BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Tilbuster Solar Farm

August 2021

Project Number: 18-645

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I, Brendon True (BAAS18155), certify that this Biodiversity Development Assessment Report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method 2017 as of 30 July 2021. The transitional arrangements have been applied. The associated case (00015472) within the BAM Calculator has been submitted as of 30 July 2021, with the calculation report reflected in Revision 11.

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Acronyms and abbreviations

AWS	Automatic weather station
BAM	Biodiversity Assessment Methodology 2017
BAM-C	Biodiversity Assessment Methodology Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
BioNet VC	BioNet Vegetation Classification
BOM	Australian Bureau of Meteorology
Cm	Centre metre
DBH	Diameter at Breast Height
DPIE	Department of Planning, Infrastructure and Environment
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
GIS	Geographic Information System
ha	hectares
HBT	Hollow-bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
kV	Kilovolt
LEP	Local Environment Plan
LLS Act	Local Land Services Act
LRET	Large Scale Renewable Energy Target
m	Metres
MW	Megawatt
NES	Matters of National environmental significance under the *EPBC Act* (c.f.)
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
PCT	Plant Community Type
PV	Photovoltaic
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
sp/spp	Species/multiple species
SAT	Spot Assessment Technique
SSD	State Significant Development

TEC	Threatened Ecological Community
CEEC	Critically Endangered Ecological Community
VIS	Vegetation Integrity Score

Executive summary

Enerpac Australia Pty Ltd (Enerpac) proposes to construct, operate and decommission a photovoltaic (PV) solar farm with an estimated capacity of 150 MW. The Tilbuster Solar Farm (the proposal) would be located on a rural property 17 km north of Armidale, NSW. This Biodiversity Development Assessment Report (BDAR) has been prepared by NGH on behalf of the proponent, Enerpac.

The aim of this BDAR is to address the requirements of the *Biodiversity Conservation Act 2016* (BC Act). This BDAR forms part of a Development Application (DA) prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to be lodged with the NSW Department of Planning, Industry and Environment (DPIE) (Formerly known as NSW Department of Planning and Environment (DPE)).

The Biodiversity Assessment Methodology (BAM) is the required assessment methodology for local developments that trigger the NSW Biodiversity Offsets Scheme (BOS), under the BC Act. This report follows the field work methodologies and assessment required by the BAM.

Comprehensive mapping and field surveys were completed in accordance with the requirements of the BAM. The majority of the 310 ha development site has been cleared of native vegetation, and purposed for stock grazing, forage cropping and improved pastures, which is the dominant land use in the area. Around 241.3 ha of native vegetation occurs in the development site as cleared, under scrubbed and thinned treed areas comprised of:

- 145.9 ha of PCT 567 - Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion (PCT 567)
- 6.1 ha of PCT 575 Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion (PCT 575)
- 89.2 ha of Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion (PCT 704)

All areas of PCTs 567 and 704 are considered to constitute the BC Act listed community *White box Yellow box Blakely's red gum woodland*. Some areas are considered to constitute the federally listed counterpart *White box - Yellow box - Blakely's red gum grassy woodlands and derived native grasslands*. PCT 575 does not constitute a state or federally listed community.

For ecosystem impacts that are unavoidable, the proposal would require the removal of:

- 69.6 ha of PCT 567, generating 269 ecosystem credits
- 1.1 ha of PCT 575, generating 18 ecosystem credits
- 44.7 ha of PCT 704, generating 103 ecosystem credits

Three species credit species, Southern Myotis *Myotis macropus*, Koala *Phascolarctos cinereus* and Greater Glider *Petauroides volans*, were recorded during targeted surveys in November 2019. Greater Glider is listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) only, however, in accordance with the bilateral agreement, the BAM has been used to assess this species resulting in an offset obligation being calculated for this species.

One further species credit species, Pale-headed Snake *Hoplocephalus bitorquatus*, were not surveyed for and are assumed to occur based on habitat presence, albeit sub-optimal. The recorded or assumed presence of the above species credit species generated the following species credits:

- 83 species credits for Pale-headed Snake for the proposed removal of 6.5 ha of assumed habitat
- 299 species credits for Koala for the proposed removal of 15.5 ha of breeding habitat
- 123 species credits for Southern Myotis for the proposed removal of 53.3 ha of habitat
- 55 species credits for Greater Glider for the proposed removal of 3.3 ha of habitat

An additional assessment of impacts on entities listed under the EPBC Act was completed for:

- Koala *Phascolarctos cinereus*
- Greater Glider *Petauroides volans*
- *White box - Yellow box - Blakely's red gum grassy woodlands and derived native grasslands*
- Black-faced Monarch *Monarcha melanopsis*
- Satin Flycatcher *Myiagra cyanoleauca*
- Rufous Fantail *Rhipidura rufifrons*
- White-throated Needletail *Hirundapus caudacutus*
- Fork-tailed Swift *Apus pacificus*

Targeted consultation with the Biodiversity Conservation Division was completed following the public exhibition of the EIS. This process resulted in further avoidance and minimisation of impacts to the highest ecological value vegetation within the development site.

These impacts have been assessed in accordance with the EPBC Act guidelines and in the case of Greater Glider and Koala, referral to the Federal Department of Environment was recommended on the basis of the proposal potentially resulting in a significant impact to either or both species. The proposed Tilbuster Solar Farm was determined to be a controlled action and will be assessed by NSW under an accredited assessment in accordance with section 87 of the EPBC Act. Supplementary SEARs for this proposal have been addressed in this BDAR. An offset strategy addressing Federal requirements will be developed based on further investigations, in line with the NSW bilateral agreement.

Biodiversity impacts have been assessed at a worst-case scenario, based on detailed plans that have been revised and altered with a reduction in impacts to higher quality vegetation, in consultation with the Biodiversity Conservation Division of DPIE. Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the design revision. Design options have been assessed against key environmental, social and economic criteria. Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct and indirect.

1. Introduction

Enerparc Australia Pty Ltd (Enerpac) proposes to construct, operate, and decommission a photovoltaic (PV) solar farm with an estimated capacity of 150 Megawatts. The Tilbuster Solar Farm (the proposal) would be located on a rural property approximately 17 km north of Armidale on a 310 hectare (ha) plot of land that is currently owned by one landowner.

The proposal is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP) and therefore a 'major project'. This Biodiversity Development Assessment Report (BDAR), prepared on behalf of Enerpac, assesses the impacts of the proposal according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal.

The following terms are used in this document:

- **Proposal:** the construction, operation and decommissioning of a 150 MW solar farm as outlined in detail in Section 1.1 below.
- **Development site:** the area of land that is subject to a proposed development, inclusive of direct and indirect impacts. The development site is around 310 ha. The development site is the area surveyed for this assessment.
- **Development footprint:** the area of land that is directly impacted by the proposal. In this case it is the area within the development site identified in Figure 1-1 as the development footprint. The development footprint includes the solar array design, perimeter fence, access roads, transmission line footprint, Asset Protection Zones (APZ) and areas used to store construction materials. The development footprint is approximately 169.7 ha.
- **Subject land:** the combined areas of the development site and development footprint, and an area where the BAM has been applied.
- **Buffer area:** all land within 1500 metres (m) of the outside edge of the boundary of the development footprint.

The BAM 2017 is being used for this assessment.

1.1 The proposal

The proposal involves the construction, operation and decommissioning of a ground-mounted PV solar array which would generate approximately 150 Megawatts (AC) to be supplied directly to the national electricity grid. The Proposal would provide enough clean, renewable energy for about 48,000 average NSW homes while displacing approximately 250,000 metric tons of carbon dioxide annually. The development site is approximately 310 ha of which approximately 169.7 ha would be developed for the solar farm and associated infrastructure (development footprint). Two existing TransGrid transmission lines transect the site, a 132 kilovolts eastern line and a 330 kilovolts central line. The 330 kilovolts transmission line would be used to connect the solar farm to the national electricity grid.

The primary access point during construction and operation for light and heavy vehicles would be off New England Highway, east of the site. The proposed infrastructure map (Figure 1-1) illustrates the indicative layout, including a concept development footprint for the solar arrays. This would be refined during the detailed design phase.

Key development and infrastructure components would include:

- Installation of approximately 400,000 PV solar modules mounted on either fixed or horizontal single-axis tracking system
- Steel mounting frames with pile foundation
- Installation of up to 30 Power Conversion Units – totalling 60 inverters, 30 transformers and associated ancillary equipment
- Electrical cabling including overhead lines and underground electrical conduits to connect PV modules to outdoor substation
- Outdoor 330 kV substation including switchgears and ancillary equipment
- Onsite energy storage facility – Storage requirements will be 30 MW/h or less, battery technology is yet to be determined and subject to change based on detail design
- Monitoring container as required for operation and maintenance
- Construction facilities including laydown, parking, site offices and staff facilities
- Storage container (40 ft)
- IB (Combiner) boxes
- Internal access road and upgrades including primary access on New England Highway – up to 6.8 km in length
- Perimeter security fencing and tracks
- Security camera poles
- Construction of 11 creek crossing, largely fords

In total, the construction phase of the proposal is expected to take 12 months, and the facility would be expected to operate for around 30 years or extended pending further approvals. Up to five fulltime equivalent operations and maintenance staff and service contractors would operate the facility. At the end of its operational life, the facility would be decommissioned. All below ground components to a depth of 500 mm would be removed and returned to its existing agricultural land capability.

The proposal would require subdivision of Deposited Plan Lots within the development site for lease and purchase agreement purposes with the involved landowner.

1.2 The development site

1.2.1 Site description

The development site is located on land zoned RU1 Primary Production to the north east under the *Armidale Dumaresq Local Environmental Plan 2012* (Armidale Regional LEP). Crown Land is located within the south east part of the development site. The development site, associated transmission and access roads are located on land zoned RU1 Primary Production under the Armidale Regional LEP.

The topography of the development site is generally undulating with steep forested hills to the east and west of the site. The Site is accessed from a single access point on the New England Highway. The Proposal is not visible from the New England Highway.

Nine dams occur within the development site; two within the south eastern portion of the development site, three within the central portion and four within the north western portion. One ephemeral watercourse and approximately eighteen other tributaries traverse the development site. The largest of the watercourses, Duval Creek, traverses the middle of the development site in a north-west to south-east direction and discharges into Tilbuster Ponds approximately 6.5 km south of the development site. Most of the smaller watercourses/overland flow paths are tributaries

of Duval Creek. An existing TransGrid 330 kV transmission line transects the central portion of the development site. There are no current exploration licences or mining leases within the development site.

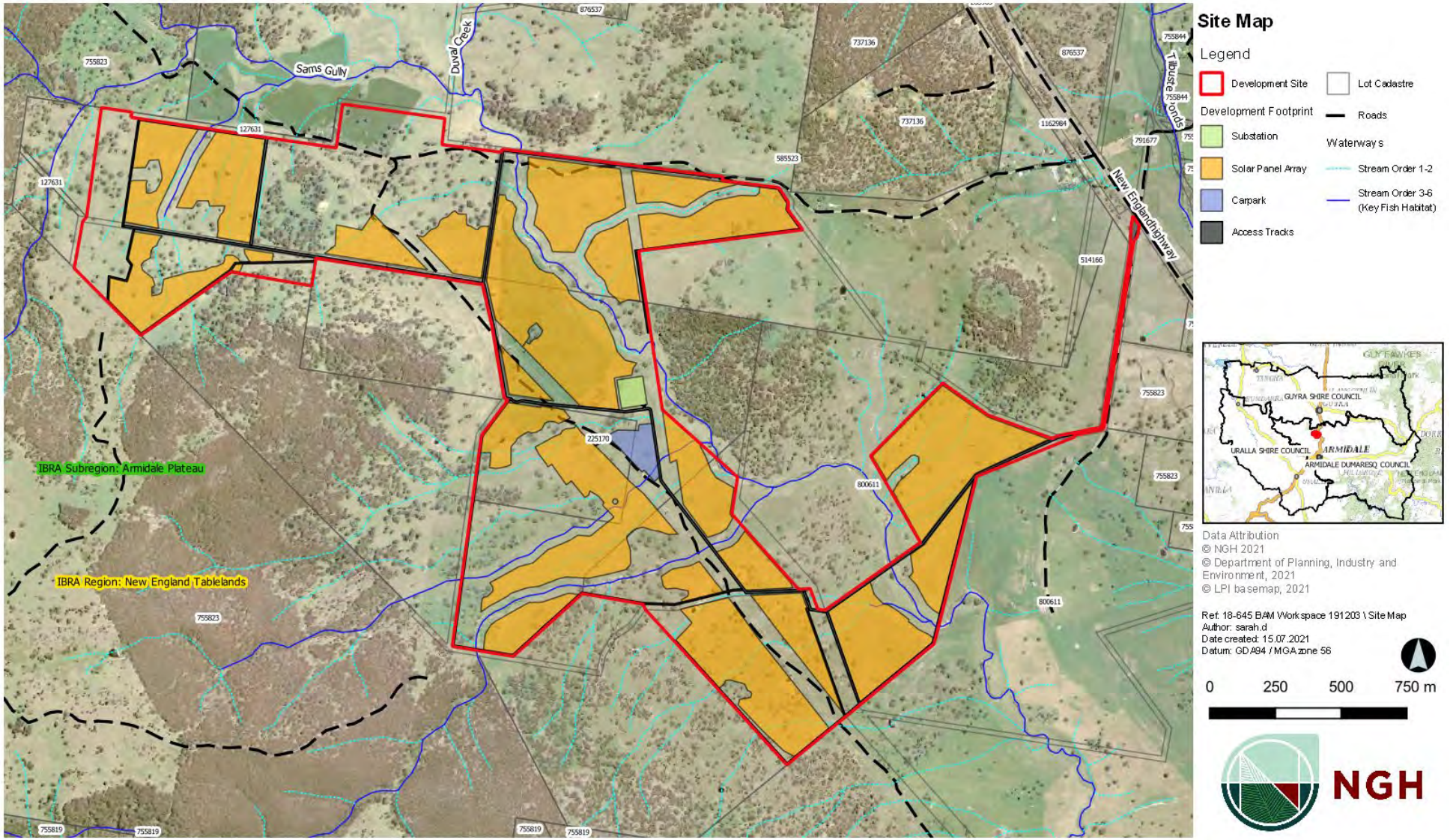

Figure 1-1 Site map

1.2.2 Site location

The development site is located on a 310 ha plot of land that is currently owned by one landowner. Pending project approval, the proposal site is intended to be leased by Enerparc.

Table 1-1 Affected lots associated with the proposed Tilbuster Solar Farm

Development footprint	Owner 1	Crown Land	Existing use	Ownership arrangements
All proposed solar farm infrastructure including solar arrays, connection infrastructure, internal roads and ancillary infrastructure.	Lot 3 DP800611 Lot 1 DP225170 Lot 1 DP585523	N/A	Agriculture	Enerparc would lease or purchase this land.

1.3 Study aims

This BDAR has been prepared by NGH on behalf of Enerpac. The aim of this BDAR is to address the requirements of the BAM, as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

Secretary's Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: • **Biodiversity** – including an assessment of the likely biodiversity impacts of the development	• An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values. • 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.

No specific considerations for any threatened species, populations or communities were specified in the SEARs or by Department of Planning, Infrastructure and Environment (DPIE).

1.4 Source of information used in the assessment

The following information sources were used in this BDAR:

- Proposal layers, construction methodology and concept designs provided by Enerpac.
- Australian Government's Species Profiles and Threats (SPRAT) database http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- NSW OEH's Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedspeciesapp/
- DPI profiles of threatened species, population, and ecological communities
- Commonwealth Department of Environment and Energy Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool

- Australia's IBRA Bioregions and sub-bioregions. Accessed September 2019 http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx).
- NSW OEH's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/.
- NSW OEH Threatened Species Profiles Accessed September 2019

  http://www.environment.nsw.gov.au/threatenedSpeciesApp/ and

  www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- OEH BioNet Vegetation Classification Database

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW Government SEED Mapping

  https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
- NSW Biodiversity Values Map
  https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

2. Landscape features

2.1 IBRA bioregions and subregion

Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions are geographically distinct bioregions based on common climates, geology, landforms and native vegetation (Thackaway and Creswell, 1995) There are 89 IBRA bioregions within Australia. The development site falls within the New England Tablelands IBRA Bioregion and Armidale Plateau Subregion.

The New England Tablelands is one of the smaller bioregions within NSW, occupying 3.5% of the state. In NSW, the bioregion boundary extends from north of Tenterfield to south of Walcha and includes towns such as Armidale and Guyra. The climate of the bioregion is temperate to cool, characterised by warm summers. Patches of montane climate occur at higher elevations, and these are characterised by mild summers and no dry season.

The bioregion is a stepped plateau of hills and plains with elevations between 600 and 1500 m on Permian sedimentary rocks, intrusive granites and extensive tertiary basalts. Soils change with topography and bedrock, with the overlying vegetation highly diverse with a high degree of endemism.

The Armidale plateau Subregion is characterised by an undulating to hilly plateau to 1100 m over fine grained carboniferous sedimentary rock, granites and multiple tertiary basalt flows. Soils contain a mix of texture contrast soils on sedimentary rocks and granite, mellow and well drained on upper slopes, harsh and poorly drained on lower slopes, variably stony loams to deep black earths in valley floors on basalt and deep, dark loamy alluvium in swampy valleys. The vegetation present reflects this range of substrates including open Ribbon Gum Eucalyptus viminalis forest and woodland on basalt. Sedimentary areas generally contain Blakely's Red Gum E. blakelyi, Yellow Box E. melliodora and Rough-barked Apple Angophora floribunda. Dryer aspects contain Stringybarks and Ribbon Gum on flats.

2.2 NSW landscape regions and area

The development site is situated on the Dingo Spur Meat-sediments Mitchell Landscape. This landscape was entered into the BAM calculator (BAM-C) for this assessment.

2.3 Native vegetation

As determined by aerial imagery and Geographic Information System (GIS) mapping, approximately 1988 ha of native vegetation occurs in the surrounding 1500 m buffer area. The native vegetation within this buffer contains a mix of Stringybark dominated woodland and forest in higher rocky areas transitioning to Yellow Box and Blakely's Red Gum on valley flats and Ribbon Gum in riparian areas.

2.4 Cleared areas

An assessment of cleared areas in the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping (OEH, 2016), NSW Land use Mapping (OEH, 2017) and field assessments. Within the 1500 m buffer area, approximately 110 ha is cleared or significantly thinned of native vegetation. This is predominantly for farming, such as improved pasture and

forage cropping, but also includes the New England Highway, residences and a central transmission line.

2.5 Rivers and streams

Within the development site, several waterways and ephemeral drainage lines occur, approximately 50% of which are 1st order streams. The presence of named watercourses is limited to Duval Creek (5th order) which is situated north-west to south-east. Tributaries of Duval Creek are mapped as a combination of 1st, 2nd and 3rd order streams. All of these waterways are ephemeral and contained no water during August or November 2019 and August 2018. Duval Creek itself, during August and November 2019 surveys, contained no water and little evidence of where remaining water may have collected before completely drying out (Figure 2 1). During August 2018, Duval Creek contained some evidence of water in isolated patches and damp depressions.

Figure 2-1 Duval Creek at the eastern end of the development site during November 2019

2.6 Wetlands

No wetlands occur within the development site. The nearest Wetland of International Importance (RAMSAR) is Gwydir wetlands, 200 – 30 km upstream. The nearest downstream wetland is Riverland, over 1000 km away.

Nine farm dams are present within the development site, two of which contained water during November 2019 surveys (Figure 2 2). None of the dams contain fringing vegetation which may present habitat.

Figure 2-2 Dam in the north of the development site during November 2019

2.7 Connectivity features

Much of the development site has been cleared or thinned of native vegetation, however, significant tracts of relatively uninterrupted bushland occur along the northern, western and southern boundary, from Black Mountain to the north to Duval Nature Reserve to the south. This bushland is a prominent connectivity feature in the landscape. In the north, west and south, this connectivity feature extends into the development site as areas of remnant trees with a cleared understory subject to grazing. These disturbed remnants often fail to extend the width of the development site wholly or without substantial disconnects, in large part due to clearing that was required to enable the construction of a transmission line situated north-south through the development site. One location in the north of the development site contains a relatively consistent canopy from the northern to opposing boundary. This area constitutes the greatest connectivity through the development site and it has been avoided by the development footprint.

Given the above, connectivity through the development site is generally poor for species that require a consistent canopy for traversal. Species that can cross the ground may utilise the development site for traversal in treed as well as wholly cleared areas. However, relatively undisturbed bushland surrounding the development site is likely to be preferred.

2.8 Areas of geological significance

No karsts, caves, significant crevices or cliffs occur within the development site. However, in the north-east a geological feature, colloquially referred to as ‘Red Rock’ is present (Figure 2 3). Red Rock is a deep marine chert which are typically grey or greenish, however, this one is red as it is a Jasper variety. The Jasper is part of the older accretionary wedge; sea floor sediments that were scraped off the down going oceanic plate about 380 – 320 million years ago.

The New England Tablelands contains other examples of this formation, but this is likely to be the most significant in terms of its size and relatively unique colouring.

Figure 2-3 Formation known as 'Red Rock' in the north-east of the development site

2.9 Site context components

Method applies

The proposal conforms to the definition of a site-based development under the BAM and therefore the site-based development assessment methodology has been used in this BAM assessment (BAAS18155/19/00015472/Revision11). Native Vegetation was calculated by estimating the percent cover of native vegetation relevant to the benchmark for the Plant Community Type (PCT). PCTs were allocated based on existing vegetation mapping, detailed survey and aerial imagery.

Percent native vegetation cover

The 1500 m buffer area around the development site comprises an area of 2889 ha. As determined by GIS mapping from aerial imagery, approximately 1988 ha of native vegetation occurs in the 1500 m buffer area (Figure 2 5).

The Percent Native Vegetation Cover within the 1500 m buffer area surrounding the development site prior to the development was calculated to be 68.7%. This was entered into the BAM-C for the assessment.

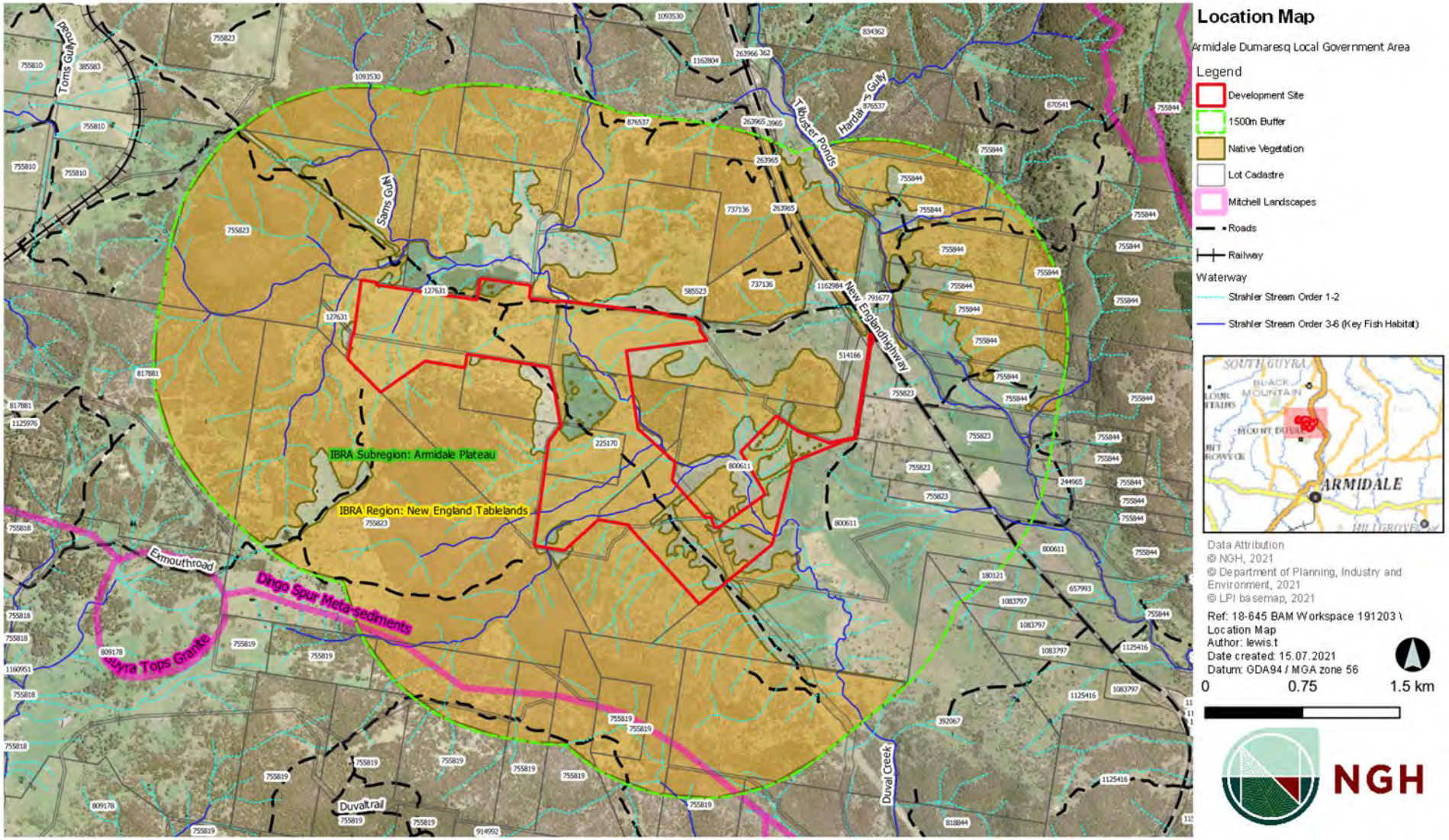

Figure 2-4 Location map

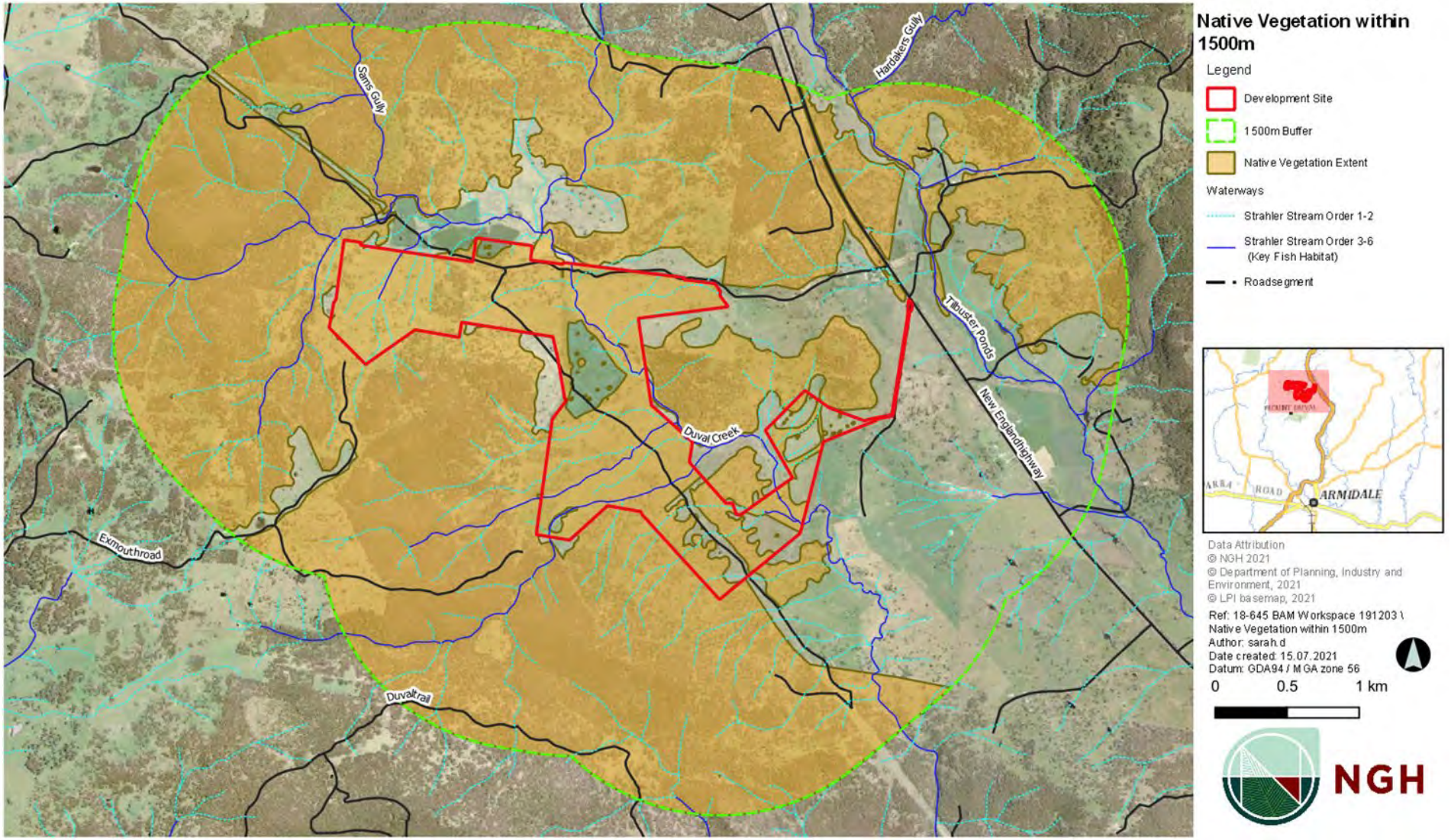

Figure 2-5 Native Vegetation Extent with the 1500 m buffer

3. Native vegetation

3.1 Native vegetation extent

About 241.4 ha of native vegetation occurs within the development site, comprised of:

- 55.2 ha of treed areas dominated by Broad-leaved Stringybark *Eucalyptus caliginosa*. This community generally occurs in higher elevations and may be associated with rock outcropping. Where it extends into lower lying areas, Yellow Box and Blakely's Red Gum are common associates. Scattered trees over Category 1 land (see below) and Category 2 land that has been cropped also occur.
- 23.5 ha of treed areas dominated by Yellow Box and Blakely's Red Gum on valley floors. Scattered trees over Category 1 land (see below).
- 6 ha of dry sclerophyll forest where Tenterfield Woollybutt *Eucalyptus banksii* occurs with Stringybarks, Yellow Box and Blakely's Red Gum.
- 156.6 ha of modified and grazed grasslands, derived of the communities above, that have a long history of grazing and pasture improvement.

No paddock trees occur within the development site. Paddock trees are defined as:

- a tree or a group of up to three trees less than 50 m apart from each other, and
- over an exotic groundcover, and
- more than 50 m away from any other living tree greater than 20 cm DBH, and
- on category 2 land surrounded by category 1 land (as defined by the BAM, 2017).*

*The regulatory land mapping has not been yet been published under the new Local Land Service Act 2016 (LLS Act). During the transitional period, land categories are to be determined in accordance with the definitions of regulated land in the LLS Act. In this case, the paddock trees are located on land with native vegetation present since January 1990, surrounded by land that has been cleared of native vegetation since January 1990

About 68.8 ha of non-native occurs including exotic vegetation and cropped Category 1 exempt.

3.2 Land category assessment

Until the entire Native Vegetation Regulatory (NVR) map is finalised and released, assessors may establish the categorisation of land for the consent authority to consider by approximating the method used to make the NVR map under the provisions of the Biodiversity Conservation Act 2016 (BC Act) and the Local Land Services Amendment Act 2016 (LLS Act). That is, for developments occurring on rural land (not including RU5 land), accredited assessors can establish whether land is Category-1 – exempt land. Under the BC Act (S6.8(3)), the BAM is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the Local Land Services Act 2013), other than any impacts prescribed by the regulations under section 6.3 of the BAM. Additionally, with the BAM (S2.3.1.1), biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation are not required to be assessed. As Category 1 Land regulatory maps are not yet publicly available, an assessment of

whether the cleared areas meet the definition of the Category 1 - exempt land was undertaken (APPENDIX A).

In order to determine and justify land identified as Category 1-exempt land, the following information was analysed via a precautionary approach;

- NSW Land Use mapping (OEH 2017)
- Woody Vegetation layer (OEH 2015)
- Sensitive Regulated Land and Vulnerable Regulated Land Mapping
- Historic aerial imagery

Using the above resources, 62.7 ha was considered to be classed as Category 1 Land (APPENDIX A). These areas are exempt from further assessment in the BAM with exception to prescribed impacts as stated in Section 6.3 of the BC Act.

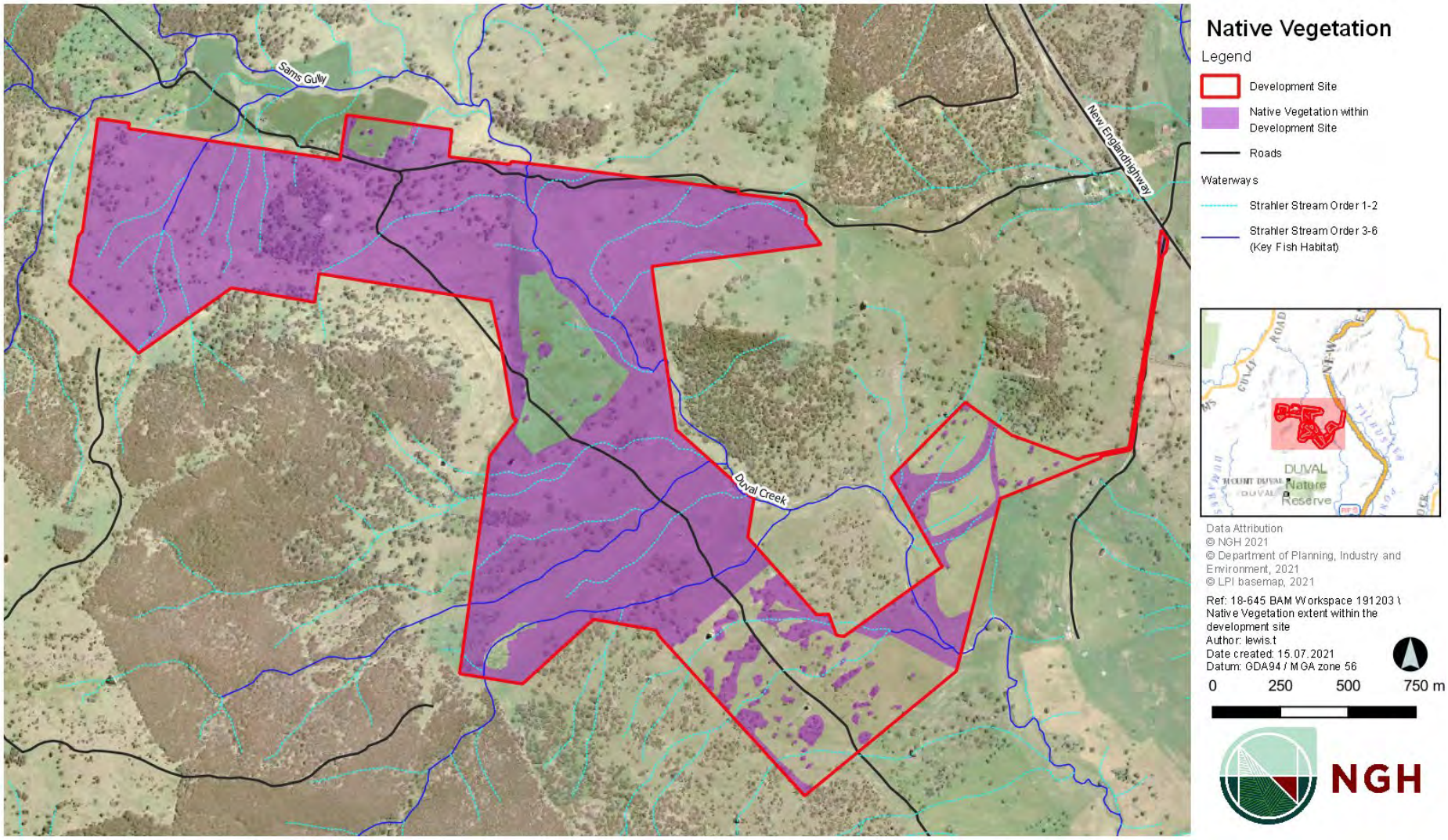

Figure 3-1 Native vegetation extent within the development site

3.3 Plant Community Types (PCTs)

3.3.1 Methods to assess PCTs

Review of existing information

A search was undertaken of the BioNet Vegetation Classification (BioNet VC) database and NSW SEED Data Sharing Portal to access existing vegetation mapping information within the subject land. The nearest State Vegetation Map layer was that of the Border Rivers Gwydir/Namoi Region (VIS_ID 4467, DPIE 2015). Despite this mapping layer terminating 2 km to the west of the subject land, it provided insight into the PCTs which are likely to be present including:

- PCT 526: Mountain Ribbon Gum - Messmate - Broad-leaved Stringybark open forest on granitic soils of the New England Tableland Bioregion
- PCT 559: Youman's Stringybark - Mountain Gum open forest of the western New England Tableland Bioregion
- PCT 565: Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion
- PCT 568: Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion
- PCT 736: Broad-leaved Stringybark - Mountain Gum - Apple Box open forest of the New England Tableland Bioregion

Floristic survey

A site overview was undertaken on the 13th – 15th of August 2018. The entire subject land was surveyed by one ecologist with the aim of confirming the PCTs present, along with their extent and condition by way of rapid data collection techniques. Random meander searches were conducted to gain an overview of the plant species present and determine variation within vegetation types. Potential PCTs were identified using the BioNet VC based on the native species present, landform, physiography and location in the IBRA subregion. The PCTs were then stratified into areas of similar condition class to determine vegetation zones for each PCT.

Detailed floristic surveys were undertaken over the 26th – 30th November 2018 and again by two ecologists over the 18th – 21st November 2019. The surveys were undertaken using the methodology presented in the BAM. The required number of vegetation integrity plots of 20 m by 50 m were established in each vegetation zone. Data was collected on the composition, structure and function of the vegetation. The extended drought conditions present across the New England Tablelands, coupled with grazing pressure, served as a severe limitation to collection of plot data as minimal groundcover vegetation was present. This is expanded upon in Section 3.4. Personnel undertaking the field work have been trained and accredited under the BAM.

3.3.2 PCTs identified on the development site

Three PCTs were identified within the development site:

- PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion

- PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion
- PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion

A description of the PCTs identified within the development site follows overleaf.

