



Renew Estate Pty Ltd

Bomen solar farm EIS

Biodiversity Development Assessment Report

August 2018

Executive summary

Renew Estate Pty Ltd proposes to develop a 120 megawatt (MW) solar farm at Bomen NSW with an associated transmission line for the project. This Biodiversity Development Assessment Report (BDAR) has been prepared by GHD Pty Ltd to identify the potential biodiversity impacts associated with part of the transmission line for the proposed Bomen solar farm project that lies outside the Wagga Wagga Biocertification area, as defined under the *Wagga Wagga Local Environmental Plan 2010* (Wagga Wagga LEP). GHD have completed an Environmental Impact Statement (EIS) as part of a development application for the proposed solar farm.

This assessment has been completed in accordance with the Biodiversity Assessment Method (BAM) and includes:

- Desktop assessment to describe the existing environment and landscape features of the study area and to identify the suite of threatened biota potentially affected by the proposal.
- Field survey in accordance with the BAM to describe the biodiversity values of the proposal site and surrounding study area and determine the likelihood of threatened biota and their habitats occurring in the proposal site or being affected by the proposal.
- Determining reasonable actions to avoid and minimise impacts to biodiversity values.

The proposal site is located within Lot 2 DP 594679, north of East Bomen Road and Lots 22 DP 1085826 and 1 DP 1115229, south of East Bomen Road, in Bomen, NSW. The proposal site is surrounded by cleared agricultural land. A TransGrid substation is located at the southern end of the proposal site. Native plantings are located west of the proposal site in the southern section, and surrounding the substation. The proposal has been designed to minimise impacts on biodiversity values as far as is practicable.

Field surveys confirmed that no native plant community types are present in the proposal site. Due to the proposal site being dominated by introduced groundcover, with no native vegetation present, no vegetation types and habitat resources could be input into the BAM credit calculator to generate threatened species that are predicted to utilise the site. No further assessment of threatened species is required under the BAM, as per section 5.1.1.5. Nevertheless threatened species with the potential to occur in the study area have been considered in this BDAR.

The habitat in the proposal site is typical of highly disturbed agricultural environments and contains only marginal habitat for threatened species. While they may still occur, due to the absence of canopy species in the site, and largely ploughed and grazed groundcover, habitat outside of this site in the wider study area and locality would likely provide preferred and/or better quality habitat.

The proposal would result in direct impacts to about 0.69 hectares of introduced groundcover vegetation within the proposal site. This vegetation is likely to provide marginal potential habitat for threatened species. Groundcover would be allowed to regenerate following construction of the proposal.

There is limited potential for indirect impacts on retained areas of native vegetation adjacent to the proposal site, i.e. the native plantings, due to the groundcover in these areas also being dominated by introduced species. No tree removal would occur for the proposal and the assessed transmission line corridor allows for refinement of the location of the seven to 11 metre easement within the corridor during detailed design, without potential impacts to adjacent native vegetation.

The proposal has aimed to avoid all impacts to native vegetation and habitat values by refining the transmission line corridor so that it is devoid of native vegetation.

To minimise the impacts of the proposal on the biodiversity of the study area, a series of safeguards and management measures have been identified, which would be implemented as part of the Construction Environmental Management Plan (CEMP) for the proposal. These include measures relating to:

- Standard CEMP protocols – including site inductions.
- Fauna habitat – including informing staff of the limit of vegetation clearing.
- Weeds – including weed management.
- Sedimentation – including erosion and sediment control measures, spill kits and protocols.

No additional mitigation measures are proposed for the operation phase of the project. The proposal is expected to have minimal operational impacts, which would be limited to maintenance of the easement.

The proposal is not likely to result in residual impacts due to vegetation removal being limited to introduced groundcover. Therefore, provision of offsets to counter residual impacts is not required.

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1. Introduction

1.1 Overview

GHD Pty Ltd (GHD) has been engaged by Renew Estate Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR). The BDAR is required to address the potential biodiversity impacts associated with part of the transmission line for the proposed Bomen solar farm project that lies outside the Wagga Wagga Biocertification area, as defined under the *Wagga Wagga Local Environmental Plan 2010* (Wagga Wagga LEP).

GHD have completed an Environmental Impact Statement (EIS) as part of a development application for a proposed 120 megawatt (MW) solar farm at Bomen NSW. The proposed solar farm was assessed as a State Significant Development (SSD) under Part 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), with Secretary's Environmental Assessment Requirements (SEARS) issued for the project (SSD 8835).

Due to changes in the Biocertification area under the Wagga Wagga LEP, part of the transmission line for the solar farm now falls outside biocertified land. As the development is a SSD, to satisfy the SEARS the impacts of the development on biodiversity values for the area not on biocertified land requires assessment using the Biodiversity Assessment Method (BAM). This information must be documented in a BDAR, in the form required by section 6.12 of the *Biodiversity Conservation Act 2016* (BC Act) and section 6.8 of the *Biodiversity Conservation Regulation 2017* and the BAM.

Renew Estate have narrowed the width of the transmission line easement to avoid all potential removal of native vegetation and therefore any likely requirement for biodiversity offsets. Nevertheless, this report considers the overall intent of the BAM and meets the minimum requirements of the BAM and their relevance to the proposal.

1.2 Biodiversity Offset Scheme and Biodiversity Assessment Methodology

The BC Act, together with the *Biodiversity Conservation Regulations 2017*, provides a mechanism to address impacts on biodiversity from land clearing associated with development. Under this legislation, there are provisions for a Biodiversity Offsets Scheme (BOS), which includes a framework to avoid, minimise and offset impacts of development on biodiversity.

The aim of the BOS is to provide a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting. It also allows for the establishment of biodiversity stewardship agreements, which are in-perpetuity agreements entered into by landholders, to secure offset sites and generate biodiversity credits, which can be used to offset impacts of development. The aim of the BOS is to ensure that the impacts of development, clearing or biodiversity certification will result in no net loss of biodiversity.

The Biodiversity Assessment Method (BAM) was established by the New South Wales (NSW) Office of Environment and Heritage (OEH) as a standard method to implement the aims of the BOS and to address the loss of biodiversity and threatened species. The scheme creates a market framework for the conservation of biodiversity values and the offsetting of development impacts. It also provides the mechanisms to offset impacts of development, clearing or biodiversity certification such that there is no loss of biodiversity values.

The BAM sets out how biodiversity values will be assessed, prescribes requirements to avoid and minimise impacts, establishes rules for calculating the number and class of credits required for unavoidable impacts, and determines the trading rules that will apply. The methodology includes a software package known as the Biodiversity Assessment Method Calculator (the

credit calculator) which processes site survey and assessment data. The credit calculator specifies the type and extent of surveys required for a biodiversity assessment and then processes survey data to calculate the number and type of biodiversity credits that are either required at a development site or will be generated at a stewardship site. The BAM must be applied by a person accredited under the BC Act.

The Biodiversity Conservation Trust Fund ensures that landowners have the funds needed to carry out the management actions required each year and provides a financial incentive to landowners to carry out those actions. The scheme is administered by OEH and ensures accountability and compliance through legislation, regular reporting requirements and financial measures.

1.3 Approach

This BDAR has been prepared to address the minimum requirements for Stage 1 and Stage 2 set out in Appendix 10 of the BAM, including assessing potential impacts of the proposal on threatened biota and their habitats (OEH 2017a).

The main components of the methodology for the biodiversity assessment include:

- Desktop assessment to describe the existing environment and landscape features of the study area and to identify the suite of threatened biota potentially affected by the proposal.
- Field survey in accordance with the BAM to describe the biodiversity values of the proposal site and surrounding study area and determine the likelihood of threatened biota and their habitats occurring in the proposal site or being affected by the proposal.
- Determining reasonable actions to avoid and minimise impacts to biodiversity values.

This biodiversity assessment and field surveys were completed by Melissa Cotterill in accordance with the BAM. A technical review of the report was undertaken by Leigh Maloney (accredited assessor number BAAS18086).

1.4 Proposal description

The proposal is for a section of the proposed transmission line for the Bomen solar farm project that now falls outside biocertified land. The proposal site¹ is shown in Figure 1 and Figure 4. The proposal site is 6.77 hectares and represents the transmission line corridor within which the underground transmission line and associated 7 – 11 metre wide easement would be sited. The width of impact will be about six metres which equates to about 0.69 hectares of impacted area within the proposal site. The transmission line corridor as assessed in this BDAR is wider than the impact area to allow for design flexibility during detailed design.

The proposal site is comprised of cleared agricultural land, with native plantings located adjacent to the proposed transmission line corridor. These plantings are located on the western side of the proposal site in the southern section, and surrounding the substation which the transmission line would connect to. About 0.69 hectares of introduced vegetation would be potentially disturbed for the proposal, through open trenching for the underground transmission line, temporarily locating spoil alongside the trench and for construction vehicle access. The proposal site is surrounded by agricultural land.

Areas zoned as RU1 – Primary Production and RE1 – Public Recreation are no longer included in the Wagga Wagga Biocertification area. The proposal site is located within these land use zones (see Figure 1).

¹ The proposal site referred to in this report is not the Bomen Solar Farm proposal site as described in the Bomen Solar Farm EIS; it is only the section of proposed transmission line corridor that falls outside the biocertified land.

1.5 Purpose of this report

This BDAR has been prepared to assess the potential biodiversity impacts of the proposal and fulfil the minimum requirements of the BAM. Specifically, the objectives of this assessment are to:

- Outline the methods used in the biodiversity assessment.
- Describe the existing environment of the proposal site in terms of its biodiversity values, including flora and fauna species and terrestrial habitats.
- Describe the conservation significance of the proposal site in terms of threatened biota and their habitats that are known or predicted to occur.
- Provide a description of the proposal, including potential impacts on biodiversity values.
- Identify measures undertaken to avoid and minimise impact to biodiversity values.
- Present the data used to perform the BAM assessment for the proposal.

1.6 Location and subject site

The proposal site is located within Lot 2 DP 594679, north of East Bomen Road and Lots 22 DP 1085826 and 1 DP 1115229, south of East Bomen Road, in Bomen, NSW (Figure 1). The proposal site is surrounded by cleared agricultural land. A TransGrid substation is located at the southern end of the proposal site. Native plantings are located on the western side of the proposal site in the southern section, and surrounding the substation (Figure 1 and Figure 3). The proposal site is within the Wagga Wagga Local Government Area (LGA).

