Appendix D – Biodiversity assessment

Renew Estate Pty Ltd

Bomen solar farm EIS

Biodiversity assessment

February 2018

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Terms and acronyms

The following definitions are utilised throughout this report and should be referred to when interpreting the results in this document:

CEMP – construction environmental management plan

DBH – diameter at breast height

Direct impacts – are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat (DEC, 2004)

DotEE – Department of the Environment and Energy

EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999*

Indirect impacts - occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas (DEC, 2004).

LGA – Local Government Area

Life cycle – Is the series or stages of reproduction, growth, development and aging and death of an organism (DEC, 2004).

Likely – taken to be a real chance or possibility (DEC, 2004).

Locality – the area within a 10 kilometre radius of the proposal site.

Local occurrence of ecological community – the ecological community that occurs within the study area. However, the local occurrence may include adjacent areas if the ecological community in the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

Local population – the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area
- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area
- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time.

In cases where multiple populations occur in the study area, each population should be assessed separately.

Movement habitat – Any form of habitat that may be used by fauna species to aid movement through an area. This may include, for example, remnant native vegetation corridors or permanent and ephemeral streams.

Matter of NES – matter of National Environmental Significance

OEH – Office of Environment and Heritage

Proposal – the action proposed to be undertaken. In this case the construction of a 120 megawatt solar farm at Bomen, north-east of Wagga Wagga, including an overhead transmission line and associated infrastructure.

Proposal site – the area to be directly affected by the proposal (DEC, 2004), in this case the portion of land within which the solar farm construction would occur, including the site compound and stockpile sites.

Region – means a biogeographical region that has been recognised and documented such as the Interim Biogeographical Regions of Australia (IBRA). The study area is located within the South Eastern Highlands Bioregion.

Risk of extinction – the likelihood that the local population will become extinct either in the short-term *or* in the long-term as a result of direct or indirect impacts on the viability of that species, population or ecological community.

SIS – Species Impact Statement

Study area – means the proposal site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account (DEC, 2004). The study area incorporates the land within a 500 metre radius of the proposal site.

Threatened biota – those threatened species, populations or ecological communities listed under the NSW *Biodiversity Conservation Act 2016* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* which are known or likely to occur in the study area.

Threatened species – a species specified in Schedule 1 Part 1 (critically endangered species), Part 2 (endangered species), Part 3 (vulnerable species), Schedule 2 (threatened ecological communities) and Schedule 3 Part 1 (extinct species) of the NSW *Biodiversity Conservation Act 2016* or listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Viable – the capacity to successfully complete each stage of the life cycle under normal conditions.

1. Introduction

1.1 Background

Renew Estate is proposing to construct a 120 megawatt solar farm at Bomen, north-east of Wagga Wagga (see Figure 1.1). The proposal site is about 276 hectares in size, including solar modules and associated electrical infrastructure, an overhead transmission line, control building and access tracks.

The proposed solar farm is State Significant Development. The Department of Planning and Environment (DP&E) has issued Secretary's Environmental Assessment Requirements for the proposal. An Environmental Impact Statement (EIS) is required to support a development application, with this biodiversity assessment to be included as a specialist study.

1.2 Purpose of this report

GHD has been engaged by Renew Estate to prepare a biodiversity assessment for the construction of the Bomen solar farm to assess the potential ecological impacts of the proposal. The biodiversity assessment addresses the following relevant legislation (see section 1.6) including:

- NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)
- NSW *Biodiversity Conservation Act 2016* (BC Act)
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

As the proposal is located on land inside the Wagga Wagga Biodiversity Certification Area (see section 1.6.7 and Figure 1.1), it is deemed not to have a significant impact on NSW-listed threatened species, populations or ecological communities and their habitats, provided it is undertaken in accordance with the *Wagga Wagga Local Environment Plan 2010* (Wagga Wagga LEP) and the Order of Biodiversity Certification (see section 1.6.7). Assessment of impacts to Commonwealth-listed species is required.

For assessment of impacts on biodiversity, the SEARs require an assessment of the biodiversity values and the likely biodiversity impacts of the development, a detailed description of the proposed regime for minimising, managing and reporting on the biodiversity impacts of the development over time, and a strategy to offset any residual impacts of the development.

The SEARs also note that for the portion of the proposal site covered by the Biodiversity Certification of the *Wagga Wagga Local Environmental Plan 2010*, the requirements of this plan and the *Wagga Wagga Development Control Plan 2010 – Bomen Urban Release Area* must be addressed. Consideration of impacts on biodiversity should be addressed in the EIS, but it is taken that development is not likely to significantly affect threatened species, so an 'assessment of significance' for threatened species is not required.

The primary objectives of the biodiversity assessment are to:

- Identify potential biodiversity constraints and opportunities, including in particular the known or likely presence of species, populations and ecological communities and their habitats listed under the NSW BC Act and Commonwealth EPBC Act
- Identify the potential for any matters of National Environmental Significance (NES) listed under the EPBC Act to occur in the study area
- Identify the potential impacts of the proposal on threatened biota and their habitats

- Identify, describe and map ecological communities present within the proposal site and study area
- Assess the significance of impacts on Commonwealth-listed threatened biota and identify the likely requirement or otherwise for further approvals under the EPBC Act
- Recommend mitigation and environmental management measures to avoid, minimise or offset potential impacts on threatened biota and biodiversity values
- Consider the principles of ecologically sustainable development (ESD) in relation to the proposal's potential impacts on ecology.

1.3 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 1.2 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 1.4 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.

1.4 Assumptions

The services undertaken by GHD in connection with preparing this biodiversity assessment:

- Assume that the construction footprint of the proposal will be as presented in this report
- Assume that all safeguards and mitigation measures will be implemented as detailed in this report.

1.5 Proposal site and existing environment

The Bomen solar farm proposal site is located in the suburb of Bomen, about seven kilometres north-east of the Wagga Wagga central business district, on the eastern side of Byrnes Road. Land parcels for the proposal are located north and south of Trahairs Road. The proposal site encompasses the area in which the solar farm would be constructed, including all electrical infrastructure, an overhead transmission line, control building, access tracks, laydown areas and a construction compound (see Figure 1.1). The project site has a total area of about 276 hectares and is located within the Wagga Wagga Local Government Area (LGA).

The study area (see Figure 1.1) includes the proposal site and any additional areas that would be affected by the proposal whether directly or indirectly. The study area for the purpose of this report is defined as the area within 500 metres of the proposal site.

The landscape in the study area is dominated by agricultural land with small scattered patches of native woodland and plantings of native vegetation. The terrain of the study area is slightly undulating. Elevation across the site varies from 200 metres above sea level in the south-east to 240 metres in the north-west.

The upper reaches of three ephemeral drainage lines are located in the central and southern parts of the proposal site and flow from west to east (see Figure 1.1). NSW Government spatial data indicates that the drainage lines converge about 2.1 kilometres east of the proposal site before flowing into Wheel of Fortune Creek, which then flows to the Murrumbidgee River.

Six farm dams are located in the proposal site, with four dams on, or near the drainage lines (see Figure 1.1).

The locality is defined as the area within a 10 kilometre radius of the proposal site.

1.6 Legislative requirements

This biodiversity assessment is required to aid in fulfilling the requirements of Part 4 of the NSW EP&A Act. The following legislation and State Environmental Planning Policies have been consulted and are relevant to the proposal.

1.6.1 State Environmental Planning Policy (State and Regional Development) 2011

The State and Regional Development SEPP identifies development:

- To which the State Significant Development assessment and approval process under Part 4 of the EP&A Act applies
- That is State Significant Infrastructure and critical State Significant Infrastructure.

Development that is specified in Schedule 1 or Schedule 2 is declared to be State Significant Development. Clause 20 of Schedule 1 relates to electricity generating developments and states that the following development is State Significant Development:

> *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:*
>
> *(a) has a capital investment value of more than $30 million, or*
>
> *(b) has a capital investment value of more than $10 million and is located in an environmentally sensitive area of State significance.*

As the proposal is for an electricity generating facility and has a capital investment of over $30 million, it is State Significant Development.

1.6.2 NSW Environmental Planning and Assessment Act 1979

Part 4 of the EP&A Act provides for the control of development that requires development consent from a consent authority. Depending on the circumstances of the proposal, the consent authority may be the local council or the Minister for Planning.

Part 4, Division 4.1 of the EP&A Act establishes an approval regime for development that is declared to be State Significant Development by either a state environmental planning policy (SEPP) or Ministerial Order. In accordance with Section 89E of the EP&A Act, the Minister for

Planning is the consent authority for State Significant Development. Pursuant to Clause 8A of Section 78A of the EP&A Act, an EIS is required to support a development application for State Significant Development.

1.6.3 NSW Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on 25 August 2017, replacing the *Threatened Species Conservation Act 1995* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*. The aim of the Act is to conserve biodiversity and deliver ecologically sustainable development though a market-based approach particularly for higher risk projects. Ecological outcomes for lower risk projects would be achieved through self-assessment of risk. The market based approach has a regional and state focus rather than a local focus on biodiversity.