Table 3-1 PCT 567 Summary

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	New England Grassy Woodland	
Vegetation type	PCT ID	567
	Common Community Name	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
Approximate extent within the development site	145.9 ha: • 53.2 ha as woodland • 2 ha as scattered trees over cropped land • 90.7 ha as grassland	
Species relied upon for PCT identification	Species name	Relative abundance
	Broad-leaved Stringybark *Eucalyptus caliginosa*	10
	Yellow Box *Eucalyptus melliodora*	2
	Blakeley's Red gum *Eucalyptus blakelyi*	1
	Silver-top Stringybark *Eucalyptus laevopinea*	1
	Cassinia quinquefaria	0.1
	Slender Rat's Tail Grass *Sporobolus creber*	1
	Peach Heath *Lissanthe strigosa*	0.2
	Swamp Dock *Rumex brownii*	0.1
	Purple Wiregrass *Aristida ramosa*	0.1
	Snow Grass *Poa sieberiana*	0.1
	Red Grass *Bothriochloa macra*	0.1

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
Justification of evidence used to identify the PCT	Entry of the dominant canopy species recorded at BAM plots 1, 4 and 5 filtered by the Armidale Plateau subregion into the BioNet VC produced a candidate list of 14 potential PCTs for this community. While PCTs such as 568, do contain a canopy dominated by Broad-leaved Stringybark, only 567 contains the full suite of other canopy species recorded. Furthermore, 567 contains the shrub species, although few were within BAM plots, that were also recorded or incidentally noted in similar vegetation adjacent to the western border of the development site. Given this strong affinity in regard to characteristic species, as well as suitable landscape position (ridges, flats and lower slopes) PCT 567 was chosen as the most likely PCT for this community.
TEC Status	This PCT is associated with the following TECs: • White Box Yellow Box Blakely's Red Gum Woodland (BC Act – Critically Endangered) • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act – Critically Endangered) This PCT has been confirmed to represent White Box Yellow Box Blakely's Red Gum Woodland, however, only in part. Areas of this PCT where only Stringybarks occur or dominate, would not qualify as the TEC. However, the BAM-C lacks the functionality to differentiate these areas from the remaining areas of the PCT that do represent the TEC (where Yellow Box and Blakely's Red Gum occur as at minimum co-dominants). The PCT has been entered as being associated with the TEC in the BAM-C. Some areas of this PCT have been found to represent White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. These areas are predominantly in the west of the development site where larger patches of the PCT are present or where disturbed remnants within the development site adjoin areas of the TEC outside the development site such that they are considered the same patch.
Estimate of percent cleared	62%

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
Examples	 Figure 3-2 Example of PCT 567 woodland  Figure 3-3 Example of PCT 567 grassland

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	
	 Figure 3-4 Example of PCT 567 scattered

Table 3-2 PCT 575 Summary

Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion		
Vegetation formation	Dry Sclerophyll Forests)Shrub/grass sub-formation)	
Vegetation class	New England Dry Sclerophyll Forests	
Vegetation type	PCT ID	575
	Common Community Name	Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion
Approximate extent within the development site	6.1 ha: • 5.4 ha as forest • 0.7 ha as a clump of trees over cropped land	
Species relied upon for PCT identification	Species name	Relative abundance
	Tenterfield Woollybutt *Eucalyptus banksii*	10
	Broad-leaved Stringybark *Eucalyptus caliginosa*	10
	Yellow Box *Eucalyptus melliodora*	2
	Variable Tick-trefoil *Desmodium varians*	0.1
	Peach Heath *Lissanthe strigosa*	0.2
	Native Geranium *solanderi*	0.2
	Sticky Cassinia *uncata*	0.1
	Snow Grass *Poa sieberiana*	0.1
	Red Grass *Bothriochloa macra*	0.1
Justification of evidence used to identify the PCT	Entry of the dominant canopy species recorded at BAM plots 3 and 8 filtered by the Armidale Plateau subregion into the BioNet VC produced only PCT 575 as a candidate. PCT 575 was also suggested to occur by DPIE (2015). Given the local occurrence of Tenterfield Woollybutt *Eucalyptus banksii* in two areas, and that there is only one PCT in the subregion to contain this species, PCT 575 was assigned to these areas.	
TEC Status	PCT 575 is not associated with any TECs.	
Estimate of percent cleared	40%	

Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion	
Examples	 Figure 3-5 Example of PCT 575 forest  Figure 3-6 Example of PCT 575 scattered

Table 3-3 PCT 704 Summary

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	New England Grassy Woodlands	
Vegetation type	PCT ID	704
	Common Community Name	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion
Approximate extent within the development site	89.4 ha: • 17.9 ha as woodland • 5.5 ha as a clump of trees over cropped land • 65.9 ha derived grassland	
Species relied upon for PCT identification	Species name	Relative abundance
	Yellow Box *Eucalyptus melliodora*	15
	Blakey's Red Gum *Eucalyptus blakelyi*	10
	Apple Box *Eucalyptus bridgesiana*	2
	Snow Grass *Poa sieberiana*	1
	Red Grass *Bothriochloa macra*	0.1
Justification of evidence used to identify the PCT	Entry of the dominant canopy species recorded at BAM plots 9 and 11 filtered by the Armidale Plateau subregion into the BioNet VC produced a list of 30 candidate PCTs for this community. Further filtering by New England Grassy Woodlands as vegetation class reduced this list to 10 PCTs. Of which , PCTs 704 and 510 (Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion) display the strongest affinity to the vegetation observed. PCT 704 was chosen over PCT 510 as the geographic distribution of PCT 704 aligns better with the development site. Also, 704 contains more of the canopy species incidentally observed in conjunction with Yellow Box and Blakely's Red Gum such as Youman's Stringybark *Eucalyptus youmanii*.	
TEC Status	This PCT is associated with the following TECs: • White Box Yellow Box Blakely's Red Gum Woodland (BC Act – Endangered) • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act – Critically Endangered) This PCT has been confirmed to represent White Box Yellow Box Blakely's Red Gum Woodland.	

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	
	Some areas of this PCT have been found to represent White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. These areas are predominantly in the west of the development site where larger patches of the PCT are present or where disturbed remnants within the development site adjoin areas of the TEC outside the development site such that they are considered the same patch. Further discussion is presented in Section 4
Estimate of percent cleared	80%
Examples	 Figure 3-7 Example of PCT 704 woodland

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion

Figure 3-8 Example of PCT 704 grassland

Figure 3-9 Example of PCT 704 scattered

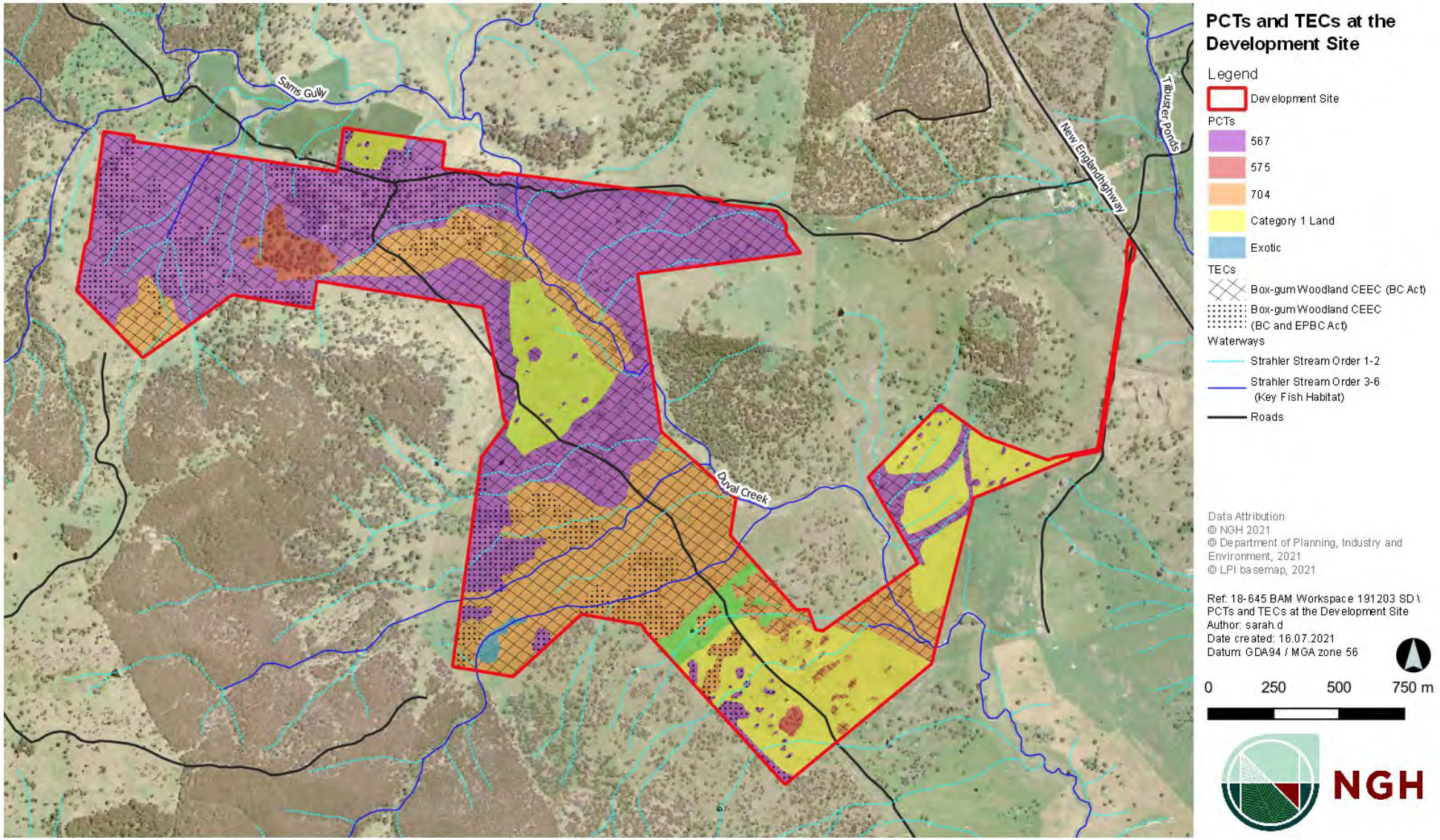

Figure 3-10 PCTs and TECs at the development site

3.4 Vegetation integrity assessment

3.4.1 Vegetation zones and survey effort

The PCTs identified within the development site were further stratified into zones according to condition described below.

Table 3-4 Vegetation zones at the development site and development footprint

Zone ID	PCT ID	Condition	Zone area development site (ha)	Zone area development footprint (ha)	Survey effort (# plots)	Patch size (ha)	Photographic example
1	567_Woodland	Areas of canopy over predominantly native grassland and very occasional midstory	53.2	7.4	5 (plots 1, 4, 5)	>100	

Zone ID	PCT ID	Condition	Zone area development site (ha)	Zone area development footprint (ha)	Survey effort (# plots)	Patch size (ha)	Photographic example
2	567_Grassland	Areas where the canopy has been removed and a predominantly native understory remains	90.7	60.6	5 (plots 12, 13, 22, 15. 16)	>100	
3	567_Scattered	Scattered canopy over cropped land (Cat 1))	2	1.6	1 (plot 17)	>100	

Zone ID	PCT ID	Condition	Zone area development site (ha)	Zone area development footprint (ha)	Survey effort (# plots)	Patch size (ha)	Photographic example
4	575_Forest	Areas of PCT 575 with a native canopy, midstory and understory	5.3	0.4	1 (plot 8)	>100	

Zone ID	PCT ID	Condition	Zone area development site (ha)	Zone area development footprint (ha)	Survey effort (# plots)	Patch size (ha)	Photographic example
5	704_Woodland	Areas of canopy over predominantly native grassland and very occasional midstory	17.9	1.9	3 (plots 9, 11, 18)	>100	
6	704_Grassland	Areas where the canopy has been removed and a predominantly native understory remains	65.9	38.2	4 (plots 19, 14, 20, 21)	>100	

Zone ID	PCT ID	Condition	Zone area development site (ha)	Zone area development footprint (ha)	Survey effort (# plots)	Patch size (ha)	Photographic example
7	704_Scattered	Scattered canopy over cropped land (Cat 1))	5.5	4.6	2 (plots 2, 23)	>100	

Zone ID	PCT ID	Condition	Zone area development site (ha)	Zone area development footprint (ha)	Survey effort (# plots)	Patch size (ha)	Photographic example
8	575_Scattered	Scattered canopy over low condition groundcover	0.7	0.7	1 (plot 3)	>100	

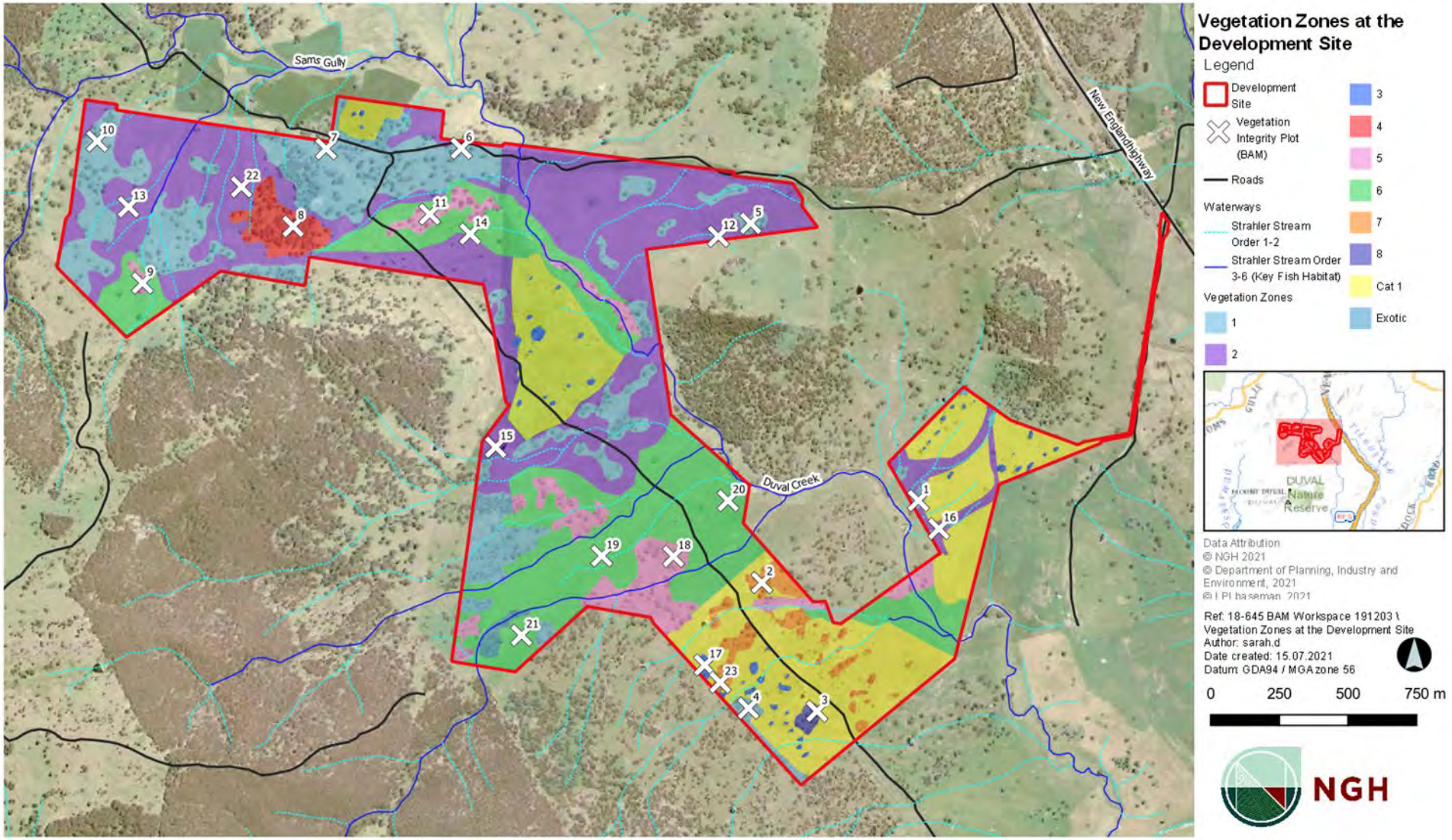

Figure 3-11 Vegetation zones at the development site

3.4.2 Vegetation integrity assessment results

The plot data from vegetation integrity survey plots undertaken were entered into the BAM calculator by accredited assessor (Brendon True - BAAS18155). The results of the vegetation integrity assessment are summarised in Table 3 5 for the vegetation zones that are impacted.

The results of the vegetation integrity assessment are provided in Table 3 5.

Table 3-5 Current vegetation integrity scores for each vegetation zone within the development site

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
1	56.5	54	52.7	**54.4**
2	5.8	0	15	**0.4**
3	5.7	31.5	33.4	**18.2**
4	52	50.2	78.9	**59.1**
5	19.6	33.9	57.7	**33.7**
6	5.3	0	15	**0.5**
7	10.9	31.7	28.3	**21.4**
8	28.8	27.7	66.7	**37.6**

4. Threatened species

4.1 Ecosystem credit species

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site:

Ecosystem Credit Species	Vegetation type(s)	NSW Listing Status	National listing status
Anthochaera phrygia **Regent Honeyeater (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Critically Endangered	Critically Endangered
Artamus cyanopterus **Dusky Woodswallow**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Calyptorhynchus lathami **Glossy Black-Cockatoo (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Chalinolobus nigrogriseus **Hoary Wattled Bat**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Chthonicola sagittata **Speckled Warbler**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Circus assimilis **Spotted Harrier**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Ecosystem Credit Species	Vegetation type(s)	NSW Listing Status	National listing status
Climacteris picumnus victoriae **Brown Treecreeper (eastern subspecies)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Daphoenositta chrysoptera **Varied Sittella**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Dasyurus maculatus **Spotted-tailed Quoll**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Endangered
Falsistrellus tasmaniensis **Eastern False Pipistrelle**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Glossopsitta pusilla **Little Lorikeet**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Grantiella picta **Painted Honeyeater**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Vulnerable
Haliaeetus leucogaster **White-bellied Sea-Eagle (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Ecosystem Credit Species	Vegetation type(s)	NSW Listing Status	National listing status
	PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion		
Hieraaetus morphnoides **Little Eagle (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Lathamus discolor **Swift Parrot (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Endangered	Critically Endangered
Lophoictinia isura **Square-tailed Kite (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Melanodryas cucullata **Hooded Robin (south-eastern form)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Melithreptus gularis **Black-chinned Honeyeater (eastern subspecies)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Miniopterus schreibersii oceanensis **Eastern Bentwing-bat**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Ecosystem Credit Species	Vegetation type(s)	NSW Listing Status	National listing status
(Foraging)	PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion		
Neophema pulchella **Turquoise Parrot**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Ninox connivens **Barking Owl (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Ninox strenua **Powerful Owl (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Petaurus australis **Yellow-bellied Glider**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Petroica boodang **Scarlet Robin**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Petroica phoenicea **Flame Robin**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Ecosystem Credit Species	Vegetation type(s)	NSW Listing Status	National listing status
	PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion		
Phascolarctos cinereus **Koala (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Vulnerable
Pteropus poliocephalus **Grey-headed Flying-fox (Foraging)**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Vulnerable
Saccolaimus flaviventris **Yellow-bellied Sheathtail-bat**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Scoteanax rueppellii **Greater Broad-nosed Bat**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Stagonopleura guttata **Diamond Firetail**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	Vulnerable	Not listed
Tyto novaehollandiae **Masked Owl**	PCT 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion PCT 575: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion	Vulnerable	Not listed

Ecosystem Credit Species	Vegetation type(s)	NSW Listing Status	National listing status
	PCT 704: Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion		

4.1.1 Species excluded from the assessment

No ecosystem credit species were excluded from the assessment; all are assumed to occur and contribute to ecosystem credits.

4.2 Species credit species

4.2.1 Candidate species to be assessed

The BAM-C predicted the following species credit species to occur at the development site. Note that habitat constraints and geographic restrictions have been sourced from the BAM-C and/or Threatened Biodiversity Data Collection (DPIE 2019). Assessment of habitat constraints was undertaken post initial site survey including some BAM plot collection, hollow-bearing tree (HBT) mapping and general habitat assessment.

Table 4-1 Candidate species credit species requiring assessment

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
***Adelotus brevis* - *endangered population* Tusked Frog population in the Nandewar and New England Tableland Bioregions**	Rainforests, wet forests and flooded grassland and pasture. They are usually found near creeks, ditches and ponds, and call while hidden amongst vegetation or debris	Very High	Endangered	Not listed	Associated with PCT 567 only. No moist plant community types or flooded pasture and present. Duval Creek is the only area of potential habitat.	Excluded	Habitat degraded such that the species is unlikely to occur. The nature of Duval Creek varied greatly across the surveys conducted and is highly ephemeral; from completely dry to some flow and pooling evident. The recent drought is likely to have presented conditions that the species could not persist through due to a lack of refuge locations. Water quality would also be poor outside of rainy periods.
***Anthochaera phrygia* Regent Honeyeater (Breeding)**	Mapped Important areas (DPIE)	High	Critically Endangered	Critically Endangered	Outside mapped important areas (DPIE)	Excluded	Not mapped as an important habitat area
***Bertya ingramii* Narrow-leaved Bertya**	Grows among rocks or in thin soils close to cliff-edges in dry woodland with she-oaks, wattles and tea-trees. Within 20 m of cliffs escarpments rocky areas	High	Endangered	Endangered	Limited rocky areas present. Dry woodland present but highly degraded generally. No	Included	Low quality potential habitat present. Survey undertaken.

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
					associate species present.		
Boronia granitica **Granite Boronia**	Grows on granitic soils amongst rock outcrops, often in rock crevices, and in forests and woodlands on granite scree and shallow soils.	High	Vulnerable	Endangered	Limited rock outcrops and crevices. Soils may be suitable.	Included	Low quality potential habitat present. Survey undertaken
Burhinus grallarius **Bush Stone-curlew**	Fallen/standing dead timber including logs	High	Endangered	Not Listed	Small areas of suitable habitat, particularly in the west of the subject land	Included	Low quality habitat present, survey undertaken
Callitris oblonga **Pygmy Cypress Pine**	Usually grows in sand along watercourses in shrubland and open woodland in granite country; it also occurs in drier sites, including exposed ridges. East of Chandler River	High	Vulnerable	Vulnerable	One watercourse present. Some rocky areas	Excluded	Subject land not east of Chandler River
Calyptorhynchus lathami **Glossy Black-Cockatoo (Breeding)**	Living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground.	High	Vulnerable	Not Listed	Suitable HBTs present within development site	Included	Potential breeding habitat present, survey undertaken
Cercartetus nanus **Eastern Pygmy-possum**	Relies on hollow bearing for breeding and nesting as	High	Vulnerable	Not Listed	Suitable HBTs present within development site	Excluded	No suitable habitat in development site due to the absence of preferred

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
	well as banksia, eucalypts and callistemon for foraging.				but minimal foraging habitat and patch size		and abundant foraging species. Habitat degraded such that species is unlikely to occur
Chalinolobus dwyeri **Large-eared Pied Bat**	Within two kilometers of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometers of old mines or tunnels.	Very High	Vulnerable	Not Listed	No suitable habitat present	Excluded	No suitable habitat in development site
Chiloglottis platyptera **Barrington Tops Ant Orchid**	Grows in moist areas in tall open eucalypt forest with a grassy understorey, and also around rainforest edges. It generally occurs in rich brown loam soils	High	Vulnerable	Not listed	No moist areas present which could support this species	Excluded	No suitable habitat in development site
Dichanthium setosum **Bluegrass**	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	High	Vulnerable	Vulnerable	Pasture and grassland areas present, though highly disturbed	Included	Low quality habitat present within PCTs 567 and 704. Habitat highly modified.
Diuris pedunculata **Small Snake Orchid**	Grows on grassy slopes or flats.	High	Endangered	Endangered	Grassy slopes flats present. No	Excluded	General habitat constraints present,

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
	Often on peaty soils in moist areas. Also, on shale and trap soils, on fine granite, and among boulders.				boulders or moist areas.		however, potential habitat highly degraded due to historical land use, namely intensive sheep and cattle grazing which can all but remove the ground cover during adverse conditions such as recent drought. Grazing is a known threat to the species. Habitat is degraded such that the species is unlikely to occur.
Eucalyptus magnificata **Northern Blue Box**	Grassy open forest or woodland on shallow, sandy or loamy soils. Occurs on moderately hilly sites and at the edge of gorges, usually at altitudes from 900 - 1050 m.	High	Endangered	Not listed	Grassy open woodland present	Included	Habitat present. Survey undertaken.
Eucalyptus nicholli **Narrow-leaved Black Peppermint**	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Tends to grow on lower slopes in the landscape.	High	Vulnerable	Vulnerable	Dry Grassy woodland present on low slopes	Included	Potential habitat present. Survey undertaken.

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
Grevillea beadleana **Beadle's Grevillea**	Oxley Wild Rivers National Park or within a 10 km buffer of the NP. Within 200 m of cliffs, escarpments or rocky areas.	High	Endangered	Endangered	Not within 10 km of Oxley Rivers National Park	Excluded	Geographic limitation not met
Haliaeetus leucogaster **White-bellied Sea-Eagle (Breeding)**	Living or dead trees within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines.	High	Vulnerable	Not Listed	Duval Creek present with large trees within 1 km thereof, though dry at the time of writing	Included	Low quality habitat present. Survey undertaken
Haloragis exalata **subsp. *velutina*** **Tall Velvet Sea-berry**	Grows in damp places near watercourses. This subspecies also occurs in woodland on the steep rocky slopes of gorges.	High	Vulnerable	Vulnerable	Associated habitat limited to PCT 567 which lacks watercourses and noteworthy damp places or steep rocky slopes	Excluded	PCT 567 habitat marginal (lacks known micro-habitats). Groundcover degraded due to historical land use, namely intensive sheep and cattle grazing which can all but remove the ground cover during adverse conditions such as recent drought.
Hieraaetus morphnoides **Little Eagle (Breeding)**	Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. Isolated trees may also be used.	High	Vulnerable	Not Listed	Duval Creek present with large trees present alongside. Isolated trees also present.	Included	Low quality habitat present. Survey undertaken

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
Hoplocephalus bitorquatus **Pale-headed Snake**	Can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. Frogs are main prey.	High	Vulnerable	Not listed	HBTs and suitable vegetation classes present, however, habitat degraded. Duval Creek unlikely to present consistent foraging habitat	Included	Low quality habitat present.
Lathamus discolor **Swift Parrot**	Mapped Important areas (DPIE)	Moderate	Endangered	Critically Endangered	Outside mapped important areas (DPIE)	Excluded	Outside mapped important area (DPIE)
Lepidium hyssopifolium **Aromatic Peppercress**	In NSW the species was known to have occurred in both woodland with a grassy understorey and in grassland. The species may be a disturbance opportunist, as it was discovered at the most recently discovered site (near Bungendore) following soil disturbance.	High	Endangered	Endangered	Associated with PCT 704. Grassy woodland present, however, degraded	Excluded	Habitat degraded such that the species is unlikely to occur. Species unlikely to persist through years of stock grazing. Low number of forbs (4) recorded in PCT 704. Threats include grazing and exotic pasture species, both prevalent within PCT 704.
Litoria subglandulosa **Glandular Frog**	Glandular Frogs may be found along streams in rainforest, moist and dry	Very High	Vulnerable	Not listed	Subject land contains grassy woodland only with	Excluded	Habitat degraded such that species is unlikely to occur. The nature of

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
	eucalypt forest or in subalpine swamps.				a degraded understory, which is far from typical habitat for the species.		Duval Creek varied greatly across the surveys conducted and is highly ephemeral; from completely dry to some flow and pooling evident. The recent drought is likely to have presented conditions that the species could not persist through due to a lack of refuge locations. Water quality would also be poor outside of rainy periods. More suitable habitat may occur in the higher altitude areas in the surrounding landscape, however, Duval Creek is unlikely to present a means of dispersal between said habitat, given the ephemeral nature of the waterway and sparse cover of woody vegetation for resting.
Lophoictinia isura **Square-tailed Kite (Breeding)**	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular	High	Vulnerable	Not listed	Potential nest trees present	Included	Low quality habitat present, survey undertaken

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
	preference for timbered watercourses.						
Miniopterus schreibersii oceanensis **Eastern Bentwing-bat (Breeding)**	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Very High	Vulnerable	Not listed	No suitable habitat present	Excluded	No suitable habitat present
Myotis macropus **Southern Myotis**	Hollow-bearing trees within 200 m of riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone	High	Vulnerable	Not Listed	Habitat constraints present, however, Duval Creek unlikely to present consistent forage	Included	Habitat constraints present, though habitat poor quality. Survey undertaken.
Ninox connivens **Barking Owl (Breeding)**	Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	High	Vulnerable	Not listed	Potential breeding habitat present	Included	Habitat present, survey undertaken
Ninox strenua **Powerful Owl (Breeding)**	Living or dead trees with hollow greater than 20 cm diameter. Within 5 km of Macleay Georges subregion	High	Vulnerable	Not listed	Breeding constraint present, not within geographic limitation	Excluded	Geographic limitation not met
****Petauroides volans*** **Greater Glider**	Largely restricted to eucalypt forest and woodland. Requires a degree of connectivity as has a low capacity for dispersal.	High	Not listed	Vulnerable	Potential breeding and foraging habitat present with treed areas of PCTs 567 and 704 in the south/west of the subject land.	Included	Habitat present. Survey undertaken.

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
Petaurus norfolcensis **Squirrel Glider**	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	High	Vulnerable	Not listed	Suitable breeding habitat present	Included	Suitable habitat present, survey undertaken
Petrogale penicillata **Brush-tailed Rock Wallaby**	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	Very High	Endangered	Vulnerable	Habitat not present	Excluded	Suitable habitat not present
Phascolarctos cinereus **Koala (Breeding)**	Areas identified via survey as important habitat based on density of Koalas and quality of habitat.	High	Vulnerable	Vulnerable	Survey required to identify if habitat present	Included	Habitat present, survey undertaken
Picris evae **Hawkweed**	Its main habitat is open Eucalypt forest including a canopy of *Eucalyptus melliodora*, *E. crebra*, *E. populnea*, *E. albens*,	High	Vulnerable	Vulnerable	Eucalyptus melliodora woodland present (PCT 704) and grassy understory,	Excluded	Habitat degraded such that species is unlikely to occur. Species unlikely to persist through years of stock grazing. Low

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
	Angophora subvelutina, Allocasuarina torulosa , and/or Casuarina cunninghamiana with a Dichanthium grassy understory.				albeit without *Dichanthium* and degraded		number of forbs (4) recorded in PCT 704. Threats include grazing which is prevalent.
Pteropus poliocephalus **Grey-headed Flying-fox (Breeding)**	Breeding camps. Breeding camps will need to be identified by survey	High	Vulnerable	Vulnerable	Breeding camps not present	Excluded	Habitat assessment undertaken, no breeding camps present
Swainsona sericea **Silky Swainson-pea**	Box-gum woodland in southern tablelands and South West Slopes. Sometimes in association with cypress pines.	High	Vulnerable	Not Listed	Box-gum woodland present, though degraded	Excluded	Habitat degraded such that species is unlikely to occur. Species unlikely to persist through years of stock grazing. Low number of forbs generally recorded. Threats include grazing and exotic pasture species, both prevalent within PCT 704 and 567.
Thesium australe **Austral Toadflax**	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda triandra*). A root parasite that takes	High	Vulnerable	Vulnerable	Grassy woodland present but contains little Kangaroo Grass (observed cover of less than 10m2 at one location only).	Excluded	Habitat degraded such that species is unlikely to occur. Kangaroo grass extremely rare. Grazing by livestock is a main threat to the species which is prevalent.

Species Credit Species	Habitat constraints, components and geographic limitations	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat components and abundance present	Included or excluded	Reasoning
	water and some nutrient from other plants, especially Kangaroo Grass.						
Tyto novaehollandiae **Masked Owl (Breeding)**	Living or dead trees with hollows greater than 20cm diameter. Paddock trees may be used. There is no seasonal variation in its distribution. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	High	Vulnerable	Not listed	Potential breeding HBTs present	Included	Habitat present, survey undertaken

* this species is EPBC Act listed only.

4.2.2 Inclusions and exclusions based on habitat features and geographic limitations

The following species credit species have been either included or excluded from further assessment based on the lack of habitat features or geographic limitations associated with the species not being met.

Table 4-2 Species credit species included and excluded based on habitat features

Species Credit Species	Habitat constraints, components and geographic limitations	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Anthochaera phrygia **Regent Honeyeater (Breeding)**	Mapped Important areas (DPIE)	Outside mapped important areas (DPIE)	Excluded	Not mapped as an important habitat area
Callitris oblonga **Pygmy Cypress Pine**	Usually grows in sand along watercourses in shrubland and open woodland in granite country; it also occurs in drier sites, including exposed ridges. East of Chandler River	One watercourse present. Some rocky areas	Excluded	Subject land not east of Chandler River
Chalinolobus dwyeri **Large-eared Pied Bat**	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	No suitable habitat present	Excluded	No suitable breeding habitat in development site
Chiloglottis platyptera **Barrington Tops Ant Orchid**	Grows in moist areas in tall open eucalypt forest with a grassy understorey, and also around rainforest edges. It generally occurs in rich brown loam soils	No moist areas or rainforest edges present which could support this species	Excluded	Habitat not present
Grevillea beadleana **Beadle's Grevillea**	Oxley Wild Rivers National Park or within a 10 km buffer of the NP.	Not within 10 km of Oxley Rivers National Park	Excluded	Geographic limitation not met

Species Credit Species	Habitat constraints, components and geographic limitations	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	Within 200 m of cliffs, escarpments or rocky areas.			
Lathamus discolor **Swift Parrot**	Mapped Important areas (DPIE)	Outside mapped important areas (DPIE)	Excluded	Outside mapped important area (DPIE)
Miniopterus schreibersii oceanensis **Eastern Bentwing-bat (Breeding)**	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	No suitable habitat present	Excluded	No suitable breeding habitat present
Ninox strenua **Powerful Owl (Breeding)**	Living or dead trees with hollow greater than 20 cm diameter. Within 5 km of Macleay Georges subregion	Breeding constraint present, not within geographic limitation	Excluded	Geographic limitation not met
Petrogale penicillata **Brush-tailed Rock Wallaby**	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	Habitat constraints not present	Excluded	Habitat constraints not present
Pteropus poliocephalus **Grey-headed Flying-fox (Breeding)**	Breeding camps. Breeding camps will need to be identified by survey	Breeding camps not present	Excluded	Habitat assessment undertaken indicated no breeding camps are present

4.2.3 Exclusions based on habitat quality

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). These species are identified in Table 4 3 along with justification regarding the habitats present.

Table 4-3 Species credit species excluded based on habitat quality

Species Credit Species	Habitat constraints, components and geographic limitations	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Adelotus brevis* - *endangered population **Tusked Frog population in the Nandewar and New England Tableland Bioregions**	Rainforests, wet forests and flooded grassland and pasture. They are usually found near creeks, ditches and ponds, and call while hidden amongst vegetation or debris	No moist plant community types present. Duval Creek unsuitable habitat and is dry at the time of writing. Duval Creek is unlikely to be able to support the species.	Excluded	Habitat degraded such that the species is unlikely to occur
Cercartetus nanus **Eastern Pygmy-possum**	Relies on hollow bearing for breeding and nesting as well as banksia, eucalypts and callistemon for foraging.	Suitable HBTs present within development site, however, PCTs present lack key foraging resources and connectivity such that the subject land is unlikely to be able to support the species.	Excluded	Habitat degraded such that species is unlikely to occur
Diuris pedunculata **Small Snake Orchid**	Grows on grassy slopes or flats. Often on peaty soils in moist areas. Also on shale and trap soils, on fine granite, and among boulders	Grassy slopes flats present. No boulders or moist areas.	Excluded	Habitat degraded such that the species is unlikely to occur. Unlikely the species would persist through years of stock grazing.
Haloragis exalata subsp. velutina **Tall Velvet Sea-berry**	Grows in damp places near watercourses and woodland on steep rocky slopes of gorges.	Watercourses present but have been dry for over 12 months. No steep rocky slopes of gorges present.	Excluded	Habitat degraded such that the species is unlikely to occur
Lepidium hyssopifolium **Aromatic Peppercress**	In NSW the species was known to have occurred in both	Woodland and grassland present, but highly degraded due to land use.	Excluded	Habitat degraded such that species is unlikely to occur

Species Credit Species	Habitat constraints, components and geographic limitations	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	woodland with a grassy understorey and in grassland			
Litoria subglandulosa **Glandular Frog**	Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps.	Duval Creek only waterbody, which is dry at the time or writing. Subject land is unlikely to be able to support the species.	Excluded	Habitat degraded such that species is unlikely to occur
Picris evae **Hawkweed**	Its main habitat is open Eucalypt forest including a canopy of *Eucalyptus melliodora*.	Woodland containing Yellow Box present, but highly degraded due to land use.	Excluded	Habitat degraded such that species is unlikely to occur
Swainsona sericea **Silky Swainson-pea**	Found in Natural Temperate Grassland and Snow Gum Eucalyptus pauciflora Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Box-gum woodland present, but highly degraded due to land use.	Excluded	Habitat degraded such that species is unlikely to occur
Thesium australe **Austral Toadflax**	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	Grassy woodland present but highly degraded due to land use. Kangaroo Grass not recorded during surveys.	Excluded	Habitat degraded such that species is unlikely to occur

4.2.4 Candidate species requiring confirmation of presence or absence

The species listed in Table 4 4 are those that are considered to have habitats present at the development site. None of these species are assumed to be present on the site. Surveys have been conducted for the remaining species. The results are summarised in Table 4 4. Details of the survey methodologies and results are provided for each surveyed species are provided below. Targeted survey locations are mapped on Figure 4 1.

Species polygons have been defined for the species present on the site as mapped on Figure 4 1.

Table 4-4 Summary of species credit species requiring confirmation of presence or absence

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Bertya ingramii **Narrow-leaved Bertya**	3	Surveyed November 2019	No	NA
Boronia granitica **Granite Boronia**	2	Surveyed November 2019	No	NA
Burhinus grallarius **Bush Stone-curlew**	2	Surveyed November 2019	No	NA
Calyptorhynchus lathami **Glossy Black-Cockatoo (Breeding)**	2	Surveyed August 2019	No	NA
Dichanthium setosum **Bluegrass**	2	Surveyed December 2020	No	NA
Eucalyptus magnificata **Northern Blue Box**	2	Surveyed August 2019	No	NA
Eucalyptus nicholli **Narrow-leaved Black Peppermint**	2	Surveyed August 2019	No	NA
Haliaeetus leucogaster **White-bellied Sea-Eagle (Breeding)**	2	Surveyed August 2019	No	NA
Hieraaetus morphnoides **Little Eagle (Breeding)**	1.5	Surveyed August 2019	No	NA
Hoplocephalus bitorquatus **Pale-headed Snake**	2	Assumed to occur	Yes	6.5 ha
Lophoictinia isura **Square-tailed Kite (Breeding)**	1.5	Surveyed November 2019	No	NA
Myotis macropus **Southern Myotis**	2	Surveyed November 2019. Recorded during survey.	Yes	53.3 ha

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Ninox connivens **Barking Owl (Breeding)**	2	Surveyed August 2019	No	NA
Petauroides volans **Greater Glider**	2	Surveyed August and November 2019 Recorded during survey	Yes	3.3 ha
Petaurus norfolcensis **Squirrel Glider**	2	Surveyed August and November 2019	No	NA
Phascolarctos cinereus **Koala (Breeding)**	2	Surveyed August and November 2019 Recorded during November 2019 survey	Yes, sections of the development site containing higher frequency of feed trees considered to constitute important habitat for breeding	15.5 ha
Tyto novaehollandiae **Masked Owl (Breeding)**	2	Surveyed August 2019	No	NA

4.2.5 Candidate species survey effort

Targeted surveys were undertaken over three visits to the development site from August 2019 to November 2019 inclusive, and December 2020. Prior, two site visits had taken place in August and November 2018 to stratify the development site and assess it for habitat values and constraints that would later be used to establish the list of candidate species to be targeted. A summary of the targeted surveys undertaken including weather conditions for survey dates from the Bureau of Meteorology (BOM) at the Tree Group Nursery (station 056037) and Armidale Airport AWS (station 056238) is provided in Table 4 5 below. Details regarding survey effort and methodology for candidate species requiring assessment follow. Pale-headed Snake Hoplocephalus bitorquatus is advised to be surveyed 1-2 days after rainfall and on humid nights, conditions that could not be satisfied. Pale-headed Snake has been assumed to occur across treed areas of PCT 704 (the species PCT associate) near water features for foraging and that have some connectivity and HBTs for sheltering. This includes Zone 5 and 6.

Table 4-5 Summary of targeted survey and weather conditions

Survey Date	Maximum temperature (ºC)	Minimum temperature (ºC)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Candidate species targeted
13th August 2019	-5.7	15.6	0, 7	30	Barking Owl, Masked Owl, Glossy Black-Cockatoo, White-bellied Sea Eagle, Little Eagle, Squirrel Glider, Koala, Northern Blue Box, Narrow-leaved Black Peppermint
14th August 2019	-5.5	16.6	0, 7	33	Barking Owl, Masked Owl, Glossy Black-Cockatoo, White-bellied Sea Eagle, Little Eagle, Squirrel Glider, Koala, Northern Blue Box, Narrow-leaved Black Peppermint
15th August 2019	-4.3	16.9	0, 7	44	Glossy Black-Cockatoo, White-bellied Sea Eagle, Little Eagle, Koala, Northern Blue Box, Narrow-leaved Black Peppermint
18th November 2019	27	8.4	0	39	Square-tailed Kite, Bush Stone- Curlew, Squirrel Glider, Koala, Southern Myotis
19th November 2019	30.4	5.4	0		Square-tailed Kite, Bush Stone- Curlew, Squirrel Glider, Koala, Southern Myotis
20th November 2019	34.6	6.8	0		Square-tailed Kite, Koala, Southern Myotis, Narrow-leaved Bertya, Granite Boronia
21st November 2019	32.6	10.7	0		Square-tailed Kite, Koala, Southern Myotis
7th December 2020	23.3	16.9	0	50	Bluegrass
8th December 2020	21	11.4	0.4	52	Bluegrass

Diurnal birds (Glossy Black Cockatoo, White-bellied Sea Eagle, Little Eagle and Square-tailed Kite)

SURVEY EFFORT

Opportunistic surveys were undertaken across 13th – 15th August and 18th – 21st November 2019 including traversing the site by car and on foot. Opportunistic sightings of birds were also recorded during all field surveys.

Surveys for large stick nests were undertaken during August for White-bellied Sea Eagle and Little Eagle, and again during November targeting Square-tailed Kite.

All trees within the development footprint were surveyed for the presence of hollows during the 14th and 15th August. The number, size and height of hollows were recorded for each tree along with any evidence of use to identify suitable breeding habitat for Glossy Black-Cockatoo. Hollows were categorised as small (< 10 cm), medium (10 – 20 cm), and large (> 20 cm).

SURVEY RESULTS

None of the targeted candidate diurnal avifauna species or evidence of breeding (i.e. large stick nests for raptors) were observed during the surveys.

