Sapphire Solar Farm

Environmental Impact Statement

Volume 3 - Appendices

Appendix B

Framework for Biodiversity Assessment (FBA) Biodiversity Assessment Report and Biodiversity Offset Strategy

Sapphire Solar Farm SSD 8643

Biodiversity Assessment and Offset Strategy

Prepared for
CWP Renewables Pty Ltd

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DOCUMENT TRACKING

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Abbreviations

Abbreviation	Description
BAR	Biodiversity Assessment Report
BBCC	BioBanking Credit Calculator Version 4.0
BC Act	NSW Biodiversity Conservation Act 2016
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environment Management Plan
DP&E	Department of Planning and Environment
Ecosystem credit	A measurement of the value of EECs, CEECs, and threatened species habitat for species that can be reliably predicted to occur within a PCT
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979

Abbreviation	Description
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPBC Regulations	Commonwealth Environment Protection and Biodiversity Conservation Regulations 2000
FBA	Framework for Biodiversity Assessment
LEP	Local Environment Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
PCT	Plant Community Type
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
the bilateral agreement	Bilateral agreement made under section 45 of the EPBC act relating to environmental assessment
the development site	lands within the Sapphire Solar Farm proposed for development
the Project	Construction and operation of the Sapphire Solar Farm
TSC Act	NSW Threatened Species Conservation Act 1995

Executive summary

Eco Logical Australia Pty Ltd (ELA) was engaged to undertake a biodiversity assessment of the proposed development near Kingsland NSW known as the Sapphire Solar Farm (SSF; the project). The proposed development of the solar farm has been declared a State Significant Development (SSD - 8643), and as such the environmental impacts of the proposal are to be assessed under Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979*.

As a SSD (and consistent with the SEARs), the impacts of the proposed development must be assessed under the Framework for Biodiversity Assessment (FBA; OEH 2014) and a Biodiversity Assessment Report (BAR) must be prepared. The purpose of this BAR is to assess the impacts to biodiversity, propose mitigating and ameliorating options, as well as calculate offsets for unavoidable residual impacts.

The Project has been designed to complement the existing Sapphire Wind Farm (SWF), by providing additional energy generation and storage within the existing SWF facility. The development site has been subject to numerous previous assessments, including the development of the SWF as a SSD. The SWF (MP09_0093) was given NSW approval on 26 June 2013, which was subject to an approved modification (Mod 1) on 30 June 2016. The SWF was also subject to a referral (2011/5854) to the Commonwealth Department of the Environment and Energy (DoEE), which was declared a controlled action and approved with conditions on 5 December 2014. As part of these NSW and Commonwealth assessments and approvals, the SWF site was subject to considerable assessment resulting in both land based offsets as well as monetary contributions for impacts to threatened ecological communities and threatened species (and their habitats).

The current SSF footprint has considered the biodiversity values known to occur within the development site, and has where possible avoided areas of native vegetation, threatened species, and their habitats. In particular, the project has avoided (where possible) areas of Threatened Ecological Communities (TECs) and known threatened species habitats. The SSF footprint has reduced through each iteration of design to provide a final footprint that:

- co-locates services, access, infrastructure, and construction facilities with existing disturbance areas of the SWF;
- locates panel arrays within areas of cultivation;
- provides for a facility that compliments the existing SWF development; and
- avoids drainage lines, high quality vegetation, and known threatened species records.

The development site is currently used for agricultural purposes as well as a wind farm, and has been substantially cultivated. 76% of the development site is considered cleared land, with only 7% of the development site occupied by poor condition woodland vegetation.

There are native remnant trees throughout the development within pasture improved and cultivated paddocks. There are three plant community types (PCTs) that occur within the development site which are represented by three biometric vegetation types described as:

- PCT510 (BR272): Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion;
- PCT921: (BR153): Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion; and
- PCT1383 (BR240): White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion.

PCT510 (BR272) occurs within the north-east of the development site on chocolate soils that are relatively fertile. This PCT exists as scattered trees within cultivated paddocks. The dominant canopy species within this PCT is *Eucalyptus blakelyi* (Blakely's Red Gum). The mid-storey is absent and native groundcover is largely absent due to extensive agricultural practices. There are areas of native grassland adjacent to remnant trees that have been mapped within the development site as the Derived Native Grassland (DNG) of this PCT. Native grasses growing within the DNG component of this community have persisted following agricultural impacts. Portions of the woodland component of this PCT are consistent with the Endangered Ecological Community (EEC) listing for White Box Yellow Box Blakely's Red Gum Woodland under the NSW *Biodiversity Conservation Act 2016* (BC Act) and with the guidance material for the Critically Endangered Ecological Community (CEEC) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), also known as 'Box Gum Woodland'. Grassland areas of this PCT are heavily degraded but have been included in the BC Act TEC listing for Box Gum Woodland. The DNG component of this PCT does not meet the EPBC Act TEC.

PCT921: (BR153) occurs on hilltops and slopes throughout the development site, and also exists as scattered trees within cultivated paddocks. The dominant canopy species within this PCT are *Eucalyptus viminalis* (Manna Gum), *Eucalyptus melliodora* (Yellow Box), and *E. blakelyi*. The mid-storey is absent and native groundcover is largely absent due to extensive agricultural practices. Portions of the woodland component of this PCT are consistent with the NSW and EPBC Act listing for Box Gum Woodland. Grassland areas of this PCT are heavily degraded but meet the requirements for the BC Act and EPBC Act TEC listing for Box Gum Woodland.

PCT1383 (BR240) occurs within the south of the development site in lower altitudes and exists as scattered trees within cultivated paddocks. The only present canopy species is *Eucalyptus albens* (White Box). The mid-storey is absent and native groundcover is largely absent due to extensive agricultural practices. Portions of the woodland component of this PCT are consistent with the NSW and EPBC Act listing for Box Gum Woodland. Grassland areas of this PCT are heavily degraded but have been included in the BC Act TEC listing for Box Gum Woodland. Portions of the DNG component of this PCT meet the EPBC Act TEC.

Despite the degraded condition of the development site, threatened fauna surveys were conducted as a precaution for *Anthochaera Phrygia* (Regent Honeyeater), *Phascolarctos cinereus* (Koala), and *Hoplocephalus bitorquatus* (Pale-headed Snake). Surveys involved diurnal surveys, inspection of habitat for scratches and scats, opportunistic surveys, spotlighting, and call playback for targeted species. No threatened fauna species were identified within the development site.

Threatened flora surveys were considered for *Dichanthium setosum* (Bluegrass) and *Thesium australe* (Austral Toadflax) which were both recorded onsite during the environmental assessment of the Sapphire Wind Farm. *Picris evae* (Hawkweed) and *Polygala linariifolia* (Native Milkwort) were also broadly considered to potentially occur due to records of the species within region, although these two species occurrence within the development site is highly unlikely due to extensive cultivation. These two species were considered during targeted surveys in late-November / early-December 2017. Reference sites for both *D. setosum* and *T. australe* were known from the SWF surveys and were inspected during the correct identification period as part of this assessment for SSF with young growth of *T. australe* observed. The reference site for *D. setosum* has been subject to agricultural activity in the intervening time since SWF surveys making identification difficult.

Given the similarities to common species, voucher specimens for *D. setosum* and *D. sericium* were reviewed at the N.C.W. Beadle Herbarium at the University of New England (with the assistance of

Professor Jeremy Bruhl and Lindsey Frost) prior to surveys to ensure correct identification of each species. Several samples of a Dichanthium species likely to be *D. setosum* were collected within the development site during surveys, and have been sent to the National Herbarium of NSW for formal identification. Should the species be confirmed within the development site, the proponent will avoid impacts to this species as part of detailed design and during the construction phase.

As part of this BAR, avoidance measures to minimise impacts to biodiversity have been proposed, including siting of the project, alternative options, as well as methodologies to minimise impacts during construction and operation of the project. Following consideration of minimisation methods, the residual unavoidable impacts of the project were calculated in accordance with the FBA using the BioBanking Credit Calculator (BBCC). More appropriate local data (MALD) is proposed within this document for calculations within the BBCC, an approach (and the same data) which was used as part of the Sapphire Wind Farm biodiversity assessment with approval from OEH (then DECCW). This MALD has been collected in accordance with Appendix C of the FBA. The BBCC calculated that a total of 662 ecosystem credits are required to offset the unavoidable impacts of the project. This included 73 BR240 credits, 170 BR272 credits, and 419 BR153 credits. No species credits are required, as threatened species formally identified within the development site will be avoided at the design and construction phase.

A Biodiversity Offset Strategy (BOS) to achieve the offset requirement has been proposed, and is provided in Stage 3 of this document. The BOS will seek to acquire, and retire the full quantum of credits as required by the BBCC.

1 Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by CWP Renewables Pty Ltd on behalf of Sapphire Solar Farm Pty Ltd (SSF; the proponent) to undertake a biodiversity assessment for the construction and operation of the Sapphire Solar Farm between Glen Innes and Inverell, NSW (the project).

1.1 Purpose

This Biodiversity Assessment Report (BAR) has been prepared as part of an Environmental Impact Statement (EIS) for the State Significant Development (SSD) of the Sapphire Solar Farm (SSF). Due to the potential for impacts to Matters of National Environmental Significance (MNES), the project has been referred to the Commonwealth Department of the Environment and Energy (DoEE) which has resulted in a controlled action declaration.

The Secretary's Environmental Assessment Requirements (SEARs) were issued on 23 August 2017, with an updated set of SEARs incorporating DotEE requirements dated 10 January 2018. Impacts to flora and fauna under this SSD are assessed using the Framework for Biodiversity Assessment (FBA) as directed by the SEARs. This assessment has been undertaken by Dr Alex Pursche, who is an accredited assessor (227) under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

This report responds specifically to the SEARs as they relate to biodiversity assessment as described in **Table 1**.

Table 1: Relevant SEARs addressed in this BAR

SEARs	Response
Biodiversity – including an assessment of the likely biodiversity impacts of the development (including but not limited to the impacts on Box Gum Woodland and Derived Native Grassland and Ribbon Gum Mountain Gum Snow Gum Grassy Open Forest / Woodland Endangered Ecological Communities) having regard to the NSW Biodiversity Offsets Policy for major Projects, in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by the Department, and an assessment of the likely impacts to the aquatic ecology of waterways (including but not limited to Kings Plain Creek, Mary Anne Creek, Frazers Creek, Horse Gully and Apple Tree Gully)	This BAR has been prepared under the FBA (OEH 2014) for major projects. Under this framework a detailed assessment must be undertaken on the vegetation to be impacted within the development site, as well as any impacts to threatened species, populations, or endangered ecological communities. This BAR also outlines the offsetting requirement due to unavoidable impacts of the project. Assessment of aquatic impacts are provided within a separate section of the EIS. This report covers terrestrial biodiversity only.

1.2 Project description

1.2.1 Location

The Sapphire Solar Farm (SSF) is located within the locality of Kingsland, NSW, approximately 36 km west of Glen Innes and 40 km east of Inverell, in the Inverell Local Government Area (LGA). The SSF is bisected by several public roads, primarily Waterloo Road but also Western Feeder Road.

The SSF occurs across five private landholdings, which are currently used as an agricultural enterprise for cattle and sheep farming. The construction of the project is contingent on an existing land use agreement between Sapphire Solar Farm Pty Ltd and the landholders.

The SSF is situated on landholdings that are currently subject to the Sapphire Wind Farm, which has undergone assessment and approval by the Department of Planning and Environment on 26 June 2013. Given the assessment history within the proposed SSF site, there is an extensive understanding of the biodiversity values present.

1.2.2 Overview

Fully constructed, the Sapphire Solar Farm (SSF the 'Proposed Development') is expected to have an electricity generation capacity of approximately 180 megawatts (MW_{AC}) at the point of connection, producing enough energy (390 GWh) to power the equivalent of 68,000 average NSW households each year. The addition of battery-based storage (c.100 MWh) will allow for the Proposed Development (along with the Sapphire Wind Farm (SWF)) to dispatch scheduled and reliable renewable energy generated power to the National Electricity Market (the NEM).

The Proposed Development would include, but not necessarily be limited to, the following elements:

- Solar arrays: solar panels supported by a mounting system installed on piles driven or screwed into the ground;
- Battery-based storage facilities;
- Power Conversion Units (PCU's) inclusive of Inverters/Rectifiers, Ring Main Units, LV/MV step-up Transformers located throughout the Proposed Development;
- Collector systems: above and/or below ground onsite cabling and electrical connections between the existing SWF substation (the 'Substation') and the respective PCU's;
- Operation and maintenance (O&M) building including workshop, warehouse, offices, ablutions, and carpark;
- Site access and onsite access tracks;
- Fencing and security system;
- Meteorological stations;
- Vegetation buffers (if required) for visual screening; and
- Firebreaks.

In addition to the key components outlined above, there would be a temporary construction compound required to facilitate the construction and decommissioning phases of the Proposed Development. In order to minimise environmental impacts, the SSF temporary construction compound is proposed to be located within the temporary construction compound currently in use for construction of Sapphire Wind Farm.

1.2.3 Development site footprint identification

The development site footprint has undergone several iterations with the view to reduce, where possible, potential impacts to biodiversity, whilst maintaining a functional solar farm. The development site footprint was initially proposed during the Preliminary Environmental Assessment in June 2016. This initial footprint was reviewed prior to formal field assessments as part of this BAR. A revised footprint (Development Footprint) was proposed and this was the subject of the field assessments. Following field assessment, the footprint was further refined to provide a final footprint for the project. The final footprint proposed within this BAR is shown in **Figure 3**.

The development site presented within this BAR contains areas that may not be impacted as part of the project. As a precautionary measure, all areas within the development site are considered to be impacted by the proposal.

1.3 General description of the development site

1.3.1 Landform, geology & soils

The SSF proposal is located within the Kings Plain district of the New England Tablelands. The landscape is a basin with undulating tertiary basalt hills as well as alluvial plains within drainage lines. The site is in the Mitchel Landscape 'Glen Innes – Guyra Basalts'.

No recent soil mapping is available for the Glen Innes locality. Previous regional soil mapping indicated Chocolate – Prarie soils are found on upper slopes, with Black Earth Euchrozem soils and Black Earth – Prarie soils within valleys and major drainage lines.

1.3.2 Vegetation

Native vegetation within the locality is considerably degraded from ongoing agricultural impacts. The majority of native vegetation present is in the form of open woodland separating cropland and improved pastures. Native vegetation is discussed further in **Chapter 4**.

1.3.3 Hydrology

The hydrology of the development site is typified by ephemeral first order streams. Several of these streams intersect each other across the development site to form Frazers Creek and Mary Anne Creek which are classed as a second order streams (Strahler, 1952), as well as Kings Plains Creek which is a third order stream, and Horse Gully which is a fourth order stream beyond the development site. All ephemeral streams within the outer assessment circle have been mapped according to stream order as shown in **Figure 2** and **Figure 4**.

All streams were dry at the time of field surveys.

1.3.4 Land uses

Historical

Previous archaeological studies from the Sapphire Wind Farm assessment suggests that indigenous occupation of the tablelands primarily traded with those of the western slopes and moved seasonally between the coast and western river systems and the tablelands. Carved trees, bora grounds and art sites have been found locally.

Since the 1830s, European squatters gave way to cattle grazing, which transitioned to sheep grazing with expansion of improved pastures and better fencing.

Mining

The primary extractive industry locally included sapphire mining and quarrying for local aggregates.

Agriculture

The primary land use locally is agriculture including sheep and cattle grazing, as well as extensive cropping. The majority of the locality is occupied by improved pastures and there are very few areas remaining that do not have any nutrient enrichment.

Energy production

The Sapphire Wind Farm is currently under construction within the same land ownership as the proposed SSF. There are several other renewable energy projects locally including White Rock Wind and Solar farms and Glenn Innes Wind Farm.

1.4 Data sources

1.4.1 Database review

The following databases were reviewed as part of this assessment:

- Atlas of NSW Wildlife (Bionet; OEH, 2017);
- Threatened Species Profile Database (OEH, 2017);
- VIS Classification 2.1 (OEH, 2017);
- NSW Planning Portal (www.planningportal.nsw.gov.au);
- NSW Major Projects (majorprojects.planning.nsw.gov.au); and

1.4.2 Literature review

The following relevant ecological literature was reviewed during this assessment:

- BioBanking Assessment Methodology and Credit Calculator Operational Manual (OEH 2016);
- Credit Calculator for Major Projects and BioBanking (OEH 2016);
- CWP Renewables (2017) Sapphire Solar Farm Preliminary Environmental Assessment.
- Eco Logical Australia (2011) Sapphire Wind Farm part 3A Ecological Assessment. Prepared for Wind Prospect CWP
- Framework for Biodiversity Assessment (OEH 2014); and
- NSW Biodiversity Offsets Policy for Major Projects (OEH 2014).

1.4.3 Aerial photography

Aerial imagery used in this assessment is from SIX Maps.

2 Policies and Legislation

2.1 New South Wales legislation

2.1.1 Environmental Planning and Assessment Act 1979

As part of an application for a Major Project under the EP&A Act, a proponent must prepare an EIS. Before preparing an EIS, proponents must apply to the Secretary of the Department of Planning and Environment (DP&E) for the SEARs, which sets out matters to be addressed in the EIS.

2.1.2 NSW Biodiversity Offsets Policy for Major Projects

As the project is identified as a Major Project, under the NSW Biodiversity Offsets Policy for Major Projects, the SEARs require the proponent, unless otherwise specified, to apply the FBA to assess impacts on biodiversity. The FBA must be applied to identify reasonable measures and strategies that can be taken to avoid and minimise impacts to biodiversity. A Biodiversity Assessment Report (BAR) will describe the biodiversity values present on the development site and the impact of the Major Project on these values. If required, a Biodiversity Offset Strategy (BOS) will outline how the proponent intends to offset the impacts of the Major Project. The BAR and BOS then form part of the EIS.

The SEARs may identify additional assessment requirements for biodiversity impacts not considered by the FBA, which must be documented separately within the EIS.

2.1.3 NSW *Biodiversity Conservation Act* 2016

In November 2016 the NSW parliament passed the NSW *Biodiversity Conservation Act 2016* (BC Act). This new legislation replaced the TSC Act on 25 August 2017.

However due to the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (described below), this project will be assessed under the previous biodiversity assessment requirements.

2.1.4 NSW *Threatened Species Conservation Act 1995*

The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The TSC Act has now been repealed, and all reference to threatened species, populations, or ecological communities has now transferred to the equivalent BC Act.

2.1.5 NSW Biodiversity Conservation (Savings and Transitional) Regulation 2017

In November 2016 the NSW parliament passed the NSW *Biodiversity Conservation Act 2016* (BC Act). This new legislation has now replaced the TSC Act. The BC Act commenced on 25 August 2017 along with the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*. Under the provisions relating to biodiversity assessment and approvals under the EP&A Act, Part 7 of the regulation allows for pending or interim planning applications to be assessed under the former planning provisions rather than the new Biodiversity Conservation Act 2016. The regulation defines a '*pending or interim planning application*' as including:

> *"(b) an application for planning approval (or for the modification of a planning approval) made within 18 months after the commencement of the new Act if an environmental impact statement is to be submitted in connection with the application and the Secretary of the Department of*

Planning and Environment issued, before the commencement of the new Act, environmental assessment requirements for the preparation of the statement"

2.1.6 State Environmental Planning Policy No. 44 (Koala Habitat) (SEPP 44)

SEPP 44 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for *Phascolarctos cinereus* (Koala) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. Developers of land with Koala habitat must consider the impact of their proposal on Koalas, and in certain circumstances, prepare individual Koala plans of management for their land.

Inverell Shire Council is listed as one of the Councils in which SEPP 44 applies. Councils are encouraged to prepare LGA-wide Koala plans of management, and once agreed to by the NSW Department of Planning, they may be used by developers to address Koala issues and individual plans of management would no longer be required. Currently, potential and core koala habitat has not been surveyed in the Inverell Shire Council LGA, or included as a special provision in the Inverell LEP, or the *Inverell Development Control Plan 2013*.

Potential Koala habitat is defined as areas of native vegetation (>1 ha) where the trees types listed in Schedule 2 of the SEPP constitute at least 15% of the total number of trees in the upper and lower strata. Core Koala habitat is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population.

The potential impact of the Proposed Development on Koalas and whether the potential Koala habitat identified meets the definition of core Koala habitat is assessed in Section 7.3 of the EIS. No core Koala habitat was identified within the Development Footprint.

2.2 Commonwealth legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Matters of National Environmental Significance (MNES) are protected. The FBA requires proponents to identify and assess the impacts on all nationally listed threatened species and threatened ecological communities that may be on the development site. Other MNES are not considered under the FBA.

One MNES has been identified within the development site, the CEEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. A referral has been submitted to DoEE (Appendix F) which has resulted in a controlled action declaration.

2.2.2 Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy

This policy outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the EPBC Act. It replaces the draft policy statement *Use of environmental offsets under the EPBC Act* (2007).

Offsets are defined as measures that compensate for the residual adverse impacts of an action on the environment. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act. This policy provides transparency around how the suitability of offsets is determined. The suitability of a proposed offset is considered as part of the decision as to whether or not to approve a proposed action under the EPBC Act.

2.2.3 Bilateral Assessment Agreement

Under the *Bilateral agreement made under section 45 of the EPBC act relating to environmental assessment* (the bilateral agreement; DotE 2015), a proposed action does not require assessment under Part 8 of the EPBC Act, if the action is to be assessed under Part 4 Division 4.1 or Part 5.1 of the EP&A Act, provided the assessment:

- Contains an assessment of all impacts the action has on each matter protected under the EPBC Act;
- Contains enough information about the controlled action and its relevant impacts to allow the Commonwealth Minister to make an informed decision whether or not to approve the action; and
- Addresses all matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regs; DotE 2000).

The proposed action will be assessed via an EIS, which will involve several public consultation periods.

Stage 1 – Biodiversity Assessment

3 Landscape features

3.1 Landscape assessment

For all analysis of landscape features within this BAR, a 400 ha inner and 4000 ha outer assessment circle has been used in accordance with Appendix 4, Table 8 of the FBA.

3.1.1 Interim Biogeographic Regionalisation of Australia

Bioregions

The development site and outer assessment circle occur wholly within the New England Tablelands Bioregion (**Table 2**). The New England Tableland Bioregion has an area of 3,004,202 ha of which 2,860,758 ha or 95.23 per cent of the bioregion lies within NSW. This bioregion is one of the smaller bioregions in NSW, occupying 3.57 per cent of the state (OEH, 2016).

This bioregion lies between the North Coast and Nandewar bioregions in north-east NSW, extending north just into Queensland. In NSW, the bioregional boundary extends from north of Tenterfield to south of Walcha and includes towns such as Armidale and Glen Innes, with Inverell just outside the boundary. The bioregion includes parts of the MacIntyre, Clarence, Gwydir, Macleay, Namoi and Manning River catchments.

Table 2: IBRA Bioregions Occurring within the Development Site and Outer Assessment Circle

IBRA Bioregion Name	% Development Site	% Outer Assessment Circle
New England Tablelands	100%	100%

Subregions

The development site occurs predominately within the Glenn Innes – Guyra Basalts IBRA subregion (**Table 3**). The geology within this subregion is typified by extensive tertiary basalt flows, small enclosed areas of granite and fine grained Permian sedimentary rocks, as well as quaternary sediments in swamps and lagoons (OEH, 2016). Characteristic landforms within this region include stepped plateaus from 700-1500 m undulating to low hills, swamps and lagoons with evidence of past higher water levels and lunettes, as well as wide valleys with evolving drainage systems (OEH, 2016). Vegetation within this subregion includes *E. viminalis* open forest and woodland with *Eucalyptus pauciflora* (Snow Gum) and *Eucalyptus stellulata* (Black Sallee) on basalt.

Table 3: IBRA subregions

IBRA Subregion Name	% Development Site	% Outer Assessment Circle
Glenn Innes – Guyra Basalts	100%	100%

3.1.2 Mitchell landscapes

Four Mitchel Landscapes are represented within the outer assessment circle, which is predominately occupied by Glenn Innes – Guyra basalts.

Small portions of the Ashford Mole Valleys, Dumaresq Channels, and Inverell Plateau Granites Mitchell Landscapes are also mapped within the outer assessment circle and development site as shown in **Table 4**.

Table 4: Mitchell Landscapes

IBRA Subregion Name	Percent cleared	% Development Site	% Outer Assessment Circle
Ashford Mole Valleys	66	1%	2%
Dumaresq Channels	88	6%	5%
Glenn Innes – Guyra Basalts	82	93%	91%
Inverell Plateau Granites	37	0%	2%

3.1.3 Streams and rivers

The site is intersected by several ephemeral first order streams which flow into Frazers Creek, Mary Anne Creek, Kings Plains Creek, and Horse Gully.

Within the outer assessment circle, Horse Gully which is a fourth order stream, occurs nearby to the development site. There are no permanent streams or rivers within the development site.

A figure showing the locations of all drainage relative to the development site is shown on **Figure 4**.

3.1.4 Wetlands

No wetlands are within the locality of the development site.

3.1.5 Native vegetation extent

Native vegetation within the outer assessment circle is disjunct as a result of land clearing for agriculture. Within the 4000 ha outer assessment circle native vegetation was mapped using the SIX Maps aerial imagery. Native vegetation mapping within the outer assessment circle also considered knowledge of the locality including the potential canopy species, history of disturbance, and previous site inspections.

Native vegetation within the locality is particularly patchy from ongoing disturbance. Broadly, the following rules were applied to mapping over-storey native vegetation extent within the outer assessment circle:

- all canopy extent was mapped to create small polygons across the landscape
- all polygons within 50m of each other were joined together, regardless of ground condition

Native vegetation occupies approximately 1,679 ha within the outer assessment circle (41.9 %), and is shown on **Figure 2**.

3.1.6 State or regionally significant biodiversity links

No state significant or regionally significant biodiversity links have been identified within a plan by the Chief Executive of the OEH. There is one fourth order stream, Horse Gully, within the outer assessment circle. This is located nearby to the development site, but does not intersect with the 20 m inner buffer.

3.2 Landscape value score

3.2.1 Attributes

Percent native vegetation cover

The current and future native vegetation cover was assessed in Geographic Information Systems (GIS) using increments of 5%. The project will result in the loss of 29.67 ha of over-storey native vegetation extent from the outer assessment circle.

Table 5: Current and Future Extent of Native Vegetation with the Inner and Outer Assessment Circles

Assessment Circle	Current Native Vegetation Extent			Future Native Vegetation Extent		
	Area (ha)	**% Cover**	**Category**	**Area (ha)**	**% Cover**	**Category**
Outer Assessment Circle (4,000 ha)	1,679	41.9	41 - 45	1649	41.2	41 - 45
Inner Assessment Circle (400 ha)	157.7	39.4	36 - 40	139.2	34.8	31 - 38

Connectivity value

Connectivity of the development site was assessed using Tables 11 – 14 in Appendix 4 of the FBA. The current and future connecting link widths and condition is shown in **Table 6** below.

Table 6: Current and Future Connecting Links with the Inner and Outer Assessment Circles

Connecting Link	Linkage Width			Linkage Condition			Connectivity Value
	Current	**Future**	**Classes Crossed**	**Current**	**Future**	**Classes Crossed**	**Score**
1	Narrow (>5 – 30)	Narrow (>5 – 30)	0	>50% of lower benchmark	>50% of lower benchmark	0	0

Patch Size

Patch size was calculated using available vegetation mapping. The patch size included all vegetation patches linked to the development site within the outer assessment circle. Patches within the development site were considered linked when the adjacent vegetation was:

- In moderate to good condition;
- Has a patch size of > 1 ha;
- Is separated by a distance of < 100 m; and
- Is not separated by a large water body, dual carriageway, wider highway, or similar hostile link.

Based on the above criteria, patch size (>100 ha) was considered to be extra-large. The percent native vegetation cleared within the Glenn Innes – Guyra Basalts Mitchell Landscape is 88%. Based on this information, the patch size score has been calculated to be 12.

3.2.2 Landscape score

Based on the assessment of landscape attributes above, the Landscape Value Score has been calculated to be 12.6.

4 Native vegetation

4.1 Review of existing data

The following documents and databases were reviewed during assessment of native vegetation within the development site:

- VIS Classification Database.
- CWP Renewables (2017) Sapphire Solar Farm Preliminary Environmental Assessment.
- Eco Logical Australia (2011) Sapphire Wind Farm part 3A Ecological Assessment. Prepared for Wind Prospect CWP.
- Eco Logical Australia (2011) Request for approval to use local benchmark data. Prepared for Wind Prospect CWP.

4.2 Native Vegetation Extent

The development footprint is 445 ha in size which includes 104.1 ha of native vegetation and 341 ha of cleared land. The extent of native vegetation within the development footprint is shown on **Figure 6**. The extent of native vegetation was determined through aerial imagery, in conjunction with site assessments.

The majority of paddocks within the development site had been sown with pasture fodder such as *Paspalum dilatatum* (Paspalum), *Trifolium sp.* (Clover), and *Phalaris aquatica* (Phalaris) within recent years leading up to the site survey. Paddocks that had not been recently ploughed, still showed evidence of ploughing and pasture improvement from previous years and had a species assemblage similar to that of currently ploughed paddocks. Nineteen full floristic plots, and plot and transects were undertaken across the development site, which included eleven plots within grassland areas to determine whether or not the paddocks should be incorporated as a plant community type in the form of a derived native grassland (DNG). The vast majority of grassland within the development site was in poor condition with varying abundances of native perennial groundcover, with native species was generally confined to localised occurrences of species, at a ground cover of less than 30%. All cropland has been excluded from the biodiversity assessment and is mapped as cleared land.

Given the extensive history of pastoral disturbance within the development site, native woody vegetation extent has predominately been mapped as the canopy cover of paddock trees. Trees where the canopy extent is closer than 50 m to each other have been joined to form a single polygon, recognising the potential connective biodiversity values of adjacent paddock trees, as well as the guidance material provided by OEH in the SEARs.

Areas where native perennial groundcover was visibly more abundant were mapped as DNG of adjacent woodland PCTs, and assessed accordingly.

4.3 Surveys

Flora survey was undertaken within the development site on 27 November – 1 December, and 18 – 20 December 2017 by David Allworth, Alex Pursche, Eliza Biggs, Natalie Mace, and Tim Henderson. Survey effort is shown in **Figure 5**. The assessment included obtaining an overview of the biodiversity values of the development site, as well as mapping of vegetation communities and floristic sampling. Areas of native vegetation were delineated using a handheld Global Positioning System (GPS). The assessment met the full requirements of the FBA including full floristic survey, as well as plot and transect survey within any PCTs identified within the development site.

In order to identify PCTs within the development site, plot-based full floristic survey and plot and transect survey was undertaken within vegetation zones as identified in Table 1 of the FBA. Given the extent of existing vegetation within the development site, 19 full floristic plot, and plot and transect surveys were undertaken. Photographs and site notes were recorded.

The location of the surveys were chosen to occur within the construction footprint of the proposed development. The minimum number of plot and transect sites required, based on the condition and extent of each vegetation zone is shown in **Table 7**, and compared to the number of plots completed.

At each survey site, the following information was collected:

- Site ID
- Name of recorder(s)
- Date
- Plot orientation, slope, and aspect
- Easting and Northing at either end of the 50 m transect
- Site photographs
- A plot-based full floristic survey and
- A plot and transect survey.

