Grass)	1	10		N
Grass & grasslike (GG)	<i>Cyperus vaginatus</i> (Stiff Flat-sedge)	0.1	2		N
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	1	10		N

BAM Site – Field Survey Form

Plot ID:	BAM32	Date:	29/04/22	Project number:	J210075	Plot dimensions:	20x20,20x50
Datum:	GDA94	Easting:	351,850	Recorders:	LO, IM		
Zone:	56	Northing:	6,705,420	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	4
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_MOD	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	11
	Forbs:	13
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0.5
	Shrubs:	0
	Grasses etc.:	12.3
	Forbs:	4.4
	Other:	0.3
High Threat Weed cover:		30.7

BAM Attribute (1000 m ² plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	15	15	5	5
Average litter cover (%):	12				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

1 Euc. Sapling in plot

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM32
		Date:	29/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Paspalum dilatatum</i> (Paspalum)	30	500		HTE
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	1	30		N
	<i>Verbena bonariensis</i> (Purpletop)	0.3	3		E
Forb (FG)	<i>Acaena</i> spp. (Sheep's Burr)	0.5	2		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	2	100		N
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	0.5	5		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.3	30		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	1	20		E
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	0.3	10		N
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	0.3	10		N
Grass & grasslike (GG)	<i>Eragrostis</i> spp. (A Lovegrass)	1	50		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.5	3		HTE
	<i>Medicago polymorpha</i> (Burr Medic)	0.2	3		E
Forb (FG)	<i>Chrysocephalum semipapposum</i> (Clustered Everlasting)	1	30		N
	<i>Hypochaeris radicata</i> (Catsear)	0.3	10		E
Forb (FG)	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	0.1	2		N
Forb (FG)	<i>Hypericum gramineum</i> (Small St John's Wort)	0.2	4		N
	<i>Cirsium vulgare</i> (Spear Thistle)	0.3	3		E
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.3	4		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.3	10		N
Grass & grasslike (GG)	<i>Rytidosperma pallidum</i> (Redanther Wallaby Grass; Silvertop Wallaby Grass)	5	100		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	3	50		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.3	4		E
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	1	30		N
	<i>Senecio madagascariensis</i> (Fireweed)	0.2	2		HTE
Forb (FG)	<i>Epilobium billardierianum</i>	0.1	1		N
Forb (FG)	<i>Euchiton sphaericus</i> (Star Cudweed)	0.2	3		N
Forb (FG)	<i>Asperula scoparia</i> (Prickly Woodruff)	1	50		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.3	4		N
Tree (TG)	<i>Angophora floribunda</i> (Rough-barked Apple)	0.5	1		N
Forb (FG)	<i>Swainsona</i> spp.	0.2	2		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> subsp. <i>falcata</i> (Rough Speargrass)	0.5	10		N
Forb (FG)	<i>Wahlenbergia stricta</i> (Tall Bluebell)	0.1	1		N
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	0.2	10		N
Grass & grasslike (GG)	<i>Bothriochloa biloba</i> (Lobed Bluegrass)	0.5	20		N
Forb (FG)	<i>Verbena gaudichaudii</i> (Verbena)	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	BAM33	Date:	28/04/22	Project number:	J210075	Plot dimensions:	
Datum:	GDA94	Easting:	352,599	Recorders:	LO, IM		
Zone:	56	Northing:	6,701,098	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	266
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_LOW	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	8
	Forbs:	6
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	9.3
	Forbs:	1.9
	Other:	0.1
High Threat Weed cover:		70.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	4
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	5	2	4	3
Average litter cover (%):	3.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM33
		Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Hypparrhenia hirta</i> (Coolatai Grass)	70	1000		HTE
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	2	50		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	30		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.3	10		E
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	1	30		N
Grass & grasslike (GG)	<i>Cynodon dactylon</i> (Common Couch)	5	300		N
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	0.3	10		N
	<i>Cyperus brevifolius</i>	2	100		E
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.3	3		N
Grass & grasslike (GG)	<i>Panicum</i> spp. (<i>Panicum</i>)	0.2	3		N
Forb (FG)	<i>Acaena</i> spp. (<i>Sheep's Burr</i>)	0.1	1		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	2		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.1	3		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.2	4		E
	<i>Verbena bonariensis</i> (Purpletop)	0.2	1		E
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.1	2		N
	<i>Trifolium repens</i> (White Clover)	10	300		E
Grass & grasslike (GG)	<i>Setaria</i> spp.	0.2	10		N
	<i>Trifolium arvense</i> (Haresfoot Clover)	0.3	20		E
Fern (EG)	<i>Cheilanthes sieberi</i> (Rock Fern)	0.2	4		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (<i>Redgrass, Bluegrass</i>)	0.5	20		N
	<i>Eragrostis curvula</i> (<i>African Lovegrass</i>)	0.5	10		HTE
Grass & grasslike (GG)	<i>Dichelachne micrantha</i> (<i>Shorthair Plumegrass</i>)	0.2	4		N
Forb (FG)	<i>Dichondra repens</i> (<i>Kidney Weed</i>)	1	30		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (<i>Purple Wiregrass</i>)	0.2	10		N
	<i>Paronychia brasiliana</i> (<i>Chilean Whitlow Wort, Brazilian Whitlow</i>)	0.2	10		E

BAM Site – Field Survey Form

Plot ID:	BAM34	Date:	28/04/22	Project number:	J210075	Plot dimensions:	
Datum:	GDA94	Easting:	350,833	Recorders:	LO, IM		
Zone:	56	Northing:	6,700,839	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	83
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	WDL	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	2
	Grasses etc.:	15
	Forbs:	18
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	48
	Shrubs:	3
	Grasses etc.:	11.9
	Forbs:	4.5
	Other:	0.2
High Threat Weed cover:		21

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	15
80 + cm:	3		
50 – 79 cm:	5		
30 – 49 cm:	1		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	2		
< 5 cm:	5		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	65	50	50	60	50
Average litter cover (%):	55				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM34
		Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	<i>Eucalyptus albens</i> (White Box)	30	6		N
	<i>Hyparrhenia hirta</i> (Coolatai Grass)	20	300		HTE
Forb (FG)	<i>Ajuga australis</i> (Austral Bugle)	0.3	10		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	3	50		N
Grass & grasslike (GG)	<i>Poa</i> spp.	1	20		N
Forb (FG)	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	1	50		N
	<i>Medicago polymorpha</i> (Burr Medic)	0.5	100		E
Other (OG)	<i>Glycine clandestina</i> (Twining glycine)	0.2	20		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	1	30		N
Forb (FG)	<i>Swainsona</i> spp.	0.3	10		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	3		N
Forb (FG)	<i>Desmodium brachypodium</i> (Large Tick-trefoil)	0.2	20		N
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	3	100		N
Tree (TG)	<i>Notelaea microcarpa</i> (Native Olive)	3	6		N
Forb (FG)	<i>Cymbonotus</i> spp.	0.2	4		N
Grass & grasslike (GG)	<i>Dichelachne micrantha</i> (Shorthair Plumegrass)	0.3	20		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	3		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	0.5	10		N
Forb (FG)	<i>Veronica</i> spp.	0.2	5		N
Shrub (SG)	<i>Bursaria spinosa</i> (Native Blackthorn)	2	6		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.1	2		N
Forb (FG)	<i>Hypericum gramineum</i> (Small St John's Wort)	0.3	10		N
	<i>Senecio madagascariensis</i> (Fireweed)	0.3	3		HTE
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.2	4		E
Grass & grasslike (GG)	<i>Panicum</i> spp. (Panicum)	0.3	10		N
	<i>Bidens pilosa</i> (Cobbler's Pegs)	0.2	4		HTE
Grass & grasslike (GG)	<i>Austrostipa scabra</i> subsp. <i>falcata</i> (Rough Speargrass)	0.3	4		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.5	2		HTE
	<i>Medicago</i> spp. (A Medic)	0.1	3		E
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.3	20		N
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	0.2	6		N
Forb (FG)	<i>Vittadinia cuneata</i> (A Fuzzweed)	0.2	1		N
Grass & grasslike (GG)	<i>Microlaena stipoides</i> (Weeping Grass)	0.2	10		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.3	20		N
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	1	30	yes	N
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.2	2		E
Forb (FG)	<i>Acaena</i> spp. (Sheep's Burr)	0.1	3		N
Grass & grasslike (GG)	<i>Echinopogon</i> spp. (A Hedgehog Grass)	0.1	2		N
	<i>Hypochaeris radicata</i> (Catsear)	0.2	2		E
Forb (FG)	<i>Hydrocotyle laxiflora</i> (Stinking Pennywort)	0.2	20		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	0.5	20		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	3		E
Shrub (SG)	<i>Acacia implexa</i> (Hickory Wattle)	1	1		N

Project name:	J210075				
Recorders:	LO, IM	Plot ID:	BAM34	Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Trifolium arvense</i> (Haresfoot Clover)	0.2	6		E
Forb (FG)	<i>Euchiton involucratus</i> (Star Cudweed)	0.1	1		N
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	0.3	10		N
Tree (TG)	<i>Angophora floribunda</i> (Rough-barked Apple)	15	2		N
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	0.3	10		N
Forb (FG)	<i>Daucus glochidiatus</i> (Native Carrot)	0.3	10		N
Forb (FG)	<i>Cynoglossum australe</i>	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	BAM35	Date:	30/04/22	Project number:	J210075	Plot dimensions:	20x20, 20x50
Datum:	GDA94	Eastings:	347,089	Recorders:	LO, IM		
Zone:	56	Northing:	6,698,889	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	264
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	WDL	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	30
	Shrubs:	0
	Grasses etc.:	2.8
	Forbs:	1.8
	Other:	0
High Threat Weed cover:		71.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	8
80 + cm:	2		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	1
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	10	10	2	5	2
Average litter cover (%):	5.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM35
		Date:	30/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	<i>Eucalyptus albens</i> (White Box)	30	1		N
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	1	20		N
	<i>Paspalum dilatatum</i> (Paspalum)	1	30		HTE
	<i>Cenchrus clandestinus</i> (Kikuyu Grass)	70	1000		HTE
	<i>Verbena bonariensis</i> (Purpletop)	10	100		E
	<i>Dactylis glomerata</i> (Cocksfoot)	5	50		E
	<i>Trifolium repens</i> (White Clover)	3	300		E
	<i>Cirsium vulgare</i> (Spear Thistle)	1	10		E
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	0.5	30		N
	<i>Taraxacum officinale</i> (Dandelion)	0.2	6		E
	<i>Bromus catharticus</i> (Prairie Grass)	0.2	3		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	1	30		E
Grass & grasslike (GG)	<i>Setaria</i> spp.	0.2	20		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	30		E
Forb (FG)	<i>Euchiton involucratus</i> (Star Cudweed)	0.2	10		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.5	30		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	0.5	30		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	1	30		N
Forb (FG)	<i>Swainsona</i> spp.	0.1	1		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	0.2	3		N
Grass & grasslike (GG)	<i>Rytidosperma bipartitum</i> (Wallaby Grass)	0.3	10		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.3	10		HTE
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.5	4		E
	<i>Medicago</i> spp. (A Medic)	2	50		E
Grass & grasslike (GG)	<i>Bromus</i> spp. (A Brome)	0.1	2		N
	<i>Cichorium intybus</i> (Chicory)	0.3	4		E
	<i>Cenchrus longisetus</i> (Feathertop, White Foxtail)	0.2	20		HTE

BAM Site – Field Survey Form

Plot ID:	BAM36	Date:	28/04/22	Project number:	J210075	Plot dimensions:		
Datum:	GDA94	Easting:	352,184	Recorders:	LO, IM			
Zone:	56	Northing:	6,701,010	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	239	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	WDL	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	1
	Grasses etc.:	16
	Forbs:	14
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	25
	Shrubs:	0.2
	Grasses etc.:	14.7
	Forbs:	5.2
	Other:	0.2
High Threat Weed cover:		1.6

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	15
80 + cm:	1		
50 – 79 cm:	1		
30 – 49 cm:	4		
20 – 29 cm:	11	Tree hollow count	0
10 – 19 cm:	3		
5 – 9 cm:	3		
< 5 cm:	6		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	40	10	10	45
Average litter cover (%):	22				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM36
		Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Rytidosperma fulvum</i> (Wallaby Grass)	1	30		N
Grass & grasslike (GG)	<i>Dichanthium sericeum</i> (Queensland Bluegrass)	2	50		N
	<i>Trifolium repens</i> (White Clover)	1	100		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.5	10		E
Grass & grasslike (GG)	<i>Poa sieberiana</i> var. <i>sieberiana</i> (Snowgrass)	0.5	20		N
Tree (TG)	<i>Eucalyptus albens</i> (White Box)	20	2		N
	<i>Eleusine tristachya</i> (Goose Grass)	0.1	3		E
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	2	50		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.3	2		HTE
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.5	20		N
Grass & grasslike (GG)	<i>Microlaena stipoides</i> (Weeping Grass)	1	30		N
	<i>Cirsium vulgare</i> (Spear Thistle)	0.2	2		E
Tree (TG)	<i>Notelaea microcarpa</i> (Native Olive)	5	3		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.5	50		N
Grass & grasslike (GG)	<i>Bothriochloa macra</i> (Red Grass)	1	30		N
Forb (FG)	<i>Chrysocephalum semipapposum</i> (Clustered Everlasting)	0.3	10		N
	<i>Trifolium campestre</i> (Hop Clover)	0.3	30		E
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	3	50		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.2	10		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	0.5	20		N
Grass & grasslike (GG)	<i>Austrostipa verticillata</i> (Slender Bamboo Grass)	3	10		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.3	20		N
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	1	30		N
	<i>Paspalum dilatatum</i> (Paspalum)	0.3	10		HTE
Grass & grasslike (GG)	<i>Echinopogon</i> spp. (A Hedgehog Grass)	0.2	5		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.2	10		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.2	20		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.3	10		E
Forb (FG)	<i>Euchiton sphaericus</i> (Star Cudweed)	0.2	4		N
Grass & grasslike (GG)	<i>Eragrostis</i> spp. (A Lovegrass)	0.3	20		N
	<i>Hypochaeris glabra</i> (Smooth Catsear)	0.3	10		E
	<i>Bromus catharticus</i> (Prairie Grass)	0.1	2		E
	<i>Hyparrhenia hirta</i> (Coolatai Grass)	1	30		HTE
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.3	20		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.5	30		E
Forb (FG)	<i>Dianella revoluta</i> (Blueberry Lily)	0.1	1		N
Forb (FG)	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	0.2	10		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	0.3	10		N
Forb (FG)	<i>Brachycome</i> spp.	0.1	2		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	0.3	20		N
	<i>Urtica dioica</i> (Giant Nettle)	0.2	6		E
Forb (FG)	<i>Acaena</i> spp. (Sheep's Burr)	0.2	4		N
	<i>Hypochaeris radicata</i> (Catsear)	0.3	10		E

Project name:	J210075				
Recorders:	LO, IM	Plot ID:	BAM36	Date:	28/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	<i>Vicia spp. (Vetch)</i>	0.2	4		E
Grass & grasslike (GG)	<i>Anthosachne scabra (Wheatgrass, Common Wheatgrass)</i>	0.3	20		N
Grass & grasslike (GG)	<i>Aristida vagans (Threeawn Speargrass)</i>	0.1	2		N
Forb (FG)	<i>Sonchus spp. (Sowthistle)</i>	0.1	1		N
Forb (FG)	<i>Oxalis exilis</i>	0.2	10		N
Shrub (SG)	<i>Pimelea curviflora (Rice Flower)</i>	0.2	4		N

BAM Site – Field Survey Form

Plot ID:	BAM37	Date:	27/04/22	Project number:	J210075	Plot dimensions:	20x20,20x50	
Datum:	GDA94	Easting:	348,886	Recorders:	LO, IM			
Zone:	56	Northing:	6,698,442	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	325	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	WDL	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	11
	Forbs:	10
	Ferns:	0
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	47.1
	Forbs:	9.4
	Other:	1.1
High Threat Weed cover:		4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	2		
5 – 9 cm:	1		
< 5 cm:	14		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	5	10	10	10
Average litter cover (%):	8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	LO, IM	Plot ID:	BAM37
		Date:	27/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	30	300		N
	<i>Verbena bonariensis</i> (Purpletop)	3	30		E
	<i>Conyza</i> spp. (A Fleabane)	3	30		E
Forb (FG)	<i>Vittadinia</i> spp. (Fuzzweed)	3	20		N
	<i>Trifolium repens</i> (White Clover)	70	2000		E
Grass & grasslike (GG)	<i>Rytidosperma racemosum</i> (Wallaby Grass)	10	100		N
	<i>Vicia</i> spp. (Vetch)	2	20		E
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	1	30		N
Forb (FG)	<i>Geranium solanderi</i> var. <i>solanderi</i>	2	30		N
Grass & grasslike (GG)	<i>Eragrostis</i> spp. (A Lovegrass)	1	10		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	5	30		E
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	1	10		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.5	3		HTE
	<i>Hypochaeris radicata</i> (Catsear)	0.3	5		E
Grass & grasslike (GG)	<i>Panicum queenslandicum</i> (Yadbila Grass)	0.5	5		N
	<i>Paspalum dilatatum</i> (Paspalum)	0.5	50		HTE
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	3	20		N
	<i>Bidens pilosa</i> (Cobbler's Pegs)	3	20		HTE
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	1	20		N
Other (OG)	<i>Glycine tabacina</i> (Variable Glycine)	0.3	3		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.2	2		E
Forb (FG)	<i>Oxalis</i> spp.	0.3	4		N
Grass & grasslike (GG)	<i>Microlaena stipoides</i> (Weeping Grass)	0.1	2		N
Other (OG)	<i>Desmodium varians</i> (Slender Tick-trefoil)	0.3	10		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.3	2		N
	<i>Vulpia myuros</i> (Rat's Tail Fescue)	0.2	4		E
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.5	10		N
	<i>Medicago polymorpha</i> (Burr Medic)	0.3	10		E
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	1	30		N
Grass & grasslike (GG)	<i>Anthosachne scabra</i> (Wheatgrass, Common Wheatgrass)	0.3	4		N
Grass & grasslike (GG)	<i>Chloris truncata</i> (Windmill Grass)	1	20		N
Forb (FG)	<i>Daucus</i> spp.	0.1	1		N
Forb (FG)	<i>Einadia nutans</i> (Climbing Saltbush)	0.5	30		N
	<i>Anagallis</i> spp.	0.2	20		E
	<i>Chondrilla juncea</i> (Skeleton Weed)	0.2	2		E
Grass & grasslike (GG)	<i>Cymbopogon refractus</i> (Barbed Wire Grass)	0.1	2		N
Grass & grasslike (GG)	<i>Dichelachne</i> spp. (A Plumegrass)	0.1	2		N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.2	3		N
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.2	3		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.5	10		E

BAM Site – Field Survey Form

Plot ID:	BAM40	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	346,369	Recorders:	IC CP		
Zone:	56	Northing:	6,698,908	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	346
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_V_LOW	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	40.5
	Forbs:	0.5
	Other:	0
High Threat Weed cover:		0.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	2	1	2	1
Average litter cover (%):	2.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Flat paddock above small creek line

Plot Disturbance

Currently grazed, previously cleared

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	IC CP	Plot ID:	BAM40
		Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	40	300		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	50		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	3		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	0.1	10		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	40		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	0.5	20		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	1		N
	<i>Plantago lanceolata</i> (Lamb's Tongues)	20	300		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	50		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	30		E
	<i>Trifolium repens</i> (White Clover)	2	50		E
	<i>Medicago sativa</i> (Lucerne)	0.2	40		E
	<i>Paspalum dilatatum</i> (Paspalum)	0.5	20		HTE
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	20		E
	<i>Soliva sessilis</i> (Bindyi)	0.1	20		E
	<i>Sonchus oleraceus</i> (Common Sowthistle)	0.1	10		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	5		E
	<i>Sonchus asper</i> (Prickly Sowthistle)	0.1	3		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.4	60		E
	<i>Hypochaeris radicata</i> (Catsear)	0.1	20		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.1	50		E
	<i>Bromus catharticus</i> (Prairie Grass)	0.1	20		E
	<i>Taraxacum officinale</i> (Dandelion)	0.1	1		E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	BAM41	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	346,296	Recorders:	IC CP		
Zone:	56	Northing:	6,699,386	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	354
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_V_LOW	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	55
	Forbs:	0.1
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	1	2	2	5
Average litter cover (%):	3				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Gentle north facing slope

Plot Disturbance

Current grazing, cleared

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	IC CP	Plot ID:	BAM41
		Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	20	3000		N
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	35	200		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	30		N
	<i>Salvia verbenaca</i> (Vervain)	0.2	40		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	10	2000		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.5	50		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	20		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.5	50		E
	<i>Trifolium repens</i> (White Clover)	0.1	20		E
	<i>Medicago sativa</i> (Lucerne)	0.1	10		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.5	50		E
	<i>Bromus catharticus</i> (Praire Grass)	0.2	5		E

BAM Site – Field Survey Form

Plot ID:	BAM42	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	346,750	Recorders:	IC CP		
Zone:	56	Northing:	6,699,587	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	146
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_V_LOW	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	12
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	65
	Forbs:	1.2
	Other:	0
High Threat Weed cover:		3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0	Tree hollow count	0
20 – 29 cm:	0		
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	7	3	10	15
Average litter cover (%):	7.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Gentle west facing slope above creek line

Plot Disturbance

Currently grazed, cleared

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	IC CP	Plot ID:	BAM42	Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	20	100		N
Forb (FG)	<i>Vitadina cuneata</i> (A Fuzzweed)	0.1	7		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	0.1	3		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	5	40		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	10		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	20		N
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.1	6		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	20		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	10		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.1	6		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	40	5000		N
Forb (FG)	<i>Mentha saturoioides</i> (Native Pennyroyal)	0.1	40		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	2		N
Forb (FG)	<i>Hypericum gramineum</i> (Small St John's Wort)	0.1	3		N
	<i>Trifolium repens</i> (White Clover)	10	200		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	20		E
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	3	100		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	1	100		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	100		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	50		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.2	30		E
	<i>Paspalum dilatatum</i> (Paspalum)	3	30		HTE
	<i>Bromus catharticus</i> (Prairie Grass)	0.3	20		E
	<i>Hypochaeris radicata</i> (Catsear)	0.2	20		E
	<i>Medicago polymorpha</i> (Burr Medic)	1	50		E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	4		E
Forb (FG)	<i>Gnaphalium</i> sp. E	0.1	10		N
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	20		E
	<i>Medicago sativa</i> (Lucerne)	0.1	20		E
	<i>Taraxacum officinale</i> (Dandelion)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	BAM43	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50	
Datum:	GDA94	Easting:	346,901	Recorders:	IC CP			
Zone:	56	Northing:	6,699,335	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	161	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_V_LOW	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	4
	Forbs:	8
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	33
	Forbs:	7.7
	Other:	0
High Threat Weed cover:		1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	1	0	1	1	0
Average litter cover (%):	0.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Gentle west facing slope above creek line

Plot Disturbance

Currently grazed, cleared

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	IC CP	Plot ID:	BAM43	Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	7	800		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	40		N
Grass & grasslike (GG)	<i>Aurolastipa aristiglumis</i> (Plains Grass)	3	50		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	20		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	10		N
Forb (FG)	<i>Plantago varia</i>	0.1	3		N
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.1	20		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	5	1000		N
Grass & grasslike (GG)	<i>Panicum effusum</i> (Hairy Panic)	5	1000		N
Grass & grasslike (GG)	<i>Aurolastipa scabra</i> (Speargrass)	20	5000		N
Forb (FG)	<i>Swainsona galegifolia</i> (Smooth Darling Pea)	0.1	5		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	1		N
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	3	100		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.2	100		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	100		E
	<i>Paspalum dilatatum</i> (Paspalum)	1	50		HTE
	<i>Trifolium repens</i> (White Clover)	3	100		E
	<i>Medicago sativa</i> (Lucerne)	0.1	20		E
	<i>Hypochaeris radicata</i> (Catsear)	0.1	2		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.3	50		E
	<i>Sonchus asper</i> (Prickly Sowthistle)	0.1	2		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	10		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	2		E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	3		E
	<i>Taraxacum officinale</i> (Dandelion)	0.1	10		E