The BC Act establishes a new biodiversity assessment method (BAM) for the calculation of biodiversity credits. The BAM applies to State Significant Development that will impact biodiversity values, including paddock trees and remnant vegetation. Where the BAM applies, a Biodiversity Development Assessment Report (BDAR) is required. The BDAR must identify the biodiversity values to be impacted by a development, detail the avoidance methods undertaken to minimise impacts, and identify any offset requirements. The BC Act also places an explicit requirement on the Minister for Planning to consider biodiversity impacts before deciding whether to approve a project and if any relevant conditions should be imposed.

Clause 8.4(2) of the BC Act states that for development (including State significant development) under Part 4 of the EP&A Act on biodiversity certified land, an assessment of the likely impact of the development on NSW-listed biodiversity is not required. As the proposal is located within the Wagga Wagga LEP Biodiversity Certification Area (see section 1.6.7). Areas of native vegetation in the proposal site identified by Council for conservation under the *Wagga Wagga Development Control Plan 2010* would be protected (see Figure 1.1), as required to comply with the Wagga Wagga Biodiversity Certification. Assessment of impacts to NSW-listed species, populations and ecological communities is not required, and therefore application of the Biodiversity Assessment Method and preparation of a Biodiversity Development Assessment Report are not required. The SEARs for the proposal require that the biodiversity impacts of the proposal should be identified. These impacts are described in chapter 4.

1.6.4 Biosecurity Act 2015

The *Biosecurity Act 2015* reforms the management of pests, diseases, weeds and contaminants in NSW. For local government, the Biosecurity Act repeals the *Noxious Weeds Act 1993* which established local councils (or in some areas, county councils) as Local Control Authorities (LCAs).

The *Biosecurity Act 2015* provides for modern, flexible tools and powers that allow effective, risk-based management of biosecurity in NSW. It provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

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

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

One priority weed was identified in the study area, identified in section 3.2.3. The potential impacts of the proposal relating to priority weeds are included in section 4.2.1.

1.6.5 State Environmental Planning Policy No 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*). SEPP 44 also aims to ensure a permanent free-living population of Koalas over their present range, and reverse the current trend of Koala population decline by:

- Requiring the preparation of plans of management before development consent can be granted in relation to areas of core Koala habitat
- Encouraging the identification of areas of core Koala habitat
- Encouraging the inclusion of areas of core Koala habitat in environment protection zones.

SEPP 44 applies to each local government area (LGA) listed in Schedule 1, which includes the Wagga Wagga LGA. Schedule 2 of SEPP 44 lists preferred feed tree species of the Koala.

White Box (*Eucalyptus albens*) trees occur in the study area and are a preferred feed tree species; therefore potential Koala habitat is present. Field surveys and habitat assessment for the Koala indicate that the study area does not contain habitat for the species.

The study area is therefore unlikely to contain core Koala habitat, defined by SEPP 44 as '*an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population*.'

1.6.6 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a mechanism for assessing the environmental impact of activities and developments, where matters of national environmental significance may be affected by the proposed activities. If the proposal is likely to have a significant impact on a matter of national environmental significance it must be referred to the Australian Government Minister for the Environment.

Matters of national environmental significance relevant to this ecological assessment include:

- Migratory species protected under international agreements
- Ramsar wetlands of international importance
- Listed threatened species and communities
- Commonwealth land.

Under the EPBC Act a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land.

1.6.7 Wagga Wagga Local Environment Plan 2010

Zoning

The project site is located within the Wagga Wagga LGA. Under the Wagga Wagga LEP, the proposal site is located in the IN1 – General Industrial, RU1 – Primary Production and RE1 – Public Recreation land use zones.

Biodiversity certification

Biodiversity Certification of the Wagga Wagga LEP was gazetted on 24 December 2010. The Biodiversity Certification Area covers about 10,655 hectares of current and future urban and industrial land around Wagga Wagga.

Within the Biodiversity Certification Area activities under Part 4 and Part 5 of the EP&A Act are deemed not to have a significant impact on NSW-listed threatened species, populations or ecological communities and their habitats, provided they are undertaken in accordance with the Wagga Wagga LEP and the Order of Biodiversity Certification.

The proposal is located on land inside the Biodiversity Certification Area (see Figure 1.1). The 'Order Conferring biodiversity certification on the Wagga Wagga Local Environmental Plan 2010' requires that areas of native vegetation proposed for protection under the draft Bomen Development Control Plan are protected. Such areas are now protected under Part E, Section 13 – 'Bomen Urban Release Area' in the *Wagga Wagga Development Control Plan 2010*, which requires protection of any low conservation value treed native vegetation within the mapped (biodiversity) sensitive area shown on the 'Natural Resources Sensitivity Map – Biodiversity'.

No areas of biodiversity sensitivity are currently mapped as occurring within the proposal site. However, some areas of native vegetation in the proposal site have been identified by Council for conservation. It is understood that these areas will be included in the 'Natural Resources Sensitivity Map – Biodiversity' in the near future.

As the proposal is located on land inside the Biodiversity Certification Area, and vegetation that has been identified by Council for conservation under the *Wagga Wagga Development Control Plan 2010* would not be impacted (see Figure 1.1), biodiversity assessment under the BC Act is not required (see section 1.6.3).

1.7 The proposal

Renew Estate is proposing to construct a 120 megawatt solar farm at Bomen, north-east of Wagga Wagga (see Figure 1.1). The proposal would be about 276 hectares in size, including solar modules and associated electrical infrastructure, an overhead transmission line, control building and access tracks.

1.7.1 Key features

Key features of the proposal include:

- About 400,000 photovoltaic solar modules (modules)
- About 4,500 trackers comprising single-axis tracking framing systems mounted on steel piles (structures)
- Up to 44 containerised power conversion stations containing electrical switchgear, inverters and medium voltage transformers
- New on-site electrical switchyard and substation (substation)
- Connection into the National Electricity Market (NEM) via about 3.5 kilometres of 132 kV transmission line between the proposed on-site substation and the existing TransGrid Wagga North Substation. The transmission line may be overhead or underground, or a combination of both, subject to detailed design. For the purpose of assessment in this EIS, it is assumed the entire transmission line would be overhead, as this would have greater environmental impacts than underground construction
- Battery storage system

- Control building including office, supervisory control and data acquisition (SCADA) systems, operation and maintenance facilities, spare parts and staff amenities serviced by septic systems and rainwater tanks
- Car park
- Internal DC and AC cabling for electrical reticulation
- Minor upgrade of the unsealed section of Trahairs Road, east of Byrnes Road, for site access (to be maintained as a single lane unsealed road)
- Internal all-weather access tracks
- Internal fire trail and bushfire asset protection zones
- Security fencing around the solar farm
- Vegetation screening – plantings along the site boundaries where required
- Meteorological stations
- Subdivision of the following lots to allow the purchase of the required land for the proposal site, as shown in the plan of proposed subdivision:
  - Lot 11 DP1130519
  - Lot 2 DP590756
  - Lot 174 DP751405
  - Lot 108 DP751405.

1.7.2 Construction activities

Construction of the proposal is expected to take about nine to 12 months and would commence in the third quarter of 2018 subject to the design and approval process.

The main construction activities would include:

- Site establishment and preparation including:
  - Minor upgrade of the unsealed section of Trahairs Road (road grading work to a width of four metres)
  - Constructing internal access roads
  - Installing perimeter fencing
  - Removing existing internal fence lines (if required)
  - Establishing construction compound and laydown areas
  - Installing environmental controls
- Installing the steel post foundation system for the trackers (driven piling)
- Installing the trackers on the steel posts
- Installing the solar modules on the trackers
- Constructing the power conversion stations
- Constructing the substation and switchyard
- Constructing the transmission line between the substation and the TransGrid Wagga Wagga North substation
- Constructing the control building
- Installing the battery storage system

- Installing underground cabling (trenching) and connecting communications equipment
- Installing ancillary facilities and infrastructure
- Landscaping works
- Removing temporary construction facilities and rehabilitation of disturbed areas.

1.7.3 Ancillary facilities

Construction compound

A temporary construction compound would be established on site and would include a site office and amenities. The location of the compound would be determined during the detailed design phase and would be positioned in an area which is not required for the final site layout.

The staff amenities building would include the following facilities:

- sanitary modules with septic tank
- change rooms
- dining room
- administrative office
- undercover storage area.

This building would be a prefabricated structure which can be brought to site on the back of a truck and removed from site when required.

Parking areas would also be provided in the vicinity of the amenities building.

Laydown areas

Hardstand areas would be required for the laydown and storage of construction materials. These areas would be temporary and would be rehabilitated following commissioning.