Table 7: Vegetation zone size and number of plots required

Zone	BVT/PCT	Condition	Area (ha)	Plots Required	Plots Completed
1	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Poor	3.89	2	2
2	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	DNG	41.2	4	5
3	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Poor	10.58	3	3
4	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	19.75	3	3
5	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	Poor	15.83	3	3
6	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	DNG	12.85	3	3
Total native vegetation			104.1	18	19
Cleared land			341.18	n/a	n/a
Total (development site)			**445.28**	**18**	**19**

4.3.1 Plot-based full floristic survey

Within a 20 m x 20 m quadrat, the following data was collected at each plot-based full floristic survey site:

- **Species name**; Scientific name and common name
- **Cover**: an estimate of the appropriate cover measure for each recorded species: from 1-5 and then to the nearest 5%
- **Abundance**: A relative measure of the number of individuals or shoots of a species within the plot using the following intervals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000, or specify a number greater than 1000 if required
- **Form**: (T) Tree; (M) Mallee tree; (S) Shrub; (G) Tussock Grass (Poa/Themeda); (D) Sod grass (Couch/Kikuyu); (L) Vine/climber/scrambler; (V) Sedge (Cyperoid); (R) Rush (Restioid, Juncaceae); (F) Forb; (E) Fern; (P) Palm; (A) Cycad.

4.3.2 Plot and Transect Surveys

Within each plot and transect survey, the following information was collected:

- Within a 20 m x 20 m quadrat:
    - The number of native species present
- Along a 50 m transect every 5 m:
    - Native over-storey cover (%)
    - Native mid-storey cover (%)
    - Exotic over-storey cover (%) and
    - Exotic mid-storey cover (%)
- Along a 50 m transect every 1 m:
    - Native ground cover (grasses)
    - Native ground cover (shrubs)
    - Native ground cover (other) and
    - Exotic ground cover.
- Within a 50 m x 20 m quadrat:
    - Number of trees with hollows and
    - Total length of fallen logs > 10 cm width (m);
- Within whole vegetation zone:
    - All canopy species and
    - Proportion of regenerating canopy species.

4.3.3 Survey results

The results of full floristic plot and plot and transect surveys is shown in **Appendix A**.

The development site is 445.28 ha in size which includes 104.1 ha of native vegetation and 341.18 ha of cleared land for agriculture, infrastructure, and the SWF. The extent of native vegetation is shown on **Figure 6**. The extent of native vegetation was determined through aerial imagery, in conjunction with site assessments.

Aerial imagery was not reflective of the extent of native vegetation within the development site with respect to the recent construction of the SWF. Several areas within the development site proposed for site compounds, access roads, underground cables, and set down areas are already in use for this function as part of the SWF. These areas are identified as cleared land.

4.4 Identification of Plant Community Types

Identification of PCTs was determined by incorporating field data with available databases and mapping. PCTs within the development site were identified by incorporating the following hierarchy of factors in conjunction with site data:

- Occurrence of the PCT within the New England Tablelands IBRA bio-region
- Vegetation formation
- Landscape position
- Dominant species

Three PCTs were identified within the development site, all of which occur within woodland and DNG formations:

- PCT510 (BR272): Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- PCT921: (BR153): Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion
- PCT1383 (BR240): White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion

All PCTs are heavily impacted by the current agricultural practices used within the development site. The mid-storey has been removed from all PCTs and the ground layer has been extensively modified from ploughing, nutrient enrichment, and sewing of pasture grasses, as well as current grazing by sheep, cattle, and infrequent impacts by feral animals such as *Lepus europaeus* (Brown Hare) and *Sus scrofa* (Feral Pig) which were both observed during site surveys.

Given the persistent and extensive impacts of agriculture, selection of PCTs was difficult, as no vegetation zones had an intact canopy, mid-storey, and groundcover layer. As such PCT selection relied heavily on the canopy species present, landscape position, and soil types, as well as previous surveys of the site by ELA (as part of the SWF NSW and Commonwealth approvals) and Environmental Property Services as part of the PEA. Where practical, intact adjacent vegetation with a similar landscape position and canopy species assemblage was used to select PCTs.

Following assessment of soil characteristics, landscape position, and vegetation surveys, the following criteria used to determine PCTs and vegetation zones within the development site as shown in **Table 8**.

Table 8: Selection Criteria for PCTs within the Development Site

Zone	PCT Code	BVT Code / Name	Selection Criteria	Species Relied Upon for Assigning PCT
1	590	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	**IBRA Subregion:** Glenn Innes – Guyra Basalts **Vegetation Formation:** Grassy Woodland **Landscape Position:** Occurs on black earth and chocolate soils derived from basalt on flats or low hills on the largely cleared Inverell basalts, and to a lesser extent on rich sedimentary or volcanic soils north of Barraba.	**Upper Stratum Species**: *Eucalyptus albens* **Mid Stratum Species**: absent **Ground Stratum Species**: *Dichondra repens, Cynodon dactylon, Austrostipa aristiglumis*
2	590 - DNG	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	**IBRA Subregion:** Glenn Innes – Guyra Basalts **Vegetation Formation:** Grassy Woodland **Landscape Position:** Occurs on black earth and chocolate soils derived from basalt on flats or low hills on the largely cleared Inverell basalts, and to a lesser extent on rich sedimentary or volcanic soils north of Barraba.	**Upper Stratum Species**: absent **Mid Stratum Species**: absent **Ground Stratum Species**: *Dichondra repens, Cynodon dactylon, Austrostipa aristiglumis*

Zone	PCT Code	BVT Code / Name	Selection Criteria	Species Relied Upon for Assigning PCT
3	510	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	**IBRA Subregion:** Glenn Innes – Guyra Basalts **Vegetation Formation:** Grassy Woodland **Landscape Position:** Occurs on undulating areas at intermediate to high altitudes, with local stands in the Horton area east of Mount Kaputar. It occupies deep, relatively fertile soils on a number of different geologies, but mainly sedimentary rocks and basalt.	**Upper Stratum Species**: *Eucalyptus blakelyi, Eucalyptus melliodora, Angophora floribunda, Eucalyptus viminalis* **Mid Stratum Species**: absent **Ground Stratum Species**: *Bothriochloa macra, Chrysocephalum apiculatum, Sorghum leiocladum, Sporobolus creber*
4	510 - DNG	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	**IBRA Subregion:** Glenn Innes – Guyra Basalts **Vegetation Formation:** Grassy Woodland **Landscape Position:** Occurs on undulating areas at intermediate to high altitudes, with local stands in the Horton area east of Mount Kaputar. It occupies deep, relatively fertile soils on a number of different geologies, but mainly sedimentary rocks and basalt.	**Upper Stratum Species**: absent **Mid Stratum Species**: absent **Ground Stratum Species**: *Bothriochloa macra, Chrysocephalum apiculatum, Sorghum leiocladum, Sporobolus creber*

Zone	PCT Code	BVT Code / Name	Selection Criteria	Species Relied Upon for Assigning PCT
5	921	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	**IBRA Subregion:** Glenn Innes – Guyra Basalts **Vegetation Formation:** Grassy Woodland **Landscape Position:** Occupies lower slopes, valley floors, gullies and drainage lines on deeper soils overlying basalts and metamorphosed sediments.	**Upper Stratum Species**: *Eucalyptus blakelyi, Eucalyptus melliodora, Angophora floribunda, Eucalyptus viminalis* **Mid Stratum Species**: absent **Ground Stratum Species**: *Austrostipa scabra, Asperula conferta, Elymus scaber*
6	921 - DNG	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	**IBRA Subregion:** Glenn Innes – Guyra Basalts **Vegetation Formation:** Grassy Woodland **Landscape Position:** Occupies lower slopes, valley floors, gullies and drainage lines on deeper soils overlying basalts and metamorphosed sediments.	**Upper Stratum Species**: absent **Mid Stratum Species**: absent **Ground Stratum Species**: *Austrostipa scabra, Asperula conferta, Elymus scaber*

4.5 Vegetation zones

All vegetation within the development site was stratified into vegetation zones. A summary of vegetation zones occurring within the development site is shown in **Table 9**.

Table 9: Summary of Vegetation Zones within Development Site

Zone	PCT	Condition	Area (ha)	Site Value Score
1	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Poor	3.89	20.83
2	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	DNG	41.2	16.67
3	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Poor	10.58	17.19
4	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	DNG	19.75	14.06
5	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	Poor	15.83	31.08
6	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	DNG	12.85	9.90

Photograph 1 BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion

Photograph 2 BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

Photograph 3 BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion

Photograph 4 Cleared land – exotic cultivated land (native vegetation in distance)

Photograph 5 Cleared land (as part of SWF) along proposed services easement

4.6 Threatened ecological communities

An assessment of the potential TECs under both the BC Act and EPBC Act has been undertaken to determine whether any of the PCTs present within the study area are consistent with the descriptions for these TECs. One TEC has the potential to occur within the development site:

- White Box Yellow Box Blakely's Red Gum Woodland.

One TEC listed under the EPBC Act was identified as occurring within the development site:

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

Under the BC Act, White Box Yellow Box Blakely's Red Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations – *Eucalyptus albens* (White Box), *E. melliodora* or *E. blakelyi*. Grass and herbaceous species generally characterise the ground layer. In some locations, the tree over-storey may be absent as a result of past clearing or thinning and at these locations only an understorey may be present. Shrubs are generally sparse or absent, though they may be locally common.

Within the development site, all woodland PCTs contain *E. albens* and/or *E. blakelyi*, and/or *E. melliodora* as dominants or co-dominants. Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, over-storey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact. There is evidence of (albeit small) areas of natural regeneration within these woodland communities suggesting there is some remnant of the seed bank remaining, in particular within close proximity to existing trees.

As such the BC Act White Box Yellow Box Blakely's Red Gum Woodland TEC is present within the development site. The BC Act TEC also applies to all the derived grasslands of each PCT present within the development site.

Assessment of PCTs against the flow chart on Page 5 of the *EPBC Act policy statement 3.5 - White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands* was undertaken. The assessment determined the following:

- The most common over storey species within all woodland PCTs includes *E. albens*, *E. melliodora*, and *E. blakelyi*
- The patch, which includes all woodland vegetation within the development site contains sufficient cover of predominately native understorey within six of the nineteen full floristic quadrats collected to appropriately assign the EPBC Act TEC listing to portions of the vegetation within the development site

As such the EPBC Act White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC is present within portions of the vegetation zones within the development site.

Unlike the BC Act TEC, the DNG component of each PCT are not all considered to be the EPBC Act TEC. All areas of BR272 DNG, and portions of BR240 DNG do not meet the condition threshold required by the EPBC guidance material.

An assessment of the perennial ground layer was undertaken for all vegetation zones. Each species was identified using information available in PlantNET (Plant Information Network System of The Royal Botanic Gardens and Domain Trust Version 2.0.) as being either annual or perennial. Species identified as biennial were allocated to annual species for the purpose of the assessment.

The cover of perennial native vegetation was assessed for each plot surveyed as shown in **Table 10**. As identified, areas of BR240 – DNG, BR153, BR240, BR272, and all areas of BR272 - DNG were identified as not containing a predominately native ground layer as described within the EPBC Act listing advice. Areas of woodland that did not have the required ground layer assemblage are still considered to meet the TEC description, being part of the same patch across the site as described within the listing advice.

A map of the TECs within the development site is shown on **Figure 7**.

Table 10 Assessment of EPBC Act Box Gum Woodland

Zone	Plant Community Type	Plot	Native perennial cover (%)	Exotic perennial (%)	% total perennial cover native	BC Act (ha)	EPBC Act (ha)
1	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Plot 09	53.5	16.4	77%	3.89	1.08. Patches of the community are not connected and do not contain the sufficient assemblage of native non-grass species
		Plot 11	14.8	95.7	13%		
2	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion - DNG	Plot 05	25.7	53	33%	41.2	30.01. Areas within the paddock containing plots 05, 10, and 12 do not contain native ground layer
		Plot 10	9.9	101.5	9%		
		Plot 12	16.3	79.1	17%		
		Plot 18	55.1	37.7	59%		
		Plot 19	63	22	74%		
3	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Plot 01	7	55.9	11%	10.58	7.86 Patches of the community are not connected and do not contain the sufficient assemblage of native perennial species
		Plot 02	21.1	50.6	29%		
		Plot 06	15.4	38.9	28%		
4	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion - DNG	Plot 07	12.2	52.6	19%	19.75	0. The ground layer is not predominately native
		Plot 08	5.1	66.3	7%		
		Plot 17	38.8	42.8	48%		

Zone	Plant Community Type	Plot	Native perennial cover (%)	Exotic perennial (%)	% total perennial cover native	BC Act (ha)	EPBC Act (ha)
5	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	Plot 03	3.9	84	4%	15.83	14.75 Patches of the community are not connected and do not contain the sufficient assemblage of native perennial species
		Plot 04	22.4	55	29%		
		Plot 15	5.1	37.5	12%		
6	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion - DNG	Plot 13	55.3	26.8	67%	12.85	12.85
		Plot 14	41.4	32.5	56%		
		Plot 16	71.9	7.4	91%		

Vegetation zones that are not TECs

Unlike the BC Act TEC, the DNG component of each PCT is not all considered to be the EPBC Act TEC. Portions of PCTs do not meet the condition threshold required by the EPBC guidance material as they have less than the required perennial native groundcover, less than the required number of non-grass species, or are part of patches that are too small for consideration.

Exotic vegetation, cultivated land, and cleared land has also been excluded from any TEC mapping.

Summary of TECs within the development site

A summary of TECs within the development site is shown in **Table 11**.

Table 11: Threatened Ecological Communities identified within the development site

Zone	BVT/PCT	BC Act	EPBC Act
1	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	White Box Yellow Box Blakely's Red Gum Woodland EEC	Portions of the community are White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
2	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion - DNG	White Box Yellow Box Blakely's Red Gum Woodland EEC	Portions of the community are White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
3	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	White Box Yellow Box Blakely's Red Gum Woodland EEC	Portions of the community are White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
4	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion - DNG	White Box Yellow Box Blakely's Red Gum Woodland EEC	
5	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	White Box Yellow Box Blakely's Red Gum Woodland EEC	Portions of the community are White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
6	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion - DNG	White Box Yellow Box Blakely's Red Gum Woodland EEC	White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

4.7 Use of more appropriate local data

In accordance with Section 2.2.2.4 of the FBA, local data may be used if the consent authority, in consultation with OEH, is of the opinion that it more accurately reflects local environmental conditions than the data in the databases.

Benchmark data that more accurately reflect the local environmental conditions for a PCT may be collected from local reference sites, or obtained from relevant published sources using the procedures set out in Appendix 3 of the FBA.

A more appropriate local data (MALD) request was submitted to the then NSW Department of Climate Change and Water (DECCW) on 22 February 2011 as part of the SWF biodiversity assessment under Part 3A of the EP&A Act (MP09_0093). This request was then approved for use for the SWF by DECCW and the use of the data was publicly exhibited via the EIS process which was approved on 26 June 2013.

Below is a table that outlines the MALD utilised within the BBCC for this project. The collection and preparation of data is consistent with the requirements of Appendix 3 of the FBA. A detailed description of the MALD collection and summary is provided in **Appendix C** of this report.

Site attribute	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest		BR272: Blakely's Red Gum - Yellow Box grassy woodland (formerly BR116)		BR240: White Box grassy woodland	
	Default	MALD	Default	MALD	Default	MALD
Number native plant species	23	>38	23	>39	23	>40
Native over-storey	6 – 25	13 – 21	6 – 25	20 – 21	6 – 25	19 – 26
Native Mid-storey	0 – 5	>0.1	0 – 5	0.1 – 1	0 – 5	0.1 – 16
Native ground cover (grasses)	30 – 40	64 – 78	30 – 40	42 – 47	30 – 40	63 – 74
Native ground cover (shrubs)	0	3 – 10	3 – 10	0.1 – 2	0	0 – 5
Native ground cover (other)	3 – 5	3 – 16	3 – 5	14 – 23	3 – 5	8 – 17
Exotic plant cover	Not applicable to MALD – Benchmark considered 0					
Number trees with hollows	1	>1	1	>5	1	>2
Over-storey regeneration	Not applicable to MALD – Benchmark considered 1					
Length of fallen logs	15	>133	15	>73	30	>58

A complete report of the locations, data collection, reference site descriptions, and benchmark calculations is provided in **Appendix C** of this document.

4.8 Modification of future site value scores

No future site value scores have been modified within this assessment meaning that the Development Footprint (including the solar PV area as a complete block) is assumed to be complete vegetation removal.

5 Threatened species and populations

5.1 Review of existing data

The following resources were reviewed as part of the assessment of threatened species and populations:

- Atlas of NSW Wildlife (Bionet)
- Threatened Species Profile Database
- CWP Renewables (2017) Sapphire Solar Farm Preliminary Environmental Assessment. Eco Logical Australia (2011) Sapphire Wind Farm part 3A Ecological Assessment. Prepared for Wind Prospect CWP
- EPBC Act Protected matters search tool (Accessed December 2017)

Information reviewed was incorporated into the assessment of candidate species.

5.2 Ecosystem credit species

The BBCC generates a list of predicted species known as 'ecosystem species'. These are threatened species that can be reliably predicted at the site based on the habitat constraint criteria shown in **Table 12** and targeted surveys for these species are not required.

Table 12: Ecosystem Species Constraints within Development Site

Habitat constraint	Development site
IBRA Subregion	Glenn Innes – Guyra Basalts
Associated PCTs	BR240, BR272, BR153
Percent Native Vegetation within Outer Assessment Circle	41.9%
Condition of Vegetation	Moderate – Good
Patch Size	>100 ha

For all vegetation zones within the development site Barking Owl was the ecosystem credit species with the highest threatened species multiplier. This was the only species included within the calculations. A complete list of all predicted ecosystem species is shown in **Table 13** below. No further assessment of ecosystem species was undertaken.

Table 13: Ecosystem Species Predicted within Development Site

Common Name	Species Name	Threatened species multiplier
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis* subsp. *gularis*	1.3
Bush Stone-curlew	*Burhinus grallarius*	2.6
Barking Owl	*Ninox connivens*	3.0
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis subsp. gularis*	1.3
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus subsp. victoriae*	2.0

Common Name	Species Name	Threatened species multiplier
Bush Stone-curlew	*Burhinus grallarius*	2.6
Diamond Firetail	*Stagonopleura guttata*	1.3
Hooded Robin (south-eastern form)	*Melanodryas cucullata subsp. cucullata*	1.7
Little Eagle	*Hieraaetus morphnoides*	1.4
Little Lorikeet	*Glossopsitta pusilla*	1.8
Scarlet Robin	*Petroica boodang*	1.3
Speckled Warbler	*Chthonicola sagittata*	2.6
Spotted Harrier	*Circus assimilis*	1.4
Spotted-tailed Quoll	*Dasyurus maculatus*	2.6
Square-tailed Kite	*Lophoictinia isura*	1.4
Swift Parrot	*Lathamus discolor*	1.3
Turquoise Parrot	*Neophema pulchella*	1.8
Varied Sittella	*Daphoenositta chrysoptera*	1.3
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	2.2

5.3 Species credit species

Species credit species are threatened flora and fauna species that cannot be predicted by habitat constraint criteria shown in **Table 12** applicable to the development site. The accredited assessor may determine that the habitat is unsuitable or too degraded for species credit species. These species do not require further assessment.

Species credit species that are likely to occur within the development site based on habitat assessment, must be surveyed to determine presence/absence, or an expert report provided.

5.3.1 Habitat present within development site

Habitat within the development site is highly modified due to persistent and extensive impacts of agriculture. The development site has been deliberately sited within areas of agricultural disturbance, to reduce the potential ecological impacts of the proposal.

Canopy species within the development site have been retained as scattered paddock trees with limited fauna habitat potential. There are however many hollow-bearing trees within the development site. The mid-storey is absent and the groundcover is almost exclusively exotic pasture grasses. There is no accumulated leaf litter or rocky outcrops present.

The following habitat features are present within the development site:

- Coastal headlands, grassland, grassy open forest or woodland on fertile or moderately fertile soils;
- Land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber;

- Grassy forest or woodland on fertile or moderately fertile soils;
- Seeding native grasses within 100 m of water;
- Shallow or infertile soils; and
- Land within 100m of stream or creek banks.

5.3.2 Candidate species

A list of candidate species was generated by the BBCC and each species assessed for likelihood of occurrence within the development site. Candidate species are selected for each development site from the Threatened Species Profile Database based on the following criteria:

- The species is identified as a species credit species;
- The geographic distribution of the species is known or predicted to include the IBRA subregion in which the development site is located;
- The development site contains habitat features or components associated with the species; or
- Previous surveys undertaken within the development site have identified the species is present

There has been extensive surveys conducted previously across the development site. As such there is a sound understanding of the potential species that may occur. This knowledge has also been applied when considering the likelihood of species occurrence within the development site.

A complete assessment of the likelihood of species credit species is provided within **Table 14**. Based on the likelihood of occurrence of each species, the following candidate species were selected for further assessment: *Thesium australe*, *Dichanthium setosum*, Koala, Pale-headed Snake, and Regent Honeyeater. Other species such as *Picris evae* and *Polygala linariifolia* were also considered during surveys given local records of each species.

Table 14: Likelihood of Occurrence of Species Credit Species

Common name	Scientific name	Habitat requirement	Habitat present within development site	Species requires further assessment?
Flora species				
Austral Toadflax	*Thesium australe*	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with *Themeda australis* (Kangaroo Grass). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. Flowers in spring. The nearest record of the species is adjacent to the development site.	Likely	Yes
Bluegrass	*Dichanthium setosum*	The species is 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. Associated species include *E. albens, E. melanophloia, E. melliodora, E. viminalis, Myoporum debile, Aristida ramosa, Themeda triandra, Poa sieberiana, Bothriochloa ambigua, Medicago minima, Leptorhynchos squamatus, Lomandra aff. longifolia, Ajuga australis, Calotis hispidula and Austrodanthonia, Dichopogon, Brachyscome, Vittadinia, Wahlenbergia* and *Psoralea* species. The nearest record of the species is within the development site.	Likely	Yes
Narrow-leaved Black Peppermint	*Eucalyptus nicholii*	Dry grassy woodland, on shallow soils of slopes and ridges.	Unlikely	Precautionary approach taken and considered during site inspections.
Narrow Goodenia	*Goodenia macbarronii*	The species is no longer listed in NSW	No	No

Common name	Scientific name	Habitat requirement	Habitat present within development site	Species requires further assessment?
Hawkweed	*Picris evae*	In NSW, north from the Inverell area, in the north-western slopes and plains regions. Recorded from Elsmore (16 km east of Inverell), Oxley Park (Tamworth) and Dangar Falls in the Oxley Wild Rivers National Park. Eucalyptus forest and *Dichanthium* grassland, roadsides and paddocks. The flowering and fruiting period is mainly October to January, with a few plants collected in flower or fruit until May. The nearest record of the species is 6.5 km to the south of the development site from 2009.	Possible	Precautionary approach taken and surveys undertaken
Native Milkwort	*Polygala linariifolia*	North from Copeton Dam and the Warialda area to southern Qld; also on the NSW north coast near Casino and Kyogle, and an isolated population in far western NSW near Weebah Gate, west of Hungerford. Sandy soils in dry eucalypt forest and woodland with a sparse understorey. Flowers from spring to summer. Has been recorded as rare, sparse, occasional and common in populations. The nearest record of the species is 2.9 km to the north west of the development site from 2007.	Unlikely, the development site is too degraded	No
Prasophyllum sp. Wybong / Tarengo Leek Orchid	*Prasophyllum* sp. Wybong / *Prasophyllum petilum*	Natural populations are known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford, Delegate and a newly recognised population c.10 km west of Muswellbrook. It also occurs at Hall in the Australian Capital Territory. This species has also been recorded at Bowning Cemetery where it was experimentally introduced, though it is not known whether this population has persisted. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites, but also grows in grassy woodland in association with River Tussock *Poa labillardieri*, Black Gum *Eucalyptus aggregata* and tea-trees *Leptospermum* spp. near Queanbeyan and within the grassy ground layer dominated by Kangaroo Grass under Box-Gum Woodland at Ilford (and Hall, ACT). The species is apparently highly susceptible to grazing, being retained only at little-grazed travelling stock reserves (Boorowa & Delegate) and in cemeteries (near Queanbeyan, Ilford and Hall).	Unlikely, the development site is too degraded	No
Silky Swainson-pea	*Swainsona sericea*	The species is found in Box-Gum Woodland in the Southern Tablelands and South West Slopes, sometimes found in association with cypress-pines *Callitris* spp. Habitat on plains unknown. The nearest record of the species is 48 km to the south west of the development site from 2003.	Unlikely, the development site is too degraded	No

Common name	Scientific name	Habitat requirement	Habitat present within development site	Species requires further assessment?
Small Snake Orchid	*Diuris pedunculata*	The 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. The nearest record of the species is 47.5 km to the north east of the development site from 2007.	Unlikely, the development site is too degraded	No
Fauna species				
Black-throated Finch (southern subspecies)	*Poephila cincta* subsp. *cincta*	In NSW it was once widespread in the northern tablelands and northwest slopes, south to the Inverell district, but not recorded since 1994 and may now be extinct in the State. Dry, open, grassy woodlands, often along watercourses. Mainly granivorous, consuming primarily native grass seed, although insects will also be taken. Typically forage in small flocks on the ground. Black-throated Finches pair for life and nest in colonies. The nearest record of the species is 4.1 km to the south of the development site from 1992.	Unlikely, the development site is too degraded	No
Booroolong Frog	*Litoria booroolongensis*	Restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. Several populations have recently been recorded in the Namoi catchment. Habitat includes permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. The nearest record of the species is 122 km away from 1974	Unlikely, the development site is too degraded	No
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	Found only on the tablelands and slopes of northern NSW and southern Qld, reaching south to Tamworth and west to Moree. A nocturnal species that shelters by day most commonly in undisturbed habitat remnants on rocky outcrops and stony hills within eucalypt and cypress-pine open forest or woodland between 500-1100 m elevation. Sheltering occurs in well-shaded boulders, rock slabs, fallen timber, bark on standing trees and deep leaf litter. These Geckos are active at night and shelter by day under rock slabs, in or under logs, and under the bark of standing trees.	Unlikely, the development site is too degraded	No

Common name	Scientific name	Habitat requirement	Habitat present within development site	Species requires further assessment?
Koala	*Phascolarctos cinereus*	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Females breed at two years of age, with mating occurring between September and February. The nearest record of the species is 1 km to the north east of the development site and recent sightings have been recorded 2014 and 2016.	Likely	Yes
Pale-headed Snake	*Hoplocephalus bitorquatus*	In NSW, it occurs from the coast to the western side of the Great Divide as far south as Tuggerah. Historically recorded west to Mungindi and Quambone on the Darling Riverine Plains, across the North West Slopes, and the New England Tablelands. Dry eucalypt forests and woodlands, cypress forest, rainforest and moist eucalypt forest. The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken. The Pale-headed Snake is well-adapted to climbing trees. There are no records of the species within the New England Tablelands IBRA bioregion	Unlikely, the development site is too degraded and there are no records in the New England Tablelands IBRA bioregion.	Unlikely, but precautionary approach adopted

Common name	Scientific name	Habitat requirement	Habitat present within development site	Species requires further assessment?
Regent Honeyeater	*Anthochaera phrygia*	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak). Two of three known key breeding areas are in NSW: the Capertee Valley and Bundarra-Barraba region. The species breeds between July and January and usually nests in horizontal branches or forks in tall mature eucalypts and Sheoaks. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes. The nearest record of the species is 16.2 km to the north east of the development site from 1994.	Possible	Yes

5.4 Surveys

Based on the likely species to occur within the development site, the following species were subject to targeted assessment:

- *Thesium australe*
- *Dichanthium setosum*
- *E. nichollii*
- Koala
- Pale-headed Snake
- Regent Honeyeater.

5.4.1 Targeted surveys for threatened flora

Targeted surveys for threatened flora have been carried out on 27 November to 1 December 2017, and subsequent surveys were carried out from 18 – 20 December 2017.

Targeted surveys for *D. setosum* and *T. australe* were undertaken across the development site in areas of suitable habitat. *Picris evae, E. nichollii* and *Polygala linariifolia* were also considered during surveys although less likely to occur given the disturbance history at the site. Local reference sites for *D. setosum* and *T. australe* were initially inspected to assess adequacy of survey timing. Both species were identified at those local reference sites during surveys and as such the timing of surveys was considered adequate.

The *D. setosum* reference site, as well as a the vast majority of grasslands within the development site have been subject to agricultural activities (as can be expected for a working agricultural operation) which have likely degraded their native species integrity. Subsequent surveys were undertaken for this species in December 2017.

Similarly, *T. australe* was identified at the reference site in early flower. A subsequent survey for the species was undertaken in late December 2017.

During December 2017, additional surveys were formally undertaken in accordance with *NSW Guide to Surveying Threatened Plants* (OEH, 2016). Surveys were undertaken in suitable habitat for each species which included parallel field traverses with two observers. Parallel traverses were spaced at approximately 10 m apart in areas of suitable habitat, in accordance with the recommended distances in open vegetation. Given the intensity of agricultural use of the development site, large areas of Phalaris grass and *Trifolium* sp. occur within grasslands at extremely high densities. These areas were not considered to be habitat for any threatened flora species.

Due to the cryptic nature of *D. setosum*, similar species from *Dichanthium* and *Bothriochloa* genus were closely inspected, if identified. Where potential observations of any threatened flora were made, a sample was collected and inspected using a light microscope for defining features (such as the size and number of anthers on the pedicellate spikelet for *Dichanthium* species). Representative samples from each occurrence of potential threatened flora have been sent to the National Herbarium of NSW for confirmation of species.

Surveys were conducted across seven days in November and December and involved random meanders and parallel traverses across areas of suitable habitat. Approximately 47 hours survey across 64 km of land was undertaken for each observer, giving a total of approximately 94 hours and 128 km survey across the development site.

5.4.2 Targeted surveys for threatened fauna

Targeted survey for threatened fauna were undertaken to determine the presence of Regent Honeyeater within the development site from 28 November – 1 December 2017. Targeted surveys involved seven, 30 minute hour surveys with two observers searching for the species within areas of suitable habitat within woodland PCTs, as well as opportunistic surveys where suitable habitat existed. Scattered paddock trees including flowering *E. blakelyi* were considered suitable habitat for the species within the development site. Surveys involved a 30 minute search with two observers recording all woodland bird species observed and heard within the vegetation patch. Surveys were all undertaken within the four hours following sunrise.

Targeted surveys for Koala involved call playback, spotlighting on foot and in vehicle, as well as inspection of every feed tree within the development site for scats and scratches.

Although unlikely to occur within the development site, targeted surveys for Pale-headed Snake involved spotlighting. A summary of all survey effort undertaken is described below.

Table 15 Targeted fauna survey effort summary

Survey Method	Survey effort	Target species	Replicates
Area search	A 1ha (200m x 500m) 20-minute search is the most common method	Regent Honeyeater	7
Spotlighting on foot	2 x 0.5 hour with two observers 2 separate nights	Koala, Pale-headed Snake, Thick-tailed Gecko, Pale-headed Snake	4 (two sites on two nights)
Spotlighting from vehicle	2 x 1 km of track in first gear on 2 separate nights	Koala, Pale-headed Snake	Approx. 17 km on two separate night
Call playback	2 sites per stratification unit up to 200 hectares. Each playback site must have the session conducted twice, on separate nights	Koala	4 x 0.5 hour (two sites on two nights)
Search for scats and signs	30 minutes searching each relevant habitat, including trees for scratch marks	Koala	Meander conducted across entire development site over four days. All trees within the development site inspected.
Habitat assessment	Meander across the entire development site noting hollow-bearing trees.	Koala, Regent Honeyeater	Meander conducted across entire development site over four days. All trees within the development site inspected.

5.5 Results

5.5.1 Weather conditions

Weather conditions during surveys were clear and sunny. Weather conditions were considered suitable for surveys and were normal conditions for early summer. Climate data collected at Glen Innes Airport (Station 056243) is provided in **Table 16** below.