BAM Site – Field Survey Form

Plot ID:	BAM44	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50	
Datum:	GDA94	Easting:	346,838	Recorders:	IC CP			
Zone:	56	Northing:	6,698,998	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	5	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_V_LOW	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	80
	Forbs:	0.5
	Other:	0
High Threat Weed cover:		2

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	3	4	5	7	0
Average litter cover (%):	3.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Crest of gentle hill

Plot Disturbance

Currently grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	IC CP	Plot ID:	BAM44	Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	40	300		N
Forb (FG)	<i>Mentha saturoioides</i> (Native Pennyroyal)	0.1	20		N
Grass & grasslike (GG)	<i>Bothriochloa decipiens</i> var. <i>decipiens</i> (Pitted Bluegrass)	5	100		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	0.1	20		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	35	2000		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	20		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	1		N
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.1	15		N
	<i>Medicago sativa</i> (Lucerne)	0.1	20		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	20		E
	<i>Paspalum dilatatum</i> (Paspalum)	2	10		HTE
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.1	100	yes	E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	60		E
	<i>Sonchus asper</i> (Prickly Sowthistle)	0.1	5		E
	<i>Hypochaeris radicata</i> (Catsear)	0.1	20		E
	<i>Verbena rigida</i> var. <i>rigida</i> (Veined Verbena)	0.1	10		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	20		E
	<i>Trifolium repens</i> (White Clover)	4	30		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.5	50		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.2	50		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.1	1		E
	<i>Salvia verbenaca</i> (Vervain)	0.1	3		E
	<i>Taraxacum officinale</i> (Dandelion)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	BAM45	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	347,601	Recorders:	IC CP		
Zone:	56	Northing:	6,699,363	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	84
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_MOD	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	3
	Forbs:	10
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.1
	Grasses etc.:	12.2
	Forbs:	7.4
	Other:	0.1
High Threat Weed cover:		0.6

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	1	2	0	5	1
Average litter cover (%):	1.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

NE facing gentle slope

Plot Disturbance

Recently burnt

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	IC CP	Plot ID:	BAM45	Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	12	100		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	5	5000		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	10		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.5	100		N
Forb (FG)	<i>Oxalis exilis</i>	0.3	40		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.5	70		N
Forb (FG)	<i>Plantago varia</i>	0.1	2		N
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	1		N
Forb (FG)	<i>Pycnosorus globosus</i> (Drumsticks)	0.5	20		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.1	20		N
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.2	40		N
Shrub (SG)	<i>Pimelea curviflora</i> (Rice Flower)	0.1	2		N
Grass & grasslike (GG)	<i>Lomandra multiflora</i> subsp. <i>multiflora</i> (Many-flowered Mat-rush)	0.1	1		N
Forb (FG)	<i>Boerhavia dominii</i> (Tarvine)	0.1	1		N
	<i>Trifolium repens</i> (White Clover)	8	100		E
	<i>Lactuca serriola</i> (Prickly Lettuce)	2	800		E
	<i>Marrubium vulgare</i> (White Horehound)	0.2	40		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	10	10000		E
	<i>Medicago polymorpha</i> (Burr Medic)	0.3	100		E
	<i>Silybum marianum</i> (Variegated Thistle)	0.1	20		E
	<i>Cirsium vulgare</i> (Spear Thistle)	1	40		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	20		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.1	20		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	60		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	10		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	3		E
	<i>Aster subulatus</i> (Wild Aster)	2	2		E
	<i>Capsella bursa-pastoris</i> (Shepherd's Purse)	0.1	20		E
	<i>Paspalum dilatatum</i> (Paspalum)	0.5	20		HTE
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.1	1		HTE
	<i>Bromus catharticus</i> (Prairie Grass)	5	300		E
Forb (FG)	<i>Lepidium</i> spp. (A Peppergrass)	0.1	30		N
	<i>Linaria arvensis</i>	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	BAM46	Date:	05/10/22	Project number:	J210075	Plot dimensions:	20 x 50	
Datum:	GDA94	Easting:	347,545	Recorders:	IC CP			
Zone:	56	Northing:	6,700,385	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	46	
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_MOD	PCT confidence:	
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	7
	Forbs:	13
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	51.7
	Forbs:	7.1
	Other:	0.1
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	8	1	0	4
Average litter cover (%):	3				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Gentle N facing slope

Plot Disturbance

Recently burnt

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	IC CP	Plot ID:	BAM46
		Date:	05/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.1	20		N
Forb (FG)	<i>Swainsona reticulata</i> (Kneed Swainson-pea)	0.1	20		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.1	12		N
Forb (FG)	<i>Arthropodium</i> spp.	0.1	50		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	1	30		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	1		N
Grass & grasslike (GG)	<i>Austrostipa aristiglumis</i> (Plains Grass)	0.2	10		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	20		N
Forb (FG)	<i>Cymbonotus lawsonianus</i> (Bear's Ear)	0.1	5		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	5	1000		N
Forb (FG)	<i>Mentha satuireioides</i> (Native Pennyroyal)	0.1	20		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	3		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	2		N
Forb (FG)	<i>Daucus glochidiatus</i> (Native Carrot)	0.1	1		N
Grass & grasslike (GG)	<i>Lomandra multiflora</i> subsp. <i>multiflora</i> (Many-flowered Mat-rush)	0.2	30		N
Grass & grasslike (GG)	<i>Aristida ramosa</i> (Purple Wiregrass)	50	2000		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	0.1	30		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	0.1	2		N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.1	3		N
Other (OG)	<i>Convolvulus erubescens</i> (Pink Bindweed)	0.1	1		N
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	5	1000		E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	2		E
	<i>Trifolium repens</i> (White Clover)	2	30		E
	<i>Lepidium bonariense</i> (Argentine Peppergrass)	0.1	20		E
	<i>Medicago polymorpha</i> (Burr Medic)	5	100		E
	<i>Lactuca serriola</i> (Prickly Lettuce)	0.2	50		E
	<i>Silybum marianum</i> (Variegated Thistle)	0.1	20		E
	<i>Convolvulus arvensis</i> (Field Bindweed)	0.1	2		E
	<i>Linaria arvensis</i>	0.1	20		E
	<i>Marrubium vulgare</i> (White Horehound)	0.5	50		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.2	30		E
	<i>Bromus catharticus</i> (Prairie Grass)	2	200		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	2		E
	<i>Taraxacum officinale</i> (Dandelion)	0.1	1		E
	<i>Salvia verbenaca</i> (Vervain)	0.1	30		E
	<i>Aster subulatus</i> (Wild Aster)	0.1	20		E
	<i>Verbascum thapsus</i> subsp. <i>thapsus</i> (Great Mullein)	0.1	1		E
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	1	100		N

BAM Site – Field Survey Form

Plot ID:	BAM47	Date:	06/10/22	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	349,334	Recorders:	IC CP		
Zone:	56	Northing:	6,700,232	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	207
Plant Community Type:	590: White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion				Condition class:	DNG_LOW	PCT confidence:
Vegetation Class:	Western Slopes Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	8
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	60
	Forbs:	1.6
	Other:	0
High Threat Weed cover:		10.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0	Tree hollow count	0
20 – 29 cm:	0		
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	8	5	8	3
Average litter cover (%):	5.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Between contour banks

Plot Disturbance

Cleared

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075				
Recorders:	IC CP	Plot ID:	BAM47	Date:	06/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.5	100		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	3		N
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.5	8		N
Forb (FG)	<i>Senecio quadridentatus</i> (Cotton Fireweed)	0.1	18		N
Forb (FG)	<i>Swainsona galegifolia</i> (Smooth Darling Pea)	0.1	2		N
Grass & grasslike (GG)	<i>Bothriochloa</i> spp. (Redgrass, Bluegrass)	50	2000		N
Forb (FG)	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	0.1	7		N
Forb (FG)	<i>Dichondra repens</i> (Kidney Weed)	0.1	10		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	10	800		N
	<i>Sanguisorba minor</i> subsp. <i>muricata</i> (Sheep's Burnet)	0.1	10		E
	<i>Paspalum dilatatum</i> (Paspalum)	10	200		HTE
	<i>Plantago lanceolata</i> (Lamb's Tongues)	1	50		E
	<i>Hypochaeris radicata</i> (Catsear)	0.2	20		E
	<i>Trifolium campestre</i> (Hop Clover)	5	100		E
	<i>Trifolium repens</i> (White Clover)	5	100		E
	<i>Silybum marianum</i> (Variegated Thistle)	0.1	5		E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	3		E
	<i>Vicia villosa</i> (Russian Vetch)	0.1	4		E
Forb (FG)	<i>Verbena</i> spp.	0.1	10		N
	<i>Rosa rubiginosa</i> (Sweet Briar)	0.1	1		HTE

BAM Site – Field Survey Form

Plot ID:	BAM48	Date:	06/10/22	Project number:	J210075	Plot dimensions:	20 x 50
Datum:	GDA94	Easting:	349,197	Recorders:	IC CP		
Zone:	56	Northing:	6,700,772	IBRA region:	New England Tablelands (Glenn Innes-Guyra Basalts)	Midline bearing:	196
Plant Community Type:	510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion				Condition class:	DNG_LOW	PCT confidence:
Vegetation Class:	New England Grassy Woodlands				EEC:		EEC confidence:

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	9
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	18.1
	Forbs:	0.9
	Other:	0
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0	Tree hollow count	0
20 – 29 cm:	0		
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	0	0	0	0	1
Average litter cover (%):	0.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Gentle hill above creekline

Plot Disturbance

Cleared, covered in clover

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code (if 'top 3'); Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
 Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
 Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210075		
Recorders:	IC CP	Plot ID:	BAM48
		Date:	06/10/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	<i>Geranium solanderi</i> (Native Geranium)	0.1	20		N
Forb (FG)	<i>Asperula conferta</i> (Common Woodruff)	0.1	50		N
Grass & grasslike (GG)	<i>Austrostipa scabra</i> (Speargrass)	5	2000		N
Forb (FG)	<i>Oxalis exilis</i>	0.1	20		N
Grass & grasslike (GG)	<i>Carex inversa</i> (Knob Sedge)	0.1	10		N
Forb (FG)	<i>Chrysocephalum apiculatum</i> (Common Everlasting)	0.1	2		N
Grass & grasslike (GG)	<i>Sporobolus creber</i> (Slender Rat's Tail Grass)	1	40		N
Grass & grasslike (GG)	<i>Bothriochloa decipiens</i> var. <i>decipiens</i> (Pitted Bluegrass)	2	200		N
Forb (FG)	<i>Rumex brownii</i> (Swamp Dock)	0.1	2		N
Grass & grasslike (GG)	<i>Rytidosperma</i> spp.	5	2000		N
Forb (FG)	<i>Wahlenbergia communis</i> (Tufted Bluebell)	0.1	1		N
Forb (FG)	<i>Crassula sieberiana</i> (Australian Stonecrop)	0.1	1		N
Forb (FG)	<i>Plantago debilis</i> (Shade Plantain)	0.1	1		N
	<i>Trifolium repens</i> (White Clover)	80	400		E
	<i>Medicago polymorpha</i> (Burr Medic)	5	20		E
	<i>Cyclosporum leptophyllum</i> (Slender Celery)	0.2	200		E
	<i>Trifolium campestre</i> (Hop Clover)	5	20		E
	<i>Cirsium vulgare</i> (Spear Thistle)	0.1	3		E
	<i>Plantago lanceolata</i> (Lamb's Tongues)	0.5	20		E
	<i>Conyza bonariensis</i> (Flaxleaf Fleabane)	0.1	20		E
	<i>Marrubium vulgare</i> (White Horehound)	0.1	10		E
	<i>Capsella bursa-pastoris</i> (Shepherd's Purse)	0.5	2		E
	<i>Hypochaeris radicata</i> (Catsear)	0.2	100		E
	<i>Rapistrum rugosum</i> (Turnip Weed)	0.2	7		E
	<i>Verbena bonariensis</i> (Purpletop)	0.1	20		E
	<i>Centaurea solstitialis</i> (St Barnabys Thistle)	0.1	3		E
	<i>Carthamus lanatus</i> (Saffron Thistle)	0.1	3		HTE
	<i>Paronychia brasiliana</i> (Chilean Whitlow Wort, Brazilian Whitlow)	0.1	20		E
Grass & grasslike (GG)	<i>Bromus</i> spp. (A Brome)	5	2000		N
	<i>Petrorhagia dubia</i>	0.1	20		E
	<i>Bromus catharticus</i> (Prairie Grass)	5	1000		E
Forb (FG)	<i>Gnaphalium</i> sp. E	0.1	30		N
	<i>Lolium perenne</i> (Perennial Ryegrass)	5	2000		E
	<i>Sanguisorba minor</i> subsp. <i>muricata</i> (Sheep's Burnet)	0.1	2		E
	<i>Linaria arvensis</i>	0.1	1		E

Appendix D

BAM-C datasets – benchmark and import data

D.1 Application of Version 1.1 benchmarks to BAM-C

The application of Version 1.1 benchmarks to an in-progress BAM-C case requires that the BDAR provides the following evidence⁵:

- screenshots from a BAM-C case that display the modified benchmark values to demonstrate that Version 1.1 benchmarks are applied to every benchmark value in the BAM-C case
- a URL link to the Version 1.1 benchmarks data
- an extract from the Version 1.1 benchmarks data of the relevant benchmark values for the case (for ease of review)
- evidence that the BAM-C case was in-progress on the date that the BAM-C was updated to include Version 1.2 benchmarks.

This information is provided below.

⁵ Guidance has been taken from:

(1) webpage "[New vegetation integrity benchmarks and plant community types](#)"

(2) BOS Update 12: release notes on the deployment of V1.2 Benchmarks in the BAM-C (January 2023)

D.1.1 Extract from Version 1.1 benchmarks data of relevant benchmark values

i Project area

Assessment ID	Proposal Name	Status	Revision	Created on	Updated on	Reference Data Version
00026138/BAAS17058/21/00026139	Sundown Solar Farm_Project Area_June2023_FINAL	Open	11	30/05/2023 05:33:29	15/06/2023 11:44:05	Legacy Classification (pre-ENSW)
00026138/BAAS17058/21/00026139	Sundown Solar Farm_Project Area_January2023_FINAL	Finalised	1			
00026138/BAAS17058/21/00026139	Sundown Solar Farm_Project Area_December2022	Locked	9	22/12/2022 21:04:54	22/12/2022 23:05:51	Current classification (live - default)
00026138/BAAS17058/21/00026139	Sundown Solar Farm_Project Area_December2022	Locked	8			
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_14Sept2022_OCTOBER2022_incl_accessRoad	Locked	7	11/10/2022 17:18:35	13/10/2022 07:40:47	Current classification (live - default)
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_14Sept2022_TurnerSplit_test	Locked	6			
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_14Sept2022	Locked	5	16/09/2022 15:31:46	19/09/2022 17:42:28	Current classification (live - default)
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_21Mar2022	Locked	4			
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_21Mar2022	Locked	3	06/04/2022 13:42:35	26/04/2022 14:56:32	Current classification (live - default)
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_October_2021_ALLTEAMS	Locked	2			
00026138/BAAS17058/21/00026139	Sundown Solar Farm_RevisedLayout_October_2021_ECO	Locked	1	04/11/2021 08:16:06	19/01/2022 16:34:41	Current classification (live - default)
00026138/BAAS17058/21/00026139	Sundown Solar Farm_preliminary_PV panel layout 18-06-2021	Locked	0			

ii Access road

Assessment ID	Proposal Name	Status	Revision	Created on	Updated on	Reference Data Version
00026138/BAAS17058/22/00037183	Sundown Solar Farm_Access Road_June2023_FINAL	Open	3	30/05/2023 05:44:36	15/06/2023 12:00:27	Legacy Classification (pre-ENSW)
00026138/BAAS17058/22/00037183	Sundown Solar Farm_Access Road_January2023_FINAL	Finalised	2	03/01/2023 15:44:25	20/01/2023 14:25:08	Current Classification (live - default)
00026138/BAAS17058/22/00037183	Sundown Solar Farm_Access Road_December2022	Locked	1	22/12/2022 23:07:00	22/12/2022 23:17:26	Current classification (live - default)
00026138/BAAS17058/22/00037183	Sundown Solar Farm_Access Road_December2022	Locked	0	13/12/2022 12:27:47	14/12/2022 09:30:26	Current Classification (live - default)

iii Scattered tree module

Assessment ID	Proposal Name	Status	Revision	Created on	Updated on	Reference Data Version
00026138/BAAS17058/22/00037433	Sundown Solar Farm_Scattered Trees_June2023_FINAL	Open	2	30/05/2023 05:48:55	15/06/2023 12:10:22	Legacy Classification (pre-ENSW)
00026138/BAAS17058/22/00037433	Sundown Solar Farm_Scattered Trees_January2023_FINAL	Finalised	1	09/01/2023 08:53:39	20/01/2023 14:30:33	
00026138/BAAS17058/22/00037433	Sundown Solar Farm_Scattered Trees_December2022	Locked	0	22/12/2022 23:19:06	23/12/2022 14:46:48	Current classification (live - default)

D.1.2 URL link to Version 1.1 benchmarks data

[BAM Calculator \(nsw.gov.au\)](https://www.nsw.gov.au/bam-calculator)

D.1.3 Extract from Version 1.1 benchmarks for relevant benchmark values

Vegetation Class	IBRA Region Code	Tree Richness	Shrub Richness	Grass And GrassLike Richness	Forb Richness	Fern Richness	Other Richness	Tree Cover	Shrub Cover	Grass And GrassLike Cover	Forb Cover	Fern Cover	Other Cover	Total Length Fallen Logs	Litter Cover	Number Large Trees	Large Tree Threshold
Eastern Riverine Forests	NET	4	6	9	11	2	3	36	5	72	9	0	1	36	24	5	50
New England Grassy Woodlands	NET	4	6	10	15	1	2	47	6	82	13	0	1	25.75	30	3	50
Western Slopes Grassy Woodlands	NET	4	4	11	15	1	2	18	2	87	11	0	1	34	35.25	2	50

D.1.4 Screenshots of modified benchmarks

i Case 00026138/BAAS17058/21/00026139 (Project area)

a PCT 84

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
Forested Wetlands	Eastern Riverine Forests	84 - River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	40	Not a TEC			<input type="button" value="ADD VEG ZONE"/> <small>Default benchmarks modified</small>	<input type="button" value="X"/>

Select type: ▼

Tree (4)	Shrub (6)	Grass & grass like (9)	Forb (11)	Fern (2)	Other (3)
<input type="text" value="4"/>	<input type="text" value="6"/>	<input type="text" value="9"/>	<input type="text" value="11"/>	<input type="text" value="2"/>	<input type="text" value="3"/>

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
Forested Wetlands	Eastern Riverine Forests	84 - River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	40	Not a TEC			<input type="button" value="ADD VEG ZONE"/> <small>Default benchmarks modified</small>	<input type="button" value="X"/>

Select type: ▼

Tree (37)	Shrub (4)	Grass & grass like (70)	Forb (8)	Fern (0)	Other (1)
<input type="text" value="36"/>	<input type="text" value="5"/>	<input type="text" value="72"/>	<input type="text" value="9"/>	<input type="text" value="0"/>	<input type="text" value="1"/>

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
Forested Wetlands	Eastern Riverine Forests	84 - River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	40	Not a TEC			<input type="button" value="ADD VEG ZONE"/> <small>Default benchmarks modified</small>	<input type="button" value="X"/>

Select type: ▼

Number of large trees (4)	Stem size class (4)	Length of fallen logs (36)	Regeneration stems (Present)	Litter cover (24)
<input type="text" value="5"/>	<input type="text" value="4"/>	<input type="text" value="36"/>	<input type="text" value="Present"/>	<input type="text" value="24"/>

b PCT 510

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
				Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri				

Select type: Composition

Tree (4) Shrub (6) Grass & grass like (10) Forb (15) Fern (1) Other (3)

Unlock Update Cancel

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		England Tableland Bioregion		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 Ri			Default benchmarks modified	

Select type: Structure

Tree (48) Shrub (6) Grass & grass like (71) Forb (12) Fern (0) Other (1)

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		England Tableland Bioregion		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 Ri			Default benchmarks modified	

Select type: Function

Number of large trees (3) Stem size class (4) Length of fallen logs (26) Regeneration stems (Present) Present Litter cover (30)

c PCT 571

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		woodland of the New England Tableland Bioregion and NSW North Coast Bioregion		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 Ri			Default benchmarks modified	

Select type: Composition

Tree (4)	Shrub (6)	Grass & grass like (10)	Forb (15)	Fern (1)	Other (3)
4	6	10	15	1	2

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		woodland of the New England Tableland Bioregion and NSW North Coast Bioregion		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 Ri			Default benchmarks modified	

Select type: Structure

Tree (48)	Shrub (6)	Grass & grass like (71)	Forb (12)	Fern (0)	Other (1)
47	6	82	13	0	1

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		woodland of the New England Tableland Bioregion and NSW North Coast Bioregion		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 Ri			Default benchmarks modified	

Select type: Function

Number of large trees (3)	Stem size class (4)	Length of fallen logs (26)	Regeneration stems (Present)	Litter cover (30)
3	4	26	Present	30

d PCT 590

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		the Nandewar Bioregion		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 Ri			Default benchmarks modified	

Select type: ▼

Tree (4)	Shrub (4)	Grass & grass like (11)	Forb (15)	Fern (1)	Other (3)
<input type="text" value="4"/>	<input type="text" value="4"/>	<input type="text" value="11"/>	<input type="text" value="15"/>	<input type="text" value="1"/>	<input type="text" value="2"/>

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		the Nandewar Bioregion		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 Ri			Default benchmarks modified	

Select type: ▼

Tree (18)	Shrub (2)	Grass & grass like (88)	Forb (10)	Fern (0)	Other (1)
<input type="text" value="18"/>	<input type="text" value="2"/>	<input type="text" value="87"/>	<input type="text" value="11"/>	<input type="text" value="0"/>	<input type="text" value="1"/>

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		the Nandewar Bioregion		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 Ri			Default benchmarks modified	

Select type: ▼

Number of large trees (2)	Stem size class (4)	Length of fallen logs (34)	Regeneration stems (Present)	Litter cover (35)
<input type="text" value="2"/>	<input type="text" value="4"/>	<input type="text" value="34"/>	<input type="text" value="Present"/> ▼	<input type="text" value="35"/>

ii Case 00026138/BAAS17058/22/00037183 (Access road)

a PCT 510

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
				NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri				

Select type: ▼

Tree (4)	Shrub (6)	Grass & grass like (10)	Forb (15)	Fern (1)	Other (3)
<input type="text" value="4"/>	<input type="text" value="6"/>	<input type="text" value="10"/>	<input type="text" value="15"/>	<input type="text" value="1"/>	<input type="text" value="2"/>

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
				NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri				

Select type: ▼

Tree (48)	Shrub (6)	Grass & grass like (71)	Forb (12)	Fern (0)	Other (1)
<input type="text" value="47"/>	<input type="text" value="6"/>	<input type="text" value="82"/>	<input type="text" value="13"/>	<input type="text" value="0"/>	<input type="text" value="1"/>

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
				NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri				

Select type: ▼

Number of large trees (3)	Stem size class (4)	Length of fallen logs (26)	Regeneration stems (Present)	Litter cover (30)
<input type="text" value="3"/>	<input type="text" value="4"/>	<input type="text" value="26"/>	<input type="text" value="Present"/>	<input type="text" value="30"/>

b PCT 590

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
	Woodlands	On the inland basins mainly in the Nandewar Bioregion		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 Ri	Community		Default benchmarks modified	

Select type: Tree (4) Shrub (4) Grass & grass like (11) Forb (15) Fern (1) Other (3)

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		the Nandewar Bioregion		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 Ri			Default benchmarks modified	

Select type: Tree (18) Shrub (2) Grass & grass like (88) Forb (10) Fern (0) Other (1)

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		the Nandewar Bioregion		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 Ri			Default benchmarks modified	

Select type: Number of large trees (2) Stem size class (4) Length of fallen logs (34) Regeneration stems (Present) Litter cover (35)

iii Case 00026138/BAAS17058/22/00037433 (Scattered tree module)

a PCT 510

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		Engilarto Tableland Bioregion		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 RI			Modify default benchmarks	

Large tree threshold size (50)

50

b PCT 571

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		woodland of the New England Tableland Bioregion and NSW North Coast Bioregion		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 RI			Modify default benchmarks	

Large tree threshold size (50)

50

c PCT 590

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
		the Nandewar Bioregion		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 RI			Modify default benchmarks	

Large tree threshold size (50)

50

D.2 Notes on BAM-C import data

The site-based component of the disturbance footprint is assessed separately to the linear-based component of the disturbance footprint. The import data applied to the BAM-C for each component are provided at the end of this Appendix.