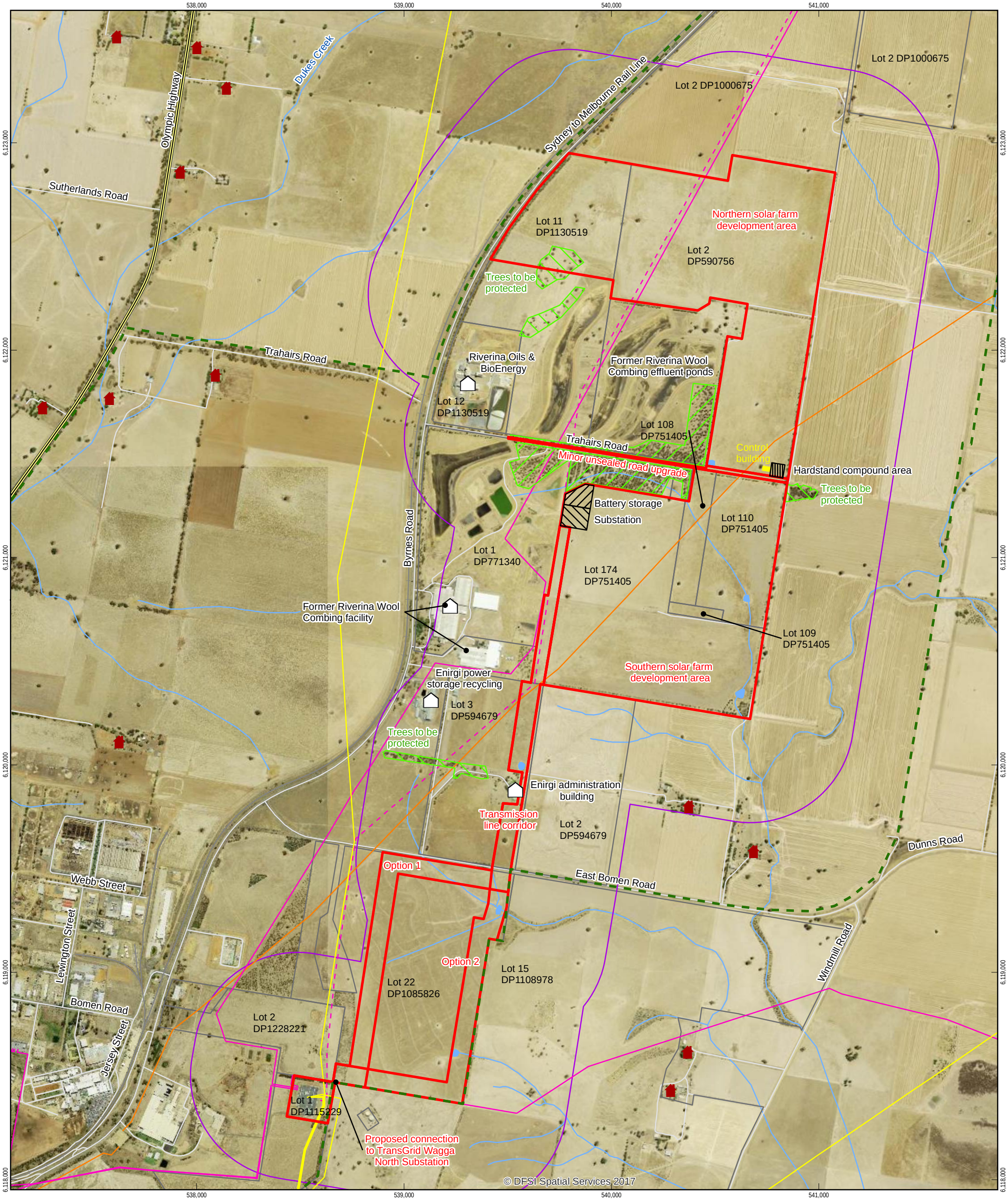
The hardstand areas may be graded and flattened, and would have gravel or similar material laid to allow the temporary storage of heavy construction material.

Topsoil removed during establishment of laydown areas would be stockpiled and used to rehabilitate the areas following commissioning.

Laydown areas would be located within the proposal site. The number of laydown areas required and their locations have not been identified at the current stage of planning.

1.7.4 Construction environmental management plan

Construction activities would be guided by a construction environmental management plan (CEMP) to ensure works are carried out to Renew Estate specifications and are completed to incorporate all safeguards described in this report.



LEGEND

- Industrial facility
- Residence
- Existing transmission line
- Subtransmission line under construction
- Existing subtransmission line
- Existing gas pipeline
- Highway
- Road
- Rail line
- Drainage line/stream
- Proposal site
- Study area
- Lot boundary
- Wagga Wagga Biodiversity Certification Area
- Dam

Proposed internal infrastructure

- Control building
- Battery storage
- Hardstand compound area
- Substation

Vegetation to be protected

- Covenant
- Development Control Plan

Paper Size A3

0 200 400 800

Metres

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

N

Renew Estate

Bomen 120 MW solar farm biodiversity assessment

Job Number	23-16243
Revision	0
Date	13 Feb 2018

Proposal site and study area

Figure 1.1

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Suite 3, Level 1, 161-169 Baylis Street Wagga Wagga NSW 2650 Australia **T** 61 2 6923 7400 **F** 61 2 6971 9565 **E** wgamail@ghd.com **W** www.ghd.com

Data source: NSW Government (LPI): Hydrolines, rail lines, lot boundaries and roads - 2012 and aerial photograph - 2017; TransGrid: Transmission lines - 2017; Essential Energy: Subtransmission lines - 2017; APA Group: Gas pipeline - 2017, Wagga Wagga City Council: Vegetation protection areas - 2017. Created by:rtrobinson

2. Methods

2.1 Desktop review

2.1.1 Landscape analysis

A brief landscape analysis was conducted to gauge the landscape value of the vegetation in the study area. The landscape assessment has taken into account the spatial configuration of vegetation, vegetation cover, connectivity and adjacent native vegetation.

Vegetation within a two kilometre radius of the proposal site was viewed using satellite imagery. This analysis is strictly limited to an analysis of the overstorey vegetation. The class and quality of overstorey were not comprehensively assessed for vegetation in the surrounding landscape.

2.1.2 Database review

A search of relevant databases was conducted to obtain records of threatened and migratory species, populations and ecological communities within the region. The search included species, populations and ecological communities listed under the NSW BC Act and Commonwealth EPBC Act with the potential to occur in the locality.

- BioNet Atlas – threatened species web application, species sightings. Licensed data for Wagga Wagga local government area. Search of all terrestrial threatened flora and fauna species (within a 10 kilometre radius of proposal site) (searched December 2017) (OEH 2017a)
- BioNet Atlas – threatened species web application, threatened biodiversity profiles (2017b) NSW, online profiles
- BioNet Atlas – vegetation classification for plant community types in the study area (OEH 2017c)
- DotEE (2017a) EPBC Act Protected Matters Search Tool – for a 10 kilometre radius around the proposal site (searched December 2017)
- DotEE (2017b) Species profile and threats database, online profiles
- DPI priority weed declarations – Riverina region (DPI 2017) (searched December 2017).

2.1.3 Previous reports

A previous report prepared by Renew Estate for the Bomen solar farm was reviewed for background information; 'Bomen solar farm preliminary environmental assessment' (October 2017).

2.2 Field survey

2.2.1 Survey objective and effort

Flora and fauna field surveys were conducted by an ecologist on 18 December 2017. Where appropriate, field surveys were conducted in accordance with the '*Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft*' (DEC 2004).

The primary objectives of the field surveys were to:

- Determine the presence and/or potential for threatened flora and fauna species, populations, ecological communities, listed under the NSW BC Act and Commonwealth EPBC Act, and their habitats to occur in the study area
- Determine the value of the habitat in the study area for flora and fauna species, particularly for threatened species and species of conservation significance, and describe potential impacts that would result from the proposal
- Describe the flora and fauna species, habitat, populations and ecological communities in the study area in relation to their occurrence and quality in the locality. This included ground-truthing and reference to satellite imagery
- Determine the condition and extent of vegetation removal required for the proposal.

Biodiversity survey effort is summarised in Table 2.1.

Table 2.1: Survey effort for biodiversity assessment

Survey method	Effort
Flora plot survey (see Figure 3.1)	Two plots (20 metres by 50 metres) and random meander transects to record incidental species
Hollow-bearing tree survey (see Figure 3.1)	GPS survey of all hollow-bearing trees with the potential to be affected by the proposal
Fauna habitat assessment	Potential fauna habitat identified within areas of potential vegetation clearing and adjacent areas.
Opportunistic fauna observations	Opportunistic fauna observations for all fauna species encountered during flora surveys and habitat assessment.

2.2.2 Weather conditions

Weather conditions during surveys were fine with a daytime maximum temperature of 35.9 degrees celsius and a minimum temperature of 21.6 degrees celsius, recorded from the Wagga Wagga weather station.

2.2.3 Flora

Flora surveys were conducted in the study area using plot surveys (see Figure 3.1) and random meandering transect surveys.

Two 20 metre by 50 metre flora survey plots were surveyed. Two flora survey plots were considered sufficient in relation to the size of the proposal site and consistent nature of the groundcover vegetation throughout the proposal site (ie dominated by introduced flora species). Within the plots, the following vegetation and habitat characteristics were recorded:

- Description of vegetation
- Groundcover species and abundance
- Any signs of previous disturbance and grazing.
- A flora survey transect was surveyed throughout the proposal site.