Table 16: Weather conditions during surveys

Weather variable	27/11/17	28/11/17	29/11/17	30/11/17	1/12/17	18/12/17	19/12/17	20/12/17
Minimum temperature (°C)	11.9	12.6	15.7	14.7	14.6	13.2	13.8	13.6
Maximum temperature (°C)	25.5	24.7	24.5	19.5	25.4	31.2	30.6	32.7
Rainfall (mm)	0	0	1.2	0	3.6	4.6	0	0

5.5.2 Targeted surveys for threatened flora

Preliminary surveys did not identify any threatened flora within the development site. Both *T. australe* and *D. setosum* were identified outside the development site.

Subsequent targeted surveys were undertaken from 18 - 20 December 2017 across all woodland and grassland PCTs that contained suitable habitat for the target species giving consideration to the *NSW Guide to Surveying Threatened Plants* (OEH, 2016).

Potential occurrences of *D. setosum* were detected at 62 locations resulting in 39 samples collected. Where multiple patches occurred in close proximity, only a single sample was collected. The majority of samples were collected in areas that were either protected from ploughing by a physical structure such as a fence line, rocky outcrop, or steep topography. All samples have been sent to the National Herbarium of NSW for confirmation of the species occurrence. Sample locations can be seen on **Figure 5**.

T. australe was positively identified outside the development site. No other threatened flora were observed within the development site.

5.5.3 Targeted surveys for threatened fauna

Survey results for threatened fauna detected only common species. *Eucalyptus blakelyi* were in profuse flower at the time of surveys. Woodland birds recorded within the development site included *Cracticus tibicen* (Australian Magpie), *Glossopsitta concinna* (Musk Lorikeet), as well as *Platycercus eximius* (Eastern Rosella).

No Regent Honeyeaters were detected during the surveys. Whilst the vegetation within the development site may provide foraging habitat for the species on occasion, it is highly unlikely that the species utilises the development site for breeding.

Spotlighting surveys identified *Ninox boobook* (Southern Boobook), *Podargus strigoides* (Tawny Frogmouth), and *Trichosurus vulpecula* (Brush-tailed Possum). Introduced species such as Brown Hare, Rabbit, and *Vulpes vulpes* (Red Fox) were observed frequently within the development site.

5.5.4 Species Credits Polygons

No threatened flora or fauna species identified as species credit species in Bionet were identified during field surveys within the development site. As such, no species credit polygons have been included within this assessment.

Stage 2 – Impact assessment

6 Measures to avoid and minimise impacts

6.1 Avoidance of impacts

6.1.1 Avoidance of direct impacts

Under the FBA the proponent must design the project to minimise impacts to biodiversity. Specifically, the FBA requires proponents to identify and avoid direct impacts to:

- Threatened Ecological Communities
- PCTs that contain threatened species habitat
- Threatened species that cannot be predicted by vegetation type
- Declared critical habitat
- Regional and state significant biodiversity links

A summary of the impact avoidance methods of the project are provided below.

Table 17: Avoidance of Direct Impacts

Direct Impact to be Avoided	Method to Avoid Impact
Impacts to Endangered Ecological Communities (EECs) and Critically Endangered Ecological Communities (CEECs)	The development site is located so as to minimise impacts upon EECs identified. Impacts to EECs have been minimised by locating the proposed development on land that is currently developed. The EECs that will be impacted by the proposal are currently of low native species integrity (i.e. in cleared farmland) or within existing easements of the SWF.
Impacts to PCTs that contain threatened species habitat	All PCTs within the development site are identified as potential foraging habitat for highly mobile fauna species. There are no caves, and no rocky outcrops. The vegetation within the development site will be intermittently used by mobile fauna species, however will not be used as breeding or refuge habitat for threatened species.
Impacts to areas that contain habitat for Vulnerable, Endangered, or Critically Endangered threatened species or populations in accordance with Step 5 in Section 6.5 of the FBA	*D. setosum* is potentially identified within the Infrastructure footprint. Areas where positively identified shall be mapped and avoided through the design and construction phases of the project.
Impacts to areas of land that the Minister for Environment has declared as critical habitat in accordance with s47 of the TSC Act	Critical habitat has not been identified within the development site.
Impacts to riparian areas of 4th order or higher streams and rivers, important wetlands and estuaries	The development site will not impact on riparian areas of rivers, wetlands, estuaries, or 4th order (or higher) streams

Direct Impact to be Avoided	Method to Avoid Impact
Impacts to state significant biodiversity links	No state significant biodiversity links have been identified within the development site

6.1.2 Site selection

Site selection was undertaken considering the extent of known biodiversity values, as well as the extent of current disturbance within the development site. A summary of considerations during the selection of the development site is shown in **Table 18**.

Table 18: Avoidance and minimisation of direct impacts through site selection

Site selection criteria	Method to avoid impact
Selecting a suitable development site for a Major Project or a route for linear projects, should be informed by knowledge of biodiversity values. An initial desktop assessment of biodiversity values would assist in identifying areas of native vegetation cover, EECs or CEECs, and potential habitat for threatened species	The broader study area has been subject to multiple NSW and Commonwealth assessments as part of the SWF. For the SSF, a desktop and field assessment was conducted within the development site in 2017 by Environmental Property Services Pty Ltd (EPS) to determine the areas of native vegetation cover, EECs or CEECs, and potential habitat for threatened species.
Stage 1 of the FBA will provide the preliminary information necessary to inform project planning. Early consideration of biodiversity values is recommended in site selection, or route selection for linear projects, and the planning phase.	Biodiversity values were identified within the development site by ELA from 2008, identifying areas of key biodiversity significance within the SWF boundary. Previous assessments were reviewed when planning the development footprint. The footprint has undergone several iterations including a significant reduction since preparation of the PEA, with the final footprint avoiding as much EEC as possible. All areas of native grassland previously identified within the PEA have been avoided, as well as areas with known threatened species have bene avoided.
The site/route selection process should include consideration and analysis of the biodiversity constraints of the proposed development site and consider the suitability of the Major Project based on the types of biodiversity values present on the development site	As identified above, previous assessments as well as the PEA were conducted to determine areas of biodiversity constraints by ELA since 2008 as well as a PEA by EPS in 2016. The current development footprint reflects the retention, where possible, of existing biodiversity within the development site.

Site selection criteria	Method to avoid impact
When considering and analysing the biodiversity constraints for the purpose of selecting a development site, the following matters should be addressed: (a) whether there are alternative sites within the property on which the proposed development is located where siting the proposed Major Project would avoid and minimise impacts on biodiversity values (b) how the development site can be selected to avoid and minimise impacts on biodiversity values as far as practicable (c) whether an alternative development site to the proposed development site, which would avoid adversely impacting on biodiversity values, might be feasible.	(a) Given the nature of the proposed development, the development footprint is largely situated within cleared agricultural land, or areas of lower biodiversity value due to past agricultural use. As described above there was a process of refining the project footprint. (b) The development site is located on cleared land, or areas disturbed by past agricultural use which minimising impacts on biodiversity values. (c) The site has been selected to integrate with the previous wind farm development, and thus an alternative development site is not feasible.
For linear projects, the route selection process must include consideration and an analysis of the biodiversity constraints of the various route options. In selecting a preferred option, loss of biodiversity values must be weighed up and justified against social and economic costs and benefits.	The proposal is not a linear project

6.1.3 Planning

Planning was considered during the selection of the development site. A summary of criteria utilised is shown in **Table 19**.

Table 19: Avoidance and Minimisation of Direct Impacts through Planning

Planning criteria	Method to avoid impact
Siting of the project – the Major Project should be located in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower site value score) or which avoid an EEC or CEEC	The siting of the project is largely within cleared agricultural land. Where native vegetation is present it is disturbed by past agricultural use.
Minimise the amount of clearing or habitat loss – the Major Project (and associated construction infrastructure) should be located in areas that do not have native vegetation, or in areas that require the least amount of vegetation to be cleared (i.e. the development footprint is minimised, and/or in areas where other impacts to biodiversity will be the lowest	The project is located primarily within cleared agricultural land to minimise vegetation clearing. Some impacts to vegetation will be required during construction, however some biodiversity values can be retained in adjacent areas. *D. setosum* is potentially identified within the Infrastructure footprint. Areas where positively identified shall be mapped and avoided through the design and construction phases of the project.

Planning criteria	Method to avoid impact
Loss of connectivity – some developments can impact on the connectivity and movement of species through areas of adjacent habitat. Minimisation measures may include providing structures that allow movement of species across barriers or hostile gaps	Connectivity within the development site is unlikely to be reduced as part of the project. The conceptual biodiversity corridor that currently exists throughout the landscape is already highly modified.

6.2 Measures to minimise impacts

The proponent will implement measures to minimise the impacts of the project during both the construction and operational phase. A Biodiversity Management Plan (BMP) and Construction Environment Management Plan (CEMP) will be drafted for the site following approval of the project, which will aim to put in place mechanisms for reduction of impacts. The BMP will address impacts to flora and fauna such as delineation of clearing boundaries and minimising harm to fauna, whereas the CEMP will minimise other environmental impacts such as sediment control, dust, noise, lighting, and protection of waterways. The BMP will include operational measures to reduce impacts of the project such as:

- Pre-clearance surveys and clearance supervision; and
- Vegetation management including weed control, soil stabilisation and rehabilitation

It is anticipated that the SSF CEMP and BMP will largely mimic that which is in the SWF management plans, given the concurrent siting and ownership of each project. Details of measures to minimise impacts during the construction and operational phase are described below.

6.2.1 Measures to minimise impacts during construction phase

Several considerations were given to minimising impacts to biodiversity during the construction phase of the project. These are detailed below in **Table 20**.

Table 20: Minimisation of impacts through during the construction phase

Matter considered to minimise impacts	Adopted matters within development site
Method of clearing – using a method of clearing during the construction phase that avoids damage to retained native vegetation and reduces soil disturbance. For example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	To avoid any additional impacts of the project, vegetation removal will use chain-saws rather than heavy machinery in areas with adjacent vegetation.

Matter considered to minimise impacts	Adopted matters within development site
Clearing operations – minimising direct harm to native fauna during actual construction operations through onsite measures such as undertaking pre-clearing surveys, daily fauna surveys and the presence of a trained ecologist during clearing events	Clearing of vegetation will be undertaken via a two stage clearing process. Clearing will not be undertaken until a pre-clearance assessment is conducted and the results communicated by qualified environmental officers. An ecologist and/or suitably trained environmental officers will be present for all vegetation clearing. Stage 1 of the clearing process will involve marking of habitat features, and removal of all vegetation except habitat features. Stage 2 will involve removal of habitat features under the supervision of ecologists to relocate resident fauna. A detailed methodology of the two stage clearing process will be included within the BMP. All clearing staff will be briefed about the two stage clearing process, and their responsibilities to minimise impacts to biodiversity.
Timing of construction – identifying reasonable measures that minimise the impacts on biodiversity. 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, can minimise the impacts of construction activities on biodiversity	Timing of construction will not mitigate any impacts to biodiversity. The development site is occupied by limited fauna species and as such there is no specific timing constraints of the project.
Other measures that minimise inadvertent impacts of the Major Project on the biodiversity values – measures such as installing temporary fencing to protect significant environmental features such as riparian zones, promoting the hygiene of construction vehicles to minimise spread of weeds or pathogens, appropriately training and inducting project staff and contractors so that they can implement all measures that minimise inadvertent adverse impacts of the Major Project on biodiversity values.	Other measures to minimise the impacts of the project on biodiversity will be detailed within the appropriate construction environmental management plan. These measures will include at a minimum: • Temporary fencing (i.e. star pickets with flagged rope) to delineate clearing boundaries • Marking of trees for retention within open space areas • Cleaning of mobile plant prior to works to prevent the spread of weeds and pathogens • Sediment controls adjacent to waterways to prevent impacts downstream • Signage within the works area to advise contractors of responsibilities

6.2.2 Minimising indirect impacts during construction

In addition to the controls identified above the following management actions will be undertaken to minimise indirect impacts during construction as shown in **Table 21**.

Table 21: Minimisation of indirect impacts

Indirect impact	Method to avoid indirect impact
Sedimentation and run-off – sediment barriers or sedimentation ponds to minimise impacts of the Major Project on biodiversity values on land that is adjoining the development site, and waterways downstream of the development site	Installation of sediment barriers, sediment ponds, stormwater management systems, delineation of works zones
Noise, dust or light spill – adopting onsite measures that can minimise the impacts on biodiversity values from noise, dust or light spill during the construction phase. For example, only undertake construction during daylight hours to avoid impacts from light spill where this may be detrimental to species habitat on adjoining lands	Construction works are to occur during standard construction hours to maximise daylight hours. Any request for an out of hours works protocol should address this indirect impact.
Inadvertent impacts on adjacent habitat or vegetation – considering measures such as retaining vegetation on the development site as a buffer to protect significant environmental features (e.g. riparian zones, likely or known threatened species habitat)	Temporary fencing to be installed prior to works, to delineate boundaries and protect retained vegetation
Feral pest, weed and/or pathogen encroachment into vegetation on land adjoining the development site – one example is using protocols for hygiene that minimise the likelihood of construction vehicles spreading weeds or pathogens from the development site into native vegetation on land adjoining the development site	A weed management plan will be included within the BMP for the development site which will include cleaning and inspection of light vehicles and mobile plant
Impacts that are infrequent, cumulative or difficult to measure – where there are likely to be indirect impacts on biodiversity that are infrequent, cumulative or difficult to measure over time, consideration should be given to how an operational monitoring program can be used to assess the timing and/or extent of these impacts. A proposal for an operational monitoring program should be set out in the BAR. Development of a monitoring program may involve determining the base-line information that will be necessary to measure the impact over time. It should also consider how the results of the monitoring program could be used to inform ongoing operations in order to reduce the extent of indirect impacts	Monitoring programs are unlikely to provide any additional management requirements for the project, given the static nature of solar farm developments.

Indirect impact	Method to avoid indirect impact
Impacts during the operational phase – measures to avoid or minimise the indirect impacts on threatened species and threatened species habitat on land adjoining the development site, migratory species or flight pathways as a result of the operation of the development. Such measures may include those adopted to avoid and minimise: (i) trampling of threatened flora species (ii) rubbish dumping (iii) noise (iv) light spill (v) weed encroachment (vi) nutrient run-off (vii) increased risk of fire, and (viii) pest animals.	.Areas of threatened flora that are identified will be partitioned off during the construction phase to prevent impacts to these species. Appropriate security measures will also be in place to reduce illegal dumping. Noise impacts will not be increased from the current levels experienced by the development site and adjacent land Light spill will be managed according to the relevant approval. Weed encroachment, and nutrient run off will be managed by a weed management plan within the BMP, and sediment and stormwater controls within construction related management plans

6.2.3 Measures to minimise impacts during operational phase

Table 22: Minimisation of impacts through during the operational phase

Operational phase impact	Method to avoid impact
Seasonal impacts – whether there are likely to be any impacts that occur during specific seasons. Minimisation measures may include amending operational times to minimise impacts on biodiversity during periods when seasonal events such as breeding or species migration occur	There are unlikely to be any additional seasonal impacts during operation of the solar farm.
Artificial habitats – using 'artificial habitats' for fauna where they may be effective in minimising impacts on such fauna. These include nest boxes, glider-crossings or habitat bridges.	Nest boxes can be installed to minimise impacts to arboreal mammals. Nest boxes will be considered as a measure to minimise impacts to arboreal or avian species. The necessity, number and locations will be resolved during the CEMP process.

7 Matters for further consideration

Certain impacts on biodiversity values will require further consideration by the consent authority. These are impacts that are considered to be complicated or severe. A decision will be made by the consent authority on whether it is appropriate for these impacts to occur. The consent authority may determine:

- The Major project cannot be approved with that particular impact;
- Modifications are required to the Major Project to reduce the severity of the impact; or
- The major Project can be approved but it will require additional offsets, supplementary measures or other actions to be undertaken with respect to that impact.

In accordance with Section 9.2 of the FBA, impacts on biodiversity values that require further consideration are:

- Impacts on landscape features, being:
  - impacts that will reduce the width of vegetation in the riparian buffer zone bordering significant streams and rivers, important wetlands or estuarine areas in accordance with Subsection 9.2.3; or
  - impacts that will prevent species movement along corridors that have been identified as providing significant biodiversity linkages across the state in accordance with Subsection 9.2.3; and
- Impacts on native vegetation that are likely to cause the extinction of an EEC/CEEC from an IBRA subregion or significantly reduce its viability in accordance with Subsection 9.2.4; or
- Impacts on critical habitat or on threatened species or populations that are likely to cause the extinction of a species or population from an IBRA subregion or significantly reduce its viability in accordance with Subsection 9.2.5.

Within the development site, several PCTs occur which conform to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, which is listed under the BC Act as an Endangered Ecological Community, and under the EPBC Act as a Critically Endangered Ecological Community. As such any impacts on this community require further consideration by the consent authority as an ecological community is considered a CEEC if it is specified in Part 2 of Schedule 1A of the (repealed) TSC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act. All further reference to the ecological community within this chapter is as a CEEC under the EPBC Act, with notes on the community as listed as an EEC under NSW legislation.

There are no other matters for further consideration within the development site.

7.1 Impacts on native vegetation

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

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

An assessment of impacts to (C)EECs that occur within the development site is shown below.

Table 23 Further consideration of impacts to CEECs within the development site

Matter for further consideration	Assessment of impacts
the area and condition of the CEEC or EEC to be impacted directly and indirectly by the proposed development	The project will remove approximately 104.1 ha of the BC Act EEC, of which 66.57 ha is the CEEC under the EPBC Act. All of the vegetation affected is in poor condition, with site value score for the six vegetation zones ranging from 9.9 to 31.08 out of 100. The vegetation is essentially remnant trees with no midstorey and limited groundcover, or DNG.
the extent and overall condition of the CEEC or EEC within an area of 1000 ha and then 10,000 ha surrounding the proposed development footprint.	Extent and condition of the CEEC was determined using spatial data associated with the State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0. VIS_ID 4467 The condition of the CEEC within this area is considered to be in moderate – good condition. Within a 4,000 ha area surrounding the development site, there is approximately 724 ha of the CEEC. Within a 10,000 ha area surrounding the development site, there is approximately 1,930 ha of the CEEC.
an estimate of the extant area and overall condition of the CEEC or EEC remaining in the IBRA subregion after the impact of the proposed development has been taken into consideration	There is approximately 32,960 ha of the CEEC in the Glenn Innes – Guyra Basalts IBRA sub-region based on the Border Rivers regional PCT mapping by OEH.
the development proposal's impact on: • abiotic factors critical to the long-term survival of the CEEC or EEC. For example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns? • 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 quality and integrity of an occurrence of the CEEC or EEC 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 CEEC or EEC.	The CEEC currently occurs within a highly modified agricultural landscape. The proposed development is unlikely to alter abiotic factors such as surface water flows and groundwater. The proposed development will increase shading of the CEEC in grassland areas. Outside of the direct footprint of the project, there is no proposal to alter functionally important canopy, mid-storey, or ground layer species. The occurrence of the CEEC is currently disturbed by agriculture, and the proposed development is unlikely to exacerbate this. The proposed development is for solar panels and associated infrastructure, so there is unlikely to be an increased mobilisation of chemicals, fertilisers or other pollutants beyond what is currently experienced by the CEEC.
direct or indirect fragmentation and isolation of an important area of the CEEC or EEC.	The area of CEEC to be impacted is not identified in any recovery plan for the community, and the extent of the

Matter for further consideration	Assessment of impacts
	CEEC is relatively small compared to other remnant areas of the community. As such the occurrence of the CEEC is not an important area of the CEEC.
the measures proposed to contribute to the recovery of the CEEC or EEC in the IBRA subregion.	The proposal will provide for biodiversity offsets in accordance with the rules of the FBA.

8 Assessment and offsetting requirement for unavoidable impacts

8.1 Introduction

The project will involve impacts to native vegetation and fauna habitat throughout the entire extent of the development site. A summary of direct impacts is provided below.

8.2 Direct loss of native vegetation

The proposal will unavoidably impact up to 104.1 ha of native vegetation, which includes vegetation communities listed under the BC Act and EPBC Act. A summary of the areas to be directly impacted by the proposal is shown in **Table 24**.

Table 24: Direct loss of native vegetation

Zone	PCT name	BC Act	EPBC Act	Area to be removed (ha)
1	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	EEC	Portions of the vegetation zone comply with the CEEC	3.89
2	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion - DNG	EEC	Portions of the vegetation zone comply with the CEEC	41.2
3	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	EEC	Portions of the vegetation zone comply with the CEEC	10.58
4	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion - DNG	EEC		19.75
5	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	EEC	Portions of the vegetation zone comply with the CEEC	15.83
6	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion - DNG	EEC	CEEC	12.85
Total				**104.1**

This assessment is required to identify all impacts and classify them under the following criteria:

- impacts that the assessor is required to identify for further consideration by the consent authority
- impacts for which the assessor is required to determine an offset
- impacts for which the assessor is not required to determine an offset
- impacts that do not require further assessment by the assessor

A summary of the guidelines for these is provided in Table 4 of the FBA. A description of the impacts requiring offsetting as part of the project are shown in **Table 25**.

Table 25: Impact thresholds for landscape features, native vegetation, and threatened species and populations

Indirect impact	Present within the development site
Impacts that require further consideration by consent authority	None identified within the SEARs
Impacts for which the assessor is required to determine an offset	Impacts to EECs that are not specifically nominated as requiring further consideration within the SEARs: areas identified as CEEC under the EPBC Act. Impacts to PCTs that are threatened species habitat and a site score ≥17: All woodland native vegetation.
Impacts for which the assessor is not required to determine an offset	Impacts on PCTs that have a site score <17, or Impacts to PCTs that are not identified as CEECs/EECs
Impacts that do not require further assessment by the assessor	All cleared areas within the development site

8.3 Impacts requiring offsetting

8.3.1 Native vegetation

Up to 104.1 ha of native vegetation requiring offsetting will be removed as part of the construction and operation phase of the project. The offsetting requirement has been calculated using the BBCC. A summary of the vegetation zones, loss in landscape value, loss in site value, and ecosystem credits required to offset the impacts of the project are shown in **Table 26**. A copy of the BBCC report is shown in **Appendix D**.

Table 26: Offsetting requirements of the project

Zone	PCT	Loss in landscape value	Loss in site value	Required ecosystem credits
1	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	12.6	20.83	73
2	BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion - DNG	12.6	16.67	0
3	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	12.6	17.19	170
4	BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion - DNG	12.6	14.06	0
5	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	12.6	31.08	419
6	BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion - DNG	12.6	9.90	0
Total				**662**

8.4 Impacts not requiring offsetting

Three vegetation zones has been classified as poor condition. Vegetation Zone 2, 4, and 6, have a site value score less than 17.

In accordance with Table 4 of the FBA and as identified in **Table 25** above, impacts to vegetation zone 2, 4, and 6 are not required to be offset.

All other native vegetation occurring within the development has been assessed and will be offset. All impacts to cleared land within the development site do not require offsetting.

Stage 3 – Biodiversity offset strategy

9 Objectives and policy framework of the offset strategy

9.1 Proposed offset measures

The proposed offset measures of the project are to acquire and retire the full quantum of ecosystem credits required by the impacts of the project as calculated within the BBCC. Ecosystem credits can either be purchased from credit holders as identified on a public register, or by establishment of a Stewardship site. All credits will be formally retired prior to construction of the project. Retirement of credits will be made prior to issue of the Construction Certificate for the development site.

The proponent has submitted a Biobanking Agreement Application to OEH for the registration of a biobank site at Windemere at 3840 Kings Plains Road, Kings Plains NSW. The registration of the Windemere biobank site will generate 3,124 ecosystem credits, of which 2,401 credits will be retired for the SWF approvals. The residual 723 credits are for BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion, which is listed as an EEC under the BC Act and CEEC under the EPBC Act. By proposing to offset the impacts of the project using credits at Windemere, the proponent provides a clear path to completion of the offset requirement

The surplus credits from Windemere are viable credits to be used at the development site for BR272 and BR153. Both of these PCTs can be fully offset using the credits at Windemere. BR240 cannot be offset with BR272 as it has a higher percent cleared value, even though it is the same (C)EEC under the BC Act and EPBC Act. The residual credit requirement for BR240 will be offset from other local vendors. Should the credits not be available, the proponent will seek to offset these credits using alternative methods as approved under the FBA, including supplementary measures and/or payment to the fund.

A summary of the credit requirement and offset strategy is provided in the table below.

Table 27 Proposed offset measures

PCT	Credits required	Credits available at Windemere	Residual
BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	73	0	73 Source credits externally
BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	170	723	553
BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	419	0	Use BR272 at Windemere
Total	**662**	**723**	**134 BR272 remaining**

9.2 Objectives of the offset strategy

The objective of this Biodiversity Offset Strategy (BOS) is to provide a pathway for delivery of a suitable offset to ameliorate the impacts of the project.

The purpose of determining offsets for the project is to achieve a long term biodiversity gain for threatened species, populations and ecological communities impacted by the project.

This BOS has been drafted to provide options for complying with the objectives of the NSW *Biodiversity Offsets Policy for Major Projects* (the NSW offsets policy), as well as the EPBC Act *Environmental Offsets Policy* (the Commonwealth offsets policy).

9.3 Policy framework of the offset strategy

This BOS is guided by policy frameworks under both NSW and Commonwealth legislation. The *NSW Biodiversity Offsets Policy for Major Projects* provides guidance for offsets to impacted threatened species, populations, and ecological communities under the TSC Act (now BC Act); and the *Environmental Offsets Policy* provides guidance for offsets to impacted Matters of National Environmental Significance (MNES) under the EPBC Act.

Both NSW and Commonwealth offsets policies are guided by principals to ensure the security, effectiveness, and transparency of offsets. These are discussed for both NSW and Commonwealth policies in **Section 9.4** and **Section 9.5** of this BOS.

9.4 NSW legislation

9.4.1 NSW Biodiversity Offsets Policy for Major Projects

For projects declared as SSD or State Significant Infrastructure (SSI), impacts of the project must be assessed under the FBA, and a BOS drafted under the NSW offsets policy to propose offsets for unavoidable impacts. The NSW offsets policy identifies that the suitability of offsets are guided by six principles. Details of how this BOS complies with the six principles of the NSW offsets policy are provided below.

Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.

The project has been located within areas that are currently cleared for agriculture. The location of the development has been sited within existing farmland areas, adjacent to the SWF to minimise impacts to biodiversity.

Within Chapter 6 of the BAR, measures to avoid and minimise direct and indirect impacts during both the construction and operation phase of the project have been detailed. Offsets have only been considered following consideration of avoidance measures. Details of avoidance measures proposed are detailed within the BAR.

Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains.

Offsets requirements have been assessed under the endorsed FBA. All losses of the project have been calculated using the BBCC. The BBCC is also the tool for measuring gains at any offset site providing for a transparent and reliable methodology for assessing the offsetting requirement of the project.

Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.

Assessment of impacts of the project and the proposed offsets are provided under a 'like for like' methodology, whereby biodiversity credits of the same Plant Community Type (PCT) are assessed for the impacts and proposed for the offsets. Under the FBA there are variation rules proposed whereby the consent authority may approve the variation to the offset rules for matching ecosystem credits where like-for-like offsets are not available. The proponent may vary the biodiversity credits used to offset an impact with a BOS, provided the proponent can demonstrate to the consent authority that (in accordance with the FBA):

All reasonable steps to secure a matching ecosystem credit have been taken by the proponent, and

- *The required ecosystem credit is not for a PCT associated with a Critically Endangered Ecological Community (CEEC) under the TSC Act or an ecological community listed under the EPBC Act, and*
- *The PCT from the same vegetation formation has a percent cleared value of the PCT in the major catchment area equal to or greater than the percent cleared of the PCT to which the required ecosystem credit relates, or*
- *Where the required ecosystem credit is for a PCT that is associated with a CEEC/EEC, the PCT from the same formation is also associated with a CEEC/EEC*.

Principle 4: Offsets must be additional to other legal requirements.

Offsets proposed under the FBA must be sourced from Biobank sites established under a BioBanking Agreement. Although the TSC Act is now repealed, the proponent will source credits primarily from an existing biobank site, Windemere, which is a funded and managed site. Any shortfall of credits not achieved at the Windemere biobank site will be sourced from other local credit vendors.

A BioBanking Agreement is a voluntary scheme entered into by land holders for the purpose of managing the land for biodiversity. A BioBanking Agreement stipulates management actions that must be undertaken at the biobank site in perpetuity as guided by a Management Action Plan (MAP). The MAP guides management actions that are additional to all other legal requirements.

Standard management actions that are required at a biobank site include:

- Management of grazing for conservation
- Weed control
- Management of fire for conservation
- Management of human disturbance
- Retention of regrowth and remnant native vegetation
- Replanting or supplementary planting where natural regeneration will not be sufficient
- Retention of dead timber
- Erosion control
- Retention of rocks

Additional management actions that may apply at a biobank site includes:

- Control of feral and overabundant native herbivores
- Vertebrate pest management
- Nutrient control
- Control of exotic fish species
- Maintenance or reintroduction of natural flow regimes

Principle 5: Offsets must be enduring, enforceable and auditable.

A BioBanking Agreement entered into at the biobank site is a legally binding agreement that operates in perpetuity. BioBanking Agreements are guided by the MAP, which contains a reporting and review schedule. Management of the biobank site is funded through annual stipends to the landholder as determined within the Total Fund Deposit spreadsheet (TFD). The condition and compliance with the MAP at all biobank sites must be provided to the Biodiversity Conservation Trust (BCT) annually to ensure continued funding of the biobank site. If the landholder is found to be non-compliant with the MAP, BCT has the capacity to recommend to withhold funding to the landholder.

In addition to annual audits, the MAP is also reviewed every 5 years by both a qualified consultant as well as BCT to ensure the MAP remains applicable to the quantum of management required to improve biodiversity at the biobank site.

Principle 6: Supplementary measures can be used in lieu of offsets.

If the proponent can suitably demonstrate that offsets have cannot be provided for the impacts, in accordance with Section 10.5 of the FBA, then the proponent may propose the use of supplementary measures to compensate for impacts. In accordance with the FBA:

The consent authority may approve supplementary measures for ecosystem credits proposed within a BOS provided:

- *all reasonable steps have been taken by the proponent to secure a matching ecosystem credit, and*
- *the PCT to which a required ecosystem credit relates is associated with a CEEC/EEC or for which the impact of development does not require further consideration according to Subsection 9.2.4, and*
- *the supplementary measure applies to that CEEC/EEC, and*
- *the supplementary measure is carried out in accordance with the rules governing supplementary measures, including calculating the financial contribution of the supplementary measures in accordance with Appendix B of the NSW Biodiversity Offsets Policy for Major Projects.*

The consent authority may approve supplementary measures for species credits proposed within a BOS provided:

- The proponent can demonstrate that all reasonable steps have been taken to secure the number and types of species credits impacted on at the development site, and
- The species to which the species credit relates is not listed on the EPBC Act or listed as critically endangered on the TSC Act.

No supplementary measures are currently proposed within this BOS.

9.5 Commonwealth legislation

Under the *Bilateral agreement made under section 45 of the EPBC act relating to environmental assessment* (the bilateral agreement; DotE 2015), a proposed Controlled Action (i.e. an action the Minister for the Environment has determined will require approval under the EPBC Act) does not require separate documentation under Part 8 of the EPBC Act, if the action is to be assessed under Part 4 Division 4.1 (SSD) or Part 5.1 (SSI) of the EP&A Act, provided the assessment:

- Contains an assessment of all impacts the action has on each matter protected under the EPBC Act

- Contains enough information about the controlled action and its relevant impacts to allow the Commonwealth Minister to make an informed decision whether or not to approve the action
- Addresses all matters outlines in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations 2000; DotE 2000)

The proposed action will be assessed via an Environmental Impact Statement (EIS), which will involve several public consultation periods.