Notes are provided below to explain where data has been added and the rationale for these amendments. As a general rule, data was never omitted but only added; and amendments made to conservatively assess vegetation integrity.

D.2.1 Scattered trees in derived native grassland zones

All grassland zones within the disturbance footprint contain scattered trees. Scattered trees within non-native grasslands (eg exotic or cultivation zones) were assessed by applying the 'Scattered trees assessment' streamlined assessment module of the BAM (Appendix B, DPIE 2020a).

For native grassland zones (ie derived native grassland zones), an attempt was made to include tree data in at least one replicate plot to capture the presence of paddock trees. However, upon review of the full dataset after completion of surveys, it was determined that not all native grassland zones included at least one plot with tree data.

As a conservative approach, where a grassland zone with scattered trees is not represented by any tree data in the replicate plot dataset, at least one plot was edited to include tree data. Tree values added to the import dataset are indicated by values in **blue text** and are as follows:

- compTree = 1
- strucTree = 0.5
- funLargeTrees = 1

These values are based on:

- species richness and cover values of BAM32 (which is a derived native grassland plot with a tree in it); and
- hollow-bearing tree survey data, which indicates that all derived native grassland zones contain at least one tree > 80 cm DBH.

D.2.2 Hollow data

Several zones contain hollow-bearing trees. In undertaking plot surveys in these zones, an attempt was made to include hollow-bearing trees in at least one replicate plot to reflect this. In undertaking a review of the full dataset after completion of surveys, it was determined that not all zones where hollow-bearing trees were recorded were represented by BAM plots with hollow data.

As a conservative approach, where a vegetation zone containing hollow-bearing trees is not represented by any hollow data in the replicate plot dataset, at least one plot was edited to include hollow data. A value of 1 was added to the import dataset in the 'funHollowtrees' column where indicated in **red text**.

D.2.3 Cultivation zones

Impacts on threatened species occurring in non-native vegetation is a prescribed impact. In accordance with Section 8.6 of the BAM (DPIE 2020a), the retirement of biodiversity credits may be used with other conservation measures to mitigate prescribed impacts of a proposal on threatened species.

Threatened species records exist in non-native (ie cultivation, exotic) vegetation within the disturbance footprint. As such vegetation zones have been identified over areas of cultivated land and are included in the BAM-C to assess for species credits.

The cultivation vegetation zones include cultivated land within 30 metres of a known threatened species record. The cultivation zones were then designated a PCT that would have likely occurred historically, and the zones were then entered into the BAM-C. As no vegetation integrity plot surveys were conducted in cultivation areas, plot data was created for input into the BAM-C as indicated below:

Data field	Data type	Value entered	Justification/Assumption
compTree	Number	0	No trees in cultivated paddocks
compShrub	Number	0	No shrubs in cultivated paddocks
compGrass	Number	1	<i>Dichanthium setosum</i>
compForbs	Number	1	<i>Thesium australe</i>
compFerns	Number	0	No native forbs in cultivated paddocks
compOther	Number	0	No other native species in cultivated paddocks
strucTree	Number with 1 decimal point	0.0	No trees in cultivated paddocks
strucShrub	Number with 1 decimal point	0.0	No shrubs in cultivated paddocks
strucGrass	Number with 1 decimal point	1.0	2 m x 2 m area represents 1% of a 400m ² BAM plot, which is a reasonable estimate of observed % foliage cover of <i>Dichanthium setosum</i>
strucForbs	Number with 1 decimal point	0.1	63 cm x 63 cm area represents 0.1% of a 400m ² BAM plot, which is a reasonable estimate of observed % foliage cover of <i>Thesium australe</i>
strucFerns	Number with 1 decimal point	0.0	No native forbs in cultivated paddocks
strucOther	Number with 1 decimal point	0.0	No other native species in cultivated paddocks
funLargeTrees	Number	0	No trees in cultivated paddocks
funHollowtrees	Number	0	No trees in cultivated paddocks
funLitterCover	Number with 1 decimal point	0.0	No litter due to cultivation activities and regrowth of ground vegetation (mainly ground cover weeds) between harvest and ripping activities.
funLenFallenLogs	Number with 1 decimal point	0.0	Cultivation areas are actively managed to keep free of timber debris.
funTreeStem5to9	[0,1]	0	No trees in cultivated paddocks
funTreeStem10to19	[0,1]	0	No trees in cultivated paddocks

Data field	Data type	Value entered	Justification/Assumption
funTreeStem20to29	[0,1]	0	No trees in cultivated paddocks
funTreeStem30to49	[0,1]	0	No trees in cultivated paddocks
funTreeStem50to79	[0,1]	0	No trees in cultivated paddocks
funTreeRegen	[0,1]	0	No trees in cultivated paddocks
funHighThreatExotic	Number with 1 decimal point	0.0	Conservatively set to 0.0

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compShru		compGras		compFor		compFern		compOth		strucShru		strucGras		strucForb		strucFern		strucOthe	
									compTree	b	s	bs	s	er	strucTree	b	s	s	s	r								
Text[Maximum 10 characters]	Number	Number	Number	Text[Letters, numbers, underscores and hyphens] Please fill condition-class name in all plots [Maximum 20 characters]	[54 or 55 or 56]			Range in [0-359]	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
BAM25	510	0.09	101	WDL_intact	56	350403	6700869.0	54	4	1	13	16	0	2	55.3	1.0	15.9	7.5	0.0	0.6								
BAM26	510	0.01	101	WDL_poor	56	347224	6701624	339	2	2	18	14	0	1	11.0	3.0	20.4	5.1	0.0	0.3								
BAM17	510	0.01	101	DNG_LOW	56	347153	6701452.0	101	1	0	4	7	0	1	0.5	0.0	11.5	1.8	0.0	0.2								
BAM21	510	0.01	101	DNG_LOW	56	349151	6700718.0	200	0	0	11	6	0	2	0.0	0.0	12.2	1.1	0.0	0.4								
BAM22	510	0.01	101	DNG_LOW	56	348649	6701341.0	308	0	0	12	3	0	1	0.0	0.0	20.1	1.2	0.0	0.3								
BAM23	510	0.01	101	DNG_LOW	56	347173	6701377.0	110	0	0	4	8	0	0	0.0	0.0	70.6	2.6	0.0	0.0								
BAM24	510	0.01	101	DNG_LOW	56	347605	6701494.0	122	0	1	9	10	0	2	0.0	0.2	8.3	2.6	0.0	0.4								
BAM48	510	0.01	101	DNG_LOW	56	349197	6700772	196	0	0	6	9	0	0	0.0	0.0	18.1	0.9	0.0	0.0								
BAM35	590	0.02	101	WDL_poor	56	347089	6698889	264	1	0	6	5	0	0	30.0	0.0	2.8	1.8	0.0	0.0								
BAM36	590	0.02	101	WDL_poor	56	352184	6701010	239	2	1	16	14	0	1	25.0	0.2	14.7	5.2	0.0	0.2								
BAM05	590	0.01	101	DNG_MOD	56	347533	6699983.0	335	0	1	14	9	0	2	0.0	0.1	42.4	0.9	0.0	0.2								
BAM15	590	0.01	101	DNG_MOD	56	347367	6700267.0	313	0	0	9	12	1	2	0.0	0.0	35.6	2.2	0.1	0.2								
BAM32	590	0.01	101	DNG_MOD	56	351850	6705420.0	4	1	0	11	13	0	1	0.5	0.0	12.3	4.4	0.0	0.3								
BAM45	590	0.01	101	DNG_MOD	56	347601	6699363.0	84	0	1	3	10	0	1	0.0	0.1	12.2	7.4	0.0	0.1								
BAM46	590	0.01	101	DNG_MOD	56	347545	6700385.0	46	0	0	7	13	0	1	0.0	0.0	51.7	7.1	0.0	0.1								
BAM03	590	0.06	101	DNG_LOW	56	349418	6700055.0	228	1	0	6	7	0	1	0.5	0.0	81.3	0.7	0.0	0.1								
BAM33	590	0.06	101	DNG_LOW	56	352599	6701098	266	0	0	8	6	1	1	0.0	0.0	9.3	1.9	0.2	0.1								
BAM47	590	0.06	101	DNG_LOW	56	349334	6700232	207	0	0	2	8	0	0	0.0	0.0	60.0	1.6	0.0	0.0								

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	funLargeT rees	funHollo wtrees	funLitterC over	funLenFal lenLogs	funTreeSt em5to9	funTreeSt em10to1 9	funTreeSt em20to2 9	funTreeSt em30to4 9	funTreeSt em50to7 9	funTreeR egen	funHighT hreatExot ic
Text[Ma ximum 10 characte rs]	Number	Number with 2 decimal point	Number	Text[Letters, numbers, underscores and hyphens] Please fill condition- class name in all plots [Maximum 20 characters]	[54 or 55 or 56]			Range in [0-359]	Number	Number	Number with 1 decimal point	Number with 1 decimal point	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	Number with 1 decimal point
BAM25	510	0.09	101	WDL_intact	56	350403	6700869.0	54	4	1	37.0	10.0	1	0	0	1	1	1	0.9
BAM26	510	0.01	101	WDL_poor	56	347224	6701624	339	4	1	18.0	2.0	0	1	0	0	1	1	3.4
BAM17	510	0.01	101	DNG_LOW	56	347153	6701452.0	101	1	1	14.0	0.0	0	0	0	0	0	0	10.5
BAM21	510	0.01	101	DNG_LOW	56	349151	6700718.0	200	0	0	1.4	0.0	0	0	0	0	0	0	1.3
BAM22	510	0.01	101	DNG_LOW	56	348649	6701341.0	308	0	0	3.0	0.0	0	0	0	0	0	0	31.4
BAM23	510	0.01	101	DNG_LOW	56	347173	6701377.0	110	0	0	10.0	0.0	0	0	0	0	0	0	1.6
BAM24	510	0.01	101	DNG_LOW	56	347605	6701494.0	122	0	0	8.0	0.0	0	0	0	0	0	0	50.3
BAM48	510	0.01	101	DNG_LOW	56	349197	6700772	196	0	0	0.2	0.0	0	0	0	0	0	0	0.1
BAM35	590	0.02	101	WDL_poor	56	347089	6698889	264	2	1	5.8	8.0	0	0	0	0	0	0	71.5
BAM36	590	0.02	101	WDL_poor	56	352184	6701010	239	2	0	22.0	15.0	1	1	1	1	1	1	1.6
BAM05	590	0.01	101	DNG_MOD	56	347533	6699983.0	335	0	0	15.0	0.0	0	0	0	0	0	0	0.1
BAM15	590	0.01	101	DNG_MOD	56	347367	6700267.0	313	0	0	15.2	0.0	0	0	0	0	0	0	0.1
BAM32	590	0.01	101	DNG_MOD	56	351850	6705420.0	4	1	1	12.0	0.0	0	0	0	0	0	1	30.7
BAM45	590	0.01	101	DNG_MOD	56	347601	6699363.0	84	0	0	1.8	0.0	0	0	0	0	0	0	0.6
BAM46	590	0.01	101	DNG_MOD	56	347545	6700385.0	46	0	0	3.0	0.0	0	0	0	0	0	0	0.0
BAM03	590	0.06	101	DNG_LOW	56	349418	6700055.0	228	1	1	8.0	0.0	0	0	0	0	0	0	3.0
BAM33	590	0.06	101	DNG_LOW	56	352599	6701098	266	0	0	3.2	4.0	0	0	0	0	0	0	70.5
BAM47	590	0.06	101	DNG_LOW	56	349334	6700232	207	0	0	5.8	0.0	0	0	0	0	0	0	10.1

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compShru compGras compFor compFern compOth					strucShru strucGras strucForb strucFern strucOthe						
									compTree b	s	bs	s	er	strucTree b	s	s	s	r		
Text[Maximum 10 characters]	Number	Number with 2 decimal point	Number	Text[Letters, numbers, underscores and hyphens] Please fill condition-class name in all plots [Maximum 20 characters]	Range in [54 or 55 or 56]	Range in [0-359]			Number	Number	Number	Number	Number	Number	Number with 1 decimal point	Number with 1 decimal point	Number with 1 decimal point	Number with 1 decimal point	Number with 1 decimal point	Number with 1 decimal point
BAM18	84	0.04	101	WDL_poor	56	349366	6700839.0	280	1	0	6	5	0	0	60.0	0.0	49.4	1.0	0.0	0.0
BAM25	510	0.19	101	WDL_intact	56	350403	6700869.0	54	4	1	13	16	0	2	55.3	1.0	15.9	7.5	0.0	0.6
BAM26	510	0.30	101	WDL_poor	56	347224	6701624	339	2	2	18	14	0	1	11.0	3.0	20.4	5.1	0.0	0.3
BAM10	510	28.94	101	DNG_MOD	56	348873	6700742.0	285	1	1	9	13	0	3	0.5	0.1	30.3	1.3	0.0	0.3
BAM12	510	28.94	101	DNG_MOD	56	348251	6700873.0	5	0	0	5	5	0	1	0.0	0.0	23.0	0.5	0.0	0.1
BAM13	510	28.94	101	DNG_MOD	56	348460	6700975.0	125	0	2	4	12	0	3	0.0	1.1	22.0	5.9	0.0	0.3
BAM14	510	28.94	101	DNG_MOD	56	348595	6700869.0	120	0	0	7	11	0	3	0.0	0.0	32.4	5.0	0.0	0.5
BAM17	510	100.75	101	DNG_LOW	56	347153	6701452.0	101	1	0	4	7	0	1	0.5	0.0	11.5	1.8	0.0	0.2
BAM21	510	100.75	101	DNG_LOW	56	349151	6700718.0	200	0	0	11	6	0	2	0.0	0.0	12.2	1.1	0.0	0.4
BAM22	510	100.75	101	DNG_LOW	56	348649	6701341.0	308	0	0	12	3	0	1	0.0	0.0	20.1	1.2	0.0	0.3
BAM23	510	100.75	101	DNG_LOW	56	347173	6701377.0	110	0	0	4	8	0	0	0.0	0.0	70.6	2.6	0.0	0.0
BAM24	510	100.75	101	DNG_LOW	56	347605	6701494.0	122	0	1	9	10	0	2	0.0	0.2	8.3	2.6	0.0	0.4
BAM48	510	100.75	101	DNG_LOW	56	349197	6700772	196	0	0	6	9	0	0	0.0	0.0	18.1	0.9	0.0	0.0
BAM29	571	0.19	101	WDL_poor	56	349043	6698745.0	322	5	5	10	12	0	2	56.0	4.0	80.0	5.5	0.0	0.4
BAM34	590	0.20	101	WDL_mod	56	350833	6700839.0	83	3	2	15	18	0	1	48.0	3.0	11.9	4.5	0.0	0.2
BAM37	590	0.20	101	WDL_mod	56	348886	6698442.0	325	0	0	11	10	0	3	0.0	0.0	47.1	9.4	0.0	1.1
BAM35	590	1.50	101	WDL_poor	56	347089	6698889	264	1	0	6	5	0	0	30.0	0.0	2.8	1.8	0.0	0.0
BAM36	590	1.50	101	WDL_poor	56	352184	6701010	239	2	1	16	14	0	1	25.0	0.2	14.7	5.2	0.0	0.2
BAM05	590	0.05	101	DNG_MOD	56	347533	6699983.0	335	0	1	14	9	0	2	0.0	0.1	42.4	0.9	0.0	0.2
BAM15	590	0.05	101	DNG_MOD	56	347367	6700267.0	313	0	0	9	12	1	2	0.0	0.0	35.6	2.2	0.1	0.2
BAM32	590	0.05	101	DNG_MOD	56	351850	6705420.0	4	1	0	11	13	0	1	0.5	0.0	12.3	4.4	0.0	0.3
BAM45	590	0.05	101	DNG_MOD	56	347601	6699363.0	84	0	1	3	10	0	1	0.0	0.1	12.2	7.4	0.0	0.1
BAM46	590	0.05	101	DNG_MOD	56	347545	6700385.0	46	0	0	7	13	0	1	0.0	0.0	51.7	7.1	0.0	0.1
BAM03	590	15.57	101	DNG_LOW	56	349418	6700055.0	228	1	0	6	7	0	1	0.5	0.0	81.3	0.7	0.0	0.1
BAM33	590	15.57	101	DNG_LOW	56	352599	6701098	266	0	0	8	6	1	1	0.0	0.0	9.3	1.9	0.2	0.1
BAM47	590	15.57	101	DNG_LOW	56	349334	6700232	207	0	0	2	8	0	0	0.0	0.0	60.0	1.6	0.0	0.0
BAM16	590	71.10	101	DNG_V_LOW	56	346693	6699171.0	156	1	0	6	7	0	2	0.5	0.0	6.2	2.7	0.0	0.2
BAM40	590	71.10	101	DNG_V_LOW	56	346369	6698908.0	346	0	0	2	5	0	0	0.0	0.0	40.5	0.5	0.0	0.0
BAM41	590	71.10	101	DNG_V_LOW	56	346296	6699386.0	354	0	0	2	1	0	0	0.0	0.0	55.0	0.1	0.0	0.0
BAM42	590	71.10	101	DNG_V_LOW	56	346750	6699587.0	146	0	0	3	12	0	0	0.0	0.0	65.0	1.2	0.0	0.0
BAM43	590	71.10	101	DNG_V_LOW	56	346901	6699335.0	161	0	0	4	8	0	0	0.0	0.0	33.0	7.7	0.0	0.0
BAM44	590	71.10	101	DNG_V_LOW	56	346838	6698998.0	5	0	0	3	5	0	0	0.0	0.0	80.0	0.5	0.0	0.0
CULT01a	510	2.05	101	Cultivation	56	347894	6700411.0	0	0	0	1	1	0	0	0.0	0.0	1.0	0.1	0.0	0.0
CULT01b	510	2.05	101	Cultivation	56	347894	6700411.0	0	0	0	1	1	0	0	0.0	0.0	1.0	0.1	0.0	0.0
CULT02	571	0.09	101	Cultivation	56	349263	6698944.0	0	0	0	1	1	0	0	0.0	0.0	1.0	0.1	0.0	0.0
CULT03a	590	4.27	101	Cultivation	56	349219	6698819.0	0	0	0	1	1	0	0	0.0	0.0	1.0	0.1	0.0	0.0
CULT03b	590	4.27	101	Cultivation	56	349219	6698819.0	0	0	0	1	1	0	0	0.0	0.0	1.0	0.1	0.0	0.0

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	funLargeT rees	funHollo wtrees	funLitterC over	funLenFal lenLogs	funTreeSt em5to9	funTreeSt em10to1 9	funTreeSt em20to2 9	funTreeSt em30to4 9	funTreeSt em50to7 9	funTreeR egen	funHighT hreatExot ic
				Text[Letters, numbers, underscores and hyphens] Please fill condition- class name in all plots [Maximum 20 characters]	[54 or 55 or 56]			Range in [0-359]	Number	Number	Number with 1 decimal point	Number with 1 decimal point	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	[0,1]	Number with 1 decimal point
BAM18	84	0.04	101	WDL_poor	56	349366	6700839.0	280	2	1	7.8	6.0	0	0	1	1	1	0	0.0
BAM25	510	0.19	101	WDL_intact	56	350403	6700869.0	54	4	1	37.0	10.0	1	0	0	1	1	1	0.9
BAM26	510	0.30	101	WDL_poor	56	347224	6701624	339	4	1	18.0	2.0	0	1	0	0	1	1	3.4
BAM10	510	28.94	101	DNG_MOD	56	348873	6700742.0	285	1	0	7.0	0.0	0	0	0	0	0	0	0.1
BAM12	510	28.94	101	DNG_MOD	56	348251	6700873.0	5	0	0	13.0	0.0	0	0	0	0	0	0	3.0
BAM13	510	28.94	101	DNG_MOD	56	348460	6700975.0	125	0	0	6.0	0.0	0	0	0	0	0	0	0.6
BAM14	510	28.94	101	DNG_MOD	56	348595	6700869.0	120	0	0	5.0	0.0	0	0	0	0	0	0	0.1
BAM17	510	100.75	101	DNG_LOW	56	347153	6701452.0	101	1	1	14.0	0.0	0	0	0	0	0	0	10.5
BAM21	510	100.75	101	DNG_LOW	56	349151	6700718.0	200	0	0	1.4	0.0	0	0	0	0	0	0	1.3
BAM22	510	100.75	101	DNG_LOW	56	348649	6701341.0	308	0	0	3.0	0.0	0	0	0	0	0	0	31.4
BAM23	510	100.75	101	DNG_LOW	56	347173	6701377.0	110	0	0	10.0	0.0	0	0	0	0	0	0	1.6
BAM24	510	100.75	101	DNG_LOW	56	347605	6701494.0	122	0	0	8.0	0.0	0	0	0	0	0	0	50.3
BAM48	510	100.75	101	DNG_LOW	56	349197	6700772	196	0	0	0.2	0.0	0	0	0	0	0	0	0.1
BAM29	571	0.19	101	WDL_poor	56	349043	6698745.0	322	3	1	12.0	6.0	0	1	1	0	1	1	6.5
BAM34	590	0.20	101	WDL_mod	56	350833	6700839.0	83	8	1	55.0	15.0	1	0	0	1	1	1	21.0
BAM37	590	0.20	101	WDL_mod	56	348886	6698442.0	325	0	0	8.0	0.0	1	1	0	0	0	1	4.0
BAM35	590	1.50	101	WDL_poor	56	347089	6698889	264	2	1	5.8	8.0	0	0	0	0	0	0	71.5
BAM36	590	1.50	101	WDL_poor	56	352184	6701010	239	2	0	22.0	15.0	1	1	1	1	1	1	1.6
BAM05	590	0.05	101	DNG_MOD	56	347533	6699983.0	335	0	0	15.0	0.0	0	0	0	0	0	0	0.1
BAM15	590	0.05	101	DNG_MOD	56	347367	6700267.0	313	0	0	15.2	0.0	0	0	0	0	0	0	0.1
BAM32	590	0.05	101	DNG_MOD	56	351850	6705420.0	4	1	1	12.0	0.0	0	0	0	0	0	1	30.7
BAM45	590	0.05	101	DNG_MOD	56	347601	6699363.0	84	0	0	1.8	0.0	0	0	0	0	0	0	0.6
BAM46	590	0.05	101	DNG_MOD	56	347545	6700385.0	46	0	0	3.0	0.0	0	0	0	0	0	0	0.0
BAM03	590	15.57	101	DNG_LOW	56	349418	6700055.0	228	1	1	8.0	0.0	0	0	0	0	0	0	3.0
BAM33	590	15.57	101	DNG_LOW	56	352599	6701098	266	0	0	3.2	4.0	0	0	0	0	0	0	70.5
BAM47	590	15.57	101	DNG_LOW	56	349334	6700232	207	0	0	5.8	0.0	0	0	0	0	0	0	10.1
BAM16	590	71.10	101	DNG_V_LOW	56	346693	6699171.0	156	1	1	6.0	0.0	0	0	0	0	0	0	1.0
BAM40	590	71.10	101	DNG_V_LOW	56	346369	6698908.0	346	0	0	2.2	0.0	0	0	0	0	0	0	0.5
BAM41	590	71.10	101	DNG_V_LOW	56	346296	6699386.0	354	0	0	3.0	0.0	0	0	0	0	0	0	0.0
BAM42	590	71.10	101	DNG_V_LOW	56	346750	6699587.0	146	0	0	7.4	0.0	0	0	0	0	0	0	3.0
BAM43	590	71.10	101	DNG_V_LOW	56	346901	6699335.0	161	0	0	0.6	0.0	0	0	0	0	0	0	1.0
BAM44	590	71.10	101	DNG_V_LOW	56	346838	6698998.0	5	0	0	3.8	0.0	0	0	0	0	0	0	2.0
CULT01a	510	2.05	101	Cultivation	56	347894	6700411.0	0	0	0	0.0	0.0	0	0	0	0	0	0	0.0
CULT01b	510	2.05	101	Cultivation	56	347894	6700411.0	0	0	0	0.0	0.0	0	0	0	0	0	0	0.0
CULT02	571	0.09	101	Cultivation	56	349263	6698944.0	0	0	0	0.0	0.0	0	0	0	0	0	0	0.0
CULT03a	590	4.27	101	Cultivation	56	349219	6698819.0	0	0	0	0.0	0.0	0	0	0	0	0	0	0.0
CULT03b	590	4.27	101	Cultivation	56	349219	6698819.0	0	0	0	0.0	0.0	0	0	0	0	0	0	0.0