Hollow-bearing trees were identified within the development footprint (Figure 4-1), however, none with suitable attributes (hollow greater than 15 cm an 5 m or more above the ground (DPIE 2019) displayed evidence of breeding by Glossy Black-Cockatoo.

A full list of bird species observed during the surveys is shown in Appendix B.2.

Nocturnal birds (Bush Stone-Curlew, Barking Owl and Masked Owl)

SURVEY EFFORT

Targeted surveys were conducted for nocturnal birds across the evenings of the 13th – 14th August (Barking Owl and Masked Owl) and 18th – 19th November (Bush Stone-Curlew). The owl species were targeted at two locations involving call-playback and spotlighting for three person hours per night. Similarly, Bush Stone-Curlew was targeted at two locations involving call-playback and spotlighting for three person hours per night. Call-playback was followed by a period of listening then spotlighting in all instances.

SURVEY RESULTS

No threatened birds were seen or heard during the survey. Generally, presence of nocturnal bird species was highly limited and with only a Tawny Frogmouth *Podargus strigoides*. It is not considered that breeding of the surveyed species occurs within the development site.

Nocturnal mammals (Squirrel Glider, Koala and Greater Glider)

SURVEY EFFORT

Spotlighting surveys undertaken across the 13th and 14th August are considered to contribute to the survey effort for Squirrel Glider, Greater Glider and Koala, with further survey, including call-playback for Squirrel Glider and Koala across the evenings of the 18th and 19th November for three person hours per night. Targeted searches for Koalas were undertaken during the day on the 13th - 15th August (as HBTs were and catalogued) and again across the 18th - 21st November. Mature feed trees via Spot Assessment Technique (SAT) were searched for signs of Koalas such as scats and scratches at four locations.

SURVEY RESULTS

No Koalas were observed during the surveys; however, faecal pellets were found at SAT Site 2 as well as a possible call during one nights' survey. Therefore, Koala are considered to be present within the development site. Although faecal pellets were found at only one tree out of the 120

trees surveyed and that the quality of habitat is considered low overall, sections of PCT 704 that contain a higher frequency of primary and secondary feed trees (Ribbon Gum, Yellow Box and Blakely's Red Gum) are considered to constitute important habitat for Koala breeding in accordance with the Threatened Biodiversity Data Collection. A species polygon for Koala has been produced accordingly, essentially covering all wooded vegetation zones, as shown of Figure 4-2.

No Squirrel Gliders were heard or observed. During November 2019, only one nocturnal mammal was observed, that of a Brush-tailed Possum *Trichosurus vulpecula*. During the August 2019 surveys, a Greater Glider, which has been recorded in Duval Nature Reserve as recently as 2009 (DPIE 2019), was recorded within Zone 1 in the west of the development site, outside the development footprint. Greater Glider are listed as Vulnerable under the (EPBC Act) only, however, in accordance with the Bilateral Agreement between the NSW and Australian Governments, Greater Glider has been assessed using the BAM. The location of the sighting of Greater Glider, as well as the species polygon generated for the species, are shown on Figure 4-3. The species polygon for Greater Glider has been prepared with the species limited dispersal capability in mind.

Impacts to Greater Glider specific to the EPBC Act are discussed in Section 5.3.

Threatened trees (Narrow-leaved Black Peppermint and Northern Blue Box)

SURVEY EFFORT

All trees within the development footprint were surveyed across the 13th – 15th August 2019 for the potential to be Narrow-leaved Black Peppermint or Northern Blue Box.

SURVEY RESULTS

Neither species were found to be present within the development footprint.

Bluegrass

SURVEY EFFORT

Bluegrass was subject to targeted surveys in early December 2020. Prior to the surveys commencing, a known nearby reference population (Armidale Bicentennial Arboretum) was inspected to determine if the species was in flower, which it was. Understory growth within the subject land was vastly different during December 2020 than it was during the previous summer (see Section 3.4). This revealed that much of the understory within potential Bluegrass habitat (PCTs 567 and 704), particularly in the north, was dominated by dense growth of exotic grass species such as Rat's Tail Fescue *Vulpia myuros* and Phalaris *Phalaris aquatica*, indicating significant historical disturbance such as cropping and pasture improvement. Areas where this was less evident and there was higher native grass cover and diversity was limited (typical species being Snowgrass *Poa sieberiana* and Common Wheatgrass *Elymus scaber* var. *scaber*) but include the southern section of Duval Creek as well as portions of Zones 1, 5, and 6, throughout the centre of the subject land. These areas were actively searched on foot utilising 5-10 m parallel traverses depending on the height and density of the groundcover. Within the other areas of PCTs 567 and 704 that were heavily exotic, a random meander style survey was utilised whereby small pockets of ground cover that had noticeably higher native resilience were actively searched in more detail. Surveys were conducted over two days for a total of 30 person hours. The areas surveyed, as well as GPS track data is shown on Figure 4-4.

SURVEY RESULTS

Bluegrass was not detected during targeted surveys for the species. The groundcover condition that was present in December 2020, as well as the soil landscape (the subject land being granite based and Bluegrass generally growing on basalt) indicates that the likelihood of the species occurring within the subject land is inherently low, and the highest likelihood areas were actively surveyed with the species not detected.

A population of Bluegrass, or part thereof, is not considered to occur within the subject land.

Southern Myotis

SURVEY EFFORT

The habitat constraint for Southern Myotis is HBTs or suitable artificial roosting structures within 200 m of a waterbody with pools/stretches 3 m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land (DPIE 2019). As Duval Creek was found to be dry during November 2019 surveys, the two farm dams that contained sufficient water were targeted using passive bat detectors (Anabat Swift from Titley Scientific) across the nights of the 18th – 20th November. Two nights at one location and one night at the other.

SURVEY RESULTS

Calls were downloaded and converted from full spectrum calls to Zero-crossing calls using Wildlife Acoustics Kaleidoscope software, then analysed through AnalookW. Analysis was undertaken and assessed with reference to Bat Calls of New South Wales (Pennay, Law and Reinhold 2004). Reference calls were used for comparison and species confirmation.

Analysis of data revealed the definite, probable, or possible presence of six microbat species:

- Lesser Long-eared Bat *Nyctophilus geoffroyi* (Probable) – non-threatened
- *Nyctophilus sp.* (Possible) – non-threatened
- Chocolate Wattled Bat *Chalinolobus morio* (Definite) – non-threatened
- Southern Myotis *Myotis macropus* (Probable) – Target Species Credit Species (Vulnerable)
- Greater Broad-nosed Bat *Scoteanax rueppellii* – Ecosystem Credit Species (Vulnerable)
- Little Forest Bat *Vespadelus vulturnus* (Definite) – non-threatened

A species polygon for Southern Myotis has been produced by buffering Duval Creek and all nine dams within the development site by 200 m as per the TBDC. This is shown on Figure 4-3. The area covered by the species polygon has been entered into the BAM-C for each affected zone to calculate species credits required to be offset for Southern Myotis.

Shrubs (Narrow-leaved Bertya and Granite Boronia)

SURVEY EFFORT

Areas of outcropping in the north-east of Zone 1 were searched via parallel field traverses in accordance with the NSW Guide for Surveying Threatened Plants during November 2019. This involved 10 m wide field traverses for three person hours.

SURVEY RESULTS

Neither species were found to be present within the development footprint.

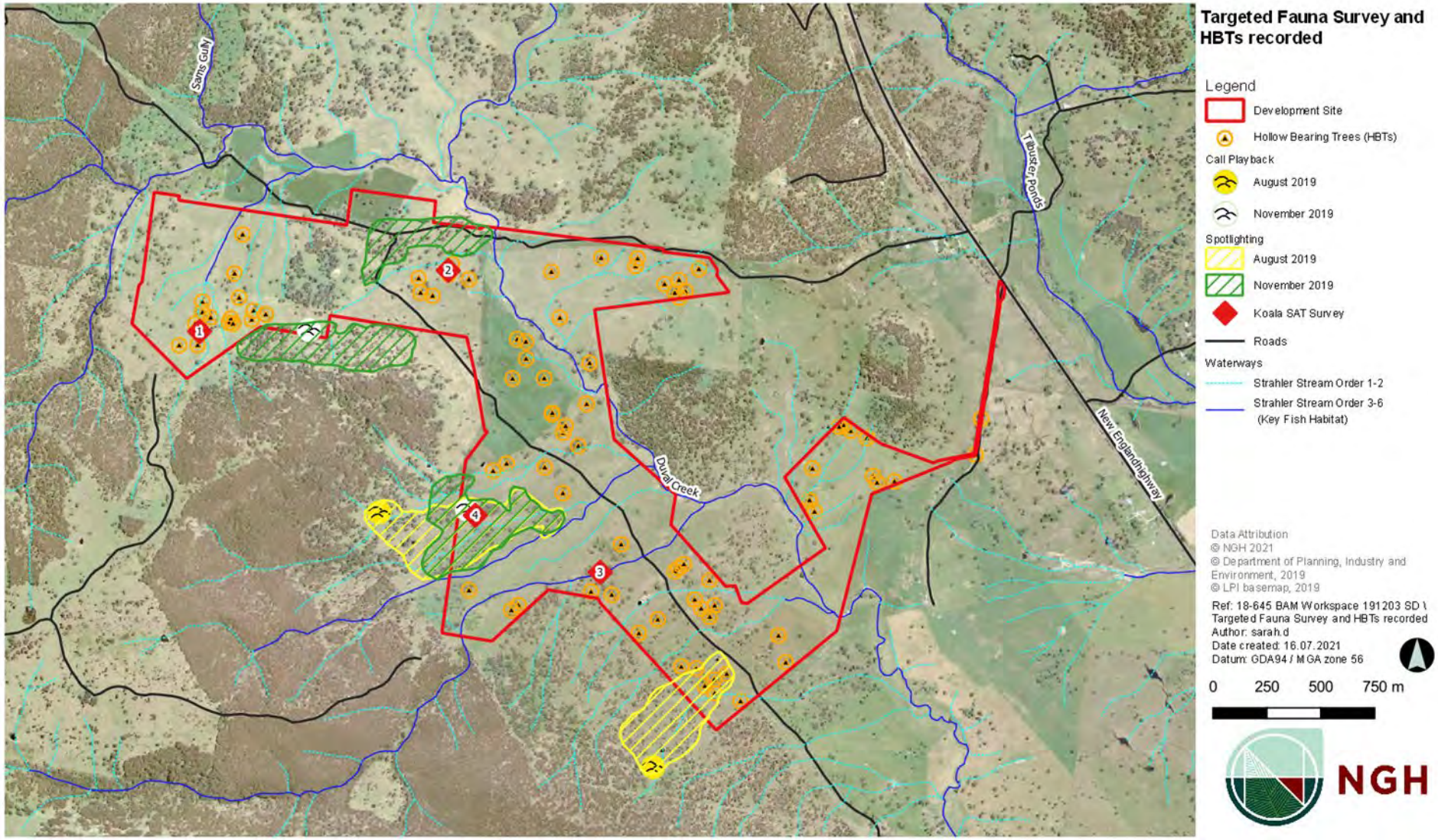

Figure 4-1 Targeted Fauna Survey and HBTs recorded

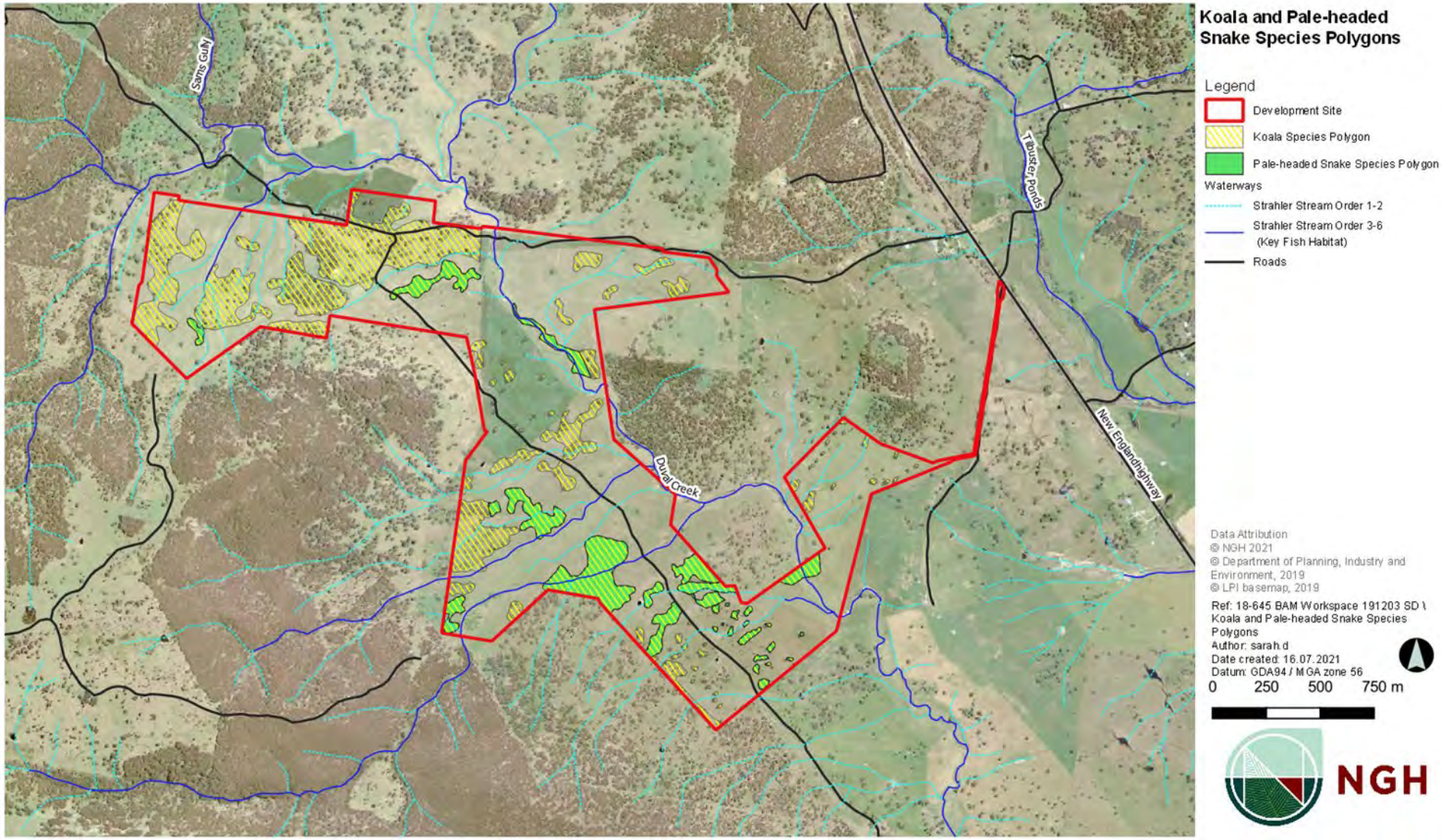

Figure 4-2 Koala and Pale-headed Snake Species Polygons

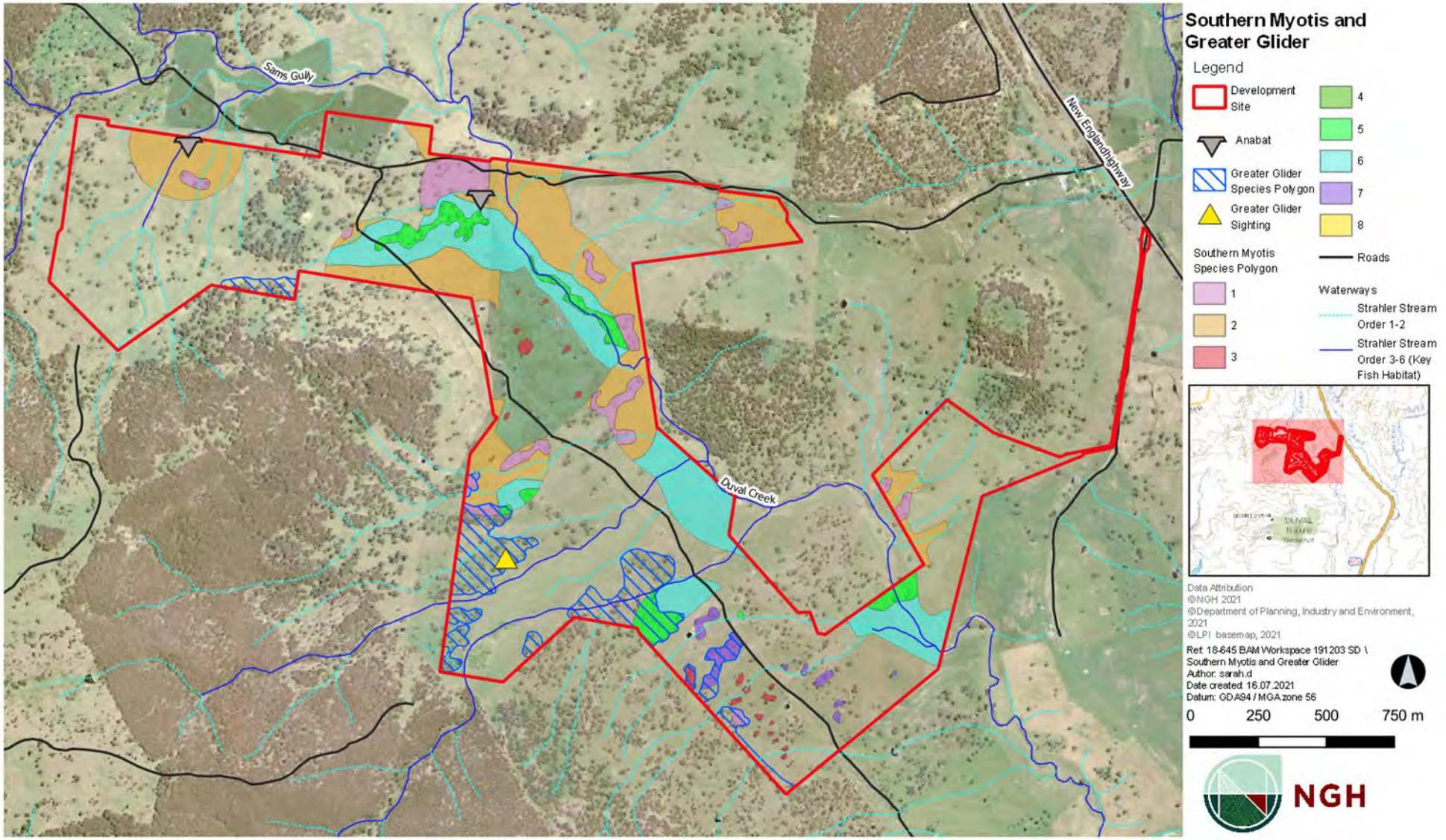

Figure 4-3 Greater Glider and Southern Myotis Species Polygons

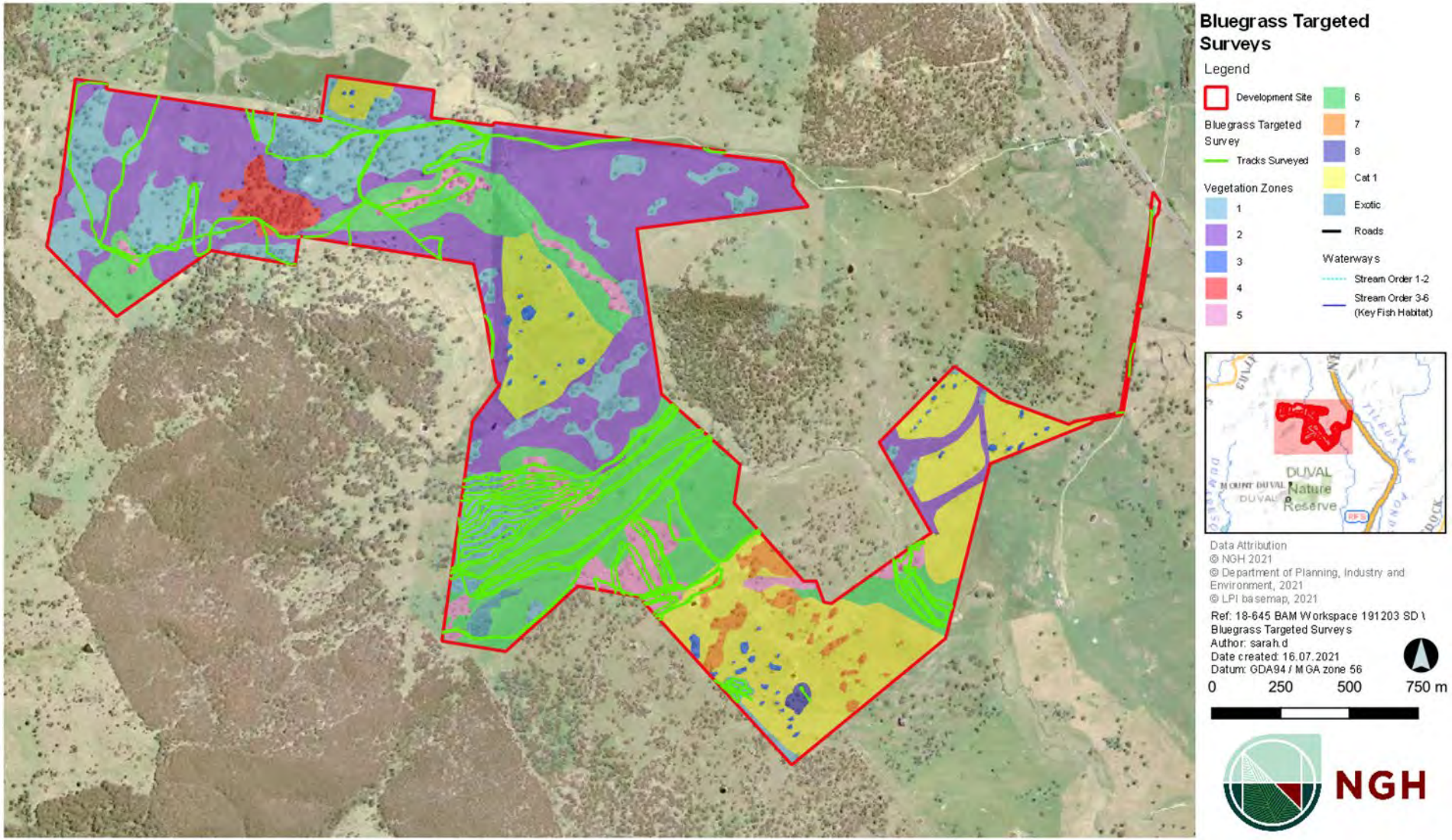

Figure 4-4 Bluegrass Field Traverses

4.3 Additional habitat features relevant to prescribed biodiversity impacts

4.3.1 Occurrences of karst, caves, crevices and cliffs

No karst, caves, crevices or cliffs occur within the development site.

4.3.2 Occurrences of rock

Isolated areas of rock outcrop were observed within Zone 1 in the north-east of the development site consisting of largely embedded rock and sporadic loose rock. They occur primarily in conjunction with small, isolated patches of remnant woodland (PCT 567). The groundcover in these locations, as with the majority of the development site, has been subject to heavy grazing.

Further to the above and as mentioned in Section 2.8, a formation known as 'Red Rock' occurs in the north-east of the development site.

Figure 4-5 Example of rock outcropping in the north-east of Zone 1

These outcrops are not considered potential habitat for species credit candidates such as Large-eyed Pied Bat or Brush-tailed Rock Wallaby. Species credit flora candidates associated with rock outcropping have all been surveyed for.

4.3.3 Occurrences of human made structures and non-native vegetation

No human-made structures that could be used by threatened species occur within the development site

Non-native vegetation within the development site consists of both cleared paddocks with improved pasture species such as Vulpia as well as a drainage line in the west of the development site that contains a Salix sp. No threatened species are considered to rely on the non-native vegetation within the development site, however, they may be used for forage of traversal for species such as Southern Myotis on occasion.

Figure 4-6 Exotic vegetation in the west of the development site

4.3.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands

Duval Creek is a fifth order stream under the Strahler stream classification system (Strahler 1952) and is situated north to south within the development site. The riparian vegetation has been subject to modification due to historical agricultural land use such that little native canopy remains and a midstorey is absent. This historical clearing has caused the banks to erode significantly along its length within the development site. While Duval Creek was dry during August and November 2019, available moisture does collect in some places that generally creates mud rather than pooling. Cumbungi Typha sp. is generally associated with these damp areas.

Unnamed drainage lines, tributaries of Duval Creek, occur on occasion throughout the development site. Some are third and second order streams (Strahler 1952) but most are first

order. These drainage lines are ephemeral and have been extensively modified through internal roads and surrounding land use. All were dry during the August and November 2019 site visits, though they would feed Duval Creek during periods of sufficient precipitation. Duval Creek represents Key Fish Habitat (Type 3 – minimally sensitive key fish habitat) (DPIE 2013 update). No waterway within the development site is mapped as threatened aquatic fauna habitat on Fisheries NSW Spatial Data Portal and Duval Creek has a Freshwater Fish Community Status of 'Poor'.

Although 11 water crossings are required, it is not anticipated that these drainage lines and Duval Creek would be significantly impacted or have broader impacts for environments that sustain and interact with the rivers, streams and wetlands either on or offsite.

Figure 4-7 Duval Creek during August 2019 site visit

5. Matters of national environmental significance

An EPBC Act protected matters report was undertaken on 2 October 2019 and again on 19 January 2021(10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (Appendix E). Relevant to Biodiversity these include:

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

The potential for these MNES to occur at the site are discussed below.

5.1 Wetlands of international importance

Four wetlands of international importance were returned from the protected matters report. The nearest of these (within 200 – 300 km upstream of the development site) is the Gwydir Wetlands. All other wetlands returned from the search are over 1000 km away. The Gwydir Wetlands occur approximately 344 km to the north-east north of the development site. There is no apparent connectivity between waters that feed this wetland and those within the development site.

5.2 Threatened ecological communities

Three threatened ecological communities were returned from the protected matters report. One of these, the critically endangered *White box - Yellow box - Blakely's red gum grassy woodlands and derived native grasslands* (Box-gum Woodland and DNGs CEEC), has been found to occur within the development site, predominantly in the west and north where larger patches of PCTs 567 and 704 are present and where disturbed remnants within the development site adjoin bushland that is likely to represent the TEC outside the development site, such that they are considered part of the same patch.

Patches of bushland can be considered Box-gum Woodland and DNGs CEEC in two ways:

- either they have a predominantly native understory of perennial species, be greater than 0.1 ha in size, and contain an important species, or
- either they have a predominantly native understory of perennial species, be greater than 2 ha in size, and contain an average of 20 or mature trees per hectare.

Patches of bushland within the development site qualify as Box-gum Woodland and DNGs CEEC using either pathway. Areas in the north, that have been avoided by the development footprint meet the requirements of the first pathway, whereas more disturbed patches, typically along the western boundary of the development site, have qualified via the second. This is possible due to their connectivity to vegetation outside the development site that, on balance, are considered likely to contain a suitable understory, sufficient total patch size and frequency of mature trees. Box-gum Woodland and DNGs CEEC has been estimated to cover 59.7 ha of the development site.

5.3 Threatened species

Thirty-three threatened species were returned from the protected matters report, excluding marine and wetland migratory species. Of these, three are considered to have the potential to utilise the habitats at the development site (Appendix F):

- Greater Glider *Petaurus volans* – Vulnerable. Recorded during August 2019 surveys in Zone 1 outside the development footprint near the western boundary of the development site. Habitat for this species within the development site is generally limited to the ribbons of wooded vegetation that remain at this location covering about 20 ha. Given the disconnectedness and patchiness of the other wooded vegetation present within the development site, Greater Glider are considered unlikely to currently be able to traverse from one side of the development site to the other, given breaks in canopy cover.
- Koala *Phascolarctos cinereus* – Vulnerable. The majority of wooded vegetation within the development site contains foraging habitat in the form of known Koala feed trees, however, given the degree of clearing within the development site, this has reduced the quality of this habitat. Koala may still utilise the development site on occasion, as was evidenced by the presence of Koala scat at Sat Site 2 (Figure 4-2), for forage and traversal, though more vegetated areas surrounding the development site are likely to be preferred. It is possible that Koala utilise the development site for means of traversal across a home range. Koala habitat is mapped as covering about 78.7 ha of the development site.
- Bluegrass *Dichanthium setosum* – Vulnerable. Low quality potential habitat identified during August 2019 which was better defined during non-drought conditions in December 2020 which revealed true groundcover condition. Bluegrass has BioNet records within 10 km of the subject land. Highest likelihood potential habitat was actively searched and the species was not recorded.

Impacts to Greater Glider and Koala are discussed in Section 4.2.

5.4 Migratory species

Five listed migratory species were returned from the protected matters report. None of these species are considered likely to occur at the site on a regular basis or rely on the habitats present.

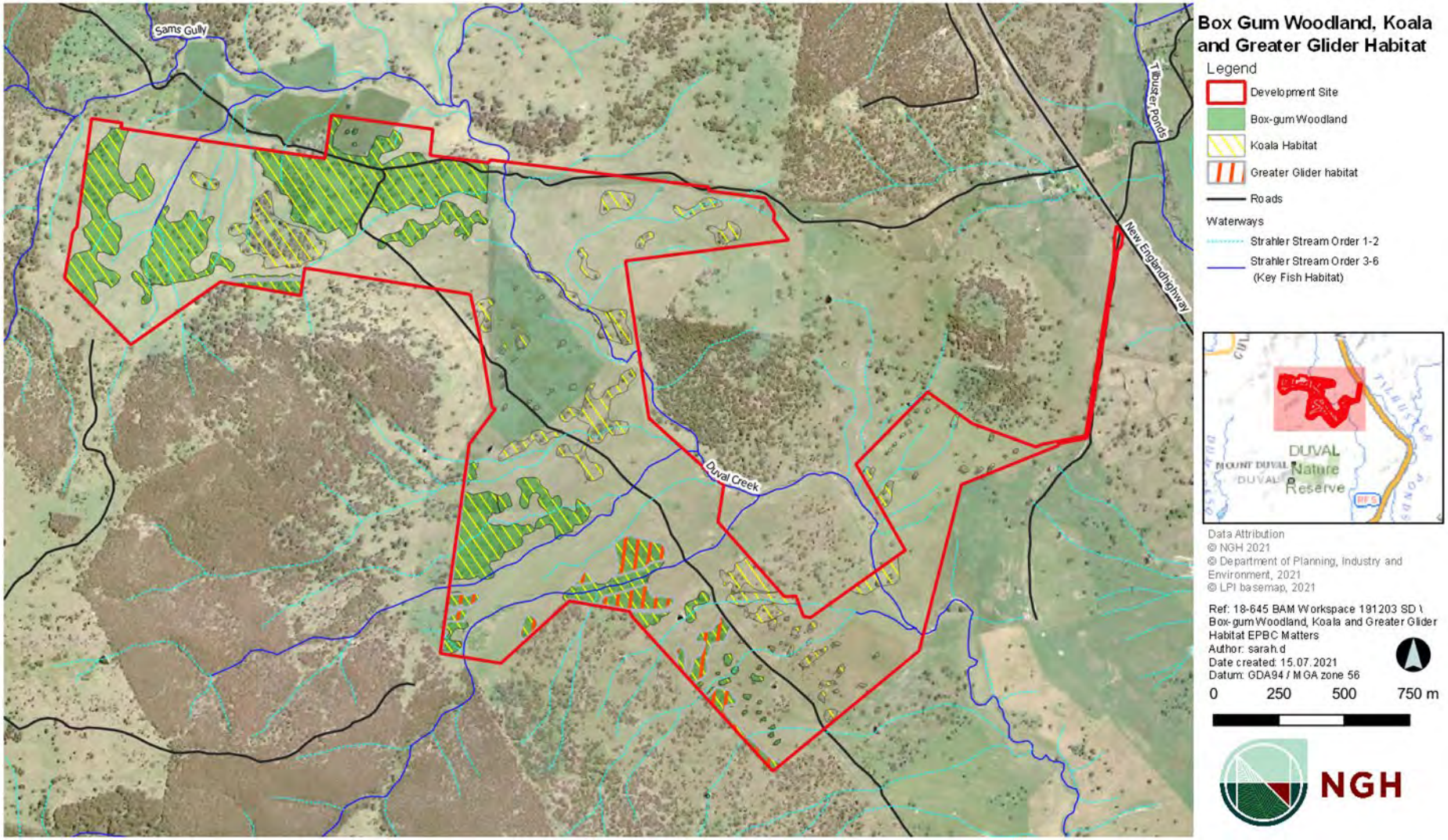

Figure 5-1 MNES within the development site

6. Avoid and minimise impacts

6.1 Avoiding and minimising impacts on native vegetation and habitat

6.1.1 Site selection – consideration of alternative locations/routes

Enerparc reviewed a large number of sites on which to build a solar farm before selecting the Tilbuster Solar Development Site. While it would have been possible to construct and operate the solar farm at some of the sites investigated, Enerparc considers the Development Site selected to be the most suitable for the construction of a solar farm due to the following factors:

- Connection and capacity:
    - The site is located approximately 17 km from the Armidale 330 kV substation and as such, a suitable location for connecting new energy generation.
    - An existing 330 kV transmission line traverses the site which means the that the connection to the high voltage network can be made without the need to construct any transmission lines.
- Solar exposure:
    - The site has high solar exposure measuring 19-20 MJ/m^2.
- Stakeholder interest:
    - A key consideration for selection of the Development Site was the willing and interested host landowners. Enerparc approached numerous landholders before option agreements were made with the host landowner.
    - Very few non-involved dwellings would be impacted by the development.
    - Substantial community support in the area for renewable projects.
- Land suitability:
    - The site has already been cleared and heavily disturbed by cultivation and grazing.
    - The Development Site is not ideal agricultural land, and the development would allow for diversification of income for the host landowner, while maintaining a level of agricultural productivity in the more arable part of the property.
    - The terrain is relatively flat.

6.1.2 Proposal components – consideration of alternate mode of technologies

The Australian Government's Large-scale Renewable Energy Target (LRET) and NSW Government's Renewable Energy Action Plan (REAP) outline the commitment by both Australia and NSW more specifically to reducing GHG emissions and have set targets for increasing the supply of renewable energy. Other forms of largescale renewable energy accounted for in the LRET include wind, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro and tidal projects depend on the availability of energy resources and grid capacity.

PV solar technology was chosen because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology which is readily available for broad scale deployment at the site. Unlike wind farms, which are installed on elevated topography, solar energy farms can be effectively screened by vegetation to reduce the impact of visual disturbance, which would also provide additional habitat for local fauna. Solar energy farms also have few moving parts and are less likely to interfere with bird flight patterns.

Superior solar resources have been identified in NSW, providing excellent opportunities for solar projects.

6.1.3 Proposal planning phase – detailed design

Development Footprint has been developed iteratively, from the early stages of the project, through to detailed assessment and consideration of agency feedback. This can be summarised as:

1. Preliminary constraints stage
2. Detailed vegetation surveys as part of the BDAR
3. Agency consultation with the Biodiversity Conservation Division

Preliminary constraints analysis

NGH (2020) conducted a preliminary analysis of biodiversity constraints to inform the initial design of the site layout. These constraints considered vegetation characteristics of high ecological value, including:

- Forming components of a TEC
- Providing threatened fauna or flora habitat
- Providing connectivity in the local landscape.

Detailed vegetation surveys and BDAR

Once identified and characterised, biodiversity constraints were avoided or minimised as far as practical in the layout design presented in the EIS (NGH 2020), by:

- Reducing the clearing footprint of the project by avoiding larger, more intact areas of wooded vegetation
- Locating ancillary facilities in areas where there are no biodiversity values
- Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)
- Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)
- Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.

The resulting site location and Development Footprint was not able to completely avoid all areas of biodiversity value as smaller areas of wooded vegetation would still be removed. However, about 65% (or 54.7 ha) was able to be avoided at this stage.

The design footprint resulting from detailed vegetation surveys as part of the BDAR is detailed in Figure 6-1. This is the footprint that was provided with the EIS lodged with DPIE and placed on public submission from 21th of October 2020 to 18th November 2020.

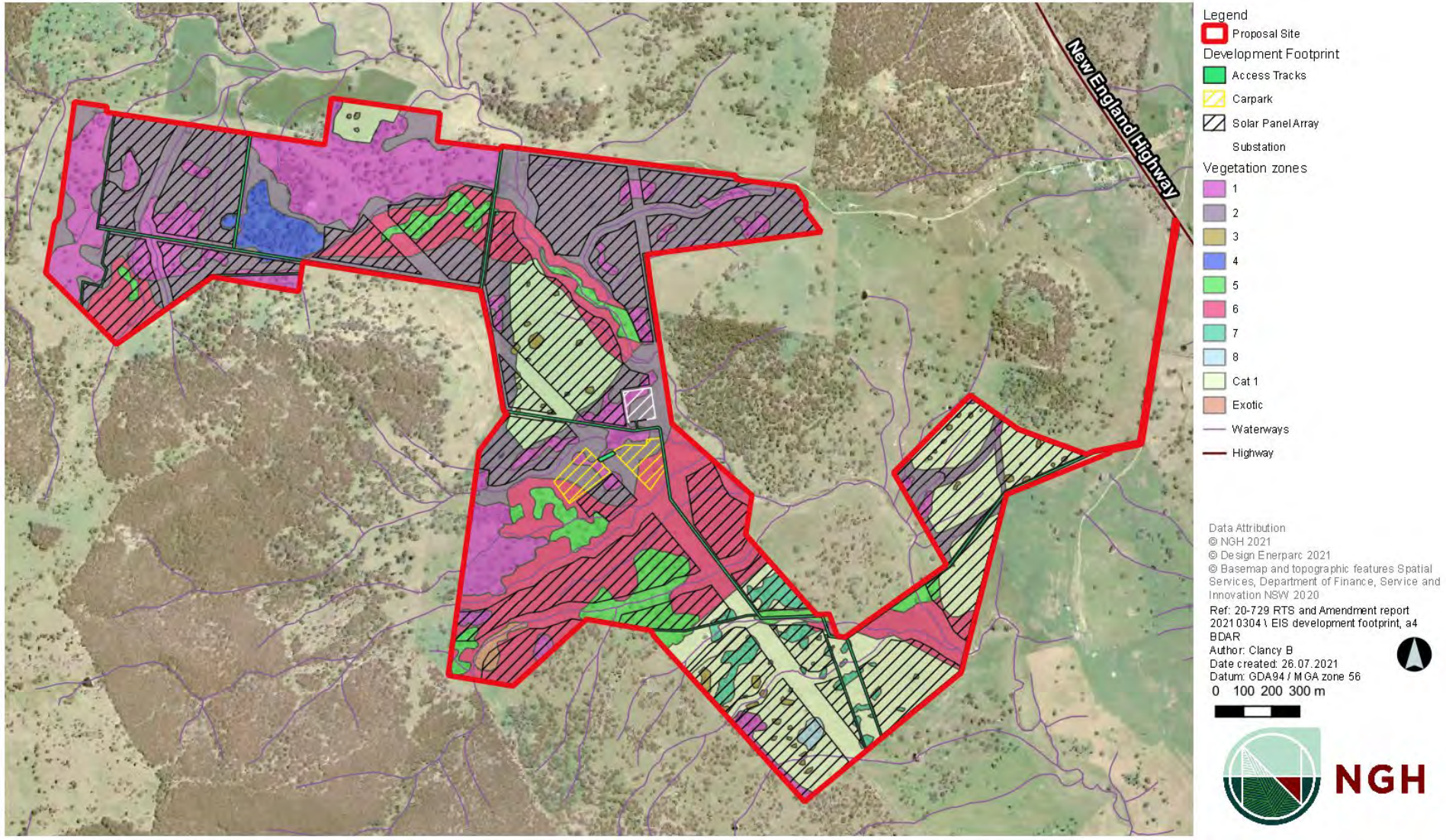

Figure 6-1 Development site and indicative Development Footprint submitted under the EIS (NGH, 2020)

Agency consultation – Biodiversity Conservation Division

Following the public exhibition of the EIS, targeted consultation was conducted with BCD to discuss the Development Footprint and identify further opportunities to avoid and minimise, particularly regarding SAII: Box Gum Woodland. Consultation took place in the following stages:

Several teleconferences and a site visit where held between representations of NGH, Enerpac DPIE and BCD was held to discuss biodiversity constraints and avoidance strategies. During these meetings, BCD flagged a number of areas of additional avoidance of BGGW CEEC to reduce SAIIs of the proposed Development as summarised in Figure 6-2 below. A threshold was set for the proposal: areas of SAII with a vegetation integrity score of 30 or higher were considered of most importance for avoidance. The vegetation zones within the Development Site that meet this threshold are vegetation zones 1 and 5.