9.5.1 EPBC Act Environmental Offsets Policy 2012

Whilst the Commonwealth assessment for any Controlled Action may be undertaken via the exhibition of an EIS according to the NSW SSD requirements, the project must demonstrate the suitability of offsets under the Commonwealth offsets policy. The Commonwealth offsets policy is guided by eight principles. Details of how this BOS complies with the eight principles of the Commonwealth offsets policy are provided below.

1. Offsets must deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action

The project will impact on 104.1 ha of native vegetation, of which 66.55 ha complies with the listing as Critically Endangered under the EPBC Act. Under the FBA an offset must be calculated using the BBCC for all direct impacts to vegetation communities that are listed as EEC or CEEC under the TSC Act.

The BBCC calculates the offsets to provide for a net gain in biodiversity as a result of the project. The FBA also requires all impacts for species, populations, and ecological communities listed under the EPBC Act to be offset with 'like for like' biodiversity credits.

2. Offsets must be built around direct offsets but may include other compensatory measures

As described under Principle 6 in **Section 9.4.1** above, supplementary measures may be included as part of the BOS under Section 10.5 of the FBA. It is noted that payment to the trust fund would also result in an on-ground conservation outcome once the trust secured these credits.

The proponent will secure direct offsets for the majority of the offset liability from land based offsets at Windemere. Any residual requirement will be achieved from local vendors at other land-based offsets.

3. Offsets must be in proportion to the level of statutory protection that applies to the protected matter

Offsets have been calculated using the BBAM which includes a threatened species multiplier within the calculation of the quantum of impacts. The threatened species multiplier increases the quantum of credits required for a project due to impacts to species, populations, and ecological communities.

4. Offsets must be of a size and scale proportionate to the residual impacts on the protected matter

The quantum of offsets required under the FBA is calculated using the BBCC which incorporates the size and scale of the impacts at the development site. Impacts to threatened species, populations, and ecological communities at the development site are adjusted by incorporating the impacts to connectivity, patch size, threatened species predicted, and vegetation type. The BBCC also incorporates the overall loss of vegetation within the locality as a result of the project.

5. Offsets must effectively account for and manage the risks of the offset not succeeding

Offsets proposed under the FBA must be secured through biodiversity credits which are generated at a biobank site, under a BioBanking Agreement. A BioBanking Agreement is legally binding, enforceable, audited, and enduring in perpetuity.

A BioBanking Agreement is the strongest voluntary covenant in NSW that can be placed on a parcel of land. The Biobanking Agreement can only be removed by the Minister, by certain mining and gas projects, or by offsetting the BioBanking Agreement via a highly inflated volume of credits.

Under a BioBanking Agreement the risk of loss is considered to be the lowest of available on-title covenants.

6. Offsets must be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action, see section 7.6)

All BioBanking Agreements are additional to existing management requirements. Should any existing requirements be stipulated under NSW planning regulations or schemes, the BBCC reduces the quantum of BioBanking credits generated at a site commensurate to the existing requirements of a site.

7. Offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable

BioBanking Agreements are a scientifically robust offsetting mechanism that is calculated using the BBCC, protects the land in perpetuity from development, funds management actions, and is annually enforced by the Biodiversity Conservation Trust (BCT)/OEH.

All direct impacts of the project will be offset according to the timeline stated in the NSW and Commonwealth approvals.

8. Offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

As discussed above, all biobank sites are annually inspected by the BCT to ensure biodiversity outcomes are managed appropriately. The quantum of credits generated at a biobank site is calculated using the BBCC which is a transparent, standardised, repeatable method for measuring biodiversity values at a site.

9.6 EPBC Act NSW bilateral agreement

This BOS has been drafted to comply with both the NSW offsets policy, Commonwealth offsets policy, as well as the criteria for offsets within section 7.2 of the *Bilateral agreement made under section 45 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) relating to environmental assessment* (DotE, 2015).

This BOS complies with Section 7.2 of the bilateral agreement by under the following criteria:

- If the action is, or is part of, a major project as referred to in the NSW Biodiversity Offsets Policy, and the BAR for this action has been drafted under the FBA.
- The BAR addresses how section 127b of the TSC Act (the BBAM) has been applied

As such, the Commonwealth Minister may choose to approve the project without assessment by the DotE.

9.7 Additional information requirements of the BOS

The minimum information requirements for the BOS are described in Table 22 of the FBA. All relevant information required in Stage 3 has been previously prepared as part of the Windemere Biodiversity Assessment Report, which is already under review at OEH.