Appendix E

Weather data

Table E.1 Weather data for targeted surveys

Date	Surveys completed	Temperature (°C)		Rain to 9.00 am (mm)	Wind (km/h)			Relative humidity (%)		Cloud cover (% of sky)	
		Min	Max		Max gust	9.00 am	3.00 pm	9.00 am	3.00 pm	9.00 am	3.00 pm
25/08/2021	Habitat assessment, hollow and nest surveys, stag watching	4.4	13.7	3.8	30	13	13	69	53	13	25
25/08/2021	Habitat assessment, hollow and nest surveys, stag watching	-1.3	14.9	0	26	9	13	69	50	13	13
27/08/2021	Habitat assessment, hollow and nest surveys, stag watching	2.7	14.4	0	37	7	15	76	36	13	13
19/10/2021	Targeted flora surveys, Spotlighting, Frog transects, Anabat surveys, nest surveys	8.2	24.4	1.4	35	7	11	68	29	25	38
20/10/2021	Targeted flora surveys, Spotlighting, Frog transects, Anabat surveys, nest surveys	7.9	24.8	0.2	46	9	20	64	32	13	38
21/10/2021	Targeted flora surveys, Spotlighting, Frog transects, Anabat surveys, nest surveys	11.2	24	0	31	17	11	70	48	63	75
22/10/2021	Targeted flora surveys, Spotlighting, Frog transects, Anabat surveys, nest surveys	12.6	26.5	0	24	13	9	76	45	75	50
23/10/2021	Targeted flora surveys, Spotlighting, Frog transects, Anabat surveys, nest surveys	14.2	30.1	0	33	11	20	82	55	75	38
24/10/2021	Targeted flora surveys	14.4	25.7	0	31	11	19	54	31	13	13
25/10/2021	Targeted flora surveys	11.4	23.8	0	33	2	11	42	30	50	13
26/10/2021	Targeted flora surveys	5.9	25.5	0	30	7	11	43	26	13	13
7/12/2021	Koala detection dogs (cut short due to weather conditions)	16.5	25.9	21	31	15	9	81	73	63	63
8/12/2021	Koala detection dogs (cut short due to weather conditions)	14.6	28.2	12.4	50	11	13	82	50	75	50
12/12/2021	Spotlighting, frog transects	13.6	26.9	0	28	9	11	70	37	13	25
13/12/2021	Spotlighting, frog transects	13.1	26.5	0	28	7	9	67	41	13	25
14/12/2021	Spotlighting, frog transects	13.9	27.8	0	30	7	13	51	31	63	50
15/12/2021	Spotlighting, frog transects	11.9	30.6	0	26	7	9	47	33	0	13

Table E.1 Weather data for targeted surveys

Date	Surveys completed	Temperature (°C)		Rain to 9.00 am (mm)	Wind (km/h)			Relative humidity (%)		Cloud cover (% of sky)	
		Min	Max		Max gust	9.00 am	3.00 pm	9.00 am	3.00 pm	9.00 am	3.00 pm
16/12/2021	Spotlighting, frog transects	15.8	-	0	-	-	11	63	45	88	88
7/02/2022	Targeted flora surveys	12.7	26	0	33	20	11	60	40	13	38
8/02/2022	Targeted flora surveys	11.3	25.7	0	30	9	11	58	38	13	63
9/02/2022	Targeted flora surveys, Koala detection dogs	11.7	28	0	33	7	15	72	35	25	38
10/02/2022	Targeted flora surveys, Koala detection dogs	12.6	31.5	0	33	7	15	59	31	0	38
20/02/2022	Harp trapping	17	29.3	0	43	7	15	70	45	50	88
21/02/2022	Harp trapping	16.1	30.1	8.8	31	-	7	87	43	38	25
22/02/2022	Harp trapping	16.8	29.9	3.2	41	7	11	79	44	88	88
23/02/2022	Harp trapping	18.2	28.7	0.2	41	17	20	66	57	38	88
12/03/2022	Harp trapping	13.1	27.3	1.6	30	15	11	74	41	13	50
13/03/2022	Harp trapping	13.4	27.3	0	28	7	13	73	41	13	38
14/03/2022	Harp trapping	11.6	26.8	0	30	9	13	72	43	13	38
15/03/2022	Harp trapping	13.6	28.1	0	35	9	9	65	44	0	75

Source: Data is from Inverell weather station – BOM station number 056018 (BOM 2023).

Cloud cover is taken from Inverell (Raglan St) – BOM station number 056242 (BOM 2023).

Appendix F

Herbarium identifications

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Cecilia Phu

From: Albrecht, Dave (NCMI, Black Mountain) <Dave.Albrecht@csiro.au>
Sent: Thursday, 3 March 2022 2:33 PM
To: Bianca Seal
Subject: Dichanthium IDs
Attachments: 22_030_Seal.pdf

CAUTION: This email originated outside of the Organisation.

Hi Bianca,

With the exception of three samples the determinations were correct on the Dichanthium samples you sent. See attachment with details. One specimen appears to be intermediate in features between *D.sericeum* and *D.setosum*, which is interesting. There are a few examples of intermediates in the CANB collection. It is possible that these intermediates are hybrids between the two species but further work would be required to prove this. We'll hang on to a selection of the specimens for our collection.

All the best,

Dave

ID Number	Suspected species	Zone	Location		Date collected	Description of area where specimen collected
			Easting	Northing		
✓ 1	<i>Dichanthium setosum</i>	56	349,429	6,699,110	8/02/2022	Grazed grassland- edge of woodland
✓ 2	<i>Dichanthium sericeum</i>	56	349,157	6,698,247	8/02/2022	Grassy woodland
— 3	<i>Dichanthium setosum</i> <i>sericeum</i>	56	348,746	6,701,149	9/02/2022	Grazed grassland- edge of woodland. In proximity to creek on floodplain
✓ 4	<i>Dichanthium sericeum</i>	56	348,069	6,700,698	10/02/2022	Grazed grassland
✓ 5	<i>Dichanthium sericeum</i>	56	348,777	6,698,955	10/02/2022	Grazed grassland
✓ 6	<i>Dichanthium sericeum</i>	56	348,589	6,698,997	10/02/2022	Grazed grassland-In proximity to creek on floodplain
✓ 7	<i>Dichanthium sericeum</i>	56	348,411	6,669,584	10/02/2022	Grazed grassland
✓ 8	<i>Dichanthium sericeum</i>	56	347,902	6,701,422	10/02/2022	Grazed grassland- edge of woodland
✓ 9	<i>Dichanthium sericeum</i>	56	348,413	6,701,007	10/02/2022	Grazed grassland-In proximity to dry tributary.
✓ 10	<i>Dichanthium setosum</i> ^{<i>sericeum</i>}	56	348,299	6,701,000	10/02/2022	Grazed grassland
— 11	<i>Dichanthium setosum</i> <i>sericeum</i>	56	349,079	6,700,233	10/02/2022	Grazed grassland-In proximity to creek on floodplain
* 12	<i>Dichanthium setosum</i> ^{<i>see note below</i>}	56	349,119	6,700,126	10/02/2022	Grazed grassland-In proximity to creek on floodplain
✓ 13	<i>Dichanthium setosum</i>	56	349,177	6,699,965	10/02/2022	Grazed grassland-In proximity to creek on floodplain
✓ 14	<i>Dichanthium sericeum</i>	56	349,397	6,698,399	10/02/2022	Historically cropped grassland
✓ 15	<i>Dichanthium setosum</i>	56	349,006	6,669,523	10/02/2022	Grazed grassland- edge of woodland. In proximity to creek on floodplain on upper bank
✓ 16	<i>Dichanthium setosum</i>	56	351,854	6,705,240	10/02/2022	Side of access track. Grassy
✓ 17	<i>Dichanthium sericeum</i>	56	351,868	6,705,445	10/02/2022	Side of access track. Grassy
✓ 18	<i>Dichanthium setosum</i>	56	352,076	6,700,964	8/02/2022	Side of access track. Grassy

* No. 12 — intermediate between *D. setosum* & *D. sericeum*

Cecilia Phu

From: Bianca Seal
Sent: Tuesday, 8 February 2022 6:01 PM
To: Cecilia Phu; Ireni Clarke
Subject: Dicanthium grass ID's from Sundown [REDACTED]

FYI- see below.

Bianca Seal

Ecologist

T 02 4907 4853

www.emmconsulting.com.au

From: Albrecht, Dave (NCMI, Black Mountain) <Dave.Albrecht@csiro.au>

Sent: Tuesday, 8 February 2022 4:36 PM

To: Bianca Seal <bseal@emmconsulting.com.au>

Subject: Your grass IDs

CAUTION: This email originated outside of the Organisation.

Hi Bianca,

Apologies for the delayed reply – I have been on leave and also had to quarantine as a close covid contact.

Confirming that the Dichanthium specimen from [REDACTED] is *D.sericeum* ssp. *sericeum* as you suggested and specimen from Inverell is *D. setosum*. We will keep the latter specimen for our collection.

All the best,

Dave

David Albrecht

Plant Identification and Liaison Officer | Australian National Herbarium

Centre for Australian National Biodiversity Research

National Research Collections Australia

CSIRO

E dave.albrecht@csiro.au

GPO Box 1700, Canberra, ACT 2601, AUSTRALIA

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Appendix G

Hollow bearing tree data

Table G.1 **Hollow-bearing tree data**

Location	Species	Number of trees	Number of small hollows (<5 cm)	Number of medium hollows (5–20 cm)	Number of large hollows (>20 cm)	Number of very large hollows (>40 cm)
Within disturbance footprint						
	<i>Angophora floribunda</i>	1	0	1	0	0
	<i>Eucalyptus albens</i>	12	11	25	0	0
	<i>Eucalyptus blakelyi</i>	14	10	15	6	1
	<i>Eucalyptus melliodora</i>	1	0	1	0	0
	<i>Eucalyptus viminalis</i>	1	0	1	0	0
	Stag	4	1	7	7	0
	Not recorded	1	1	6	0	0
Outside disturbance footprint						
	<i>Angophora floribunda</i>	9	4	7	1	0
	<i>Casuarina cunninghamiana</i>	34	58	43	4	0
	<i>Eucalyptus albens</i>	88	55	121	16	0
	<i>Eucalyptus blakelyi</i>	19	8	22	9	0
	<i>Eucalyptus melliodora</i>	7	6	6	1	0
	<i>Eucalyptus viminalis</i>	9	3	13	4	0
	<i>Eucalyptus</i> sp.	4	0	5	0	0
	Stag	35	28	62	16	1
	Not recorded	1	0	2	0	0
Grand Total		240	185	337	64	2

Note: hollow size classes refer to diameter at hollow entrance in centimetres.

Appendix H

Koala detection dog survey

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Koala detection dog surveys for EMM Consulting – Sundown Solar

Introduction

EMM Consulting requested Koala detection dog surveys at “Sundown Solar” in Newstead, NSW.

The first surveys were attempted on 7th and 8th December 2021 but were halted early due to bad weather and poor site access.

The second round of surveys were completed on 9th and 10th February 2022.

Methodology

The search area is divided up into approximately 1 ha sites of suitable Koala habitat.

Each detector dog and handler team work 200m in one direction with the dog searching 25m left and right of the handler. When the handler hits the end of the 200m, they will move 50m across to the nearest suitable habitat and then work back 200m to create a fully surveyed 1Ha block.

Accessible outlier habitat or sections smaller than 1Ha will be opportunistically surveyed as the handlers move throughout the site.

The aim being to accurately survey any possible habitat across the entire site for Koala presence

The dogs will alert to Koala scat and fur.

Koala detection dog surveys for EMM Consulting – Sundown Solar

Results

No Koala presence detected anywhere throughout the survey area.

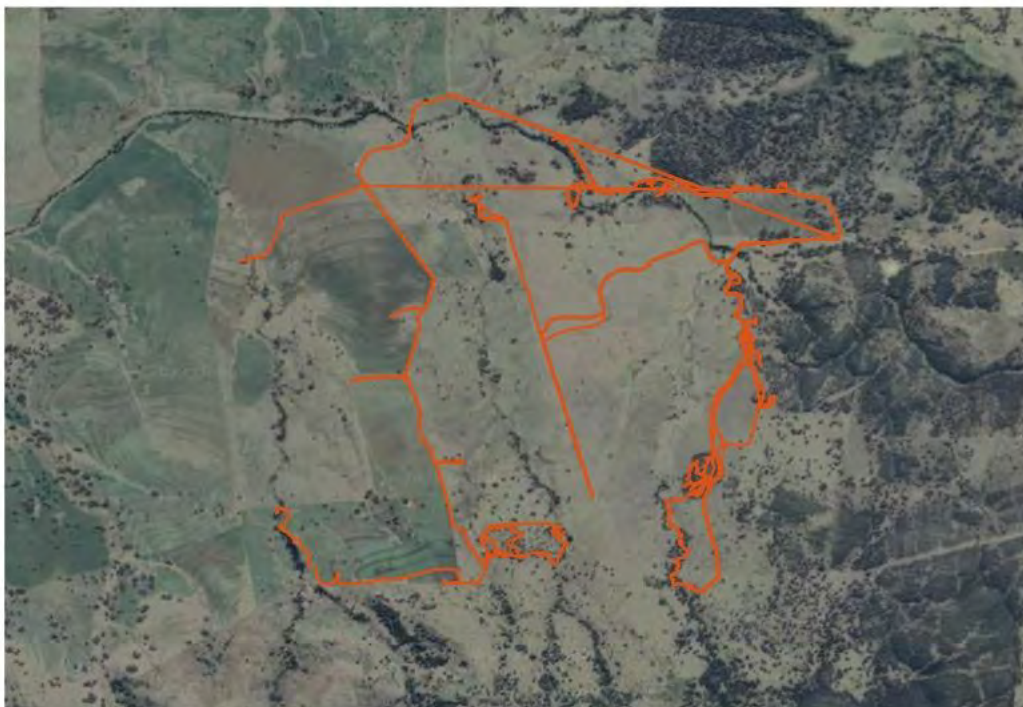


Image 1. Map of the survey area with the koala detection dog track logs.

Discussion

Some sections of the site with suitable habitat for Koalas were not surveyed due to poor access or unsafe terrain for dogs to work (zero visibility due to head high grass cover). However, all connected corridors of suitable Koala habitat and all site boundaries of suitable habitat were thoroughly surveyed and confirmed absence, which suggests the gaps in between are very unlikely to have Koala presence.

The teams encountered, several mobs of pigs, deer, some foxes and rabbits.

www.tateanimals.com

Appendix I

Microchiropteran bat surveys



CORYMBIA ECOLOGY

Amy Rowles
 415 Parishes Rd, Hilldale, NSW, 2420
 Mob: 0418451488
 Email: amy@corymbiaecology.com.au
 ABN 61854031078

BAT CALL ANALYSIS RESULTS

EMM – Sundown Solar project – New England- 19-26/10/2021

34619 files (23977 noise files excluded from analysis)

Species	AB1	AB2	AB3	AB4	AB5	AB6	AB7	AB8	AB9	Overall ID Confidence	Notes
<i>Austronomus australis</i>	D	D	D	D	D	D	D		D	D	
<i>Ozimops planiceps</i>	D	D	D	D	D	D	D	D	D	D	25-28khz
<i>Ozimops petersi / planiceps / ridei</i>	E	E	E	E	E	E	E	E	E		29-31khz
<i>Ozimops ridei</i>										Po	
<i>Ozimops petersi</i>						Pr				Pr	
<i>Chalinolobus gouldii</i>	D	D	D	D	D	D	D	D	D	D	
<i>Chalinolobus morio</i>	D	D	D	D	D	D	D	D	D	D	High activity
<i>Nyctophilus sp. / Myotis macropus</i>	E	E	E	E	E	E	E	E	E	E	See notes below.
<i>Scotorepens balstoni</i>	Po	Po	Po	Po	Po	Po			Po	Po	Potential overlap with other species making confident ID difficult
<i>Scotorepens orion</i>	Po									Po	
<i>Scotorepens orion / Falsistrellus tasmanensis / Scoteanax rueppellii</i>			E			E					Only a few passes
<i>Scotorepens greyii / Scotorepens sp. / Scotorepens orion / setirostris eleryi</i>			E								Only one pass
<i>Vespadelus regulus</i>			Pr			Pr	Po	Po	Po	Pr	
<i>Vespadelus vulturnus</i>	D	D	D	D	Pr	Pr	D		D	D	
<i>Vespadelus troughtoni</i>	Po		Po	Po		Po		Po	Po	Po	These passes are most likely <i>Vespadelus vulturnus</i> , however it is difficult to distinguish between these species. If suitable cave habitat occurs in the vicinity trapping is recommended to investigate the potential presence of

Species	AB1	AB2	AB3	AB4	AB5	AB6	AB7	AB8	AB9	Overall ID Confidence	Notes
											this species.
<i>Miniopterus orianae oceanensis</i>	Po			Pr	Pr	D	Po	Pr		D	
<i>Miniopterus orianae oceanensis</i> / <i>Vespadelus darlingtoni</i>		E	E						E		Passes were short and not able to be distinguished between these species
<i>Ozimops lumsdenae</i> or social calls of other species		E						E			Pulses were not consistent enough to determine whether these were standard ultrasonic calls or social calls.

Note: only calls identified a definite should be entered in Bionet

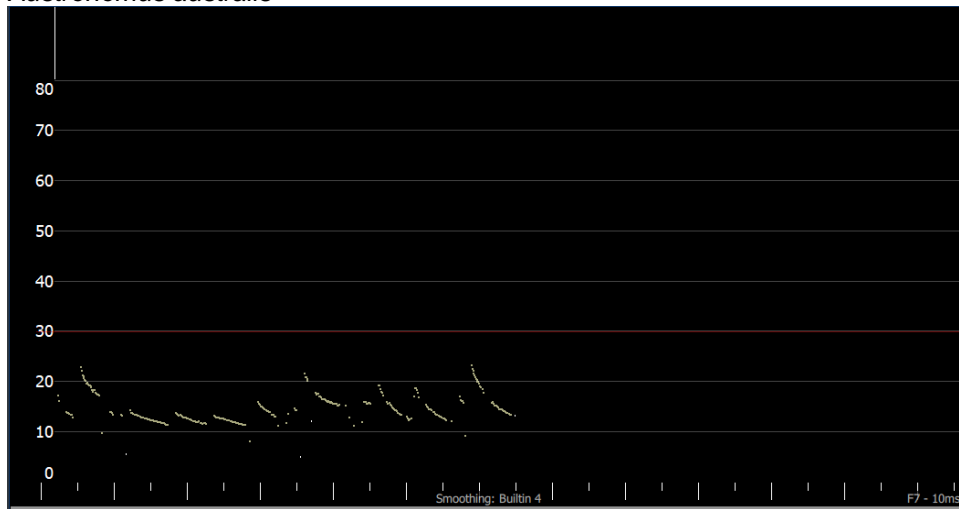
- D – definite; Pr – probable; Po – possible; E-either.
- Calls were analysed using Anabat Insight.
- Example calls presented below are displayed in this report at F7.
- Analysis was completed on the 28 November 2021.
- The following resources were consulted during analysis:
 - Pennay M., Law B., and Reinhold L. (2004) Bat Calls of NSW. DEC of NSW.
 - Corben C. (2009) Anabat Techniques Workshop, Titley Scientific.
 - Personal experience analysing calls and collection of reference calls in NSW
 - Anabat Insight Workshop (2019), Titley Scientific and Balance Environmental.
 - Reinhold et.al. (2001) Key to the Bat Calls of South-East Queensland and North-East New South Wales.

Myotis macropus* / *Nyctophilus corbeni

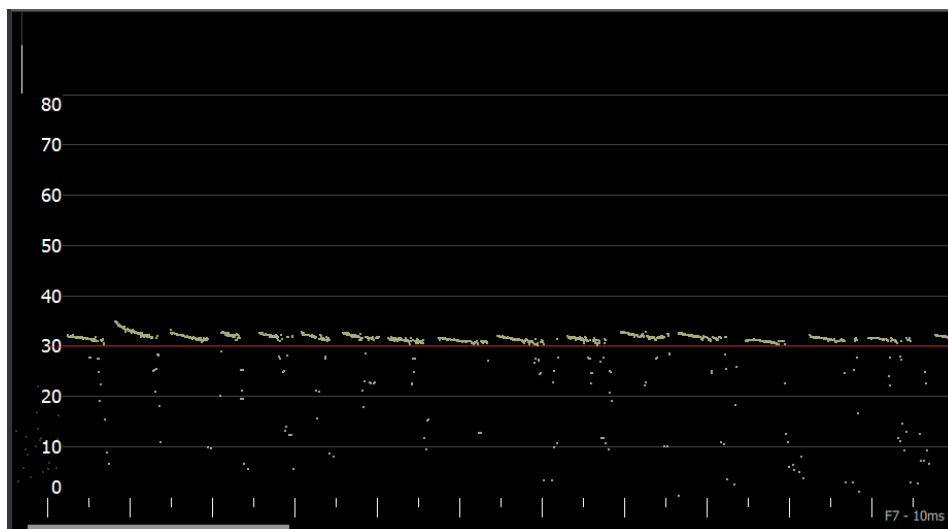
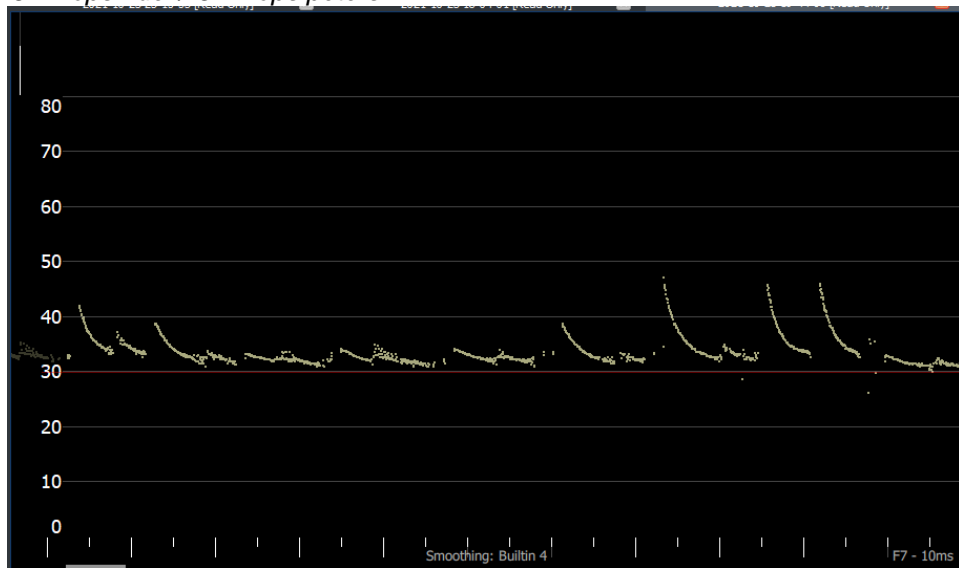
The characteristics of the passes recorded fell in the overlap between these species. It is not possible to distinguish between *Nyctophilus* species and there are few reference calls for *Nyctophilus corbeni*. Some of the passes are quite long with strong pulses indicating *Myotis* as it has a louder call that is easier to pick up from a greater distance. The strong section of the pulses is also at a slighter lower frequency than that expected for *Nyctophilus geoffroyi* or *N. gouldi*, however it is possible that *N. corbeni* may produce louder calls that are at a slightly lower frequency. Usually, reasonable activity as seen at this site will result in *Myotis* passes including characteristic pulses with a different slope interspersed amongst the other pulses, however here the pulses are of consistent slope throughout the pass which is typical of *Nyctophilus*. Overall, the passes recorded are more likely to be *Nyctophilus*, with a high possibility of being *N. corbeni* and there is the possibility that both species occur. The identification of these species cannot be confirmed on these calls alone and trapping is recommended. Site six contained the highest activity, with one and seven also recording reasonable activity.