The avoidance process was iterative, with several meeting and a joint site visit occurring between the concerned parties. The meeting dates and a summary of meeting findings were follows:

1. 3rd March 2021 teleconference. An initial discussion of areas for avoidance was had and important habitat linkages were identified.
2. 12th March 2021 teleconference. Further refinement of the development footprint was discussed. It was noted that given the other (non-ecological) onsite constraints, the layout of the Proposal would become highly fragmented in a full avoidance scenario.
3. 8th April 2021 Teleconference. Further analysis of onsite constraints was completed and the possibility of reducing stream buffers was raised. This would allow further avoidance of vegetation zones 1 and 5, without fragmenting the layout of the Proposal to the extent it was unfeasible.
4. 27th April 2021 Site visit. A joint field visit to the Development Site by representatives of NGH, Enerpac, DPIE and BCD was conducted on 27 April 2021 to review and discuss BCD's flagged areas of concern on-the-ground. These areas are shown in Figure 6-2. Additionally, the PCTs and condition states were verified. The key issues discussed, and their outcomes are summarised in Table 6-1. As a result of the site visit, the Development Footprint was reduced by about 8 ha, and the impacts to the high value vegetation zones (1 and 5) was reduced from 23.2 ha to 9.2 ha. The comparison on impact areas is presented in Table 6-2. In addition, a survey of streams was undertaken during the site visit, that identified a number of areas where stream buffers could be reduced. This work is detailed in the Amendment Report.
5. 24 June teleconference. Finally, in response to BCD's concerns and the outcomes of the field visit, the development footprint was further refined to avoid and minimise SAII on BGGW CEEC. The extent of change between the layout presented in the EIS and in this update are summarised in. BCD

The amended Development Footprint demonstrating further avoidance of areas of SAII is detailed in Figure 6-4. It is noted that the update also included further consideration of the disturbance required to construct the Proposal. i.e. the installation of environmental controls and all areas requiring disturbance during construction. Additional buffers were added and 'slivers' of vegetation that could not be adequately protected from impacts are now included in the updated development footprint. This provides.

- Additional flexibility to the proponent during detailed design of the layout and construction program
- Certainty regarding areas that will be protected from impact (all areas outside the development footprint).

To achieve the amended Development footprint, areas of the Development Footprint were both added and subtracted (for example to reduce stream buffers where appropriate). These additions and subtractions are presented in Figure 6-3. A comparison of the EIS layout versus the amended layout, of the clearing areas of each vegetation zone is presented in Table 6-2. The highest ecological value vegetation zones are zones1 and 5. The EIS would have cleared 32.6% of these zones within the Development Site. The amended Development Footprint would involve clearing 12.95 % of these zones within the Development Site. In addition, the amended Development Footprint utilise almost 3 ha more of category 1 land, compared to the EIS Development Footprint. These changes represent a significant reduction of the proposed ecological impacts of the proposal.

During a post-field visit teleconference on 24th June 2021 date, BCD expressed that they were satisfied with the refined Development Footprint and that their concerns had been adequately addressed.

Table 6-1 BCD areas of concern and additional avoidance of SAII across the Development site

Area	Initial BCD advice	Field visit (27 April 2021)	Outcome in the updated Development Footprint –(Table 6-1 and Table 6-2)	Site photos (where applicable)
A	Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	No further issues raised.	Development footprint increased: - Panel area enlarged to the north-west of Area A. - Existing Zone 1 vegetation corridor maintained.	
B	Additional avoidance of vegetation Zone 1 and5 required. Patches at point B, to the southwest of point B and south east of point B, where connectivity exists to offsite vegetation. Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	No further issues raised.	Reduction in panel areas: - Within vegetation zone 5 at point B - Within vegetation zones 1 and 5 to the southwest of point B - Within vegetation zone 1 southeast of point B	

Area	Initial BCD advice	Field visit (27 April 2021)	Outcome in the updated Development Footprint –(Table 6-1 and Table 6-2)	Site photos (where applicable)
C	Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	Area C suggested as a better location to preserve BGGW and avoid given better vegetation connectivity.	The development footprint was refined at Area C, which connects to a larger avoided area, to better preserve SAII.	 

Area	Initial BCD advice	Field visit (27 April 2021)	Outcome in the updated Development Footprint –(Table 6-1 and Table 6-2)	Site photos (where applicable)
D	Refine development footprint to avoid impacts to areas of BGGW CEEC is recommended.	Long term viability of connectivity is in question as area D is quite fragmented due to intersecting existing Transmission Line easements and riparian zones. Area of SAII may be better preserved elsewhere.	No further change to development footprint.	
E	Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	No further issues raised.	No further change to development footprint.	

Area	Initial BCD advice	Field visit (27 April 2021)	Outcome in the updated Development Footprint –(Table 6-1 and Table 6-2)	Site photos (where applicable)
F	Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	No further issues raised.	No further change to development footprint.	
G	Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	No further issues raised.	No further change to development footprint.	

Area	Initial BCD advice	Field visit (27 April 2021)	Outcome in the updated Development Footprint –(Table 6-1 and Table 6-2)	Site photos (where applicable)
H	Inadequate habitat connectivity is present. Refine development footprint to widen the corridor link and establish better habitat connectivity through the BMP (refer safeguards in Section 8)	Area H able to be retained within significant imposition of proposed panel area. Current Zone 1 vegetation corridor could be extended to the south-east to link with offsite zone 1 vegetation. Wider corridor linkages- >20m) are preferred. The road to the south-west could be adjusted to allow for additional panel area.	Development site was refined at Area H to: - Avoid areas of Zone 5 vegetation to the south, to create a north-south habitat linkage - Remove small area of panels to the southeast to allow for zone 1 vegetation connectivity; and, - Extend the panel area to the SW of Area H.	 

Area	Initial BCD advice	Field visit (27 April 2021)	Outcome in the updated Development Footprint –(Table 6-1 and Table 6-2)	Site photos (where applicable)
I	Adequate habitat connectivity exists or will be re-established through the BMP (refer safeguards in Section 8)	No further issues raised.	No further change to development footprint.	
J	Refine development footprint to avoid impacts to areas or BGGW CEEC is recommended.	Presence of BGGW SAII confirmed at Area J. Additional HBT was identified. Smaller buffer area around trees may be appropriate as vegetation at Area J is not technically open woodland.	Development site refined at Area J, to avoid BGGW SAII and also enable future long-term connectivity between onsite and offset Zone 1 vegetation.	

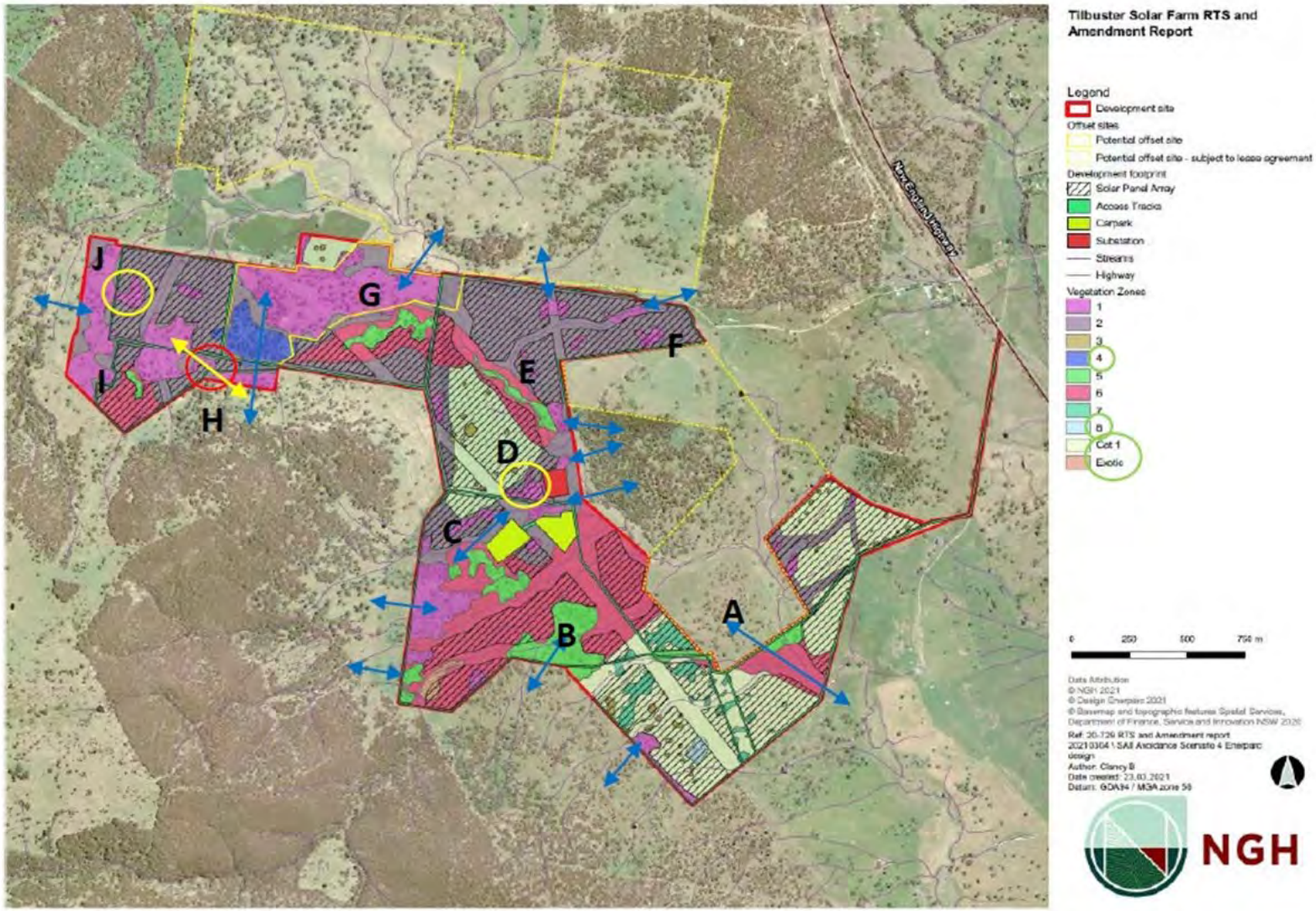

Figure 6-2 BCD response to the indicative development footprint and outcomes of preliminary constraints analysis. Diagram by NGH, markup by BCD

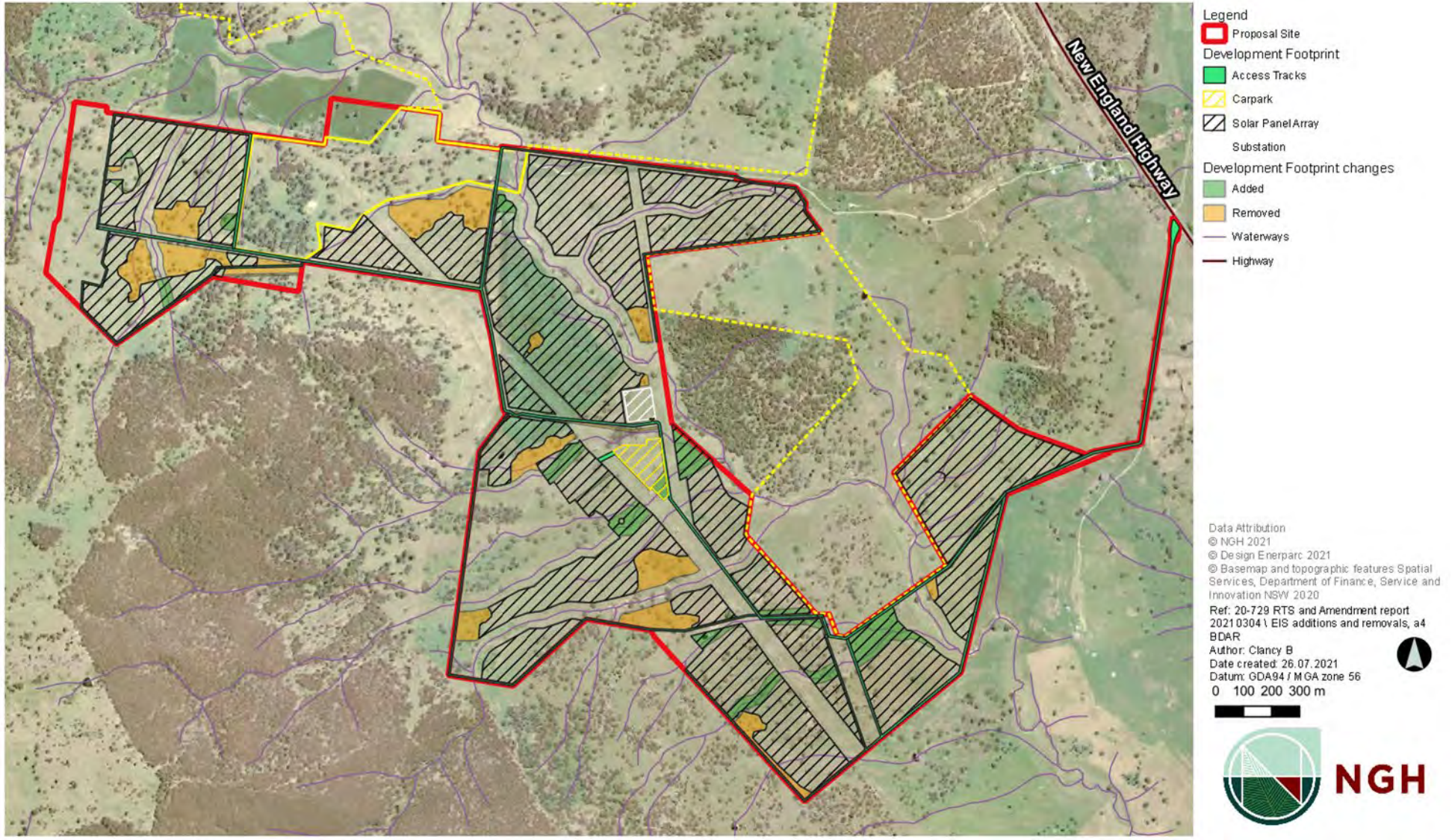

Figure 6-3 Refinements to the indicative development footprint

Table 6-2 Vegetation zone impacts, comparing EIS layout to amended layout

Vegetation zone	EIS Development Footprint (ha)	EIS Development Footprint (% of Development Site)	EIS Development Site area (ha)	Amended Development Footprint (ha)	Amended Development Footprint (% of Development Site)	Amended Development Site area (ha)*
1	14.9	28.05%	53.2	7.3	13.69%	53
2	61.4	67.69%	90.7	60.7	66.78%	90.9
3	1.7	84.83%	2	1.6	79.73%	2
4	0.2	4.56%	5.3	0.4	7.52%	5.3
5	8.3	46.13%	17.9	1.9	10.78%	17.9
6	35.9	54.57%	65.8	38.3	58.12%	65.9
7	4.3	77.66%	5.5	4.6	84.14%	5.5
8	0.7	92.22%	0.7	0.7	92.42%	0.7
Cat 1	50.8	75.29%	67.5	53.7	79.62%	67.5
Exotic	0.3	28.53%	1.2	0.3	28.61%	1.2
Grand total	178.5	-	309.8	169.5	-	309.9
Zone 1 and 5 combined	23.2	32.60%	71.1	9.2	12.95%	70.9

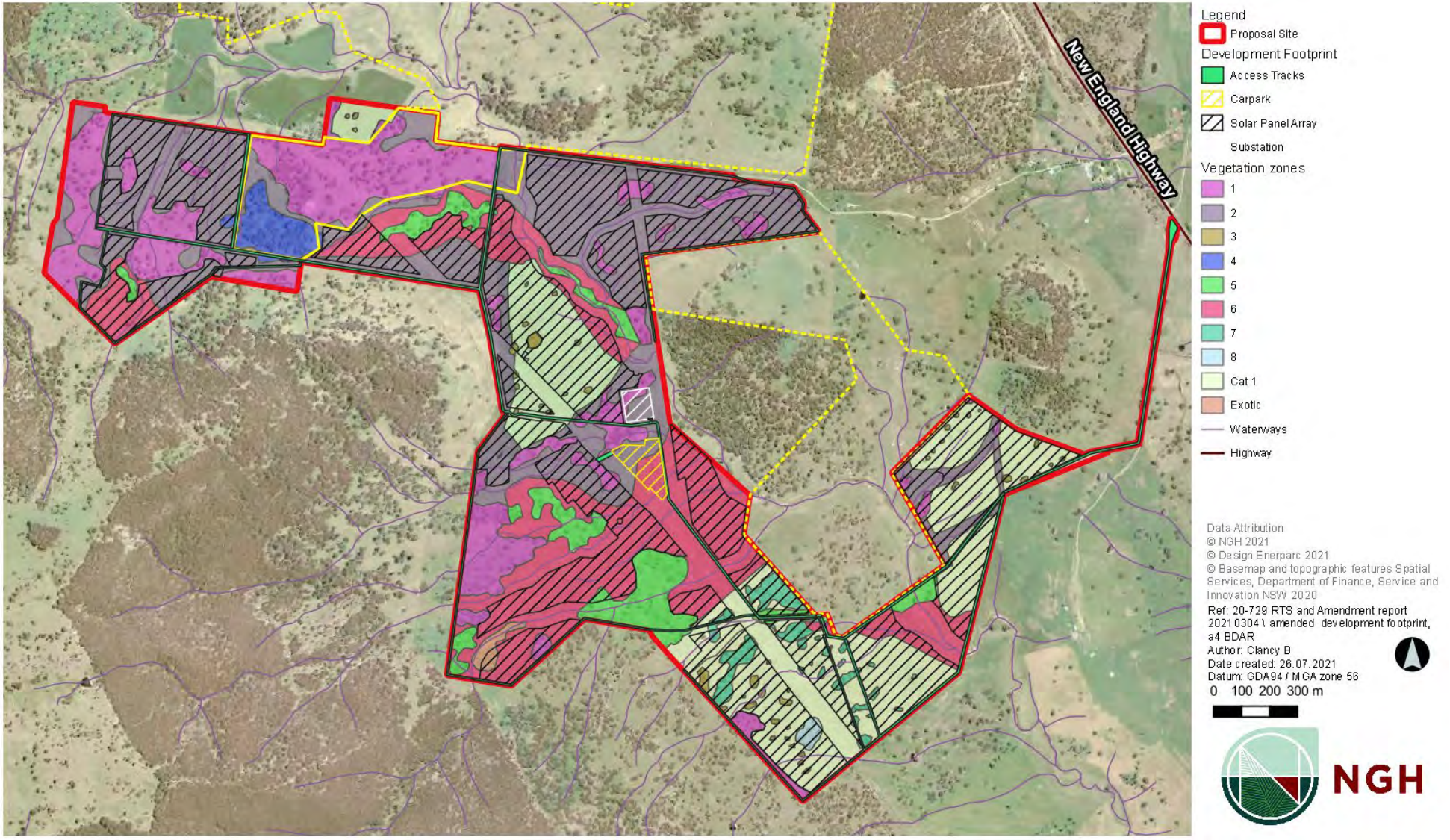

Figure 6-4 Biodiversity constraints and the updated amended Development Footprint following BCD consultation

6.2 Avoiding and minimising prescribed biodiversity impacts

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme:

a) Impacts of development on the habitat of threatened species or ecological communities associated with:
    - o karst, caves, crevices, cliffs and other geological features of significance, or
    - o rocks, or
    - o human made structures, or
    - o non-native vegetation

b) Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

c) Impacts of development on movement of threatened species that maintains their life cycle

d) Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)

e) Impacts of wind turbine strikes on protected animals

f) Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

The following prescribed impacts are relevant to the proposal:

a) Impacts of development on the habitat of threatened species or ecological communities associated with:
    - o karst, caves, crevices, cliffs and other geological features of significance, or
    - o rocks, or
    - o non-native vegetation

b) Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

c) Impacts of development on movement of threatened species that maintains their life cycle

d) Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)

e) Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

How these prescribed impacts have been avoided and minimised by the proposal is detailed below.

6.2.1 Impacts of development on the habitat of threatened species or ecological communities associated with geological features of significance

An area of geological significance, known as ‘Red Rock’ occurs within the development footprint in the north-east of the development site. Whilst a feature in the landscape, this area is not considered to present potential habitat for any species credit species predicted to occur or for Box-gum Woodland CEEC present within the development site.

6.2.2 Impacts of development on the habitat of threatened species or ecological communities associated with rocks

Isolated areas of rock outcrop occur within Zone 1 and 2 in the north-east of the development site consisting of largely embedded rock and sporadic loose rock. Some are associated with small, isolated patches of remnant woodland (Zone 1). The groundcover in these locations, as with the majority of the development site, has been subject to heavy grazing.

The rocky areas, on their own, are not considered to constitute habitat for any species credit species predicted to occur. A limited number of Yellow Box are present, which form part of Box-gum Woodland CEEC.

6.2.3 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

The development site and footprint contains a patch of non-native vegetation near the western boundary. This area is dominated by Salix sp. Threatened species are unlikely to rely on this habitat, however, it may be used for traversal by highly mobile threatened fauna such as avifauna. As it is associated with a drainage line, much of this area has been avoided, however, 0.34 ha would be removed.

6.2.4 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

As discussed in Section 2.7, connectivity of treed vegetation through the development site is poor. Where it is greatest, in the north of the development site, the development footprint has avoided and minimised vegetation removal, such the present state of connectivity in this area would be maintained. Avifauna would not be inhibited from moving through the development site. Threatened species that require a consistent canopy, such as arboreal mammals, are already unlikely to utilise the development site for traversal across their range given the current degree of disconnect between trees and patches of trees. The layout of the proposal has sought to maintain the current level of connectivity for such species in the north as stated, and also in the south.

Mitigation measures, including the use of fauna friendly fencing, would be implemented to assist the movement of fauna that utilise the ground, such as Koala, through the development site post construction in areas of greatest connectivity. Southern Myotis and Greater Broad-nosed Bat, given their manoeuvrability, are unlikely to be inhibited from moving across their range by the proposal.

6.2.5 Impacts of development on the movement of threatened species that maintains their life cycle

The development site is not a known migratory path for threatened species and as discussed in Section 6.2.4, present connectivity across the development site is poor for species that require consistent canopy for traversal. This limits the potential for the development site to act as a pathway for threatened species traversing the landscape to complete their lifecycle. Nevertheless, the development footprint has avoided where connectivity is as it greatest, maintaining the most likely area to be utilised by dispersing threatened species such as Koala. Given the nature of the proposal, avifauna would not be inhibited from moving through the development site.

Mitigation measures, including the use of fauna friendly fencing, would be implemented to assist the movement of fauna, such as Koala, through the development site post construction. Southern Myotis and Greater Broad-nosed Bat, given their manoeuvrability, are unlikely to be inhibited from conducting the movement required to complete their lifecycle by the proposal.

6.2.6 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

As mentioned in Sections 2.5 and 2.6, Duval Creek and a number of similarly ephemeral tributaries occur within the development site. In addition to this, nine farm dams are also present. During the August and November 2019 surveys, all water features within the development site, with the exception of two farm dams, were dry. Nevertheless, they may still play a role in sustaining threatened species that may utilise the development site such as Southern Myotis as well as the occurrence of White box Yellow box Blakely's red gum woodland (Box-gum Woodland CEEC). Koala, long believed to not require the consumption of free water, during summer heatwaves and as present drought conditions intensify reduce moisture levels within eucalyptus leaves, may utilise such resources more readily.

Not all of the waterways and drainage lines within the development site can be avoided by the development footprint. Some crossings will be required for access tracks that would be used during construction and operation of the proposal. The indicative layout has identified the most likely crossings; eleven in total, three of which are across Duval Creek which are proposed to be bridges or fords to minimise any hydraulic impact. Two fords are already present across Duval Creek within the development site. No all dams have been avoided; five of the nine dams present would be filled which are potential foraging habitat for Southern Myotis.

A hydrological assessment (Footprint 2020) completed for the proposal, did not predict a significant impact on flood behaviour within the floodplain as a result of the proposal, as flood levels, depths, velocities and hazards remaining relatively would remain relatively unchanged. Sediment and erosion and pollution control measures will be put in place during construction to maintain water quality moving outside of the development site. No indirect impacts to the dams or rivers downstream are considered likely.

6.2.7 Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

Vehicle strikes on threatened species is limited presently as the development site is wholly farmland and situated over 700 m from the nearest major roadway, the New England Highway. The potential for vehicle strikes on threatened species, such as Koala, is largely restricted to the construction phase of the proposal. However, maintenance vehicles will also be present within the development site for the proposal’s duration.

Avoiding vehicle strikes is action that takes place on a situational basis; however, the risk can be minimised. To increase the likelihood that vehicle strikes are avoided, mitigation measure such as warning signage, speed limits and education of construction personnel would be implemented.

7. Impacts unable to be avoided

7.1 Direct impacts

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and existence of infrastructure.

Shading is also considered a direct impact. Most of the development footprint will be used to mount solar panels above the ground. The impacts of shading and of diversion of rainfall runoff from the panels on the groundcover beneath the panels is largely unknown. For the purpose of this BDAR, the entire development footprint is assumed to be removed however, as the indicative layout shows, substantial under panel areas are likely to be retained in fairly similar condition. It is likely that several perennial native species will persist underneath the solar arrays.

Certainly, only a minor proportion of the seed bank in the 113.7 ha affected by shading will be impacted, given the limited excavation proposed. This is therefore a 'worst case' conservative approach to the assessment of impacts. There is currently limited ability to vary this assumption without specific scientific data to justify a lesser impact extent; such as the results of ground cover monitoring beneath solar arrays in a comparable situation (geographic location, species assemblage). Therefore, the costs associated with purchasing and retiring ecosystem and species credits or the need for offset areas is currently an 'over estimated result' of the impacts of this solar farm undertaken to address current uncertainty.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	7.4 ha (Zone 1) 60.6 ha (Zone 2) 1.6 ha (Zone 3) 0.4 ha (Zone 4) 1.9 ha (Zone 5) 38.2 ha (Zone 6) 4.6 ha (Zone 7) 0.7 ha (Zone 8) Total = 115.5 ha	Regular	Construction	• Direct loss of native flora and fauna habitat • Potential over-clearing of habitat outside proposed development footprint • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock
Displacement of resident fauna	Unknown	Regular	Construction, operation	• Direct loss of native fauna • Decline in local fauna populations
Injury or death of fauna	Unknown	Regular	Construction	• Direct loss of native fauna

Nature of impact	Extent	Frequency	Duration and timing	Consequence
				• Decline in local fauna populations
Disruption to connectivity	Removal of 16.7 ha of wooded vegetation, permanent fencing	Regular	Construction, long-term	• Decline in local fauna populations
Removal of habitat features e.g. HBTs	58 HBTs	One-off	Construction, long-term	• Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features
Shading by solar infrastructure	108.5 ha (70% of solar array) across all zones	Regular	Operational Phase: Long-term	• Modification of native fauna habitat • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Existence of permanent solar infrastructure	169.7 ha across the development site	Regular	Operational Phase: Long-term	• Modification of habitat beneath array • Reduced fauna movements across landscape due to fencing • Collision risks to birds and microbats (fencing).
Impact to geological features	Areas of rocky outcrops	One-off	Operational Phase: Long-term	• Loss of rocky outcrop habitat

7.1.1 Changes in vegetation integrity scores

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 7 2 below.

Table 7-2 Current and future vegetation integrity scores for each vegetation zone within the development site

Zone ID	PCT	EEC and/or threatened species habitat?	Area development footprint (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	567_Woodland	Box-gum Woodland CEEC	7.4	54.4	0
2	567_Grassland	Box-gum Woodland CEEC	60.6	0.4	0
3	567_Scattered	Box-gum Woodland CEEC	1.6	18.2	0

4	575_Forest	No	0.4	59.1	0
5	704_Woodland	Box-gum Woodland CEEC	1.9	33.7	0
6	704_Grassland	Box-gum Woodland CEEC	38.2	0.5	0
7	704_Scattered	Box-gum Woodland CEEC	4.6	21.4	0
8	575_Scattered	No	0.7	37.6	0

7.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7 3 below.

Table 7-3 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost (ha)
Southern Myotis *Myotis macropus*	2	53.3
Pale-headed Snake *Hoplocephalus bitorquatus*	2	6.5
Koala *Phascolarctos cinereus*	2	15.5
Greater Glider *Petauroides volans*	2	3.3

7.1.3 Loss of hollow-bearing trees

HBT surveys were focused on areas within the development footprint, as such the total number of HBTs within the development site is unknown. Nevertheless, 108 were recorded, 58 of which are within the development footprint as detailed below.

Table 7-4 Hollow-bearing trees impacted by the proposal

Zone	PCT ID	HBTs impacted
1	567_Woodland	16
2	567_Grassland	7
3	567_Scattered	8
4	575_Forest	0
5	704_Woodland	2
6	704_Grassland	2
7	704_Scattered	5
8	575_Scattered	2
	Category 1 Land	16
	Total	58

7.2 Indirect impacts

Indirect impacts of the proposal include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. Table 7 5 below details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal. In accordance with the BAM a proponent can retire credits to offset indirect impacts that cannot be avoided or adequately minimised. However, in the case of the proposal, given that areas of native vegetation proposed to be retained will be actively managed (via a Biodiversity Management Plan) to improve its condition and ecological function, this is deemed to nullify any potential requirement to offset indirect impacts.

Indirect impact zones are mapped on Figure 7 1.

Table 7-5 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short-term	• Box-gum Woodland CEEC • Koala • Southern Myotis • Greater Broad-nosed Bat • Greater Glider	• Minor direct loss of native flora and fauna habitat • Low potential for injury and mortality of fauna during clearing of fauna habitat and habitat trees • Minor disturbance to stags, fallen timber, and bush rock • Increased edge effects The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to edge effects	Unknown	Constant	Operational Phase: Long-term	• Box-gum Woodland CEEC • Koala • Southern Myotis • Greater Broad-nosed Bat • Greater Glider	• Degradation of Box-gum Woodland CEEC • Minor loss of native flora and fauna habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to noise, dust or light spill	Unknown	Rare	Operational Phase: Short-term	• Koala • Southern Myotis • Greater Broad-nosed Bat • Greater Glider	• May alter fauna activities and/or movements • Minor loss of foraging or breeding habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Irregular	Construction & Operational Phase: Long-term	• Box-gum Woodland CEEC	• Degradation of Box-gum Woodland CEEC through weed encroachment • Minor loss of native flora and fauna habitat. The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Rare	Construction & Operational Phase: Long-term	• Koala • Southern Myotis • Greater Broad-nosed Bat • Greater Glider	• Loss of foraging habitat
Loss of breeding habitats	86 HBTs, trees within wooded Zones that may be used for nesting/roosting	Constant	Construction Phase: Long-Term	• Southern Myotis • Greater Broad-nosed Bat • Greater Glider	• Loss of potential breeding habitat including fallen and hollow logs at height; • Loss of vegetation close to water; and • Increased pressure and competition for remaining HBT resources from native and exotic hollow dependent fauna. • Cumulative loss of HBTs in conjunction with rural clearing and other developments within the proposed renewable energy hub increasing competition and pressure for resources
Rubbish dumping	Unknown	Regular	Construction & Operational Phase: Long term	• Box-gum Woodland CEEC	• Degradation of Box-gum Woodland CEEC
Earthworks and mobilisation of sediments	Unknown	Regular	Construction phase: Short term	• Box-gum Woodland CEEC	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats. • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Increase risk of fire	Unknown	Regular	Operational Phase: Long term	• Box-gum Woodland CEEC • Koala • Southern Myotis • Greater Broad-nosed Bat • Greater Glider	• Slight increase in the unlikely event componentry failure or damage results in a bushfire resulting in biodiversity impacts

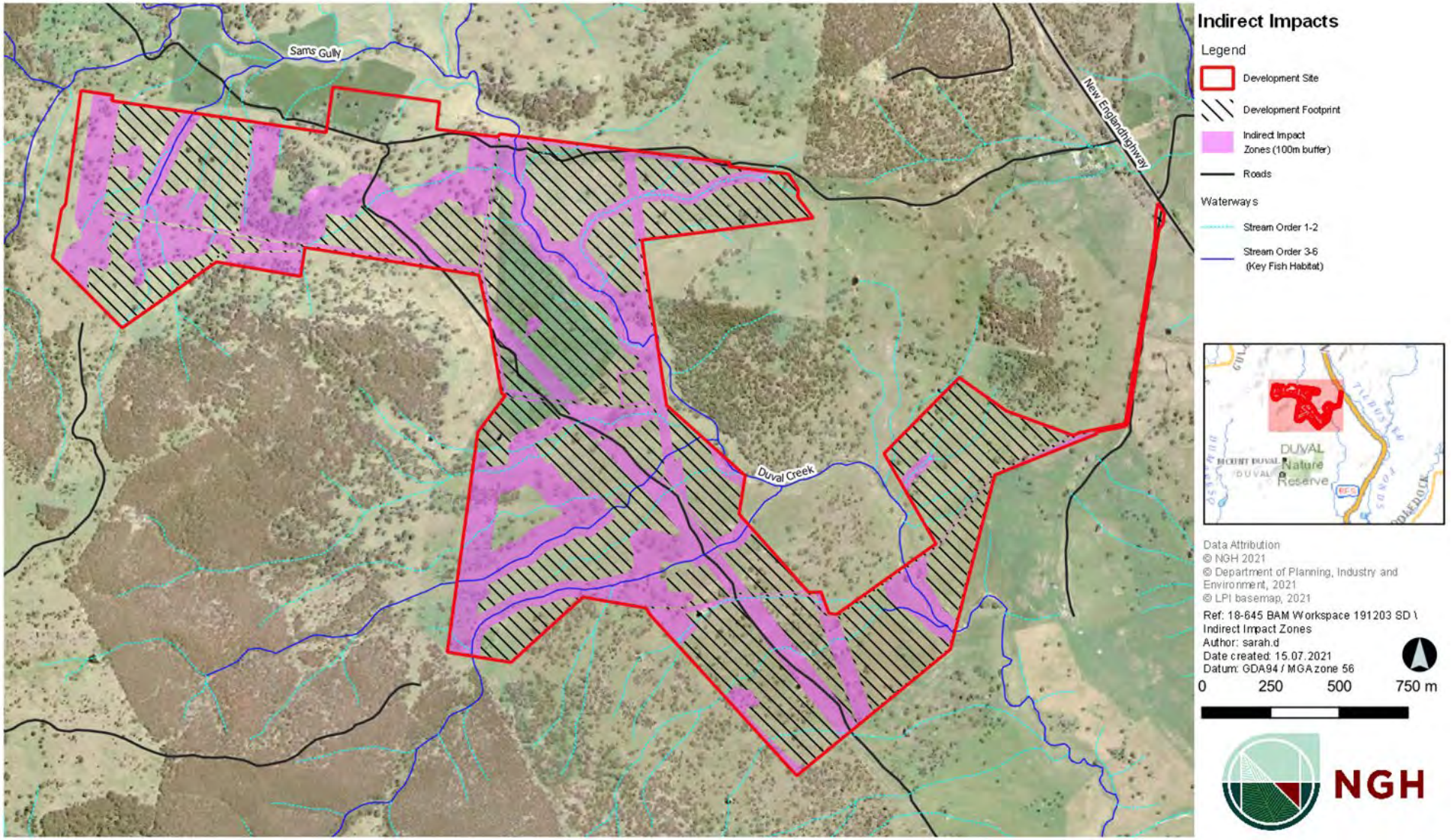

Figure 7-1 Indirect impact zones

7.3 Prescribed impacts

The following prescribed biodiversity impacts are relevant to the proposal:

a) Impacts of development on the habitat of threatened species or ecological communities associated with:
    - o karst, caves, crevices, cliffs and other geological features of significance, or
    - o rocks, or
    - o non-native vegetation

b) Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

c) Impacts of development on movement of threatened species that maintains their life cycle

d) Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)

e) Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

These are discussed in detail below and the necessary information required by Section of the BAM provided.

7.3.1 Impacts to karst, caves, crevices, cliffs and other features of geological significance

The rock formation known as Red Rock, which is within the development footprint, represents potential habitat for two candidate species associated with rock outcropping; Granite Boronia and Narrow-leaved Bertya. Both species were surveyed for at this location during November 2019 and neither were observed. Given this survey result and the level of habitat degradation, neither species are considered likely to use this habitat.

The removal of Red Rock is not considered to impact the persistence of any threatened species or communities as none are considered likely to utilise this habitat or rely on it.

7.3.2 Impacts on development on the habitat of threatened species or ecological communities associated with rocks

Areas of rock within Zones 1 and 2 in the north-east of the development footprint, represent potential habitat for two candidate species associated with rock outcropping; Granite Boronia and Narrow-leaved Bertya. Both species were surveyed for at this location during November 2019 and neither were observed. Given this survey result and the level of habitat degradation, neither species are considered likely to use this habitat.

The removal of rocky areas is not considered to impact the persistence of any threatened species or communities as none are considered likely to utilise this habitat or rely on it.

7.3.3 Impacts on development on the habitat of threatened species or ecological communities associated with non-native vegetation

An area of 0.34 ha of non-native vegetation occurs with the development footprint near the western boundary. This vegetation does not provide key foraging or breeding habitat for any candidate species and given its small size and location; its removal would not impact upon habitat connectivity for any candidate species. Similarly, this vegetation is of little value to surrounding areas of Box-gum Woodland CEEC.

7.3.4 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

As discussed in Section 2.7, connectivity of treed vegetation through the development site is generally poor due to clearing and thinning of native vegetation to facilitate farming of livestock. The area of greatest connectivity located in the north of the development site, which is likely to benefit candidate species such as Koala, has been avoided by the development footprint. The treed areas that would be impacted by the proposal generally have inconsistent canopies which fail to connect areas of habitat surrounding, and that encroach on the development site. As such, these patches are unlikely to be utilised for movement across arrange by threatened species that require a contiguous canopy for traversal such as gliders. For these species, consistently treed areas surrounding that development site are more likely to be used. Therefore, the removal of treed areas proposed, whilst constituting a reduction in habitat varyingly connected to higher quality habitat outside the development site, is considered unlikely to encumber threatened species such as arboreal mammals from moving across their range.

As the development site would be fenced by 2 m high chain wire fencing, threatened species that may utilise the ground for traversal such as Koala, would be hindered from doing so. Mitigation measures proposed, including Koala friendly fencing, would mitigate this impact. However, some disruption to the present movement of individuals, whose home ranges may intersect with the development site, is unavoidable.

The proposal is not considered likely to prevent highly mobile threatened species such as avifauna and microbats from moving across their range.

7.3.5 Impacts of the development on movement of threatened species that maintains their life cycle

The development site is not a known migratory path for threatened species and as discussed above, present connectivity across the development site is poor that require consistent canopy of traversal. For highly mobile threatened species such as birds and microbats, the degree of vegetation removal proposed is considered unlikely to impede such species from undertaking any movement that maintains their life cycle.

Several individual Koala may have home ranges that overlap with the development site. Females, or a dominant male, may move through the development site during breeding season. Though this movement would be hindered via fencing generally, Koala friendly fencing would mean that this movement would not be prevented absolutely. It is considered unlikely that movement of Koala would be impeded to such a degree that the bioregional persistence of the species is impacted.

The proposal is not considered likely to prevent highly mobile threatened species such as avifauna and microbats from carrying out the movement that is required to complete their life cycle.

7.3.6 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

Not all aquatic features would be avoided by the proposal as outlined in Section 6.2.6; five dams would be filled and 11 water crossings are proposed.

Southern Myotis, as a species credit species recorded during targeted surveys, may utilise the farm dams and Duval Creek dams for foraging when sufficient water level is present. Whether the individual or individuals recorded rely on these resources perennially, or were simply investigating foraging opportunities, is unknown. Outside of drought conditions, the five small farm dams that would be impacted are unlikely to be a vital or even preferential foraging resource for the residing population of Southern Myotis. However, as the present drought conditions continue, these small areas of habitat may become increasingly important for persistence of the species in the bioregion. Whether the proposal would lead to a situation where there is mortalities of individuals due to malnutrition, is uncertain, but considered unlikely given the other viable foraging resources within the development site that would not be impacted.

Although the construction and operation of the proposal would involve a range of activities that would disturb soils and potentially impact surface water quality. Appropriate drainage features would be constructed along internal access roads to minimise the risk of dirty water leaving the site or entering waterways. With the exception of internal roads, parking areas and areas around site offices, the site would be largely vegetated with grass cover (specifically, ground cover would be maintained beneath the solar array). There would be a low risk of contamination in the event of a chemical spill (fuels, lubricants, herbicides etc.) as storage and emergency handling protocols would be implemented.

A hydrological assessment completed for the proposal (Footprint 2020), showed no significant impact on flood behaviour within the floodplain is predicted as a result of the proposal, as flood levels, depths, velocities and hazards would be relatively unchanged. Nevertheless, there is be some small change in the hydrology of the development site, however, this is considered unlikely to greatly detriment the threatened species and ecological community present.