Figures

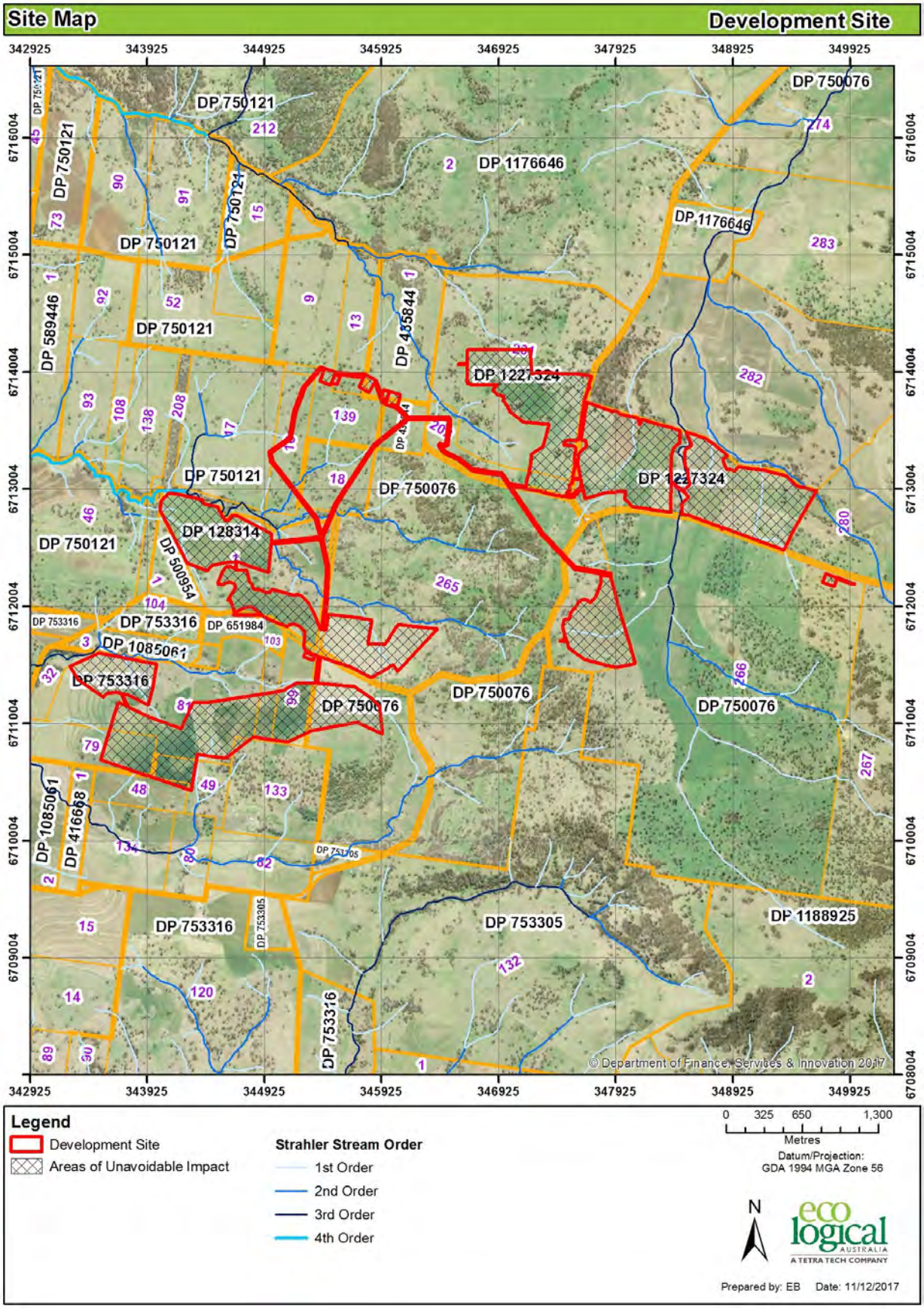

Figure 1 Site map

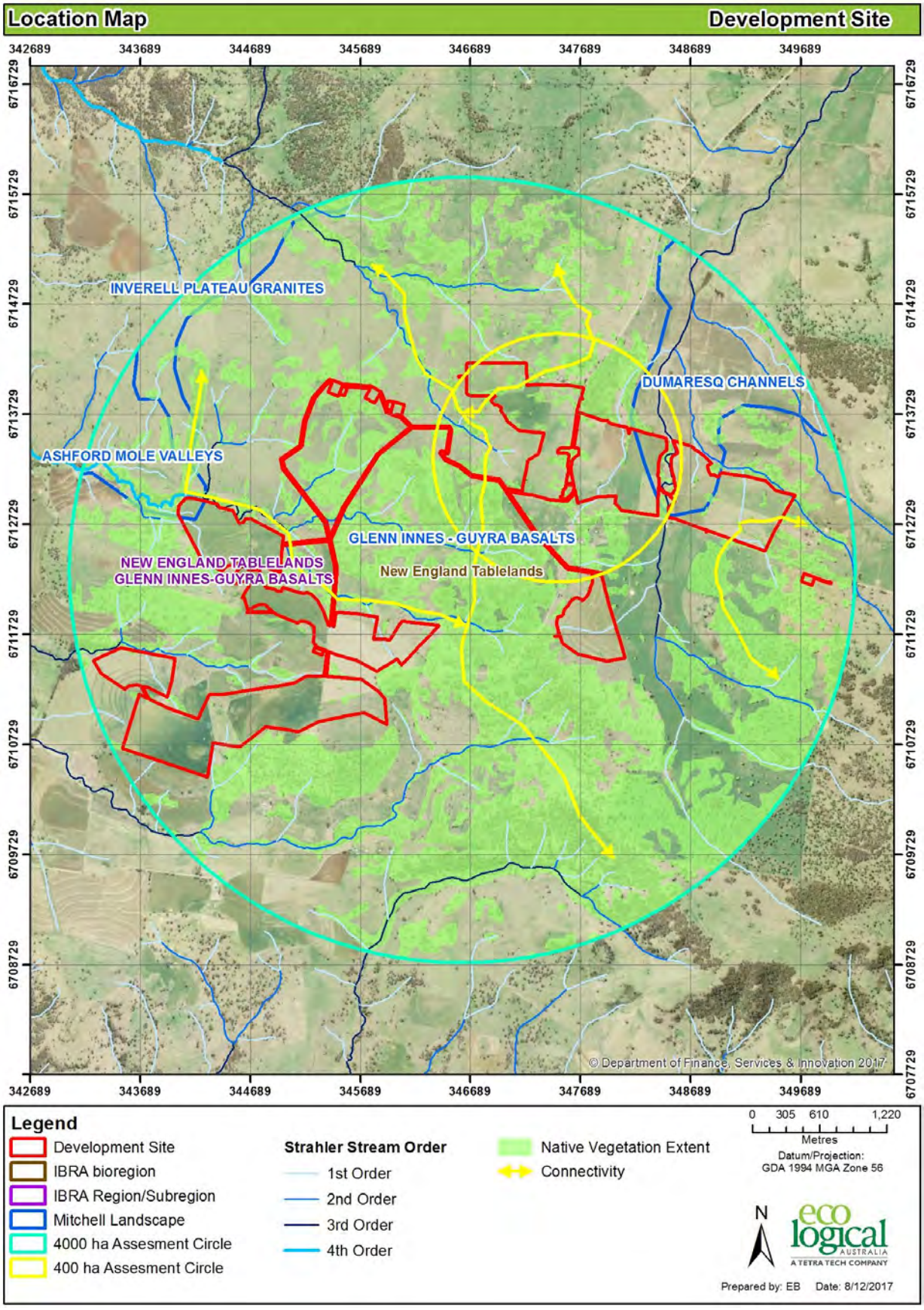

Figure 2 Location map

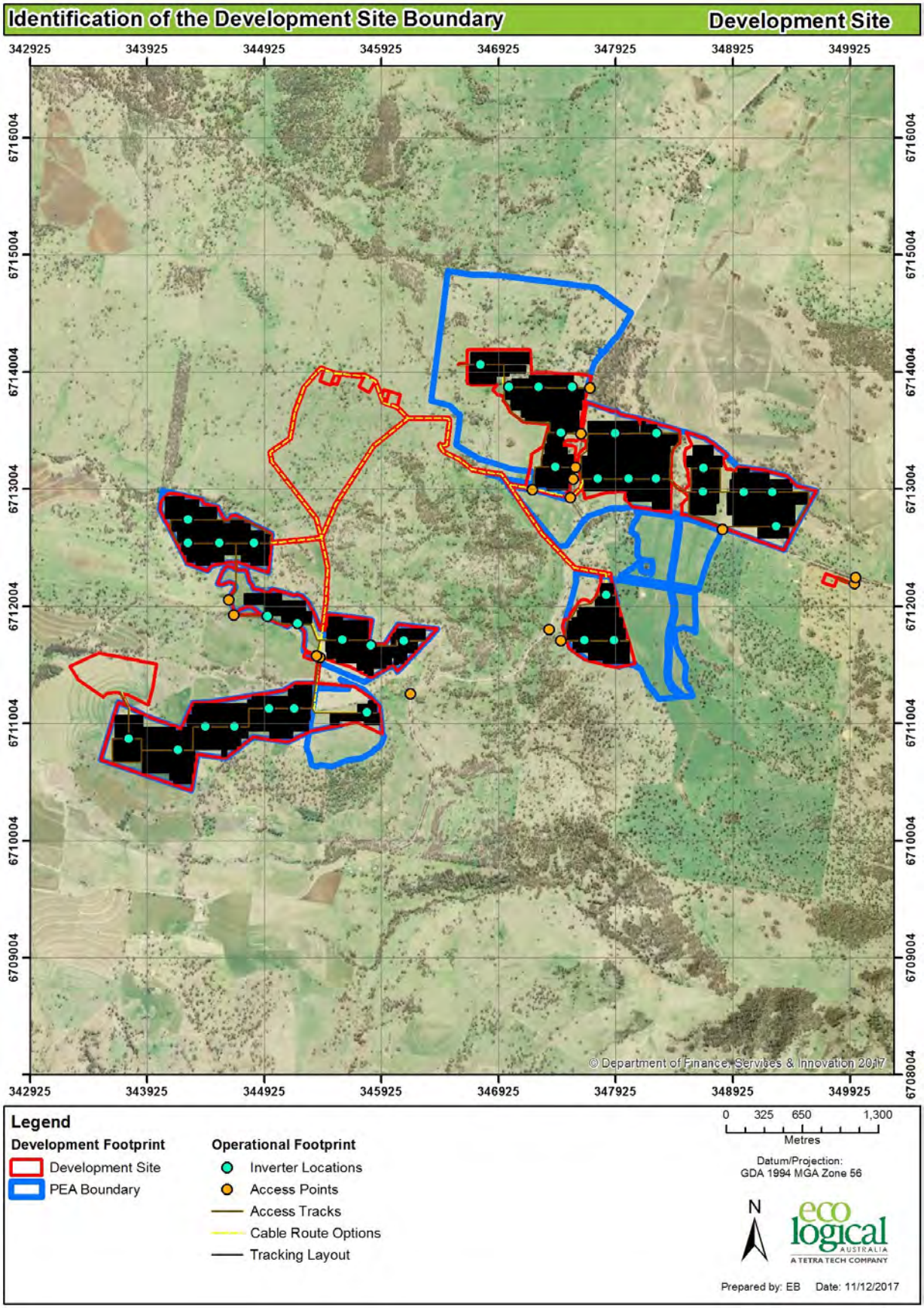

Figure 3 Identification of the development site boundary

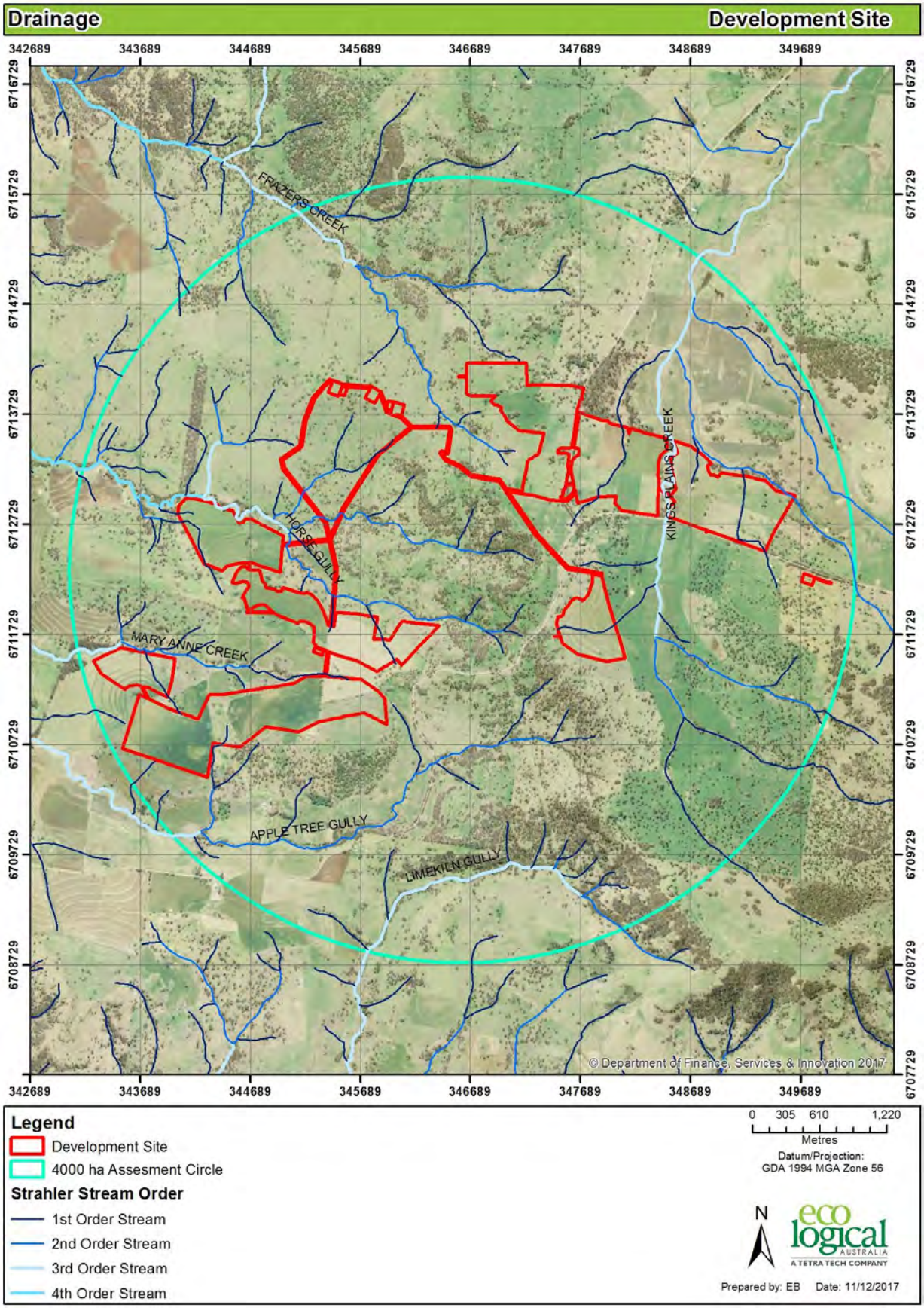

Figure 4 Drainage

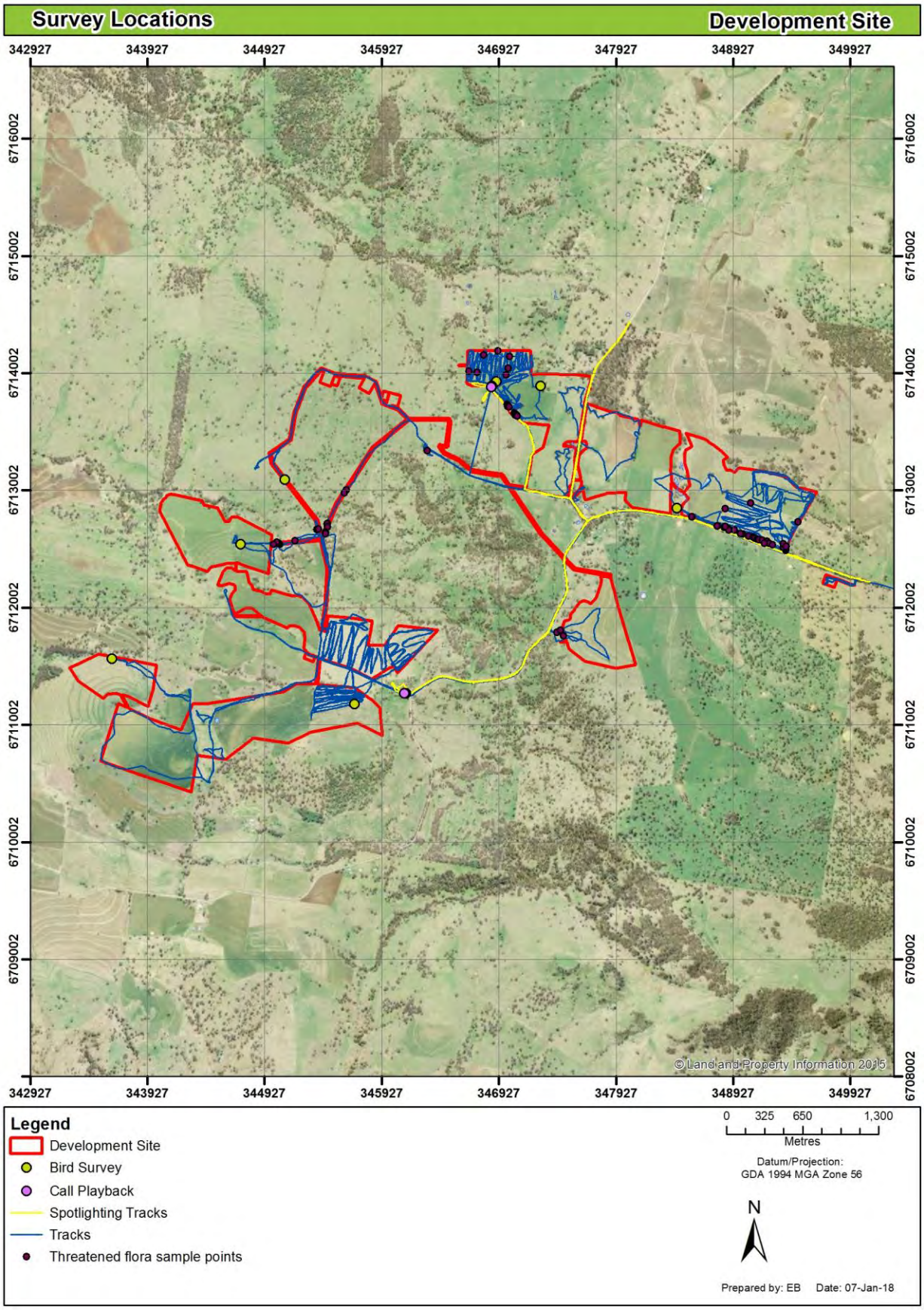

Figure 5 Survey locations

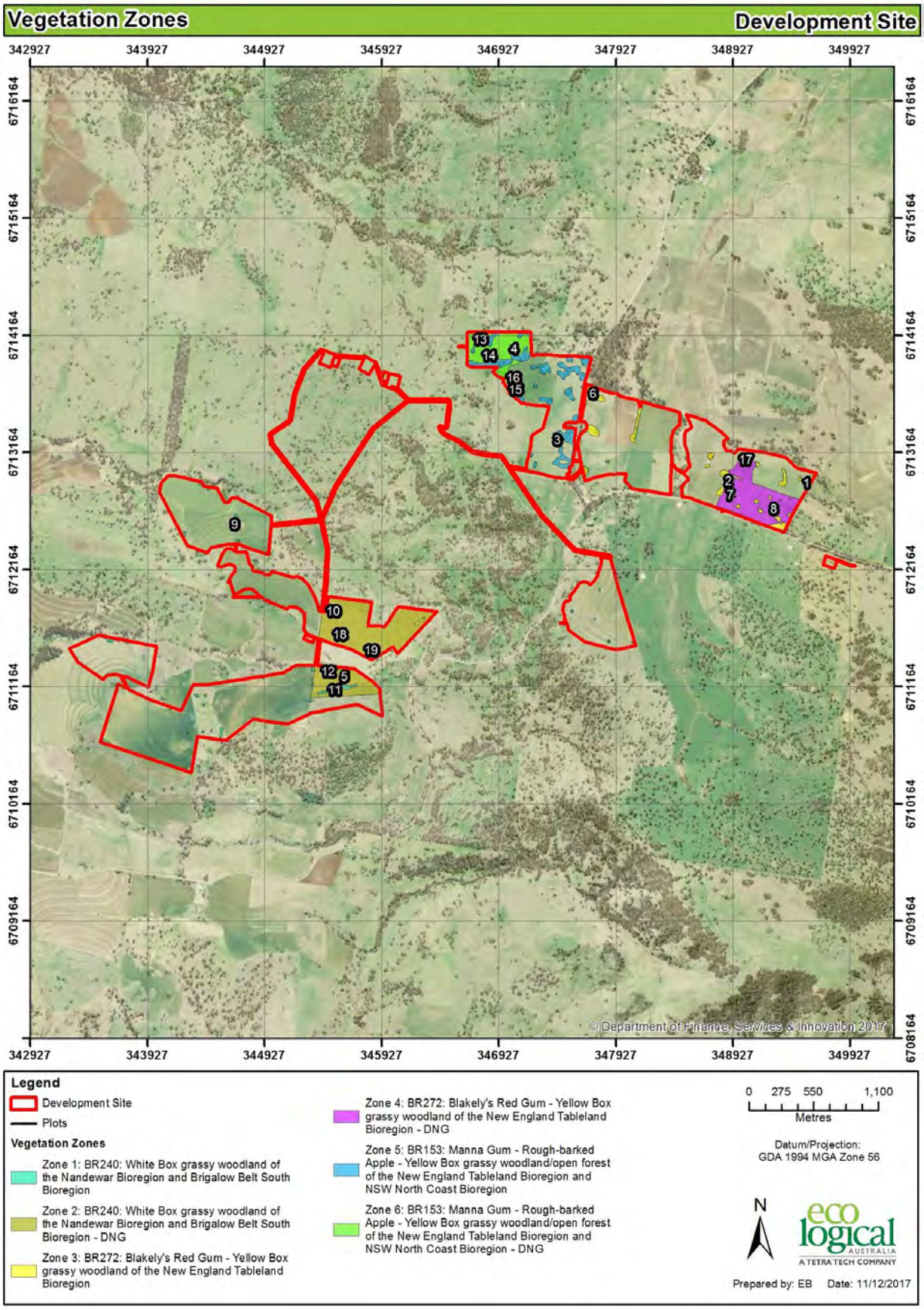

Figure 6 Vegetation zones

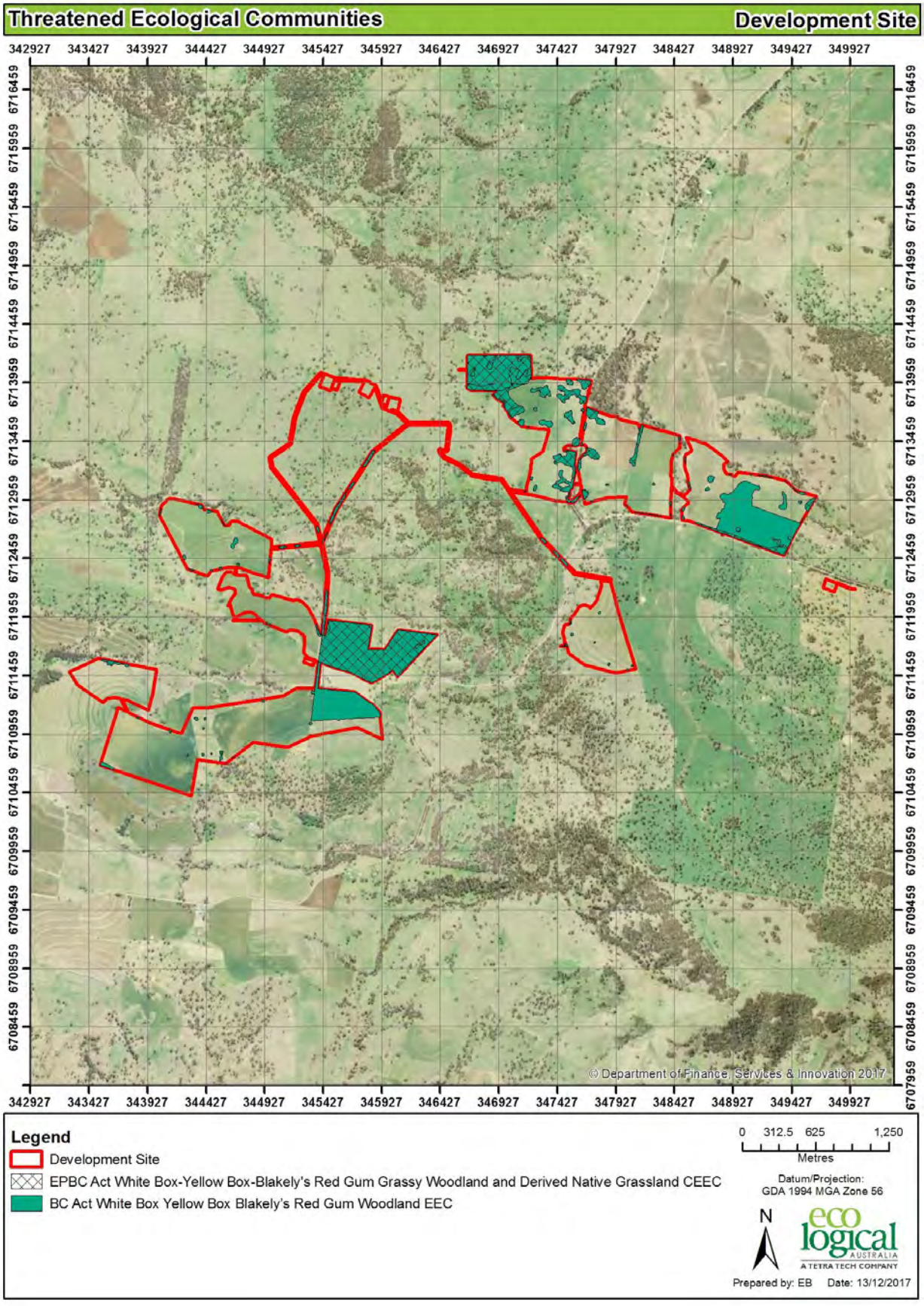

Figure 7 Threatened ecological communities

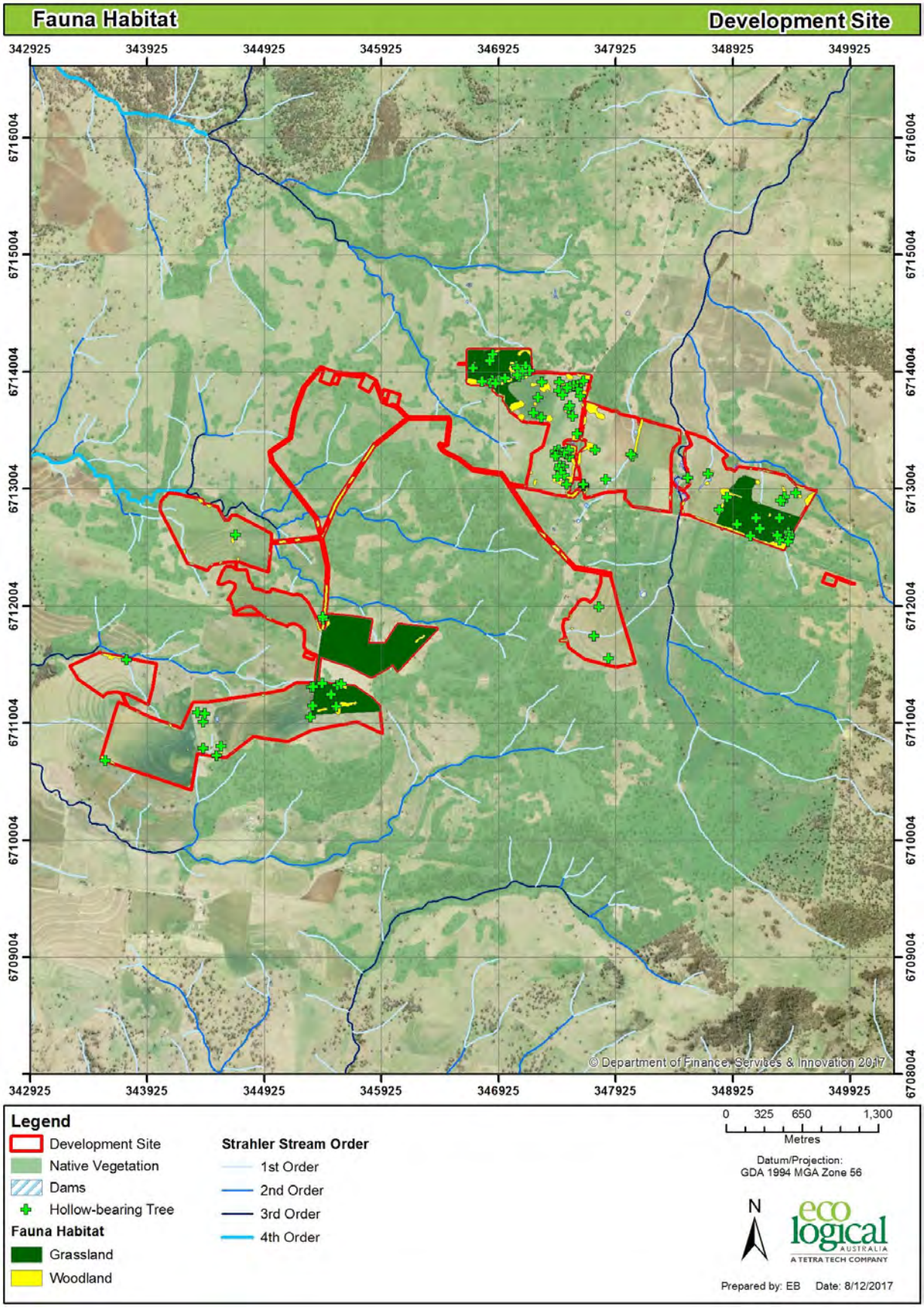

Figure 8 Fauna habitat

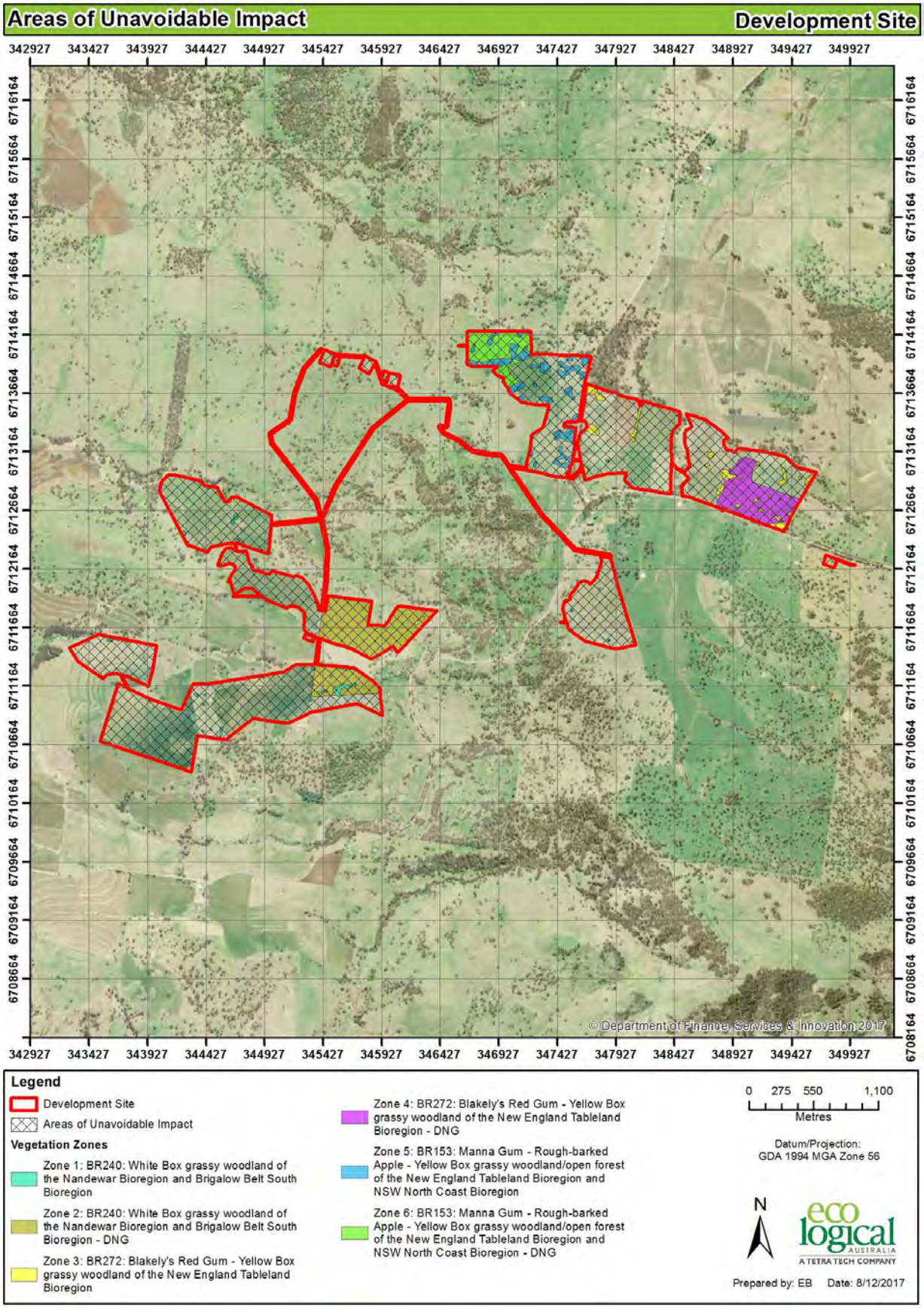

Figure 9 Areas of unavoidable impact

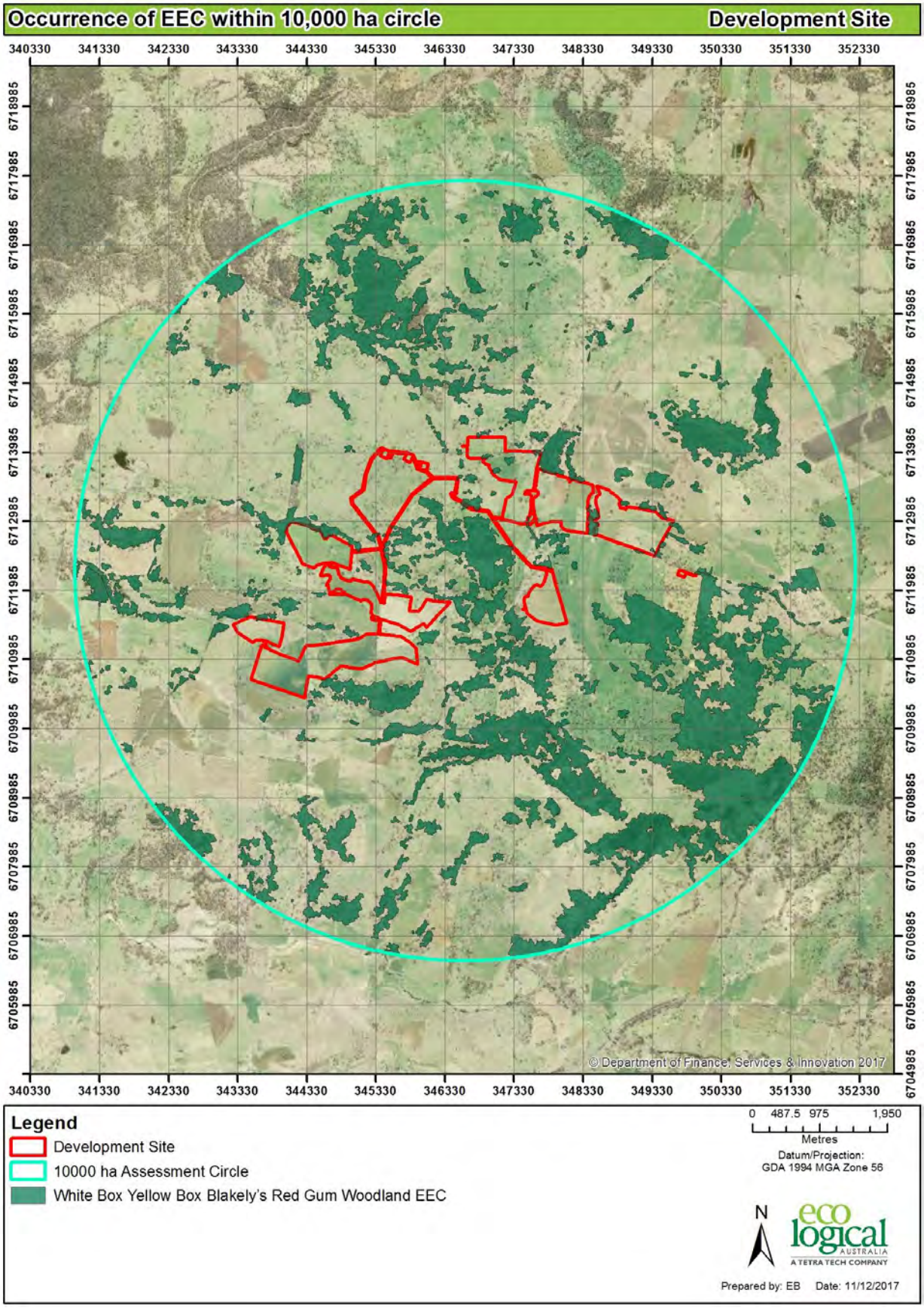

Figure 10 Occurrence of the EEC within a 10,000 ha radius

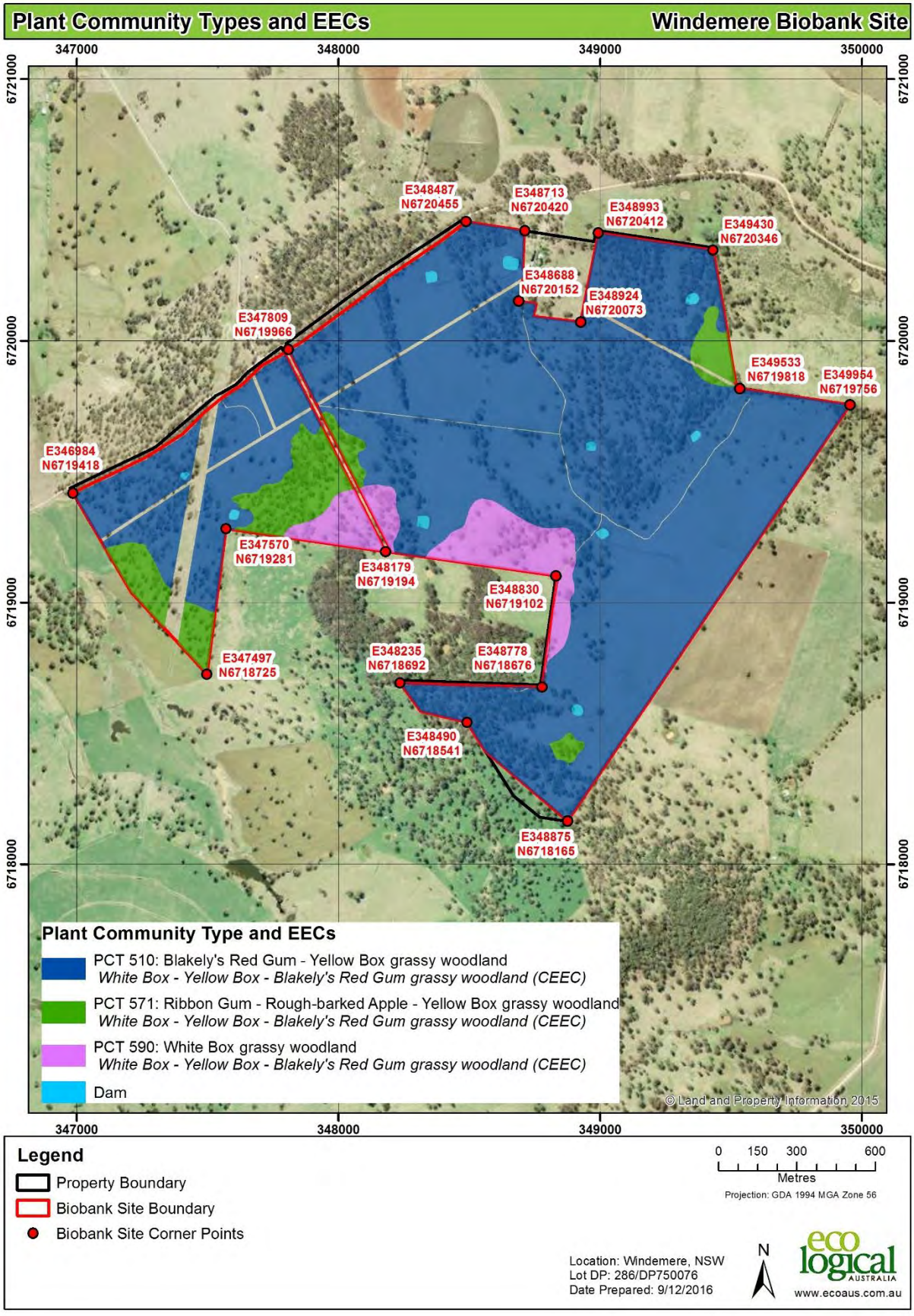

Figure 11 Windemere biobank site

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Appendix A Full floristic data

Form	Species	Common	Annual / Perennial	*Exotic	BR240				BR240 DNG										BR272						BR272 DNG						BR153						BR153 DNG					
					Plot 09		Plot 11		Plot 05		Plot 10		Plot 12		Plot 18		Plot 19		Plot 01		Plot 02		Plot 06		Plot 07		Plot 08		Plot 17		Plot 03		Plot 04		Plot 15		Plot 13		Plot 14		Plot 16	
					C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Tree	*Eucalyptus albens*	White Box					0.1	1																																		
Tree	*Eucalyptus albens*	White Box					0.1	1																																		
Tree	*Eucalyptus blakelyi*	Blakely's Red Gum																			0.1	6																				
Tree	*Eucalyptus melliodora*	Yelow Box																					2	1									20	7								
Shrub	*Marrubium vulgare*	White horehound		*	0.1	20																							0.2	5	0.1	2	7	500								
Shrub	*Rosa rubiginosa*	Sweet Briar		*							0.1	1																					0.1	1					0.1	1		
Shrub	*Cassinia laevis*	Cough Bush																																			39.5				
Shrub	*Einadia nutans*	Climbing Saltbush																													0.5	2	0.1	5								
Sedge	*Carex inversa*	Knob Sedge	P		0.2	20					0.5	100							0.1	50	4	300	0.1	1	0.5	50	0.1	5	0.1	10			0.2	50	0.1	50			1	300	0.3	20
Sedge	*Carex appressa*	tall sedge	P																								0.1	1														
Sedge	*Schoenus apogon*																				5	500	0.1	1	2	100			0.1	2												
Sedge	*Juncus usitatus*		P																4.1	205	3	200			5	200	0.1	5	0.1	2					0.1	1						
Grass	*Bromus catharticus*	Prairie Grass	P	*	10	100	0.5	200			0.1	5	0.2	100	0.5	10	1	10					0.1	20							0.5	50	0.2	20	0.1	5						
Grass	*Bromus hordeaceus subsp.molliformis*	Soft Brome	A	*															30	2000	25	2000	0.5	100	15	2000	10	3000	2	500	0.5	50										
Grass	*Bromus brevis*		A	*																			0.1	5							0.1	10								
Grass	*Dactylis glomerata*	Cocksfoot	P	*					0.5	50	2	100	5	500	0.1	10	0.5	30					0.1	5			0.5	50			0.1	1										
Grass	*Eleusine spp.*		P	*																																	0.1	3			
Grass	*Eragrostis curvula*	African Lovegrass	P	*																											0										
Grass	*Hordeum leporinum*	Barley Grass	A	*	10	2000																	0.1	3																	
Grass	*Hyparrhenia hirta*	Coolatai Grass	P	*																			0.1	1							0.1	1								
Grass	*Lolium perenne*	Perennial Ryegrass	P	*	5	1000	30	5000	0.2	100	2	500	0.5	100							4	500	2	500			0.5	50	5	1000	0.5	200			25	8000			0.5	100		
Grass	*Lolium rigidum*	Wimmera Ryegrass	A	*			5	500															0.5	100							0.5	200	0.1	5	5	1000					0.5	200
Grass	*Nassella neesiana*	Chilean needle grass	P	*													0.1	1																			0.1	3				
Grass	*Paspalum dilatatum*	Paspalum	P	*			2	200			15	1000	25	1000			5	200	45	2000	15	500	1	20	10	500	35	2000	2	200	1	50	1	20					0.2	10		
Grass	*Phalaris aquatica*	Phalaris	P	*	1	20	3	200	25	2000	15	1000	45	3000	20	1000	10	500	0.5	30	1	30					2	200	0.2	5	65	5000	0.1	2	0.5	20	1	100	1	100		
Grass	*Vulpia sp. (tiny)*		A	*																			0.1	20																	
Grass	*Chloris truncata*	Windmill Grass	P	+															0.1	1			0.1	10					0.1	10							0.1	5	0.1	5	0.5	100
Grass	*Aristida ramosa*	Purple Wiregrass	P																																		1	20				
Grass	*Rytidospermum bipartitum*		P				1	1000	1	100	0.1	5	5	1000	50	5000	50	10000	0.1	10	0.2	40	10	3000	0.5	50	0.2	10	32	5100			0.1	100			20	2000	25	2000	70	24000
Grass	*Austrostipa aristiglumis*		P		17	300																																		
Grass	*Austrostipa scabra*		P		0.5	20																	0.1	5							10	1000	1	100	3	200	5	500		
Grass	*Austrostipa spp.*		P				0.1	2																																
Grass	*Bothriochloa macra*	Red Grass	P														0.1	1	0.1	10	0.1	1	0.5	100					1	200	0.5	10	2	200			2	200	3	500	0.1	10
Grass	*Cymbopogon refractus*	Barbed Wire Grass	P						0.1	1	0.1	5	1	20			1	100													0.2	5								
Grass	*Cynodon dactylon*	Couch	P		35	2000																																		
Grass	*Dichanthium sericeum*	Queenslan d Bluegrass	P		0.1	1	2	200	20	2000	5	500	10	1000	3	200	10	1000					0.1	1			0.1	20			0.1	50			0.5	50	0.5	100	0.1	10
Grass	*Dichelachne micrantha*	Shorthair Plumegrass	P		0.1	10															0.1	5	0.1	10											0.5	50				
Grass	*Dichelachne crinata*		TBC																						0.1	5					1	200								
Grass	*Elymus scaber*	Wheatgrass	P		0.1	20	0.5	500			0.5	50					0.5	50	2	200			3	500			0.5	100	1	200	2	200	5	1000			2	1000	1	200
Grass	*Enteropogon acicularis*		P																																		0.1	5			
Grass	*Lachnagrostis filiformis*		P																		1	100	0.1	5	0.1	5															
Grass	*Microlaena stipoides*	Weeping Grass	P																												0.1	3			0.2	20				

Form	Species	Common	Annual / Perennial	*Exotic	BR240				BR240 DNG										BR272						BR272 DNG						BR153						BR153 DNG					
					Plot 09		Plot 11		Plot 05		Plot 10		Plot 12		Plot 18		Plot 19		Plot 01		Plot 02		Plot 06		Plot 07		Plot 08		Plot 17		Plot 03		Plot 04		Plot 15		Plot 13		Plot 14		Plot 16	
					C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Grass	*Panicum decompositum*	Native Millet	P														0.2	50																								
Grass	*Poa labillardierei*	Tussock	P																0.1	10	0.2	20	0.1	2	0.5	10	0.1	5							0.1	10			1	20		
Grass	*Poa sieberiana*	Tussock	P		0.1	2															2	100																				
Grass	*Festuca elatior*	Tussock	P				0.5	20											0.1	50													1	20			0.5	20			0.2	5
Grass	*Sorghum leiocladum*	wild sorghum	P				0.1	5	1	10	2	50							0	1					0.5	10							0.1	3								
Grass	*Sporobolus creber*	Western Rat-tail Grass	P						0.1	5											10	200			4	400	3	100	0.5	20							0.1	3				
Forb	*Avena spp.*	Oats	A	*	0.1	1																																				
Forb	*Bidens subalternans*	Greater Beggar's Ticks	A	*																													1	500								
Forb	*Brassica spp.*		P	*																																			0.5	100
Forb	*Capsella bursa-pastoris*	Shepherd's Purse	A	*	0.1	3																											0.1	1								
Forb	*Carthamus lanatus*	Saffron Thistle	A	*	0.1	2											0.1	1													2	100			3	500	5	500		
Forb	*Centaurea melitensis*	Maltese Cockspur	A	*			0.1	5																											0.1	5				
Forb	*Centaurea solstitialis*	St Barnabys Thistle	A	*			0.2	20																															0.2	50
Forb	*Centaurium erythraea*	Common Centaury	A	*																			0.1	3	0.5	100							0.1	20	0.1	1				
Forb	*Cirsium vulgare*	Spear Thistle	Bi	*			0.1	2	0.1	2	0.1	4	0.1	20	0.1	10	0.1	20	0.1	10	0.1	4	0.1	5			0.2	10	0.1	5	2	50	4	100	0.1	10	2	50	3	300	0.1	5
Forb	*Conyza bonariensis*	Flaxleaf Fleabane	A	*	0.2	20	0.1	10			0.1	1	0.1	20			0.1	20			0.1	10											0.1	20	0.1	10			0.1	30		
Forb	*Cyclospermum leptophyllum*	Slender Celery	A	*	0.1	100	0.1	50	0.2	100	0.1	50	0.1	50					0.1	10	0.1	30	0.2	200					0.1	50	0.1	20	0.1	20			0.2	100	1	1000	0.1	5
Forb	*Festuca elatior*		P	*																	0.2	5																				
Forb	*Gamochaeta spherics*	Cudweed	A	*																																			0.1	5		
Forb	*Hypochaeris glabra*	Smooth Catsear	A	*			0.1	20	2	250													1	500							1	100	0.5	100			0.5	500	0.2	100		
Forb	*Hypochaeris radicata*	Flatweed	P	*					2	250	2	200	2	500			0.2	50	0.1	50	0.1	30	5	2000	2	200	3	1000	10	5000	1	100	3	500			0.5	500	0.2	100	0.1	20
Forb	*Lepidium bonariense*		A	*																															0.1	1						
Forb	*Malva parviflora*	Small-flowered Mallow	A	*																															0.1	5						
Forb	*Malva spp.*		A	*	0.1	20																																				
Forb	*Medicago polymorpha*	Burr Medic	A	*					10	2000			2	200	0.1	10																			0.1	20					0.1	5
Forb	*Medicago sativa*	Lucerne	P	*							0.1	5							0.1	10			0.1	2					0.2	50					2	200			5	500
Forb	*Mouse ear*		A	*													0.1	50																								
Forb	*Paronychia brasiliana*	Chilean Whitlow Wort	P	*	0.1	500	0.2	500											0.1	5			0.1	20	0.1	50	0.2	500	0.1	10	0.5	1000	0.1	5	0.7	100					0.1	100
Forb	*Petrorhagia nanteuilii*		A	*			0.2	500	0.2	300	0.5	20											0.1	5							0.1	100			0.1	5	0.2	10	0.2	100
Forb	*Plantago lanceolata*	Lamb's Tongues	A	*			2	500	3	500	10	2000			0.1	20	0.5	60	0.5	100	0.1	20	3	1000	0.5	50			0.1	20	2	1000			1	300	0.1	3	0.1	50	1	500
Forb	*Polygonum aviculare*	Wireweed	P	*																											0.1	1								
Forb	*Ranunculus repens*	Creeping Buttercup	P	*							0.1	20																														
Forb	*Rapistrum sp.*	Turnip Weed	A	*																																						
Forb	*Rumex crispus*	Curled Dock	P	*																			0.1	1									0.1	5								
Forb	*Sisymbrium officinale*	Hedge Mustard	A	*	1	100																											0.1	20								
Forb	*Sonchus oleraceus*	Common Sowthistle	A	*							0.1	1	0.1	10			0.1	20															0.1	2	0.1	5	0.1	2	0.1	20	0.1	3
Forb	*Taraxacum officinale*	Dandelion	P	*					0.1	10			0.2	100					0	1	0.2	50													0.1	2	0.1	2	0.1	5		
Forb	*Trifolium campestre*	Hop Clover	A	*			15	3000	10	2000	10	5000	2	200	0.5	50	1	100			0.5	50	10	5000	2	1000			0.2	30	1	500					10	5000	5	2000	1	200
Forb	*Trifolium fragiferum*	Strawberry Clover	P	*					15	2000	25	10000	0.1	2	2	200	0.1	2					0.2	10									0.1	10								
Forb	*Trifolium repens*	White Clover	P	*			60	10000	10	1500	40	10000	1	100	15	1500	5	500	10	1500	30	10000	30	5000	40	10000	25	5000	25	2000	15	2000	50	20000	2	400	25	10000	30	6000	1	200
Forb	*Trifolium sp.*		A	*																													0.5	500								
Forb	*Trifolium spp.*		A	*																													0.5	500								
Forb	*unidentified 1*		A	*																																	0.1	3				
Forb	*urochloa sp.*		A	*	0.1	20																																				
Forb	*Verbena officinalis*	Common verbena	A	*					0.1	5			0.1	5			0.1	5																								

Form	Species	Common	Annual / Perennial	*Exotic	BR240				BR240 DNG										BR272						BR272 DNG						BR153						BR153 DNG					
					Plot 09		Plot 11		Plot 05		Plot 10		Plot 12		Plot 18		Plot 19		Plot 01		Plot 02		Plot 06		Plot 07		Plot 08		Plot 17		Plot 03		Plot 04		Plot 15		Plot 13		Plot 14		Plot 16	
					C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A	C	A
Forb	*Vicia sativa*	Common Vetch	A	*					0.5	500	0.2	50	1	200	0.1	10	0.5	100											0.1	10														
Forb	*Xanthium spinosum*	Bathurst Burr	P	*	0.1	1																																				
Forb	*Alternanthera pungens*	Khaki Weed	P	*N																													0.1	5								
Forb	*Rumex brownii*	Swamp Dock	P	+	0.1	20			0.2	50	0.2	20	0.1	20	0.1	10	0.1	20	0	10	0.1	30			0.5	10	0.1	5	0.2	50	0.1	5	0.1	20	0.1	5	0.1	20	0.2	50	0.2	50
Forb	*Asperula conferta*	Common Woodruff	P		0.1	200	0.2	500			0.1	50					0.1	50	0.1	50	0.1	100			0.5	2000	0.5	1000									25	20000	0.5	500	0.1	20
Forb	*Calotis cuneifolia*	Purple Burr-daisy	P																														0.5	100								
Forb	*Calotis lappulacea*	Yellow burr-daisy	P																														0.2	50	0.1	5						
Forb	*Chenopodium pumilio*	Small Crumbweed	A																														0.1	2								
Forb	*Chrysocephalum apiculatum*	Common everlasting	P		0.1	3																																				
Forb	*Convolvulus erubescens*	Blushing Bindweed	P																														0.1	5	0.1	1						
Forb	*Craspedia canens*	Grey Billy-buttons	TBC				0.1	5																																		
Forb	*Cymbonotus lawsonianus*	Bears-ear	A																														0.2	20	0.1	5	0.1	10	0.1	10		
Forb	*Daucus glochidiatus*	Native Carrot	A														0.1	1																				0.1	20		
Forb	*Desmodium varians*	Slender Tick-trefoil	TBC		0.1	10	0.1	50																									0.1	50	0.1	10			0.1	10		
Forb	*Dichondra repens*	Kidney Weed	P		0.1	100	5	5000	0.5	500	1	500			2	100	0.1	50			0.2	100	1	1000					3	100			0.5	1000	0.1	50	2	2000	1	2000	0.1	50
Forb	*Euchiton sp*		A																		0.1	2																				
Forb	*Euchiton sphaericus*		A								0.1	0																														
Forb	*Geranium solanderi*	Native Geranium	P																0.1	4	0.1	6	0.1	5			0.5	50			1	200	0.5	100	1	30			1	200		
Forb	*Haloragis heterophylla*	Rough Raspwort	P																0.1	50	0.1	100			0.5	2000																
Forb	*Mentha satureioides*	Creeping Mint	P				3	3000	0.5	1000	0.1	100	0.2	500			0.3	500															0.2	100			0.1	100				
Forb	*Oxalis perennans*		A		0.1	100	0.1	100									0.1	100			0.1	10			0.1	10			0.1	10			0.1	20	0.1	10						
Forb	*Plantago debilis*		P						2	500							0.5	60											1	100			0.1	1								
Forb	*Ranunculus lappaceus*	Common Buttercup	P						0.1	5									0	5																						
Forb	*Senecio quadridentatus*	Cotton Fireweed	P				2	500	0.1	30	0.1	5					0.1	5					0.1	1							0.1	2	0.1	1			0.1	2				
Forb	*Senecio spp.*		P				0.1	30	0.1	5	0.1	3	0.1	5			0.1	3																								
Forb	*Swainsona galegifolia*	Smooth Darling-pea	P				0.2	20	0.1	5					0.1	10																					0.2	20				
Forb	*Swainsona spp.*		P								0.3	10																									0.1	3	0.1	20		
Forb	*Urtica incisa*	Stinging Nettle	P		0.1	3																							0.1	1			2	60			0.3	5		
Forb	*Vittadinia cuneata*	Fuzzweed	A				1	200	0.7	500	0.1	50			0.1	3	0.1	30											0.1	20	0.1	50			0.1	100	0.1	100	0.1	5
Forb	*Vittadinia muelleri*		P																																0.1	10						
Forb	*Vittadinia spp.*		A				0.1	50																													0.1	100				
Forb	*Wahlenbergia communis*	Tufted Bluebell	P						0.1	20									0.1	10															0.1	5	0.1	50	1	100		
Forb	*Wahlenbergia spp.*		P				0.1	50															0.1	50	0.1	5					0.1	5	0.1	100						

Appendix B Plot and transect data

PCT	Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
BR240	Plot 09	14	1.5	0	44	0	0	17	1	1	10	344671.5	6712553	56
BR240	Plot 11	19	1	0	20	0	4	70	0	1	0	345535.7	6711138	56
BR240 - DNG	Plot 05	14	0	0	12	0	8	82	0	1	0	345610.7	6711264	56
BR240 - DNG	Plot 10	14	0	0	8	0	0	90	0	1	0	345569.7	6711817	56
BR240 - DNG	Plot 12	5	0	0	20	0	16	66	0	1	0	345468.7	6711283	56
BR240 - DNG	Plot 18	5	0	0	40	0	0	50	0	1	0	345661.9	6711596	56
BR240 - DNG	Plot 19	15	0	0	60	0	6	20	0	1	0	345857.4	6711485	56
BR272	Plot 01	7	1	0	8	0	20	72	0	1	0	349554.1	6712903	56
BR272	Plot 02	17	1	0	36	0	12	52	0	1	0	348890.6	6712948	56
BR272	Plot 06	15	2	0	46	0	0	52	0	1	0	347826.9	6713609	56
BR272 - DNG	Plot 07	13	0	0	18	0	4	70	0	0.66	0	348898.4	6712801	56
BR272 - DNG	Plot 08	9	0	0	26	0	0	66	0	0.66	0	349312.7	6712694	56
BR272 - DNG	Plot 17	11	0	0	36	0	2	46	0	0.66	0	349028.8	6713095	56
BR153	Plot 03	8	2	0	20	0	6	70	0	1	0	347431.5	6713289	56
BR153	Plot 04	25	1	0.1	32	0	6	54	0	1	0	347056.4	6714043	56
BR153	Plot 15	17	17.5	0	2	0	0	38	0	1	20	347075.7	6713717	56
BR153 - DNG	Plot 13	19	0	0	28	0	30	36	0	0	0	346780.6	6714125	56
BR153 - DNG	Plot 14	18	0	0	36	0	10	54	0	0	0	346831	6714005	56
BR153 - DNG	Plot 16	9	0	0	66	0	0	30	0	0	0	347049.6	6713789	56

Appendix C More appropriate local data report

REQUEST FOR APPROVAL TO USE LOCAL BENCHMARK DATA

Sapphire Wind Farm

Prepared for
Wind Prospect CVWP Pty Ltd

22 February 2011

DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Request for approval to use Local Benchmarks Data – Sapphire Wind Farm
Project Number	10SYDECO-0056
File location	G:\Synergy\Projects\10SYDECO\10SYDECO-0056 Sapphire Wind Farm Part 3A\Report\Local Benchmarks report
Prepared by	NS, AF, TH, PR
Approved by	RH
Status	Final
Version Number	1
Last saved on	22 February 2011
Cover photo	*Chrysocephalum apiculatum* (top left), *Wahlenbergia gracilis* (top right), Sapphire landscape (centre) (photo credit: AF, Eco Logical Australia).