Examples of calls for definite and probable identified species

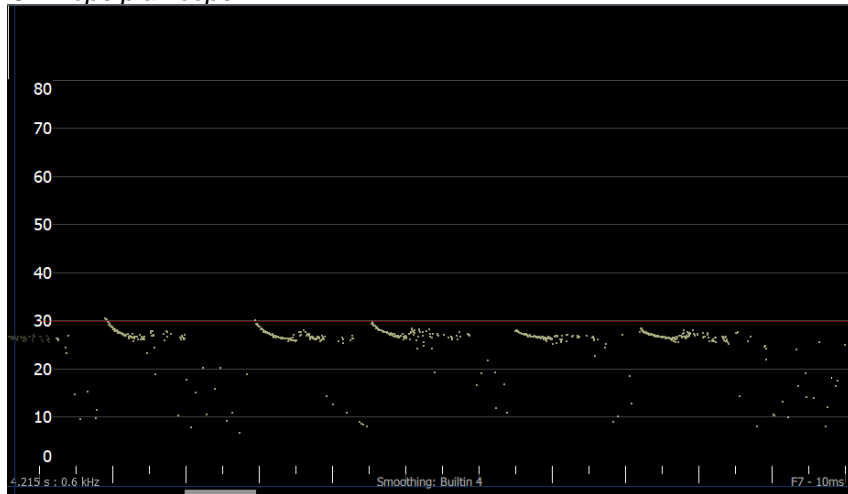
Austronomus australis



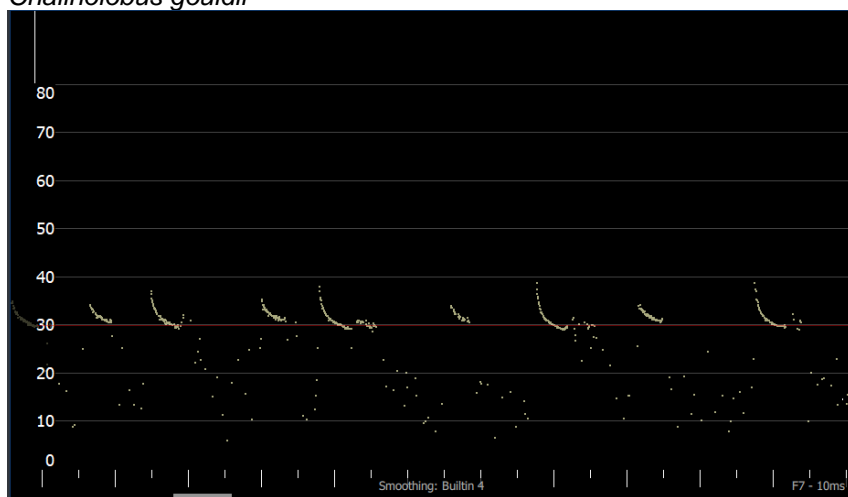
Ozimops ridei / *Ozimops petersi*



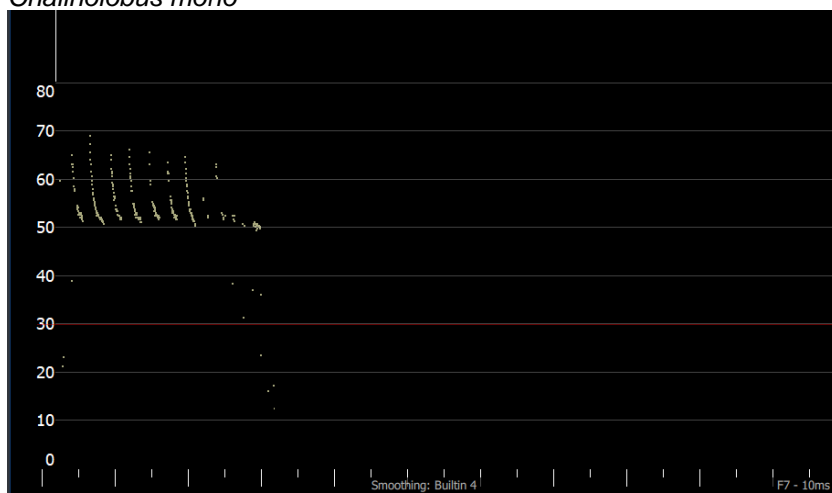
Ozimops planiceps



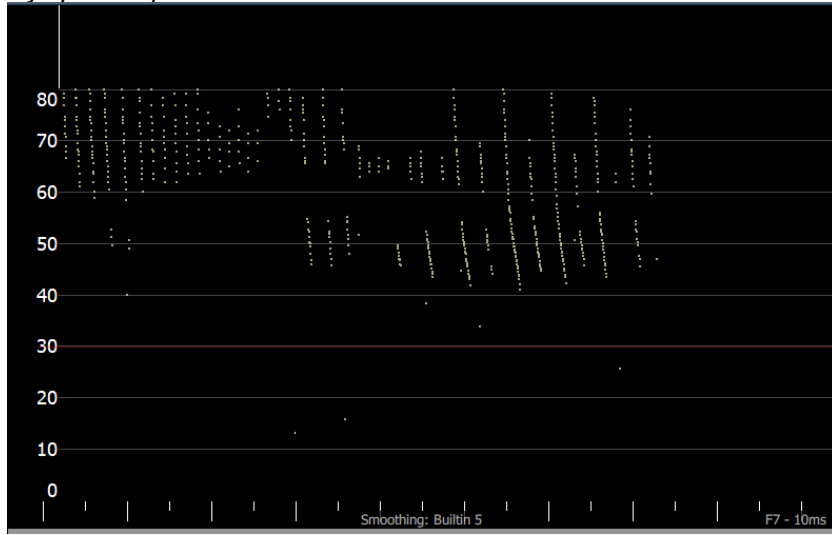
Chalinolobus gouldii



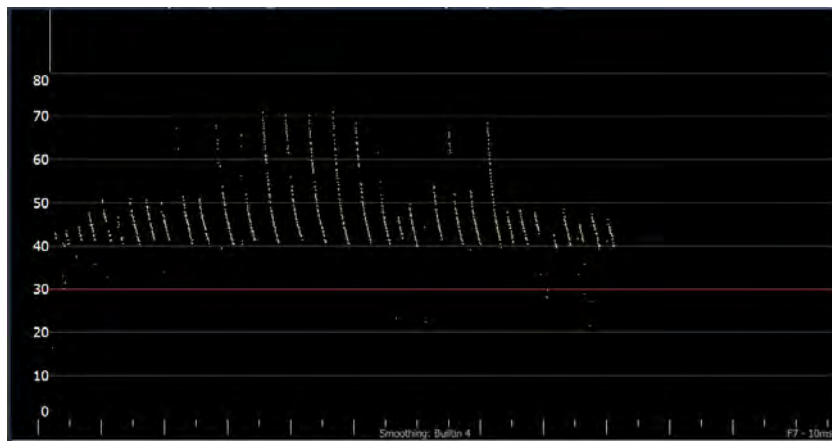
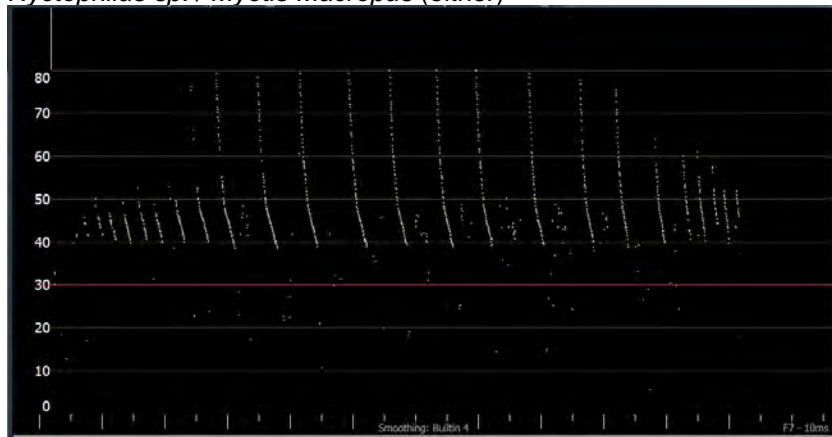
Chalinolobus morio

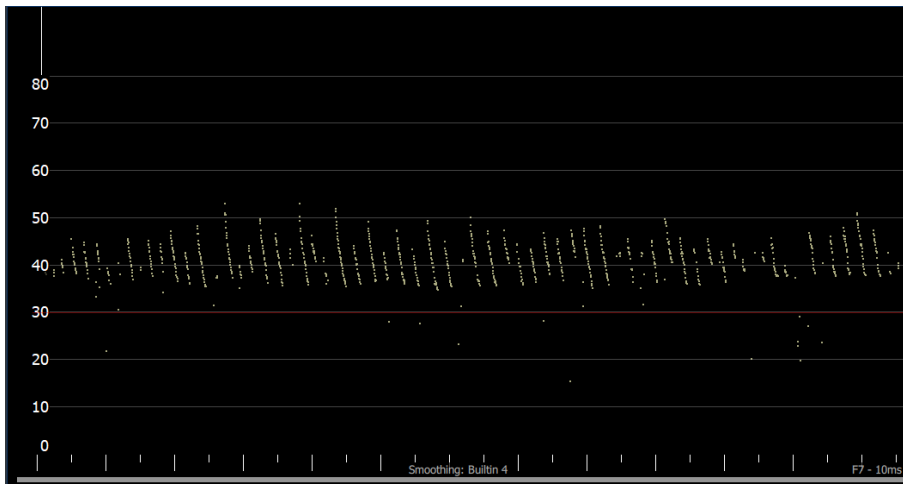


Nyctophilus sp.

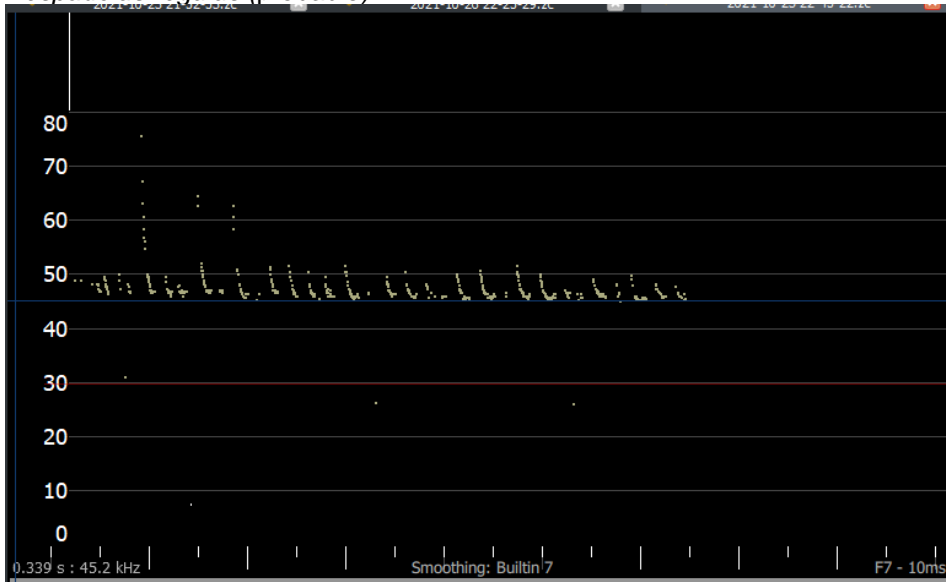


Nyctophilus sp. / Myotis Macropus (either)

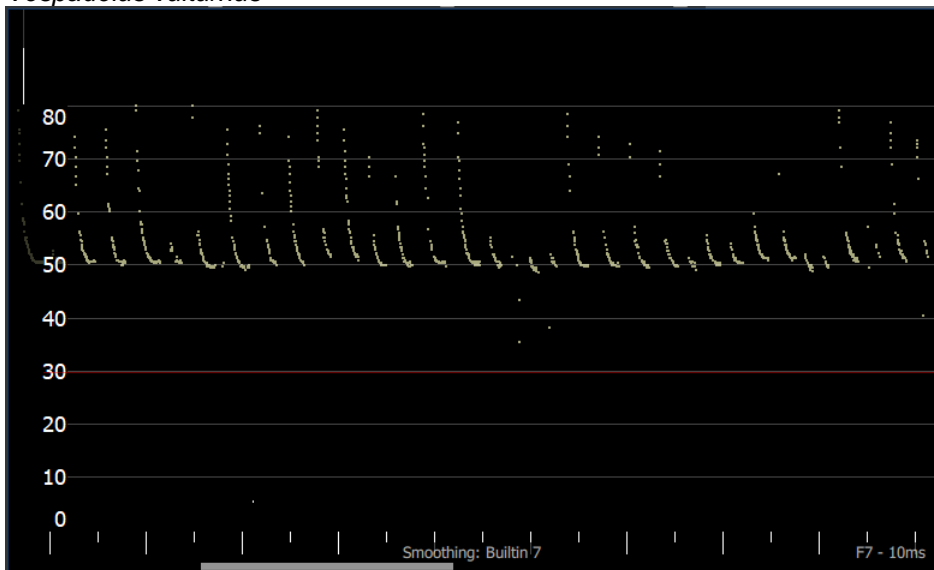




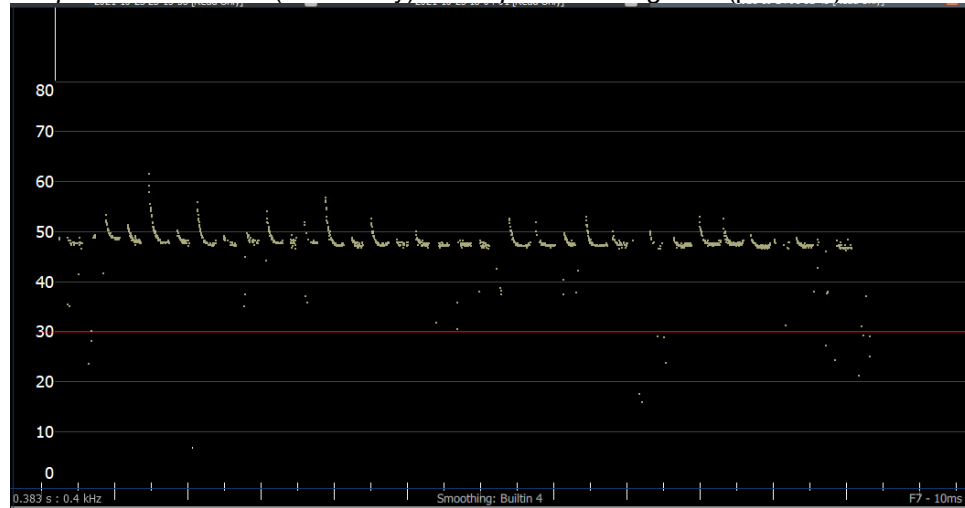
Vespadelus regulus (probable)



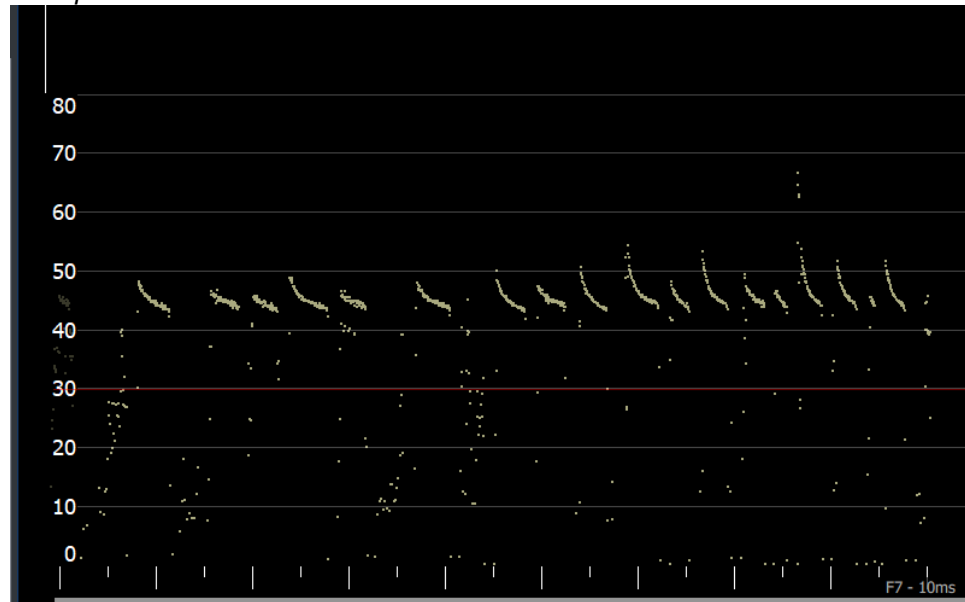
Vespadelus vulturnus



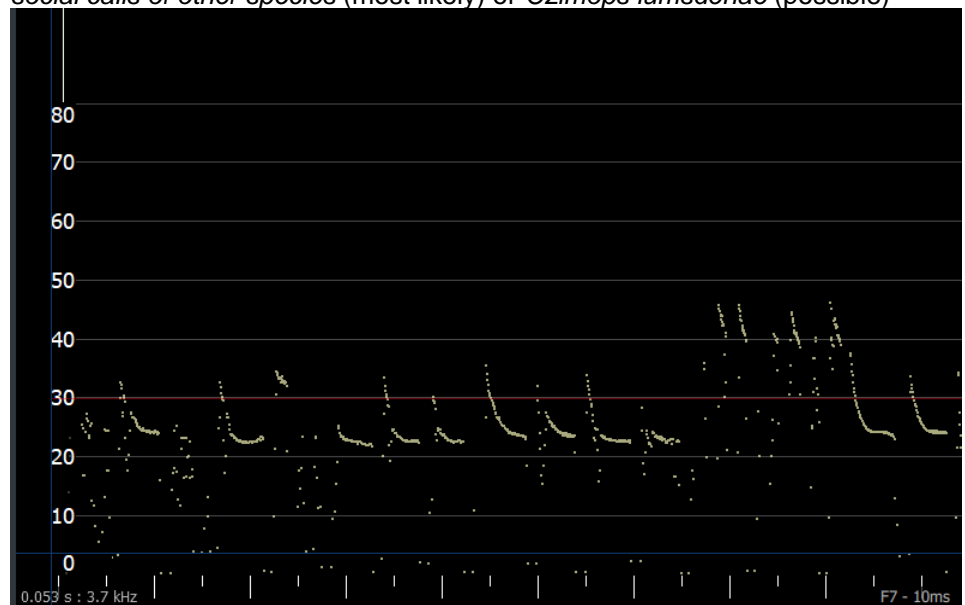
Vespadelus vulturnus (most likely) or *Vespadelus trouhtoni* (possible)



Miniopterus orianae oceanensis



social calls of other species (most likely) or *Ozimops lumsdenae* (possible)



21st March 2022

EMM

Ground floor, 20 Chandos Street,

St Leonards NSW 2065

Attention: Ireni Clarke**Re: Targeted Southern Myotis surveys – Sundown Solar Farm Project**

Please find a small letter report detailing the findings from a recently completed targeted survey for the Southern Myotis (*Myotis macropus*) at the proposed Sundown Solar Farm.

Field surveys were undertaken over two time periods summarised as follows:

- 20-23 February 2022 when 5 standard harp traps (Ausbat) were used at five locations along Kings Creek culminating in 15 nights of survey effort. The weather conditions during this time were suitable with warm days culminating in afternoon and evening thunderstorms with a reduced moon (Table A-1), and
- 12-16 March 2022 when 5 harp traps were used at six different locations along Kings Creek culminating in 20 nights of survey effort (i.e. Plate 1-1). The weather conditions during this time were suitable although the days and evening temperatures were milder and there was no rainfall yet a near full moon provided increased evening light (Table A-1).

No Southern Myotis were captured during the survey. Six Lesser Long-eared Bat (*Nyctophilus geoffroyi*) were captured during the survey and may explain the call recordings which can be confused with Myotis. One-hundred and one (101) microchiropteran bats comprising just three species were captured during the survey (Table A-1).

In an attempt to locate Myotis, a number of potential roost sites were inspected. This included a bridge over Swan Brook on Spring Mountain Road (E: 351828 N: 6705027) and the Gwydir Highway (E: 348726 N: 6705488) along with a recently completed pre cast bridge just downstream of the confluence of Kings Creek and the Macintyre River (E: 332186 N: 6700668; Plate 1-2). Whilst all three provided some potential bat roost habitat it was only the pre cast bridge on Stannifer Road (E: 332186 N: 6700668) that contained bats, one threatened Eastern Bent-wing Bat (*Miniopterus orianae oceanensis*). All other locations inspected were either concrete causeways or very low structures that did not support potential roost habitat for Myotis. This included the two concrete structures crossing Kings Creek in the project study area.



Plate 1-1. Harp trap location 8 along Kings Creek.



Plate 1-2. Recently completed bridge over the Macintyre River that was found to provide roost habitat for the Eastern Bent-wing Bat (*Miniopterus orianae oceanensis*).

Other Threatened Species

The following threatened species were recorded on the study site during the course of the field surveys:

- Little Lorikeet with flock sizes of between 2-12 birds were regularly heard and observed along Kings Creek and adjacent vegetation (Table 1-1);
- Diamond Firetail with 2 individuals observed (Table 1-1);
- Dusky Woodswallow with observations of 8 and 11 individuals at two locations along and near Kings Creek (Table 1-1);
- Brown Treecreeper with one individual; observed adjacent to Kings Creek (Table 1-1).