7.3.7 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

Vehicle strikes on threatened species that are part of a TEC, such as Koala, is an impact that is most likely to occur during the construction phase of the proposal. While the likelihood of enacting this impact can be minimised, it cannot be reduced to zero.

Vehicle strikes, to threatened species such as Koala, are not considered to be a likely occurrence. Should they occur in isolation as a worst case scenario, they are unlikely to have substantive consequences on the local and bioregional persistence of Koala.

7.4 Impacts to biodiversity values that are uncertain

Impacts to biodiversity values, such as the removal of foraging habitat or HBTs, are readily quantifiable. However, impacts such as vehicle strikes, as discussed in Section 7.3.7, are uncertain.

7.5 Impacts to matters of national environmental significance

Two EPBC Act listed species, Greater Glider (Vulnerable) and Koala (Vulnerable) were recorded during surveys. A single Greater Glider was recorded in vegetation in the west of the development site during August 2019 spotlighting and Koala faecal pellets were found at Koala SAT Site 2 during November 2019.

Vegetation within the development site and footprint contains foraging habitat of lesser quality for both species, however, it may still form part of an individual of either species' home range.

Bluegrass (Vulnerable), was not detected during targeted surveys in December 2020 when the species was known to be in flower nearby and conditions were more favourable. Bluegrass is not considered to occur within the subject land, therefore, is not known to be impacted.

In the case of Greater Glider, given the species low dispersal ability (DoE 2012) to move between fragments through cleared areas, habitat within the development site is restricted to treed areas that have some connectivity to areas outside the development site. Primarily this occurs along and adjacent to the western boundary. Removal of such habitat totals 3.3 ha. Koala, however, as they are able to traverse cleared areas, may utilise any part of the development site, but are most likely to visit denser wooded areas where food and shelter trees are more frequent.

The EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 7 6 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 7 5 resulted in a score of 8 and as such habitat within the development site is considered to be critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is required. Removal of habitat for Koala is equal to the removal of all treed areas of PCTs 567,575 and 704, covering 15.5 ha.

Table 7-6 Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	✓ Recorded during the surveys
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ No areas containing emerging trees would be impacted. However, woodland areas contain several Koala feed tree species including Ribbon Gum *Eucalyptus viminalis*, Blakely's Red Gum and Yellow Box.

Attribute	Score	Inland	Applicable to the proposal?
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	✓ Some areas that would be impacted are connected to outside bushland that exceeds 1000 ha.
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	✓
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	✓ No Koala mortality observed during the survey
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table	

Attribute	Score	Inland	Applicable to the proposal?
		1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓ Development site is not considered a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge
Total	**8**	**Decision: Habitat critical to the survival of the Koala—assessment of significance required**	

Box-gum Woodland and DNGs CEEC is estimated to cover 59.7 ha of the development site, 5 ha of which would be removed.

An assessment of significant impact was completed for Box-gum Woodland and DNGs CEEC, Koala and Greater Glider (APPENDIX G). Based on these characterisations of the significance of the proposal's impacts to these MNES, in all cases, the proposal is considered to have the potential to result in a significant impact. Therefore, EPBC Act referral was undertaken for both species. The proposed Tilbuster Solar Farm was determined to be a controlled action and will be assessed by NSW under an accredited assessment in accordance with section 87 of the EPBC Act. Supplementary SEARs for this proposal have been addressed in this BDAR.

Offset obligations in accordance with the BOS have been generated for Koala and Greater Glider (Table 10 2).

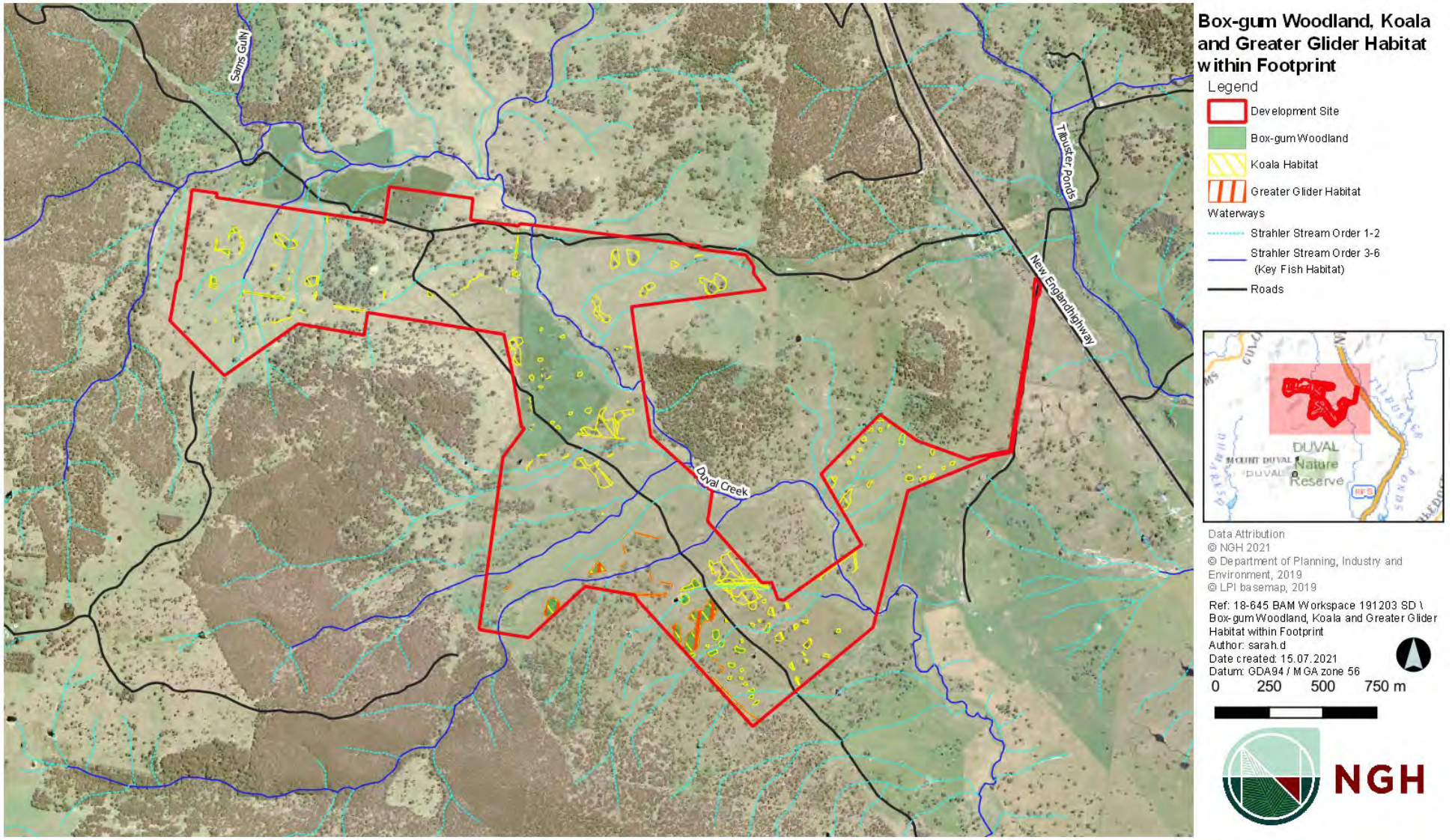

Figure 7-2 MNES impacted areas only

7.6 Limitations to data, assumptions and predications

Vegetation integrity plot surveys were undertaken across November 2018 and November 2019. Therefore, the flora species recorded are reflective of these timeframes. Across the 12 month gap in surveys, drought conditions across NSW generally and the Armidale Plateau IBRA Sub-region worsened. BoM climate data (BOM 2019) indicates that in this 12 month period, rainfall totalled 33.9.2 ml, 45.5% of the annual average recorded since 1997. This lack of rainfall, coupled with grazing pressure exacerbated by the drought, has had the effect of lowering structure condition scores for sub-canopy growth forms for vegetation zones where plot data has been collected during November 2019. Primarily, this has influenced Vegetation Integrity Scores (VIS) for grassland vegetation zones (3 and 6) as plot data was almost exclusively collected during November 2019 for these zones, resulting in VIS of less than one. It is possible that, under more favourable conditions, grassland vegetation zones may have sufficient condition (% cover of native species and higher native diversity) resulting in a VIS that would require offsetting. However, at the time of November 2019 data collection, they do not and are considered highly degraded. Proof of the effect of the drought, exacerbated by grazing, was evident during the December 2020 targeted Bluegrass surveys. Photographs illustrating the dramatic change in growth of understory vegetation (both native and exotic) across these grassland vegetation zones is provided below (Figure 7 3 - Figure 7 6). Although these grasslands zones had high cover of exotic species such as Rat's Tail Fescue Vulpia myuros and Phalaris aquatica during December 2020, native grasses were also present, such as Dichelachne sp. and Common Wheatgrass Elymus scaber var. scaber, was also present in greater amounts than what was recorded during November 2019.

Climatic conditions may influence the species present at any one time. The drought conditions described above also have the effect of limiting habitat suitability within the development site for candidate species credit species where water is a key limiting factor.

Where survey has been undertaken for candidate species requiring confirmation of presence or absence, this has been done employing appropriate methods and timing. Nevertheless, it is an unavoidable limitation that not all species that utilise an area will be detected. This is generally due to their mobility and unpredictable movement throughout their habitat.

Where survey for candidate species requiring confirmation of presence or absence was not undertaken, this is stated explicitly in the assessment and measures identified to address the limitation; i.e. assumption of occurrence of the species.

The calculation of HBTs, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows (Gibbons and Lindenmayer 2000).

Figure 7-3 Photograph of Plot 13 during November 2019

Figure 7-4 Photograph of approximate location of Plot 13 during December 2020

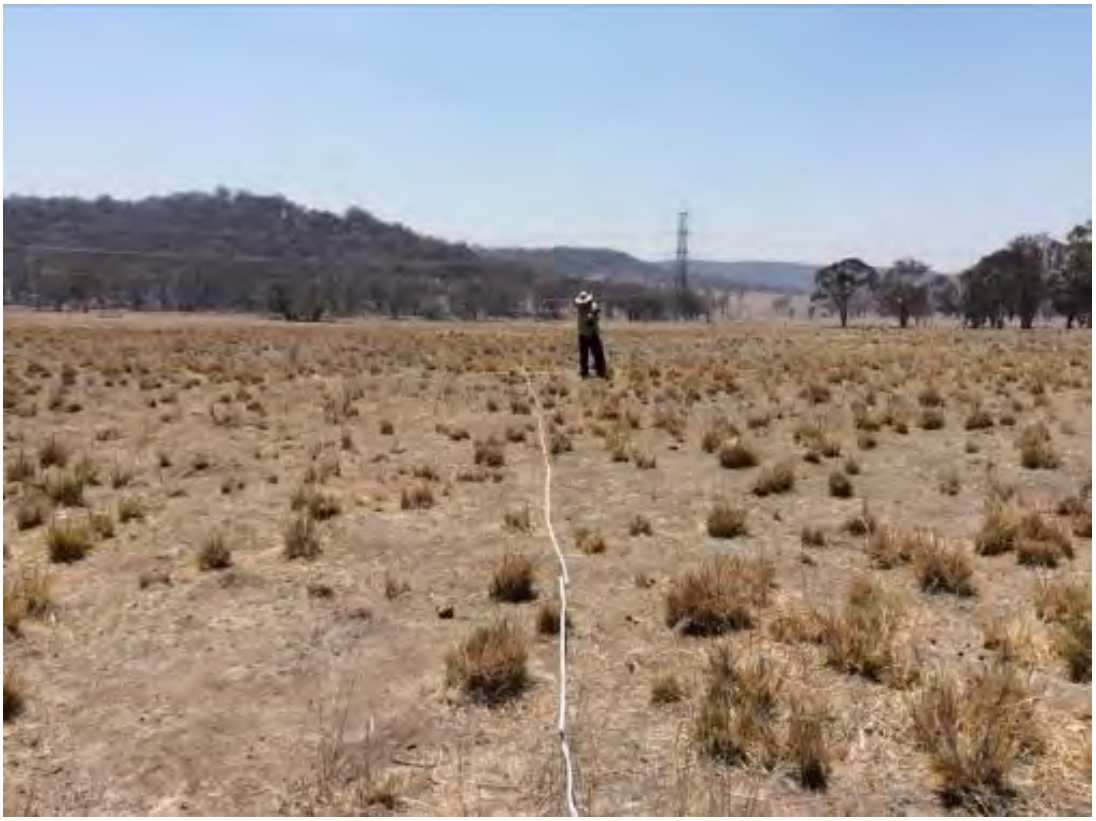

Figure 7-5 Photograph of Plot 19 during November 2019

Figure 7-6 Photograph of approximate location of Plot 19 during December 2020

8. Mitigating and managing impacts

8.1 Mitigation measures

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8 1.

8.1.1 Impacts from the clearing of vegetation and habitats

1. Time works to avoid critical life cycle events
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler
3. Relocate habitat features (fallen timber, hollow logs) from within the development site to an adjacent area.
4. Implementation of a Biodiversity Management Plan to actively manage and improve retained native vegetation.

8.1.2 Indirect impacts

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed
2. Adaptive dust monitoring programs to control air quality
3. Temporary fencing to protect significant environmental features and threatened species habitat
4. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas
5. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented
6. Implementation of a Biodiversity Management Plan to actively manage and improve retained native vegetation.

8.1.3 Prescribed impacts

1. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment
2. Enforce speed limits and install signage during construction to reduce impacts of vehicle strikes on threatened fauna.
3. Clearly survey and mark environmental no-go areas during construction to prevent clearing within unauthorised areas and where threatened species habitat occurs
4. Fencing to deter Koala from entering the development site during construction
5. Use of non-barbed wire fencing for permanent fencing
6. Installation of artificial connectivity measures to allow traversal of species such as Koala between areas of habitat surrounding the habitat site post construction

7. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented
8. Implementation of a Biodiversity Management Plan to actively manage and improve retained native vegetation.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
timing works to avoid critical life cycle events such as breeding or nursing	• Where practicable, hollow-bearing trees would not be removed during breeding and hibernation season (June to January) to mitigate impacts • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken by an ecologist or suitably qualified person to ensure no impacts to fauna would occur	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	• Pre-clearing checklist • Tree clearing procedure • Staged habitat removal • Unexpected threatened species finds procedure	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
relocation of habitat features (fallen timber, hollow logs) from within the development site the development footprint to retained	• Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
areas within the development site						
Indirect impacts on native vegetation and habitat						
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing. • No stockpiling or storage within dripline of any mature trees • In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance	Construction	Regular	Contractor	Low	None
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	• Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible.	Construction	Regular	Contractor	Low	None
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	• Avoid Night Works • Direct lights away from vegetation	Construction /Operation	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
adaptive dust monitoring programs to control air quality	• Daily monitoring of dust generated by construction and operation activities • Construction would cease if dust observed being blown from site until control measures were implemented • All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site	Construction	Regularly	Contractor	Moderate	None
programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting	• Where practicable, time construction activities outside Koala breeding season • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken by an ecologist or suitably qualified person to ensure no impacts to fauna would occur	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
temporary fencing to protect significant environmental features such as riparian zones	• Fencing from buffer of riparian zones and drainage lines	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	• A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include: o Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction o Weed hygiene protocol in relation to plant, machinery, and fill • The weed management procedure would be incorporated into the Biodiversity Management Plan.	Construction , Operation	Regular	Contractor	Moderate	Weed encroachment
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Site induction • Toolbox talks	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened species for Staff training not being followed
preparation of a Biodiversity Management Plan (BMP)	• Preparation of a Biodiversity Management Plan that would include the following management actions and protocols at a minimum: o Protection of native vegetation to be retained o Best practice removal and disposal of vegetation	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species from Construction Flora and Fauna Management Plan not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist o Avoiding the removal of hollow-bearing trees during spring, where practicable, to avoid the main breeding period for hollow-dependent fauna o Unexpected threatened species finds procedure o Rehabilitation of disturbed areas with flora species that are characteristic of the PCTs that would be impacted (PCTs 567 and 704) o Installation of next boxes or hollow augmentation at a 2:1 ratio to mitigate removal of HBTs that are potential Greater Glider den sites o Controlling weeds, feral pests and pathogens. o Active management of retained vegetation to substantially improve its condition, connectivity and					

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	ecological function (see below)					
Prescribed biodiversity impacts						
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events for rocks, human made structures and non-native vegetation	• Pre-clearing checklist • Tree clearing procedure • Staged habitat removal • Unexpected threatened species finds procedure	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
installing artificial connectivity measures to re-establish connections between habitat and favoured movement pathways, e.g. glider poles, rope crossings, habitat bridges	• No use of barbed wire fencing as it provides a hazard to fauna such as Koala, Greater Glider and microbats • Fencing adjacent to areas of the development site that are connected to areas of bushland outside the development site are to include Koala friendly structures to aid traversal of Koala across their range	Post construction	One-off	Contractor	Low	Koala hindered from moving across their range. Alternate routes are present that would likely to be utilised instead.
temporary fencing to protect significant environmental features	• Fencing from buffer of riparian zones, drainage lines and farm dams to be retained	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
such as karst/caves, rocks and water bodies						
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	• An erosion and sediment control plan would be prepared in conjunction with the final design and implemented • Spill management procedures would be implemented.	Construction	Regular	Contractor	Moderate	Indirect impacts may occur to waterways if erosion and sedimentation control plan not implemented.
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced to minimise fauna strike.	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles
fencing or other measures to control animal and vehicle interactions	• Development site to be fenced entirely during construction and operation	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles

8.2 Biodiversity Management Plan (BMP)

A recommended outline of the BMP is provided below:

- Introduction
    - Purpose and objectivities
    - Description of the proposal
- Planning Requirements
- Existing environments
    - Flora and fauna values
    - Soils
    - Weeds and pests
- Environmental Impacts
- Construction and Operational activities
- Management Zones
    - Protocols, actions, and procedures
- Performance criteria, triggers, and responses
- Compliance Management
- Review and Improvement

A key function of the BMP would be to facilitate the improvement of retained vegetation within the development site and improve ecological function, such as connectivity, where best suited. To achieve this, retained portions of each vegetation zone within the development site would be categorised into management zones. The BMP would then detail the required management actions, including timing and duration, within each management zone to a clear set of performance targets. An outline of the management actions required in each management zone is provided in the in Table 8-2 below. Some management actions, particularly those related to revegetation, would be required to varying degrees, depending on how each management zone responds to stock exclusion. Note, vegetation zones 3 and 8 are not included in Table 8-2 as these zones will almost entirely be developed.

Initially, implementation of the BMP would be for five years, after which a review would be undertaken. The BMP would then be amended as required in line with the adaptive management strategy below.

Table 8-2 Summary of restoration management actions likely to be required

Vegetation Zone	Stock Exclusion	Weed Control	Passive Regeneration	Direct Seeding (including soil preparation)	Infill Planting
1	X	X	X		X
2	X	X	X	X (if passive regeneration insufficient)	X
4	X	X	X		X
5	X	X	X		X
6	X	X	X	X (if passive regeneration insufficient)	X
7	X	X	X		X
Category 1 Land	X	X	X		X (canopy species only for connectivity purposes, no planting under transmission line)

Table 8-3 Suggested 5 year performance targets

Vegetation Zone	Stock Exclusion	Weed Control	Passive Regeneration	Direct Seeding (including soil preparation)	Infill Planting	Target VIS
1	Stock excluded from commencement of construction	<10% exotic cover across the zone	Passive regeneration monitored 2 months post commencement of construction		90% survivorship of plantings, 40% PFC of trees, no gaps in canopy (remnant or planted) greater than 20 m	80
2	Stock excluded from commencement of construction	<10% exotic cover across the zone	Passive regeneration monitored 2 months post commencement of construction	No areas of failed seed mix greater than 50m^2	90% survivorship of plantings, 20% PFC of trees, no gaps in canopy (remnant or planted) greater than 30 m	30
4	Stock excluded from commencement of construction	<10% exotic cover across the zone	Passive regeneration monitored 2 months post commencement of construction		90% survivorship of plantings, 50% PFC of trees, no gaps in canopy (remnant or planted) greater than 20m	80
5	Stock excluded from commencement of construction	<10% exotic cover across the zone	Passive regeneration monitored 2 months post commencement of construction		90% survivorship of plantings, 40% PFC of trees, no gaps in canopy (remnant or planted) greater than 20m	60

Vegetation Zone	Stock Exclusion	Weed Control	Passive Regeneration	Direct Seeding (including soil preparation)	Infill Planting	Target VIS
6	Stock excluded from commencement of construction	<10% exotic cover across the zone	Passive regeneration monitored 2 months post commencement of construction	No areas of failed seed mix greater than 50m^2	90% survivorship of plantings, 20% PFC of trees, no gaps in canopy (remnant or planted) greater than 30m	30
7	Stock excluded from commencement of construction	<10% exotic cover across the zone	Passive regeneration monitored 2 months post commencement of construction		90% survivorship of plantings, 40% PFC of trees, no gaps in canopy (remnant or planted) greater than 20m	35
Category 1 Land	Stock excluded from commencement of construction	<50% exotic cover	Passive regeneration monitored 2 months post commencement of construction		90% survivorship of plantings, no gaps in canopy (remnant or planted) greater than 30m	-

PFC - Projected Foliage Cover

8.2.1 Adaptive management strategy

A Biodiversity Management Plan (BMP) would be prepared demonstrating adaptive management strategies to ensure key milestones are achieved including:

- Requirements for additional and ongoing surveys to better ascertain Koala and Greater Glider presence, and associated impacts to use as for baseline monitoring;
- Fauna monitoring and management protocol including identification and reporting of fauna mortalities to the relevant Biodiversity Conservation Division office;
- Protecting vegetation and fauna habitat outside the approved disturbance areas and managing the remaining remnant vegetation and fauna habitat within the subject land toward the performance targets in Table 8-3;
- Next box monitoring and reporting;
- Monitoring criteria;
- Clear performance targets;
- Corrective actions
- Timing and responsibilities.

9. Serious and Irreversible Impacts (SAII)

9.1 Potential Serious and Irreversible Impact entities

9.1.1 Threatened ecological communities

One threatened ecological community listed as a potential SAII entity in the Guidance to assist a decision-maker to determine a serious and irreversible impact would be impacted by the proposal;

- White Box-Yellow Box- Blakely's Red Gum Woodland (Box-gum Woodland CEEC)

9.1.2 Threatened species

There are no SAII candidate species recorded at the development site.

9.1.3

No further species were considered to be potential SAII entities.

9.2 Assessment of Serious and Irreversible Impacts

9.2.1 White Box-Yellow Box-Blakeley's Red Gum Woodland (Box-gum Woodland CEEC)

a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

Up to 235.2 ha of Box-gum Woodland CEEC occurs within the development site. This occurs as three condition states:

- areas with canopy over mixed native and exotic grazed understory (71.2 ha),
- areas of mixed native and exotic understory only (156.5 ha),
- and areas of scattered canopy over cropped understory (7.6 ha).

Areas containing canopy are considered to be of highest ecological and conservation value, of which 63.1 ha (or 80.2%) has been avoided within the development site. The measures outlined in Section 8 detail how indirect impacts would be mitigated.

b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone

Up to 114.4 ha of Box-gum Woodland CEEC would be impacted by the proposal as follows:

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
1	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	7.4	54.4
2	567_Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	60.6	0.4
3	567_Scattered	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	1.6	18.2
5	704_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	1.9	33.7
6	704_Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	38.2	0.5
7	704_Scattered	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	4.6	21.4

c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact

No threshold has yet been defined by DPIE for the extent of Box-gum Woodland CEEC to be removed that constitutes a serious and irreversible impact.

d) the extent and overall condition of the potential TEC within an area of 1000 ha, and then 10,000 ha, surrounding the proposed development footprint

Box-gum Woodland CEEC, in the context of the broader locality surrounding the development site, is likely to have be heavily modified and degraded due to human land use. More so on valley floors where the land is arguably more fertile and accessible, such as that within the subject land. Areas of Box-gum Woodland CEEC that grade into PCTs of higher elevations, may be in better condition due to less historical clearing and ongoing grazing pressure.

Using a combination of State Vegetation Mapping available through the NSW Government's SEED data portal, as well as interpreting aerial imagery via GIS, it is estimated that 622 ha of Box-gum Woodland CEEC occurs within an area of 1000 ha surrounding the proposed development footprint and 4618 ha of Box-gum Woodland CEEC occurs within an area of 10000 ha surrounding the proposed development footprint.

Given data deficiency, it is difficult to provide detail other than general statements such as 'poor', or 'very poor'. It is feasible that the VI scores for the CEEC across the required area are similar to that of the subject land

e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration

Detailed state vegetation type mapping is not available for the Armidale Plateau IBRA Subregion and New England Tablelands IBRA Bioregion. However, mapping of the Border Rivers Gwydir /

Namoi Region, covers the western portion of the IBRA Region from Nundle in the south to the Queensland border in the north, approximately 55% of the IBRA Region. Reference to this mapping (DPIE 2015) indicates that over 115868 ha of Box-Gum Woodland CEEC could occur within the mapped area, with a further 162000 ha mapped as derived grasslands, some of which are likely to represent Box-gum Woodland CEEC in an understory form as allowed by the NSW Scientific Communities final determination (NSWSC 2011). The 119.6 ha that would be removed for the proposal, largely as disturbed grassland, equates to just over 0.1% of the lower estimate above.

DPIE (2015) marginally enters the Armidale Plateau Subregion in the west, as such, it is not able to estimate the cover of Box-gum Woodland CEEC on the Armidale Plateau. However, the Subregion comprises approximately 10% of the Bioregion. A conservative estimate would be that 2% of the Box-gum Woodland CEEC within the Bioregion occurs within the Subregion. Meaning that about 5% of that within the Subregion would be impacted by the proposal. This estimate is considered to be considerably higher than the reality given the assumptions made.

f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

Detailed state vegetation type mapping is not available for the entire New England Tablelands IBRA Bioregion and 90% of the Armidale Plateau Subregion. Review of plans of management for reserves within the IBRA and region and sub-region had the following results:

- Oxley Wild Rivers National Park, plan of management makes no mention of Box-gum Woodland CEEC
- Duval Nature Reserve, plan of management makes no mention of Box-gum Woodland CEEC
- Imbota Nature reserve, plan of management and states that Red Gum Yellow Box Grassy Woodlands is within the reserve, however, no indication of area is given
- Yina Nature Reserve, plan of management states that ‘red gum yellow box community’ is present, however no indication of area is given
- Avondale State Conservation Area, plan of management makes no mention

Given the lack of available information, a credible estimate of area cannot be given.

g) the development, clearing or biodiversity certification proposal’s impact on:

- **abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns**

Groundwater supplies and levels are unlikely to be affected by the proposal plant and no groundwater is anticipated to be intercepted or extracted. During construction, the proposal would have a short term gross impact upon soils and possibly surface water flow, within discreet areas. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to impact on abiotic factors critical to the long-term survival of Box-gum Woodland CEEC.

- **characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants**

The large mature trees that would be removed provide foraging and roosting habitat. Their removal, in addition to other foraging and nectar resources, would constitute the loss of functionally important species. They provide habitat for Southern Myotis, Greater Glider and Koala, that are known to occur.

No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development.

- **the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC**

It is likely the remaining 120.9 of Box-gum Woodland CEEC within the development site avoided by the development footprint would remain unchanged from the current existing condition.

h) direct or indirect fragmentation and isolation of an important area of the potential TEC

As noted in Section 3, connectivity of treed areas within the development site is poor and the occurrence of Box-gum Woodland CEEC within the development site and immediate surrounding landscape has been subject to clearing for historical land use. Higher condition areas have been avoided by the development footprint and connectivity of more intact areas has been maintained via maintaining the vague north-south corridor that is present. The proposal is not considered to fragment or isolate an important area of the TEC.

i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

The 114.4 ha of Box-gum Woodland CEEC to be removed by the proposal would be offset by the retiring of 607 ecosystem credits, to provide perpetuity management and improvement of Box-gum Woodland CEEC, ensuring no net loss.

Retained Box-gum Woodland CEEC within the development site, of which there is 120.9 ha, would be managed in accordance with the BMP to ensure recovery of these remnants.

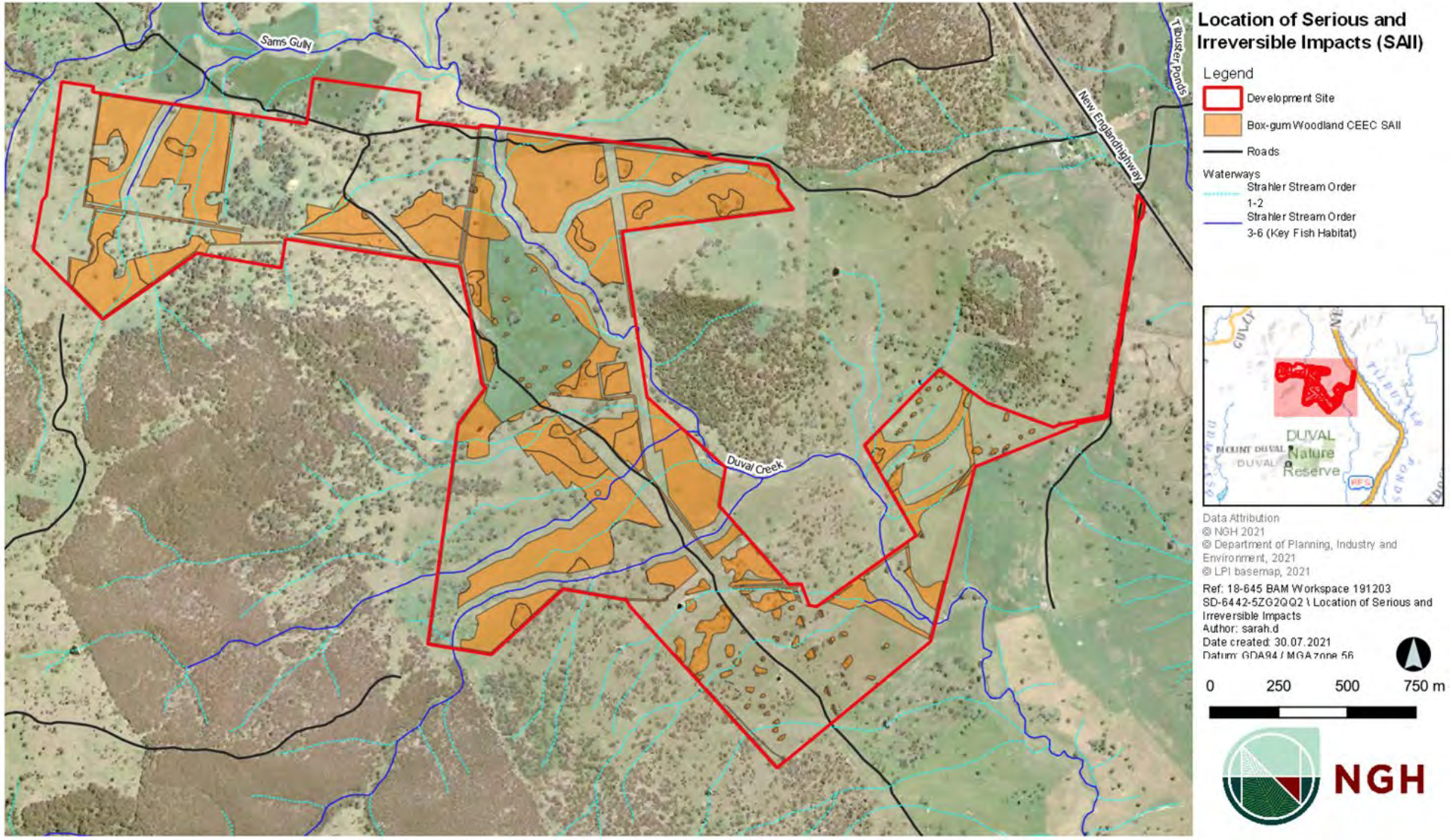

Figure 9-1 Location of serious and irreversible impacts

10. Requirement to offset

10.1 Impacts requiring an offset

10.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or

b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 10-1 and mapped on Figure 10-1.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
1	567_Woodland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	7.4	54.4	251
3	567_Scattered	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	1.6	18.2	18
4	575_Forest	Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion	0.4	59.1	9
5	704_Woodland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	1.9	33.7	41
7	704_Scattered	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	4.6	21.4	62
8	575_Scattered	Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion	0.7	37.6	9

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix H.

10.1.2 Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 10 2 and are included in map on Figure 10 1. Note, areas that require offsets are comprised of areas that generate ecosystem credits, species credits or both.

Table 10-2 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost (ha)	Species credits required
Southern Myotis *Myotis macropus*	2	53.3	123
Pale-headed Snake *Hoplocephalus bitorquatus*	2	6.6	83
Koala *Phascolarctos cinereus*	2	15.5	299
Greater Glider *Petauroides volans*	**2**	**3.3**	**55**

The full Biodiversity Credit Report generated by the BAM-C is provided in Appendix G.2.

10.1.3 Offsets required under the EPBC Act

Assessments of Significance for the Koala and Greater Glider determined the potential for these species to be significantly impacted by the proposal, or where the determination is uncertain, referral is recommended (APPENDIX G). As such, referrals have been made to the Federal Minister for Agriculture, Water and Environment. The proposed Tilbuster Solar Farm was determined to be a controlled action and will be assessed by NSW under an accredited assessment in accordance with section 87 of the EPBC Act. Supplementary SEARs for this proposal have been addressed in this BDAR. The requirement to settle an EPBC Act offset obligations will be undertaken in accordance with the NSW offset rules where applicable to do so consistent with the endorsed bilateral agreement. An offset strategy addressing Federal requirements will be developed based on further investigations, prior to approval.

10.2 Impacts not requiring an offset

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 do not require offsets. These PCTs and vegetation zones are identified in Table 10 3 and mapped on Figure 10 1.

Table 10-3 PCTs and vegetation zones that do not require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
2	567_Grassland	Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion	60.6	0.4

6	704_Grassland	Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion	38.2	0.5

10.3 Areas not requiring assessment

Areas not requiring assessment are lands that have been deemed to be Category 1 Exempt Lands. These areas are mapped on Figure 10 1.

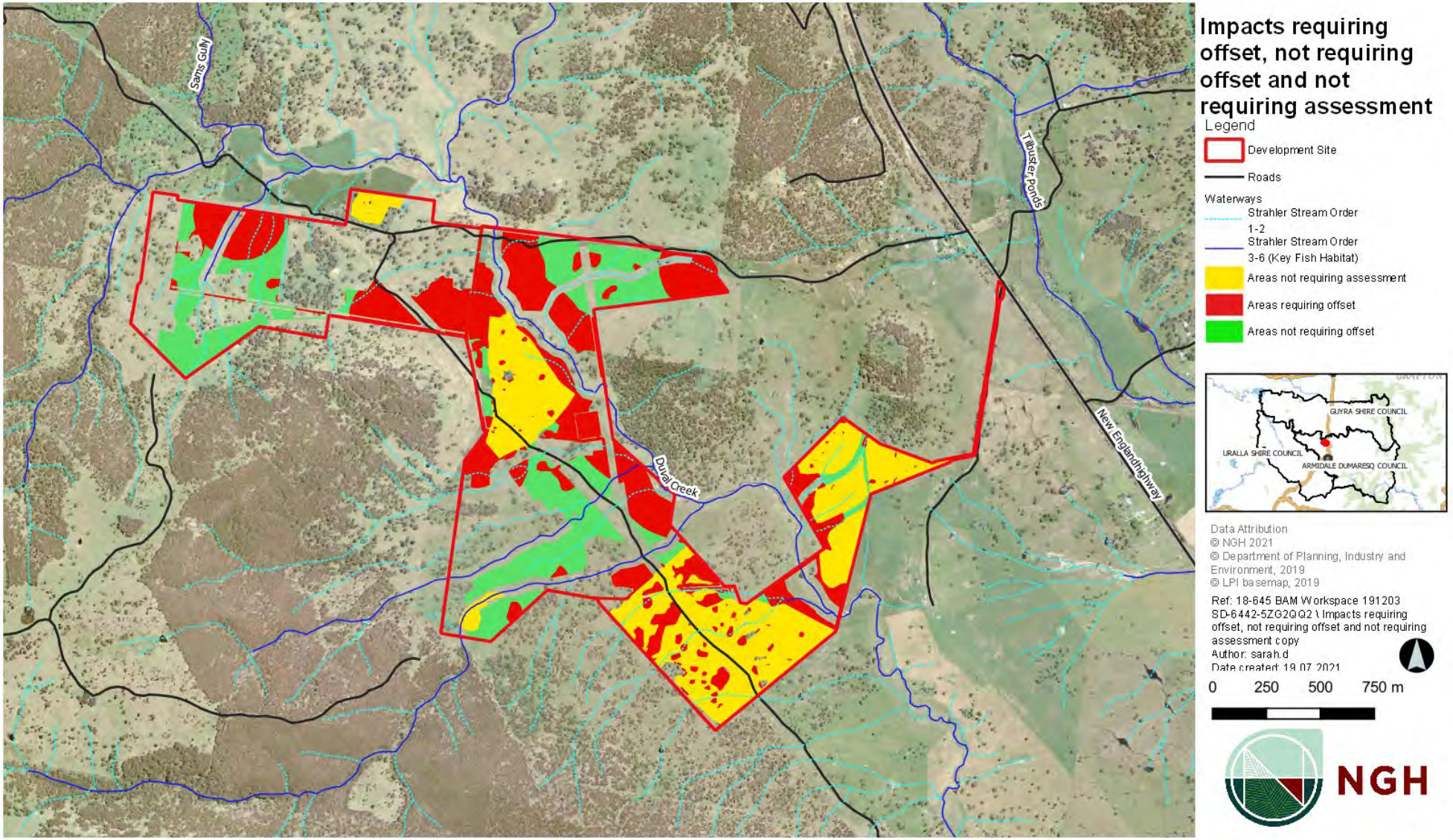

Figure 10-1 Impacts requiring offsets, impacts not requiring offsets and areas not requiring assessment

11. Conclusion

NGH has prepared this BDAR on behalf of Enerpac on for the Tilbuster Solar Farm in Tilbuster, NSW. The purpose of this BDAR was to address the requirements of the BAM, and to address the biodiversity matters raised in the SEARs and Supplementary SEARs. In this BDAR:

- Biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the BAM
- Biodiversity impacts have been assessed at a worst-case scenario, based on an indicative easement (development site) which will be reduced upon final design
- Mitigation measures have been outlined to reduce impacts to biodiversity
- The credit requirement has been defined as:
    - 269 Ecosystem Credits for impacts to PCT 567-Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion
    - 18 Ecosystem Credits for impacts to PCT 575-Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion
    - 103 Ecosystem Credits for impacts to 704-Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion
    - 83 species credits for Pale-headed Snake that is assumed within the development site
    - 299 species credits for Koala recorded within the development site
    - 123 species credits for Southern Myotis that was recorded within the development site
    - 55 species credits for Greater Glider that was recorded within the development site

The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets Scheme, and will be achieved by:

- acquiring or retiring credits under the Biodiversity Offsets Scheme
- making payments into the Biodiversity Conservation Fund using the offsets payment calculator, or
- funding a biodiversity action that benefits the threatened entity(ies) impacted by the development.

An offset strategy addressing Federal requirements will be developed based on further investigations, prior to approval.

12. Reference List

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Appendix A Land category assessment

9th December 2019

Nicky Owner
Senior Conservation Planning Officer,
North East Branch
Department of Planning, Industry and Environment
24 Moonee Street
Coffs Harbour NSW 2450

Nicky.owner@environment.nsw.gov.au

Dear Nicky,

Re: 18-645 Tilbuster Solar Farm

NGH has been engaged to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed Tilbuster Solar Farm, located approximately 15kms north of Armidale. The development site includes Lot 1 DP225170, Lot 4 DP800611 (Figure 1).

Section 6.8(3) of the *Biodiversity Conservation Act 2016* determines that the Biodiversity Assessment Method (BAM) is to exclude the assessment of the impacts of clearing of native vegetation on Category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013*) with exception to any impacts prescribed by the regulations under section 6.3 . Boundaries mapping Category 1-exempt land on the Native Vegetation Regulatory Mapping are not yet publicly available however, during the transitional period, accredited assessors may establish the categorisation of land for the agency head to consider, following the method utilised to develop the Native Vegetation Regulatory Map (NVR).

Category 1-exempt land is defined under the LLS act as;

- Land cleared of native vegetation as at 1 January 1990 or lawfully cleared after 1 January 2019
- Low Conservation Grasslands (following commencement of the new framework on 25th August 2017
- Land (not being grasslands) containing only low conservation groundcover (following commencement of the new framework on 25th August 2017)
- Native vegetation identified as regrowth in a Property Vegetation Plan under the repealed Native Vegetation Act 2003
- Land biodiversity certified under the *Biodiversity Conservation Act 2016*.