This report should be cited as 'Eco Logical Australia 2011. Request for approval to use Local Benchmark Data - *Sapphire Wind Farm*. Prepared for Wind Prospect CWP Pty Ltd.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Wind Prospect CWP. Pty Ltd

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Abbreviations

ABBREVIATION	DESCRIPTION
BAMCCOM	Biobanking Assessment Methodology and Credit Calculator Operational Manual
BSMP	Biobank Site Management Plan
CMA	Catchment Management Authority
DECCW	NSW Department of Environment, Climate Change and Water
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
LGA	Local Government Area
Local area	Within 10 km radius of the site
LPMA	Land and Property Management Authority (formerly Department of Lands)
NPWS	National Parks and Wildlife Service (part of DECCW)
RBVT	Revised Biometric Vegetation Types
TSC Act	NSW *Threatened Species Conservation Act 1995*
Wind Prospect	Wind Prospect CWP Pty Ltd

1 Introduction

Wind Prospect CWP Pty Ltd (Wind Prospect) is currently finalising an Environmental Assessment Report for the proposed Sapphire Wind Farm (ELA in prep). The study area is located 18 km west of Glen Innes and 28 km east of Inverell, on the New England Tablelands of New South Wales (NSW), mainly within the Glen Innes - Guyra Basalts sub-region of the Border Rivers Gwydir CMA and a very small portion in the Severn Rivers subregion (Figure 1).

The project is being assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* as a critical infrastructure project. The Department of Planning has issued Director-General's requirements for the environmental assessment that include a requirement to assess impacts to biodiversity values and offset any residual impacts that cannot be avoided, minimised or mitigated using "improve or maintain" principles.

Wind Prospect proposes to address this requirement using the Biobanking Assessment Methodology to "inform" the quantum of offset required, however, a formal Biobank Assessment and Credit Report is not being undertaken.

Section 2.11.2 and 3.4.3 of the Biobanking Assessment Methodology and Credit Calculator Operational Manual (BAMCCOM) allows the use of "certified local data", including local benchmark data, where the Director-General of the Department of Environment, Climate Change and Water (DECCW) certifies that they more accurately reflect local environmental conditions than the data in the Biobanking databases. The use of certified local data is subject to a number of conditions:-

- Use of certified local data must be approved by the Director-General before a biobanking statement or agreement is approved.
- The applicant must provide justification for the use of local data as part of the Biobanking Assessment report for the development proposal.
- Benchmark can be obtained from reference sites or published data.
- If local benchmark data are developed, they must be derived from reference site measurements of the same vegetation type in a relatively unmodified condition as indicated in the criteria listed in section 3.4.3 of the BAMCCOM (Section 2 of this report).

This report has been prepared by Eco Logical Australia for Wind Prospect CWP for the Sapphire Wind Farm project and addresses each of these requirements.

The request for use of local data is for the purpose of the Wind Farm only and not other projects in the region.

Local benchmark data have been collected in accordance with the requirements outlined in section 3.4.3 of the BAMCCOM (refer to section 5 of this report), justification for the use of local benchmark data has been provided (Section 3) and the data have been collected by accredited Biobank assessors and a vegetation mapping/condition expert.

Assessor Name: Nathan Smith (formerly ELA now Niche Consulting)

Assessor Number: 0047

Vegetation Expert: Peter Richards (formerly ELA now a self-employed ecological consultant)

Peter Richards is a highly experienced conservation ecologist who has extensive experience in ecological survey and assessment at both landscape-scale and finer scale. Through twenty-five years of work with the Royal Botanic Gardens, Sydney, the NSW National Parks and Wildlife Service, State Forests of NSW and private enterprise, Peter has acquired an excellent knowledge of NSW threatened flora and fauna, native vegetation and ecological processes, particularly of the NSW North Coast, New England Tablelands and Nandewar bioregions. He has been involved with a number of key Government broad-scale natural resource assessment projects including Comprehensive Regional Assessments (CRAs) and regional Wilderness assessments. Peter has submitted a number of scientific articles to peer-reviewed journals, and is also the author or co-author of several contributions to the Flora of New South Wales.

Peter possesses a diverse range of technical skills including systematic and targeted flora and fauna survey, habitat assessment, vegetation classification and mapping, data collation and analysis and GIS-based spatial analysis. Peter has undertaken numerous systematic and targeted vegetation and flora surveys across the abovementioned bioregions. He has participated on a variety of government expert panels in reviewing native vegetation information for the 'Biometrics' vegetation database, threatened flora ecological information for the Biobanking assessment tool, allocation of native vegetation types to threatened flora and fauna species profiles, trialling the 'PVP assessment tool' for use by CMA vegetation officers, and analysis of vegetation data towards a classification of native vegetation of the Northern Rivers CMA. Peter also contributed a classification of native vegetation communities of the western New England Tablelands and Nandewar bioregions to the Botanic Gardens Trust's NSW Vegetation Classification and Assessment database (NSWVCA).

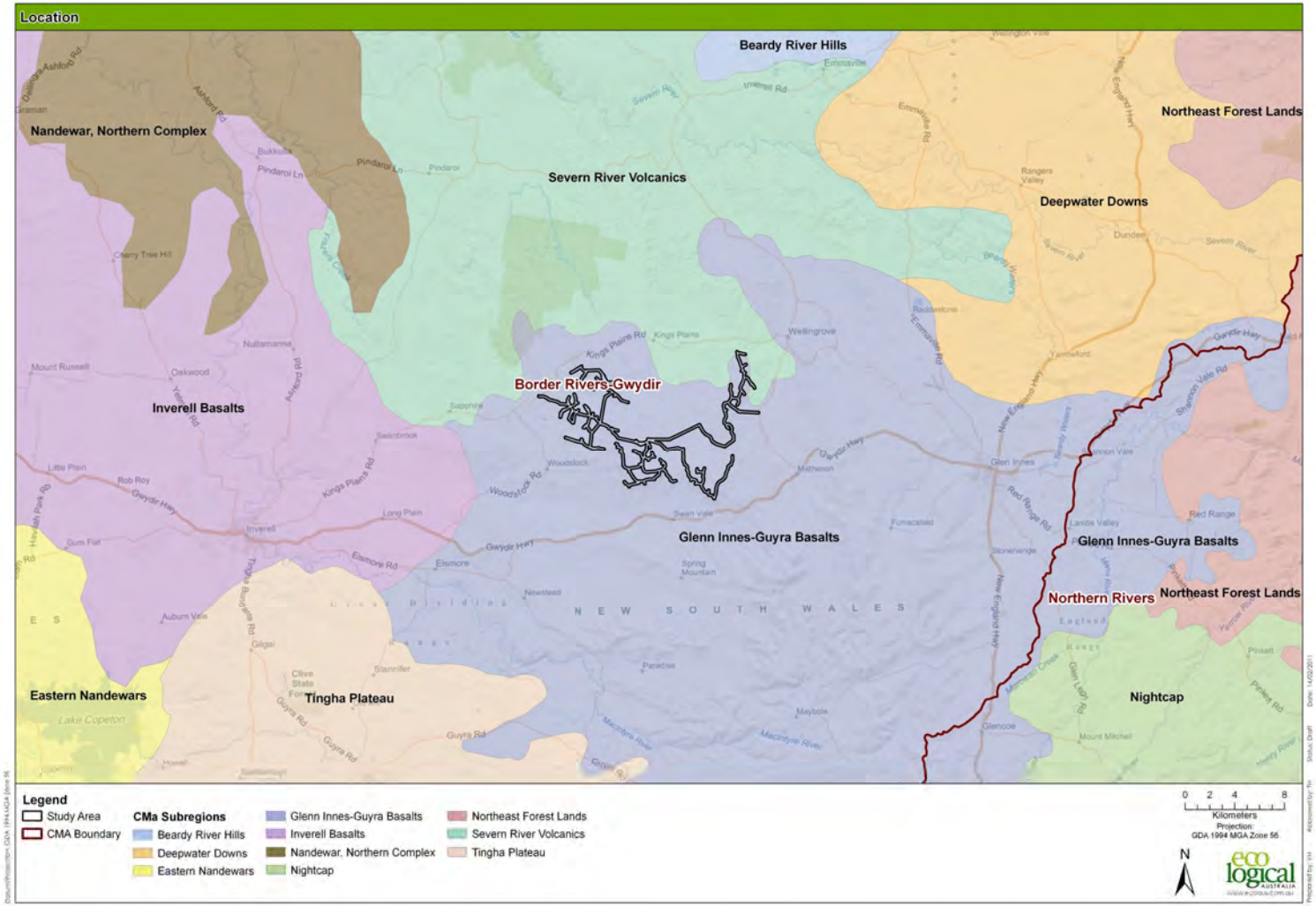

Figure 1: Location of Study Area and CMA sub-region boundaries

2 Criteria & Method for Developing Local Benchmarks

The following criteria (listed in section 3.4.3 of the BAMCCOM) must be addressed when developing benchmarks from local reference sites:-

Locating reference sites

Reference sites must have little modification relative to other vegetation in the region, as indicated by:-

- minimal timber harvesting (few stumps, coppicing, cut logs),
- minimal firewood collection,
- minimal exotic weed cover,
- minimal grazing and trampling by introduced or overabundant native herbivores,
- minimal soil disturbance,
- dieback not in excess of normal senescence,
- no evidence of very recent major perturbation such as fire or flood,
- not subject to high frequency burning, and
- evidence of recruitment of native species.

The BAMCCOM states that "*it may be difficult to find totally unmodified sites in a landscape, particularly in highly cleared regions or during periods of extended drought. Vegetation in relatively unmodified condition can be found in some travelling stock routes and reserves, national parks and nature reserves, state forests (especially Flora Reserves), cemeteries, roadsides and commons. Appropriate reference sites may sometimes exist on the development site or the biobank site. Reference sites can occur in small remnants, such as narrow roadsides and cemeteries. Different reference sites can be used to collect benchmark data on different condition attributes*".

Numbers of reference plots

To encompass the variation in benchmark condition, a minimum of three reference transects/plots for each variable should be measured at reference sites for each vegetation type, with more transects/plots being desirable.

Field methods for measuring vegetation condition variables on reference sites

The methods for recording data from reference plots are identical to the methods for recording data for Site Value, as outlined in Appendix 2 of the BAMCCOM. An Excel spreadsheet (Local Benchmark Calculator.xls) for calculating local benchmarks can also be downloaded from the DECCW website.

Determining a benchmark from a local reference site

The data from all reference plots for a specific assessment are then used to develop the local benchmark for that vegetation type.

Local benchmarks are entered into the credit calculator by the assessor in Step 5. The information sources used to develop the local benchmark must be provided to DECCW as part of the impact assessment. If the source is a local reference site, then the assessor should provide a copy of the site attribute data and a description of the site as part of the Biobanking Assessment Report.

Developing the benchmark

The data from all reference sites and transects/plots need to be entered into the Local Benchmark Calculator.xls for a specific development or biobank site (available for download from the BioBanking website). Once the data have been entered into the spreadsheet, the benchmark values are automatically calculated. These benchmarks then need to be copied into the credit calculator at *Step 5b* as part of data entry for the Site Value assessment. A copy of the data and other supporting information used to generate the benchmark should be submitted as part of the application for the biobanking agreement or statement.

3 Justification for the use of Local Benchmark Data

Section 2.11.2 of the BAMCCOM states that "*the applicant must provide justification for the use of local data as part of the Biobanking Assessment report for the development proposal*". Justification for the use of local data to inform benchmarks for the vegetation types present at the Sapphire study area is provided below.

The benchmarks in Version 1.1 of the BAMCCOM for the Border Rivers Gwydir CMA Revised Biometric Vegetation Types (RBVTs) are provided only at the vegetation class level of Keith (2004), and not for the individual RBVTs within the CMA. Since the collection of local floristic data has not been undertaken at the RBVT scale, the use of existing BAMCCOM benchmarks does not allow for a realistic assessment of relative condition of the subject vegetation types.

Most Keith vegetation classes, including those in the subject area, are represented by multiple vegetation types and the benchmarks at the class level are accordingly broad enough to encompass the full range of natural condition states of all of the vegetation types that are grouped within a single class. They are, therefore, not an entirely accurate reflection of the range of natural condition values for any one particular vegetation type and can lead to either an over- or under-estimation of site value scores. A comparison of the benchmark data collected for each vegetation type in the study area with the current benchmarks for the corresponding broad vegetation class (Tables 3,5,7,9,11 and 13 in chapter 6 following) clearly reveals this trend.

The use of local reference plots enables the generation of benchmarks that are specific, and therefore more relevant, to each vegetation type within the locality.

4 Location & Description of Reference Sites

Reference sites were chosen to reflect uncleared local vegetation in as near a natural, undisturbed state as possible. The Sapphire region has a long agricultural history of grazing and cropping, making finding totally unmodified sites difficult.

The sites selected as local reference sites were mainly from a Travelling Stock Reserve (TSR) along Kings Plains Road and on freehold land where vegetation has not been significantly cleared (Figure 2).

Eleven plots are located within the Kings Plains Road TSR, located between the study area and Kings Plains National Park, one within Kings Plain National Park and six within freehold land.

Three replicate plots were collected within each of the 6 vegetation types impacted by the Wind Farm proposal (i.e. 18 plots in total).

Site selection was largely influenced by the relative absence of previous disturbance.

Reference sites showed no evidence of recent major disturbance from fire, frequent burning regimes, flooding, and minimal or no evidence of timber harvesting, firewood collection, soil disturbance, or dieback (in excess of normal senescence). This statement is corroborated by the abundance of tree hollows and fallen timber as shown in the results for each plot in Tables 2-13.

Exotic weed cover was low relative to other vegetation in the region, and there was no evidence of recent trampling or grazing by introduced herbivores.

The reference sites in the TSR have not been subject to pasture improvement, and species richness/diversity was high. The vegetation on freehold land was in a similar condition.

There is no evidence to suggest that native herbivores, such as Swamp Wallabies and Eastern Grey Kangaroos, are overabundant in the area. Natural recruitment of native plant species was evident at each of the sites chosen for local benchmarks plots.

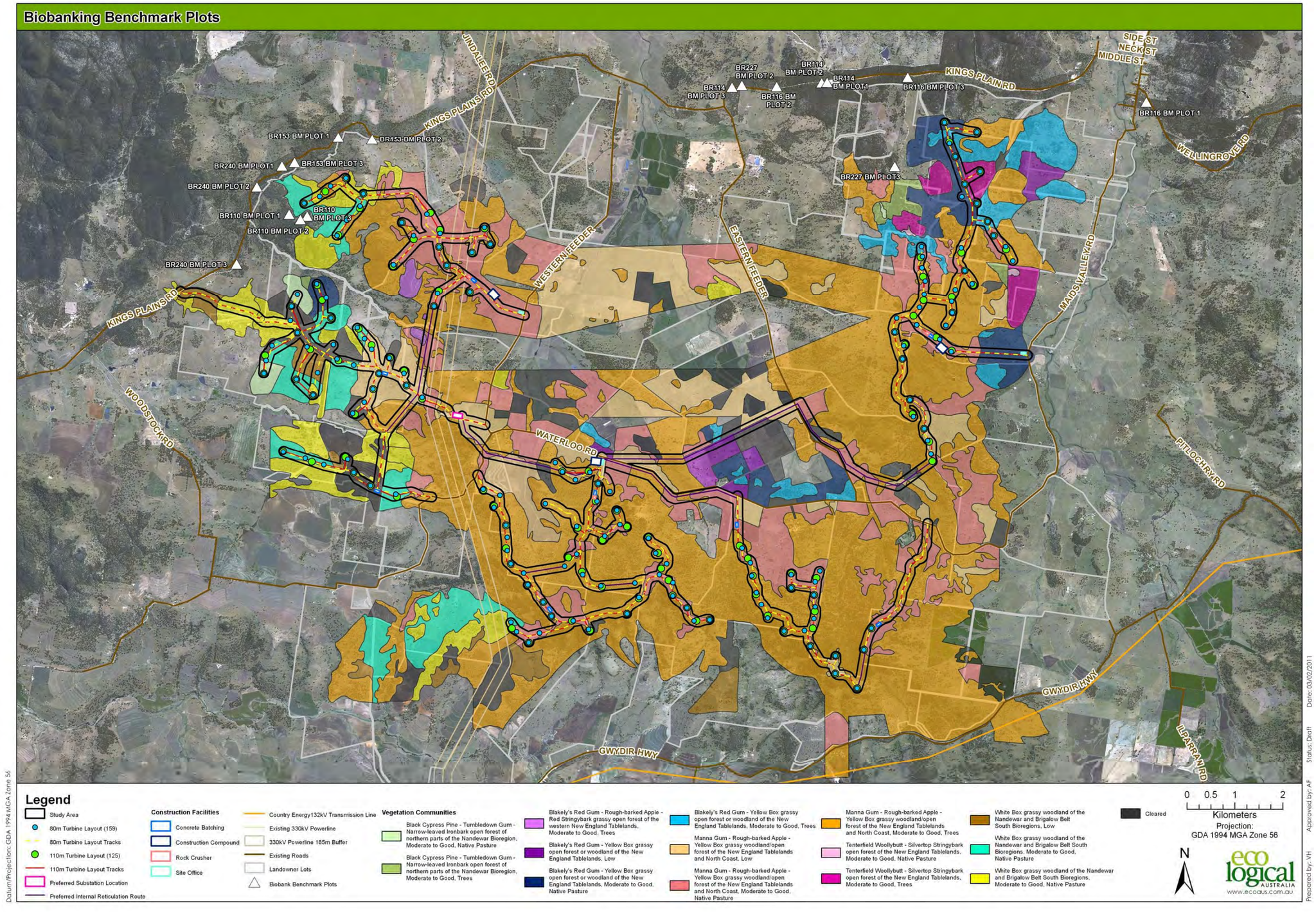

Figure 2. Location of local benchmark plots

5 Methods

Six Border Rivers – Gwydir CMA Revised Biometric Vegetation Types (RBVTs) have been mapped throughout the study area and broader locality as part of the Environmental Assessment report (ELA in prep) (Figure 2). They are outlined in Table 1 along with their EEC equivalents.

Table 1 Revised Biometric Vegetation Types and EEC Equivalents mapped at proposed Sapphire Wind Farm study area

Revised Biometric Vegetation Type	TSC Act EEC	EPBC Act EEC
BR110: Black Cypress Pine – Tumbledown Gum – Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion	-	-
BR114: Blakely's Red Gum – Rough-barked Apple – Red Stingybark grassy open forest of the Western New England Tablelands		
BR116: Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tablelands	White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) – ***Critically endangered on EPBC Act***
BR153: Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast	Ribbon Gum, Mountain Gum, Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	-
BR227: Tenterfield Woollybutt – Silvertop Stringybark open forest of the New England Tablelands	-	-
BR240: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) – ***Critically endangered on EPBC Act***

Local benchmark data have been collected for each of these six vegetation types.

The method used in collecting local benchmark data is as described in Appendix 2 of the BAMCCOM and summarised in Table 2:-

Table 2 BioBanking attributes subject to local benchmark variation.

Attribute	Assessment Method	Subject to Local Benchmark Variation
Native Plant Species Richness (Number of Species)	20m X 20m plot	Yes
Native Over-storey Cover (Tallest woody stratum – Trees in this case)	Percent Foliage Cover at 10 points along a 50m transect	Yes
Native Mid-storey Cover (Shrubs and tree regeneration between 1m and the Over-storey)	Percent Foliage Cover at 10 points along a 50m transect	Yes
Native Ground Cover (Grasses) (Native grasses below 1m)	Percent frequency of grasses at 50 points along the 50m transect (i.e. every 1m)	Yes
Native Ground Cover (Shrubs) (Native shrubs below 1m)	Percent frequency of shrubs at 50 points along the 50m transect (i.e. every 1m)	Yes
Native Ground Cover Other (Native herbaceous dicots, monocots, ferns, lilies, orchids, sedges and rushes. Fungi, lichens and bryophytes not included)	Percent frequency of native 'other' at 50 points along the 50m transect (i.e. every 1m)	Yes
Exotic Plant Cover (Exotic plants are vascular plants not native to Australia)	Over-storey and mid-storey weeds - Percent Foliage Cover at 10 points along a 50m transect Ground cover weeds - Percent frequency of grasses at 50 points along the 50m transect (i.e. every 1m)	No
Number of Trees with Hollows	Number of living and dead trees with hollows within 50m X 20m plot	Yes
Length of Fallen Logs	The total length of logs at least 10 cm in diameter and at least 0.5 m long	Yes
Over-storey Regeneration	The proportion of over-storey species present in the zone that are regenerating (i.e. with diameter at breast height < 5 cm)	No

Local Benchmark data were collected during May 2009 by Nathan Smith and Peter Richards. In total, 18 plots were completed for the six biometric vegetation types (Figure 2).

Field Data sheets for all plots are included in Appendix A and a summarised list of all species recorded in Appendix B.

The local benchmark calculator.xls was used to generate local benchmarks (Results included in Tables 2-13 and raw data in Appendix C).

These benchmarks are proposed for use, subject to Director-General DECCW approval, in Step 5b of the Biobanking Credit calculator for the Site Value assessment (DECC 2009).

6 Local Benchmark Data Results

6.1 BR110: BLACK CYPRESS PINE – TUMBLEDOWN GUM – NARROW-LEAVED IRONBARK OPEN FOREST

BR110 was an open forest type largely associated with acid volcanic outcrops in the locality (

Figure 3).

BR110 was dominated by *Eucalyptus dealbata* (Tumbledown Gum) and *E. crebra* (Narrow-leaved Ironbark), while *Callitris endlicheri* (Black Cypress Pine) was present mostly as juvenile regrowth. *Eucalyptus laevopinea* (Silvertop stringybark) was present as a co-dominant tree species while *Notelaea microcarpa* (Native Olive), *Monotoca scoparia*, *Lespedeza juncea* subsp. *sericea* and *Indigofera australis* (Australian Indigo) were occasionally present as shrubs. A variety of native herbs and grasses dominated the ground layer and included species such as *Aristida ramosa* (Purple Wiregrass), *Bothriochloa macra* (Red Grass), *Poa sieberiana* (Snow Grass), *Calotis cuneata* (Mountain Burr-Daisy), *Desmodium varians* (Slender Tick-trefoil), *Geranium solanderi* (Native Geranium) and *Wahlenbergia communis* (Tufted Bluebell).

BR110 does not equate to any EEC as listed on the TSC or EPBC Acts.

Table 3 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR110.

Keith Formation & Class: Dry sclerophyll forests (shrubby sub-formation) - Northern Tableland Dry Sclerophyll Forests					
Vegetation Type: Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion					
Veg Type ID: BR110	**Current Benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Revised Local Benchmark**
20m x 20m Plot					
Native plant species	30	46	40	43	≥43
50m transect					
Native over-storey cover	25-40	21	20	23.5	20-23
Native mid-storey cover	6-25	0	0	2	*0-2
Native ground cover (grasses)	20-30	62	64	58	59-64
Native ground cover (shrubs)	3-10	2	0	0	0-2
Native ground cover (other)	3-5	58	30	34	31-53
50m x 20m plot					
Number of trees with hollows	2	9	5	8	≥8
Total length of fallen logs	20	210	234	220	≥220
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 4 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR110 BM PLOT 1	343449	6717327
BR110 BM PLOT 2	343686	6717214
BR110 BM PLOT 3	343829	6717284

6.2 BR114: BLAKELY'S RED GUM – ROUGH-BARKED APPLE – RED STRINGYBARK GRASSY OPEN FOREST

BR114 was an open forest type and was associated with a single acid volcanic outcrop within the study area (Figure 3).

Within the study area, BR114 was dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *E. macrorhyncha* (Red Stringybark). *Acacia terminalis* (Sunshine Wattle), *N. microcarpa* and *L. juncea* subsp. *sericea* were occasionally present as shrubs. The ground layer was dominated by a variety of native herbs and grasses that were in common with BR110.

BR114 does not equate to an EEC as listed on the TSC or EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 5 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR114.

Keith Formation & Class: Grassy Woodlands - New England Grassy Woodlands					
Vegetation Type: Blakely's Red Gum - Rough-barked Apple - Red Stringybark grassy open forest of the western New England Tablelands					
Veg Type ID: BR114	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	25	36	40	51	≥40
50m transect					
Native over-storey cover	6-25	24.5	30	33	26-32
Native mid-storey cover	0-5	6	0	1.5	*0-5
Native ground cover (grasses)	30-40	50	24	44	28-49
Native ground cover (shrubs)	3-10	8	4	0	1-7
Native ground cover (other)	3-5	24	16	32	18-30
50m x 20m plot					
Number of trees with hollows	1	6	4	4	≥4
Total length of fallen logs	15	266	125	53	≥125
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 6 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR114 BM PLOT 1	354676	6720081
BR114 BM PLOT 2	354560	6720073
BR114 BM PLOT 3	352692	6719983

Figure 3. Black Cypress Pine - Tumbledown Gum - Narrow-leaved Ironbark open forest.

Figure 4. Blakely's Red Gum - Rough-barked Apple - Red Stringybark grassy open forest

6.3 BR116: BLAKELY'S RED GUM – YELLOW BOX GRASSY OPEN FOREST OR WOODLAND

Within the study area BR116 was present as an open forest type or woodland and was associated with the basalt geology within the study area (Figure 4).

Within the study area, BR116 was dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *E. melliodora* (Yellow Box). *Acacia implexa* (Hickory Wattle), *Exocarpos cupressiformis* (Native Cherry) and *Lespedeza juncea* subsp. *sericea* were only present as a sparse layer of shrubs at the benchmark plots. The ground layer of this RBVT was dominated by a variety of herbs and grasses including *Aristida* spp., *Asperula conferta* (Common Woodruff), *Carex inversa* (Knob Sedge), *Cymbopogon refractus* (Barbed Wire Grass), *Desmodium varians* (Slender Tick-trefoil), *Wahlenbergia communis* (Tufted Bluebell) and *Themeda australis* (Kangaroo Grass).

BR116 equates to the Box – Gum Woodland EEC as listed on the TSC and EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 7 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR116.

Keith Formation & Class: Grassy Woodlands - New England Grassy Woodlands					
Vegetation Type: Blakely's Red Gum - Rough-barked Apple - Red Stringybark grassy open forest of the western New England Tablelands					
Veg Type ID: BR116	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	25	39	38	39	≥39
50m transect					
Native over-storey cover	6-25	21.5	20	21	20-21
Native mid-storey cover	0-5	0	0	1	*0-1
Native ground cover (grasses)	30-40	48	42	44	42-47
Native ground cover (shrubs)	3-10	0	2	0	*0-2
Native ground cover (other)	3-5	24	12	20	14-23
50m x 20m plot					
Number of trees with hollows	1	6	3	5	≥5
Total length of fallen logs	15	95	73	57	≥73
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 8 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR116 BM PLOT 1	361334	6719672
BR116 BM PLOT 2	353624	6719994
BR116 BM PLOT 3	356357	6720186

6.4 BR153: MANNA GUM – ROUGH-BARKED APPLE – YELLOW BOX GRASSY WOODLAND/OPEN FOREST

Within the study area BR153 was present as an open forest type or woodland and was specifically associated with the basalt geology within the study area (Figure 5).

Within the study area, BR153 was dominated by *Eucalyptus viminalis* (Ribbon/Manna Gum) and *Angophora floribunda* (Rough-barked Apple) with *E. melliodora* (Yellow Box) less common. Shrubs were largely absent from this RBVT within the study area and the ground layer was dominated by a similar variety of herbs and grasses to BR116.

BR153 equates to the Ribbon Gum, Mountain Gum, Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion as listed on the TSC Act. There is no equivalent EEC listing on the EPBC Act for this RBVT.

Biometric benchmark comparison to local benchmark

Table 9 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR153.

Keith Formation & Class: Grassy Woodlands - Tableland Clay Grassy Woodlands					
Vegetation Type: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast					
Veg Type ID: BR153	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	23	38	31	38	≥38
50m transect					
Native over-storey cover	6-25	18.5	12	21.5	13-21
Native mid-storey cover	0-5	0	0	0	*0-0
Native ground cover (grasses)	30-40	80	62	72	64-78
Native ground cover (shrubs)	0	8	10	2	3-10
Native ground cover (other)	3-5	16	0	16	3-16
50m x 20m plot					
Number of trees with hollows	1	0	1	4	≥1
Total length of fallen logs	15	146	31	133	≥133
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 10. Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR153 BM PLOT 1	344474	6718932
BR153 BM PLOT 2	345182	6718891
BR153 BM PLOT 3	343563	6718406

Figure 5. Blakely's Red Gum - Yellow Box grassy open forest or woodland.

Figure 6. Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest.

6.5 BR227: TENTERFIELD WOOLLYBUTT – SILVERTOP STRINGYBARK OPEN FOREST

BR227 was an open forest type and was associated with acid volcanic outcrops within the locality (Figure 6).

Within the study area, BR227 was dominated by *Eucalyptus banksii* (Tenterfield Woollybutt), a stringybark *E. subtilior* and *E. crebra*. The shrub layer was largely removed, however *Indigofera australis* (Australian Indigo) and *Lespedeza juncea* subsp. *sericea* were occasionally present. The ground layer was typical of the RBVTs associated with acid volcanics as previously described for BR110 and BR114.

BR227 does not equate to an EEC as listed on the TSC or EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 11 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR227.