Table 1-1. Threatened species records

Species	Date	Easting	Northing	Observation Type	Number
Little Lorikeet	21.2.2022	350139	6700867	Observed + Heard	12
Little Lorikeet	21.2.2022	349308	6700885	Observed + Heard	6
Little Lorikeet	22.2.2022	348798	6701221	Observed + Heard	4
Little Lorikeet	13.3.2022	348424	6701399	Observed + Heard	10
Little Lorikeet	13.3.2022	347055	6701817	Observed + Heard	2
Little Lorikeet	15.3.2022	347771	6701808	Observed + Heard	4
Little Lorikeet	16.3.2022	348077	6701386	Observed + Heard	5
Diamond Firetail	21.2.2022	349873	6700906	Observed	2
Dusky Woodswallow	13.3.2022	348807	6701313	Observed	11
Dusky Woodswallow	14.3.2022	347748	6701838	Observed	8
Brown Treecreeper	20.2.2022	350368	6700854	Observed + Heard	1

Noxious/exotic Species

During the field surveys, the following noxious plant and animals were recorded:

- Feral Pig where small numbers of 1-3 individuals were observed on most days during the survey. As for locations, these were generally close to or within a couple of hundred meters of the harp trap locations;
- European Hare with one individual (E: 347239 N: 6701573) recorded whilst driving along a vehicle track south of Kings Creek;
- Rabbit with one individual recorded adjacent to harp trap 7;
- Chital Deer with 2 individuals recorded at harp trap 5;
- St John's Wort recorded sporadically within the riparian zone between harp trap 4 and harp trap 8;
- Blackberry recorded sporadically throughout Kings Creek;
- African Boxthorn recorded sporadically along Kings Creek, in particular adjacent Harp trap 7 to 9.

Should you require any additional information please contact me at your convenience.

Kind Regards,



Ben Lewis
Director
Lewis Ecological Surveys

Appendix A

Table A1 – Summary harp trapping results

Harp trap number	Installation date	Retrieval date	No. Harp Trap Nights	Easting	Northing	night 1	night 2	night 3	night 4	Total Individuals Captured
1	20.02.2022	23.02.2022	3	349308	6700885	Vespadelus vulturinus x 3	No captures	No captures	-	3
2	20.02.2022	23.02.2022	3	349372	6700846	Vespadelus vulturinus x 10, Nyctophilus geoffroyi x 1, Chalinolobus morio x 3	No captures	Vespadelus vulturinus x 1		15
3	20.02.2022	23.02.2022	3	349502	6700800	No captures	No captures	Vespadelus vulturinus x 2		2
4	20.02.2022	23.02.2022	3	347055	6701817	Vespadelus vulturinus x 10, Nyctophilus geoffroyi x 1, Chalinolobus morio x 3	nil	Vespadelus vulturinus x 1		15
5	20.02.2022	23.02.2022	3	347296	6701723	No captures	Vespadelus vulturinus x 1	Vespadelus vulturinus x 2		3
6	12.3.2022	14.3.2022	2	347430	6701749	Vespadelus vulturinus x 1	Vespadelus vulturinus x 1	Vespadelus vulturinus x 2	No captures	4
7	12.3.2022	16.3.2022	4	347771	6701808	No captures	Vespadelus vulturinus x 1	Vespadelus vulturinus x 2	No captures	3
8	12.3.2022	16.3.2022	4	348066	6701696	Vespadelus vulturinus x 5	Vespadelus vulturinus x 10, Chalinolobus morio x 1	Vespadelus vulturinus x 9, Chalinolobus morio x 1	Vespadelus vulturinus x 6, Nyctophilus geoffroyi x 1	33
9	12.3.2022	16.3.2022	4	348424	6701399	No captures	vespadelus vulturinus x 2	Vespadelus vulturinus x 2	No captures	4
10	12.3.2022	16.3.2022	4	348798	6701221	No captures	Vespadelus vulturinus x 6	Vespadelus vulturinus x 3; Nyctophilus geoffroyi x 1	Vespadelus vulturinus x 4	14
11	14.3.2022	16.3.2022	2	349886	6700375	Nyctophilus geoffroyi x 2	Vespadelus vulturinus x 3			5

Appendix J

Biodiversity credit report

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BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026138/BAAS17058/21/00026139	Sundown Solar Farm_Project Area_June2023_FINAL	14/04/2023
Assessor Name	Assessor Number	BAM Data version *
Cecilia Phu	BAAS17058	58
Proponent Names	Report Created	BAM Case Status
	20/06/2023	Finalised
Assessment Revision	Assessment Type	Date Finalised
12	Major Projects	20/06/2023

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
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 Ri	Critically Endangered Ecological Community	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

BAM Biodiversity Credit Report (Like for like)

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 Ri	Critically Endangered Ecological Community	571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion
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 Ri	Critically Endangered Ecological Community	590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks



BAM Biodiversity Credit Report (Like for like)

PCT

84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion

510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion

590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

Predicted Threatened Species Not On Site

Name

Ephippiorhynchus asiaticus / Black-necked Stork

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Not a TEC	0.0	1	0	1
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	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 Ri	132.2	16	0	16
571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	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 Ri	0.3	10	0	10
590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	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 Ri	92.7	225	0	225



BAM Biodiversity Credit Report (Like for like)

84-River Oak - Rough-barked Apple - red gum - box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Eastern Riverine Forests This includes PCT's: 42, 84, 85, 485, 486, 1105, 1106, 1108, 1127, 1270, 1271, 1292, 1293, 1318, 1714, 3020, 4061, 4063, 4064, 4065, 4066, 4067, 4068, 4069, 4070, 4071, 4072, 4073, 4075, 4076, 4077, 4078, 4079, 4080, 4081, 4083, 4084, 4085, 4086, 4087, 4139	Eastern Riverine Forests <50%	84_WDL_poor	Yes	1	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW	-	510_WDL_intact	Yes	8	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and

BAM Biodiversity Credit Report (Like for like)

	<p>North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri</p> <p>This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331,</p>				<p>Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	<p>1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>				
	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347,</p>		510_WDL_poor	Yes	<p>8 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>

BAM Biodiversity Credit Report (Like for like)

	<p>350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>				
	<p>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New</p>	-	510_DNG_MO D	No	0 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau.

BAM Biodiversity Credit Report (Like for like)

	<p>England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383,</p>				<p>or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	<p>1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>				
	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381,</p>		510_DNG_LOW	Yes	<p>0 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>



BAM Biodiversity Credit Report (Like for like)

	<p>382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>				
	<p>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland,</p>		510_Cultivation	No	<p>0 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or</p>

BAM Biodiversity Credit Report (Like for like)

	<p>Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri</p> <p>This includes PCT's:</p> <p>74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608,</p>				<p>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281,	-	571_WDL_poor	Yes	10	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



BAM Biodiversity Credit Report (Like for like)

	<p>282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native</p>		571_Cultivation	No	0	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River</p>



BAM Biodiversity Credit Report (Like for like)

	<p>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 Ri</p> <p>This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307,</p>				<p>Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	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 Ri This includes PCT's:	-	590_WDL_mod	Yes	8	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



BAM Biodiversity Credit Report (Like for like)

	<p>74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	White Box - Yellow Box - -		590_WDL_poor	Yes	40	Glenn Innes-Guyra Basalts, Armidale

BAM Biodiversity Credit Report (Like for like)

	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710,</p>				<p>Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	<p>711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267,</p>	-	590_DNG_MO D	Yes	1	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>



BAM Biodiversity Credit Report (Like for like)

	<p>268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>White Box - Yellow Box - Blakely's Red Gum</p>		<p>590_DNG_LOW</p>	<p>Yes</p>	<p>176</p>	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell</p>

BAM Biodiversity Credit Report (Like for like)

	<p>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 Ri</p> <p>This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840,</p>				<p>Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau.</p> <p>or</p> <p>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	<p>847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276,</p>		590_DNG_V_LO W	Yes		<p>0 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>



BAM Biodiversity Credit Report (Like for like)

	<p>277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and</p>		590_Cultivation	No	0	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap,</p>

BAM Biodiversity Credit Report (Like for like)

	<p>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 Ri</p> <p>This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099,</p>				<p>Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau.</p> <p>or</p> <p>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
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Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Cercartetus nanus / Eastern Pygmy-possum	84_WDL_poor, 510_WDL_intact, 510_WDL_poor, 571_WDL_poor, 590_WDL_mod, 590_WDL_poor	2.4	60.00
Dichanthium setosum / Bluegrass	510_WDL_intact, 510_DNG_MOD, 510_DNG_LOW, 590_DNG_LOW, 590_DNG_V_LOW, 510_Cultivation, 590_Cultivation	182.3	973.00

BAM Biodiversity Credit Report (Like for like)

Thesium australe / Austral Toadflax	510_WDL_intact, 510_DNG_MOD, 510_DNG_LOW, 590_DNG_LOW, 590_DNG_V_LOW, 510_Cultivation, 590_Cultivation	186.7	732.00
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Credit Retirement Options

Like-for-like credit retirement options

Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Dichanthium setosum / Bluegrass	Spp	IBRA subregion
	Dichanthium setosum / Bluegrass	Any in NSW
Thesium australe / Austral Toadflax	Spp	IBRA subregion
	Thesium australe / Austral Toadflax	Any in NSW

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026138/BAAS17058/22/00037183	Sundown Solar Farm_Access Road_June2023_FINAL	14/04/2023
Assessor Name	Assessor Number	BAM Data version *
Cecilia Phu	BAAS17058	58
Proponent Names	Report Created	BAM Case Status
	20/06/2023	Finalised
Assessment Revision	Assessment Type	Date Finalised
3	Major Projects	20/06/2023

* 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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
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 Ri	Critically Endangered Ecological Community	510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion



BAM Biodiversity Credit Report (Like for like)

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 Ri	Critically Endangered Ecological Community	590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion
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Species

Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT

510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion

Predicted Threatened Species Not On Site

Name

No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Assessment Id

00026138/BAAS17058/22/00037183

Proposal Name

Sundown Solar Farm_Access Road_June2023_FINAL

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BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	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 Ri	0.1	5	0	5
590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	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 Ri	0.1	3	0	3

510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New	-	510_WDL_intact	Yes	4	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau.



BAM Biodiversity Credit Report (Like for like)

	<p>England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383,</p>				<p>or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	<p>1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381,</p>		510_WDL_poor	Yes		<p>1 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>



BAM Biodiversity Credit Report (Like for like)

	<p>382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland,</p>	-	510_DNG_LOW	Yes	0	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or</p>



BAM Biodiversity Credit Report (Like for like)

	<p>Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri</p> <p>This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608,</p>					<p>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281,	-	590_WDL_poor	Yes		1 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



BAM Biodiversity Credit Report (Like for like)

	<p>282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native</p>		<p>590_DNG_MO D</p>	<p>Yes</p>	<p>1</p>	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River</p>



BAM Biodiversity Credit Report (Like for like)

	<p>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 Ri</p> <p>This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307,</p>				<p>Volcanics, Tingha Plateau and Wongwibinda Plateau.</p> <p>or</p> <p>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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BAM Biodiversity Credit Report (Like for like)

	<p>1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150</p>					
	<p>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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298,</p>		590_DNG_LOW	Yes	1	<p>Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>



BAM Biodiversity Credit Report (Like for like)

302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
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Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

Species	Vegetation Zone/s	Area / Count	Credits
Cercartetus nanus / Eastern Pygmy-possum	510_WDL_intact, 510_WDL_poor, 590_WDL_poor	0.1	5.00
Dichanthium setosum / Bluegrass	590_DNG_MOD, 590_DNG_LOW	0.0	2.00
Thesium australe / Austral Toadflax	510_WDL_intact	0.0	1.00

Credit Retirement Options

Like-for-like credit retirement options

Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Dichanthium setosum / Bluegrass	Spp	IBRA subregion
	Dichanthium setosum / Bluegrass	Any in NSW
Thesium australe / Austral Toadflax	Spp	IBRA subregion
	Thesium australe / Austral Toadflax	Any in NSW

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00026138/BAAS17058/22/00037433	Sundown Solar Farm_Scattered Trees_June2023_FINAL	14/04/2023
Assessor Name	Assessor Number	BAM Data version *
Cecilia Phu	BAAS17058	58
Proponent Names	Report Created	Date Finalised
	20/06/2023	20/06/2023
Assessment Revision	Assessment Type	BAM Case Status
2	Scattered Trees	Finalised
BOS entry trigger	* 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.	
Major Project		

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Ecosystem Credit Summary

BAM Biodiversity Credit Report (Like for like)

PCT	TEC	HBT Cr	No HBT Cr	Credits
510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	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 Ri	9	4	13
571-Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion	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 Ri	1	0	1
590-White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion	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 Ri	8	23	31

Credit classes for 510	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	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 Ri	-	Yes	9	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	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 Ri	-	No	4	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Credit classes for 571	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	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 Ri	-	Yes	1	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Credit classes for 590	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region
	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 Ri	-	Yes	8	Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	<p>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 Ri</p>	-	No	<p>23 Glenn Innes-Guyra Basalts, Armidale Plateau, Deepwater Downs, Inverell Basalts, Moredun Volcanics, Nightcap, Northeast Forest Lands, Severn River Volcanics, Tingha Plateau and Wongwibinda Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
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Appendix K

Likelihood of occurrence assessment (EPBC species)

K.1 Threatened ecological communities

Table K.1 Likelihood of occurrence for threatened ecological communities

Ecological community	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	CE	The ecological community occurs from the Darling Downs in Queensland to Dubbo in NSW. It is typically composed of perennial native grasses. Native grasslands are dynamic ecosystems with changing species composition in response to soils, rainfall fire and grazing pressures. Temperate grasslands are typically dominated by tussock grasslands in the genera <i>Austrodanthonia</i> , <i>Austrostipa</i> , <i>Bothriochloa</i> , <i>Chloris</i> , <i>Enteropogon</i> , or <i>Themeda</i> . Tree canopy is typically absent and shrub layer is very minor. The ecosystem occurs on landforms that are typically flat to very low slopes.	Negligible. Does not occur – this community is not consistent with any of the PCTs identified during the field surveys.
New England Peppermint (<i>Eucalyptus nova-anglica</i>) Grassy Woodlands	CE	The ecological community is a type of temperate grassy eucalypt woodland to open forest in which the tree canopy is dominated or co-dominated by England Peppermint (<i>Eucalyptus nova-anglica</i>). The community mainly occurs on the tablelands of southern Queensland and northern NSW, known as the New England Tablelands or Northern Tablelands. The dominant structural feature of the tablelands is the New England Fold Belt, composed of sedimentary rocks which are now overlain by Tertiary basalt flows.	Negligible. Does not occur – this community is not consistent with any of the PCTs identified during the field surveys.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	Characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum. Tree-cover is generally discontinuous and consists of widely spaced trees of medium height in which the canopies are clearly separated.	Recorded. This community was confirmed during EMM's vegetation mapping. Further detail provided in Section 4.2.4 and 4.3.5.

Notes: 1. CE – critically endangered, E – endangered, V – vulnerable

K.2 Threatened species

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
Plants				
<i>Arthraxon hispidus</i>	Hairy-joint Grass	V	Creeping perennial grass with a distribution spanning from the northern tablelands to the north coast of NSW. Grows in moist, shaded areas within the vicinity of rainforest and wet sclerophyll woodland, often close to waterbodies.	Low. There are no records within the locality. The disturbance footprint lacks suitable wet habitat for this species to occur within.
<i>Astrotricha roddii</i>	Rodd's Star Hair	E	Occurs in NSW in the Ashford area north of Inverell, including Kwiambal and Kings Plains National Parks, Severn River Nature Reserve and Severn River State Forest, and has also been recorded at one site in southern Queensland. The species usually grows in low dry woodland and shrublands on granite outcrops, often in rock crevices.	Low. There are no records within the locality. The species has a limited distribution to the north of the study area. It is not associated with the PCTs mapped within the study area, and the site lacks suitable rocky outcrop habitat.
<i>Boronia granitica</i>	Granite Boronia	E	Medium shrub with a scattered distribution spanning from the New England Tablelands and the North West Slopes north from Armidale to Stanthorpe district. Grows amongst rock outcrops, rock crevices, and on granite scree in North-west Slopes Dry Sclerophyll Woodlands, Northern Tableland Dry Sclerophyll Forests, Yetman Dry Sclerophyll Forests, New England Grassy Woodlands and Northern Montane Heaths. Grows in areas of low rainfall on granite scree in shallow, granitic soils.	Low. There is one record within the locality. The disturbance footprint lacks rocky outcrops necessary for the species to grow within.
<i>Cadellia pentastylis</i>	Ooline	V	Medium sized, spreading tree occurring on the western edge of the North West Slopes ranging from the north of Gunnedah to west of Tenterfield. Grows in Western Vine Thickets. Grows in low to medium nutrient soils ranging from surface layers of sandy loam grading to light-medium clay soils deeper in the soil profile.	Low. There are no records within the locality. The disturbance footprint lacks suitable habitat including vine thickets.
<i>Callistemon pungens</i>	-	V	Shrub distributed throughout the north-east region of NSW. The species occurs in riparian areas dominated by River Oak as well as woodland and rocky shrubland. It is often found in rocky watercourses, usually with sandy granite creek beds.	Low. There are records of the species within the locality. The study area contains suitable sandy granite soils within watercourses. However, the species was not recorded during targeted surveys.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Dichanthium setosum</i>	Bluegrass	V	Upright grass, growing on the New England Tablelands, North West Slopes and Plains, and the Central Western Slopes of NSW. Grows in moderately disturbed areas including cleared woodlands, roadside remnants and agricultural pasturelands in a variety of communities including Inland Riverine Forests, Northern Tableland Dry Sclerophyll Forests, Western Slopes Grassy Woodlands and Coastal Valley Grassy Woodlands. Grows on heavy black basaltic soils and red-brown loams with clay subsoils.	Recorded. The study area contains suitable habitat for this species. The species was recorded within the disturbance footprint by ELA and EMM during targeted surveys.
<i>Diuris pedunculata</i>	Small Snake Orchid	E	Terrestrial orchid confined to north-east NSW scattered from Tenterfield to the Hawkesbury River. Grows amongst boulders in a variety of communities including New England Sclerophyll Forests, Northern Tableland Forests, Western Slopes Grassy Woodlands and Northern Escarpment Wet Sclerophyll Forests. Grows in peaty soils and occasionally shale and trap soils on granite substrates.	Low. The study area contains suitable grassy habitat on granite soils. However, there are no records within the locality, and the species was not recorded during targeted flora surveys.
<i>Eucalyptus caleyi</i> subsp. <i>ovendenii</i>	Ovenden's Ironbark	V	Medium sized tree distributed within the New England Tablelands from west of Guyra to the west of Tenterfield. Grows in grassy woodland between elevations of 610 to 820m in North-west Slopes Dry Sclerophyll Woodlands, Northern Tableland Dry Sclerophyll Forests and Western Slopes Dry Sclerophyll Forests. Grows on dry shallow soils of moderate fertility on granitic substrates.	Low. There are no records within the locality. The study area is outside the species' distribution.
<i>Eucalyptus mckieana</i>	McKie's Stringybark	V	Medium sized tree, confined to the drier, western side of the New England Tablelands from Torrington to Bendemeer. Grows on gently sloping or flat sites in New England Dry Sclerophyll Forests, Northern Tableland Dry Sclerophyll Forests, Inland Rocky Hill Woodlands, North-west Alluvial Sand Woodlands, Subtropical Semi-arid Woodlands, and Western Peneplain Woodlands. Grows on acid volcanic substrates in sandy loam soils.	Low. The study area contains suitable grassy open forest and there are numerous records of the species within the locality. However, the species was not recorded during targeted flora surveys.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	Medium sized tree, sparsely distributed from Nundle through to the north of Tenterfield, also in urban tree plantings. Grows on slopes and ridges in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, New England Grassy Woodlands and Tableland Clay Grassy Woodlands. Grows on shallow, infertile soils on shale substrates.	Low. The study area contains suitable grassy woodland habitat for this species to occur within and there are records of the species within the locality. However, the species was not recorded during targeted flora surveys.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Eucalyptus rubida</i> <i>subsp. barbigerorum</i>	Blackbutt Candlebark	V	Tall tree with a scattered distribution from Guyra to Tenterfield in the New England Tablelands with some populations in Barayamal and Guy Fawkes National Parks. Grows on cold flats in a variety of communities including New England Dry Sclerophyll Forests, Northern Gorge Dry Sclerophyll Forests, Northern Tableland Dry Sclerophyll Forests, New England Grassy Woodlands and Tablelands Clay Grassy Woodlands. Grows on medium to high fertility soils.	Low. The species is known from the area and there is suitable habitat mapped within the study area. However, the species was not recorded during targeted flora surveys.
<i>Homoranthus prolixus</i>	Granite Homoranthus	V	Occurs in scattered locations between Inverell and Manilla. This species is conserved in Ironbark Nature Reserve, Gwydir River National Park and Tingha Plateau and Goonooigal State Conservation Areas west of Guyra. It grows in heath patches, in skeletal soil among crevices of granite outcrops.	Low. The study area is outside the distribution for the species and there are no records in the locality. The study area lacks suitable rocky outcrop habitat.
<i>Lepidium peregrinum</i>	Wandering Pepper-cress	E	Spreading perennial herb thought to be extinct until recently rediscovered in scattered populations near Tenterfield in north-eastern NSW. Grows in Eastern Riverine Forests, Inland Riverine Forests and New England Grassy Woodlands. Grows on sandy alluvium.	Low. There are no records of the species within the locality. The study area is outside the species' distribution.
<i>Picris evae</i>	Hawkweed	V	Soft stemmed annual with a population distribution spanning north from the Inverell area including Inverell, Elsmore and Myall Creek, Oxley Park and Dangar Falls in the Oxley Wild Rivers National Park. Found growing in modified and disturbed areas in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Floodplain Transition Woodlands, New England Grassy Woodlands and Temperate Montane Grasslands. Grows in shallow black, dark grey or red-brown stony soils, reddish clay-loam or medium clay soils.	Low. The study area contains suitable habitat within open eucalypt forest and native grassland areas and there are records of the species within the locality. However, the species was not recorded during targeted flora surveys.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Prasophyllum</i> sp. <i>Wybong</i>	A Leek-orchid	CE	Terrestrial orchid restricted to five sites within NSW at Boorowa, Captains Flat, Ilford, a Travelling Stock Route at Delegate and 10 km south-east of Muswellbrook. Found growing in open sites and patchy forest in Natural Temperate Grassland, Box-Gum Woodlands, Temperate Montane Grasslands, Southern Tableland Grassy Woodlands, Subalpine Woodlands, Tableland Clay Grassy Woodlands, Western Slopes Grassy Woodlands. This species is cryptic and most visible when flowering between October and December. Grows in fertile soils.	Low. The study area is located within the predicted distribution of the species and there is some suitable Box-Gum Woodland habitat within the study area. There are no records of the species within the locality. The species was not recorded during targeted flora surveys.
<i>Rutidosis heterogama</i>	Heath Wrinklewort	V	Heath Wrinklewort has been recorded on the central and north coast of NSW, and on the New England Tablelands. It grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Low. There are no records in the locality but the study area is within the predicted distribution of the species, and it is associated with the PCTs recorded on site. However, the species was not recorded during targeted surveys.
<i>Thesium australe</i>	Austral Toadflax	V	Austral Toadflax is a hairless, yellow-green perennial herb with slender wiry stems to 40 cm high and tiny white flowers. The species occurs in NSW, the ACT, Queensland and Victoria and has a sporadic and widespread distribution within this range. The species occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast and is often found in association with Kangaroo Grass (<i>Themeda australis</i>).	Recorded. There are numerous records of the species within the locality. The study area contains suitable grassland and grassy woodland. The species was recorded within the disturbance footprint by ELA and EMM during targeted surveys.
<i>Vincetoxicum forsteri</i> -		E	<i>Vincetoxicum forsteri</i> (also known as <i>Tylophora linearis</i>) is a slender, almost hairless twiner with a clear sap that grows in dry scrub and open forest. It has been recorded from low altitude dry woodlands with altitudes around 300–400m a.s.l. The species occurs in southern Queensland and across central western NSW.	Low. Although the study area contains some suitable dry woodland habitat, the study area is not within the predicted distribution of the species, and the species is not associated with any of the PCTs recorded on site. The study area is at a higher altitude than the species preferred range. There are no records of the species within the locality, and it was not recorded during targeted flora surveys.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
Birds				
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	The Regent Honeyeater is a striking, predominantly black and yellow bird. Its head and neck are black, with warty pink or yellow skin around the eyes. Endemic to mainland south-eastern Australia, the species has a patchy distribution from south-east Queensland, through NSW and the ACT into central Victoria. Records are widely distributed across this range, but the species is only found regularly at a few localities in NSW and Victoria. Most records of regent honeyeaters come from box-ironbark eucalypt associations, where the species seems to prefer more fertile sites with higher soil water content. Other forest types regularly utilised by the Regent Honeyeater include wet lowland coastal forest dominated by Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum-Ironbark associations and riverine woodlands.	Moderate. There are no records within the locality. However, the study area contains suitable habitat for the species. Important areas for the Regent Honeyeater are mapped to the north and south of the study area.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	The Australasian Bittern is widespread and found over most of NSW except for far north-west. Preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds or cutting grass (<i>Gahnia</i> sp.) growing over a muddy or peaty substrate.	Low. There are no records within the locality. No wetland habitat occurs within the study area.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, Mi	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Low. There are no records within the locality. No coastal or suitable aquatic habitat within the study area.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Calyptorhynchus lathami lathami</i>	Glossy Black-Cockatoo	V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. The species inhabits 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.	Low. There are some records of this species within the locality, and some suitable habitat within the study area. However, the species was not recorded during targeted surveys.
<i>Erythroriorchis radiatus</i>	Red Goshawk	V	The red goshawk occurs in a patchy, widespread distribution across coastal and sub-coastal regions. The species inhabits coastal and sub-coastal tall open forests and woodlands, escarpments, tropical savannas traversed by wooded or forested rivers, and the edges of rainforests, usually on fertile soils.	Low. There are no records within the locality. The study area is outside the species distribution and lacks their preferred coastal habitat.
<i>Falco hypoleucos</i>	Grey Falcon	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	Low. There are no records within the locality. The study area is outside the species distribution.
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	Found from north Queensland to the North West Slopes of NSW and extending down to the Liverpool Plains and Dubbo. Today they are very rare in the southern parts of their range.	Low. There are no records within the locality. The study area is outside the species distribution.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Grantiella picta</i>	Painted Honeyeater	V	The species is sparsely distributed from south-eastern Australia to north-western Queensland, with its greatest concentrations and breeding locations occurring on the inland slopes of the Great Dividing Range in NSW. It inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box and River Red Gum (<i>E. camaldulensis</i>), Box-Ironbark-Yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarina, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips although it breeds in quite narrow roadside strips if ample mistletoe fruit is available.	Moderate. There are no records within the locality. The species is known to inhabit eucalypt forests/woodlands with mature trees, and mistletoe species as well as trees on farmland. The study area contains box eucalypts and box gum woodland derived native grassland.
<i>Hirundapus caudacutus</i>	White-throated Needletail	V, Mi	The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW, this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	Moderate. There are three records of the species within the locality. The species is known to occur within open forest and in clearings. The study area contains suitable habitat for this species to fly over and potentially roost.
<i>Lathamus discolor</i>	Swift Parrot	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box. Commonly used lerp infested trees include Grey Box (<i>E. macrocarpa/moluccana</i>) and Blackbutt (<i>E. pilularis</i>). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Moderate. There are no records within the locality. The species is known to occur within a wide range of habitat types including eucalypt woodland. The study area contains potential habitat for the species to forage within.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Poephila cincta cincta</i>	Black-throated Finch (southern subspecies)	E	The Black-throated Finch is only known to occur in Queensland around Townsville and central-eastern Queensland, and is presumed extinct in NSW. It was historically found as far south as the NSW border. The species inhabits grassy open woodlands and forests, often along or near watercourses.	Negligible. There are no records from this species in the locality. The study area is outside the species distribution as it is only known from Queensland and is presumed extinct in NSW.
<i>Polytelis swainsonii</i>	Superb Parrot	V	The Superb Parrot is found throughout eastern inland NSW. This species inhabits forests and woodlands dominated by eucalypts, especially River Red Gums and box eucalypts such as Yellow Box or Inland Grey Box. Superb Parrots breed in either River Red Gum forests and woodlands or box woodlands.	Low. There are no records within the locality. The study area is outside the species' distribution.
<i>Rostratula australis</i>	Australian Painted Snipe	E	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The species also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	Low. There are no records within the locality. The study area lacks suitable wetland habitat, swamps and/or dams.
Mammals				
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	Low. There are no records within the locality. The study area sits just outside the species distribution. There are no associated PCTs mapped within the disturbance footprint.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tail Quoll	E	The Spotted-tailed Quoll is one of Australia’s largest extant marsupial carnivores and has a distinctive spotted appearance. The species is primarily forest-dependent, and occupies a wide range of habitat types, including rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas. The species has home ranges of several hundred to several thousand hectares in size and will use multiple dens. moving between den sites every 1–4 days. The species occurs at low densities.	Moderate. There are five records of the species within the locality. The species is known to occur within a range of habitat types including woodland and occasionally in grassland. There is potential for the species to occur within the disturbance footprint.
<i>Nyctophilus corbeni</i>	Corben’s Long-eared Bat	V	Inhabits a variety of vegetation types, including mallee, Bull Oak and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Roosts in tree hollows, crevices, and under loose bark. A slow flying agile bat, utilising the understorey to hunt non-flying prey – especially caterpillars and beetles – and will even hunt on the ground. The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches, suggesting its home range is probably large. The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer.	Moderate. There is a single record of the species within the locality. The species is known to occur within box eucalypt dominated communities. Potential foraging and breeding woodland habitat occurs within the study area. The study area is located on the edge of the species distribution. Although the species was not recorded during harp trapping surveys, some calls characteristic of <i>Nyctophilus</i> were recorded during anabat surveys.
<i>Petauroides volans</i>	Southern Greater Glider	E	The Southern Greater Glider is the largest gliding possum in Australia. The species is distributed across eastern Australia, occurring from Proserpine in Queensland through New South Wales and into central Victoria, with an elevational range from sea level to 1,200 m above sea level. The species is restricted to eucalypt forests and woodlands, typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The species distribution may be patchy even in suitable habitat.	Low. There are no records within the locality. The study area lacks suitable tall eucalypt forest with abundance of large hollow bearing trees.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Petaurus australis australis</i>	Yellow-bellied Glider	V	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. It inhabits tall mature eucalypt forest in areas with high rainfall.	Low. There are no records within the locality and the species distribution is largely on the eastern side of the Great Dividing Range. The species is not associated with any of the PCTs recorded on site, and the study area lacks suitable tall mature eucalypt forest.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	V	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.	Low. There are no records within the locality. The species is found within rocky areas containing caves, crevices and rocky outcrops. The study area does not contain any of these features, and there are no rocky areas within 1 km of the disturbance footprint.
<i>Phascolarctos cinereus</i>	Koala	E	The Koala is a tree-dwelling, medium-sized marsupial, distributed from Cairns to South Australia, however, the listed population does not include Victoria or South Australia. Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus Eucalyptus. The distribution of Koalas is also affected by altitude, with the species limited to below 800 m ASL. The Koala feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Low. There are records of the species within the locality. The study area contains several of the Koala use tree species listed in the BAM survey guidelines for Koala (DPE 2022d) for the Northwest slopes koala modelling region. However, the species was not recorded during targeted surveys. Section 5.4.4vd of this report outlines the survey effort for koalas in detail.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	Grey-headed Flying foxes occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Low. There are no records within the locality. The study area does not contain a Grey-headed Flying-fox camp. The nearest camp is recorded approximately 20 km from the study area near Inverell. The study area lacks suitable foraging habitat for this species.