This letter report establishes the methodology, results and conclusions to evaluate the land categorisation for the development site. It is anticipated that the Department of Planning, Industry and Environment (DPIE) (Biodiversity and Conservation Division) would support this approach and provide endorsement for the land categorisation of the development site for Tilbuster Solar Farm.

If you have any questions, please contact me on the number below. I would be pleased to discuss this matter with you further.

Yours sincerely,
NGH Pty Ltd

Mitch Palmer
Technical Lead
Accredited Assessor BAAS 17051
Ph: 6923 1534

Attachment 1

Methodology

An initial desktop assessment and subsequent field assessments were undertaken over the development site to determine the ecological constraints and native vegetation communities on site. Assessment of the development site as Category 1-Exempt and Category 2- Regulated Land was undertaken using the following data sources:

- Aerial imagery of historical land use (Sourced from Google Earth and Spatial Services unit Department of Finance, Services and Innovation);
- 2017 Land Use Dataset (Australian Land Use and Management (ALUM) Classification Version 7 (OEH, 2017);
- NSW Woody vegetation extent and FPC 2011 (OEH, 2015);
- Sensitive regulated and vulnerable regulated lands on the Native Vegetation Regulatory Map portal
- Relevant vegetation mapping layers available from the SEED portal.

The potential of land legally cleared at or since 1 Jan 1990 (Woody vegetation only) and/or land significantly disturbed or modified since 1990 (Non-woody vegetation) was assessed. Where there was any doubt, or where data was conflicting, the precautionary principle was applied, and deferred to Category 2 – Regulated Land.

Results

The analysis of the above sources identified in conjunction with aerial imagery that obvious portions of the land within the development site has been used continuously for cropping and grazing prior to and post 1990. Although smaller areas of past cropping are clearly evident, the vast majority of the development site is identified as having modified pastures in the relevant land use layers, however, conclusive evidence within the supporting historical imagery could not determine the significance of groundcover modification and therefore a precautionary approach was applied, with exception of more recent areas of cropping evident during the field surveys (for example being the most south eastern portion of the development site). The following table (Table 1) demonstrates how the above-mentioned layers were used in determining land category:

Table 1 – Summary of date sources and interpretation

Data Sources	Category 1 – Exempt Land	Category 2– Regulated Land	Excluded Land
Aerial Imagery Tilbuster Locality • 1990 • 2001 • 2015	• Clear evidence of cropping • Clear evidence of significant groundcover modification	• Woody vegetation present at 1990 in conjunction with woody vegetation extent layer	N/A
2017 Land Use Dataset	Land use identified as; • Grazing modified pastures (excluding woody vegetation) where clear evidence of significant groundcover modification has occurred post 1990 • Cropping • Manufacturing and industrial • Residential and farm infrastructure • Transport and communication	Land use identified as; • Managed resource protection • Grazing native vegetation • Grazing modified pastures where evidence of significant groundcover modification is absent	N/A

		(precautionary principle applied)	
NSW Woody vegetation extent	• Areas of woody vegetation regrowth that has occurred post 1990 following previous clearing events	• Woody vegetation present as at 1990 in conjunction with historic aerial imagery	N/A
Native regulatory map • Sensitive regulated land • Vulnerable regulated land • Excluded land	N/A	• All areas identified as vulnerable regulated land • All areas identified as sensitive regulated land	N/A

Another determining feature of constant agricultural use is a lack of woody vegetation regrowth in the majority of areas, as represented in the aerial images. The 2011 Woody Vegetation extent does however demonstrate scattered patches and isolated paddock trees in the development site which has been mapped as Category 2 Regulated Land. In areas where it is not 100% conclusive whether the grassland areas have been previously cropped or significantly modified, a precautionary approach has been applied and mapped as Category 2 – Regulated Land.

The NVR Map identifies areas of both Vulnerable Regulated Land and Sensitive Regulated Land occurring within the development site, and therefore has mapped at Category 2 – Regulated land.

PCTs in various conditions states within the development site that have recorded during the field surveys undertaken thus far include;

- PCT 704 - *Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion;*
- PCT 567 - *Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion;* and
- PCT 575 - *Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion*.

Conclusion

Based on the above data sources, there is evidence to suggest that portions of Lot 1 DP225170 and Lot 4 DP800611 within the Armidale Local Government Area (LGA), has been under regular rotational cropping or significantly modified since 1990. This primarily consists of ploughing and sowing of improved pasture species such as *Vulpia sp*.

The 2017 Land Use Mapping data supports primary land use within the identified areas within these lots as cropping or modified pastures, will smaller areas of grazing native vegetation. The 2017 Land Use map shows the majority of the site to be 'Grazing modified pastures', with site surveys identifying evidence of cropping in these areas to the east of the development site (Figure1 and Table 2). These areas are considered to meet the definition of Category 1- Exempt Land. Woody vegetation and areas identified as 'Grazing native vegetation' have been included as Category 2 - Regulated land. Where in doubt, or where data sources are conflicting, a precautionary approach has been implemented to areas deemed inconclusive in terms of determining historical land use.

A draft map of areas considered to be Category 1 Exempt Land and Category 2 Regulated Land and has been produced and shown in Figure 1 to Figure 8.

Figures

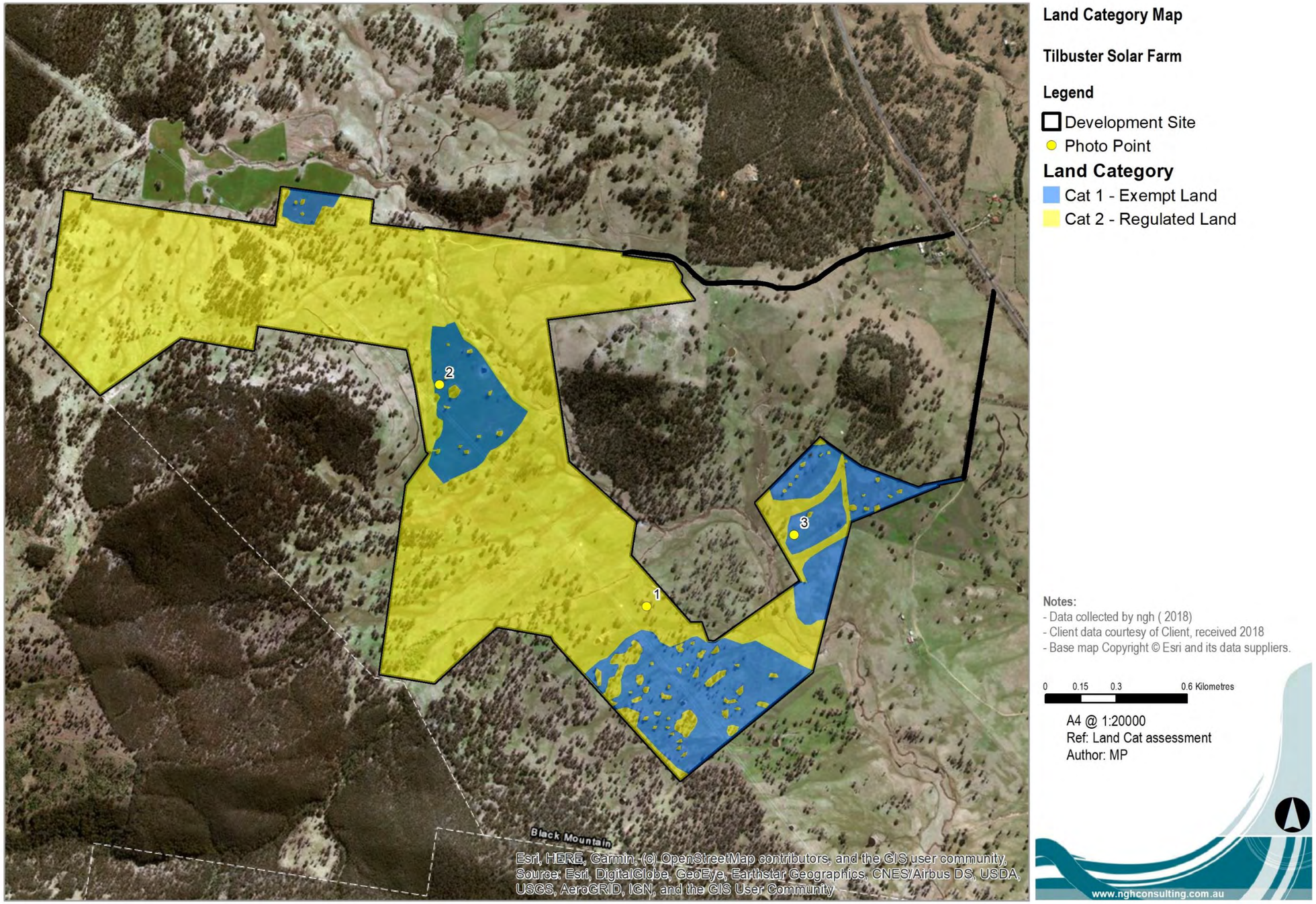


Figure 1 Proposal area and land categorisation 2015 Image (Source ESRI)

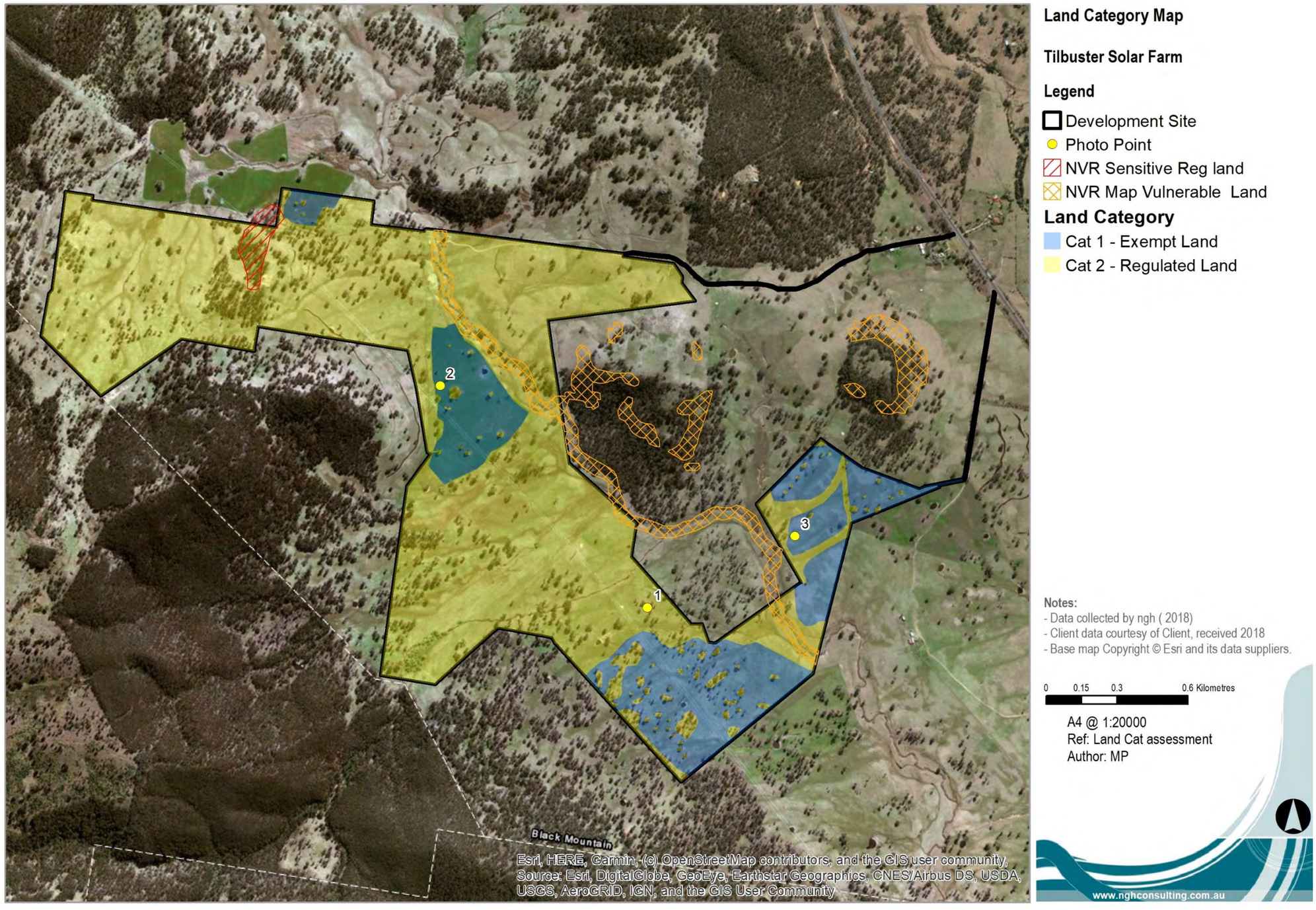


Figure 2 Land categorisation, Vulnerable regulated land and Sensitive regulated land (Source ESRI)

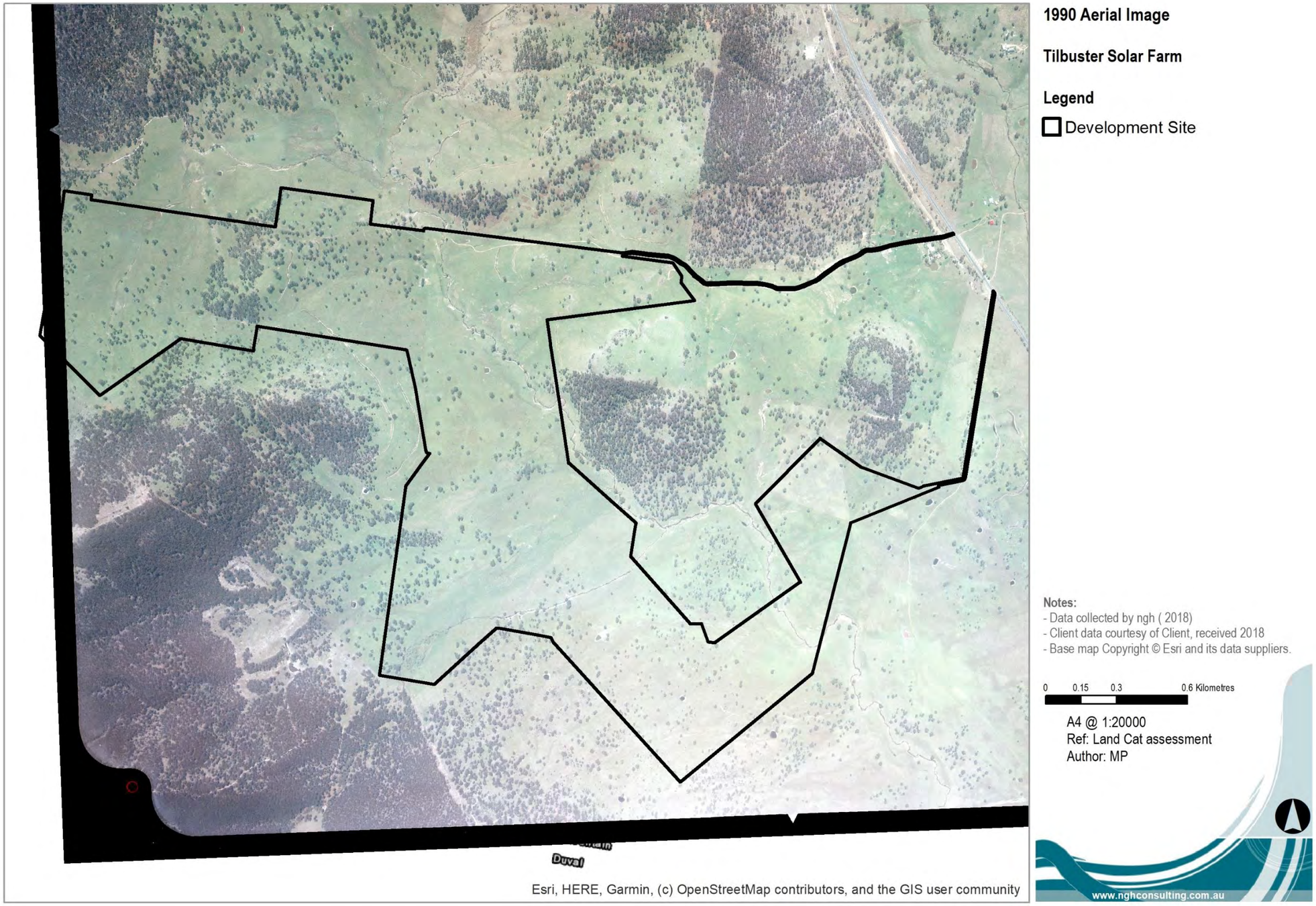


Figure 3 Aerial Imagery 1990 (Source: Dept. Spatial Services delivery)

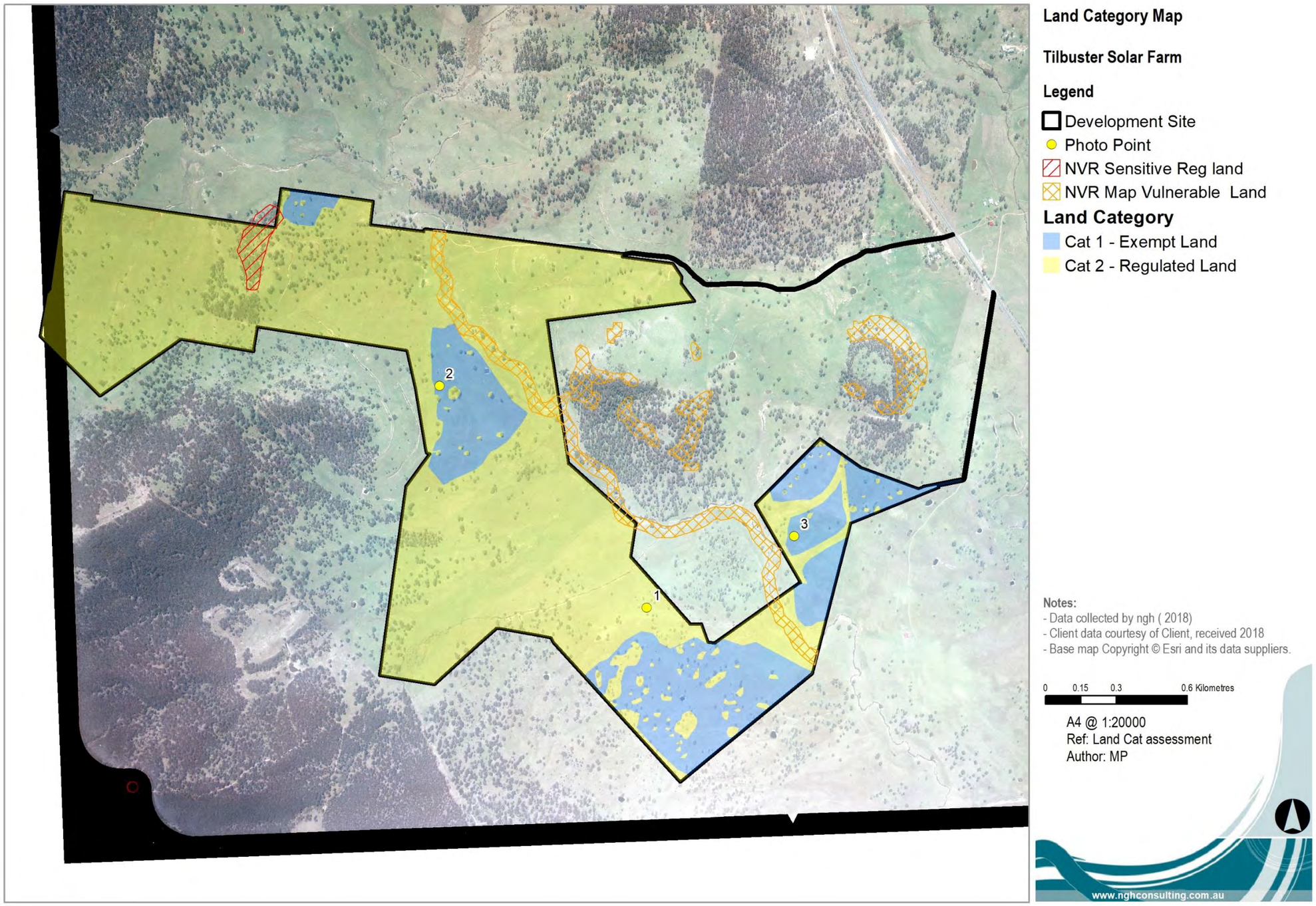


Figure 4 Aerial Imagery 1990 with Land categorisation (Source: Dept. Spatial Services delivery)

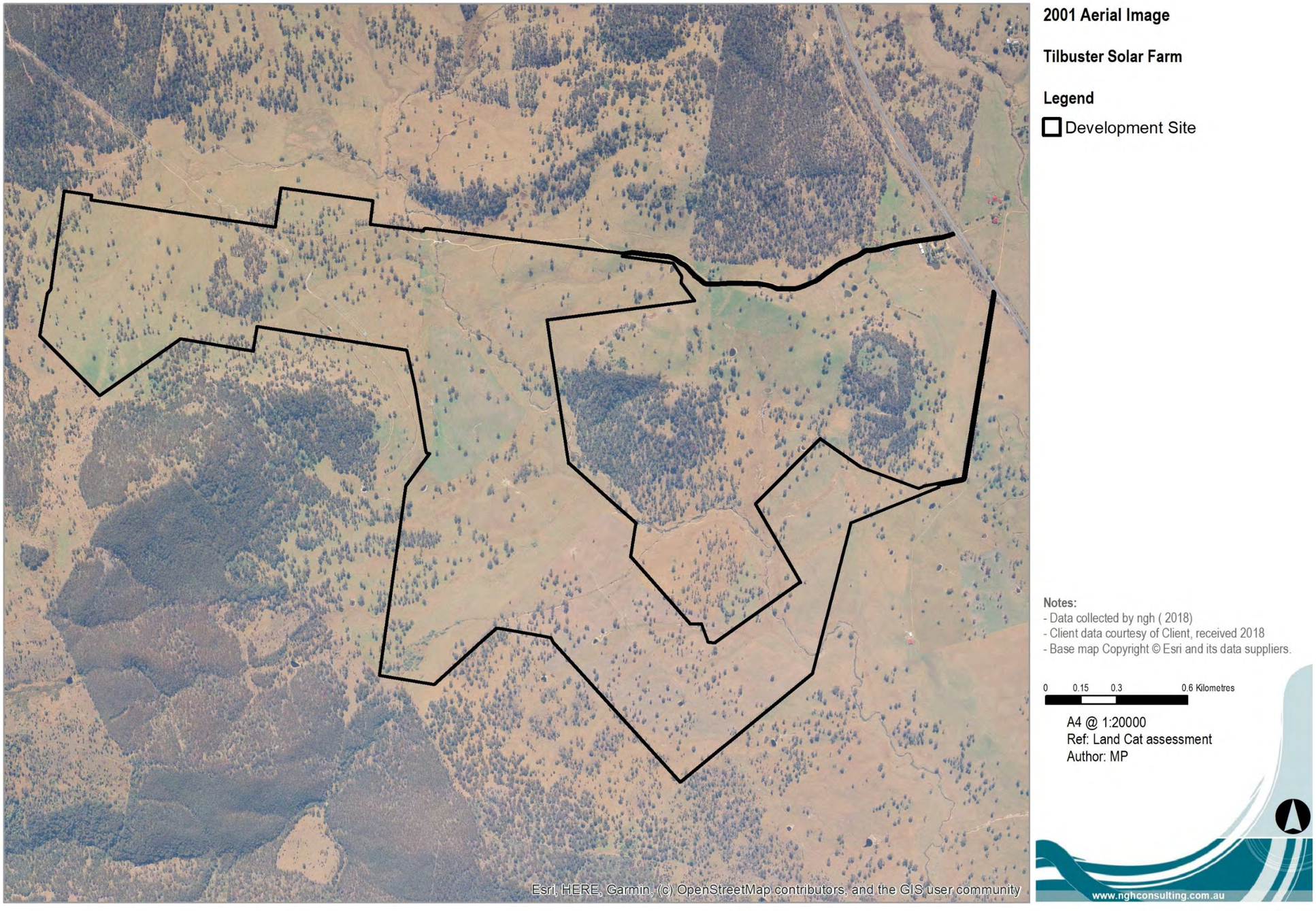


Figure 5 Aerial Imagery 2001 (Source: Dept. Spatial Services delivery)

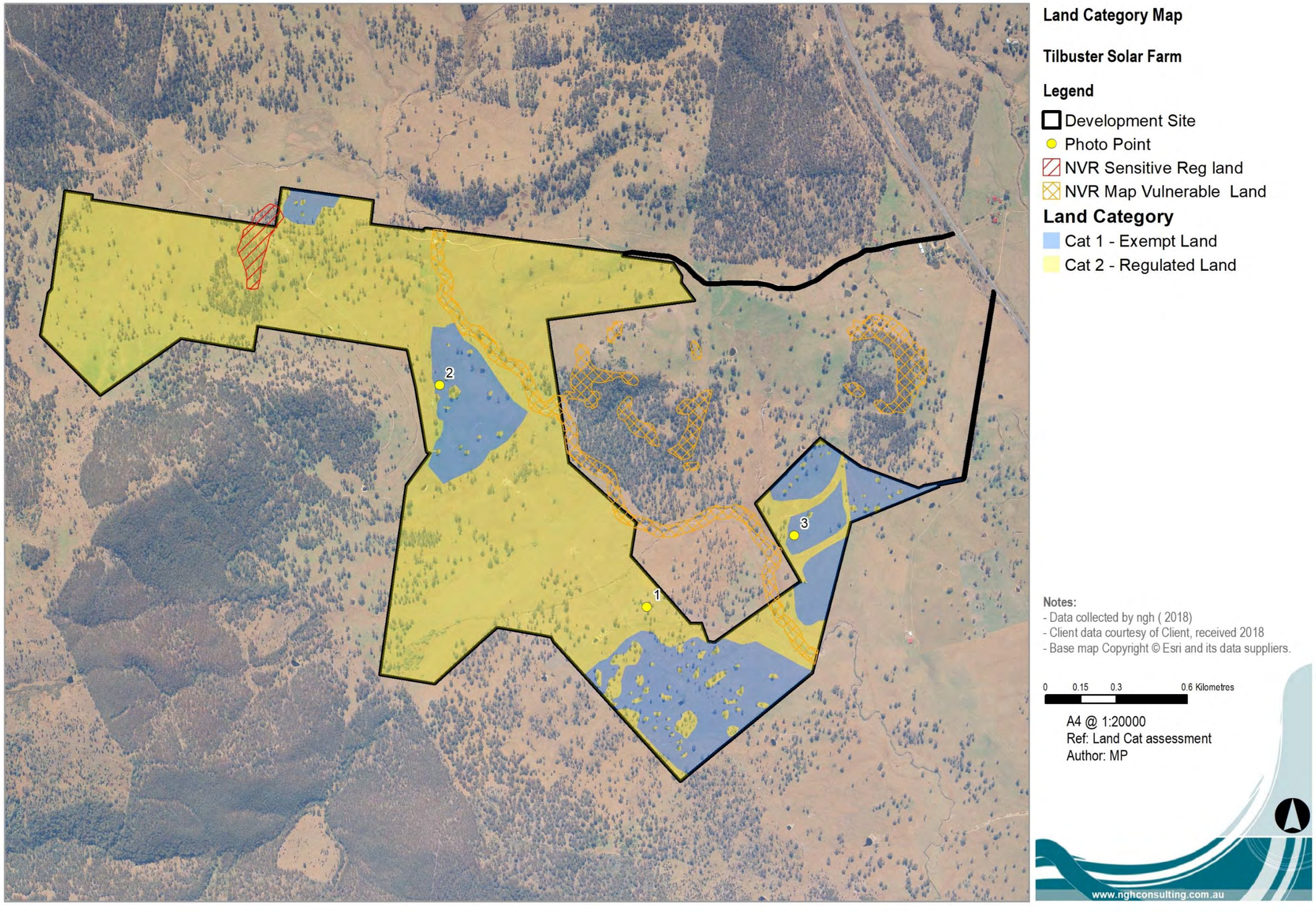


Figure 6 Aerial Imagery 2001 with Land categorisation (Source: Dept. Spatial Services delivery)

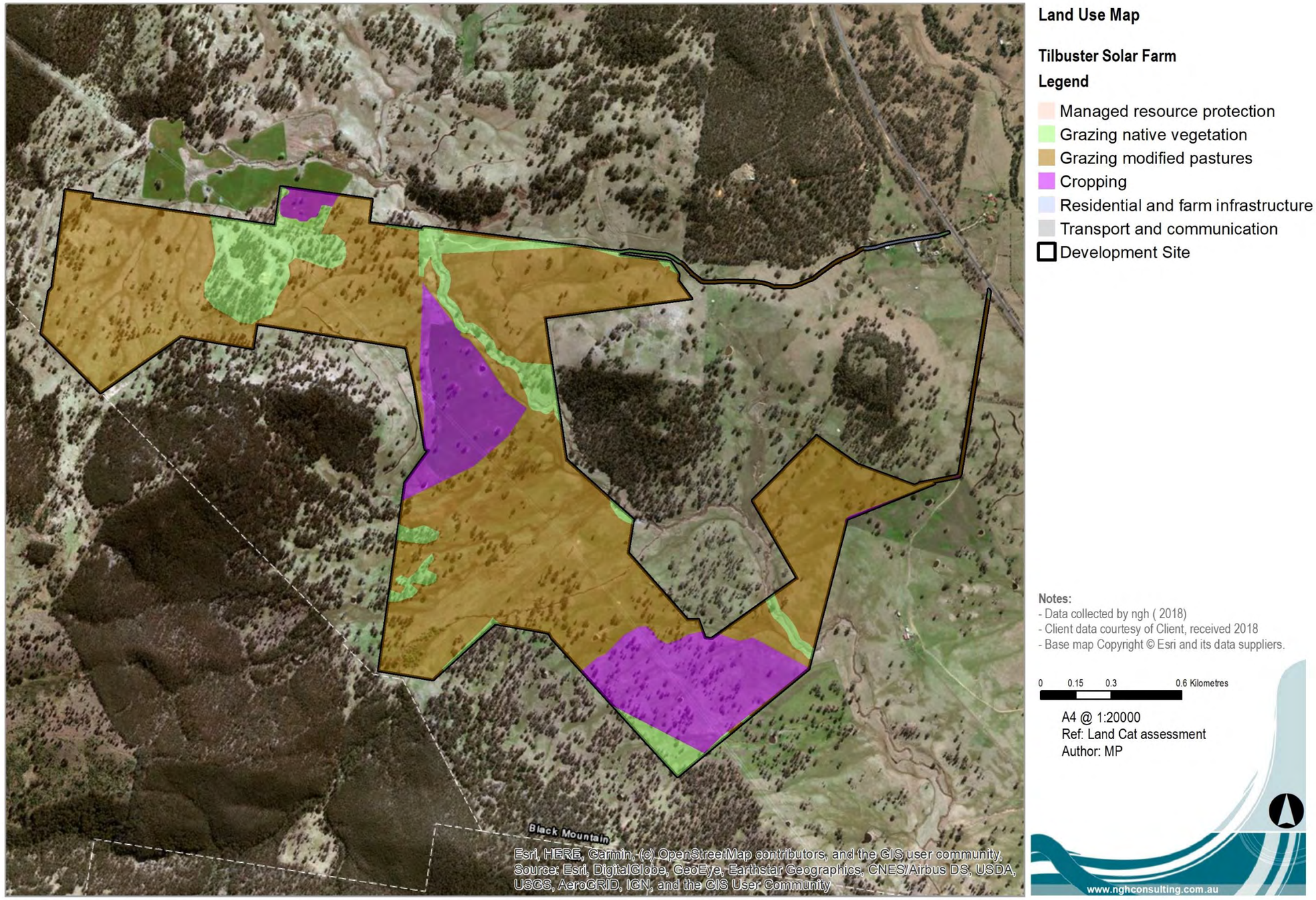


Figure 7 2017 Land Use Dataset

Woody vegetation

Tilbuster Solar Farm

Legend

- Non Woody
- Woody
- Development Site

Notes:

- Data collected by ngh (2018)
- Client data courtesy of Client, received 2018
- Base map Copyright © Esri and its data suppliers.

0 0.15 0.3 0.6 Kilometres

A4 @ 1:20000
Ref: Land Cat assessment
Author: MP

www.nghconsulting.com.au

Figure 8 NSW Woody vegetation extent and FPC 2011

Table 2 – Supporting photographic evidence of current cropping

Photo point	Summary	Image
Photo Point 1	Evidence of cropping within the development site with sown *Vulpia* sp. surrounding category 2 vegetation	
Photo Point 2	Ploughed paddock beyond fence line	

Photo Point 3	Stag located within ploughed paddock (16th August 2019)	

Appendix B Plot field data

Plot 1

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	80%	**71.25%**
	Shrub (SG)	**1**		15m	75%	
	Forb (FG)	**4**		25m	70%	
	Grass & grasslike (GG)	**11**		35m	60%	
	Fern (EG)	**0**		45m		
	Other (OG)	**0**	**Bare ground cover**	5m	2%	**4%**
	TOTAL	**18**		15m	10%	
BAM Attribute (20x20m plot) Structure				25m	2%	
	Stratum	**Sum**		35m	3%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**7**		45m		
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.4**		15m	0%	
	Grass & grasslike (GG)	**63.8**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m		
	TOTAL Native	**71.3**	**Rock Cover**	5m	1%	**1%**
	TOTAL 'HTE'	**0.2**		15m	3%	
				25m	1%	
				35m	0%	
				45m		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2		
50-79			
30-49	1		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		5	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Cynodon dactylon	Common Couch	Poaceae	50			Grass & grasslike (GG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	10			Grass & grasslike (GG)	No		
Austrostipa scabra	Speargrass	Poaceae	2	500		Grass & grasslike (GG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	1	300		Grass & grasslike (GG)	No		
Eragrostis leptocarpa	Drooping Lovegrass	Poaceae	0.2	100		Grass & grasslike (GG)	No		
Poa sieberiana	Snowgrass	Poaceae	0.1	100		Grass & grasslike (GG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	0.1	100		Grass & grasslike (GG)	No		
Urtica incisa	Stinging Nettle	Urticaceae	0.1	50		Forb (FG)	No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.1	6		Forb (FG)	No		
Crassula sieberiana	Australian Stonecrop	Crassulaceae	0.1	20		Forb (FG)	No		
Dichelachne micrantha	Shorthair Plumegrass	Poaceae	0.1	100		Grass & grasslike (GG)	No		
Bothriochloa macra	Red Grass	Poaceae	0.1	100		Grass & grasslike (GG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.1	4		Shrub (SG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Carex inversa	Knob Sedge	Cyperaceae	0.1	3		Grass & grasslike (GG)	No		
Calotis cuneata	Mountain Burr-Daisy	Asteraceae	0.1	10		Forb (FG)	No		
Panicum effusum	Hairy Panic	Poaceae	0.1	100		Grass & grasslike (GG)	No		

Plot 2

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	60%	**17.00%**
	Shrub (SG)	**1**		15m	5%	
	Forb (FG)	**2**		25m	5%	
	Grass & grasslike (GG)	**5**		35m	5%	
	Fern (EG)	**0**		45m	10%	
	Other (OG)	**0**	**Bare ground cover**	5m	2%	**70%**
	TOTAL	**10**		15m	90%	
BAM Attribute (20x20m plot) Structure				25m	85%	
	Stratum	**Sum**		35m	95%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**50**		45m	80%	
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**2.1**		15m	0%	
	Grass & grasslike (GG)	**6.2**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**58.4**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	1%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79	1		
30-49	1		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	3	1		Tree (TG)	No		
Eucalyptus melliodora	Yellow Box	Myrtaceae	2	1		Tree (TG)	No		
Vulpia myuros	Rat's Tail Fescue	Poaceae	60		*		No		
Calotis cuneata	Mountain Burr-Daisy	Asteraceae	2	300		Forb (FG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	1	100		Grass & grasslike (GG)	No		
Eragrostis leptocarpa	Drooping Lovegrass	Poaceae	2	300		Grass & grasslike (GG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	0.1	7		Grass & grasslike (GG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.1	1		Shrub (SG)	No		
Lolium perenne	Perennial Ryegrass	Poaceae	1	400	*		No		
Carex inversa	Knob Sedge	Cyperaceae	0.1	100		Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.2	300	*		No		
Bromus hordeaceus	Soft Brome	Poaceae	1	300	*		No		
Urtica incisa	Stinging Nettle	Urticaceae	0.1	30		Forb (FG)	No		
Elymus scaber	Common Wheatgrass	Poaceae	3			Grass & grasslike (GG)	No		

Plot 3

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	50%	**56.00%**
	Shrub (SG)	**1**		15m	40%	
	Forb (FG)	**3**		25m	80%	
	Grass & grasslike (GG)	**7**		35m	70%	
	Fern (EG)	**1**		45m	40%	
	Other (OG)	**0**	**Bare ground cover**	5m	10%	**22%**
	TOTAL	**14**		15m	40%	
BAM Attribute (20x20m plot) Structure				25m	10%	
	Stratum	**Sum**		35m	10%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**18**		45m	40%	
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**1%**
	Forb (FG)	**1.3**		15m	5%	
	Grass & grasslike (GG)	**25.4**		25m	0%	
	Fern (EG)	**0.2**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**45**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**2**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	3		
50-79			
30-49	3		
20-29	3		
10-19	1		
5-9			
<5			N/A
Length of logs (m)		17	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	8			Tree (TG)	No		
Eucalyptus banksii	Tenterfield Woollybutt	Myrtaceae	10			Tree (TG)	No		
Calotis cuneata	Mountain Burr-Daisy	Asteraceae	1	400		Forb (FG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.1	3		Shrub (SG)	No		
Lachnagrostis filiformis		Poaceae	0.1	1		Grass & grasslike (GG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	10			Grass & grasslike (GG)	No		
Panicum effusum	Hairy Panic	Poaceae	0.1	20		Grass & grasslike (GG)	No		
Cheilanthes sieberi	Rock Fern	Pteridaceae	0.2	20		Fern (EG)	No		
Eragrostis brownii	Brown's Lovegrass	Poaceae	5			Grass & grasslike (GG)	No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.1	10		Forb (FG)	No		
Urtica incisa	Stinging Nettle	Urticaceae	0.2	6		Forb (FG)	No		
Rytidosperma tenuius	A Wallaby Grass	Poaceae	0.1	100			No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	10			Grass & grasslike (GG)	No		
Echinopogon caespitosus	Bushy Hedgehog-grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	0.1	1		Grass & grasslike (GG)	No		

Plot 4

BAM Attribute (20x20m plot) Composition	BAM Attributes (1 x 1m Plots) Function

	Stratum	Sum		Tape length	% cover	Average %
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	40%	**53.00%**
	Shrub (SG)	**2**		15m	30%	
	Forb (FG)	**9**		25m	50%	
	Grass & grasslike (GG)	**8**		35m	65%	
	Fern (EG)	**0**		45m	80%	
	Other (OG)	**0**	**Bare ground cover**	5m	50%	**26%**
	TOTAL	**21**		15m	20%	
BAM Attribute (20x20m plot)				25m	20%	
	Stratum	**Sum**		35m	20%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**11**		45m	20%	
	Shrub (SG)	**0.3**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**3.6**		15m	0%	
	Grass & grasslike (GG)	**55.4**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**70.3**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	1%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1		
50-79	2		
30-49			
20-29	2		
10-19			
5-9			
<5			N/A
Length of logs (m)		7	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eragrostis leptocarpa	Drooping Lovegrass	Poaceae	20			Grass & grasslike (GG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	15			Grass & grasslike (GG)	No		
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	10			Tree (TG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	10			Grass & grasslike (GG)	No		
Vulpia myuros	Rat's Tail Fescue	Poaceae	10		*		No		
Lachnagrostis filiformis		Poaceae	10			Grass & grasslike (GG)	No		
Calotis cuneifolia	Purple Burr-daisy	Asteraceae	2	500		Forb (FG)	No		
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	1	1		Tree (TG)	No		
Cotula australis	Common Cotula	Asteraceae	0.5	300		Forb (FG)	No		
Dichondra repens	Kidney Weed	Convolvulaceae	0.5	500		Forb (FG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.2	6		Shrub (SG)	No		
Bromus hordeaceus	Soft Brome	Poaceae	0.1	1	*		No		
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	Caryophyllaceae	0.1	100	*		No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
Daviesia genistifolia	Broom Bitter Pea	Fabaceae (Faboideae)	0.1	1		Shrub (SG)	No		
Geranium solanderi	Native Geranium	Geraniaceae	0.1	50		Forb (FG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	20	*		No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Crassula sieberiana	Australian Stonecrop	Crassulaceae	0.1	10		Forb (FG)	No		
Elymus scaber	Common Wheatgrass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
Aristida ramosa	Purple Wiregrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	0.1	5		Grass & grasslike (GG)	No		
Carex inversa	Knob Sedge	Cyperaceae	0.1	50		Grass & grasslike (GG)	No		
Urtica incisa	Stinging Nettle	Urticaceae	0.1	6		Forb (FG)	No		
Asperula conferta	Common Woodruff	Rubiaceae	0.1	1		Forb (FG)	No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.1	10		Forb (FG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	5	*		No		