The study area is about 22.48 hectares in size and contains native tree plantings (Figure 1). The proposal site represents the transmission line corridor within which the underground transmission line and easement would be sited. The width of impact will be up to six metres which equates to about 0.69 hectares. The proposal site is located on land zoned as RU1 Primary Production and RE1 Public Recreation under the Wagga Wagga LEP.

1.7 Glossary and terms and acronyms

Term	Definition
AOBV	Areas of Outstanding Biodiversity Value
BC Act	<i>Biodiversity Conservation Act 2016</i>
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
Biodiversity Assessment Method (BAM)	The rules for biodiversity assessment established under the BC Act that determine credits created, credits required and the circumstances that improve or maintain biodiversity values.
Biodiversity credit	A unit of biodiversity value to measure specific development impacts or conservation gains in accordance with the BAM. Includes ecosystem credits and species credits.
Biodiversity credit report	Specifies the number and type of biodiversity credits: required to offset the impacts of a development to obtain a Biodiversity Certification Agreement; or that would be generated through conservation and management of a Stewardship site under a Biodiversity Stewardship site agreement.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.

Term	Definition
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
BOS	Biodiversity Offset Scheme
CEEC	Critically endangered ecological community
CEMP	Construction Environmental Management Plan
DotEE	Department of the Environment and Energy
DPI	Department of Primary Industries
Ecosystem credit	A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered ecological community
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FFMP	Flora and Fauna Management Plan
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environment Plan
LGA	Local Government Area
Locality	The area within a 10 km radius of the subject site.
Migratory species	Species listed under listed under international agreements (i.e. Ramsar, JAMBA and CAMBA conventions) to which Australia is a party
MNES	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
Proposal site	The area that would be directly impacted by construction and operation of the proposal.
SAIL	Serious and irreversible impacts
SAIL entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAILs)
SEPP	State Environment Planning Policy
Species credit	A credit that relates to an individual threatened species that cannot be reliably predicted based on habitat surrogates. Threatened species that require species credits are identified in the Threatened Biodiversity Data Collection
Study area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the proposal
TEC	Threatened ecological community
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act.

1.8 Definitions

The following terms are used in this report:

- The 'proposal' refers to the proposed transmission line works that fall outside the Biocertification area.
- The 'proposal site' refers to the area that could be directly impacted by the proposal. It represents the transmission line corridor within which the underground transmission line and easement would be sited (of 6.77 hectares, an impact area of about 0.69 hectares).
- The 'study area' refers to the area that was subject to field survey and assessed for direct or indirect impacts that may arise from the proposal.
- The 'locality' refers to the area within a 10 kilometre radius of the proposal site.

1.9 Assumptions and accredited assessor judgements

This report has been prepared based on the proposal description and maps and plans provided by the proponent. A 'proposal site' polygon (i.e. transmission corridor) was prepared by the proponent for the biodiversity assessment. It is assumed that the description and spatial data accurately represent the extent of potential direct impacts arising from the proposal and so these data have been used to calculate the extent of removal of vegetation and habitat arising from the proposal using GIS.

1.10 Scope and limitations

This report has been prepared by GHD for Renew Estate Pty Ltd and may only be used and relied on by Renew Estate Pty Ltd for the purpose agreed between GHD and the Renew Estate Pty Ltd as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Renew Estate Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

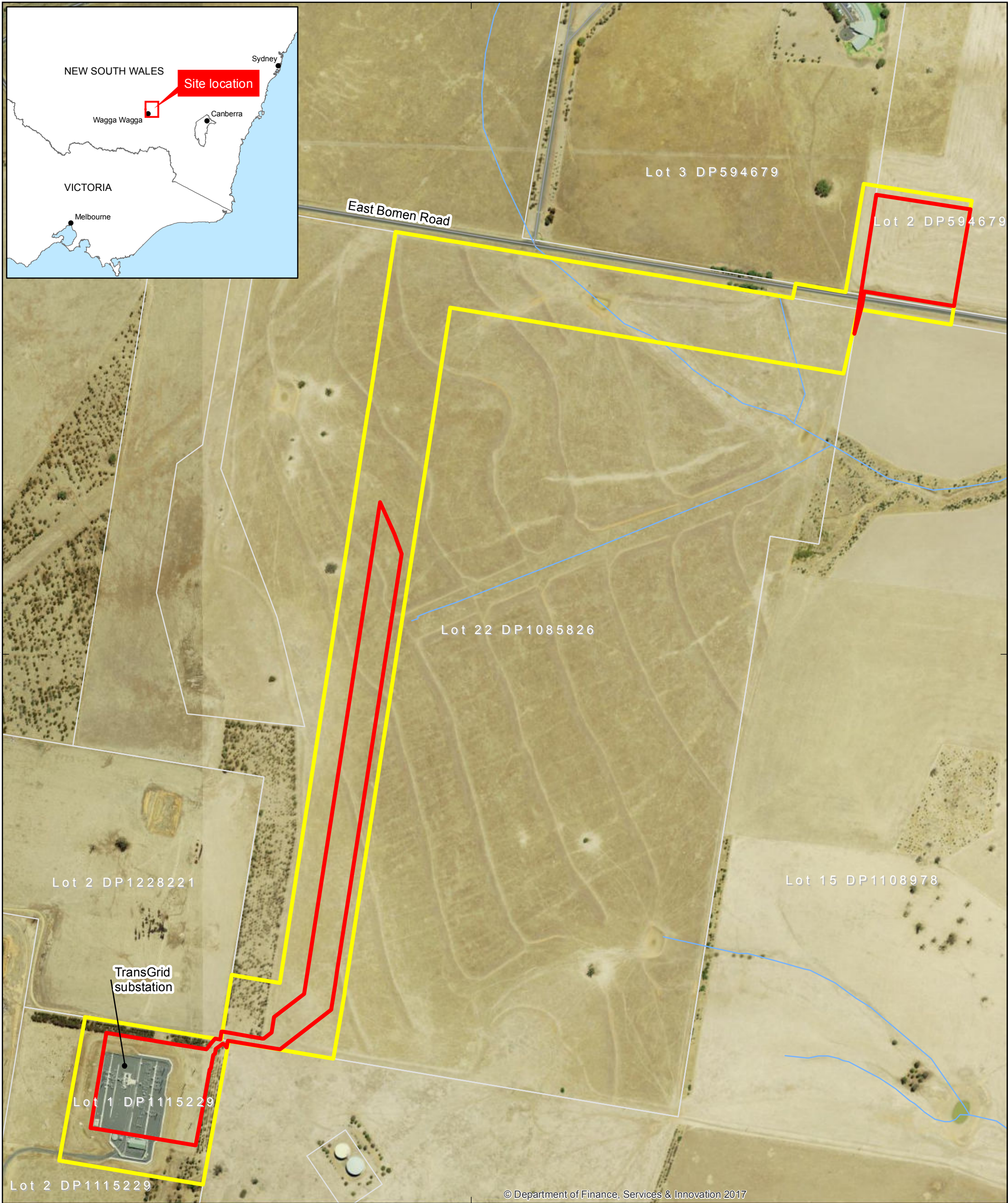
The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.9 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Renew Estate Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

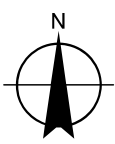
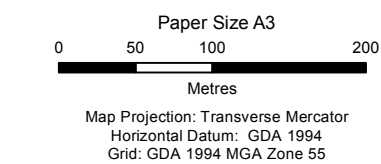
The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.



- LEGEND
- Proposal site assessment area
 - Study area
 - Lot boundary
 - Road
 - Waterway

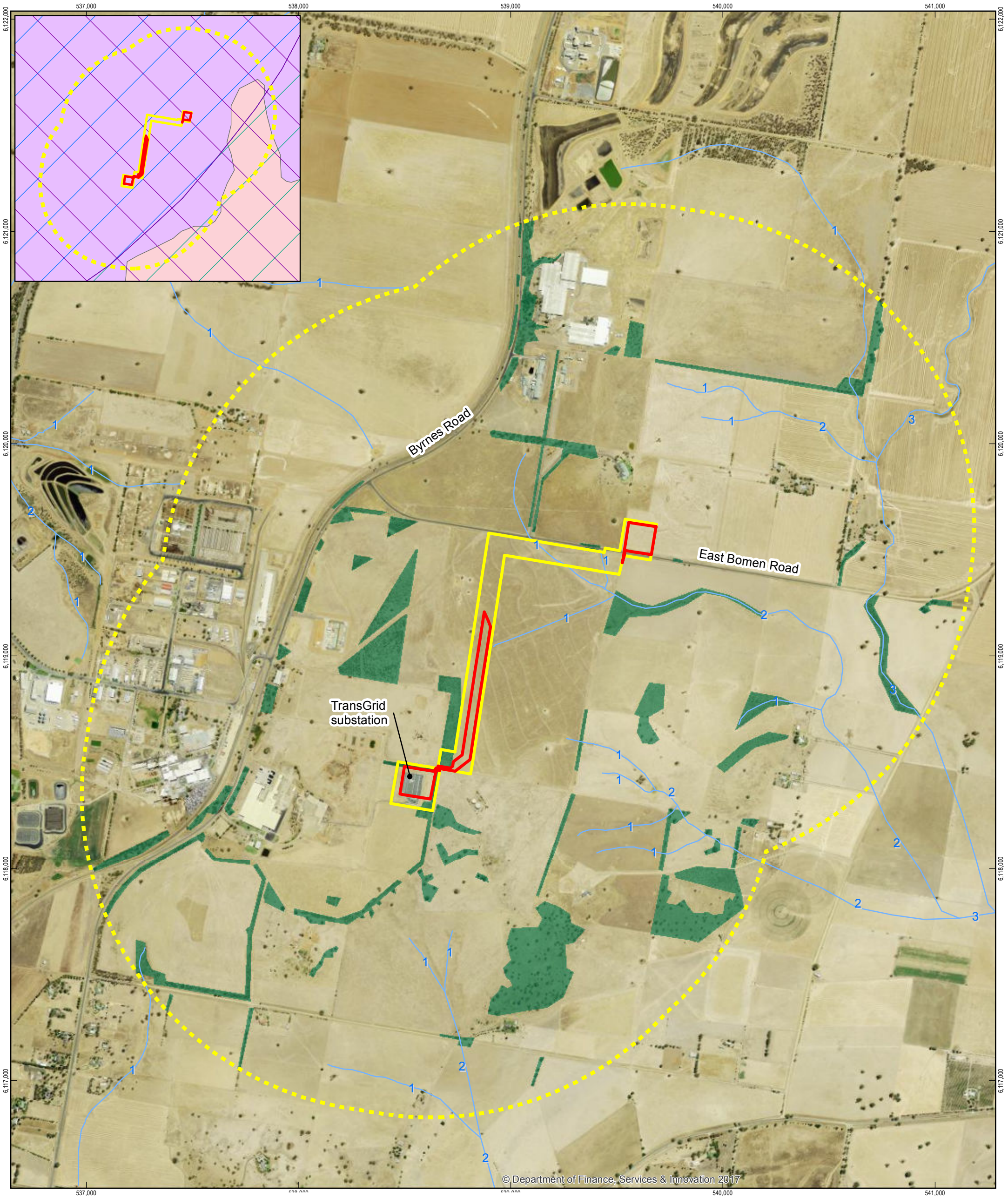


Renew Estate
Bomen solar farm transmission line
Biodiversity Development Assessment Report