Table K.2 Likelihood of occurrence for EPBC listed species

Scientific name	Common name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
Amphibians				
<i>Litoria booroolongensis</i>	Booroolong Frog	E	The Booroolong Frog occurs predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout the remainder of its range. It inhabits permanent streams with fringing vegetation cover, on/near cobble banks or other rock features. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing pools.	The only existing records of this species in the locality are from the 1970s, but the site is within the predicted distribution and there is some suitable habitat along King's Creek. However, the species was not recorded during targeted surveys.
<i>Litoria castanea</i>	Yellow-spotted Tree Frog	CE	The Yellow-spotted Tree Frog has only recently (2010) been recorded in the wild again. Before this it had not been recorded in the wild since the 1970s. It has a disjunct distribution, being recorded on the New England Tableland and on the southern highlands from Lake George to Bombala. There are unconfirmed reports from near Bathurst and Orange. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation. It shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation.	Low. There are no records within the locality. Stream habitat within the study area lacks large pools and emergent vegetation for this species to shelter within.
Reptiles				
<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	V	The Border Thick-tailed Gecko is found on the tablelands and slopes of norther NSW and southern Queensland. The species occurs on steep rocky or scree slopes, especially granite. It favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. It is a nocturnal reptile, sheltering by day under rock slabs or under logs.	Low. There is a single record of the species within the locality. The study area lacks suitable steep rocky slopes. Additionally, the study area is outside the species' distribution.
<i>Wollumbinia belli</i>	Bell's Turtle	V	Within NSW, the Bell's Turtle is found in four disjunct populations in the upper reaches of the Namoi, Gwydir and Border Rivers systems, on the escarpment of the North West Slopes. The species occurs in shallow to deep pools in the upper reaches or small tributaries of major rivers in granite country. Occupied pools are most commonly less than 3 m deep with rocky or sandy bottoms and patches of vegetation.	Moderate. There are no records within the locality. The study area contains potential habitat for the species, with shallow pools along Kings Creek.

Notes: 1. Mi – Migratory, CE – critically endangered, E – endangered, V – vulnerable

K.3 Migratory species

Table K.3 Likelihood of occurrence for migratory species

Scientific Name	Common Name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
Migratory marine birds				
<i>Apus pacificus</i>	Fork-tailed Swift	Mi	In Australia, the Fork-tailed Swift is almost exclusively aerial, mostly occurring over inland plains but sometimes above foothills or in coastal areas. This species can also occur over cliffs, beaches, treeless grassland and plains covered with spinifex, open farmland and inland and coastal sand-dunes. The species breeds in Asia but migrates to Australia from September to April. Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 m high.	Low. The Fork-tailed Swift is a coastal marine species. The study area does not contain any suitable habitat for this species.
Migratory terrestrial species				
<i>Hirundapus caudacutus</i>	White-throated Needletail	Mi, V	The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW, this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	Moderate. There are three records of the species within the locality. The species is known to occur within open forest and in clearings. The study area contains suitable habitat for this species to fly over and potentially roost.
<i>Monarcha melanopsis</i>	Black-faced Monarch	Mi	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland.	Low. The study area lacks the damp forest and woodland habitats preferred by the Black-faced Monarch. This species is generally found in more coastal areas to the east of the study area.
<i>Motacilla flava</i>	Yellow Wagtail	Mi	This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra.	Low. The disturbance footprint lacks suitable wetland habitat. The streams within the disturbance footprint are ephemeral.

Table K.3 Likelihood of occurrence for migratory species

Scientific Name	Common Name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi	The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	Low. The study area lacks heavily vegetated areas including gullies; therefore, the species is unlikely to occur.
<i>Rhipidura rufifrons</i>	Rufous Fantail	Mi	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. The species mainly inhabits wet sclerophyll forests often in gullies dominated by eucalypts such as Tallow-wood (<i>Eucalyptus microcorys</i>), Mountain Grey Gum (<i>E. cypellocarpa</i>), Narrow-leaved Peppermint (<i>E. radiata</i>), Mountain Ash (<i>E. regnans</i>), Alpine Ash (<i>E. delegatensis</i>), Blackbutt. During migration it can stray into gardens and more open areas.	Low. The study area lacks the dense forest habitats preferred by this species.
Migratory wetland species				
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi	In Australia, the Common Sandpiper is found along all coastlines. The species is also widespread inland in small numbers. In Australia, the population is concentrated in Northern and Western Australia. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	Low. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat. Streams within the study area were observed dry and degraded and unlikely to support suitable waterlogged habitat for the Common Sandpiper.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season.	Low. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat. Streams within the disturbance footprint were observed dry and degraded and unlikely to support suitable mudflats or floodplain habitat for the Sharp-tailed Sandpiper.

Table K.3 Likelihood of occurrence for migratory species

Scientific Name	Common Name	EPBC Status ¹	Habitat requirements	Likelihood of occurrence
<i>Calidris ferruginea</i>	Curlew Sandpiper	Mi, CE	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Low. There are no records within the locality. No coastal or suitable aquatic habitat within the study area.
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	Low. Unlikely to occur as the study area is not on coastline and lacks suitable aquatic habitat. Streams within the disturbance footprint were observed dry and degraded and unlikely to support suitable mudflats or floodplain habitat for the Pectoral Sandpiper.
<i>Gallinago hardwickii</i>	Latham's Snipe	Mi	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2,000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	Negligible. No permanent or ephemeral wetlands within proposal area. No aquatic habitats.

Notes: 1. Mi – Migratory, CE – critically endangered, E – endangered, V – vulnerable.

Appendix L

Protected matters search results

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Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 12-Jan-2023

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	36
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [\[Resource Information \]](#)

Ramsar Site Name	Proximity
Banrock station wetland complex	1100 - 1200km upstream from Ramsar site
Riverland	1000 - 1100km upstream from Ramsar site
The coorong, and lakes alexandrina and albert wetland	1200 - 1300km upstream from Ramsar site

Listed Threatened Ecological Communities [\[Resource Information \]](#)

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

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area
New England Peppermint (<i>Eucalyptus nova-anglica</i>) Grassy Woodlands	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat may occur within area
MAMMAL		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANT		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area
Boronia granitica Granite Boronia [18598]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat may occur within area
Callistemon pungens [55581]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus caleyi subsp. ovendenii Ovenden's Ironbark [56193]	Vulnerable	Species or species habitat may occur within area
Eucalyptus mckieana McKie's Stringybark [20199]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus nicholii Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992]	Vulnerable	Species or species habitat may occur within area
Eucalyptus rubida subsp. barbigerorum Blackbutt Candlebark [64618]	Vulnerable	Species or species habitat likely to occur within area
Lepidium peregrinum Wandering Pepper-cress [14035]	Endangered	Species or species habitat may occur within area
Picris evae Hawkweed [10839]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Vincetoxicum forsteri listed as Tylophora linearis [92384]	Endangered	Species or species habitat may occur within area

REPTILE

Uvidicolus sphyurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area
Wollumbinia belli Bell's Turtle, Western Sawshell Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle [86071]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Migratory Terrestrial Species

Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area

Migratory Wetlands Species

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
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Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [\[Resource Information \]](#)

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

Commonwealth Land Name	State
Commonwealth Trading Bank of Australia	
Commonwealth Land - Commonwealth Trading Bank of Australia [13947]	NSW

Listed Marine Species [\[Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area

Extra Information

EPBC Act Referrals [Resource Information]			
Title of referral	Reference	Referral Outcome	Assessment Status
Sundown Solar Farm	2022/09249		Assessment
Controlled action			
Sapphire Wind Farm, NSW	2011/5854	Controlled Action	Post-Approval
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Not controlled action (particular manner)			
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact us](#) page.

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Appendix M

Significant impact assessments (MNES)

The below assessments are completed according to the *Matters of National Environmental Significance – Significance Impact Guidelines 1.1* (DotE 2013c), to determine if the project is likely to have a ‘significant impact’ on MNES.

A ‘significant impact’ is defined as “an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts” (DotE 2013c).

M.1 Box gum woodland

Box Gum Woodland is listed as critically endangered under the EPBC Act.

Table M.1 Assessment of significance for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Criteria	Discussion
1. Reduce the extent.	<p>The proposed works will result in the removal of up to 29.48 ha of the CEEC, representing 0.007% of the predicted national extent of the community (TSSC 2006).</p> <p>The disturbance footprint has been designed to avoid areas of higher quality vegetation including woodland areas. Of the 29.48 ha to be impacted, 29 ha is derived native grassland (DNG) and 0.48 ha is woodland. Additional areas of the community are present within the study area which will not be directly impacted by the project.</p> <p>Although steps have been taken to avoid higher quality areas of the CEEC, the project will result in a reduction of the extent of this community.</p>
2. Fragment or increase fragmentation.	<p>The project is located within a highly disturbed landscape, with much of the disturbance footprint in various stages of cultivation or grazing.</p> <p>Through detailed design the disturbance footprint has been developed to avoid high quality areas of the CEEC containing intact and connected vegetation. These areas of higher quality of the CEEC are largely concentrated around waterways and most of which will be left undisturbed to maintain connectivity between surrounding areas.</p> <p>Given the existing level of disturbance within the site boundary and the areas of higher quality vegetation to be avoided, it is unlikely the project will result in a significant increase in fragmentation of the vegetation community.</p>
3. Adversely affect habitat critical to survival.	<p>The proposed works will result in the removal of up to 29.48 ha of the CEEC, representing 0.007% of the predicted national extent of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.</p> <p>Habitat critical to the survival of Box-gum Grassy Woodland is defined as areas on moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range (DECCW 2011). Given the level of fragmentation and degradation of this community, all areas of Box-gum woodland that meet the minimum criteria for the EPBC listing as outlined in the recovery plan should be considered critical to the survival of the community.</p> <p>According to these criteria, all areas mapped as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland within the disturbance footprint is classified as critical. Therefore, the proposed works will result in the removal of 29.48 ha of habitat critical to survival.</p>

Table M.1 Assessment of significance for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Criteria	Discussion
<p>4. 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.</p>	<p>Proposed work involves the construction of solar panels within the existing grassland, with minimal intervention in drainage patterns or groundwater flow through the impact site. There will be no reduction or draw-down of groundwater levels associated with the project; therefore, the project is not expected to impact on groundwater.</p>
<p>5. 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.</p>	<p>The proposed works involve the clearing of up to 29.48 ha of the ecological community. This includes 0.48 ha of mapped woodland which will be removed, including mature trees and hollow bearing trees.</p> <p>The PV panels create a range of microclimates resulting in alteration of species composition and coverage. Groundcover species will have the potential to grow underneath the panels but would likely be limited to grasses and forbs.</p> <p>The study area is located within a highly disturbed environment, including weeds, grazing and crop cultivation. The project has the potential to result in indirect impacts such as introduction and/or increase in weed species. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to the CEEC:</p> <ul style="list-style-type: none"> • appropriate identification, disposal and management of weed species during clearing works • wash down of all vehicles and equipment prior to entry to site. <p>Therefore, it is considered unlikely that the project will result in the introduction of new weeds or increase of existing weed species within the CEEC, further resulting in the decline of functionally important species.</p>
<p>6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:</p> <ul style="list-style-type: none"> • 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. 	<p>The project has the potential to result in indirect impacts such as introduction and/or increase in weed species and introduction of pathogens. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to the CEEC:</p> <ul style="list-style-type: none"> • appropriate identification, disposal and management of weed species during clearing works • wash down of all vehicles and equipment prior to entry to site. <p>With the above mitigation measures implemented it is unlikely the project will result in the introduction of weeds and/or pathogens to the area.</p> <p>For the above reasons, it is unlikely that the quality or integrity of the ecological community outside the disturbance footprint will be impacted as a result of the project.</p>

Table M.1 Assessment of significance for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Criteria	Discussion
<p>7. Interfere with recovery.</p>	<p>The national recovery plan for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DECCW 2011) identifies the following objectives for the recovery of Box-gum Grassy Woodland:</p> <ul style="list-style-type: none"> • achieving no net loss in extent and condition of the ecological community throughout its distribution • increasing protection of sites with high recovery potential • increasing landscape functionality of the ecological community through management and restoration of degraded sites • increasing transitional areas around remnants and linkages between remnants • changes in land management attitudes and practices to increase extent, integrity and function of Box-Gum Grassy Woodland. <p>The project will result in a reduction of extent of the community by 29.48 ha. Through detailed design the disturbance footprint has been developed to avoid high quality areas of the CEEC containing intact and connected vegetation. The disturbance footprint is located on land used for agricultural uses; and is therefore considered not to be a site with high recovery potential.</p> <p>Given the above, the proposed works are unlikely to interfere with the recovery of the community.</p>
<p>Conclusion</p>	<p>The following measures have been taken to minimise the impact to the Box-gum Grassy Woodland community:</p> <ul style="list-style-type: none"> • the disturbance footprint has been designed to avoid clearing of woodland areas and higher quality grassland areas • the areas to be cleared are actively managed as agricultural land for both clearing and cultivation, there are considered to have a low recovery potential under the current land use • mitigation measures will be implemented to ensure the project does not result in the spread or introduction of weed species • the works will not impact on abiotic factors that the community requires for survival • areas of higher quality vegetation within the study area will be left undisturbed and maintain some level of connectivity for the community through the study area • higher quality areas of the CEEC will be retained providing connectivity and habitat for threatened species. <p>A conservative approach has been undertaken to determine the project will have a significant impact on the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland given the project will result in the removal of 29.48 ha of the CEEC.</p>

M.2 Bluegrass and Austral Toadflax

The significant impact assessments for Bluegrass and Austral Toadflax have been combined as they are both listed as vulnerable under the EPBC Act, and occupy similar habitats in the study area.