Plot 5

BAM Attribute (20x20m plot) Composition			**BAM Attributes (1 x 1m Plots) Function**			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	35%	**25.00%**
	Shrub (SG)	**3**		15m	35%	
	Forb (FG)	**8**		25m	19%	
	Grass & grasslike (GG)	**7**		35m	20%	
	Fern (EG)	**0**		45m	16%	
	Other (OG)	**2**	**Bare ground cover**	5m	10%	**5%**
	TOTAL	**22**		15m	5%	
BAM Attribute (20x20m plot) Structure				25m	1%	
	Stratum	**Sum**		35m	5%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**12**		45m	2%	
	Shrub (SG)	**0.3**	**Cryptogam cover**	5m	5%	**6%**
	Forb (FG)	**0.9**		15m	10%	
	Grass & grasslike (GG)	**61.7**		25m	10%	
	Fern (EG)	**0**		35m	2%	
	Other (OG)	**5.1**		45m	2%	
	TOTAL Native	**80**	**Rock Cover**	5m	50%	**51%**
	TOTAL 'HTE'	**0.1**		15m	50%	
				25m	70%	
				35m	5%	
				45m	80%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2		
50-79			
30-49	2		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		7	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Cynodon dactylon	Common Couch	Poaceae	40			Grass & grasslike (GG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	15			Grass & grasslike (GG)	No		
Eucalyptus melliodora	Yellow Box	Myrtaceae	7			Tree (TG)	No		
Clematis aristata	Old Man's Beard	Ranunculaceae	5			Other (OG)	No		
Eragrostis brownii	Brown's Lovegrass	Poaceae	5			Grass & grasslike (GG)	No		
Bromus hordeaceus	Soft Brome	Poaceae	5		*		No		
Eucalyptus laevopinea	Silver-top Stringybark	Myrtaceae	5			Tree (TG)	No		
Phytolacca octandra	Inkweed	Phytolaccaceae	1		*		No		
Poa sieberiana	Snowgrass	Poaceae	1			Grass & grasslike (GG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.5	200		Grass & grasslike (GG)	No		
Geranium solanderi	Native Geranium	Geraniaceae	0.2	200		Forb (FG)	No		
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	Caryophyllaceae	0.2	200	*		No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.1	100		Forb (FG)	No		
Oxalis perennans		Oxalidaceae	0.1	50		Forb (FG)	No		
Calotis cuneifolia	Purple Burr-daisy	Asteraceae	0.1	50		Forb (FG)	No		
Wahlenbergia luteola	Bluebell	Campanulaceae	0.1	20		Forb (FG)	No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	20		Forb (FG)	No		
Cassinia quinquefaria		Asteraceae	0.1	1		Shrub (SG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Ageratum houstonianum		Asteraceae	0.1	1	*		No		
Bothriochloa macra	Red Grass	Poaceae	0.1	20		Grass & grasslike (GG)	No		
Desmodium varians	Slender Tick-trefoil	Fabaceae (Faboideae)	0.1	20		Other (OG)	No		
Rubus parvifolius	Native Raspberry	Rosaceae	0.1	10		Shrub (SG)	No		
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush	Lomandraceae	0.1	2		Grass & grasslike (GG)	No		
Dichondra repens	Kidney Weed	Convolvulaceae	0.1	20		Forb (FG)	No		
Vittadinia muelleri	A Fuzzweed	Asteraceae	0.1	10		Forb (FG)	No		
Acetosella vulgaris	Sheep Sorrel	Polygonaceae	0.1	5	*		HTE		
Trifolium repens	White Clover	Fabaceae (Faboideae)	0.1	1	*		No		
Olearia elliptica	Sticky Daisy-bush	Asteraceae	0.1	1		Shrub (SG)	No		

Plot 6

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	70%	**73.00%**
	Shrub (SG)	**1**		15m	55%	
	Forb (FG)	**3**		25m	85%	
	Grass & grasslike (GG)	**9**		35m	85%	
	Fern (EG)	**0**		45m	70%	
	Other (OG)	**0**	**Bare ground cover**	5m	5%	**15%**
	TOTAL	**15**		15m	35%	
BAM Attribute (20x20m plot) Structure				25m	5%	
	Stratum	**Sum**		35m	5%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**13**		45m	25%	
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.3**		15m	0%	
	Grass & grasslike (GG)	**53.2**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**66.6**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	1%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	3		
50-79	1		1
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Vulpia myuros	Rat's Tail Fescue	Poaceae	25		*		No		
Cynodon dactylon	Common Couch	Poaceae	25			Grass & grasslike (GG)	No		
Eucalyptus bridgesiana	Apple Box	Myrtaceae	10			Tree (TG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	10			Grass & grasslike (GG)	No		
Bothriochloa macra	Red Grass	Poaceae	5			Grass & grasslike (GG)	No		
Eragrostis brownii	Brown's Lovegrass	Poaceae	5			Grass & grasslike (GG)	No		
Bromus hordeaceus	Soft Brome	Poaceae	5		*		No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	5			Grass & grasslike (GG)	No		
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	3	1		Tree (TG)	No		
Aristida ramosa	Purple Wiregrass	Poaceae	2	300		Grass & grasslike (GG)	No		
Poa sieberiana	Snowgrass	Poaceae	1	20		Grass & grasslike (GG)	No		
Austrostipa scabra	Speargrass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
Calotis cuneifolia	Purple Burr-daisy	Asteraceae	0.1	50		Forb (FG)	No		
Cymbonotus lawsonianus	Bear's Ear	Asteraceae	0.1	6		Forb (FG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	0.1	50		Grass & grasslike (GG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Lissanthe strigosa	Peach Heath	Ericaceae	0.1	2		Shrub (SG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	20	*		No		
Oxalis perennans		Oxalidaceae	0.1	50		Forb (FG)	No		
Lolium perenne	Perennial Ryegrass	Poaceae	0.1	1	*		No		

Plot 7

BAM Attribute (20x20m plot) Composition			**BAM Attributes (1 x 1m Plots) Function**			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**4**	**Litter Cover**	5m	95%	**41.00%**
	Shrub (SG)	**2**		15m	50%	
	Forb (FG)	**8**		25m	30%	
	Grass & grasslike (GG)	**7**		35m	20%	
	Fern (EG)	**0**		45m	10%	
	Other (OG)	**0**	**Bare ground cover**	5m	0%	**4%**
	TOTAL	**21**		15m	5%	
BAM Attribute (20x20m plot) Structure				25m	10%	
	Stratum	**Sum**		35m	5%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**15**		45m	2%	
	Shrub (SG)	**0.3**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**2.6**		15m	0%	
	Grass & grasslike (GG)	**40.6**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**58.5**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	2%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2		
50-79	1		
30-49	3		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		2	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Aristida ramosa	Purple Wiregrass	Poaceae	0.5	300		Grass & grasslike (GG)	No		
Asperula conferta	Common Woodruff	Rubiaceae	0.1	5		Forb (FG)	No		
Austrostipa scabra	Speargrass	Poaceae	0.1	50		Grass & grasslike (GG)	No		
Bromus hordeaceus	Soft Brome	Poaceae	5		*		No		
Calotis cuneifolia	Purple Burr-daisy	Asteraceae	0.1	10		Forb (FG)	No		
Crassula sieberiana	Australian Stonecrop	Crassulaceae	0.1	300		Forb (FG)	No		
Cynodon dactylon	Common Couch	Poaceae	5			Grass & grasslike (GG)	No		
Dichondra repens	Kidney Weed	Convolvulaceae	1	200		Forb (FG)	No		
Eragrostis brownii	Brown's Lovegrass	Poaceae	10			Grass & grasslike (GG)	No		
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	2	1		Tree (TG)	No		
Eucalyptus bridgesiana	Apple Box	Myrtaceae	2	1		Tree (TG)	No		
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	3	1		Tree (TG)	No		
Eucalyptus melliodora	Yellow Box	Myrtaceae	8			Tree (TG)	No		
Hibbertia obtusifolia	Hoary Guinea Flower	Dilleniaceae	0.1	1		Shrub (SG)	No		
Hydrocotyle laxiflora	Stinking Pennywort	Apiaceae	1	200		Forb (FG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	15			Grass & grasslike (GG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.2	3		Shrub (SG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	50	*		No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Poa sieberiana	Snowgrass	Poaceae	5			Grass & grasslike (GG)	No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	10		Forb (FG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	5			Grass & grasslike (GG)	No		
Tricoryne elatior	Yellow Autumn-lily	Anthericaceae	0.1	1		Forb (FG)	No		
Trifolium repens	White Clover	Fabaceae (Faboideae)	1	2	*		No		
Urtica incisa	Stinging Nettle	Urticaceae	0.1	6		Forb (FG)	No		

Plot 8

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**3**	**Litter Cover**	5m	30%	**63.00%**
	Shrub (SG)	**1**		15m	75%	
	Forb (FG)	**10**		25m	70%	
	Grass & grasslike (GG)	**5**		35m	70%	
	Fern (EG)	**0**		45m	70%	
	Other (OG)	**1**	**Bare ground cover**	5m	30%	**12%**
	TOTAL	**20**		15m	5%	
BAM Attribute (20x20m plot) Structure				25m	2%	
	Stratum	**Sum**		35m	20%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**19**		45m	2%	
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**2.6**		15m	0%	
	Grass & grasslike (GG)	**60.3**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0.1**		45m	0%	
	TOTAL Native	**82.1**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	1%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2		
50-79	4		
30-49	2		1
20-29	2		
10-19			
5-9			
<5			N/A
Length of logs (m)		83	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Microlaena stipoides	Weeping Grass	Poaceae	40			Grass & grasslike (GG)	No		
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	15	10		Tree (TG)	No		
Cynodon dactylon	Common Couch	Poaceae	10			Grass & grasslike (GG)	No		
Eragrostis brownii	Brown's Lovegrass	Poaceae	10			Grass & grasslike (GG)	No		
Vulpia myuros	Rat's Tail Fescue	Poaceae	5		*		No		
Bromus hordeaceus	Soft Brome	Poaceae	5		*		No		
Eucalyptus banksii	Tenterfield Woollybutt	Myrtaceae	2	1		Tree (TG)	No		
Eucalyptus melliodora	Yellow Box	Myrtaceae	2	2		Tree (TG)	No		
Dichondra repens	Kidney Weed	Convolvulaceae	1	500		Forb (FG)	No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.5	500		Forb (FG)	No		
Mentha satureioides	Native Pennyroyal	Lamiaceae	0.2	200		Forb (FG)	No		
Geranium solanderi	Native Geranium	Geraniaceae	0.2	200		Forb (FG)	No		
Oxalis perennans		Oxalidaceae	0.2	100		Forb (FG)	No		
Lachnagrostis filiformis		Poaceae	0.2	200		Grass & grasslike (GG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	1	*		No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	10	*		No		
Vittadinia muelleri	A Fuzzweed	Asteraceae	0.1	3		Forb (FG)	No		
Crassula sieberiana	Australian Stonecrop	Crassulaceae	0.1	50		Forb (FG)	No		
Cymbonotus lawsonianus	Bear's Ear	Asteraceae	0.1	10		Forb (FG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Poa sieberiana	Snowgrass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	Caryophyllaceae	0.1	100	*		No		
Desmodium varians	Slender Tick-trefoil	Fabaceae (Faboideae)	0.1	1		Other (OG)	No		
Calotis cunefolia	Purple Burr-daisy	Asteraceae	0.1	2			No		
Cassinia uncata	Sticky Cassinia	Asteraceae	0.1	1		Shrub (SG)	No		
Wahlenbergia luteola	Bluebell	Campanulaceae	0.1	1		Forb (FG)	No		
Ageratum houstonianum		Asteraceae	0.1	1	*		No		
Cotula australis	Common Cotula	Asteraceae	0.1	1		Forb (FG)	No		

Plot 9

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**3**	**Litter Cover**	5m	50%	**43.00%**
	Shrub (SG)	**0**		15m	25%	
	Forb (FG)	**4**		25m	50%	
	Grass & grasslike (GG)	**3**		35m	50%	
	Fern (EG)	**0**		45m	40%	
	Other (OG)	**0**	**Bare ground cover**	5m	5%	**24%**
	TOTAL	**10**		15m	70%	
BAM Attribute (20x20m plot) Structure				25m	40%	
	Stratum	**Sum**		35m	1%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**28**		45m	5%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**20.3**		15m	0%	
	Grass & grasslike (GG)	**60**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**108.3**	**Rock Cover**	5m	0%	**1%**
	TOTAL 'HTE'	**0**		15m	5%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2		
50-79	2		
30-49	1		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		3	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus melliodora	Yellow Box	Myrtaceae	15			Tree (TG)	No		
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	10			Tree (TG)	No		
Eucalyptus bridgesiana	Apple Box	Myrtaceae	3	1		Tree (TG)	No		
Urtica incisa	Stinging Nettle	Urticaceae	20			Forb (FG)	No		
Cynodon dactylon	Common Couch	Poaceae	50			Grass & grasslike (GG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	5			Grass & grasslike (GG)	No		
Oxalis perennans		Oxalidaceae	0.1	10		Forb (FG)	No		
Vulpia myuros	Rat's Tail Fescue	Poaceae	5		*		No		
Calotis cuneifolia	Purple Burr Daisy	Asteraceae	0.1	6		Forb (FG)	No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.1	20		Forb (FG)	No		
Eragrostis leptocarpa	Drooping Lovegrass	Poaceae	5			Grass & grasslike (GG)	No		
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	Caryophyllaceae	0.1	50	*		No		
Bromus hordeaceus	Soft Brome	Poaceae	5		*		No		

Plot 10

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**

Count of Native Richness	**Tree (TG)**	**3**	**Litter Cover**	5m	85%	**67.00%**
	Shrub (SG)	**0**		15m	50%	
	Forb (FG)	**5**		25m	60%	
	Grass & grasslike (GG)	**6**		35m	60%	
	Fern (EG)	**0**		45m	80%	
	Other (OG)	**0**	**Bare ground cover**	5m	2%	**9%**
	TOTAL	**14**		15m	2%	
BAM Attribute (20x20m plot) Structure				25m	40%	
	Stratum	**Sum**		35m	1%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**17**		45m	0%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.5**		15m	0%	
	Grass & grasslike (GG)	**17.1**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**34.6**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0.1**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1		
50-79	1		
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus melliodora	Yellow Box	Myrtaceae	8			Tree (TG)	No		
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	6			Tree (TG)	No		
Eucalyptus bridgesiana	Apple Box	Myrtaceae	3	1		Tree (TG)	No		
Juncus subsecundus	Finger Rush	Juncaceae	5			Grass & grasslike (GG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	5			Grass & grasslike (GG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	9	*		No		
Vulpia myuros	Rat's Tail Fescue	Poaceae	50		*		No		
Bothriochloa macra	Red Grass	Poaceae	1	500		Grass & grasslike (GG)	No		
Poa sieberiana	Snowgrass	Poaceae	1	100		Grass & grasslike (GG)	No		
Calotis cuneifolia	Purple Burr-daisy	Asteraceae	0.1	10		Forb (FG)	No		
Bromus hordeaceus	Soft Brome	Poaceae	5		*		No		
Cynodon dactylon	Common Couch	Poaceae	5			Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	3	*		No		
Plantago debilis	Shade Plantain	Plantaginaceae	0.1	1		Forb (FG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Cymbonotus lawsonianus	Bear's Ear	Asteraceae	0.1	1		Forb (FG)	No		
Urtica incisa	Stinging Nettle	Urticaceae	0.1	50		Forb (FG)	No		
Einadia hastata	Berry Saltbush	Chenopodiaceae	0.1	20		Forb (FG)	No		
Rosa rubiginosa	Sweet Briar	Rosaceae	0.1	2	*		HTE		
Carex inversa	Knob Sedge	Cyperaceae	0.1	50		Grass & grasslike (GG)	No		

Plot 11

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	50%	**52.00%**
	Shrub (SG)	**0**		15m	70%	
	Forb (FG)	**3**		25m	60%	
	Grass & grasslike (GG)	**7**		35m	40%	
	Fern (EG)	**0**		45m	40%	
	Other (OG)	**0**	**Bare ground cover**	5m	0%	**4%**
	TOTAL	**12**		15m	0%	
BAM Attribute (20x20m plot) Structure				25m	10%	
	Stratum	**Sum**		35m	1%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**13**		45m	10%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.7**		15m	0%	
	Grass & grasslike (GG)	**21.3**		25m	1%	
	Fern (EG)	**0**		35m	1%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**35**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1		
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Anthoxanthum odoratum	Sweet Vernal Grass	Poaceae	25		*		No		
Aristida ramosa	Purple Wiregrass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
Bothriochloa macra	Red Grass	Poaceae	0.1	50		Grass & grasslike (GG)	No		
Calotis cuneifolia	Purple Burr-daisy	Asteraceae	0.5	200		Forb (FG)	No		
Eragrostis brownii	Brown's Lovegrass	Poaceae	5			Grass & grasslike (GG)	No		
Eragrostis leptocarpa	Drooping Lovegrass	Poaceae	5			Grass & grasslike (GG)	No		
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	8			Tree (TG)	No		
Eucalyptus melliodora	Yellow Box	Myrtaceae	5			Tree (TG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	50	*		No		
Juncus subsecundus	Finger Rush	Juncaceae	0.1	10		Grass & grasslike (GG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	10			Grass & grasslike (GG)	No		
Oxalis perennans		Oxalidaceae	0.1	50		Forb (FG)	No		
Poa sieberiana	Snowgrass	Poaceae	1			Grass & grasslike (GG)	No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
Vulpia myuros	Rat's Tail Fescue	Poaceae	45		*		No		

Plot 12

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	1%	**28.40%**
	Shrub (SG)	**0**		15m	1%	
	Forb (FG)	**0**		25m	55%	
	Grass & grasslike (GG)	**4**		35m	75%	
	Fern (EG)	**0**		45m	10%	
	Other (OG)	**0**	**Bare ground cover**	5m	59%	**49%**
	TOTAL	**4**		15m	40%	
BAM Attribute (20x20m plot) Structure				25m	45%	
	Stratum	**Sum**		35m	25%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	75%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0**		15m	0%	
	Grass & grasslike (GG)	**0.4**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.4**	**Rock Cover**	5m	40%	**20%**
	TOTAL 'HTE'	**0**		15m	44%	
				25m	0%	
				35m	0%	
				45m	15%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Juncus spp.	A Rush	Juncaceae	0.1	50		Grass & grasslike (GG)	No		
Aristida ramosa	Purple Wiregrass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
Carex spp.		Cyperaceae	0.1	100		Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	20	*		No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	3	*		No		
Cynodon dactylon	Common Couch	Poaceae	0.1	200		Grass & grasslike (GG)	No		

Plot 13

BAM Attribute (20x20m plot) Composition			**BAM Attributes (1 x 1m Plots) Fucntion**			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	25%	**21.00%**
	Shrub (SG)	**0**		15m	30%	
	Forb (FG)	**1**		25m	25%	
	Grass & grasslike (GG)	**2**		35m	10%	
	Fern (EG)	**0**		45m	15%	
	Other (OG)	**0**	**Bare ground cover**	5m	75%	**75%**
	TOTAL	**3**		15m	50%	
BAM Attribute (20x20m plot) Structure				25m	75%	
	Stratum	**Sum**		35m	90%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	85%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**0.3**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.4**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Carex spp.		Cyperaceae	0.1	500		Grass & grasslike (GG)	No		
Cynodon dactylon	Common Couch	Poaceae	0.2	1000		Grass & grasslike (GG)	No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	100		Forb (FG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	6	*		No		

Plot 14

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	25%	**36.00%**
	Shrub (SG)	**0**		15m	35%	
	Forb (FG)	**1**		25m	55%	
	Grass & grasslike (GG)	**4**		35m	50%	
	Fern (EG)	**0**		45m	15%	
	Other (OG)	**0**	**Bare ground cover**	5m	75%	**64%**
	TOTAL	**5**		15m	65%	
BAM Attribute (20x20m plot) Structure				25m	45%	
	Stratum	**Sum**		35m	50%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	85%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**0.5**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.6**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Rumex brownii	Swamp Dock	Polygonaceae	0.1	40		Forb (FG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
Cynodon dactylon	Common Couch	Poaceae	0.2	400		Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	50	*		No		
Juncus spp.	A Rush	Juncaceae	0.1	1		Grass & grasslike (GG)	No		
Carex spp.		Cyperaceae	0.1	100		Grass & grasslike (GG)	No		

Plot 15

BAM Attribute (20x20m plot) Composition			**BAM Attributes (1 x 1m Plots) Function**			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	60%	**43.00%**
	Shrub (SG)	**0**		15m	35%	
	Forb (FG)	**1**		25m	40%	
	Grass & grasslike (GG)	**2**		35m	25%	
	Fern (EG)	**0**		45m	55%	
	Other (OG)	**0**	**Bare ground cover**	5m	40%	**57%**
	TOTAL	**3**		15m	65%	
BAM Attribute (20x20m plot) Structure				25m	60%	
	Stratum	**Sum**		35m	75%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	45%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**0.4**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.5**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Hypochaeris radicata	Catsear	Asteraceae	0.2	500	*		No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	9		Forb (FG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.3	1000		Grass & grasslike (GG)	No		
Juncus spp.	A Rush	Juncaceae	0.1	1		Grass & grasslike (GG)	No		

Plot 16

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	15%	**20.00%**
	Shrub (SG)	**0**		15m	20%	
	Forb (FG)	**1**		25m	30%	
	Grass & grasslike (GG)	**3**		35m	25%	
	Fern (EG)	**0**		45m	10%	
	Other (OG)	**0**	**Bare ground cover**	5m	85%	**80%**
	TOTAL	**4**		15m	80%	
BAM Attribute (20x20m plot) Structure				25m	70%	
	Stratum	**Sum**		35m	75%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	90%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**0.3**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.4**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Hypochaeris radicata	Catsear	Asteraceae	0.1	50	*		No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
Juncus spp.	A Rush	Juncaceae	0.1	20		Grass & grasslike (GG)	No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	7		Forb (FG)	No		
Carex spp.		Cyperaceae	0.1	100		Grass & grasslike (GG)	No		

Plot 17

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**1**	**Litter Cover**	5m	1%	**28.40%**
	Shrub (SG)	**2**		15m	1%	
	Forb (FG)	**0**		25m	55%	
	Grass & grasslike (GG)	**0**		35m	75%	
	Fern (EG)	**0**		45m	10%	
	Other (OG)	**0**	**Bare ground cover**	5m	59%	**49%**
	TOTAL	**3**		15m	40%	
BAM Attribute (20x20m plot) Structure				25m	45%	
	Stratum	**Sum**		35m	25%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**65**		45m	75%	
	Shrub (SG)	**0.2**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0**		15m	0%	
	Grass & grasslike (GG)	**0**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**65.2**	**Rock Cover**	5m	40%	**20%**
	TOTAL 'HTE'	**0**		15m	44%	
				25m	0%	
				35m	0%	
				45m	15%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79	1		
30-49	4		
20-29	1		
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	65			Tree (TG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.1	3		Shrub (SG)	No		
Bursaria spinosa	Native Blackthorn	Pittosporaceae	0.1	1		Shrub (SG)	No		

Plot 18

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	90%	**55.00%**
	Shrub (SG)	**1**		15m	75%	
	Forb (FG)	**0**		25m	65%	
	Grass & grasslike (GG)	**2**		35m	20%	
	Fern (EG)	**0**		45m	25%	
	Other (OG)	**0**	**Bare ground cover**	5m	10%	**44%**
	TOTAL	**5**		15m	20%	
BAM Attribute (20x20m plot) Structure				25m	35%	
	Stratum	**Sum**		35m	80%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**15**		45m	75%	
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0**		15m	0%	
	Grass & grasslike (GG)	**0.2**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**15.3**	**Rock Cover**	5m	0%	**1%**
	TOTAL 'HTE'	**0**		15m	5%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2		
50-79	1		
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		28.5	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	10			Tree (TG)	No		
Eucalyptus melliodora	Yellow Box	Myrtaceae	5			Tree (TG)	No		
Bursaria spinosa	Native Blackthorn	Pittosporaceae	0.1	1		Shrub (SG)	No		
Juncus spp.	A Rush	Juncaceae	0.1	50		Grass & grasslike (GG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		

Plot 19

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Junction			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	65%	**29.00%**
	Shrub (SG)	**0**		15m	20%	
	Forb (FG)	**1**		25m	20%	
	Grass & grasslike (GG)	**4**		35m	30%	
	Fern (EG)	**0**		45m	10%	
	Other (OG)	**0**	**Bare ground cover**	5m	35%	**71%**
	TOTAL	**5**		15m	80%	
BAM Attribute (20x20m plot) Structure				25m	80%	
	Stratum	**Sum**		35m	70%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	90%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**0.5**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.6**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Carex spp.		Cyperaceae	0.2	300		Grass & grasslike (GG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	200	*		No		
Cirsium vulgare	Spear Thistle	Asteraceae	0.1	50	*		No		
Aristida ramosa	Purple Wiregrass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
Bromus hordeaceus	Soft Brome	Poaceae	0.1	1	*		No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
Dysphania spp.		Chenopodiaceae	0.1	6		Forb (FG)	No		
Juncus spp.	A Rush	Juncaceae	0.1	50		Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.2	500	*		No		

Plot 20

BAM Attribute (20x20m plot) Composition			**BAM Attributes (1 x 1m Plots) Function**			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	75%	**79.00%**
	Shrub (SG)	**0**		15m	80%	
	Forb (FG)	**1**		25m	85%	
	Grass & grasslike (GG)	**3**		35m	85%	
	Fern (EG)	**0**		45m	70%	
	Other (OG)	**0**	**Bare ground cover**	5m	25%	**21%**
	TOTAL	**4**		15m	20%	
BAM Attribute (20x20m plot) Structure				25m	15%	
	Stratum	**Sum**		35m	15%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	30%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**0.4**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.5**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.2	200		Grass & grasslike (GG)	No		
Carex spp.		Cyperaceae	0.1	100		Grass & grasslike (GG)	No		
Juncus spp.	A Rush	Juncaceae	0.1	20		Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	50	*		No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	5		Forb (FG)	No		

Plot 21

BAM Attribute (20x20m plot) Compistion			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	55%	**61.00%**
	Shrub (SG)	**0**		15m	80%	
	Forb (FG)	**1**		25m	45%	
	Grass & grasslike (GG)	**1**		35m	40%	
	Fern (EG)	**0**		45m	85%	
	Other (OG)	**0**	**Bare ground cover**	5m	45%	**39%**
	TOTAL	**2**		15m	20%	
BAM Attribute (20x20m plot) Structure				25m	55%	
	Stratum	**Sum**		35m	60%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	15%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.1**		15m	0%	
	Grass & grasslike (GG)	**1**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**1.1**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Hypochaeris radicata	Catsear	Asteraceae	0.1	100	*		No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	1	1000		Grass & grasslike (GG)	No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	10		Forb (FG)	No		

Plot 22

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**0**	**Litter Cover**	5m	45%	**38.00%**
	Shrub (SG)	**0**		15m	35%	
	Forb (FG)	**3**		25m	30%	
	Grass & grasslike (GG)	**3**		35m	30%	
	Fern (EG)	**0**		45m	50%	
	Other (OG)	**0**	**Bare ground cover**	5m	55%	**62%**
	TOTAL	**6**		15m	65%	
BAM Attribute (20x20m plot) Structure				25m	70%	
	Stratum	**Sum**		35m	70%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**		45m	50%	
	Shrub (SG)	**0**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0.3**		15m	0%	
	Grass & grasslike (GG)	**0.5**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**0.8**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	0%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Juncus spp.	A Rush	Juncaceae	0.1	10		Grass & grasslike (GG)	No		
Sporobolus creber	Slender Rat's Tail Grass	Poaceae	0.3	300		Grass & grasslike (GG)	No		
Hypochaeris radicata	Catsear	Asteraceae	0.1	10	*		No		
Rumex brownii	Swamp Dock	Polygonaceae	0.1	3		Forb (FG)	No		
Carex spp.		Cyperaceae	0.1	100		Grass & grasslike (GG)	No		
Calotis cuneifolia	Purple Burr-Daisy	Asteraceae	0.1	1		Forb (FG)	No		
Oxalis perennans		Oxalidaceae	0.1	1		Forb (FG)	No		

Plot 23

BAM Attribute (20x20m plot) Composition			BAM Attributes (1 x 1m Plots) Function			
	Stratum	**Sum**		**Tape length**	**% cover**	**Average %**
Count of Native Richness	**Tree (TG)**	**2**	**Litter Cover**	5m	75%	**25.80%**
	Shrub (SG)	**1**		15m	35%	
	Forb (FG)	**0**		25m	10%	
	Grass & grasslike (GG)	**0**		35m	4%	
	Fern (EG)	**0**		45m	5%	
	Other (OG)	**0**	**Bare ground cover**	5m	25%	**74%**
	TOTAL	**3**		15m	65%	
BAM Attribute (20x20m plot) Structure				25m	90%	
	Stratum	**Sum**		35m	95%	
Count of cover abundance (native vascular plants)	**Tree (TG)**	**23**		45m	95%	
	Shrub (SG)	**0.1**	**Cryptogam cover**	5m	0%	**0%**
	Forb (FG)	**0**		15m	0%	
	Grass & grasslike (GG)	**0**		25m	0%	
	Fern (EG)	**0**		35m	0%	
	Other (OG)	**0**		45m	0%	
	TOTAL Native	**23.1**	**Rock Cover**	5m	0%	**0%**
	TOTAL 'HTE'	**0**		15m	0%	
				25m	0%	
				35m	1%	
				45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79	1		
30-49	1		
20-29	2		
10-19			
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Eucalyptus caliginosa	Broad-leaved Stringybark	Myrtaceae	8			Tree (TG)	No		
Eucalyptus blakelyi	Blakely's Red Gum	Myrtaceae	15			Tree (TG)	No		
Lissanthe strigosa	Peach Heath	Ericaceae	0.1	20		Shrub (SG)	No		

B.1 Plot photos

Plot 1	**PCT 567 Woodland**
	
Plot 2	**PCT 704 Scattered**
	

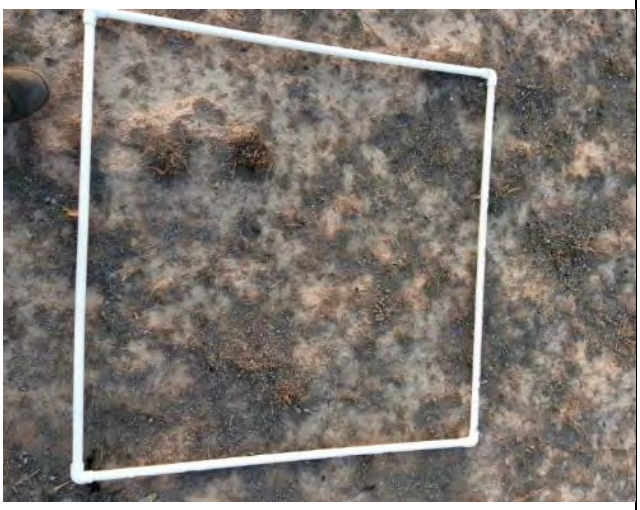
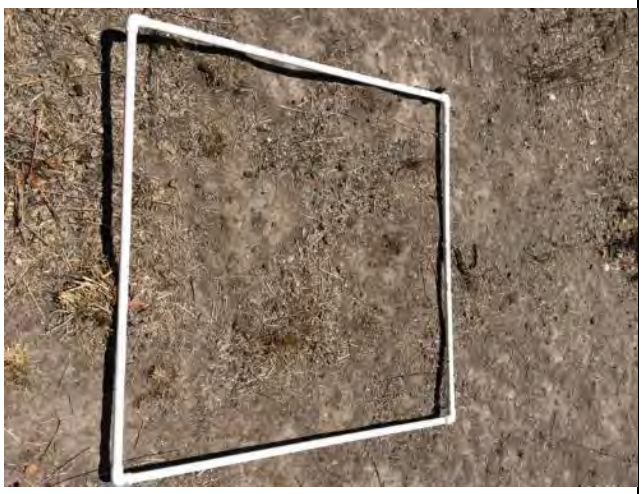
Plot 3	**PCT 575 Scattered**
	
Plot 4	**PCT 567 Woodland**
	

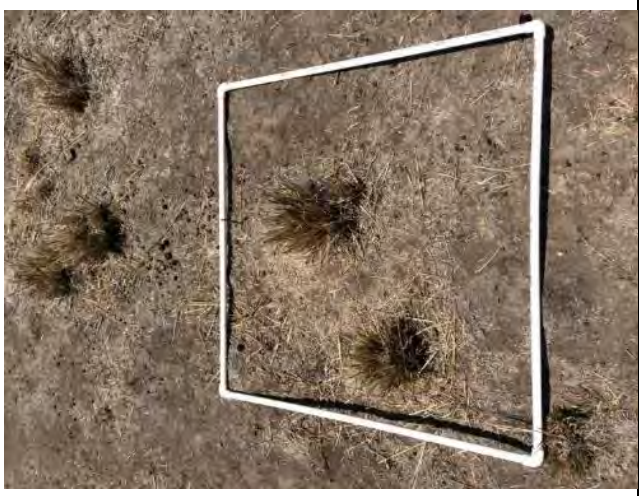
Plot 5	**PCT 567 Woodland**
	
Plot 6	**PCT 567 Woodland**
	

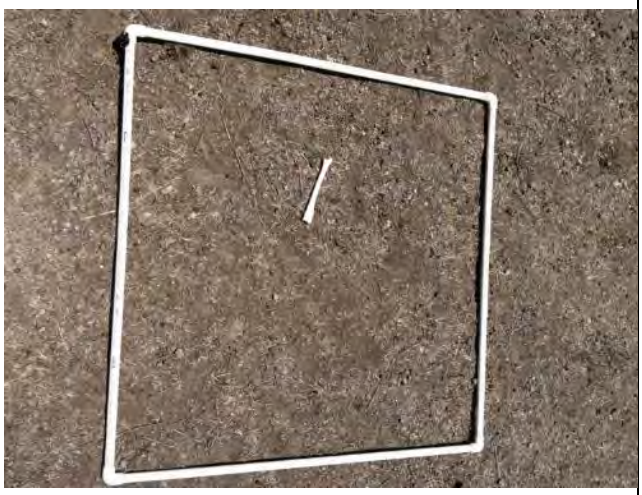
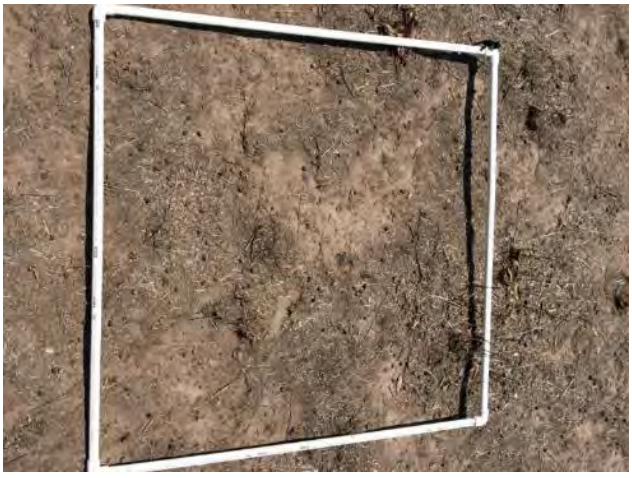
Plot 7	**PCT 567 Woodland**
	
Plot 8	**PCT 575 Forest**
	

Plot 9	**PCT 704 Woodland**
	
Plot 10	**PCT 567 Woodland**
	

Plot 11	**PCT 704 Woodland**
	
Plot 12	**PCT 567 Grassland**
	
Plot 13	**PCT 567 Grassland**
	

Plot 14	**PCT 704 Grassland**
	
Plot 15	**PCT 704 Grassland**
	
Plot 16	**PCT 567 Grassland**
	

Plot 17	**PCT 567 Scattered**
	
Plot 18	**PCT 704 Woodland**
	
Plot 19	**PCT 704 Grassland**
	
Plot 20	**PCT 704 Grassland**

	
Plot 21	**PCT 704 Grassland**
	
Plot 22	**PCT 567 Grassland**
	

Plot 23	**PCT 704 Scattered**
	

B.2 Fauna survey results

			Survey Timing and Type					
			Aug-19		Nov-19			
Class	**Common name**	**Scientific Name**	**Incidental**	**Spotlighting/Call playback**	**Incidental**	**Spotlighting/Call playback**	**SAT**	**Anabat**
Aves	Australian Magpie	*Cracticus tibicen*	X		X			
Aves	Australian Raven	*Corvus coronoides*	X		X			
Aves	Australian Wood Duck	*Chenonetta jubata*	X		X			
Aves	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*			X			
Aves	Crested Pigeon	*Ocyphaps lophotes*	X					
Aves	Crimson Rosella	*Platycercus elegans*	X		X			
Aves	Eastern Rosella	*Platycercus eximius*	X		X			
Aves	Galah	*Eolophus roseicapilla*	X					
Aves	Grey Butcherbird	*Cracticus torquatus*	X		X			
Aves	Grey Teal	*Anas gracilis*	X					
Aves	King Parrot	*Alisterus scapularis*	X					
Aves	Laughing Kookaburra	*Dacelo novaeguineae*	X		X			
Aves	Magpie-lark	*Grallina cyanoleuca*	X		X			
Aves	Nankeen Kestrel	*Falco cenchroides*	X		X			
Aves	Noisy Miner	*Manorina melanocephala*	X		X			
Aves	Peaceful Dove	*Geopelia placida*			X			
Aves	Pied Currawong	*Strepera graculina*	X		X			

			Survey Timing and Type					
			Aug-19		Nov-19			
Class	**Common name**	**Scientific Name**	**Incidental**	**Spotlighting/Call playback**	**Incidental**	**Spotlighting/Call playback**	**SAT**	**Anabat**
Aves	Red-rumped Parrot	*Psephotus haematonotus*	X		X			
Aves	Spangled Drongo	*Dicrurus bracteatus*			X			
Aves	Spotted Dove	*Spilopelia chinensis*			X			
Aves	Straw-necked Ibis	*Threskiornis spinicollis*	X		X			
Aves	Striated Pardalote	*Pardalotus striatus*	X		X			
Aves	Superb Fairy-wren	*Malurus cyaneus*	X					
Aves	Tawny Frogmouth	*Podargus strigoides*	X			X		
Aves	Wedge-tailed Eagle	*Aquila audax*	X					
Aves	Welcome Swallow	*Hirundo neoxena*	X		X			
Aves	White-necked Heron	*Ardea pacifica*			X			
Aves	White-winged Chough	*Corcorax melanorhamphos*	X					
Aves	Willy Wagtail	*Rhipidura leucophrys*			X			
Mammals	Chocolate Wattled Bat	*Chalinolobus morio*						X
Mammals	Common Brushtail Possum	*Trichosurus vulpecula*				X		
Mammals	Eastern Grey Kangaroo	*Macropus giganteus*			X			
Mammals	Greater Broad-nosed Bat	*Scoteanax rueppellii*						X
Mammals	Greater Glider	*Petaurus australis*		X				
Mammals	Koala	*Phascolarctos cinereus*					X	

			Survey Timing and Type					
			Aug-19		Nov-19			
Class	**Common name**	**Scientific Name**	**Incidental**	**Spotlighting/Call playback**	**Incidental**	**Spotlighting/Call playback**	**SAT**	**Anabat**
Mammals	Lesser Long-eared Bat	*Nyctophilus geoffroyi*						X
Mammals	Little Forest Bat	*Vespadelus vulturnus*						X
Mammals	Sheep	*Ovis aries*	X					
Mammals	Southern Myotis	*Myotis macropus*						X
Mammals		*Nyctophilus sp.*						X

Appendix C Personnel

Name	Title	Qualifications	Role
Brendon True	Ecologist	• BAM Accredited Assessor #BAAS18155 • B. Science (Ecology and Biodiversity) • Masters Conservation Biology	Fieldwork, data analysis, GIS mapping, lead author
Mitch Palmer	Acting Principal Ecologist	• BAM Accredited Assessor #BAAS17051) • B.Science (Geology and Geography)	Direction in BAM Assessment, Land Category Assessment, Approval of BDAR, BDAR review. Targeted surveys D.Setosum
Martin Kim	Graduate Environmental Consultant/Ecologist	• B.EnvSc (Hons)	Fieldwork, data analysis
Lewis Tinley	Environmental Consultant	• BEnvScMgt	GIS mapping
Zoe Quaas	Environmental Consultant	• BEnvScMgt (Hons1)	Fieldwork

Appendix D Hollow-bearing tree inventory

The table below contains the hollow-bearing trees that would be removed as a result of the proposal.