Job Number 23-1624310
Revision 0
Date 13 Aug 2018

Site map

Figure 1

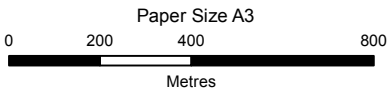


LEGEND

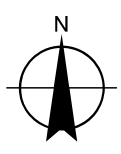
- Proposal site assessment area
- Study area
- 1500m buffer area
- Waterway and stream order
- Native vegetation extent

INSET MAP

- IBRA subregion**
 - Lower Slopes
 - Northern Inland Slopes, Upper Slopes
- IBRA region**
 - IBRA region
- Mitchell Landscape**
 - Junee Hills and Slopes
 - Murrumbidgee - Tarcutta Channels and Floodplains



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Renew Estate
Bomen solar farm transmission line
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Location map

Figure 2

2. Methodology

2.1 Desktop assessment

A literature and database review was undertaken to identify threatened flora and fauna species, populations and ecological communities (threatened biota) listed under the BC Act, FM Act, and EPBC Act, that could be expected to occur in the locality, based on previous records, known distribution ranges, and habitats present.

The threatened biota and migratory species identified in the desktop assessment are in Appendix A. Following collation of database records and threatened species and community profiles, a 'likelihood of occurrence' assessment was prepared for threatened biota and migratory species with reference to the broad vegetation types and habitats contained within the study area. This was further refined following field surveys and verification of vegetation types and identification and assessment of habitat present within the proposal site. A likelihood of occurrence ranking was attributed to these biota based on this information.

Information sources used in the preparation of this report include:

- The NSW BioNet database to help identify PCTs that occur in/adjacent to the proposal site as required by the BAM (OEH 2018c).
- OEH threatened biota profiles for descriptions of the ecology, distribution and habitat requirements of threatened biota (OEH 2018b). This resource was used to identify the suite of threatened ecological communities (TECs) that could potentially be affected by the proposal and to inform habitat assessments.
- Department of the Environment and Energy (DotEE) *Protected Matters Online Search Tool* for Matters of National Environmental Significance (MNES) listed under the EPBC Act and predicted to occur in the locality (DotEE 2018a).
- DotEE online *Species profiles and threats database* (SPRAT) (DotEE 2018b).
- The NSW *BioNet Vegetation Classification* database to help identify Plant Community Types (PCTs) that occur in/adjacent to the proposal site as required by the BAM (OEH 2018c).
- Groundwater Dependent Ecosystem Atlas (BOM 2018a).
- Aerial photographs and satellite imagery of the proposal site and buffer area.

2.2 Site survey

2.2.1 Survey effort and timing

Site surveys were conducted in the study area by a GHD ecologist on 18 December 2017, with additional surveys in the proposal site on 7 August 2018. Site surveys included:

- Initial site stratification and vegetation mapping.
- One BAM plot in the proposal site.
- Opportunistic fauna observations.

Survey effort that has directly contributed to this BDAR is described in detail below.

Targeted surveys for threatened flora were not considered necessary for this proposal given the following:

- The disturbed nature of the study area through past and present land uses including grazing and cropping.
- The low likelihood of threatened flora occurring based on the dominance of introduced vegetation and lack of native vegetation in the proposal site.

2.2.2 Vegetation mapping

Native vegetation in the study area was initially assigned a vegetation community name based on observed floristic and structural characteristics. Intact native vegetation communities were defined according to BioNet vegetation classification, Plant Community Types (PCT) (OEH 2018c). All vegetation communities were then mapped using aerial photographic interpretation within a geographical information system (GIS) as guided by the field survey results.

Vegetation within the proposal site is dominated by introduced groundcover species and therefore, does not classify as a PCT. The adjacent plantings to the proposal site that do classify as a PCT are however, discussed in this BDAR.

2.2.3 Vegetation survey plots

One plot was conducted in the proposal site in accordance with the BAM. The proposal site is dominated by introduced groundcover vegetation with no canopy species present in the proposal site. Introduced vegetation does not require further assessment (as per Section 5.1.1.5 of the BAM). The vegetation within the proposal site does not qualify as a vegetation zone (as per section 5.3.1.1 of the BAM) and therefore there are no minimum number of plots to complete as required by Table 4 of the BAM. The BAM plot completed was to demonstrate that the proposal site was dominated by introduced groundcover vegetation and was not a derived native grassland.

All flora species within a 20 metre by 20 metre plot nested within the 50 metre by 20 metre plot were identified according to the nomenclature of the Royal Botanic Gardens and Domain Trust (2018). Each species identified was allocated a growth form group and designated as either native, exotic or high threat exotic in accordance with lists provided by OEH. The location of the plot is shown on Figure 3.

2.2.4 Terrestrial fauna survey

Under the BAM, targeted surveys are not required for threatened fauna species known or predicted to occur within the subject site (ecosystem credit species). These species are assumed to be present within certain PCTs, given a certain patch size and condition.

No candidate threatened species from the BAM calculator were identified for the proposal based on site geomorphology and absence of native vegetation. No information could therefore be input into the BAM calculator.

Fauna habitat assessment

Fauna habitat assessments were undertaken throughout the proposal site, including active searches for potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, food trees, the density of understorey vegetation, the composition of ground cover, the soil type, presence of hollow-bearing trees, leaf litter and ground debris were noted.

Habitat assessments included searches for resources of potential value to threatened fauna including:

- Trees with bird nests or other potential fauna roosts.

- Burrows, dens and warrens.
- Rocky outcrop and ground debris.
- Distinctive scats or latrine sites, owl white wash and regurgitated pellets under roost sites.
- Tracks or animal remains.
- Evidence of activity such as feeding scars, scratches and diggings.
- Specific food trees and evidence of foraging.

The locations and quantitative descriptions of significant habitat features were captured with a handheld GPS unit and photographed where appropriate.

Opportunistic observations

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. This included a conscious focus on suitable areas of habitat during flora surveys. Any bird species observed during flora surveys were recorded as opportunistic observations. Birds were also identified by call identification.

2.3 Survey conditions

The field surveys were undertaken in December 2017 and August 2018. Conditions were hot in December and cold in August. Wind during opportunistic fauna surveys was low during both survey dates and so would not have hampered the detection of bird species.

Bureau of Meteorology (BOM) records for the survey dates are outlined in Table 2.1. These records were taken at the Wagga Wagga weather station (072150) located about nine kilometres from the proposal site (BOM 2018b).

Table 2.1 Daily weather observations during the survey period

Date	Minimum temp (Deg Celsius)	Max temp (Deg Celsius)	Rainfall (mm)
18/12/2017	21.6	35.9	0
07/08/2018	5.4	13.0	0.8

2.4 Geographical Information (GIS) analysis

GIS analysis is an integral part of the BAM. GIS was used to:

- Plot the proposal site on a high resolution aerial photo base and to map survey effort, native vegetation, habitat resources and biodiversity values across the site.
- Confirm the relevant Interim Biogeographic Regionalisation for Australia (IBRA) bioregion, IBRA subregion and Mitchell Landscape for the site.

Additional GIS analysis was used to plot a 1,500 metre buffer area surrounding the site to gain an understanding of site context. Native vegetation cover, extent and connectivity were assessed using aerial photography. Air photo interpretation was used to identify and record distinct vegetation patches, determine the broad condition state of vegetation types and the location and extent of vegetated habitat corridors.

2.5 BAM calculations

The proposal was assessed according to the methodology presented in the BAM (OEH 2017a). However, due to the absence of native vegetation in the proposal site, application of the credit calculator was not required, as per section 5.1.1.5 of the BAM which states areas that are not

native vegetation do not require further assessment. BAM credit calculations were therefore not conducted for the proposal.

2.6 Staff qualifications

This BDAR was prepared by Melissa Cotterill (GHD ecologist) in accordance with the BAM, based on field surveys also completed by Melissa. Melissa has completed the BAM training and her accreditation is currently pending based on OEH processing system payments. A technical review of the report was undertaken by Leigh Maloney (accredited assessor number BAAS18086). Staff qualifications are presented in Table 2.2.

Table 2.2 GHD ecology staff and qualifications

Name	Position / Project Role	Qualifications	Relevant Experience
Melissa Cotterill	Ecologist / desktop assessment, field surveys, reporting	BSc (Biology) BAM accreditation pending	6+ years
Leigh Maloney	Technical review	BEnvSc (Hons) Accredited BAM Assessor (BAAS18086) Former accredited BioBanking assessor (Acc No. 0050)	16+ years

3. Existing environment

3.1 Landscape features

The BAM requires the assessment of landscape features to help describe the biodiversity values of the proposal site and assess the impacts of the proposal. Landscape features relevant to the proposal are shown on Figure 2, discussed below and summarised in Table 3.1.

3.1.1 Location and land uses

The proposal site is located within Lot 2 DP 594679, north of East Bomen Road and Lots 22 DP 1085826 and 1 DP 1115229, south of East Bomen Road, in Bomen, within the Wagga Wagga LGA (see Figure 1).

The site within Lot 22 is currently being grazed by cattle with Lot 2 currently cropped. The only infrastructure present is the substation within Lot 1, which the proposed transmission line would connect to. Recent land uses have included agricultural practices such as grazing and cropping.

3.1.2 Bioregion and IBRA subregion

The proposal site occurs within the Lower Slopes IBRA subregion of the South Western Slopes bioregion (see Figure 2). The South Western Slopes bioregion comprises the lower inland slopes of the Great Dividing Range and covers an area of 8,657,426 hectares, which includes about 10.1 percent of NSW. The region extends from north of Cowra through southern NSW into western Victoria. It includes parts of the Murray, Murrumbidgee, Lachlan and Macquarie River catchments.