As rare plants often exist in discrete populations in specific areas, a random search can increase the probability of finding rare plant populations. A random search effort also encompasses a greater portion of the landscape, as the search is not limited to specific areas

(only the stratification unit), and is useful in surveying difficult terrain and irregular shaped search areas.

2.2.4 Vegetation communities

Surveys of vegetation communities in the study area were undertaken to characterise vegetation formation, class, structure and condition. Plant community composition is especially important for those areas that have the potential to be a threatened ecological community.

Flora surveys enabled determination of the composition and extent of ecological communities occurring in the study area. The study area was investigated by random meandering transect to identify vegetation communities present and to identify any areas with the potential to be classified as a threatened ecological community.

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 2017c).

Introduced or highly modified native vegetation was defined based on structure and species composition.

All vegetation communities were mapped using aerial photographic interpretation guided by the field survey results and GPS data.

For areas with the potential to classify as a threatened ecological community, an analysis was undertaken using the criteria for classification under the BC Act and EPBC Act.

2.2.5 Hollow-bearing tree survey

Surveys of hollow-bearing trees were undertaken in the proposal site. Hollow-bearing trees were surveyed by collecting a GPS position at the location of the tree. For each hollow-bearing tree the following characteristics were recorded:

- Species
- Diameter at breast height (DBH)
- Number of hollows
- Size of hollows.

2.2.6 Fauna

Fauna surveys

Fauna surveys comprised habitat assessment for all fauna groups and observations of fauna during flora surveys. Targeted surveys were not conducted in the study area due to the relatively small areas of habitat within the proposal site. Fauna habitat resources were assessed to identify areas of potential habitat within the study area. Specific resources such as shelter, basking, roosting, nesting and foraging sites for birds, bats, arboreal mammals, amphibians, ground-dwelling mammals and reptiles were noted.

Habitat assessment

Habitat details recorded included presence or absence of:

- Hollow-bearing trees (arboreal mammals, hollow-nesting birds and microchiropteran bats)
- Feed trees (eg *Allocasuarina* spp. and mistletoe)
- Roost sites (hollow-bearing trees or caves/rocky outcrops for bats)

- Waterbodies (amphibians)
- Nests (birds)
- Rocky outcrops and ground debris (reptiles)
- Other features likely to provide potential habitat for threatened fauna.

Searches for potential mammal, amphibian, and reptile habitat were undertaken and recorded during flora surveys. Opportunistic sightings of all fauna species were also recorded.

Opportunistic observations

Any bird species observed during flora and hollow-bearing tree surveys were recorded as opportunistic observations. Birds were also identified by call identification.

These results were used in identifying the likelihood of occurrence for threatened species in the study area.

Observations of fauna signs

Any indirect evidence of fauna (eg scats, feathers, fur, tracks, dens, nests, scratches, chew marks and owl wash) was recorded and/or photographed.

2.3 Likelihood of occurrence assessment and assessments of significance

An assessment of the likelihood of occurrence and possibility of impact was completed for listed species, populations and ecological communities with the potential to occur in the study area (Appendix B).

In assessing which of these species, populations and ecological communities are 'likely' to occur in the study area (as described in 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft') (DEC 2004) the following factors were taken into consideration:

- The presence of potential habitat within the study area
- Condition and approximate extent of potential habitat within the study area
- Species occurrence within the locality and region (including results of current and previous surveys and results of database searches and literature review).

The criteria used for the assessment of the likelihood of occurrence, and their meanings are as follows:

- *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 (10 kilometres) 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 (within 10 kilometres). 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 were specifically targeted by surveys and not recorded
- *None* – Suitable habitat is absent from the study area.

For each species, population or ecological community listed under the EPBC Act with a likelihood of occurrence category of recorded, high or moderate, and likely to be impacted by the proposal, a significance assessment was completed in line with the EPBC Act Policy Statement Statement 'Matters of National Environmental Significance: Significant impact guidelines 1.1' (DotE 2013). No assessments of significance were completed for species, populations or ecological communities listed under the BC Act due to the proposal site being located in the Biodiversity Certification Area of the Wagga Wagga LEP. Development under Part 4 of the EP&A Act is deemed not to have a significant impact on these matters (see section 1.6.7).

2.4 Limitations

Some fauna species are mobile and transient in their use of resources. Consequently, it is likely that not all species either resident or transitory at the site would have been recorded during the site inspections. The disadvantage of this limitation was reduced by undertaking database searches, and by assessing the habitat value of the study area for threatened and migratory species known to occur in the region to determine their likelihood of occurrence.

This survey was not designed to enable all species, either resident or transitory to the study area, to be detected. Instead it was aimed at providing an overall assessment of the ecological values of the study area with particular emphasis on threatened and migratory species to allow an assessment of the potential impacts of the proposal. For those species of conservation significance that were not detected but likely to occur in the study area, an assessment of the likelihood of their occurrence was made based on known habitat requirements.

2.5 Key threatening processes

A threatening process is eligible to be listed as a key threatening process under the BC Act if, in the opinion of the Scientific Committee:

- It adversely affects threatened species or ecological communities
- It could cause species or ecological communities that are not threatened to become threatened.

There are currently 38 key threatening processes listed under the BC Act and 21 under the EPBC Act. A number of key threatening processes are listed under both Acts.

Those key threatening processes potentially relevant to the proposal and specific mitigation measures to limit the impacts of these key threatening processes are discussed in section 5.

2.6 Key personnel

Two key people have been involved in preparing this report (see Table 2.2).

Table 2.2: Key personnel and their role in writing the report

Name	Title	Qualifications	Role
Leigh Maloney	Senior Ecologist	BAppSc (Environmental Science) (Hons), Biodiversity Assessment Method Accredited Assessor	Senior ecologist - oversight
Reuben Robinson	Senior Ecologist	BAppSc (Environmental Science) (Hons)	Senior ecologist - review
Melissa Cotterill	Ecologist	BSc (Biology)	Ecologist and report writing

3. Existing environment

3.1 General description

3.1.1 Bioregion

The study area occurs in the South West Slopes Bioregion. This bioregion covers the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria.

3.1.2 Surrounding landuse and vegetation

The surrounding landscape is primarily dominated by agricultural land use, such as cropping and grazing. There is one residential dwelling and four industrial facilities in the study area. Roads in the vicinity of the proposal site include Byrnes Road, Trahairs Road and East Bomen Road. These provide access to rural properties and industrial facilities in the study area. The Sydney to Melbourne Rail Line is located west of the proposal site. Scattered patches of native woodland and plantings exist in the study area, predominantly along road reserves.

3.1.3 Terrain, geology and drainage

Terrain

The terrain of the study area is slightly undulating. Elevation across the site varies from 200 metres above sea level in the south-east to 240 metres in the north-west. The proposal site is located in the Junee Hills and Slopes Mitchell Landscape, 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 (Mitchell 2002).

Geology

The Junee Hills and Slopes Mitchell Landscape has a geology of Silurian-Devonian massive granite and granodiorite (Mitchell 2002).

Drainage

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 three ephemeral drainage lines are located in the central and southern parts of the proposal site and flow from west to east (see Figure 1.1). NSW Government spatial data indicates that the drainage lines converge about 2.1 kilometres east of the proposal site before flowing into Wheel of Fortune Creek, which then flows to the Murrumbidgee River.

Six farm dams are located in the proposal site, with four dams on, or near the drainage lines (see Figure 1.1). One of the dams captures runoff from the Enirgi administration building site.

3.1.4 Soils

The Junee Hills and Slopes Mitchell Landscape contains 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).

3.1.5 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).

3.2 Vegetation

3.2.1 Plant community types

Two PCTs are present in the study area (see Figure 3.1).

PCT 266 – White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
Vegetation formation	Grassy woodlands
Vegetation class	Western Slopes grassy woodlands
PCT	This PCT is a tall woodland with trees to 25 metres high, dominated by White Box (*Eucalyptus albens*) often as the only tree species. The shrub layer is usually sparse or absent with a mid-dense to dense groundcover.
Conservation status	High: This community is consistent with White Box Yellow Box Blakely's Red Gum Woodland, which is listed as an endangered ecological community under the BC Act. In the proposal site, the community does not meet the classification criteria of the critically endangered form of the ecological community listed under the EPBC Act.
Estimate of percent cleared	95 per cent of this PCT has been cleared throughout its distribution in the NSW South Western Slopes Bioregion.
Description	Within the proposal site, this community occurs as a tree planting of White Box in the south of the proposed transmission line corridor. The planting is of a uniform age and about four to six metres high. Due to past clearing, predominantly for cropping and grazing, the groundcover is dominated by introduced species including Wild Oats (*Avena fatua*) and Flatweed (*Hypochaeris radicata*). The priority weed Silverleaf Nightshade (*Solanum elaeagnifolium*) is also common in this area.

PCT 266 – White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	
Photograph	 Photo 3.1 – White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.

PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	
Vegetation formation	Grassy woodlands
Vegetation class	Western Slopes grassy woodlands
PCT	This PCT is a tall woodland with trees to 20 metres high, dominated by Blakely's Red Gum (*E. blakelyi*) and/or Yellow Box (*E. melliodora*), and often with other eucalypt tree species and/or White Cypress Pine (*Callitris glaucophylla*). The shrub layer is usually sparse or absent with a dense to sparse groundcover.
Conservation status	High: This community is consistent with White Box Yellow Box Blakely's Red Gum Woodland, which is listed as an endangered ecological community under the BC Act. In the proposal site, the community does not meet the classification criteria of the critically endangered form of the ecological community listed under the EPBC Act.
Estimate of percent cleared	95 per cent of this PCT has been cleared throughout its distribution in the NSW South Western Slopes Bioregion.
Description	This community occurs as sparse woodland dominated by Yellow Box and predominantly occurs in the north-western section of the proposal site. Other tree species that occur include Grey Box (*E. microcarpa*) and White Cypress Pine. Due to past clearing, predominantly for cropping and grazing, the groundcover is dominated by introduced species including Common Wheat (*Triticum aestivum*), Witchgrass (*Panicum capillare*) and Wild Oats. Silverleaf Nightshade is common in the northern section of the study area.

PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	
Photograph	 Photo 3.2 – Blakey's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.

Mixed plantings are located along paddock boundaries in the proposal site and in neighbouring properties. These are mostly comprised of non-locally endemic species such as various eucalypts and Melaleucas. Mugga Ironbark (*E. sideroxylon*), River Sheoak (*Casuarina cunninghamiana*) and acacias including Silver Wattle (*Acacia dealbata*) and Cootamundra Wattle (*A. baileyana*) also feature in plantings in the study area. These plantings do not conform to any plant community type.

Initial consultation with Council indicates that tree plantings at the former Riverina Wool Combing property north and south of Trahairs Road are likely to be protected by a covenant under section 88B of the *Conveying Act 1919*, as per conditions of consent for the plant. Several other plantings and patches of remnant vegetation in the study area are identified for conservation under the *Wagga Wagga Development Control Plan 2010* (see Figure 3.1). These areas are to be protected, as required to comply with the Wagga Wagga Biodiversity Certification.

3.2.2 Groundwater dependent ecosystems and riparian land

The Atlas of Groundwater Dependent Ecosystems (BoM 2018b) mapping shows that no native vegetation with high or moderate potential to be a groundwater dependent ecosystem is present in the proposal site. The Yellow Box woodland in the northern solar farm development area is mapped as having low potential to be a groundwater dependent ecosystem.

No riparian land is present in the proposal site.

3.2.3 Flora survey results and priority weeds

Field surveys identified a total of 68 flora species, of which 24 species are native and 44 species are introduced (Appendix A).

One flora species listed as a priority weed for the Riverina region (DPI 2017) was recorded during flora surveys; Silverleaf Nightshade. The control duty listed for this species is '*prohibition*

on dealings', which means the plant must not be imported into the State or sold. The species is common in the northern section of the study area, north of Trahairs Road, and generally occurs in isolated patches in the cropped areas.

Plant community type

- PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (planting - Box-Gum Woodland BC Act)
- PCT 277 - Blakey's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (Box-Gum Woodland BC Act)
- Planting

Northern solar farm development area

Southern solar farm development area

Trees to be protected

Trees to be protected

Trees to be protected

Trees to be protected

Trees to be protected

P1

P2

Transmission line corridor

Option 1

Option 2

Trahairs Road

Trahairs Road

Trahairs Road

Byrnes Road

East Bomen Road

Webb Street

Lewington Street

Bomen Road

Jersey Street

Windmill Road

538,000 539,000 540,000 541,000

6,123,000 6,122,000 6,121,000 6,120,000 6,119,000

LEGEND

- Flora plot survey
- Hollow-bearing tree
- Remove
- Retain
- Road
- Drainage line/stream
- Proposal site
- Study area
- Rocky outcrop
- Dam
- Vegetation to be protected
- Covenant
- Development Control Plan

Paper Size A3

0 150 300 600

Metres

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

N

Renew Estate

Bomen 120 MW solar farm biodiversity assessment

Job Number 23-16243
Revision 0
Date 15 Feb 2018

Flora surveys, plant community types, rocky outcrops and hollow-bearing trees

Figure 3.1

G:\23\16243\GIS\Maps\Deliverables\Biodiversity\BomenSolarFarmBiodiversity_Fig3-1.mxd

Suite 3, Level 1, 161-169 Baylis Street Wagga Wagga NSW 2650 Australia T 61 2 6923 7400 F 61 2 6971 9565 E wgamail@ghd.com W www.ghd.com

Data source: NSW Government (LPI): Hydrolines and roads - 2012 and aerial photograph - 2017, Wagga Wagga City Council: Vegetation protection areas - 2017. Created by:rtrobinson

3.3 Fauna

3.3.1 Fauna habitats

Woodland

Fauna habitat in the study area is largely limited to roadside vegetation, scattered paddock trees and native tree plantings. The remainder of the study area has previously been cleared for agriculture and is dominated by introduced groundcover species, including large areas of crops.

Remnant vegetation provides potential roosting, movement and foraging habitat for a range of fauna groups including birds, bats, mammals, and to a lesser extent, reptiles. Woodland and plantings also allow for some transient use by mammals such as kangaroos. Vegetation may also provide habitat or threatened species considered likely to occur such as the Superb Parrot (*Polytelis swainsonii*).

Mature eucalypt trees are present in the study area as isolated paddock trees and in patches of woodland along road reserves. No regeneration of canopy species was observed during surveys in the proposal site. The mature trees in the study area would be used for nesting and foraging by a range of woodland birds, arboreal mammals and microchiropteran bats.

Hollow-bearing trees occur in the proposal site and study area. Hollow-bearing trees located in or near the proposal site are shown in Figure 3.1. Hollow-bearing trees in the study area are likely to provide roosting and nesting habitat for microchiropteran bats and a range of woodland birds, including the threatened Superb Parrot, which is known to breed in the Box-Gum Woodland and along the Murrumbidgee River corridor in the locality. Although hollow-bearing trees in the proposal site are limited to paddock trees, these still provide potential nesting locations.

Woodland areas with woody debris and leaf litter, although minimal, would provide habitat for reptiles such as snakes and skinks, as well as foraging habitat for woodland birds.

Relatively young tree plantings within the study area provide foraging, movement and breeding woodland habitat. These plantings contain shrub species such as acacias, which provide foraging habitat particularly for bird species.

Native grassland

Native grassy areas in the study area are very limited and restricted to the road reserve. However, they provide foraging habitat for common mammals such as the Eastern Grey Kangaroo (*Macropus giganteus*). Grassy areas also provide foraging habitat for woodland birds, including threatened species such as the Diamond Firetail (*Stagonopleura guttata*).

Rocky outcrops

Rocky outcrops exist in three main areas in the proposal site (see Figure 3.1):

- In the south-western corner of the southern solar farm development area
- Midway along the transmission line corridor
- At the southern end of the transmission line corridor.

These rocky outcrops are mostly comprised of large embedded rocks. They provide limited value as fauna habitat including roosting sites for birds and potential basking/sheltering sites for reptiles. They are common in the study area and locality.

Aquatic habitat

No permanent watercourses occur in the study area. Three unnamed ephemeral drainage lines intersect the proposal site in the central and southern sections. A number of farm dams are also

located in the proposal site. The drainage lines and dams have little or no fringing or emergent aquatic vegetation, and have limited value as habitat for fauna. However, they provide potential habitat for frogs such as the Eastern Sign-bearing Froglet (*Crinia parinsignifera*). Aquatic habitat also provides foraging and breeding habitat for wetland birds, such as ducks and herons.

3.3.2 Fauna survey results

A total of 26 fauna species were recorded during field surveys (Appendix A).

The woodland in the study area provides habitat for a number of bird species. Twenty-three bird species were observed during field surveys, all of which were native except one; the Common Starling (*Sturnus vulgaris*). Commonly occurring species included the Galah (*Eolophus roseicapilla*), Australian Magpie (*Cracticus tibicen*) and the Eastern Rosella (*Platycercus eximius*).

Three species of mammal were observed during surveys; the Eastern Grey Kangaroo, and the introduced European Rabbit (*Oryctolagus cuniculus*) and European Hare (*Lepus europaeus*). Arboreal mammals such as the Common Brushtail Possum (*Trichosurus vulpecula*), may use trees in the study area for foraging.

No reptiles or amphibians were recorded during the field surveys. Minimal suitable reptile habitats are present in the proposal site.

3.4 Threatened ecological communities

Due to the presence of White Box and Yellow Box in the study area, two plant communities in these areas meet the classification criteria for the ecological community *White Box Yellow Box Blakely's Red Gum Woodland* (listed as endangered under the BC Act), hereon referred to as Box-Gum Woodland. This vegetation does not meet the classification criteria for Box-Gum Woodland under the EPBC Act due to the dominance of introduced species in the groundcover.