Table M.2 Assessment of significance for Bluegrass and Austral Toadflax

Criteria	Discussion
1. Long-term decrease of an important population.	<p>A recovery plan has not been developed for Bluegrass or Austral Toadflax and important populations have not been identified. As described in DotE (2013c) an important population can include populations that are near the limit of the species range.</p> <p>The Austral Toadflax and Bluegrass were recorded across the site boundary including within the disturbance footprint. These species are known to occur within the area with previous records within the locality.</p> <p>Given the study area is within the known distribution for both species, and not at the limit of the species range, it is unlikely the recorded population is considered an important population.</p>
2. Reduce occupancy area for important population.	<p>As per above, the recorded populations of Bluegrass and Austral Toadflax are not considered important populations.</p> <p>The project will result in the removal of 187 ha for Austral Toadflax and 182 ha of habitat for Bluegrass. The Austral Toadflax and Bluegrass were recorded within woodland and grassland areas, near creeks and access roads within the eastern portion of the study area. The disturbance footprint is located within a large landscape of similar vegetation. Given the habitat remaining within the locality and adjacent to the site boundary, it is unlikely the project will result in a significant reduction of habitat for either Bluegrass or Austral Toadflax.</p>
3. Fragment an important population.	<p>As per above, the recorded populations of Bluegrass and Austral Toadflax are not considered important populations.</p> <p>The project is located within a highly disturbed landscape, with fragmented woodland and derived grassland. The site boundary has been subjected to historical clearing and is currently subject to cultivation of crops and grazing of livestock. Through detailed design the disturbance footprint has been placed within highly disturbed areas, avoiding high quality woodland along the creeks. The woodland vegetation along the creeks will not be cleared, allowing connectivity between these areas where Bluegrass and Austral Toadflax were recorded and high-quality vegetation to the west of the site boundary. Therefore, it is unlikely the project will result in fragmentation of an important population.</p>
4. Adversely affect habitat critical to survival.	<p>Habitat critical to the survival of these species has not been outlined in the approved conservation advice (DEWHA 2008; DotE 2013a). Both species inhabit a range of grassy and grassy woodland habitats. The habitat found within the disturbance footprint is not considered critical to the survival of either species given the extent of habitat remaining with the locality and the extent of records adjacent to the development footprint.</p>
5. Disrupt breeding cycle of an important population.	<p>As per above, the predicted populations of Bluegrass and Austral Toadflax are not considered important populations.</p> <p>Little information is known about the ecology of Bluegrass and Austral Toadflax including how these species pollinate.</p>
6. Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline.	<p>The project will involve the removal of up to 187 ha of potential habitat for Austral Toadflax and 182 ha of habitat for Bluegrass. The project has the potential to result in indirect impacts to retained habitat including weed invasion and/or increase in abundance of pest species. Controls such as appropriate disposal of wheels and vehicle and equipment washdown will be implemented to minimise these impacts.</p> <p>Considering the extent of habitat adjacent to remain within the locality it is unlikely the project will result in a significant decrease of availability of habitat to the extent that the species are likely to decline.</p>

Table M.2 Assessment of significance for Bluegrass and Austral Toadflax

Criteria	Discussion
<p>7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.</p>	<p>The project has the potential to result in the introduction of weed species and/or pest species. These species cause degradation to habitat and high grazing pressures to native vegetation.</p> <p>During construction and operation, appropriate weed controls will be implemented to stop the spread of weeds and the introduction of new weeds or pest specie. This includes appropriate disposal and management of weeds will be implemented to stop the spread of existing weed species. Wash down stations will be constructed at suitable locations to stop the spread of weeds and introduction of new species.</p> <p>In addition, mitigation measures such as appropriate storing of waste will be implemented to reduce the risk of increased pest species.</p> <p>Based on the proposed mitigation measures it is not expected the project will result in a significant increase of invasive species.</p>
<p>8. Introduce disease.</p>	<p>There are no known diseases associated with these species. Hygiene protocols such as washdown of all vehicles, machinery and equipment prior to entering the site will be implemented to minimise the potential for introduction or spread of pathogens.</p>
<p>9. Interfere with recovery.</p>	<p>No recovery plan has been developed for these species. The Approved Conservation Advice (DEWHA 2008; DotE 2013a) lists a variety of priority actions for recovery and threat abatement. Local priority actions include minimising habitat loss, disturbance, and modification, and weed, fire and stock management.</p> <p>Detailed design will focus on reducing impacts to native vegetation and high-quality threatened species habitat, avoiding known populations of these species wherever possible. Areas of higher quality habitat, such as along watercourses, will be avoided.</p> <p>Although the project has the potential to result in indirect impacts such as soil disturbance and introduction of weeds and pests, mitigation measures will be implemented to reduce this potential, such as weed and drainage control measures.</p> <p>Given the avoidance of higher quality habitat and the proposed mitigation measures to be implemented, the project is not predicted to interfere with the recovery of these species.</p>
<p>Conclusion</p>	<p>A conservative approach has been undertaken to determine the project has the potential to result in a significant impact on Bluegrass and Austral Toadflax as:</p> <ul style="list-style-type: none"> • direct impacts will occur to up to 187 ha of predicted habitat for Austral Toadflax and 182 ha of predicted habitat for Bluegrass • areas of higher quality grassland habitat to be avoided • mitigation measures to control weeds are proposed. <p>If possible, additional detailed design will be conducted to further reduce impacts to Bluegrass and Austral Toadflax habitat.</p>

M.3 Regent Honeyeater and Swift Parrot

The significant impact assessment for the Regent Honeyeater and Swift Parrot have been combined as they are both listed as critically endangered under the EPBC Act, and have broadly similar habitat requirements.

Table M.3 Assessment of significance for Regent Honeyeater and Swift Parrot

Criteria	Discussion
1. Lead to a long-term decrease in size of a population.	<p>The Regent Honeyeater and Swift Parrot are known to occur throughout eastern NSW, with existing records in the areas surrounding the study area. Whilst the species were not recorded during surveys, they are considered to have potential to utilise sub-optimal foraging habitat within the disturbance footprint.</p> <p>The project will result in the removal of up to 2.52 ha of foraging habitat for the Regent Honeyeater and Swift Parrot. The disturbance footprint is situated within agricultural land with surrounding areas containing similar habitat. The project will result in the removal of derived grassland with scattered paddock trees and small isolated patches of woodland.</p> <p>It is not predicted that the impact to foraging habitat will lead to a long-term decrease in the size of a population of these two woodland birds, given the extent of higher quality woodland within the locality.</p>
2. Reduce the area of occupancy for the species.	<p>The project will result in the removal of up to 2.52 ha of foraging habitat for the Regent Honeyeater and Swift Parrot. The disturbance footprint is located within a highly modified agricultural landscape.</p> <p>The vegetation to be impacted will largely be isolated patches of woodland and the disturbance footprint will avoid all extensive areas of more connected woodland. Given the remaining foraging habitat within the locality, it is unlikely the project will result in a significant reduction of foraging habitat for the Regent Honeyeater or the Swift Parrot.</p>
3. Fragment an existing population into two or more populations.	<p>The study area is located within a highly disturbed landscape with historical clearing and existing agricultural land uses. The project will include the construction of solar panels and access tracks. Given both species can fly across the site the project will not result in significant fragmentation of the species habitat.</p>

Table M.3 Assessment of significance for Regent Honeyeater and Swift Parrot

Criteria	Discussion
<p>4. Adversely affect habitat critical to survival of a species.</p>	<p>Habitat critical to the survival of the Regent Honeyeater has been defined by the recovery plan (DotE 2016) as:</p> <ul style="list-style-type: none"> • any breeding or foraging habitat in areas where the species is likely to occur (as defined by distribution maps in the recovery plan) • any newly discovered breeding or foraging locations. <p>The study area lies within the species distribution. One of the key areas for breeding and foraging is the Bundarra-Barraba area, approximately 50km south-west of the study area. This is listed as a regularly used area, with the Inverell-Ashford-Emmaville region (north of the study area) listed as a subsidiary area.</p> <p>Habitat critical to the survival of the Swift Parrot have not been defined by the approved recovery plan (Saunders <i>et al.</i> 2011), however it does lay out priority habitats for conservation management as being those which are used:</p> <ul style="list-style-type: none"> • for nesting • by large proportions of the Swift Parrot population • repeatedly between seasons (site fidelity) • for prolonged periods of time (site persistence). <p>The Swift Parrot recovery plan identifies eight catchment areas in NSW considered as priority habitat regions for conservation management. The study area is not located within one of the identified catchment areas.</p> <p>The draft Swift Parrot recovery plan was exhibited in 2019 but has not yet been approved (Commonwealth of Australia 2019). It defines critical habitat to be those areas identified in the draft plan as either:</p> <ul style="list-style-type: none"> • nesting sites or foraging areas where the species is known or likely to occur; and • any newly discovered breeding or important foraging areas. <p>The project is not located in areas identified in the draft recovery plan as foraging areas where the species is known or likely to occur. Swift Parrots do not breed on the mainland and so the project is clearly not located within or near nesting sites. The project is also not located within an area identified on the Important Habitat Maps for Swift Parrot.</p> <p>The project will result in the removal of up to 2.52 ha of foraging habitat for the Regent Honeyeater and Swift Parrot. The area is not considered critical habitat for the Swift Parrot. Whilst the study area is mapped as critical habitat for the Regent Honeyeater, it is unlikely the project will adversely affect habitat critical to the species given majority of the disturbance footprint consists of derived grassland and higher quality habitat will be retained within the locality.</p>
<p>5. Disrupt breeding cycle of a population.</p>	<p>The study area is outside of the known breeding areas of these species. The closest key breeding area for the Regent Honeyeater is the Bundarra-Barraba area, approximately 50 km south-west of the study area. The Swift Parrot breeds in Tasmania. The proposed impacts will not directly disrupt the breeding cycle.</p>
<p>6. Modify, destroy, remove, isolate or degrade habitat to the extent that the species is likely to decline.</p>	<p>The project will remove up to 2.52 ha of potential foraging habitat for the Regent Honeyeater and Swift Parrot.</p> <p>The study area is outside the known breeding areas for both species.</p> <p>The Swift Parrot and Regent Honeyeater are known to occur across south-eastern NSW and Victoria, with the Swift Parrot also occurring in Tasmania. Given the project will remove foraging habitat only, it is unlikely this will result in a substantial reduction of the species.</p>

Table M.3 Assessment of significance for Regent Honeyeater and Swift Parrot

Criteria	Discussion
<p>7. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.</p>	<p>Known threats to the Swift Parrot include weed invasion impacting on habitat regeneration and health and predation by cats (OEH 2000). Introduced species are not known threats to Regent Honeyeaters.</p> <p>The project has the potential to result in increase and/or spread of weeds and increase in pest species, although is unlikely to impact feral predators such as cats. Mitigation measures such as appropriate storage of waste, appropriate disposal of weeds and washdown of vehicles and equipment prior to entering site will be implemented to prevent the introduction of invasive species.</p>
<p>8. Introduce disease that may cause the species to decline</p>	<p>There are no known diseases that pose a threat to the Regent Honeyeater.</p> <p>PBFD is a common and potentially deadly disease that is widespread in wild populations of many Australian parrots. The potential impacts of the disease depend on environmental conditions and the general health of parrot populations. The disease has the potential to impact Swift Parrot populations if their health declines due to competition for nesting and food resources (TSSC 2015a).</p> <p>It is not predicted that the proposed works would impact on the levels of PBFD directly as it already exists in wild populations, or indirectly, as the relatively small area of foraging habitat to be cleared will not cause significant stress to parrot populations.</p>
<p>9. Interfere with the recovery of the species</p>	<p>Recovery actions for the Swift Parrot aim to identify the extent and quality of habitat, manage and protect habitat at the landscape scale, monitor and manage the impact of collisions, competition and disease, and monitor population and habitat. Given that the recovery actions are largely focused on increasing knowledge of the species, the project will not interfere with recovery.</p> <p>Recovery actions for the Regent Honeyeater include improving the extent and quality of habitat, bolstering wild populations with captive-bred birds, increasing understanding of the population dynamics of the wild population, and increasing community engagement. Whilst the project will result in the reduction of up to 2.52 ha of foraging habitat, it is not predicted to significantly interfere with the recovery of the Regent Honeyeater.</p>
<p>Conclusion</p>	<p>The project will not have a significant impact on the Regent Honeyeater or Swift Parrot as:</p> <ul style="list-style-type: none"> • direct impacts will occur to up to 2.52 ha of foraging habitat • the habitat to be cleared is already fragmented and mostly small, isolated patches of woodland • no direct impacts will occur to breeding habitat • the works are not likely to have a significant impact on populations size, area or increase isolation of these species.

M.4 Painted Honeyeater

The Painted Honeyeater is listed as vulnerable under the EPBC Act.

Table M.4 Assessment of significance for Painted Honeyeater

Criteria	Discussion
1. Long-term decrease of an important population.	<p>The species is considered to comprise a single population, based on its dispersive and nomadic habits (DAWE 2021). The recovery plan for the Painted Honeyeater identifies seven key biodiversity areas (KBAs) that are important for the survival of the species. The study area is not located within any of these KBAs.</p> <p>As described in DotE (2013c) an important population can include populations that are near the limit of the species range. The study area is located within the predicted distribution range of the Painted Honeyeater, and near the eastern limit of the distribution of the species. However, there are records of the species further east and the species has been recorded on the east coast. The species is distributed widely across the east of Australia. Given that the study area is not on the edge of the distribution of these species, it is unlikely that any individuals present in the study area would be part of an important population.</p>
2. Reduce occupancy area for important population.	<p>As per above, it is unlikely that individuals in the study area would form part of an important population.</p> <p>The project will result in the removal of 2.52 ha of foraging and roosting habitat for the Painted Honeyeater. The study area has been subjected to historical clearing and agricultural activities, resulting in degradation of habitat. High quality connective habitat remains to the east of the study area. Given this it is unlikely the project will result in a significant reduction of habitat for the Painted Honeyeater.</p>
3. Fragment an important population.	<p>As per above, it is unlikely that individuals in the study area would form part of an important population.</p> <p>The project is located within a highly disturbed landscape, with much of the disturbance footprint in various stages of cultivation or grazing. The majority of the disturbance footprint contains cleared agricultural land, with scattered trees. Higher quality vegetation will remain to the east of the study area. Given this species can fly across the site it is unlikely the project will result in significant fragmentation of the species habitat.</p>
4. Adversely affect habitat critical to survival.	<p>Habitat critical to the survival of the Painted Honeyeater has not been described.</p> <p>The woodland habitat within the disturbance footprint provides potential foraging and breeding habitat for the Painted Honeyeater. This species feeds predominantly on the fruits of mistletoe, some of which are present on site.</p> <p>Given the extent of remaining habitat within the locality, it is unlikely the project will result in adverse effects to habitat critical to the survival of this species.</p>
5. Disrupt breeding cycle of an important population.	<p>As per above, it is unlikely that individuals in the study area would form part of an important population.</p> <p>The Painted Honeyeater breeds in large remnant mature woodland with an abundance of mistletoe. The disturbance footprint contains sub-optimal breeding habitat for the Painted Honeyeater. Given the extent of connected high quality habitat to the east of the study area, it is unlikely the project will have a significant impact on the species breeding cycle.</p>
6. Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline.	<p>The project will remove up to 2.52 ha of potential habitat for the Painted Honeyeater.</p> <p>The disturbance footprint contains sub-optimal foraging and breeding habitat for the Painted Honeyeater.</p> <p>Given the species has a widespread distribution across the east of Australia, the removal of habitat within the disturbance footprint will not substantially reduce the national extent of this species.</p>

Table M.4 Assessment of significance for Painted Honeyeater

Criteria	Discussion
<p>7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.</p>	<p>Known threats to the Painted Honeyeater include habitat infestation by weeds such as African boxthorn, Gazania and invasive grasses.</p> <p>The project has the potential to result in increase and/or spread of weeds. Mitigation measures such as appropriate disposal of weeds and washdown of vehicles and equipment prior to entering site will be implemented to reduce the risk.</p> <p>Therefore, is unlikely that the proposed works will introduce any further invasive species that would threaten the Painted Honeyeater.</p>
<p>8. Introduce disease.</p>	<p>There are no known diseases associated with this species.</p> <p>Hygiene protocols such as washdown of all vehicles, machinery and equipment can be implemented to minimise the potential for introduction or spread of pathogens.</p>
<p>9. Interfere with recovery.</p>	<p>There is a national recovery plan for the Painted Honeyeater (DAWE 2021), which defines habitat critical to the survival of the species as:</p> <ul style="list-style-type: none"> • breeding habitat • foraging habitat • all KBAs with Painted Honeyeater as a trigger species • suitable habitat in future climate niches. <p>The plan also acknowledges that critical habitat is difficult to define as Painted Honeyeaters opportunistically use areas depending on the occurrence of foraging resources.</p> <p>The protection, management and restoration of habitat is a key focus of the recovery plan and the Approved Conservation Advice for this species (DotE 2015). Other recovery actions include reducing sources of mortality, improved population measurements, understanding habitat use at a landscape scale, and specifically protecting and encouraging adequate numbers of mature trees and mistletoe populations for the Painted Honeyeater.</p> <p>The study area is not within one of the seven KBAs outlined in the recovery plan that are important for the survival of the Painted Honeyeater. Whilst the painted Honeyeater was not recorded during surveys, the disturbance footprint contains sub-optimal foraging and breeding habitat, as the site is unlikely to support the density of mistletoe preferred by the species. The areas of woodland proposed for removal consist of isolated patches and paddock trees.</p> <p>Given the extent of higher quality habitat in the surrounding area, the removal of 2.52 ha of woodland habitat is unlikely to interfere with the recovery of the Painted Honeyeater.</p>
<p>Conclusion</p>	<p>The proposed clearing will not have a significant impact on the Painted Honeyeater as:</p> <ul style="list-style-type: none"> • direct impacts will occur to 2.52 ha of habitat • the habitat is suboptimal foraging and breeding habitat for the Painted Honeyeater • important populations will not be adversely affected • the works are not likely to have a significant impact on important population size, area or increase the isolation of the species • the works are unlikely to interfere with the recovery of the species.

Appendix N

Seven-part tests of significance (FM Act)

N.1 Seven-part tests of significance for threatened fish

N.1.1 Southern Purple Spotted Gudgeon

Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) is a slow-moving, ambush predator freshwater fish species (Lintermans 2007). It has declined significantly in the Murray-Darling Basin but is still locally abundant in the Border Rivers catchment, where the project is located (MDBA 2007). The species lives at the bottom of rivers, creeks and billabongs in slow-moving or standing water with low turbidity (DPI 2017). The species is associated with good aquatic cover and for this reason, habitat features that are important for the species include instream aquatic vegetation, banks with over-hanging vegetation, rocks and snags and leaf litter (Lintermans 2007; DPI 2017).

Southern Purple Spotted Gudgeon feeds on terrestrial insects and their larvae, worms, small fish, tadpoles, and some plant matter. The species lays several batches of eggs per season that are deposited on solid surfaces such as rocks, wood or broad-leaved plants. The eggs hatch between 3–8 days (DPI 2017).

Southern Purple Spotted Gudgeon is at risk from a number of threats, including (DPI 2017):

- predation by Gambusia (*Gambusia holbrooki*) and Redfin Perch (*Perca fluviatilis*)
- loss of preferred habitat, particularly aquatic plants
- damage of stream banks by livestock access
- decreased water quality from agricultural runoff and siltation.

Kings Creek and Swan Brook are surrounded by agricultural land and are accessed by livestock at some sections. At times of high rainfall, the water flow can be rapid. Kings Creek contains some rock and gravel cover along the creek bed in sections, but these features are intermittent rather than well-established and there is little vegetation cover in the form of macrophytes or overhanging bank vegetation. The habitat values for Southern Purple Spotted Gudgeon within the study area are likely to be marginal. On a conservative basis, it is considered that there is some potential for Southern Purple Spotted Gudgeon to occur.

N.1.2 Murray-Darling Basin population of Eel-tailed Catfish

The Eel-tailed Catfish is also a bottom-dwelling freshwater fish species that can be found in a diverse range of freshwater environments in mud, rock and gravel substrates (DPI 2015b). It also prefers clear, slow-moving or still waters but can sometimes be found in flowing streams in turbid waters (DPI 2015b). Eel-tailed Catfish are most likely to be present where there is a high cover of cobbles and gravel, with extensive submerged aquatic vegetation and a low daily flow (Duncan, Gilligan *et al.* 2017). The species also prefers small dams and lakes where there is substantial submergent and emergent aquatic vegetation (Duncan, Gilligan *et al.* 2017).

Eel-tailed Catfish will breed at sites where there is a high abundance of bedrock and boulders, riffles and rapids and emergent vegetation (Duncan, Gilligan *et al.* 2017). Males construct and defend a nest up to 2 m from gravel and pebbles; the females lay large, non-adhesive eggs that settle towards the middle of the nest and the eggs hatch after approximately 7 days (DPI 2015b).

Eel-tailed Catfish is at risk from a number of threats, including (DPI 2015b):

- competitive and predatory interactions with European Carp (*Cyprinus carpio*) and Redfin Perch (*Perca fluviatilis*)
- loss of suitable habitat through river regulation

- loss of spawning sites due to siltation and reduced success of spawning and recruitment due to alterations to flow patterns and flooding regimes
- decreased water quality from agricultural runoff including chemical pesticides.

Kings Creek and Swan Brook are surrounded by agricultural land including crop cultivation. Kings Creek does contain some timber debris and rocks in sections but lacks significant amounts of gravel and cobbles at the locations of the proposed crossings. It also does not support areas of aquatic vegetation in the form of emergent and submergent macrophytes along much of the sections observed upstream and downstream of the crossings. The habitat values for Eel-tailed Catfish are likely to be marginal. On a conservative basis, it is considered that there is some potential for Eel-tailed Catfish to occur.

An assessment of significance for both species are provided in the following section.

220ZZ Significant effect on threatened species, populations or ecological communities, or their habitats

(2A) The following factors must be taken into account in making a determination under this section—	Assessment
(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	<p>Bridge crossings exist at Kings Creek and Swan Brook where Sturmans Road and Spring Mountain Road cross the watercourses respectively.</p> <p>It is not known what the construction method would be at present, the upgrades of the bridge crossings are expected to be highly localised works that are unlikely to remove snags, rocks and riparian vegetation. Where any instream works are proposed, works would be consistent with relevant guidelines (Fairfull & Witheridge 2003; DPE 2022c).</p> <p>As there is very little instream aquatic vegetation, the proposed crossing upgrades are unlikely to remove aquatic vegetation that would be utilised by the Southern Purple Spotted Gudgeon at the crossing points.</p> <p>Kings Creek and Swan Brook are degraded or impacted habitats, and although some rocks and snags are present in some sections, the habitats are not considered high quality habitats for the species.</p> <p>The upgrades of the crossings are not expected to have an adverse effect on the species' life cycle such that a viable local population is likely to be placed at risk of extinction.</p>
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	<p>Bridge crossings exist at Kings Creek and Swan Brook where Sturmans Road and Spring Mountain Road cross the watercourses respectively.</p> <p>It is not known what the construction method would be at present, the upgrades of the bridge crossings are expected to be highly localised works that are unlikely to remove snags, rocks and riparian vegetation. Where any instream works are proposed, works would be consistent with relevant guidelines (Fairfull & Witheridge 2003; DPE 2022c).</p> <p>As there is very little instream aquatic vegetation, the proposed crossing upgrades are unlikely to remove aquatic vegetation that would be utilised by the Eel-tailed Catfish at the crossing points.</p> <p>Kings Creek and Swan Brook are degraded or impacted habitats, and although some rocks and snags are present in some sections, the habitats are not considered high quality habitats for the species.</p> <p>The upgrades of the crossings are not expected to have an adverse effect on species' life cycle such that a viable local population is likely to be placed at risk of extinction.</p>
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed—	-

2202Z Significant effect on threatened species, populations or ecological communities, or their habitats

(2A) The following factors must be taken into account in making a determination under this section—	Assessment
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	Not applicable.
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	Not applicable.
(d) in relation to the habitat of a threatened species, population or ecological community—	-
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	<p>As there are existing bridge crossings at the location of proposed works, the extent to which habitat is likely to be removed is expected to be minimal, since the works will either upgrade the existing crossings or replace them at the same location. Some riparian vegetation (0.04 ha) along Kings Creek may require removal to accommodate the road upgrades.</p> <p>The critical habitat features (ie cobble/gravel, macrophyte cover) for both species are marginal within the disturbance footprint and the project is unlikely to substantially impact such features.</p>
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	<p>As there are existing bridge crossings at the location of proposed works, the crossing upgrades are unlikely to fragment or isolate fish habitats. Works will be designed to be consistent with relevant guidelines (Fairfull & Witheridge 2003) to avoid obstruction to fish passage.</p>
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	<p>Kings Creek and Swan Brook are surrounded by agricultural land including crop cultivation and are currently impacted waterways. These are impacted habitats that are unlikely to provide high quality habitats.</p>
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	<p>There are no critical habitats listed on the Register of critical habitat for either species.</p>
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	<p>There are a number of recovery actions stipulated for both species. The project will be implemented in a manner that will not contradict these and will maintain consistency with the Priorities Action Statement.</p>
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	<p>The project may be part of and have potential to exacerbate the following key threatening processes (KTPs):</p> <ul style="list-style-type: none"> • degradation of native riparian vegetation along New South Wales water courses • installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams • removal of large woody debris from New South Wales rivers and streams. <p>There is potential for minimal areas of disturbance to riparian vegetation (0.04 ha) and some removal of large woody debris for the upgrade or crossing construction works.</p> <p>There may be some instream works as part of the construction or upgrade of the existing crossings, but the works and the crossing design will be consistent with relevant guidelines (Fairfull & Witheridge 2003) to avoid obstruction to fish passage.</p>

2202Z Significant effect on threatened species, populations or ecological communities, or their habitats

(2A) The following factors must be taken into account in making a determination under this section—

Assessment

Conclusion

The project is unlikely to have a significant impact on a potential local population of Southern Purple Spotted Gudgeon or a threatened population of Eel-tailed Catfish because:

- The existing habitat values of Kings Creek and Swan Brook for supporting critical life cycle events are marginal.
- The works will replace or upgrade existing crossings, that is, no new crossings will be established.
- The construction activity will be temporary in duration.
- The design of construction and permanent crossing infrastructure will be consistent with guidelines for fish passage and waterway crossings (Fairfull & Witheridge 2003; DPE 2022c).

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