3.1.3 NSW landscape region (Mitchell Landscapes)

The proposal site is entirely within the Junee Hills and Slopes Mitchell Landscape (see Figure 2), which comprises rolling hills, low ranges and undulating plains. The general elevation of the landscape is 300 to 450 metres above sea level, with local relief typically 60 metres. Soils are comprised of coarse siliceous sands amongst rock outcrop and tors, and thin gritty red and yellow texture-contrast soils on slopes with harsh blocky subsoil (Mitchell 2002).

Vegetation differs with the location and type of soil profile and comprises Dwyer's Red Gum (*Eucalyptus dwyeri*) and Mugga Ironbark (*Eucalyptus sideroxylon*) on high rocky areas. Open forests of Grey Box (*E. microcarpa*) and Red Stringybark (*E. macrorhyncha*) occur on open slopes, with patches of Black Cypress Pine (*Callitris endlicheri*) in rocky outcrops. River Red Gum (*E. camaldulensis*) and River Sheoak (*Casuarina cunninghamiana*) occurs along streams (Mitchell 2002).

Due to the absence of remnant vegetation, it is difficult to determine the original vegetation characteristics of the proposal site, however, Grey Box is present further to the north of the proposal site, with River Red Gum known to occur along creeks in the area. The adjacent Mitchell Landscape, Murrumbidgee – Tarcutta Channels and Floodplains seems a better fit for the biophysical environment of the proposal site due to the lower general elevation and local relief, and the presence of Yellow Box (*E. melliodora*) open woodland, which is known to occur extensively in the area.

3.1.4 Climate

Climate data in the vicinity of the proposal was sourced from Wagga Wagga AMO (site number 072150) at the Wagga Wagga Airport.

The Wagga Wagga area receives an average annual rainfall of 573.7 millimetres. Rainfall is spread evenly throughout the year with a maximum of 56.9 millimetres in October (BoM 2018a).

The hottest month is January, with a mean maximum temperature of 31.7 degrees Celsius and a mean minimum temperature of 16.3 degrees Celsius. The coldest month is July, with a mean maximum temperature of 12.7 degrees Celsius and a mean minimum temperature of 2.9 degrees Celsius (BoM 2018a).

3.1.5 Soils and geology

Soil landscapes

The northern part of the proposal site is mapped as occurring on the East Bomen soil landscape, which comprises undulating rises of Silurian Wantabadgery Granodiorite. This soil landscape has a local relief of 15 to 40 metres with slopes between three to 10 percent. Soils in this landscape are moderately deep to deep (40 to 200 centimetres) (OEH 2018d).

The central and southern sections of the proposal site are mapped as occurring on the Glenmornon soil landscape, which comprises ridges and crests of granite low hills. This soil landscape has a local relief of 30 to 100 metres with slopes greater than 15 percent (some greater than 30 percent). Soils in this landscape are moderately deep (40 to 100 centimetres) (OEH 2018d).

Soil hazards

Soil landscapes for the proposal site and surrounding buffer area indicate that soils associated with the East Bomen soil landscape have a moderate potential for erosion with slopes of 3–10 per cent and soil profiles that contain highly erodible clays. Minor gully erosion and moderate sheet erosion are common in disturbed areas.

Soils associated with the Glenmornon soil landscape have a high potential for erosion, with slopes usually greater than 15 per cent. Some clay subsoils are sodic and dispersive making them highly erodible. Moderate sheet erosion may be found in disturbed areas.

There is minimal risk of acid sulfate soils as the site is not in a coastal location and has an elevation ranging from about 220-274 metre AHD. Acid sulfate soil risk mapping indicates that there are no known occurrences at the proposal site (OEH 2018d).

Areas of geological significance

There are no karst, caves, crevices, cliffs or other areas of geological significance located within the proposal site or buffer area surrounding the site.

3.1.6 Hydrology

The proposal site does not contain any drainage lines, waterbodies or watercourses. The proposal site is located within the Murrumbidgee River catchment, with the Murrumbidgee River located about 2.8 kilometres south of the proposal site. The upper reaches of two ephemeral drainage lines are located east of the proposal site, south of East Bomen Road, and flow from west to east (see Figure 1).

3.1.7 Patch size and connectivity features

Vegetation that would be impacted within the site is wholly comprised of introduced groundcover and is therefore not part of a patch of vegetation or connected to native vegetation in the study area or locality. Scattered patches of native woodland exist in the 1,500 metre buffer area of the proposal site, predominantly along road reserves and as plantings in private properties and

along fence line boundaries. The surrounding landscape is primarily dominated by agricultural land use, including dryland cropping and livestock grazing.

Within the 1,500 metre buffer area surrounding the proposal site, native vegetation comprises about 78.05 hectares, which is about 5.95 percent of the buffer area.

Table 3.1 provides a summary of the landscape features present within the proposal site.

Table 3.1: Summary of landscape features present within the proposal site

Landscape feature	Proposal site
Method applied for site context components	Site-based
IBRA bioregion	South Western Slopes
IBRA subregion	Lower Slopes
Mitchell landscapes	Junee Hills and Slopes
% native vegetation extent within buffer area	5.95 percent
Rivers, streams and estuaries	None
Wetlands	None
Connectivity features	Vegetation within the proposal site is wholly comprised of introduced groundcover and is therefore not part of a patch of vegetation or connected to native vegetation in the study area or locality. This is due to historical land clearing for agriculture. There is scattered patches of native vegetation and plantings within the buffer of the proposal site.
Areas of geological significance or soil hazard features	Soil landscapes for the proposal site and surrounding buffer area indicate that soils associated with the East Bomen soil landscape have a moderate potential for erosion. Soils associated with the Glenmornon soil landscape have a high potential for erosion. Acid sulphate soil risk mapping indicates that there is a low probability of occurrence at the proposal site (OEH 2018d). There are no karst, caves, crevices, cliffs or other areas of geological significance located within the proposal site or buffer area surrounding the site.
Other landscape features	Nil
Current percent native vegetation cover buffer area	5.95 percent
The future percent native vegetation cover buffer area	5.95 percent

3.1.8 Non-native vegetation

Non-native vegetation occurs as introduced grassland within the proposal site. Introduced grassland occupies the entire proposal site, which is about 6.77 hectares. Introduced grassland in the proposal site has been subject to historical and ongoing disturbances including ploughing for agriculture and grazing by livestock. One floristic plot (Plot 1) was sampled in introduced grassland (see Figure 3) to confirm the absence of native vegetation from within the site. There is no native overstorey or midstorey species within the site. Native species richness is very low in the understorey, and was restricted to sparse occurrences of Red-leg Grass (*Bothriochloa macra*), Corrugated Sida (*Sida corrugata*) and Swamp Dock (*Rumex brownii*). An exotic understorey comprising mostly Capeweed (*Arctotheca calendula*), Subterranean Clover (*Trifolium subterraneum*), Long Storksbill (*Erodium botrys*) and Onion Grass (*Romulea rosea*

var. *australis*) dominated cover and abundance of flora within the plot. Introduced grassland was not assigned a PCT or considered in BAM calculations due to the level of disturbance and absence of native vegetation (refer to section 5.1.1.5 of the BAM (OEH 2017a)).

Flora species

A total of 28 flora species from 12 families were recorded within the proposal site, comprising six native and 22 exotic species. The most diverse family recorded was Poaceae with eight species, followed by Asteraceae with five species. A full list of flora species recorded is provided in Appendix B. The most commonly recorded species are identified above.

3.2 Native vegetation

3.2.1 Plant community types

Field surveys confirmed that no native plant community types are present in the proposal site (see Figure 3). There is however, a native planting to the west of the proposal site, in the wider study area, that classifies as a PCT. The planting is of a uniform age and about four to six metres in height. Due to past clearing, predominantly for cropping and grazing, the groundcover is dominated by introduced species similar to those within Plot 1, although very sparse due to current stock movement and grazing. The planting is comprised of Red Box (*E. polyanthemos*) and most closely fits PCTID 318 *Mugga Ironbark – Tumbledown Red Gum – Red Box – Black Cypress Pine open forest on shallow stony soils on hills in the NSW South Western Slopes Bioregion*.

This planting was previously identified as being dominated by White Box (*E. albens*) due to limited access to the site to properly identify the planting. It was classified as PCTID 266 *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*. None of this planting would be impacted by the proposal, either directly or indirectly.

3.2.2 Groundwater dependent ecosystems

The *NSW State Groundwater Dependent Ecosystems Policy* defines groundwater dependent ecosystems (GDEs) as ecosystems which have their species composition, and their natural ecological processes determined by groundwater (DLWC 2002). Ecosystems vary dramatically in the degree of dependency of groundwater, from having no apparent dependence through to being entirely dependent on it (DLWC 2002).

Dependence (or interaction) of the vegetation communities identified within the proposal site on groundwater was determined by searching the Atlas of GDEs (BOM 2018a). This Atlas predicts the occurrence of groundwater dependent ecosystems and ecosystems that potentially use groundwater. It shows ecosystems that interact with the subsurface expression of groundwater (including vegetation ecosystems) or the surface expression of groundwater (such as rivers and wetlands). The Atlas also shows the likelihood that landscapes are accessing water in addition to rainfall, such as soil water, surface water or groundwater. Native vegetation within the proposal site is not mapped as an aquatic, terrestrial or subterranean groundwater dependent ecosystems (BOM 2018a). Native vegetation within the proposal site is unlikely to comprise an in-flow dependant ecosystem, namely an ecosystem that is “accessing a water source in addition to rainfall, such as water stored in the unsaturated zone, surface water or groundwater” (Australian Government 2012).