Box-Gum Woodland in the study area includes:

- A tree planting of White Box in the south of the proposed transmission line corridor, which 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 including Wild Oats and Flatweed. The priority weed Silverleaf Nightshade is also common in this area.
- Woodland in the western section of the northern solar farm development area is dominated by Yellow Box. Due to past clearing, predominantly for cropping and grazing, the groundcover is dominated by introduced species including Common Wheat, Witchgrass and Wild Oats. Silverleaf Nightshade is prevalent in the northern section of the northern solar farm development area.

3.5 Threatened species and populations

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 do still support threatened species. The BC Act and EPBC Act listed vulnerable Superb Parrot is known to occur in the locality and locality and breeds in Box-Gum Woodland and River Red Gum trees with hollows. 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.

3.5.1 Summary of NSW listed species, communities and populations

The literature review, database search and field surveys identified two ecological communities, five flora species, 21 birds, seven mammals, one frog, two reptiles and one endangered population listed under the BC Act that could potentially occur in the locality (see Appendix B).

Of these, one ecological community (Box-Gum Woodland) and two bird species (Superb Parrot and Flame Robin – *Petroica phoenicea*) listed under the BC Act were recorded or have a high or moderate likelihood of occurrence in the study area (see Appendix B).

Due to the proposal site being located in the Wagga Wagga LEP Biodiversity Certification Area, an assessment of the likely impacts on threatened species, populations or ecological communities listed under the BC Act is not required, pursuant to section 8.4. Therefore, assessments of significance (5 part tests) under section 7.3 of the BC Act were not completed for Box-Gum Woodland or the Superb Parrot.

3.5.2 Summary of matters of NES

Matters of NES are listed and protected under the EPBC Act. The act identifies two matters of NES relevant to this ecological assessment:

- Threatened species and ecological communities
- Migratory species.

The literature review, database search and field surveys identified two ecological communities, five flora species, eight birds, five mammals, two reptiles and one frog listed under the EPBC Act that could potentially occur in the locality (see Appendix B).

Of these, one bird species listed under the EPBC Act was recorded or has a high or moderate likelihood of occurrence in the study area, the Superb Parrot, which is listed as vulnerable under the EPBC Act (see Appendix B).

A significance assessment was prepared in line with the EPBC Act Policy Statement Statement 'Matters of National Environmental Significance: Significant impact guidelines 1.1' (DotE 2013)to assist in determining the significance of the potential impacts of the proposal on matters of NES (Appendix C). The assessment concluded that the proposal is unlikely to significantly impact on any threatened biota listed under the EPBC Act.

Migratory species

Migratory species are protected under the international agreements to which Australia is a signatory, including the *Japan-Australia Migratory Bird Agreement* (JAMBA), the *China-Australia Migratory Bird Agreement* (CAMBA), the *Republic of Korea-Australia Migratory Bird Agreement* (RoKAMBA) and the *Bonn Convention on the Conservation of Migratory Species of Wild Animals.* Migratory species are considered matters of NES and are protected under the EPBC Act.

No migratory bird species were recorded in the study area or considered likely to be impacted by the proposal.

4. Potential impacts

4.1 Direct impacts

4.1.1 Vegetation/habitat removal

Most of the vegetation proposed to be removed would be introduced groundcover vegetation for the construction of the solar farm infrastructure. Native vegetation removal would include:

- Up to 0.2 hectares of a White Box planting, which classifies as Box-Gum Woodland under the BC Act
- Sixteen remnant trees, including ten hollow-bearing trees
- Up to 1.4 hectares of additional native tree plantings.

The size classes of the remnant native paddock trees to be removed are provided in Table 4.1 below.

Table 4.1: Size class of trees to be removed

	Size class of tree to be removed – DBH (cm)			
	20-40	40-60	60-80	>80
	1	2	2	11
Total	**16**			

The hollow-bearing trees to be removed are large paddock trees, mostly from within the southern solar farm development area (see Figure 3.1). Table 4.2 below indicates the number and size of hollows that would be removed by the proposal. A total of 54 hollows would be removed from the ten hollow-bearing trees. One hollow-bearing tree in the proposal site would be retained to provide shade adjacent to the control building.

Table 4.2: Hollow-bearing trees, number and size of hollows to be removed

Tree #	Species	DBH (cm)	No. of hollows/diameter (cm)				
			<5	5-10	10-20	20-30	>30
1	*E. melliodora*	220	4	4	1	1	
2	*E. melliodora*	140	1	2	2		
3	*E. melliodora*	90	2	1			
4	*E. microcarpa*	180	3	3	1		
6	*E. melliodora*	90	1	1			
7	*E. melliodora*	100	1	2	1	1	
8	*E. melliodora*	100	3	1	1	2	1
9	*E. melliodora*	120	3	2			
10	*E. melliodora*	120	2	1			
11	*E. melliodora*	120	2	4			
Total			**26**	**24**	**7**	**4**	**1**

Tree #	Species	DBH (cm)	No. of hollows/diameter (cm)				
			<5	5-10	10-20	20-30	>30
Total			**54**				

Hollow-bearing trees are a vital habitat component for many fauna species in the study area. They are likely to provide roosting and nesting habitat for microchiropteran bats, arboreal mammals and woodland birds. A stick nest was also observed in tree 2 and tree 9. The removal of these hollow-bearing paddock trees, however, is unlikely to substantially affect fauna in the study area due to the presence of additional hollow-bearing trees in the study area and locality within patches of woodland that provide better quality habitat.

Introduced groundcover vegetation would also be removed for the construction of some parts of the proposal (such as the substation, battery storage system, control building, hardstand compound area, transmission line towers, and areas where earthworks are required).

4.1.2 Removal of rocky habitat

The rocky outcrop in the south-western corner of the southern solar farm development area (see Figure 3.1) would potentially be removed. The outcrop consists of about 1.5 hectares of large deeply embedded rocks that provide limited habitat value for fauna in the agricultural landscape. Similar rocky outcrops are common in the study area and locality. The removal of the rocks is unlikely to cause a substantial impact to native fauna.

4.1.3 Removal of aquatic habitat

Three farm dams would potentially be decommissioned, which would involve filling the dams with material excavated from other parts of the proposal site. Dams are common in the study area and locality. The potential removal of these dams from the agricultural landscape would be unlikely to cause a substantial impact to native fauna.

4.1.4 Injury and mortality

During construction, death or injury may occur to any fauna present during the clearing of trees. If birds are present but not nesting during construction they will generally move away from the proposal site to escape the disturbance. Clearing of hollow-bearing trees carries the risk of injury to hollow dependent fauna that may be using hollows at the time of clearing.

Potential impacts to fauna would be reduced through the implementation of safeguards outlined in section 5.2.

4.2 Indirect impacts

4.2.1 Invasion and spread of weeds

The groundcover vegetation in the study area is dominated by introduced species. During construction and operation, the proposal has the potential to further introduce and spread weeds in the study area through movement of machinery and light vehicle traffic.

One priority weed species was identified during field surveys; Silverleaf Nightshade. The proposal has the potential to cause the spread of priority weeds such as Silverleaf Nightshade in the proposal site and study area.

The spread of weeds would be managed by implementing safeguards identified in section 5.2.

4.2.2 Sedimentation

Soil erosion and sedimentation impacts are described in sections 6.9 and 6.11 of the EIS. Vegetation removal and earthworks have the potential to lead to minor erosion of drainage lines, and sedimentation, impacting on water quality during periods of rainfall.

Sedimentation has the potential to affect flora and fauna, including frogs, turtles and macroinvertebrates through runoff to waterways and dams. An erosion and sediment control plan would be prepared as part of the CEMP to manage potential erosion and sedimentation issues during construction. Potential impacts from sedimentation would also be managed by implementing safeguards identified in section 5.2.

4.2.3 Water quality

Potential accidental spills of contaminants such as fuel or chemicals could impact on aquatic fauna and flora in dams or drainage lines during periods of flow. Due to the limited habitat value of the waterways in the proposal site, impacts on water quality are unlikely to substantially affect any aquatic flora and fauna.

Potential water quality impacts would be minimised through the implementation of safeguards outlined in section 5.2.

4.2.4 Invasion and spread of pathogens and disease

The proposal has the potential to result in the spread of pathogens such as bacteria and fungi. This could occur through the spread of soils on vehicle tyres and staff footwear. Impacts of pathogens include spread of known diseases that are detrimental to fauna such as the amphibian chytrid fungus and psittacine circoviral (beak and feather) disease.

The potential spread of pathogens would be minimised through the implementation of safeguards outlined in section 5.2.

4.3 Key threatening processes

The proposal may involve four key threatening processes listed under the BC Act and EPBC Act:

- Clearing of native vegetation – the proposal would remove up to 0.2 hectares of a White Box planting classified as Box-Gum Woodland, up to 1.4 hectares of additional native plantings, and 16 remnant native paddock trees from the proposal site
- Loss of hollow-bearing trees – the proposal would remove about ten hollow-bearing trees from the proposal site
- Removal of dead wood and dead trees – the proposal would remove two dead trees
- Removal of bush rock – the proposal would potentially remove the rocky outcrop in the south-western corner of the southern solar farm development area.