Keith Formation & Class: Dry sclerophyll forests (shrub/grass sub-formation) - New England Dry Sclerophyll Forests					
Vegetation Type: Tenterfield Woollybutt - Silvertop Stringybark open forest of the New England Tablelands					
Veg Type ID: BR227	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	33	53	35	49	≥49
50m transect					
Native over-storey cover	25-40	30.5	18.5	15.5	16-28
Native mid-storey cover	6-25	4	2	0	*0-4
Native ground cover (grasses)	18-20	12	36	84	17-74
Native ground cover (shrubs)	3-10	14	18	4	6-17
Native ground cover (other)	3-5	8	18	18	10-18
50m x 20m plot					
Number of trees with hollows	2	4	3	0	≥3
Total length of fallen logs	20	80	364	157	≥157
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 12 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR227 BM PLOT 1	344012	6726149
BR227 BM PLOT 2	352897	6720021
BR227 BM PLOT3	356086	6718319

6.6 BR240: WHITE BOX GRASSY WOODLAND

BR240 was present as a woodland type and was associated with the basalt geology largely in the western part of the study area (Figure 7).

Within the study area, BR240 was dominated by *Eucalyptus albens* (White Box) with *A. floribunda* as an associated species. Shrubs were largely absent while the ground layer was typical of the other units associated with basalt geology, BR116 and BR153. Clearing and grazing were substantial within this RBVT within the study area. Some areas retained some resilience with a variety of native grasses and herbs present but for the most part BR240 was degraded due to soil disturbance (tilling and pasture improvement) and subsequent weed invasion.

BR240 equates to the Box – Gum Woodland EEC as listed on the TSC and EPBC Acts.

Biometric benchmark comparison to local benchmark

Table 13 Comparison of biometric benchmark, local benchmark plot data and calculated local benchmark for Vegetation Type BR240.

Keith Formation & Class: Grassy Woodlands - Western Slopes Grassy Woodlands					
Veg Type: White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions					
Veg Type ID: BR240	**DECCW benchmark**	**Plot 1**	**Plot 2**	**Plot 3**	**Local Benchmark**
20m x 20 m plot					
Native plant species	23	40	47	33	≥40
50m transect					
Native over-storey cover	6-25	26	18	25	19-26
Native mid-storey cover	0-5	0	20	0	*0-16
Native ground cover (grasses)	30-40	66	62	76	63-74
Native ground cover (shrubs)	0	0	0	6	0-5
Native ground cover (other)	3-5	6	18	14	8-17
50m x 20m plot					
Number of trees with hollows	1	3	2	2	≥2
Total length of fallen logs	30	144	58	24	≥58
Note: * Anything benchmark with a value of zero should be discussed with DECCW and changed to a value of 0.1 as per other benchmarks and correspondence with John Siedel.					

Table 14 Location of reference plots used in local benchmark calculator.

Reference Plot	Easting	Northing
BR240 BM PLOT 1	343300	6718331
BR240 BM PLOT 2	342777	6717896
BR240 BM PLOT 3	342354	6716288

Figure 7.Tenterfield Woollybutt – Silvertop Stringybark open forest.

Figure 8. White Box grassy woodland.

References

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Appendix A: Reference site field data sheets

Provide as scanned PDF files

Appendix B: Reference plot floristic data

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Acacia buxifolia	Box-leaved Wattle													x					
Acacia deanei	Green Wattle																x	x	x
Acacia filicifolia	Fern-leaved Wattle						x		x							x			
Acacia implexa	Hickory Wattle			x		x		x					x						
Acacia neriifolia	Silver Wattle													x					
Acacia terminalis	Sunshine Wattle			x															
Acacia ulicifolia	Prickly Moses				x														
Acaena ovina							x	x			x	x	x				x	x	x
Ajuga australis	Austral Bugle				x	x	x	x		x	x			x		x	x		
Amyema spp.																x			
Angophora floribunda	Rough-barked Apple				x	x	x				x	x	x	x			x	x	
Aristida leptopoda	White Speargrass																x		
Aristida ramosa	Purple Wiregrass	x	x																x
Aristida ramosa var. *speciosa*					x	x							x	x		x			
Aristida spp.				x			x	x	x	x					x			x	
Aristida vagans	Threeawn Speargrass					x									x	x			
Arthropodium spp.		x						x	x										
Asperula conferta	Common Woodruff	x	x	x				x			x	x	x	x					x
Austrodanthonia racemosa									x		x					x			
Austrodanthonia spp.		x	x	x	x	x			x	x		x			x	x			x
Austrostipa scabra	Speargrass																		x
Austrostipa spp.																		x	
Bidens pilosa	Cobbler's Pegs	x	x	x	x		x	x									x	x	
Bidens subalternans	Greater Beggar's Ticks						x												
Billardiera scandens	Appleberry					x													
Bothriochloa biloba													x						
Bothriochloa decipiens var. *decipiens*																x			
Bothriochloa macra	Red Grass	x	x	x					x		x	x	x				x	x	x
Brachyloma daphnoides	Daphne Heath					x													
Brachyscome microcarpa		x	x															x	
Brachyscome procumbens														x	x				
Brachyscome spp.				x			x					x				x			
Bursaria spinosa	Native Blackthorn		x				x		x										
Callitris endlicheri	Black Cypress Pine									x									
Calotis cuneata	Mountain Burr-Daisy	x					x												
Calotis cuneifolia	Purple Burr-Daisy				x										x	x		x	
Calotis lappulacea	Yellow Burr-daisy					x		x	x	x									
Carex inversa	Knob Sedge	x	x		x	x	x	x			x	x	x		x		x	x	

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Cassinia laevis	Cough Bush									x							x		
Cassinia quinquefaria										x					x				
Chamaesyce spp.		x															x		
Cheilanthes sieberi		x	x	x						x					x	x			x
Chloris ventricosa	Tall Chloris																		x
Choretrum candollei	White Sour Bush									x									
Chrysocephalum apiculatum	Common Everlasting						x			x				x	x	x			
Cirsium vulgare	Spear Thistle						x			x	x	x		x		x			
Conyza bonariensis	Flaxleaf Fleabane		x		x		x	x		x					x	x		x	
Conyza spp.											x								
Cotoneaster spp.										x									
Cyclospermum leptophyllum	Slender Celery													x					
Cymbonotus lawsonianus	Bear's Ear				x	x				x				x			x	x	
Cymbopogon refractus	Barbed Wire Grass	x	x		x	x	x	x	x	x				x	x	x	x	x	x
Cynoglossum spp.									x	x	x						x		
Cyperus gracilis	Slender Flat-sedge	x												x					
Daucus glochidiatus	Native Carrot		x	x			x		x	x	x			x					x
Daviesia genistifolia	Broom Bitter Pea								x	x									
Desmodium brachypodum	Large Tick-trefoil	x	x	x							x						x	x	
Desmodium gunnii	Slender tick trefoil		x	x	x		x											x	
Desmodium varians	Slender Tick-trefoil	x					x	x	x				x	x		x			
Deyeuxia spp.										x									
Dianella caerulea	Blue Flax-lily											x						x	
Dianella longifolia							x	x			x		x			x	x		
Dianella revoluta					x	x	x	x	x	x	x		x	x	x		x		
Dianella spp.			x																
Dichanthium sericeum	Queensland Bluegrass												x	x				x	x
Dichelachne micrantha	Shorthair Plumegrass	x		x	x	x	x	x		x	x			x	x	x	x	x	
Dichondra repens	Kidney Weed	x	x															x	
Dichondra sp. A							x	x	x	x			x			x	x		
Dillwynia phylicoides														x					
Dillwynia sieberi													x			x		x	
Dipodium spp.											x						x		
Dodonaea viscosa subsp. *spatulata*																x			
Echinopogon caespitosus	Bushy Hedgehog-grass	x	x	x	x	x	x	x	x	x				x	x	x		x	
Einadia nutans	Climbing Saltbush		x															x	
Elymus scaber							x	x				x	x						
Entolasia stricta	Wiry Panic													x					
Eragrostis brownii	Brown's Lovegrass		x	x															
Eragrostis curvula	African Lovegrass							x							x	x			
Eragrostis leptostachya	Paddock Lovegrass				x	x			x	x						x			
Eremophila debilis	Amulla												x						x
Eucalyptus albens	White Box																x	x	x

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Eucalyptus banksii	Tenterfield Woollybutt				x	x								x	x	x			
Eucalyptus blakelyi	Blakely's Red Gum				x	x	x	x	x	x		x			x				
Eucalyptus bridgesiana	Apple Box						x												
Eucalyptus caliginosa	Broad-leaved Stringybark														x				
Eucalyptus crebra	Narrow-leaved Ironbark	x	x	x	x									x	x				
Eucalyptus dealbata	Tumbledown Red Gum	x	x	x															
Eucalyptus laevopinea	Silver-top Stringybark	x	x	x															
Eucalyptus macrorhyncha	Red Stringybark																	x	
Eucalyptus mckieana (vulnerable)	McKie's Stringybark					x	x		x					x		x			
Eucalyptus melliodora	Yellow Box		x	x				x	x	x		x				x			
Eucalyptus subtilior					x									x	x	x			
Eucalyptus viminalis	Ribbon Gum										x	x	x						
Euchiton spp.				x			x	x		x	x	x	x	x		x	x	x	
Exocarpos cupressiformis	Native Cherry	x						x											
Fimbristylis dichotoma	Common Fringe-sedge				x	x	x	x								x			
Galium aparine	Goosegrass	x																	
Galium gaudichaudii	Rough Bedstraw						x							x		x			
Geranium solanderi	Native Geranium	x	x									x							
Geranium spp.				x			x	x	x		x		x	x	x	x	x	x	x
Glycine clandestina		x			x			x	x	x		x	x		x	x	x	x	
Glycine spp.			x	x															x
Glycine tabacina	Glycine	x				x	x		x			x	x			x	x	x	
Gonocarpus tetragynus							x												
Goodenia bellidifolia					x		x	x	x	x					x	x			
Goodenia paniculata		x																	
Grevillea ramosissima subsp. *ramosissima*	Fan Grevillea													x					
Haloragis heterophylla						x		x							x				
Hardenbergia violacea	False Sarsaparilla			x		x	x		x					x	x	x			
Heliotropium spp.																		x	
Hibbertia obtusifolia	Hoary guinea flower	x	x	x											x	x		x	
Hovea heterophylla							x									x			
Hovea linearis				x															
Hydrocotyle laxiflora	Stinking Pennywort													x			x		
Hydrocotyle peduncularis							x												
Hydrocotyle spp.																		x	x
Hypericum gramineum	Small St John's Wort	x	x	x		x	x			x								x	
Hypericum perforatum	St. Johns Wort										x								
Hypochaeris glabra	Smooth Catsear									x				x		x			
Hypochaeris radicata	Catsear	x	x	x			x	x		x	x	x	x	x	x			x	
Imperata cylindrica var. *major*	Blady Grass										x								
Indigofera australis	Australian Indigo	x				x								x	x	x			
Jacksonia scoparia	Dogwood			x															
Joycea pallida	Silvertop Wallaby Grass				x		x							x					

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Juncus bufonius	Toad Rush							x											
Juncus usitatus					x	x	x	x		x									
Lachnagrostis filiformis															x				
Lactuca serriola	Prickly Lettuce									x						x			
Lagenophora stipitata	Blue Bottle-daisy													x		x		x	
Lepidium spp.			x																
Lepidosperma laterale														x					
Leptospermum brevipes					x									x					
Lespedeza juncea subsp. *sericea*		x	x		x		x	x			x	x	x	x	x			x	x
Leucochrysum albicans																		x	x
Leucopogon muticus	Blunt Beard-heath					x								x					
Lissanthe strigosa	Peach Heath				x	x	x		x						x	x			
Lolium perenne	Perennial Ryegrass						x												
Lomandra confertifolia				x															
Lomandra filiformis	Wattle Matt-rush							x											
Lomandra longifolia	Spiny-headed Mat-rush				x	x	x		x	x				x	x	x			
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush		x	x	x	x	x	x	x	x		x		x		x	x	x	
Lotus australis	Australian Trefoil																	x	
Luzula spp.							x								x				
Medicago spp.		x	x	x														x	
Melichrus urceolatus	Urn Heath	x		x	x	x	x			x				x	x	x			
Mentha diemenica	Slender Mint																x		
Mentha satureioides	Native Pennyroyal								x										
Mentha spp.																		x	
Micrantheum ericoides																			x
Microlaena stipoides		x	x	x	x	x	x		x	x	x				x	x			
Microseris lanceolata											x								
Monotoca scoparia		x												x					
Muellerina eucalyptoides						x													
Notelaea microcarpa	Native Olive	x	x	x									x				x	x	x
Olearia elliptica	Sticky Daisy Bush																	x	
Olearia sp. aff. *elliptica*							x												
Opercularia aspera	Coarse Stinkweed				x	x	x	x							x	x			
Opercularia diphylla		x	x	x															
Oxalis perennans		x	x	x		x					x	x	x	x			x		x
Oxalis spp.										x									
Panicum queenslandicum	Yadbila Grass	x	x								x	x							
Paspalum dilatatum	Paspalum										x	x							
Persoonia cornifolia														x					
Petrorhagia nanteuilii			x																
Phyllanthus spp.																			x
Phyllanthus virgatus											x	x							
Picris hieracioides	Hawkweed Picris												x					x	

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Picris spp.			x								x								
Pimelea curviflora											x		x				x	x	x
Pimelea neo-anglica	Poison Pimelea															x			
Plantago debilis			x	x							x	x	x				x		x
Plantago lanceolata	Lamb's Tongues						x	x		x									
Platysace ericoides														x					
Poa sieberiana		x			x	x	x	x	x	x	x	x					x	x	x
Poa spp.			x																
Polygala japonica																	x		
Polygala spp.				x															
Pomax umbellata						x													
Poranthera microphylla																x			
Poranthera spp.		x		x															
Pratia concolor	Poison Pratia												x						x
Pterostylis spp.														x					
Pultenaea foliolosa														x					
Pultenaea retusa																		x	
Pycnosorus globosus											x	x							
Ranunculus lappaceus	Common Buttercup							x											
Ranunculus repens	Creeping Buttercup												x						
Rhodanthe spp.											x								
Rosa rubiginosa	Sweet Briar						x	x		x	x	x	x			x	x		
Rostellularia spp.																			x
Rubus parvifolius	Native Raspberry										x								x
Rumex brownii	Swamp Dock												x						
Sarga leiocladum								x	x		x	x	x				x		
Scleranthus biflorus								x	x		x	x						x	
Scutellaria humilis	Dwarf Skullcap													x					
Senecio hispidulus	Hill Fireweed								x								x		
Senecio prenanthoides							x				x								
Senecio quadridentatus	Cotton Fireweed										x	x	x				x		
Senecio spp.							x			x				x	x				
Sigesbeckia orientalis subsp. *orientalis*	Indian Weed	x	x	x															
Solanum nigrum	Black-berry Nightshade									x									
Sonchus oleraceus	Common Sowthistle	x	x					x		x									
Spartothamnella juncea																			x
Sporobolus creber	Slender Rat's Tail Grass						x												
Styphelia triflora	Pink Five-Corners													x					
Styphelia viridis																		x	
Swainsona galegifolia	Smooth Darling Pea										x		x				x	x	
Swainsona spp.				x															
Taraxacum officinale	Dandelion											x						x	
Themeda australis	Kangaroo Grass				x	x	x	x		x	x	x	x		x	x	x	x	x

Scientific Name	Common Name	BR110 Plot 1	BR110 Plot 2	BR110 Plot 3	BR114 Plot 1	BR114 Plot 2	BR114 Plot 3	BR116 Plot 2	BR116 Plot 3	BR116 Plot 1	BR153 Plot 1	BR153 Plot 2	BR153 Plot 3	BR227 Plot 1	BR227 Plot 2	BR227 Plot 3	BR240 Plot 1	BR240 Plot 2	BR240 Plot 3
Thesium australe (vulnerable)	Austral Toadflax												x						
Trachymene incisa										x						x			
Trifolium campestre	Hop Clover										x						x		
Trifolium repens	White Clover	x	x	x															
Verbascum virgatum	Twiggy Mullein						x												
Verbena rigida var. *rigida*	Veined Verbena													x			x		
Vernonia cinerea		x	x	x	x	x			x							x			
Veronica calycina	Hairy Speedwell							x									x		
Veronica plebeia	Trailing Speedwell	x	x	x														x	
Vicia sativa																		x	
Viola betonicifolia	Native Violet	x						x	x		x	x		x			x	x	
Vittadinia cuneata	Fuzzweed	x			x								x	x				x	
Wahlenbergia communis	Tufted Bluebell	x	x	x	x	x	x	x		x	x	x		x		x	x	x	x
Wahlenbergia gracilis	Sprawling Bluebell												x						
Westringia eremicola	Slender Westringia													x					
Xanthorrhoea johnsonii														x					
Zornia dictyocarpa var. dictyocarpa				x															

Appendix C: Local Benchmark Calculator Spreadsheet

Provided as a xls file.

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Appendix D Fauna species list

Class	Common	Species	Exotic
Amphibia	Peron's Tree Frog	*Litoria peronii*	
Aves	Australian Magpie	*Cracticus tibicen*	
	Australian Wood Duck	*Chenonetta jubata*	
	Channel-billed Cuckoo	*Scythrops novaehollandiae*	
	Crimson Rosella	*Platycercus elegans*	
	Eastern Rosella	*Platycercus eximius*	
	Galah	*Eolophus roseicapillus*	
	Grey Butcherbird	*Cracticus torquatus*	
	Laughing Kookaburra	*Dacelo novaeguineae*	
	Magpie-lark	*Grallina cyanoleuca*	
	Masked lapwing	*Vanellus miles*	
	Musk Lorikeet	*Glossopsitta concinna*	
	Nankeen Kestrel	*Falco cenchroides*	
	Noisy Miner	*Manorina melanocephala*	
	Red Wattlebird	*Anthochaera carunculata*	
	Red-rumped Parrot	*Psephotus haematonotus*	
	Rufous Songlark	*Cincloramphus mathewsi*	
	Straw-necked Ibis	*Threskiornis spinicollis*	
	Striated Pardalote	*Pardalotus striatus*	
	Sulphur-crested Cockatoo	*Cacatua galerita*	
	Tawny Frogmouth	*Podargus strigoides*	
	Torresian Crow	*Corvus orru*	
Mammalia	Brown Hare	*Lepus capensis*	*
	Eastern Grey Kangaroo	*Macropus giganteus*	
	Feral Pig	*Sus scrofa*	*
	Rabbit	*Oryctolagus cuniculus*	*
	Red Fox	*Vulpes vulpes*	*
Reptilia	Bearded Dragon	*Pogona barbata*	

Appendix E BioBanking Credit Calculator report

Biodiversity credit report

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

Date of report: 11/12/2017 Time: 3:36:45PM Calculator version: v4.0

Major Project details

Proposal ID:	227/2017/4602MP
Proposal name:	Sapphire Solar Farm - SSD8643
Proposal address:	Waterloo Road Kingsland NSW 2370
Proponent name:	CWP Solar Pty Ltd
Proponent address:	PO Box 1708 Newcastle NSW 2300
Proponent phone:	02 4013 4640
Assessor name:	Alex Pursche
Assessor address:	Suite 28 & 29, Level 7 19 Bolton Street Newcastle NSW 2300
Assessor phone:	+61 2 4910 3406
Assessor accreditation:	227

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	30.33	170.00
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion	28.68	419.00
White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	45.09	73.03
Total	104.10	662

Credit profiles

1. Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion, (BR153)

Number of ecosystem credits created	419
IBRA sub-region	Glen Innes-Guyra Basalts

Offset options - Plant Community types	Offset options - IBRA sub-regions
Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion, (BR153) Black Sallee grassy woodland of the New England Tableland Bioregion, (BR112) Snow Gum - Black Sallee grassy woodland of the New England Tableland Bioregion, (BR218) Snow Gum - New England Peppermint grassy open forest of the New England Tableland Bioregion, (BR220) Black Sallee - Snow Gum grassy woodland of the New England Tableland Bioregion, (BR269) Candlebark - Ribbon Gum grassy woodland of the New England Tableland Bioregion, (BR279) New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion, (BR319) Ribbon Gum - Mountain Gum - Snow Gum grassy open forest or woodland of the New England Tableland Bioregion, (BR329) Mountain Gum - Ribbon Gum open forest of drainage lines of the southern New England Tableland Bioregion, (BR307)	Glen Innes-Guyra Basalts and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR240)

Number of ecosystem credits created	73
IBRA sub-region	Glen Innes-Guyra Basalts

Offset options - Plant Community types	Offset options - IBRA sub-regions
White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR240) Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (BR141) Grey Box - Blakely's Red Gum - Yellow Box grassy open forest of the Nandewar Bioregion and New England Tableland Bioregion, (BR144) White Cypress Pine - Silver-leaved Ironbark grassy woodland of the Nandewar Bioregion, (BR244) Carbeen - White Box +/- Silver-leaved Ironbark grassy tall woodland on basalt hills, Brigalow Belt South Bioregion, (BR280) Silver-leaved Ironbark grassy tall woodland on clay-loam soils on plains in the Brigalow Belt South Bioregion, (BR350) Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion, (BR296) White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion, (BR388) White Box grassy woodland on the Inverell basalts mainly in the Nandewar Bioregion, (BR391)	Glen Innes-Guyra Basalts and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion, (BR272)

Number of ecosystem credits created	170
IBRA sub-region	Glen Innes-Guyra Basalts

Offset options - Plant Community types	Offset options - IBRA sub-regions
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion, (BR272) Broad-leaved Stringybark - Blakely's Red Gum grassy woodlands of the New England Tableland Bioregion, (BR121) Rough-barked Apple - Cabbage Gum grassy woodland of the New England Tableland Bioregion, (BR334) Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion, (BR330)	Glen Innes-Guyra Basalts and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Appendix F EPBC Referral

Title of Proposal - Sapphire Solar Farm Project, 28km east of Inverell, NSW

Section 1 - Summary of your proposed action

Provide a summary of your proposed action, including any consultations undertaken.

1.1 Project Industry Type

Energy Generation and Supply (renewable)

1.2 Provide a detailed description of the proposed action, including all proposed activities.

Sapphire Solar Farm Pty Ltd (a subsidiary of CWP Solar Pty Ltd) propose to build and operate a utility-scale photovoltaic solar farm with battery storage at Kings Plains, within the Inverell Shire Local Government Area (LGA) 30 km east of Inverell in northern NSW. The project is called the Sapphire Solar Farm ('SSF'; the 'Proposed Development'). Fully constructed, the SSF is currently expected to have an electricity generation capacity of approximately 180 megawatts (MW - alternating current(AC)) at the point of connection, producing enough energy (370 GWh) to power the equivalent of 66,000 average NSW households each year. The addition of battery-based storage (c.100 MWh) will allow for the Proposed Development, along with the Sapphire Wind Farm (SWF), to dispatch scheduled and reliable renewable energy generated power to the National Electricity Market (NEM).

The electricity generated and dispatched by the Proposed Development would result in significant carbon savings due to the electricity displaced from the current NSW generation supply, which is heavily reliant on coal powered generation. Based on current NSW emission figures of 0.87 kg of CO2-equivilent per kWh, up to 330,000 tonnes of CO2 would be displaced by the Proposed Development annually.

The Proposed Development would include, but not necessarily be limited to, the following elements:
-Solar arrays: solar panels supported by a mounting system installed on piles driven or screwed into the ground;
-Battery-based storage facilities;
-Power Conversion Units (PCU's) inclusive of Inverters/Rectifiers, Ring Main Units, LV/MV step-up Transformers located throughout the Proposed Development;
-Collector systems: above and/or below ground onsite cabling and electrical connections between the existing SWF substation (the 'Substation') and the respective PCU's;
-Operation and maintenance (O&M) building including workshop, warehouse, offices, ablutions, and carpark;
-Site access and onsite access tracks;
-Fencing and security system;
-Meteorological stations;
-Vegetation buffers (if required) for visual screening; and
-Firebreaks.

In addition to the key components outlined above, there would be a temporary construction compound required to facilitate the construction and decommissioning phases of the Proposed Development. In order to minimise environmental impacts, the SSF temporary construction compound is proposed to be located within the temporary construction compound currently in use for construction of SWF.

The final scale and capacity of the Proposed Development would be optimised within the Site during post-consent studies based on a combination of the most suitable technology at the time of procurement, along with detailed geotechnical and grid connection studies.

It is anticipated that the Proposed Development would take up to 18 months to construct and would be operational over an initial term for approximately 25 years, however could extend for a further term depending on market and commercial circumstances.

It is expected that upgrading or repowering of the PV modules and ancillary equipment may be required throughout, or to extend, the operational life of the project. This will be a commercial decision made at the time based on the relative economics of solar PV generation and battery-based storage compared to alternatives. Decommissioning and restoration would occur at the end of the operational life of the Proposed Development. As such, planning consent for the Proposed Development is sought for 55 years to cover two full terms of operation and associated construction, upgrading and decommissioning periods.

A detailed description of the infrastructure is attached to this referral ('Description of Solar Farm Key Components").

1.3 What is the extent and location of your proposed action? Use the polygon tool on the map below to mark the location of your proposed action.

Area	Point	Latitude	Longitude
SSF approx bounding area	1	-29.704153294505	151.44578546204
SSF approx bounding area	2	-29.704302398711	151.44578546204
SSF approx bounding area	3	-29.70877542194	151.44321054139
SSF approx bounding area	4	-29.705644326599	151.42913430848
SSF approx bounding area	5	-29.707657184811	151.42698854127
SSF approx bounding area	6	-29.717720870645	151.42922013917
SSF approx bounding area	7	-29.723833135478	151.40999406495

Area	Point	Latitude	Longitude
SSF approx bounding area	8	-29.722715066071	151.39557450928
SSF approx bounding area	9	-29.726814592997	151.38381570496
SSF approx bounding area	10	-29.715931844669	151.38166993775
SSF approx bounding area	11	-29.716677276034	151.40012353577
SSF approx bounding area	12	-29.713024609457	151.3917121283
SSF approx bounding area	13	-29.70653893523	151.38750642457
SSF approx bounding area	14	-29.694311927542	151.39437287964
SSF approx bounding area	15	-29.691404066436	151.41548722901
SSF approx bounding area	16	-29.704153294505	151.44578546204

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for off-shore actions, shortest distance to mainland).

The Proposed Development is in an agricultural area located approximately 28 km east of Inverell and 35 km west of Glen Innes, in the Northern Tablelands region of NSW.

1.6 What is the size of the proposed action area development footprint (or work area) including disturbance footprint and avoidance footprint (if relevant)?

445ha

1.7 Is the proposed action a street address or lot?

Lot

1.7.2 Describe the lot number and title. Multiple - refer attached document.

1.8 Primary Jurisdiction.

New South Wales

1.9 Has the person proposing to take the action received any Australian Government grant funding to undertake this project?

No

1.10 Is the proposed action subject to local government planning approval?

No

1.11 Provide an estimated start and estimated end date for the proposed action.

Start date 06/2018

End date 12/2043

1.12 Provide details of the context, planning framework and State and/or Local government requirements.

Under the NSW *State Environmental Planning Policy (State and Regional Development) 2011*, electricity generating works (including solar) that have a capital investment value of more than $30 million are classified as "State Significant Development" (SSD) and require approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) through the preparation of an EIS. The Proposed Development has an estimated capital value of c. $280 million.

As such, this EIS has been prepared under Part 4 of the EP&A Act, in accordance with the Secretary's Environmental Assessment Requirements (SEARs), dated 23rd August 2017, and the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) which have been provided by the NSW Department of Planning and Environment (DP&E) who are the consent authority.

The local council (Inverell Shire Council) have been consulted throughout the process, and provided input into the SEARs however are not a consent authority for SSD.

1.13 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders.

Effective and broad community and stakeholder consultation provides communities and stakeholders with a clear understanding of a development proposal as well as opportunities to provide feedback to identify issues important to them and, as such, it is an essential part of the EIA process. CWP has carried out extensive consultation with the local community, stakeholders from the wider area and relevant Government Agencies in order to understand

and respond to community concerns during the design and assessment process leading to this Development Application (DA). A detailed account of all consultation will be prepared in the EIS however consultation thus far can be summarised as described in the list below.

Indigenous stakeholders have been consulted as part of the heritage assessments for the EIS. Consultation with the Aboriginal community was conducted by NSW Archaeology Pty Ltd in accordance with guidance set out in the DECCW (2010a) document Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. Registered Aboriginal Parties (RAPs) have had the opportunity to provide feedback on the draft Aboriginal Cultural Heritage Assessment (ACHA) prior to its finalisation and submission to OEH (as part of the NSW State planning process). The ACHA identifies ongoing consultation commitments and recommends the development of a Cultural Heritage Management Plan (CHMP) to guide this process.

Summary of Consultation

-March 2016 | SWF host landowners | Concept discussion

-April 2016 | TransGrid | Concept discussion

-August 2016 | SWF CCC | Concept discussion

-February 2017 | Potential host consultations | Land use suitability and interest

-March 2017 | Community | Community meeting and feedback

-June 2017 | Potential host consultations | Land use suitability and interest

-June 2017 | Mining lease/licence holder | Discussion and feedback

-July 2017 | Community | Revised footprint

-July 2017 | All stakeholders| PEA submission

-August 2017 | All stakeholders | Media coverage

-August 2017 | Community | CCC participation

-August 2017 | Community | Community meeting and feedback

-August 2017 | Individual neighbours | One-to-one consultations

-August 2017 | Council | Discussion in relation to transport and waste

-September 2017 | Registered Aboriginal Parties | Participation in onsite surveys

-October 2017 | Mining lease/licence holder | Agreement to the Proposed Development

-October 2017 | SWF CCC | Presentation and feedback

-November 2017 | Host consultations | Refined project footprint

-November 2017 | Community | Updated layout

-November 2017 | Potentially affected residences | Potential mitigation measures

-November 2017 | Waterloo Road residences | Potential impacts and concerns

-December 2017 | DPE | Issue draft EIS

1.14 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project.

This EIS has been prepared under Part 4 of the EP&A Act, in accordance with the Secretary's Environmental Assessment Requirements (SEARs), dated 23rd August 2017, and the requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

The EIS addresses the SEARs including a number of specialist reports including:

-Biodiversity

-Aboriginal cultural heritage

-Historic heritage

-Land resources

-Visual impact

-Noise

-Transport

-Water

-Hazards and risks

-Waste and resource use

-Socio-economic factors

-Cumulative impacts

As the Proposed Development is SSD, the biodiversity impacts must be assessed under the Framework for Biodiversity Assessment (FBA; OEH 2014) and a Biodiversity Assessment Report (BAR) must be prepared. The purpose of this BAR is to assess the impacts to biodiversity, propose mitigating and ameliorating options, as well as calculate offsets for unavoidable residual impacts (detailed in a component report referred to as a Biodiversity Offset Strategy or BOS)

The EIS indicates that the impacts of the Proposed Development are generally low and are suitably mitigated using proven successful mitigation measures.

Once submitted to the NSW DP&E and deemed suitable for public exhibition, the DP&E will place the EIS on public exhibition for a period of 30 days. In that period public and Government agency comments are made, following which Sapphire Solar Pty Ltd will prepare a Respone to Submission report addressing comments and issues raised.

1.15 Is this action part of a staged development (or a component of a larger project)?

No

1.16 Is the proposed action related to other actions or proposals in the region?

No

Section 2 - Matters of National Environmental Significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest. Consideration of likely impacts should include both direct and indirect impacts.

Your assessment of likely impacts should consider whether a bioregional plan is relevant to your proposal. The following resources can assist you in your assessment of likely impacts:

• Profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;

• Significant Impact Guidelines 1.1 – Matters of National Environmental Significance;

• Significant Impact Guideline 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.