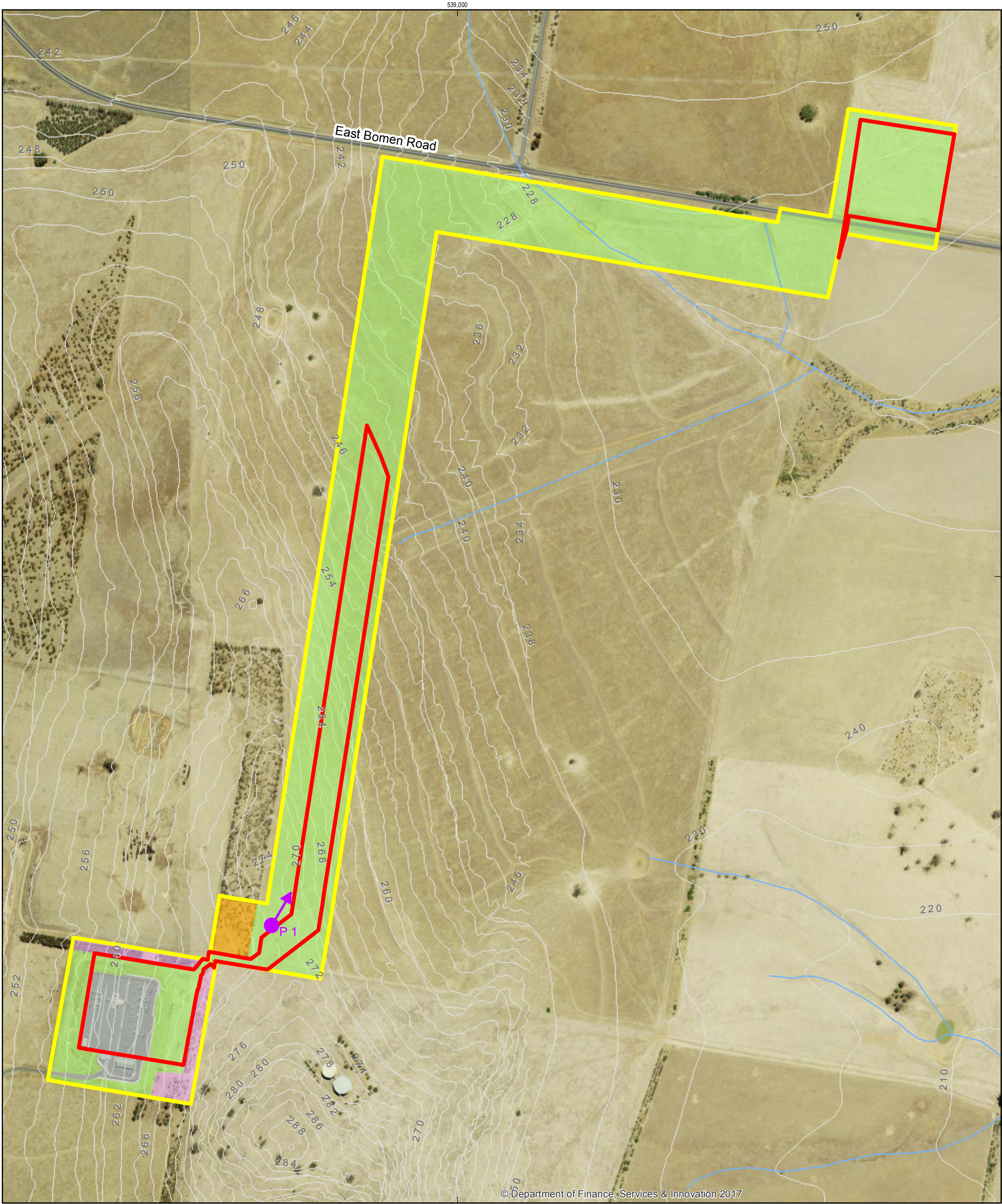
3.2.3 Habitat resources

The proposal site is comprised of introduced groundcover vegetation, with limited habitat resources available within the site. The proposal site is not considered to provide suitable habitat for any threatened species listed under the BC Act and/or the EPBC Act.

Fauna species with the potential to occur at the proposal site would be limited to those species capable of persisting in fragmented and modified landscapes. Wide-ranging highly mobile species capable of travelling throughout fragmented landscapes may utilise the site on occasion, as part of a larger home range and network of habitats. Species that may utilise the site in response to favourable conditions include highly mobile wide ranging fauna such as the Superb Parrot (*Polytelis swainsonii*) and Flame Robin (*Petroica phoenicea*).

Woody debris and leaf litter in the proposal site is absent.

A rocky outcrop is located at the southern end of the proposal site in Lot 22. These rocky outcrops are mostly comprised of large embedded rocks and therefore provide limited value as fauna habitat including roosting sites for birds and potential basking/sheltering sites for reptiles. In addition, the rocky outcrop is located in highly disturbed grassland, which provides marginal fauna habitat.



LEGEND

- Plot/transect
- Proposal site assessment area
- Study area
- Contour
- Waterway
- Road

Other site features

- Exotic grassland
- Infrastructure

Vegetation type

- PCT 318 - Mugga Ironbark – Tumbledown Red Gum – Red Box – Black Cypress Pine open forest on shallow stony soils on hills in the NSW South Western Slopes Bioregion
- Planting - unclassified

4. Threatened biota

4.1 Identification of threatened species under the BAM

Due to the proposal site being dominated by introduced groundcover, with no native vegetation present, no vegetation types and habitat resources could be input into the BAM credit calculator to generate threatened species that are predicted to utilise the site. No further assessment of threatened species is required under the BAM, as per section 5.1.1.5. Nevertheless threatened species with the potential to occur in the study area have been considered in this BDAR.

Searches of threatened species databases were completed to determine any threatened species that are known or predicted to occur in the locality (see Appendix A). These results were reviewed giving consideration to the habitats available on site to determine threatened species that may potentially occur at the proposal site.

4.2 Threatened species survey results

No threatened species or populations were observed in the study area during field surveys.

The habitat in the proposal site and study area is typical of the fragmented agricultural environments in the south west slopes. These environments can still support threatened species. The BC Act and EPBC Act listed vulnerable Superb Parrot is known to occur in the locality and breeds in hollow-bearing trees in Box-Gum Woodland and River Red Gum Woodland. There are numerous records of the Superb Parrot in the locality, including along the Murrumbidgee River corridor, 2.8 kilometres south of the proposal site, and in remnant vegetation in road reserves, including Yellow Box trees along Trahairs Road about two kilometres to the north.

The BC Act listed vulnerable Flame Robin has also been recorded in the locality of the proposal site, in woodland vegetation within the road reserve of Trahairs Road about two kilometres to the north.

The threatened ecological community White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland), listed as endangered under the BC Act and critically endangered under the EPBC Act is known to occur in the locality as remnant vegetation on private properties and along road reserves. However, the community does not occur in the study area of the proposal site.

The habitat in the proposal site is typical of highly disturbed agricultural environments and contains only marginal habitat for threatened species. While they may still occur, due to the absence of canopy species in the site, and largely ploughed and grazed groundcover, habitat outside of this site in the wider study area and locality would likely provide preferred and/or better quality habitat.

5. Impact assessment

5.1 Introduction

The proposal would result in direct impacts to about 0.69 hectares of introduced groundcover vegetation within the proposal site. This vegetation is likely to provide marginal potential habitat for threatened species. Groundcover would be allowed to regenerate following construction of the proposal.

There is limited potential for indirect impacts on retained areas of native vegetation adjacent to the proposal site, i.e. the native plantings, due to the groundcover in these areas also being dominated by introduced species. No tree removal would occur for the proposal and the transmission corridor for the proposal allows for refinement of the location of the seven to 11 metre transmission easement during detailed design, without potential impacts to adjacent native vegetation.

A small area of a rocky outcrop in the south of the proposal site would also be potentially removed during construction. The outcrop consists mostly of large embedded rocks and therefore provides limited value as fauna habitat.

Specific mitigation measures are recommended to minimise potential impacts on biodiversity values. These measures are presented according to the hierarchy of avoidance and mitigation of impacts. The proposal is not likely to result in residual impacts due to vegetation removal being limited to introduced groundcover. Therefore, provision of offsets to counter residual impacts is not required.

5.2 Avoidance of impacts

The proposal has aimed to avoid all impacts to native vegetation and habitat values by refining the transmission corridor to an area devoid of native vegetation. Originally the transmission corridor included some of the native tree plantings adjacent to the proposal site, however was later narrowed to avoid all potential native vegetation removal including tree plantings. This approach has avoided habitat fragmentation and maintained the connectivity of surrounding native vegetation in the locality.

5.3 Minimisation of impacts

5.3.1 Construction phase

A Construction Environmental Management Plan (CEMP) would be required for the construction phase of the project. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and waterways in accordance with relevant policy documentation and Government guidelines.

The safeguards and management measures detailed in Table 5.1 would be used during the construction period to minimise the impacts of the proposal on the biodiversity of the study area. These safeguards and management measures would be incorporated into a CEMP to be implemented during construction.

Table 5.1: Safeguards and management measures

Impact	Safeguards and management measures	Timing	Responsibility
Loss of native vegetation and fauna habitat	<ul style="list-style-type: none"> Staff will be inducted and informed of the limits of vegetation clearing and the areas of vegetation to be retained. 	Construction	Construction contractor
Spread of weeds	<ul style="list-style-type: none"> Priority weed control measures will be implemented as part of the CEMP to prevent their spread in the study area. 	Pre-construction	Construction contractor
	<ul style="list-style-type: none"> Declared priority weeds will be managed according to requirements of the NSW <i>Biosecurity Act 2015</i> Soil material and stripped groundcover vegetation with the potential to contain priority weeds will not be removed from the proposal site Soil disturbance will be avoided as much as possible to minimise the potential for spreading weeds. 	Construction and operation	Construction contractor
Sedimentation	<ul style="list-style-type: none"> A site specific erosion and sediment control plan will be prepared as part of the CEMP. All erosion and sediment control measures shall be designed, implemented and maintained in accordance with relevant sections of 'Managing Urban Stormwater: Soil and Construction Volume 1' (Landcom 2004) ('the Blue Book') (particularly section 2.2) and 'Managing Urban Stormwater: Soil and Construction Volume 2A – Installation of Services' (DECC 2008). The ESCP will include stockpiles, stormwater runoff, trees, site boundaries, site access and storage areas. 	Pre-construction	Construction contractor
	<ul style="list-style-type: none"> Areas disturbed during the works will be rehabilitated, including stabilising disturbed soils to resist erosion and weed invasion Stabilisation activities will be carried out progressively to limit the time disturbed areas are exposed to erosion processes Activities with a risk of soil erosion such as earthworks will not be undertaken immediately before or during high rainfall or wind events. 	Construction	Construction contractor
Water quality, chemical and fuel impacts on flora and fauna	<ul style="list-style-type: none"> A site specific emergency spill plan will be developed, and will include spill management measures in accordance relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers) 	Pre-construction	Construction contractor