The impacts of key threatening processes would be minimised through the implementation of safeguards detailed in section 5.2.

4.4 Cumulative impacts

The following projects (proposed or in progress) in Table 4.3 the local area were identified.

Table 4.3: Other current relevant projects in the Wagga Wagga LGA

Project	Location	Status
Essential Energy Construction of new subtransmission line	On the proposal site	Construction in progress – poles constructed
Renewed Metals Technology – Bomen (Enirgi) Expansion of Battery Resource Recovery Facility	240 metres west of the proposal site	Major project, SEARs issued, EIS in progress
Potential waste management facility at the site of the decommissioned Riverina Wool Combing effluent ponds	Adjacent to the proposal site to the west	Early planning stages
Teys Australia Wagga Wagga Relocation of Retail Ready Meat Products Facility	About 4 km west of the proposal site	Major project, SEARs issued
Terrain Solar Wagga Wagga Solar Farm	Immediately east of the transmission line option 2 corridor	Development Application, being assessed by the Southern Joint Regional Planning Panel

The proposal and other projects identified in Table 4.3 could result in cumulative impacts relating to removal of paddock trees and planted trees in the Bomen area. These cumulative impacts are unlikely to be substantial, as vegetation removal for the proposal would be within the Wagga Wagga Biodiversity Certification Area and would result in a low loss of habitat and low impacts on biodiversity.

5. Avoid, minimise and mitigate impacts

Development of the proposal has incorporated a hierarchy of avoiding, minimising and mitigating impacts wherever possible.

5.1 Avoidance and minimisation

To minimise the impacts of the proposal, several measures have been implemented, including:

- Avoidance of woodland patches by locating infrastructure outside of these areas
- Retaining trees on the boundary of the development, including plantings
- Minimising the upgrade of Trahairs Road to avoid impacts to remnant roadside vegetation.

5.2 Safeguards and management measures

The safeguards and management measured 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	Likely efficacy of mitigation	Residual impacts
Loss of native vegetation and fauna habitat	A flora and fauna management plan will be prepared as part of the CEMP to minimise the ecological impacts of the proposal, which will include: • Plans for the construction site and adjoining area showing native vegetation, flora and fauna habitat and threatened ecological communities • Plans showing areas to be cleared and areas to be protected, including exclusion zones and protected habitat features (including the hollow-bearing tree near the control building and areas of vegetation identified for conservation under the *Wagga Wagga Development Control Plan 2010*) • A landscaping plan showing areas for planting of locally native vegetation to replace vegetation removed by the proposal.	Pre-construction	Effective	Loss of 16 remnant trees, including 10 hollow-bearing trees containing a total of 54 hollows, and 0.77 hectares of tree plantings, including 0.2 hectares that classify as Box-Gum Woodland under the BC Act.
	• Pre-clearing surveys will be undertaken to identify exclusion zones and specific habitat features to be retained (including the hollow-bearing tree next to the southern boundary of the northern solar farm development area and trees identified for protection) • Temporary exclusion fencing will be erected to prevent encroachment and clearing of remnant vegetation and protected areas beyond the construction footprint • Staff will be inducted and informed of the limits of vegetation clearing and the areas of vegetation to be retained • Where practicable, vegetation removal will occur between January and August, outside the main fauna breeding season, to avoid potential breeding disturbance to fauna • If tree removal is required during the breeding season, an ecologist will investigate if any of the hollows are being used for breeding by threatened species such as the Superb Parrot during pre-clearing surveys. Controls to prevent breeding disruption will be implemented as necessary.	Construction	Effective	
Spread of weeds	• Priority weed control measures will be implemented as part of the CEMP to prevent their spread in the study area.	Pre-construction	Effective	Unlikely
	• Declared priority weeds will be managed according to requirements of the NSW *Biosecurity Act 2015*	Construction and operation	Effective	Unlikely

Impact	Safeguards and management measures	Timing	Likely efficacy of mitigation	Residual impacts
	• Soil material and stripped groundcover vegetation with the potential to contain Silverleaf Nightshade will not be removed from the proposal site • Soil disturbance will be avoided as much as possible to minimise the potential for spreading weeds.			
Disturbance of aquatic habitat	• Disturbance of aquatic habitat in dams will be minimised if possible.	Construction	Effective	Unlikely
Loss of hollows	• Felled limbs with hollows will be placed in woodland or plantings along the boundary of the development area. The woody debris retained will be spread in a fashion that replicates the natural occurrence of woody debris in the environment and will not be stacked.	Construction	Effective	Loss of 54 hollows
Impacts to fauna	• Fauna handling during vegetation removal will be undertaken by a qualified ecologist or Wildlife Information, Rescue and Education Service (WIRES) representative.	Construction	Effective	Unlikely
Sedimentation	• 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	Effective	Unlikely
	• 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	Effective	Unlikely
Water quality, chemical and fuel impacts on flora and fauna	• 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	Pre-construction	Effective	Unlikely

Impact	Safeguards and management measures	Timing	Likely efficacy of mitigation	Residual impacts
	initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers)			
	• 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	Effective	
	• 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	Effective	
	• 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	Effective	
Pathogen spread and establishment	• Vehicle wash down facilities will be provided should evidence of pathogens or fungus such as Phytophthora or Chytrid be found.	Construction	Effective	Unlikely

6. Impact assessment

6.1 NSW legislation

The assessment of likelihood of occurrence found that the proposal may potentially impact upon one ecological community (Box-Gum Woodland) and two bird species (Superb Parrot and Flame Robin) listed under the BC Act.

Due to the proposal site being located within the Wagga Wagga LEP Biodiversity Certification Area, it is deemed not to have a significant impact on NSW-listed ecological communities, threatened species, or populations and their habitats provided that the development or activity is undertaken in accordance with the Wagga Wagga LEP and Order of Biodiversity Certification. Therefore, assessments of significance (5 part tests) under section 7.3 of the BC Act were not completed for Box-Gum Woodland, the Superb Parrot or the Flame Robin.

6.2 Commonwealth legislation

The assessment of likelihood of occurrence found that the proposal may potentially impact upon one bird species listed as threatened under the EPBC Act; the Superb Parrot (Appendix B). The EPBC Act Policy Statement 'Matters of National Environmental Significance: Significant impact guidelines 1.1' (DotE 2013) was reviewed when determining if a significant impact is likely on the species (Appendix C).

The significance assessment concluded that the proposal is unlikely to have a significant impact on the Superb Parrot primarily due to:

- The small area of habitat being removed in relation to habitat available in the locality
- Tree removal being limited to isolated paddock trees and plantings in introduced grassland
- There being areas of higher quality habitat value in patches outside the study area.

6.3 Impact summary

A summary of the impacts of the proposal is provided in Table 6.1.

Table 6.1: Summary of main impacts

Impact	Biodiversity values	Nature of impact	Extent of impact	Duration	Key threatening process	Confidence in assessment
Removal of native vegetation	Native vegetation	Direct	Site-based	Long term	Clearing native vegetation	Sufficient
Removal and degradation of fauna habitat (hollow-bearing trees, dead wood and dead trees, rock and aquatic habitat in dams)	Woodland fauna and fauna typical of degraded agricultural landscapes, including threatened species	Direct	Site-based	Long term	Loss of hollow-bearing trees; removal of dead wood and dead trees; bush rock removal; removal of aquatic habitat	Sufficient
Potential injury and mortality	Woodland fauna	Direct	Site-based	Short term	Clearing native vegetation	Sufficient
Potential invasion and spread of pathogens and disease	Frogs, birds, trees	Indirect	Local	Long term	Infection of native plants by *Phytophthora cinnamomi.* Infection of frogs by amphibian chytrid causing the disease chytridiomycosis. Infection of birds with psittacine circoviral disease.	Sufficient

7. Ongoing management and offsetting

The biodiversity impacts of the proposal would occur within the Wagga Wagga Biodiversity Certification Area and are considered to be relatively low overall. The impacts would be managed during construction through the safeguards and management measures detailed in section 5. As the impacts of the proposal would be low and limited to construction, a regime for minimising, managing and reporting on the biodiversity impacts of the development over time is not considered necessary.

Similarly, offsetting the loss of native vegetation is not considered necessary due to the minor loss of vegetation proposed and low impacts to threatened fauna.

8. Principles of ecologically sustainable development

The Council of Australian Governments National Strategy for Ecologically Sustainable Development defines ecologically sustainable development (ESD) as “using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased” (Council of Australian Governments, 1992).

Section 6(2) of the *Protection of the Environment Administration Act 1991* outlines the principles of ESD:

- The precautionary principle
- Intergenerational and intergenerational equity
- Conservation of biological diversity and ecological integrity
- Improved valuation and pricing of environmental resources.

The integration of these principles in the proposal is discussed below.

8.1 Precautionary principle

This principle states that “if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”.