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
1	*Eucalyptus calignosa*	0	4	3	0	0	1	0				
5	*Stag*	500	4	0	0	0	0	0	Yes			
6	*Eucalyptus calignosa*	900	1	0	0	0	0	0				
8	*Eucalyptus calignosa*	1100	1	0	0	0	0	0				
10	*Eucalyptus calignosa*	600	0	0	0	1	0	0				
11	*Eucalyptus calignosa*	600	1	0	0	0	0	0				
12	*Eucalyptus bridgesiana*	1500	2	0	0	0	0	0				
13	*Eucalyptus melliodora*	0	0	0	0	0	0	0	On limb			
14	*Eucalyptus calignosa*	500	0	0	0	3	0	0	Yes			Hollow trunk and dead limbs
15	*Eucalyptus calignosa*	800	1	0	0	0	0	0				

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
17	*Eucalyptus calignosa*	800	1	0	0	1	0	0				
18	*Eucalyptus calignosa*	1200	2	0	0	0	0	0				
19	*Stag*	1000	3	1	0	2	0	0				
20	*Eucalyptus calignosa*	1000	0	1	0	0	0	0				
21	*Eucalyptus calignosa*	1100	1	1	0	0	0	0				
22	*Eucalyptus calignosa*	900	2	0	0	0	0	0	On trunk			
25	*Eucalyptus bridgesiana*	1500	1	0	0	0	0	0				
26	*Eucalyptus melliodora*	400	0	0	0	0	0	0	Yes	Yes		Hollow trunk
27	*Stag*	300	1	0	0	0	0	0				Entrance to hollow trunk
28	*Eucalyptus bridgesiana*	900	3	0	0	0	0	0				
29	*Eucalyptus bridgesiana*	1250	0	0	0	0	1	0				
30	*Eucalyptus bridgesiana*	0	0	1	0	0	1	0				
31	*Stag*	0	0	0	0	0	0	0	Yes	Yes		Small openings

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
32	*Stag*	0	2	0	0	0	0	0	Yes			Hollow trunk
35	*Eucalyptus melliodora*	700	0	0	0	1	0	0				
36	*Eucalyptus dalrympleana subsp. heptantha*	1000	0	0	0	0	1	0				
37	*Eucalyptus dalrympleana subsp. heptantha*	140	0	0	0	0	0	0				Small stick nest
38	*Eucalyptus melliodora*	600	1	0	0	1	0	0				Small trunk hollow enters hollow side of trunk
39	*Eucalyptus melliodora*	800	1	1	0	0	0	0	Yes			Spout
40	*Eucalyptus melliodora*	0	0	0	0	0	0	0				
41	*Eucalyptus bridgesiana*	800	4	2	0	0	0	0				Hollow limb

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
42	*Stag*	400	0	0	0	1	0	0				Small opening to hollow trunk
43	*Stag*	1100	2	2	0	0	1	0				
46	*Stag*	400	0	0	0	1	1	0				Hollow trunk
47	*Eucalyptus bridgesiana*	300	1	0	0	0	0	0				Hollow half trunk
48	*Eucalyptus calignosa*	700	2	0	0	0	0	0				
50	*Stag*	400	2	1	0	0	0	0				
52	*Eucalyptus calignosa*	400	0	0	0	2	0	0				
53	*Eucalyptus calignosa*	700	1	1	0	0	0	0				
54	*Eucalyptus calignosa*	600	0	2	0	0	0	0				
55	*Eucalyptus laevopinea*	650	1	0	0	0	1	0				Half of trunk hollowed out
56	*Eucalyptus calignosa*	500	0	0	0	0	2	0				
57	*Stag*	600	0	0	0	0	0	0	Yes			

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
58	*Stag*	1000	2	2	0	0	0	0				
59	*Stag*	0	2	0	0	1	0	0				
60	*Eucalyptus melliodora*	600	4	0	0	0	0	0				
61	*Eucalyptus melliodora*	700	2	2	0	2	1	1				
62	*Eucalyptus melliodora*	1000	2	0	0	0	0	0				
63	*Eucalyptus calignosa*	700	2	0	0	0	0	0	Yes			Hollow middle trunk
64	*Eucalyptus calignosa*	600	0	0	0	1	1	0	Yes			Hollow central trunk
67	*Stag*	400	1	1	0	0	0	0				
68	*Stag*	400	0	0	0	1	0	0	Yes			
69	*Eucalyptus calignosa*	400	1	0	0	1	0	0				
70	*Eucalyptus calignosa*	400	0	0	0	1	0	0				
71	*Eucalyptus calignosa*	350	1	0	0	0	0	0				
72	*Eucalyptus calignosa*	550	1	0	0	0	0	0				

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
73	*Eucalyptus calignosa*	600	0	1	0	0	0	0				
74	*Eucalyptus calignosa*	550	2	0	0	0	0	0				
75	*Eucalyptus melliodora*	500	0	0	0	1	0	0				
76	*Eucalyptus calignosa*	400	0	0	0	1	0	0				Leads to dead portion of trunk.
77	*Eucalyptus calignosa*	400	3	1	0	0	0	0				
78	*Stag*	400	2	0	0	0	0	0				
80	*Eucalyptus calignosa*	650	2	0	0	0	0	0				
81	*Eucalyptus calignosa*	700	0	0	0	0	1	0				
82	*Eucalyptus bridgesiana*	600	1	0	0	0	0	0				
83	*Stag*	450	0	0	0	0	0	0		Yes		
84	*Eucalyptus calignosa*	700	2	0	0	0	0	0		Yes		
85	*Eucalyptus calignosa*	450	1	0	0	0	0	0				

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
86	*Eucalyptus youmanii*	600	2	0	0	0	0	0				
87	*Eucalyptus bridgesiana*	800	1	0	0	0	0	0				
88	*Stag*	250	0	0	0	1	0	0				
89	*Eucalyptus calignosa*	300	1	0	0	0	0	0				
90	*Eucalyptus calignosa*	900	2	0	0	0	0	0				
95	*Stag*	400	1	0	0	1	0	0				
98	*Eucalyptus bridgesiana*	400	0	0	0	0	0	0		Yes		
100	*Eucalyptus calignosa*	800	1	0	0	0	0	0		Yes		
102	*Eucalyptus bridgesiana*	1000	2	0	0	0	0	0		Yes		
103	*Stag*	300	1	0	0	1	0	0				
104	*Eucalyptus bridgesiana*	0	2	0	0	0	0	0				
105	*Eucalyptus calignosa*	500	1	0	0	0	0	0				
106	*Eucalyptus calignosa*	550	0	0	0	0	1	0				
108	*Stag*	1300	0	0	0	2	0	0				

ID	Species	DBH (mm)	Small Hollow Limb	Medium Hollow Limb	Large Hollow Limb	Small Hollow Trunk	Medium Hollow Trunk	Large Hollow Trunk	Fissuring	Decorticated Bark	Fauna Present	Notes
109	*Eucalyptus calignosa*	600	3	0	0	0	0	0				Medium stick nests
110	*Eucalyptus bridgesiana*	1400	2	0	0	0	0	0				
111	*Eucalyptus calignosa*	900	1	0	0	0	0	0				
112	*Stag*	400	2	0	0	0	0	0				

Appendix E EPBC protected matters search

Australian Government

Department of Agriculture, Water and the Environment

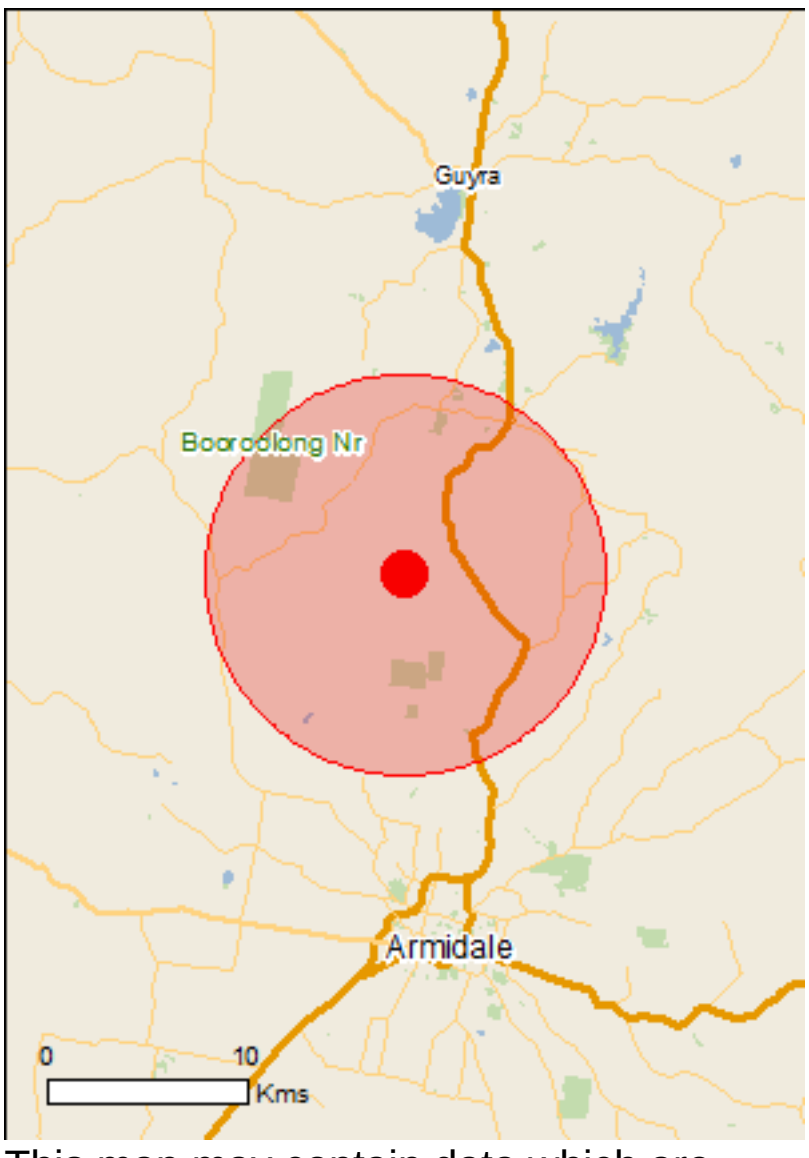
EPBC Act Protected Matters Report

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

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

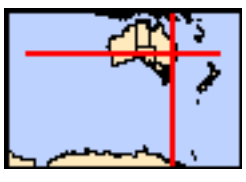
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 19/01/21 12:33:39



Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	34
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	1
Invasive Species:	28
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	1100 - 1200km
Gwydir wetlands: gingham and lower gwydir (big leather) watercourses	200 - 300km upstream
Riverland	1000 - 1100km
The coorong, and lakes alexandrina and albert wetland	1200 - 1300km

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to 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 known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat likely to occur within area
Litoria piperata Peppered Tree Frog [1827]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known 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]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to 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 known to occur within area
Diuris eborensis [88275]	Endangered	Species or species habitat may occur within area
Diuris pedunculata Small Snake Orchid, Two-leaved Golden Moths, Golden Moths, Cowslip Orchid, Snake Orchid [18325]	Endangered	Species or species habitat likely to occur within area
Eucalyptus mckieana McKie's Stringybark [20199]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Eucalyptus nicholii Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992]	Vulnerable	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Haloragis exalata subsp. velutina Tall Velvet Sea-berry [16839]	Vulnerable	Species or species habitat may occur within area
Leionema lachnaeoides [64924]	Endangered	Species or species habitat may 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
Reptiles		
Uvidicolus sphyrurus 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 Sawshelled Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle [86071]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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 likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
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 known to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Booroolong	NSW
Duval	NSW
New England Tableland	NSW

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species	[Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat may occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine,		Species or species

Name	Status	Type of Presence
Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
New England Wetlands	NSW

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.37296 151.64306

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 F EPBC Act habitat assessment

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
Fauna				
Anthochaera phrygia Regent Honeyeater	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Occurs in woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Present but low quality. Few mistletoes present	Low - outside mapped important areas (OEH). Not detected during surveys	No – Unlikely to occur on site
Australian Bittern *Botaurus poiciloptilus*	Permanent freshwater wetlands with tall, dense vegetation.	Absent – no freshwater wetlands with dense vegetation	Low	No – Unlikely to occur on site
Curlew Sandpiper *Calidris ferruginea*	Intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. Also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand	Absent – no intertidal mudflats	None	No – Unlikely to occur on site
Red Goshawk *Erythrotriorchis radiatus*	The species is very rare in NSW. Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Open woodland present but degraded such that a viable food source is lacking. Lack of permanent water and diversity if vegetation types.	Low – a rare species in the state and the development site lacks preferred habitat.	No – Unlikely to occur on site
Painted Honeyeater *Grantiella picta*	Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark	Degraded Box-gum woodland present, low	Unlikely – not detected during site surveys.	No – Unlikely to occur on site

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
	Forests. Specialist feeder on the fruits of mistletoes.	frequency of mistletoes.	Little foraging resources (mistletoes)	
White-throated Needletail *Hirundapus caudacutus*	White-throated Needletails are non-breeding migrants in Australia. Breeding takes place in northern Asia.	Foraging present.	Low- a vagrant visitor to Australia. Not observed during surveys.	No – Unlikely to occur on site
Swift Parrot *Lathamus discolor*	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box and Lerp infested trees such as Grey Box and Black Butt.	Present, but poor quality	Unlikely – outside mapped important areas (OEH). Not detected during surveys	No – Unlikely to occur on site
Australian Painted Snipe *Rostratula australis*	Shallow terrestrial freshwater or occasionally brackish wetlands, including temporary and permanent lakes, swamps, and claypans, as well as inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms, and bore drains. Fringes of swamps, dams, and nearby marshy areas with cover of grasses, lignum, low scrub, or open timber. Shallow wetlands with areas of bare wet mud.	Absent	None	No – Unlikely to occur on site
Murray Cod *Maccullochelle peeli*	Wide range of warm water habitat including clear rocky streams, slow flowing turbid rivers, and billabongs, most frequently in main river channel and larger tributaries but occasionally in floodplain channels during floods. Near complex structural cover such as large rocks, woody debris, and overhanging vegetation.	Absent – Duval Creek does present suitable habitat	None	No - suitable habitat
Large-eared Pied Bat *Chalinolobus dwyeri*	Caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon*	Absent	Unlikely, not detected during survey.	No – Unlikely to occur on site

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
	ariel), frequenting low to mid-elevation dry open forest and woodland close to these features.			
Spotted-tail Quoll *Dasyurus maculatus*	Variety of vegetation types including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Present	Unlikely	No – Unlikely to occur on site
Corben's Long-eared Bat *Nyctophilus corbei*	Variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but most common in vegetation with distinct canopy and dense understorey. Roost in tree hollows, crevices, and under loose bark.	Marginal	Unlikely, not detected during survey.	No – Unlikely to occur on site.
Greater Glider *Petauroides volans*	Tall, montane, moist eucalypt forests with relatively old trees and abundant hollows and a high diversity of eucalypts	Present	Recorded during August 2019 surveys with a patch of Zone 1 near the western boundary of the development site.	Yes – recorded as present and habitat would be impacted. AoS required.
Brush-tailed Rock-wallaby *Petrogale penicillata*	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north	Absent	Unlikely	No – Unlikely to occur on site
Koala *Phascolarctos cinereus*	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils.	Present	Recorded – faecal pellets found during SAT survey 2.	Yes – utilises the development site. AoS required.
Long-nosed Potoroo *Potorous tridactylus tridactylus*	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.	Absent	Unlikely	No – Unlikely to occur on site

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
	Inhabits coastal heaths and dry and wet sclerophyll forests.			
Grey-headed Flying-fox *Pteropus poliocephalus*	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Border Thick-tailed Gecko *Uvidicolus sphyrurus*	Found only on the tablelands and slopes of northern NSW and southern Queensland, reaching south to Tamworth and west to Moree. Most common in the granite country of the New England Tablelands. Occurs at sites ranging from 500 to 1100 m elevation. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey.	Marginal	Unlikely – areas of rock within the development site are isolated and the species is unlikely to cross cleared land as it requires shrubby open forest.	No – Unlikely to occur on site
Bells turtle *Wollumbinia belli*	In NSW, currently 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. Shallow to deep pools in 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.	Absent	Unlikely	No – Unlikely to occur on site
Black-faced Monarch *Monarcha melanopsis*	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Yellow Wagtail *Motacilla flava*	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	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
	grassy tundra. In the north of its range it is also found in large forest clearings. It breeds from April to August, although this varies with latitude.			
Satin Flycatcher *Myiagra cyanoleuca*	The Satin Flycatcher is found along the east coast of Australia in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Absent	Unlikely	No – Unlikely to occur on site
Rufous Fantail *Rhipidura rufifrons*	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	Absent	Unlikely	No – Unlikely to occur on site
Flora				
Austral Toadflax *Thesium austral*	This species is often hidden amongst grasses and herbs. Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (Themeda australis).	Marginal – no Kangaroo present. Highly degraded.	Unlikely	No – Unlikely to occur on site
Bluegrass *Dichanthium setosum*	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Associated species include Eucalyptus albens, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus viminalis.	Marginal – may be more favourable outside of drought conditions and heavy grazing	Unlikely flowing targeted surveys.	No – unlikely to occur on site.

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
Callistemon pungens	In NSW the species occurs from near Inverell to the eastern escarpment in New England National Park. Habitats range from riparian areas dominated by *Casuarina cunninghamiana* subsp. *cunninghamiana* to woodland and rocky shrubland	Marginal – rocky areas present.	Unlikely – survey of potential habitat did not detect any individuals.	No – Unlikely to occur on site
Diuris eborensis	Endemic to New South Wales and known from five locations on the eastern side of the New England Tableland. Favours brown clay loams on moist grassy flats near creeks and has been recorded at altitudes of between 900 and 1400 m a.s.l.	Absent – not associated with PCTs present.	Unlikely	No – Unlikely to occur on site
Euphrasia arguta	Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance.	Marginal – highly degraded	Unlikely	No – Unlikely to occur on site
Small Snake Orchid *Diuris pedunculata*	Confined to north east NSW. It was originally found scattered from Tenterfield south to the Hawkesbury River, but is now mainly found on the New England Tablelands, around Armidale, Uralla, Guyra and Ebor. Often in peaty moist areas and sometimes found within shale and trap soils, on fine granite, and among boulders	Marginal – highly degraded. General habitat constraints present, however, potential habitat highly degraded due to historical land use, namely intensive sheep and cattle grazing which can all but remove the ground cover during adverse conditions such as recent drought. Grazing is a known threat to the species. Habitat is	Unlikely	No – Unlikely to occur on site

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
		degraded such that the species is unlikely to occur.		
Narrow-leaved Peppermint *Eucalyptus nicholli*	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	Present	Unlikely – surveyed for and not recorded	No – Unlikely to occur on site
Prasophyllum sp. Wybong	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Known to occur in open eucalypt woodland and grassland.	Marginal – highly degraded	Unlikely	No – Unlikely to occur on site
Tall Velvet Sea-berry *Haloragis exalata* subsp. *velutina*	This subspecies of Tall Sea-berry occurs on the north coast of NSW and southeastern Queensland. It is plentiful in inaccessible areas of the upper Macleay River. Occurs in woodland on the steep rocky slopes of gorges.	PCT 567 habitat marginal (lacks known micro-habitats). Groundcover degraded due to historical land use, namely intensive sheep and cattle grazing which can all but remove the ground cover during adverse conditions such as recent drought.	Unlikely	No – Unlikely to occur on site
Threatened Ecological Communities				
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	This woodland community is dominated by trees of New England Peppermint Eucalyptus nova-anglica and occasionally Mountain Gum E. dalrympleana subsp.	**Present**	**Unlikely, not detected during surveys.**	No – Unlikely to occur on site

Species	Distribution and Habitat	Habitat components and abundance on site	Likelihood of occurrence	Potential for impact?
	heptantha, and is usually 8-20 metres tall. Occurs primarily in valley flats subject to cold air drainage and valley flats that are composed of basaltic soils, fine-grained sedimentary and acid volcanic substrates with poorly drained loam-clay soils. In NSW all sites are within the New England Tablelands. This community is or has been known to occur in the Armidale Dumaresq, Guyra, Inverell, Severn and Tenterfield Local Government Areas			
Upland Wetlands of the New England Tablelands (New England Tableland Bioregion) and the Monaro Plateau (South Eastern Highlands Bioregion)	This community is composed of a series of high altitude wetlands in the New England Tablelands of Northern NSW. Known to occur between the Tenterfield and Uralla Local Government Areas but may occur elsewhere within the New England Tablelands. Generally above 900m altitude and associated with basalt soils and not connected to river systems by floodplains	Absent	Unlikely	No – Unlikely to occur on site
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Box-Gum Woodland is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the tablelands and western slopes of NSW.	Present	Recorded	Yes – occurs within development site.

Appendix G EPBC assessment of significant impact

The *Environment Protection and Biodiversity Conservation Act 1999* specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

- White Box – Yellow Box – Blakeley's Red Gum – Grassy Woodland and Derived Native Grassland (Critically Endangered)
- Koala *Phascolarctos cinereus* (Vulnerable)
- Greater Glider *Petauroides volans* (Vulnerable)

Different significant impact criteria apply depending on the level at which a species or community is listed (i.e. vulnerable, endangered, critically endangered etc.). The appropriate criteria have been applied to the entities listed above.

In the context of the assessments below, 'the action' refers to 'the proposal' as described in Section 1.1.

Significant impact criteria

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

- *lead to a long-term decrease in the size of a population*
- *reduce the area of occupancy of the species*
- *fragment an existing population into two or more populations*
- *adversely affect habitat critical to the survival of a species*
- *disrupt the breeding cycle of a population*
- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*
- *introduce disease that may cause the species to decline, or*
- *interfere with the recovery of the species.*

b) A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- *a geographically distinct regional population, or collection of local populations, or*
- *a population, or collection of local populations, that occurs within a particular bioregion.*

c) An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of an important population of a species*
- *reduce the area of occupancy of an important population*
- *fragment an existing important population into two or more populations*
- *adversely affect habitat critical to the survival of a species*
- *disrupt the breeding cycle of an important population*
- *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
- *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*
- *introduce disease that may cause the species to decline, or*

- *interfere substantially with the recovery of the species.*

d) Each of these criteria are addressed below. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

G.1 White Box–Yellow Box–Blakely's Red Gum grassy woodland and derived native grassland

a) reduce the extent of an ecological community?
Native vegetation within the development site that is considered to conform to White Box – Yellow Box – Blakeley's Red Gum – Grassy Woodland and Derived Native Grassland (Box-gum Woodland and DNGs CEEC) occurs in the north, west and south of the development site. In these areas there is connectivity between vegetation inside and outside of the development site such that criteria relating to patch size and understory health are presumed satisfied. These areas cover about 59.7 ha within the development site, the most intact, diverse and connected of which have been avoided by the development footprint, however, up to 5 ha of the community would be removed as a result of the proposal. The extent of the community in the surrounding landscape is likely to be in similar condition due to land use and patchiness of remnant vegetation. The local extent of the CEEC would measure in hundreds of hectares.
b) fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
The Box-gum Woodland and DNGs CEEC occurring within the development site has poor connectivity generally. Historical clearing, primarily for livestock grazing, but also for significant transmission line infrastructure, has meant that most areas of the community that are connected to suitable vegetation outside the development site on one side, do not extend through the development site to connect with areas on another side. Where this does occur, primarily in the north of the development site but also the south to a lesser degree, avoidance has meant that this connectivity, though poor, has been maintained. As much of the community that would be removed constitutes small patches with a sparse, poorly connected canopy, the proposal would result in only minor fragmentation of the community. No areas thought to be of high conservation value would be disconnected.
c) Will 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
Whilst surface flows will be altered during construction, with mitigation measures implemented, it is considered unlikely that the abiotic factors necessary for the community's survival would be modified or destroyed by the proposal.
d) cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?
The proposal will remove an area of approximately 5 ha of modified Box-gum Woodland and DNGs CEEC. These areas are influenced by the invasion of exotic improved pasture species but contain enough native understory to be considered the community in light of connectivity to larger, more intact patches that connect to the development site and extend into the surrounding landscape. As such, the less diverse areas of these patches, i.e. that within the development footprint, would be impacted, leaving, surrounding, higher condition areas unchanged. These circumstances are considered likely to ensure that the species complexity and composition of the greater patches remains.
e) cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • assisting invasive species, that are harmful to the listed ecological community, to become established, or • causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or • interfere with the recovery of an ecological community

- The proposal is not considered likely to generate an increase in invasive species harmful to the ecological community. Mitigation measures implemented during a construction will strictly manage and restrict weed movement through the proposal site.
- It is considered unlikely that proposal would kill or inhibit the growth of the community from the regular mobilisation of fertilisers, herbicides or other chemicals.
- The Box-gum Woodland and DNGs CEEC that occurs within the development site is highly modified and would be subject to ongoing human land use lowering its overall conservation value. However, the better condition and connected areas have been avoided by the development footprint maintaining areas more likely to contribute to the recovery of the community.

Conclusion

The proposal will impact upon 5 Box-gum Woodland and DNGs CEEC, particularly through the siting of solar arrays. Many of the largest patches of the community that occur within and extend outside the development site have been avoided, with impacts limited to those patches with lesser connectivity and ecological value.

Connectivity of the larger patches of the community that extend into the surrounding landscape has generally been maintained. Given the poorest quality areas of the community would be impacted, proposal is not considered to interfere with the recovery of the community. Potential indirect impacts such as altered hydrology are not considered likely to impact the community.

However, given that 5 ha of the 59.7 ha (8.4%) of the community is proposed to be cleared, this is considered to potentially generate a significant impact to the community and referral to DAWE has been recommended.

G.2 Koala *Phascolarctos Cinereus*

e) Lead to a long-term decrease in the size of an important population of a species?
An important population is defined as one that is necessary for a species' long-term survival and recovery, and includes: • A key source population either for breeding or dispersal; • A population that is necessary for maintaining genetic diversity, and/or • A population that is near the limit of the species' distribution range. Targeted surveys undertaken revealed Koala scat at one location, no individuals were directly observed. The individual or individuals that frequent the development site are members of a population likely to occupy far higher quality habitat surrounding the development site, primarily to the north, west and south. Visits are likely to be infrequent given the disparity in quality of habitat within the development site and that described above. The size of this population is unknown and as Koala are widely distributed in NSW, it is not near the limit of the species' range. Regionally, the population may act as a key source population for breeding or dispersal aiding in the species' long-term survival and recovery, therefore, the population can be considered an important population. Mortality of individuals or interruption of breeding is not an anticipated as impacts to Koala concern the removal of 15.5 ha of treed areas containing forage and sheltering resources. Contextually, these resources are widespread and in better quality in the locality such that the population of Koala present is unlikely to rely on them for persistence and/or growth. Therefore, the habitat removal required for the proposal is considered unlikely to lead to a long-term decrease of an important population of Koala.
f) Reduce the area of occupancy of an important population
While there will be habitat removal as described above, this would not decrease the total range of the population.
g) Fragment an existing important population into two or more populations;
Due to historical land use and clearing, connectivity of Koala habitat across the development site is poor, however, the development site may still be used for traversal across a home range. Areas where connective pathways are present, has generally been avoided. Proposed permanent fencing would act as an impediment to traversal through the development site, as Koala may now. Although pathways present around the development site, particularly along the western boundary, would remain, to assist movement of Koala through the development site, connective structures are proposed. This is at one location in the north of the development site where connectivity is arguably at its greatest. These connective structures are aimed at maintaining this dispersal pathway. In light of the above, the proposal is considered unlikely to fragment an important population.
h) Adversely affect habitat critical to the survival of a species
The EPBC Act referral guidelines for the vulnerable koala (DoE, 2014) focus on the impacts of proposals to habitat critical to the survival of the koala. Table 4 of the guidelines provide a habitat assessment tool that allows for a flowchart to be followed in determining whether the habitat proposed to be impacted should be considered critical habitat. In the case of the proposal, the habitat to be impacted generated a score of 8 and is therefore considered critical habitat. 15.5 ha of critical habitat would be adversely affected, indicating that a referral is recommended.
i) Disrupt the breeding cycle of an important population
Koala are considered unlikely to breed within the development site as females tend to inhabit higher quality habitat which can support reproduction. The development site supports Koala feed trees but not at a density that would be preferred for a females' home range. The individual that produced the scats found is likely to be a male, possibly a dispersing juvenile. Although the proposal would provide a physical

impediment for movement of individuals during breeding season, with the connectivity structure proposed implemented, and maintenance of connectivity around the development site, breeding of the residence population is considered unlikely to be disrupted.

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

The extent of habitat modification and removal proposed would marginally reduce the extent of resources available to the population to be impacted. This is considered unlikely to cause the population to decline given the habitat's poor quality contextually. Habitat for the species will be retained within the higher quality portions within the development site. Avoidance of higher quality habitat areas has also maintained connectivity such that no areas of habitat would be isolated.

k) Result in invasive species that are harmful to an vulnerable species becoming established in the vulnerable species' habitat

The proposal is considered unlikely to generate an increase in invasive species harmful to the species. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the development site. Additionally, the proposal is not considered likely to generate an increase in feral predators such as dogs.

l) Introduce disease that may cause the species to decline;

The proposal is considered unlikely to introduce disease that may cause the species to decline.

m) Interfere substantially with the recovery of the species;

The EPBC Act referral guidelines for the vulnerable koala (DoE, 2014) list several potential impacts that could interfere substantially with the recovery of the species, including:

- Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.
- Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.
- Facilitating the introduction or spread of disease or pathogens for example *Chlamydia* or *Phytophthora cinnamomi*, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat.
- Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala.
- Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

As mentioned, the habitat to be removed may constitute critical habitat for Koala. Direct mortality of individuals from impacts such as vehicle strike and disruption of breeding is considered unlikely as such impacts can be reliably mitigated. Similarly, implementing hygiene protocols for plant and equipment, and through ensuring that hydrological regimes remain unaltered as far as is practical would protect remaining adjacent vegetation. A barrier to movement would not be created.

The proposal may, however, through the removal of habitat, reduce the carrying capacity of the population through increased competition for resources. The degree of potential reduction is unknown but foreseeably minor given the extent and quality of habitat to be removed. It is entirely possible that there would be no reduction at all. Therefore, a substantial interference to the recovery of the species is considered unlikely.

Conclusion

Despite the 15.5 ha of Koala habitat that would be impacted by the proposal being in sub-optimal condition, it has been assessed as constituting habitat critical to Koala suggesting a significant impact is possible. On this basis, referral to DAWE is recommended.

G.3 Greater Glider *Petauroides Volans*

a) Lead to a long-term decrease in the size of an important population of a species?
An important population is defined as one that is necessary for a species' long-term survival and recovery, and includes: • A key source population either for breeding or dispersal; • A population that is necessary for maintaining genetic diversity, and/or • A population that is near the limit of the species' distribution range. During nocturnal surveys undertaken in August 2019 a Greater Glider was found within a treed area connected to bushland outside the development site near the development site's western boundary. Repeat surveys in November 2019 did not find any Greater Glider. The species has generally been recorded east of the Great Dividing Range, but this may be a function of study as well as habitat preferences. BioNet records exist as far west as Mount Kaputar National Park, over 140 km west of the development site. This indicates Greater Glider may inhabit suitable habitat from the coast to Mount Kaputar National Park such that the development site is not near the limit of the species' range. In the context of the Armidale Plateau, BioNet records exist in Booroolong Nature Reserve to the north-west and Duval Nature Reserve directly to the south and west. The individual recorded within the development site is likely to be a member of a population present at the latter location whose range includes connected bushland which enters the development site in the south and west. This population is considered an important population as it may be a source population for breeding or dispersal. Habitat for Greater Glider within the development site and footprint is limited to those treed areas with good connectivity (cover about 20 ha) as the species are poor disperses and unable to traverse large disconnects in canopy as smaller, more mobile glider species can. Given this limitation, up to 3.3 ha of foraging habitat and seven hollow-bearing trees (HBTs) would be removed. The seven HBTs do not contain hollows suitable for sheltering or breeding. Although the foraging resources are poor in quality due to historical disturbance, they may contain species preferred by Greater Glider that are seasonally important resources. Whether their removal could lead to a long-term reduction in the population is unclear. The foraging resources to be removed, largely a form of Box-gum Woodland, is likely to be one of the scarcest habitat types present across the populations' range, meaning that any degree of removal is exacerbated
b) Reduce the area of occupancy of an important population
While there will be habitat removal as described above, this would not decrease the total range of the population.
c) Fragment an existing important population into two or more populations;
Due to historical land use and clearing, connectivity of Greater Glider habitat across the development site and immediate surrounds is poor. Where it is greatest, this has been avoided. No barbed wire fencing would be used. As the proposal would have little impact on general connectivity for the species, it is unlikely to fragment an important population.
d) Adversely affect habitat critical to the survival of a species
Currently there is no critical habitat declared for Greater Glider, nor any standardised means for determining habitat quality. Greater Gliders are known to use a number of hollows. Detailed design following constraint assessment and during construction will preferentially has avoided areas of greatest connectivity to which Greater Glider would be most reliant. The area of occupancy has direct linkages to good quality vegetation with abundant hollow bearing trees that would not be impacted. Given the avoidance of higher quality habitat areas where canopy vegetation would remain a at distance suitable for gliding, it is unlikely that habitat critical to the survival of the Greater Glider be considered likely to adversely affected.

e) Disrupt the breeding cycle of an important population
The HBTs accessible to Greater Glider within the development footprint are not suitable den sites. Therefore, direct disruption to breeding cycle of the species is considered unlikely.
f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The extent of habitat modification and removal proposed would reduce the extent of resources available to the population to be impacted. Particularly, the type of resources to be removed, Box-gum Woodland, is likely to be scarcely available to the population. Were Box-gum Woodland a depended upon seasonal resource, malnourishment or competition for resources could cause mortality or decreased reproductive output.
g) Result in invasive species that are harmful to an vulnerable species becoming established in the vulnerable species' habitat
The proposal is considered unlikely to generate an increase in invasive species harmful to the species. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the development site. Additionally, the proposal is not considered likely to generate an increase in feral species.
h) Introduce disease that may cause the species to decline;
The proposal is considered unlikely to introduce disease that may cause the species to decline.
i) Interfere substantially with the recovery of the species;
As mentioned, the habitat to be removed (3.3 ha) may provide an important seasonal resource for the Greater Glider population. This may lead to malnourishment or decreased reproductive output reducing the size of the carrying capacity of the population. This indirect impact could interfere with the recovery of the species, however, the degree of which is difficult to quantify.

Conclusion

Despite the 3.3 ha of Greater Glider habitat that would be impacted by the proposal being in sub-optimal condition, the Eucalypt composition of the habitat may be such that it provides an important seasonal resource for the population present. Given the extent of habitat removal proposed and that the impact this will have on the regional persistence of the species is uncertain, referral to DAWE is recommended.

G.4 White-throated needletail *Hirundapus Caudacutus*

a) Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species

An area of 'important habitat' for a migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- habitat that is of critical importance to the species at particular life-cycle stages, and/or
- habitat utilised by a migratory species which is at the limit of the species range, and/or
- habitat within an area where the species is declining.

White-throated Needletails are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity.

The White-throated Needletail was not detected during site inspections, however, no targeted searches were conducted for this species. As such, presence has been assumed for the purpose of this assessment.

The proposal will result in the loss of 169.2 ha of potential foraging and roosting habitat for this species. However, an abundance of available intact habitat exists to the west of the development site. Contextually, the 169.2 ha to be removed represents a small amount of habitat in a locality that has ample similar resources. It's disturbance or removal is considered unlikely to modify, destroy or isolate an area of important habitat for a migratory species.

b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or

The proposal is considered unlikely to generate an increase in invasive species harmful to the species. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the development site. Additionally, the proposal is not considered likely to generate an increase in feral species.

c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The White-throated Needletail is not known to utilise the site as a breeding location. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. As such, the proposal is considered unlikely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of this species

G.5 Migratory birds

- Fork-tail Swift (*Apus pacificus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Satin Flycatcher (*Myiagra cyanoleauca*)
- Rufous Fantail (*Rhipidura rufifrons*)

a) Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
An area of 'important habitat' for a migratory species is: • habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or • habitat that is of critical importance to the species at particular life-cycle stages, and/or • habitat utilised by a migratory species which is at the limit of the species range, and/or • habitat within an area where the species is declining. The Black-faced Monarch, Fork-tail Swift, Satin Flycatcher and Rufous Fantail inhabit rainforests, eucalypt woodlands, coastal scrub and damp gullies. Neither the Black-faced Monarch, Satin Flycatcher and Rufous Fantail were detected during site inspections, however, no targeted searches were conducted for these species. As such, presence has been assumed for the purpose of this assessment. The proposal will result in the loss of 169.2 ha of potential foraging and roosting habitat for these species. However, an abundance of available intact habitat exists to the west of the development site. Contextually, the 169.2 ha to be removed represents a small amount of habitat in a locality that has ample similar resources. It's disturbance or removal is considered unlikely to modify, destroy or isolate an area of important habitat for a migratory species.
b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
The proposal is considered unlikely to generate an increase in invasive species harmful to the species. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the development site. Additionally, the proposal is not considered likely to generate an increase in feral species.
c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.
No nests were observed during site inspections for these species. The proposal will result in the loss of 169.2 ha of potential foraging and roosting habitat for these species. However, an abundance of available intact habitat exists to the west of the development site. Contextually, the 169.2 ha to be removed represents a small amount of habitat in a locality that has ample similar resources. As such, the proposal is considered unlikely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of this species.

Appendix H Credit report

BAM Credit Summary Report

Proposal Details

Assessment Id
00015471/BAAS18155/19/00015472

Proposal Name
Tilbuster Solar Farm

BAM data last updated *
10/06/2021

Assessor Name
Brendon True

Report Created
30/07/2021

BAM Data version *
45

Assessor Number
BAAS18155

BAM Case Status
Finalised

Date Finalised
30/07/2021

Assessment Revision
11

Assessment Type
Major Projects

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Blakely's Red Gum - Yellow Box grassy open forest or woodland of the New England Tableland Bioregion											
5	704_Woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	33.7	33.7	1.9	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	41

6	704_Grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	0.5	0.5	38.2	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	0

7	704_Scattered	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	21.4	21.4	4.6	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	62
										Subtotal	**103**

Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion											
1	567_Woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	54.4	54.4	7.4	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	251

2	567_Grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	0.4	0.4	60.6	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	0

3	567_Scattered	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	18.2	18.2	1.6	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	18
										Subtotal	**269**
Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tableland Bioregion											
4	575_Forest	Not a TEC	59.1	59.1	0.4			High Sensitivity to Potential Gain	1.50		9
8	575_Scattered	Not a TEC	37.6	37.6	0.67			High Sensitivity to Potential Gain	1.50		9
										Subtotal	**18**
										Total	**390**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits

Hoplocephalus bitorquatus / Pale-headed Snake (Fauna)								
704_Woodland	33.7	33.7	1.9	Vulnerable	Not Listed	2	False	33
704_Scattered	21.4	21.4	4.6	Vulnerable	Not Listed	2	False	50
							Subtotal	**83**
Myotis macropus / Southern Myotis (Fauna)								
567_Woodland	54.4	54.4	2.9	Vulnerable	Not Listed	2	False	78
567_Grassland	0.4	0.4	30.6	Vulnerable	Not Listed	2	False	6
567_Scattered	18.2	18.2	0.9	Vulnerable	Not Listed	2	False	8
704_Woodland	33.7	33.7	0.47	Vulnerable	Not Listed	2	False	8
704_Grassland	0.5	0.5	16.7	Vulnerable	Not Listed	2	False	4
704_Scattered	21.4	21.4	1.8	Vulnerable	Not Listed	2	False	19
							Subtotal	**123**
Petauroides volans / Greater Glider (Fauna)								
567_Woodland	54.4	54.4	0.99	Not Listed	Vulnerable	2	False	27
567_Scattered	18.2	18.2	0.28	Not Listed	Vulnerable	2	False	3
704_Woodland	33.7	33.7	0.53	Not Listed	Vulnerable	2	False	9
704_Scattered	21.4	21.4	1.5	Not Listed	Vulnerable	2	False	16
							Subtotal	**55**
Phascolarctos cinereus / Koala (Fauna)								
567_Woodland	54.4	54.4	7.4	Vulnerable	Vulnerable	2	False	201
567_Scattered	18.2	18.2	1.6	Vulnerable	Vulnerable	2	False	15
704_Woodland	33.7	33.7	1.9	Vulnerable	Vulnerable	2	False	33
704_Scattered	21.4	21.4	4.6	Vulnerable	Vulnerable	2	False	50
							Subtotal	**299**