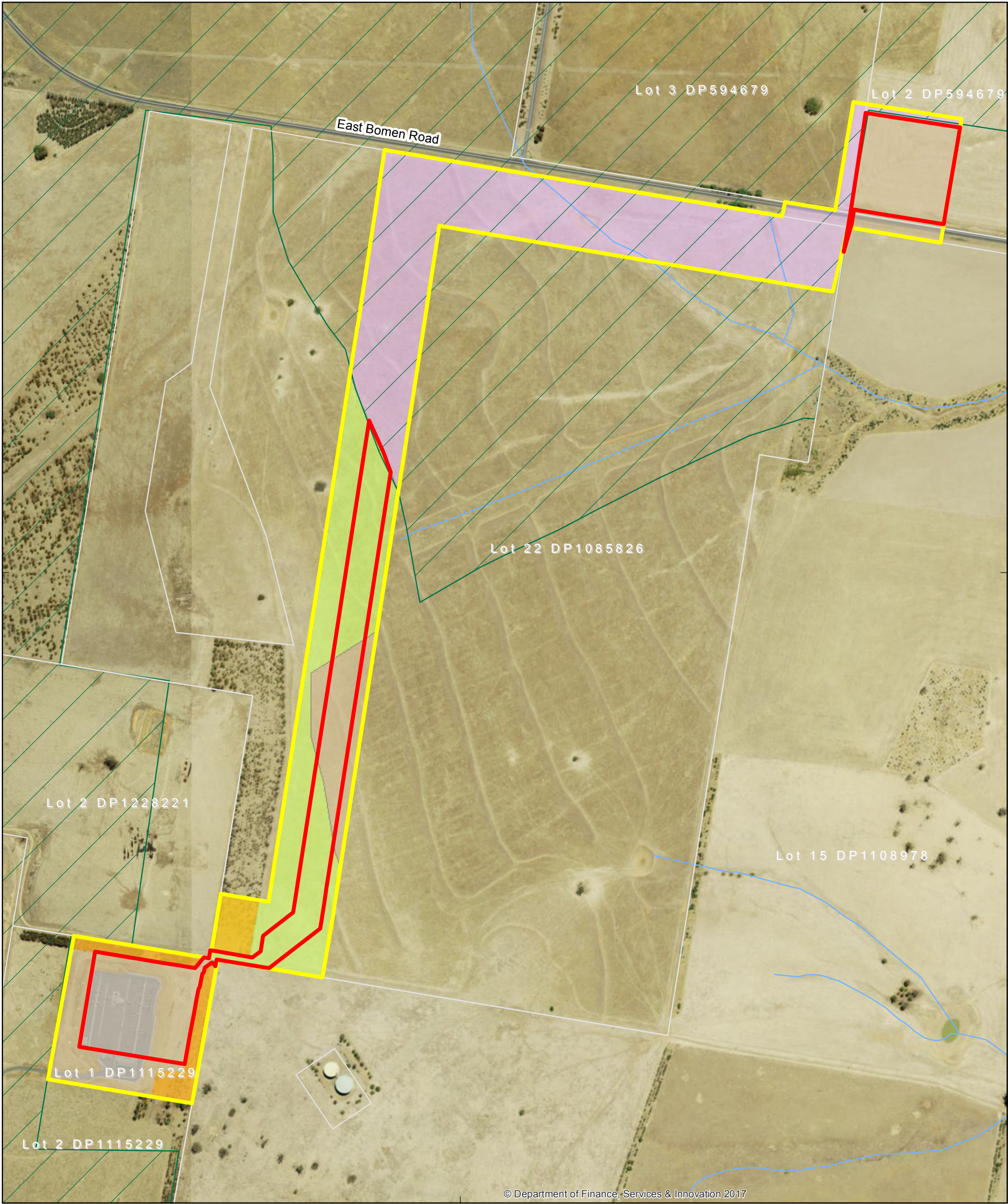
Impact	Safeguards and management measures	Timing	Responsibility
	<ul style="list-style-type: none"> An emergency spill kit will be kept on site at all times. All staff will be made aware of the location of the spill kit and trained in its use 	Construction	Construction contractor
	<ul style="list-style-type: none"> Any herbicides used for weed control will be applied to the manufacturer's specifications and as outlined in the manufacturer's Material Safety Data Sheet 	Construction	Construction contractor
	<ul style="list-style-type: none"> Machinery will be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery. All staff will be appropriately trained through toolbox talks for the minimisation and management of accidental spills. 	Construction	Construction contractor
Pathogen spread and establishment	<ul style="list-style-type: none"> Vehicle wash down facilities will be provided should evidence of pathogens or fungus such as Phytophthora or Chytrid be found. 	Construction	Construction contractor

5.3.2 Operation phase

No additional mitigation measures are proposed for the operation phase of the project. The proposal is expected to have minimal operational impacts, which would be limited to maintenance of the easement.

5.4 Residual impacts to be offset

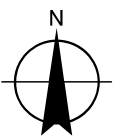
The proposal is not likely to result in residual impacts due to vegetation removal being limited to introduced groundcover. Therefore, provision of offsets to counter residual impacts is not required.



- LEGEND
- | | | | |
|--|-------------------------------|---------------------------------|------------------------|
| | Proposal site assessment area | | Substation |
| | Study area | | Native planting |
| | Lot boundary | Land use zone within study area | |
| | Biocertification area | | IN1 General Industrial |
| | Waterway | | RU1 Primary Production |
| | Road | | RE1 Public Recreation |

Paper Size A3
0 50 100 200
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Renew Estate
Bomen solar farm transmission line
Biodiversity Development Assessment Report

Job Number	23-1624310
Revision	0
Date	13 Aug 2018

Project footprint

Figure 4

G:\23116243\GIS\Maps\Deliverables\BDAR\BomenBDARVeg_Fig4.mxd

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Data source: NSW Government (LPI): Hydrolines, lot boundaries, land use zones and roads - 2012 and aerial photograph - 2017; Renew Estate: Proposal site assessment area, study area - 2018; Wagga Wagga City Council: Biocertification area (adjusted) - 2018. Created by:mjcotterill

6. Offset requirements

6.1 Assessment of impacts requiring offsetting

There are no impacts associated with the proposal that require offsetting due to impacts being restricted to the removal of introduced vegetation.

No threatened biota were identified as being a candidate Serious and Irreversible Impact (SAIL) entity. Consultation with Wagga Wagga City Council did not identify any Council listed SAIL entities for the LGA.

6.2 Assessment of impacts not requiring offsetting

The wider study area contains about 0.4 hectares of native vegetation (PCTID 318 – Mugga Ironbark – Tumbledown Red Gum – Red Box – Black Cypress Pine open forest on shallow stony soils on hills in the NSW South Western Slopes Bioregion), which would not be directly or indirectly impacted by the proposal. About 0.6 hectares of an additional native planting, which does not classify as a PCT would also not be impacted by the proposal. These areas therefore, do not require offsetting.

6.3 Areas not requiring assessment

The proposal site comprises 6.77 hectares defined as 'cleared land' in accordance with the BAM, comprising wholly of introduced grassland that has been ploughed and grazed (Plate 1) and 1.29 hectares of land comprised of the TransGrid substation.

The BAM states that "*areas that are not native vegetation...do not require further assessment in the BAM except where:*

- a. They are proposed for restoration as part of an offset*
- b. They are assessed as habitats for threatened species."*

As such, all of the proposal site land does not require assessment, however, has nevertheless been included as the subject of this BDAR.



Plate 1: Cleared land not requiring offsetting

7. Conclusion

Renew Estate Pty Ltd is proposing to construct a transmission line for a proposed 120 MW solar farm at Bomen, NSW that is subject to an EIS as part of its assessment under Part 4.1 of the EP&A Act as an SSD project. Due to changes in the Biocertification area under the Wagga Wagga LEP, part of the transmission line for the solar farm now falls outside biocertified land. As the development is a SSD, to satisfy the SEARS the impacts of the development on biodiversity values for the area not on biocertified land requires assessment using the BAM.

This Biodiversity Development Assessment Report (BDAR) has been prepared by GHD to identify the potential impacts of the proposal on biodiversity values within the proposal site. This assessment has been completed in accordance with the BAM and includes:

- Desktop assessment to describe the existing environment and landscape features of the proposal site and to identify the suite of threatened biota potentially affected by the proposal.
- Field survey to describe the biodiversity values of the proposal site and surrounding study area and to determine the likelihood of threatened biota and their habitats occurring in the proposal site or being affected by the proposal.

The proposal would result in direct impacts to about 0.69 hectares of introduced groundcover vegetation within the proposal site. The BAM states that areas of non-native vegetation do not require further assessment. Due to the proposal site being wholly comprised of introduced groundcover, with no native vegetation present, no vegetation types and habitat resources could be input into the BAM credit calculator to generate threatened species that are predicted to utilise the site. Therefore, no further assessment of threatened species under the BAM was required. Nevertheless, threatened species with the potential to occur in the area were considered in this BDAR (see Appendix A). It is concluded that the proposal is unlikely to impact on any threatened species.

Due to the proposal not removing any native vegetation or potential threatened species habitat no credit report was required to be generated for the proposal and no offsetting is therefore required.

A series of mitigation and management measure have been identified for the proposal to avoid and minimise potential impacts of the proposal on biodiversity (Table 5.1). These would be implemented as part of the construction environmental management plan for the site.

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Appendices

Appendix A – Likelihood of occurrence table

An evaluation of the likelihood and extent of impact to threatened and migratory fauna recorded from within the Wagga Wagga LGA; and within a 10 kilometre radius of the proposal site (EPBC Act threatened and migratory species). Records are from a search of the Office of Environment and Heritage (OEH) Bionet Atlas, and the EPBC Environmental Reporting Tool available from the Department of the Environment and Energy (DotEE) website. Ecology information has been obtained from the threatened biodiversity profiles on the Bionet Atlas threatened species web application (<http://www.environment.nsw.gov.au/threatenedspecies/>) and from the Species Profiles and Threats Database on the Commonwealth DotEE website (<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>).

Status

National *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

NSW *NSW Biodiversity Conservation Act 2016*

E: Endangered

CE: Critically Endangered

V: Vulnerable

Mi: Migratory

Likelihood of occurrence in study area

- **Recorded** – The species was observed in the study area during the current survey
- **High** – It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration
- **Moderate** – Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded
- **Low** – It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species is a non-cryptic perennial flora species that was specifically targeted by surveys and not recorded
- **None** – Suitable habitat is absent from the study area.