2.1 Is the proposed action likely to have ANY direct or indirect impact on the values of any World Heritage properties?

No

2.2 Is the proposed action likely to have ANY direct or indirect impact on the values of any National Heritage places?

No

2.3 Is the proposed action likely to have ANY direct or indirect impact on the ecological character of a Ramsar wetland?

No

2.4 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes

2.4.1 Impact table

Species	Impact
White Box, Yellow Box, Blakely's Red Gum	Degraded throughout the impact area, however

Species	Impact
Woodland and Derived Native Grassland	clearing of 66.55ha (23.69ha woodland in poor condition and 42.86ha derived native grassland).

2.4.2 Do you consider this impact to be significant?

Yes

2.5 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed migratory species, or their habitat?

No

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

No

2.7 Is the proposed action to be taken on or near Commonwealth land?

No

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

No

2.9 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

2.10 Is the proposed action a nuclear action?

No

2.11 Is the proposed action to be taken by the Commonwealth agency?

No

2.12 Is the proposed action to be undertaken in a Commonwealth Heritage Place Overseas?

No

2.13 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

Section 3 - Description of the project area

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed in Section 2).

3.1 Describe the flora and fauna relevant to the project area.

Biodiversity values within the project area are well understood having been subject to both NSW and Commonwealth assessments as part of the Sapphire Wind Farm project in 2011.

Recent investigations of the project are by Environmental Planning Services Pty Ltd (EPS) and Eco Logical Australia Pty Ltd (ELA) have sought to refine understanding of biodiversity values specific to the Sapphire Solar Farm application.

High-level vegetation characterisation surveys were undertaken in July 2017 by EPS, which was supplemented by ELA conducting detailed flora, fauna and vegetation surveys were undertaken during 27 November – 1 December 2017. Methods used by ELA were consistent with those recommended in the NSW *Framework for Biodiversity Assessment* (FBA; OEH, 2014).

Habitat within the project area is highly modified due to persistent and extensive impacts of agriculture. It is mostly covered by agricultural exotic vegetation. Native vegetation comprises approximately 23% of the project area (refer section 3.5). Woodland patches and scattered trees across the project area are White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*), Yellow Box (*Eucalyptus melliodora*), Rough-barked Apple (*Angophora floribunda*) and Manna Gum (*Eucalyptus viminalis*). Native grasses occur within the understorey of woodland patches and areas of native grassland contain Couch (*Cynodon dactylon*), Plains Grass (*Austrostipa aristiglumis*), Red Grass (*Bothriochloa macra*), Wild Sorghum (*Sorghum leiocladum*), Western Rat-tail Grass (*Sporobolus creber*) and Wheatgrass (*Elymus scaber*) at varying cover abundances.

Given the present assemblage of vegetation, portions of the project area are consistent with the EPBC Act listing for the Critically Endangered Ecological Community (CEEC) White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland).

Likely threatened flora and fauna within the project area included review of previous assessment reports for the SWF NSW and Commonwealth assessment, operation of the BioBanking Credit Calculator, as well as the use of the Protected Matters Search Tool (PMST; operated on 7/12/17). The PMST identified the potential for 17 threatened flora, 29 threatened fauna, and one threatened fish to potentially occur within the project area. An analysis of the likelihood of occurrence of all species identified during the literature review considered the distribution, habitat requirements, local occurrence, and proposed impacts to each species and their habitats. Based on this review the following species or habitats have potential to occur

within the project area and require consideration:

Flora species: *Dichanthium setosum* (Bluegrass), *Picris evae* (Hawkweed) and *Thesium australe* (Austral Toadflax).

Fauna Species: *Anthochaera Phrygia* (Regent Honeyeater), *Grantiella picta* (Painted Honeyeater), *Lathamus discolour* (Swift Parrot), *Motacilla flava* (Yellow Wagtail) and *Pteropus pollocephalus* (Grey-headed Flying Fox).

Field surveys were conducted from 2008 to 2011 as part of the SWF approvals process. Subsequent field studies have been undertaken in November and December 2017 by ELA to target threatened woodland birds, Koala, and threatened flora with potential to occur within the marginal quality habitat present.

No threatened fauna were identified during field surveys.

T. australe was identified outside the project area. Subsequent surveys are planned for late December 2017 to determine the extent (if any) of this species, as well as *D. setosum* within the project area.

3.2 Describe the hydrology relevant to the project area (including water flows).

The Proposed Development is located within the upper tributaries of the Macintyre River, part of the Border Rivers Catchment. This catchment occupies 49,500 km2, and comprises 24,500 km2 in northern NSW and 25,000 km2 in southern Queensland (NSW Office of Water Border Rivers website). In NSW, the catchment's major urban centres are Glen Innes, Inverell, and Tenterfield, all located within the upper catchment. Goondiwindi, on the northern bank of the Macintyre River in Queensland is the major town in the middle of the catchment, along with the smaller town of Boggabilla in NSW. The town of Mungindi lies on the Barwon River at the lower end of the catchment. The Barwon becomes the Darling River, which joins the Murray in South Western NSW before flowing to the Southern Ocean.

The Proposed Development occurs in the area covered by the *Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources* which commenced on 1 June 2012 (NSW Office of Water, 2012). The majority of the site is located within the Kings Plains Surface Water Source, with a small southern portion falling within the Inverell Surface Water Source.

The Development Footprint has intentionally been designed to avoid higher order drainage lines and generally contains First and Second Order drainage lines (Strahler 1952) which are ephemeral.

The Proposed Development is located in the upper reaches of the Macintyre catchment and comprises the following sub-catchment areas (all Uncontrolled Streams):

- 849 ha in the upper reaches of Kings Plains Creek catchment;

- 1,150 ha in the upper reaches of Frazers Creek catchment; and

- 424 ha in the upper Swan Brook catchment.

Kings Plains Creek drains the eastern portion of the Proposed Development site. The source of Kings Plains Creek is located upstream of the Proposed Development and passes through the solar array located to the north of Waterloo Road as a Third Order stream (Strahler 1952). Downstream of the Proposed Development, Kings Plains Creek flows in a northerly direction for approximately 20 km, passing through Kings Plains National Park, before turning west to joint Weean Creek, which is part of the Frazers Creek Catchment.

The Frazers Creek Catchment area drains the western portion of the Proposed Development, and includes Weean Creek, Frazers Creek, Horse Gully and Mary Anne Creek. Frazers Creek converges with the regulated Severn River just north of Ashford, approximately 55 km North West of the Proposed Development site. The Severn River converges with the Macintyre River within Kwiambal National Park, 80 km North West of the Proposed Development site.

The southernmost portion of the Proposed Development site drains via Apple Tree Gully into Swan Brook. Swan Brook flows into the Macintyre River North of Inverell, approximately 20 km west of the Proposed Development site.

3.3 Describe the soil and vegetation characteristics relevant to the project area.

Vegetation is described in section 3.5. The soils of the Site are described from the *Reconnaissance Soil Landscape Mapping for the Border Rivers Gwydir Catchments* 1:100,000 mapsheet (CWP, 2012) as:

- Vertosols and Ferrosols (most common across the Development Footprint) on the undulating plains, rise and footslopes;

- Vertosols in the alluvial landscapes restricted to drainage depressions;

- Dermosols and Ferrosols on ridges and upper slopes; and

- Rudosols and Tenosols (erosional soil areas) restricted to small areas on the footslopes.

The majority of the site has moderate to moderate-severe limitations (Class 3 and Class 4) for more intensive use other than grazing and cultivation, but remains suitable for a variety of land uses if careful management to prevent long-term degradation is implemented (according to an eight class system where Class 1 designates the most suitable soil for intensive and constant cultivation and Class 8 is land not suitable for agriculture (OEH 2012)).

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area.

No outstanding natural features occur in the area impacted by the Proposed Development

3.5 Describe the status of native vegetation relevant to the project area.

In such an agricultural landscape, native vegetation comprises patches of treed woodlands (usually on the rockier, elevated country) and grasslands which occur mostly on fallow agricultural paddocks. The lower or flatter (non-rocky) country in the Development footprint is generally in a multi-year cycle of cultivation. The vegetation surveys conducted as part of the EIS estimate that of the 445 ha Development Footprint, 104 ha is covered by native vegetation (~23%) which is mostly native trees with an understorey of degraded native species quality and grasslands of native grass species tolerant of disturbance.

The native vegetation types are described as 'Plant Community Types' (PCTs) (the standard NSW process for vegetation description) which are categorised according to different dominant species. Those PCTs are further described in broad condition types describing native species assemblage and structural integrity, e.g. 'woodland' or a 'derived native grassland'. The vegetation zones and areas of the Development Footprint occupied are:

Vegetation Zone # | PCT | Condition | Area (ha)

- 1 | BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion | Woodland (Poor)* | 3.89

- 2 | BR240: White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion | Derived Native Grassland (DNG)* | 41.2

- 3 | BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | Woodland (Poor)* | 10.58

- 4 | BR272: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | DNG | 19.75

- 5 | BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion | Woodland (Poor)* | 15.83

- 6 | BR153: Manna Gum - Rough-barked Apple - Yellow Box grassy woodland/open forest of the New England Tableland Bioregion and NSW North Coast Bioregion | DNG* | 12.85

All meet the criteria for the NSW *Biodiversity Conservation Act* 2016 (BC Act) listed Endangered Ecological Community (EEC): White Box Yellow Box Blakely's Red Gum Woodland.

Some parts of the vegetation zones designated by * above meet the criteria for the Commonwealth EPBC Act-listed Critically Endangered Ecological Community (CEEC): White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

These vegetation zones are of relatively low quality as measured using quantitative methods designated in the NSW assessment requirements (the FBA as designated in the SEARs). Their landscape occurrence and general characteristics are described below.

PCT510 (BR272) occurs within the north-east of the development site on chocolate soils that are relatively fertile. This PCT exists as scattered trees within cultivated paddocks. The dominant canopy species within this PCT is *Eucalyptus blakelyi* (Blakely's Red Gum). The mid-storey is absent and native groundcover is largely absent due to extensive agricultural practices. There are areas of native grassland adjacent to remnant trees that have been mapped within the development site as the Derived Native Grassland (DNG) of this PCT. Native grasses growing within the DNG component of this community have persisted following agricultural impacts. Portions of the woodland component of this PCT are consistent with the Endangered Ecological Community (EEC) listing for White Box Yellow Box Blakely's Red Gum Woodland under the NSW *Biodiversity Conservation Act 2016* (BC Act) and with the guidance material for the Critically Endangered Ecological Community (CEEC) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), also known as 'Box Gum Woodland'. Grassland areas of this PCT are heavily degraded but have been included in the BC Act TEC listing for Box Gum Woodland. The DNG component of this PCT does not meet the EPBC Act TEC.

PCT921: (BR153) occurs on hilltops and slopes throughout the development site, and also exists as scattered trees within cultivated paddocks. The dominant canopy species within this PCT are *Eucalyptus viminalis* (Manna Gum), *Eucalyptus melliodora* (Yellow Box), and *E. blakelyi*. The mid-storey is absent and native groundcover is largely absent due to extensive agricultural practices. Portions of the woodland component of this PCT are consistent with the NSW and EPBC Act listing for Box Gum Woodland. Grassland areas of this PCT are heavily degraded but meet the requirements for the BC Act and EPBC Act TEC listing for Box Gum Woodland.

PCT1383 (BR240) occurs within the south of the development site in lower altitudes and exists as scattered trees within cultivated paddocks. The only present canopy species is *Eucalyptus albens* (White Box). The mid-storey is absent and native groundcover is largely absent due to extensive agricultural practices. Portions of the woodland component of this PCT are consistent with the NSW and EPBC Act listing for Box Gum Woodland. Grassland areas of this PCT are heavily degraded but have been included in the BC Act TEC listing for Box Gum Woodland. Portions of the DNG component of this PCT meet the EPBC Act TEC.

3.6 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

Solar farms are typically built on flat country of low relief. Whilst the surrounding wind farm occurs on hilly, ridgeline country, the Proposed Development layout is in relatively flatter areas in and around the wind farm ridges. The Site is generally an undulating landscape, where elevation ranges between 810 m AHD at its lowest point in the south west of the Development Footprint to 1000 m AHD in the northern part of the Development Footprint.

3.7 Describe the current condition of the environment relevant to the project area.

The Site is an agricultural landscape. It has been historically cleared and grazed for sheep and cattle production and is typical of farmland in the region. As described in section 3.5, it is estimated that only ~23% of the Development Footprint is covered by native vegetation (~23%) which is mostly native trees with an understorey of degraded native species quality and grasslands of native grass species tolerant of disturbance. A number of stock dams have been developed across the Site. A considerable portion of the Site has been cultivated for improved pasture and other fodder crops. Surrounding land uses include: Agriculture, Sapphire exploration and mining, and Wind farm operation.

3.8 Describe any Commonwealth Heritage Places or other places recognised as having heritage values relevant to the project area.

A heritage assessment is being undertake as part of the EIS process to satisfy the SEARs which includes analysis of heritage values of the site. The historic heritage assessment was undertaken in accordance with the *NSW Heritage Manual* (NSW Heritage Office & NSW Department of Urban Affairs and Planning, 1996), specifically the guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning, 2009), and with reference to the Burra Charter (the Australian ICOMOS Charter for Places of Cultural Significance) (ICOMOS (Australia), 2013).

Searches of relevant databases for the Inverell Local Government Area (LGA) area identified no listed heritage items in the Development footprint. Items identified on the relevant databases were few, and all greater than 5 km away from the Development Footprint. The analysis undertaken as part of the EIs concluded that no impacts would occur to these items from the Proposed Development.

The on-ground historic heritage survey identified one item of potential heritage significance near the Development Footprint: an old telephone pole located adjacent to Waterloo Road. The pole is still standing between the tall current electricity pole to the right, and the stand of eucalypts in the paddock. It is formed from an undressed tree trunk and has two glass insulators affixed to its upper section. The pole is well outside areas of the Proposed Development and does not satisfy any criteria for heritage listing.

3.9 Describe any Indigenous heritage values relevant to the project area.

A heritage assessment is being undertake as part of the EIS process to satisfy the SEARs which includes analysis of heritage values of the site (including Indigenous heritage: referred to as an Aboriginal Cultural Heritage Assessment (ACHA). Consultation has been undertaken with the Indigenous groups in accordance with the NSW OEH's Aboriginal cultural heritage consultation requirements for proponents (DECCW 2010b).

The ACHA has been guided by the specifications set out in the following documents:

- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales (OEH, 2011); and

- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010b).

The study has sought to identify and record Aboriginal cultural areas, objects or places, assess the archaeological potential of the proposal area and formulate management recommendations based on the results of the community consultation, background research, field survey and a significance assessment.

A search of the NSW OEH Aboriginal Heritage Management Information System (AHIMS) has been conducted for this project on 8 September 2017 (AHIMS Reference: #300555). The search area measured 432 km² and encompassed the area between eastings 339000 – 363000, and northings 6703000 – 6721000 Twenty seven Aboriginal object sites are listed for the search area (although three are duplicate recordings). None of those AHIMS records occur in the Development Footprint.

The results of a field survey conducted 6-9 November 2017 identified 15 Aboriginal object sites including (but not limited to) stone artefacts and an unconfirmed scarred tree. Most were assigned a significance of low (n=9), with some low/moderate (n=-5) and one potentially moderate. Many of those (including the latter) will be outside of the Development Footprint.

The ACHA concluded with recommendation including:

- No further archaeological investigations are required in respect of the proposal. No areas were identified that could be characterised as places with a high probability of possessing subsurface Aboriginal objects with high potential conservation value. Accordingly, archaeological test excavation has not been undertaken in respect of the proposal as it could not be justified (DECCW 2010a).

- Management and mitigation strategies are set out in Section 7 of the ACHA. These should be used to formulate appropriate Statement of Commitments to condition Development Approval.

- It is recommended that additional archaeological assessment is conducted in any areas which are proposed for impacts that have not been surveyed during the current assessment. It is predicted that significant Aboriginal objects can occur anywhere in the landscape and, accordingly, they need to be identified and impact mitigation strategies implemented prior to impacts. The assessment may be conducted by predictive modelling, if appropriate.

- The proponent should develop a Cultural Heritage Management Plan for the appropriate management and mitigation of development impacts during any further planning and project construction. The development of an appropriate Cultural Heritage Management Plan should be undertaken in consultation with the project archaeologist, the registered Aboriginal parties and the NSW OEH.

- The Cultural Heritage Management Plan would be prepared to guide the process for

management and mitigation of impacts to Aboriginal cultural heritage and to set out procedures relating to the conduct of additional archaeological assessment, if required, and the management of any further Aboriginal cultural heritage values which may be identified.

- Personnel involved in the construction and management phases of the project should be trained in procedures to implement recommendations relating to cultural heritage, as necessary.

- Cultural heritage should be included within any environmental audit of impacts proposed to be undertaken during the construction phase of the development.

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area.

All land is freehold.

3.11 Describe any existing or any proposed uses relevant to the project area.

The Proposed Development is agricultural land. In the absence of the Proposed Development, the likely future landuses would be primarily agricultural. Some areas of the Development Footprint are within Mining Lease (ML) and Exploration Licence (EL) areas (four in total: two of each). ML1687, ML1374 and EL8536 are held by Eastern Feeder Holdings Pty Ltd, and EL8230 by Bond Resources Pty Ltd. Consultation with Eastern Feeder Holdings Pty Ltd has resulted in agreement for SSF to progress with the proposal within ML1687, ML1374 and EL8536. To facilitate ongoing activities in the area by Eastern Feeder Holdings Pty Ltd, Coordination Deeds between the parties are in the process of being drafted. Consultation with Bond Resources Pty Ltd has confirmed their acceptance of SSF insofar as it impacts upon EL8230.

Should the Proposed Development occur, it will not be preclusive of some agricultural use. The future landuse can remain as agricultural because sheep grazing can occur in the solar PV panel areas with sheep able to freely pass underneath the panels.

Section 4 - Measures to avoid or reduce impacts

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action.

The Development Footprint has evolved through an iterative process involving refining the Proposed Development from an initial broader area based on the goal to avoid environmental impacts. Specifically relating to biodiversity, the following avoidance measures have been considered in designing the Development Footprint:

- The Proposed Development has been selected to integrate with the approved SWF development, sharing infrastructure and facilities in order to minimise the area required for the Development Footprint.

- The broader study area has been subject to multiple previous NSW and Commonwealth assessments as part of the SWF approvals process. Biodiversity values were first identified within the Site by ELA from 2011, identifying areas of key biodiversity significance within the SWF boundary. Previous assessments were reviewed when planning the SSF Development Footprint. The footprint has undergone several iterations including a significant reduction since preparation of the PEA, with the final footprint avoiding as much CEEC as practicable.

- As part of the current assessment, desktop and field assessments were conducted within the Site in 2017 by Environmental Property Services Pty Ltd (EPS) to determine the areas of native vegetation cover, EECs or CEECs, and potential habitat for threatened species. This preliminary assessment informed the areas to avoid in order to minimise the environmental impact of the footprint. The current development footprint reflects the retention, where possible, of existing biodiversity within the Site.

- Given the nature of the Proposed Development, the Site is predominantly situated within existing cleared agricultural land. The constraints identification and iterative design process has led to the current Development Footprint. This Development Footprint is the alternative to earlier designs with substantial ecological impact avoidance applied.

Residual impacts will be managed and mitigated in management plans which are a standard conditional approval requirement of the NSW SSD approvals process. These will be prepared in liaison with relevant NSW Government agencies. With regard to biodiversity MNES,

management measures to minimise the construction and operational impacts will likely include:

- Installation of sediment barriers, sediment ponds, stormwater management systems, delineation of works zones;

- Weed and pathogen hygiene and management measures;

- Construction works to occur during daylight hours only;

- Use of temporary fencing to demark boundaries and protect retained vegetation;

- Clearing processes for fauna habitats (e.g. hollow-bearing trees);

- Delineation of clearing and access limits;

- Consideration of compensatory 'artificial' habitat;

- Management of waste and refuse generation, storage and disposal;

- Management of lightspill and out of hours noise generation;

- Contractor environmental induction.

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved.

As identified in Section 2, the only MNES likely to be impacted by the Proposed Development is the CEEC White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland.

Up to 66.55 ha (of which 42.86 ha is low quality grassland) of Box Gum Woodland may be impacted by the proposed action. The footprint acknowledges the extent of the community within the locality, and will retain much larger tranches of the CEEC onsite.

As a result of the removal of the CEEC, formal offsets will be proposed under the FBA, which will involve sourcing of credits from land secured in perpetuity under a BioBanking Agreement. The extent, location, and condition of proposed offsets will be publicly exhibited via the NSW EIS process.

Section 5 – Conclusion on the likelihood of significant impacts

A checkbox tick identifies each of the matters of National Environmental Significance you identified in section 2 of this application as likely to be a significant impact.

Review the matters you have identified below. If a matter ticked below has been incorrectly identified you will need to return to Section 2 to edit.

5.1.1 World Heritage Properties

No

5.1.2 National Heritage Places

No

5.1.3 Wetlands of International Importance (declared Ramsar Wetlands)

No

5.1.4 Listed threatened species or any threatened ecological community

Listed threatened species and communities - Yes

5.1.5 Listed migratory species

No

5.1.6 Commonwealth marine environment

No

5.1.7 Protection of the environment from actions involving Commonwealth land

No

5.1.8 Great Barrier Reef Marine Park

No

5.1.9 A water resource, in relation to coal/gas/mining

No

5.1.10 Protection of the environment from nuclear actions

No

5.1.11 Protection of the environment from Commonwealth actions

No

5.1.12 Commonwealth Heritage places overseas

No

5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action.

Not applicable.

Section 6 – Environmental record of the person proposing to take the action

Provide details of any proceedings under Commonwealth, State or Territory law against the person proposing to take the action that pertain to the protection of the environment or the conservation and sustainable use of natural resources.

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Please explain in further detail.

Yes, the proponent has a satisfactory record of responsible environmental management.

The Proposed Development is being undertaken by Sapphire Solar Farm Pty Ltd, who's related entity CWP Renewables, is a well-established Australian renewable energy company currently responsibly managing other operations in Australia.

6.2 Provide details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either (a) the person proposing to take the action or, (b) if a permit has been applied for in relation to the action – the person making the application.

Not applicable.

6.3 If it is a corporation undertaking the action will the action be taken in accordance with the corporation's environmental policy and framework?

Yes

6.3.1 If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework.

Sapphire Solar Farm Pty Ltd will be able to leverage from the experience of its related entity, CWP Renewables, which has significant experience developing, constructing and operating renewable energy projects in Australia. CWP Renewables has construction and operational management systems that are both legislatively compliant, but also best practice.

Construction contractor selection will focus scrutiny on past environmental performance, and

proposed environmental management measures.

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes

6.4.1 EPBC Act No and/or Name of Proposal.

Whilst Sapphire Solar Farm Pty Ltd has not previously referred a project to the Minister under the EPBC Act, its related entity, CWP Renewables, has developed (and is in the process of developing) several projects previously referred:

2013/7026 - Uungula Wind Farm

2013/6810 - Bango Wind Farm

2011/6206 - Crudine Ridge Wind Farm

2011/5854 - Sapphire Wind Farm

2009/4905 - Boco Rock Wind Farm

Section 7 – Information sources

You are required to provide the references used in preparing the referral including the reliability of the source.

7.1 List references used in preparing the referral (please provide the reference source reliability and any uncertainties of source).

Reference Source	Reliability	Uncertainties
Australian ICOMOS Charter for Places of Cultural Significance (ICOMOS Australia). (2013). The Burra Charter.	High. Australian Government guidance.	Nil
CWP Solar Pty Ltd. (2017). Sapphire Solar Farm Preliminary Environmental Assessment. CWP Renewables	High. Recent ecological assessment	Updated by ELA 2017
Department of Environment, Climate Change and Water NSW (2010). National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Department of Environment, Climate Change and Water NSW, Sydney. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/white-and-yellow-box.html.	High. Australian Government reference material. In effect under the EPBC Act from 22-Mar-2013	Nil
Eco Logical Australia Pty Ltd (ELA). (2011). Sapphire Wind Farm part 3A Ecological Assessment. Prepared for Wind Prospect CWP.	High. Recent ecological assessment.	Nil
Eco Logical Australia Pty Ltd (ELA). (2017). Sapphire Solar Farm Environmental Impact Statement. Prepared for CWP Solar.	High. Recent ecological assessment.	Nil
Environmental Property Services Pty Ltd (EPS) 2017. Sapphire Solar Farm –	High. Recent ecological assessment.	Preliminary mapping updated by ELA 2017

Reference Source	Reliability	Uncertainties
Preliminary Ecological Constraints Assessment. Prepared for CWP Renewables		
Fairfull, S. & Witheridge, G. (2003). Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Department of Primary Industries.	High. Published reference material.	Nil
Heritage Branch of the Department of Planning. (2009). Assessing Significance for Historical Archaeological Sites and 'Relics'. Heritage Branch of the Department of Planning, Sydney.	High. Australian Government guidance.	Nil
NSW Department of Environment, Climate Change & Water (DECCW). (2010b). Due Diligence Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.	High. NSW Government guidance. NSW OEH's Aboriginal cultural heritage consultation requirements for proponents	Nil
NSW Department of Environment, Climate Change & Water (DECCW). (2010a). Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. Department of Environment, Climate Change & Water, Sydney.	High. NSW Government guidance.	Nil
NSW Department of Planning & Environment (DP&E). (2016). NSW Planning Portal. Retrieved from: https://www.planningportal.nsw.gov.au/	High. NSW Government guidance.	Nil
NSW Department of Primary Industries (NSW DPI). (2004). Policy and Guidelines for Fish Friendly Waterway Crossings. NSW Department of Primary Industries, Sydney.	High. NSW Government guidance.	Nil
NSW Heritage Office & NSW Department of Urban Affairs and Planning. (1996). NSW Heritage Manual. NSW	High. NSW Government reference material.	Nil

Reference Source	Reliability	Uncertainties
Heritage Office & NSW Department of Urban Affairs and Planning, Sydney.		
NSW Office of Environment & Heritage (OEH). (2011). Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW. NSW Office of Environment and Heritage, Sydney.	High. NSW Government guidance.	Nil
NSW Office of Environment & Heritage (OEH). (2012). The land and soil capability assessment scheme – second approximation. NSW Office of Environment and Heritage, Sydney. The eight class soil classification system (OEH, 2012)	High. NSW Government guidance.	Nil
NSW Office of Environment & Heritage (OEH). (2017). Aboriginal Heritage Management Information System (AHIMS) search on 8 September 2017 (AHIMS Reference: #300555)	High. NSW Government guidance.	Nil
NSW Office of Water (NOW). (2012). Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources commenced on 1 June 2012	High. NSW Government guidance.	Nil
NSW Rural Fire Service (RFS). (2006). Planning for Bushfire Protection: A guide for Councils. Planners, Fire Authorities and Developers. NSW Rural Fire Service.	High. NSW Government guidance.	Nil
Office of Environment and Heritage (OEH) (2016). BioBanking Credit Calculator version 4.0	High. NSW Government guidance.	Nil
SMA Solar Technology. (2017). PV Power Plants. Retrieved from http://www.sma-australia.com.au/industrial-systems/pv-	High	Nil

Reference Source	Reliability	Uncertainties
power-plants.html		
Wind Prospect CWP Pty Ltd (CWP). (2012). Proposed Development Sapphire Wind Farm Northern New South Wales: Preferred Project Report and Responses to Submissions. Prepared for Sapphire Wind Farm Pty Ltd.	High. Reconnaissance Soil Landscape Mapping for the Border Rivers Gwydir Catchments 1: 100 000 mapsheet	Nil
Strahler (1952), Hypsometric (area-altitude) analysis of erosional topology, Geological Society of America Bulletin 63 (11): 1117–1142	High. Published reference material.	Nil
Threatened Species Scientific Committee (2006). Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/box-gum.html. In effect under the EPBC Act from 18-May-2006	High: NSW TSSC advice.	Nil

Section 8 – Proposed alternatives

You are required to complete this section if you have any feasible alternatives to taking the proposed action (including not taking the action) that were considered but not proposed.

8.0 Provide a description of the feasible alternative?

This is a unique circumstance where the consideration of alternative locations is marginalised by the opportunity to co-locate a solar and battery project with a wind farm and connection asset, already consented and under construction, to establish the New England / Sapphire Renewable Energy Hub. Decisions around alternatives will be made during detailed design with a view to minimising environmental and social impacts while maintaining the investment viability, however these will occur at the micro scale rather than macro, site selection, level. There are no feasible alternatives proposed.

Avoidance measures which have been undertaken (refer section 4) were part of the evolution of the Proposed Development as alternatives to the original design to reduce ongound impacts, although the original designs have not been retained and were built in to the design.

8.1 Select the relevant alternatives related to your proposed action.

8.27 Do you have another alternative?

No

Section 9 – Contacts, signatures and declarations

Where applicable, you must provide the contact details of each of the following entities: Person Proposing the Action; Proposed Designated Proponent and; Person Preparing the Referral. You will also be required to provide signed declarations from each of the identified entities.

9.0 Is the person proposing to take the action an Organisation or an Individual?

Organisation

9.2 Organisation

9.2.1 Job Title

Director

9.2.2 First Name

Ed

9.2.3 Last Name

Mounsey

9.2.4 E-mail

ed.mounsey@cwpr.com.au

9.2.5 Postal Address

PO Box 1708
Newcastle NSW 2300
Australia

9.2.6 ABN/ACN

ACN

620649069 - Sapphire Solar Farm Pty Ltd

9.2.7 Organisation Telephone

+61240134640

9.2.8 Organisation E-mail

admin@cwprenewables.com.au

9.2.9 I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

Not applicable

Small Business Declaration

I have read the Department of the Environment and Energy's guidance in the online form concerning the definition of a small a business entity and confirm that I qualify for a small business exemption.

Signature:..... Date: .....

9.2.9.2 I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations

No

9.2.9.3 Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made

Person proposing the action - Declaration

I, Edward Mounsey, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature: ..... Date: 15/12/17

I, Edward Mounsey, the person proposing the action, consent to the designation of Edward Mounsey as the proponent of the purposes of the action describe in this EPBC Act Referral.

Signature: ..... Date: 15/12/17

9.3 Is the Proposed Designated Proponent an Organisation or Individual?

Organisation

9.5 Organisation

9.5.1 Job Title

Director

9.5.2 First Name

Ed

9.5.3 Last Name

Mounsey

9.5.4 E-mail

ed.mounsey@cwpr.com.au

9.5.5 Postal Address

PO Box 1708
Newcastle NSW 2300
Australia

9.5.6 ABN/ACN

ACN

620649069 - Sapphire Solar Farm Pty Ltd

9.5.7 Organisation Telephone

+61240134640

9.5.8 Organisation E-mail

admin@cwprenewables.com.au

Proposed designated proponent - Declaration

I, Edward Mounsey, the proposed designated proponent, consent to the designation of myself as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature: ..... Date: 15/12/17

9.6 Is the Referring Party an Organisation or Individual?

Organisation

9.8 Organisation

9.8.1 Job Title

Head of Development

9.8.2 First Name

Ed

9.8.3 Last Name

Mounsey

9.8.4 E-mail

ed.mounsey@cwpr.com.au

9.8.5 Postal Address

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9.8.6 ABN/ACN

ABN

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9.8.7 Organisation Telephone

+61240134640

9.8.8 Organisation E-mail

admin@cwprenewables.com.au

Referring Party - Declaration

I, EDWARD MAUNSELL, I declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature: ..... Date: 15/12/17

Appendix A - Attachments

The following attachments have been supplied with this EPBC Act Referral:

1. 171212_ssf_proposed_layout_context_lowres.pdf
2. 171215_footprint_bggw_data.zip
3. 171215_ssf_cwpr_s1.2.pdf
4. 171215_ssf_cwpr_s1.7.2.pdf
5. fig6_tec_map_bar_v2.jpg

ecological AUSTRALIA

ISO 14001 Environmental Management

AS/NZS 4801:2001 Occupational Health and Safety Management

ISO 9001 Quality Management

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