Flora and ecological communities

Species / Communities	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Ecological communities				
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	E	E	Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, <i>Eucalyptus microcarpa</i> (Inland Grey Box), is often found in association with <i>E. populnea</i> subsp. <i>bimbil</i> (Bimble or Poplar Box), <i>Callitris glaucophylla</i> (White Cypress Pine), <i>Brachychiton populneus</i> (Kurrajong), <i>Allocasuarina luehmannii</i> (Bulloak) or <i>E. melliodora</i> (Yellow Box), and sometimes with <i>E. albens</i> (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent.	None – Grey Box does not occur in the study area and is not known to have previously occurred. The ecological community does not occur within the study area.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland)	CE	E	Characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. Commonly co-occurring eucalypts include <i>Eucalyptus bridgesiana</i> , <i>E. polyanthemos</i> , <i>E. rubida</i> , <i>E. pauciflora</i> , <i>E. cinerea</i> , <i>E. mannifera</i> , <i>E. macrorhyncha</i> , <i>E. microcarpa</i> and others.	None – Yellow Box and White Box trees that form the community are present in the wider study area and locality along road side reserves and as scattered paddock trees, however there are none located in the proposal site or study area. Therefore the community would not be impacted by the proposal.
Plants				
A Spear Grass <i>Austrostipa wakoolica</i>	E	E	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Flowers from October to December, mainly in response to rain. The species has not been recorded in the locality.	Low – Suitable habitat is not present in the study area and the groundcover in the study area is dominated by introduced species.

Species / Communities	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Claypan Daisy <i>Brachyscome muelleroides</i>	V	V	The Claypan Daisy occurs in the Wagga Wagga, Narranderra, Tocomwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocomwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with <i>Pycnosorus globosus</i> , <i>Agrostis avenacea</i> and <i>Austrodanthonia duttoniana</i> . Also recorded from the margins of lagoons in mud or water, and in association with <i>Calotis anthemoides</i> . The species has been recorded once in the locality, about 8.4 kilometres south-west of the proposal site.	Low - Suitable habitat does not occur in the study area due to lack of associated species and habitat types including claypans and moist areas.
Greencomb Spider-orchid <i>Caladenia tensa</i>	E	-	The Greencomb Spider-orchid grows on red-brown sandy loams on rises in open woodland dominated by Yellow Gum (<i>Eucalyptus leucoxylon</i> sens. lat.) and Rottnest Island Pine (<i>Callitris preissii</i>). More recently, the various habitats for the species has been described, including dry Cypress-pine /Yellow Gum Woodland, Pine/Box woodland, mallee-heath sites, heathy woodland and mallee woodland, generally with rock outcrops. The species has not been recorded in the locality. Predicted to occur in DotEE Species Profile and Threats Database.	Low - Suitable habitat does not occur in the study area due to lack of associated species and suitable woodland areas.
Small Purple-pea <i>Swainsona recta</i>	E	E	Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum <i>Eucalyptus blakelyi</i> , Yellow Box <i>E. melliodora</i> , Candlebark Gum <i>E. rubida</i> and Long-leaf Box <i>E. goniocalyx</i> . Grows in association with understorey dominants that include Kangaroo Grass <i>Themeda australis</i> , Poa tussocks <i>Poa</i> spp. and spear-grasses <i>Austrostipa</i> spp. The species has been recorded twice in the locality, however these are historical records from 1900.	Low - Suitable habitat limited within the study area due to the dominance of introduced species and previous disturbance.
Tarengo Leek Orchid <i>Prasophyllum petilum</i>	E	E	Natural populations are known from a total of four sites in NSW. These are at Boorowa, Captains Flat, Ilford and Delegate. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock <i>Poa labillardieri</i> , Black Gum <i>Eucalyptus aggregata</i>	Low - Suitable habitat limited within the study area due to the dominance of introduced species and previous disturbance.

Species / Communities	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			<p>and tea-trees <i>Leptospermum</i> spp. at Captains Flat and within the grassy groundlayer dominated by Kangaroo Grass under Box-Gum Woodland at Ilford. Apparently highly susceptible to grazing, being retained only at little-grazed travelling stock reserves (Boorowa & Delegate) and in cemeteries (Captains Flat and Ilford).</p> <p>The species has not been recorded in the locality.</p>	
Woolly Ragwort <i>Senecio garlandii</i>	-	V	<p>This daisy is found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds). There is a single population in Victoria at Chiltern. Woolly Ragwort occurs on sheltered slopes of rocky outcrops.</p> <p>The species has been previously recorded within the township of Wagga Wagga, however, the species is unlikely to have present. The nearest known location of the species is at The Rock Nature Reserve, about 37.5 kilometres south-west of the proposal site. The study area does contain rocky outcrops, however the species is unlikely to inhabit these areas due to the previous disturbance and dominance of introduced species.</p>	Low - Suitable habitat limited within the study area due to the dominance of introduced species and previous disturbance.

Fauna

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Birds				
Australasian Bittern <i>Botaurus poiciloptilus</i>	E	E	This species favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). Hides during the day among dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. The species has not been previously recorded in the locality.	Low – The study area does not contain suitable wetland habitat for the species and it is unlikely to occur.
Australian Painted Snipe <i>Rostratula australis</i>	E	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground among tall vegetation, such as grasses, tussocks or reeds. Forages nocturnally on mud-flats and in shallow water. The species has not been previously recorded in the locality.	Low – The study area does not contain suitable wetland habitat for the species and it is unlikely to occur.
Barking Owl <i>Ninox connivens</i>	-	V	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. Previously recorded along the Murrumbidgee River, about 5.5 kilometres south of the study area.	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Black-chinned Honeyeater (eastern subspecies) <i>Melithreptus gularis gularis</i>	-	V	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>E. sideroxylon</i>), White Box (<i>E. albens</i>), Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. The species was recorded about 3.8 kilometres south-east of the study area, in 1979.	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Black Falcon <i>Falco subniger</i>	-	V	<p>The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993).</p> <p>The species has been recorded along the Murrumbidgee River, about 5.4 kilometres south of the study area.</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	-	V	<p>Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range. The species mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species, and is also found in mallee and River Red Gum Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. They are usually not found in woodlands with a dense shrub layer.</p> <p>The species has been previously recorded about 800 metres south of the proposal site.</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Diamond Firetail <i>Stagonopleura guttata</i>	-	V	<p>The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities.</p> <p>Previously recorded in 1994, about 7.7 kilometres south-west of the study area.</p>	Low - The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	-	V	<p>Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range.</p> <p>Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. Depending on location and local climatic conditions (primarily temperature and rainfall), the dusky woodswallow can be resident year round or migratory. In NSW, after breeding, birds migrate to the north of the state and to southeastern Queensland. Previously recorded in 1994, about 6.5 kilometres south-west of the study area.	groundcover is unlikely to impact on the species.
Flame Robin <i>Petroica phoenicea</i>	-	V	Prefer forests and woodlands up to about 1800 metres above sea level but are often recorded in fragmented landscapes foraging in open farmland adjoining box-gum woodlands. Previously recorded about three kilometres east of the study area.	Low - The species is known to forage in the wider study area (previous GHD staff observations), however is likely to utilise preferred woodland habitat and adjacent areas. Removal of introduced groundcover is unlikely to impact on the species.
Fork-tailed Swift <i>Apus pacificus</i>	Mi	-	Migratory marine visitor to eastern Australia. It is a highly nomadic and dispersive species which feeds on insects in the air. The species has not been previously recorded in the locality.	Low – The species may occasionally use the habitat adjacent to the study area as roosting habitat. The proposal is unlikely to have an impact on the aerial resources of the species.
Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	-	V	The eastern subspecies (<i>temporalis</i>) occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. Previously recorded about 1.8 kilometres west of the study area.	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is more likely to occur in woodland patches in the wider study area due to their laborious nature and removal of introduced groundcover is unlikely to impact on the species.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Hooded Robin (south-eastern form) <i>Melanodryas cucullata cucullata</i>	-	V	<p>Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.</p> <p>The species has not been previously recorded in the locality.</p>	Low - The species is more likely to utilise diverse habitats outside of the study area and therefore unlikely to be impacted.
Little Eagle <i>Hieraaetus morphnoides</i>	-	V	<p>Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.</p> <p>Recorded most recently in 1980, about 3.2 kilometres south-west of the study area.</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Little Lorikeet <i>Glossopsitta pusilla</i>	-	V	<p>Mostly occur in dry, open eucalypt forests and woodlands. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. On the western slopes and tablelands White Box and Yellow Box are particularly important food sources for pollen and nectar and mistletoe is also a common habitat feature.</p> <p>The species has been recorded once in the locality, in 1970, about 4.7 kilometres south-west of the study area. The study area contains woodland dominated by White Box and Yellow Box, preferred habitat trees for the species.</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Painted Honeyeater <i>Grantiella picta</i>	-	V	<p>Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Also eats saltbush fruit, berries, seed and flowers. Migratory species.</p> <p>The species has not been previously recorded in the locality.</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Regent Honeyeater <i>Anthochaera phrygia</i>	E	E	<p>The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.</p> <p>The species has been recorded once in the locality, in 1980, about 6.6 kilometres south-west of the study area.</p>	Low – The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. In addition, there have been a lack of recent records of the species in the locality.
Satin Flycatcher <i>Myiagra cyanoleuca</i>	Mi	-	<p>Satin Flycatchers are mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as Brown Barrel, <i>Eucalypt fastigata</i>, Mountain Gum, <i>E. dalrympleana</i>, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash, <i>E. regnans</i>. Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood, <i>Acacia melanoxylon</i>. The species may also occur in woodlands such as Box-Gum Woodland.</p> <p>The species has not been previously recorded in the locality.</p>	Low – The species has not been recorded in the locality and is likely to utilise preferred, higher quality habitat outside the study area.
Scarlet Robin <i>Petroica boodang</i>	-	V	<p>Primarily a resident in dry forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.</p> <p>The species has previously been recorded about 7.7 kilometres south-west of the study area.</p>	Low - The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Speckled Warbler <i>Chthonicola sagittata</i>	-	V	<p>The Speckled Warbler lives in a wide range of <i>Eucalyptus</i> dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.</p> <p>The species has not been previously recorded in the locality.</p>	Low - The species is more likely to utilise diverse habitats outside of the study area and therefore unlikely to be impacted.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Superb Parrot <i>Polytelis swainsonii</i>	V	V	<p>The species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. May forage up to 10 kilometres from nesting sites, primarily in grassy box woodland.</p> <p>The species has been previously recorded, nearest to the proposal site about 800 metres to the south.</p>	Low – The species has been recorded numerous times in the locality and is known to use River Red Gum woodland and Box-Gum Woodland in the locality to breed. The species is likely to occur in woodland and potentially utilise paddock trees in the wider study area. It may also feed on introduced groundcover, however this is common and widespread in the study area and locality and a small area of its removal is unlikely to impact the species.
Swift Parrot <i>Lathamus discolor</i>	E	E	<p>The species occurs in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i>, Spotted Gum <i>Corymbia maculata</i>, Red Bloodwood <i>C. gummifera</i>, Mugga Ironbark <i>E. sideroxylon</i>, and White Box <i>E. albens</i>. Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i>, Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i>.</p> <p>The species has previously been recorded about 5.4 kilometres west of the study area, in 2002.</p>	Low - The species is more likely to utilise woodland habitats outside of the study area where profuse flowering occurs, and is unlikely to be impacted by the removal of introduced groundcover vegetation.
Turquoise Parrot <i>Neophema pulchella</i>	-	V	<p>Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.</p> <p>The species has been recorded once in the locality, in 2007, about 3.8 kilometres south of the study area.</p>	Low - The study area does not contain suitable woodland habitat for the species and it is unlikely to occur. The species is likely to utilise habitat outside the study area and removal of introduced groundcover is unlikely to impact on the species.
Varied Sittella <i>Daphoenositta chrysoptera</i>	-	V	<p>Occurs in eucalypt woodlands and forests throughout their range. They prefer rough-barked trees e.g. stringybarks and ironbarks</p> <p>The species has not been previously recorded in the locality.</p>	Low - The species is unlikely to inhabit the study area due to lack of recent records and woodland or forest habitat.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
White-throated Needletail <i>Hirundapus caudacutus</i>	Mi	-	<p>This is a highly nomadic and dispersive species, which follows low pressure atmospheric pockets where it feeds on insects. The species is generally found in eastern New South Wales and occasionally in inland NSW.</p> <p>The species was previously recorded within the proposed transmission line easement of the proposal site in 1992</p>	Low – The species may occasionally forage above the study area and use adjacent habitat to the study area as roosting habitat. The proposal is unlikely to have an impact on the aerial resources of the species.
Mammals				
Bilby <i>Macrotis lagotis</i>	V	E	<p>A hundred years ago, Bilbies were common in many habitats throughout Australia, from the dry interior to temperate coastal regions. Changes to the Bilby's habitat have seen their numbers greatly reduced and today the species is nationally listed as vulnerable, and is presumed extinct in NSW.</p> <p>One historic record from 1912 exists for this species in the locality.</p>	None – Presumed extinct in NSW.
Koala <i>Phascolarctos cinereus</i>	V	V	<p>In NSW it mainly occurs on the central and north coasts with some populations in the western region. Inhabits eucalypt woodlands and forests.</p> <p>One historic record from 1966 exists for this species in the locality.</p>	Low – The species no longer inhabits the Wagga Wagga LGA.
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i> (SE mainland population)	E	V	<p>Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.</p> <p>One historic record from 1980 exists for this species in the locality.</p>	Low – The species has been recorded once in the locality in 1980. The species is unlikely to inhabit the study area due to a lack of recent records and suitable rocky or woodland habitats.
Squirrel Glider population in the Wagga Wagga Local Government Area <i>Petaurus norfolcensis</i>	-	EP	<p>The extent of the endangered population is legally defined by the boundaries of the Wagga Wagga LGA. The distribution of the Squirrel Glider and its known or potential habitats within, or linked across, this boundary is not well defined. However, potential habitat occurs at low densities and is patchily distributed on public lands (TSRs, NPWS reserves, Bush Heritage Trust reserves), private lands and roadside corridors with remnant vegetation.</p> <p>Inhabits a wide range of open forest, woodland and riverine forest</p>	Low – The species is unlikely to inhabit the study area due to the absence of woodland habitat. The removal of introduced groundcover is unlikely to impact on the species.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			habitats. Utilise remnants of various sizes, including small remnants and even small stands of trees within Travelling Stock Reserves, roadside reserves or private land. Often utilise linear remnant vegetation along roadsides or rivers and streams. Numerous records for the species exist along the Murrumbidgee River, about three kilometres to the south of the study area.	
Bats				
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	-	V	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested and woodland areas, catching moths and other flying insects above the tree tops. The species has been recorded once in the locality, in 2007, about 3.8 kilometres south of the study area, along the Murrumbidgee River.	Low – The species is more likely to inhabit woodland outside of the study area, where roosting habitat is available. The removal of introduced groundcover is unlikely to impact on the species.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometres of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feeds on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Also forages in cultivated gardens and fruit crops. The species has not been previously recorded in the locality.	Low – More suitable habitat available within the locality. The removal of introduced groundcover is unlikely to impact on the species due to its high mobility.
Southern Myotis <i>Myotis macropus</i>	-	V	Preferred habitat is riparian. Roosts in caves, mines, tree hollows, aqueduct tunnels and under bridges and in dense vegetation in the vicinity of bodies of slow-flowing or still water (including estuaries). The species has been recorded once in the locality, in 2000, about 5.5 kilometres south-west of the study area, along the Murrumbidgee River.	Low – The species is more likely to inhabit riparian areas along the Murrumbidgee River, outside the study area. The removal of introduced groundcover is unlikely to impact on the species.
South-eastern Long-eared Bat <i>Nyctophilus corbeni</i>	V	V	Occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. Also known to occupy man-made structures such as timber bridges.	Low – More suitable habitat available within the locality. The removal of introduced groundcover is unlikely to

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			The species has not been previously recorded in the locality.	impact on the species due to its high mobility.
Reptiles				
Pink-tailed Worm Lizard <i>Aprasia parapulchella</i>	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayer, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. The species has not been previously recorded in the locality.	None – The species has not been recorded in the locality and is unlikely to occur due to lack of suitable partially-buried rocky habitats dominated by native grasses. The removal of introduced groundcover and potential removal of embedded rocky habitat is unlikely to impact on the species.
Striped Legless Lizard <i>Delma impar</i>	V	V	The species is found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass <i>Themeda australis</i> , spear-grasses <i>Austrostipa</i> spp. and poa tussocks <i>Poa</i> spp., and occasionally wallaby grasses <i>Austrodanthonia</i> spp. Sometimes present in modified grasslands with a significant content of exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter. The species has not been previously recorded in the locality.	None – The species has not been recorded in the locality and is unlikely to occur due to lack of native grassland. The removal of introduced groundcover is unlikely to impact on the species.
Amphibians				
Southern Bell Frog <i>Litoria raniformis</i>	V	E	Found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. The species has not been previously recorded in the locality.	None – The species is not known to occur in the LGA and the study area lacks suitable wetland habitat.

Appendix B – Species recorded within proposal site

Flora species recorded within proposal site

* Introduced species

Cover - An estimate of Projected Foliage Cover for each species present with a 20x20m plot. Foliage cover estimates are recorded using the following number series: 0.1, 0.2, 0.3...1,2,3...10,15,20,25...100%.

Family	Scientific Name	Common Name	Cover P1	Incidental
Asteraceae	<i>Arctotheca calendula</i> *	Capeweed	20	
Asteraceae	<i>Hypochaeris radicata</i> *	Catsear	0.1	
Asteraceae	<i>Lactuca serriola</i> *	Prickly Lettuce		✓
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sowthistle		✓
Asteraceae	<i>Xanthium spinosum</i> *	Bathurst Burr		✓
Boraginaceae	<i>Echium plantagineum</i> *	Paterson's Curse	5	
Boraginaceae	<i>Heliotropium europaeum</i> *	Common Heliotrope		✓
Fabaceae	<i>Trifolium glomeratum</i> *	Clustered Clover	1	
Fabaceae	<i>Trifolium subterraneum</i> *	Subterranean Clover	10	
Geraniaceae	<i>Erodium botrys</i> *	Long Storksbill	10	
Geraniaceae	<i>Erodium moschatum</i> *	Musky Crowfoot	5	
Iridaceae	<i>Romulea rosea</i> var. <i>australis</i> *	Onion Grass	5	
Malvaceae	<i>Sida corrugata</i>	Corrugated Sida	0.1	
Poaceae	<i>Avena fatua</i> *	Wild Oats	1	
Poaceae	<i>Bothriochloa macra</i>	Red Grass, Red-leg Grass	5	
Poaceae	<i>Cenchrus clandestinus</i> *	Kikuyu		✓
Poaceae	<i>Eragrostis cilianensis</i> *	Stinkgrass	0.1	
Poaceae	<i>Lolium rigidum</i> *	Wimmera Ryegrass		✓
Poaceae	<i>Panicum effusum</i>	Hairy Panic		✓
Poaceae	<i>Panicum capillare</i> *		0.1	
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum		✓
Polygonaceae	<i>Polygonum aviculare</i> *	Wireweed		✓
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock	0.1	
Pteridaceae	<i>Cheilanthes</i> sp.	Rock Fern		✓
Rosaceae	<i>Acaena</i> sp.			✓
Scrophulariaceae	<i>Verbascum thapsus</i> *	Great Mullein		✓
Solanaceae	<i>Solanum nigrum</i> *	Blackberry Nightshade		✓
Solanaceae	<i>Solanum</i> sp.*		0.5	

Fauna species recorded within proposal site

* Introduced species

O = observed, W = heard

Scientific Name	Common Name	Observation type
BIRDS		
<i>Acanthiza</i> sp.	A Thornbill	W
<i>Cracticus tibicen</i>	Australian Magpie	O, W
<i>Corvus coronoides</i>	Australian Raven	O, W
<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	W
<i>Sturnus vulgaris</i> *	Common Starling	O
<i>Platycercus eximius</i>	Eastern Rosella	W
<i>Cracticus nigrogularis</i>	Pied Butcherbird	O
<i>Strepera graculina</i>	Pied Currawong	W
<i>Anthochaera carunculata</i>	Red Wattlebird	W
<i>Pardalotus striatus</i>	Striated Pardalote	W
<i>Malurus cyaneus</i>	Superb Fairy-wren	W
<i>Haliastur sphenurus</i>	Whistling Kite	O
MAMMALS		
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O

Appendix C – BAM plot data

PCT ID	Plot	Tree richness	Shrub richness	Grass and grass-like richness	Forb richness	Fern richness	Other richness	Tree cover	Shrub cover	Grass and grass-like cover	Forb cover	Fern cover	Other cover	Litter cover	Total length of fallen logs	Number of large trees (threshold >50cm dbh)
Exotic grassland	1	0	0	1	2	0	0	0.0	0.0	5	0.2	0.0	0.0	0.0	0.0	0

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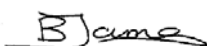

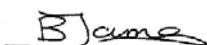
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2316243-26530/BDAR for transmission line outside Biocertification area

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft A	M. Cotterill	L. Maloney		B. James		14/08/2018
Rev1	M. Cotterill	L. Maloney		B. James		14/08/2018

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