The detailed assessment of potential environmental impacts in the planning of the proposal has sought to minimise impacts on the ecology of the study area while achieving the necessary outcomes for the proposal. A number of safeguards have been proposed to minimise potential impacts and these safeguards would be implemented during the proposal. No safeguards have been postponed as a result of lack of scientific certainty.

A CEMP would be prepared by the contractor prior to construction and would incorporate agreed safeguards. This requirement would ensure that the proposal achieves a high level of environmental performance. No safeguards, management measures or management mechanisms would be postponed as a result of a lack of information.

8.2 Intergenerational equity

The principle states, “the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations”.

Appropriate safeguards would be implemented during the design and construction phases to minimise impacts on native flora and fauna. The design of the proposal has been altered to allow for protection of areas of habitat. This would ensure that the principle of intergenerational equity is not compromised.

8.3 Conservation of biological diversity and ecological integrity

This principle states that the “diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival”.

A thorough assessment of the existing local ecology has been undertaken to identify and manage any potential impacts of the proposal on local biodiversity. Safeguards and

management measures would be implemented to minimise impacts upon the local biodiversity, including threatened and migratory species. In addition, the footprint of the proposal has been altered to minimise native vegetation removal.

8.4 Improved valuation and pricing of environmental resources

This principle requires that “costs to the environment should be factored into the economic costs of a project”.

The biodiversity assessment has examined the environmental consequences of the proposal and identified safeguards and management measures where there is the potential for impacts. Requirements imposed in terms of implementation of these safeguards and management measures would result in an economic cost to Renew Estate. The implementation of safeguards and management measures would increase the capital costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

9. Conclusion

The study area has been heavily modified by agricultural development, with large areas cleared of native vegetation. Remnant patches of native woodland and plantings exist in the study area, mainly along paddock boundaries and in the road reserves. These areas of woodland are known or likely to provide habitat for biota listed under the BC Act and/or the EPBC Act, including a range of fauna species and an ecological community.

The proposal would remove 16 remnant trees, including 10 hollow-bearing trees, and up to 1.4 hectares of native tree plantings, of which about 0.2 hectares is classified as Box-Gum Woodland under the BC Act (and not the EPBC Act). Vegetation removal, including isolated paddock trees and plantings, would occur in disturbed areas containing introduced grassland. Introduced groundcover vegetation would also be removed for the construction of some parts of the proposal (such as the substation, battery storage system, control building, hardstand compound area, transmission line towers, and areas where earthworks are required).

The proposal has the potential to affect two threatened bird species and one threatened ecological community listed under the BC Act. Due to the proposal being located in the Wagga Wagga LEP Biodiversity Certification Area, it is deemed not to have a significant impact on ecological communities, threatened species, or populations and their habitats listed under the BC Act. Therefore, assessments of significance (5 part tests) under section 7.3 of the BC Act were not completed for these biota.

A significance assessment was completed for the Superb Parrot, as listed under the EPBC Act. The proposal is unlikely to have a significant impact on the Superb Parrot due to the small area of habitat being removed in relation to habitat available within the study area and locality, and due to tree removal being limited to isolated paddock trees and plantings in introduced grassland. A referral to the Commonwealth Minister for the Environment is therefore not required.

10. References

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Appendices

Appendix A – Species recorded

FLORA LIST

* Introduced species

✓ Species present

All numbers are per cent cover

Scientific Name	Common Name	P1	P2	Incidental
Acacia baileyana	Cootamundra Wattle			✓
Acacia dealbata	Silver Wattle			✓
*Alternanthera pungens**	Khaki Weed		0.1	
Amaranthus sp.*			0.1	
Austrostipa scabra	Speargrass			✓
*Avena fatua**	Wild Oats		50	
Boerhavia dominii	Tarvine		1	
Bothriochloa macra	Red-leg Grass		30	
Brachychiton populneus	Kurrajong			✓
*Brassica napus**	Canola			✓
Bromus sp.*			0.1	
*Bromus diandrus**	Great Brome			✓
Callitris glaucophylla	White Cypress Pine			✓
*Carthamus lanatus**	Saffron Thistle			✓
Casuarina cunninghamiana	River Sheoak			✓
*Chenopodium album**	Fat Hen	0.5	0.1	
Chloris truncata	Windmill Grass		0.1	
*Chondrilla juncea**	Skeleton Weed		0.1	
*Cichorium intybus**	Chicory			✓
*Cirsium vulgare**	Spear Thistle	✓		
Citrullus lanatus var. *lanatus**	Camel Melon	0.1		
Conyza sp.*	Fleabane			✓
Corymbia citriodora	Lemon-scented Gum			✓
Cucumis myriocarpus subsp. *leptodermis**	Paddy Melon	5	0.1	
Cynodon dactylon	Couch		10	
*Cyperus eragrostis**	Umbrella Sedge			✓
*Echium plantagineum**	Paterson's Curse	0.1	1	
*Eragrostis cilianensis**	Stinkgrass		0.1	
Eucalyptus albens	White Box			✓
Eucalyptus melliodora	Yellow Box		2	
Eucalyptus microcarpa	Grey Box			✓
Eucalyptus sideroxylon	Mugga Ironbark			✓
*Heliotropium europaeum**	Potato Weed			✓
*Hordeum leporinum**	Barley Grass	5		
*Hypericum perforatum**	St John's Wort			✓
*Hypochaeris radicata**	Catsear		0.1	
*Lactuca serriola**	Prickly Lettuce			✓

Scientific Name	Common Name	P1	P2	Incidental
Lepidium sp.*		0.1		
*Lolium rigidum**	Wimmera Ryegrass	0.5		
Lythrum hyssopifolia	Hyssop Loosestrife		0.1	
*Malva parviflora**	Small-flowered Mallow	0.5	0.1	
*Marrubium vulgare**	White Horehound			✓
*Olea europaea**	Olive			✓
Oxalis perennans			0.1	
*Panicum capillare**	Witchgrass	40	1	
*Paspalum dilatatum**	Paspalum			✓
*Phalaris aquatica**	Phalaris			✓
*Polygonum aviculare**	Wireweed	0.5	0.1	
Portulaca oleracea	Pigweed			✓
Rumex brownii	Swamp Dock		0.1	
*Rumex crispus**	Curled Dock			✓
Rytidosperma carphoides	Short Wallaby Grass			✓
*Salvia verbenaca**	Vervain		0.1	
Sida sp.			0.1	
Sida corrugata	Corrugated Sida			✓
*Silybum marianum**	Variegated Thistle			✓
Sisymbrium sp.*				✓
*Solanum elaeagnifolium**	Silver-leaved Nightshade			✓
*Solanum nigrum**	Black-berry Nightshade	0.1		
*Sonchus oleraceus**	Common Sowthistle	✓		
*Tribulus terrestris**	Cathead		5	
Trifolium sp.*	A Clover		0.1	
*Trifolium arvense**	Haresfoot Clover		0.1	
*Triticum aestivum**	Common Wheat	30		
*Verbascum thapsus**	Great Mullein			✓
Vittadinia cuneata	Fuzzweed			✓
Vulpia sp.*	Fescue		0.1	
*Xanthium spinosum**	Bathurst Burr	0.1		

FAUNA LIST

* Introduced species

Species	Common Name	Status	
		BC Act	EPBC Act
BIRDS			
Coturnix sp.	A Quail	-	-
Anthus novaeseelandiae	Australasian Pipit	-	-
Cracticus tibicen	Australian Magpie	-	-
Corvus coronoides	Australian Raven	-	-

Species	Common Name	Status	
		BC Act	EPBC Act
Chenonetta jubata	Australian Wood Duck	-	-
Coracina novaehollandiae	Black-faced Cuckoo-shrike	-	-
Cincloramphus cruralis	Brown Songlark	-	-
*Sturnus vulgaris**	Common Starling	-	-
Ocyphaps lophotes	Crested Pigeon	-	-
Platycercus eximius	Eastern Rosella	-	-
Petrochelidon ariel	Fairy Martin	-	-
Eolophus roseicapilla	Galah	-	-
Dacelo novaeguineae	Laughing Kookaburra	-	-
Grallina cyanoleuca	Magpie-lark	-	-
Falco cenchroides	Nankeen Kestrel	-	-
Cracticus nigrogularis	Pied Butcherbird	-	-
Psephotus haematonotus	Red-rumped Parrot	-	-
Pardalotus striatus	Striated Pardalote	-	-
Malurus cyaneus	Superb Fairy-wren	-	-
Aquila audax	Wedge-tailed Eagle	-	-
Ardea pacifica	White-necked Heron	-	-
Rhipidura leucophrys	Willie Wagtail	-	-
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	-	-
MAMMALS			
Macropus giganteus	Eastern Grey Kangaroo	-	-
*Lepus europaeus**	European Hare	-	-
*Oryctolagus cuniculus**	European Rabbit	-	-

Appendix B – 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.

Significance assessments

Recorded, high and moderate likelihood of occurrence and likely to be impacted - An EPBC Act significance assessment is required for this species, population or ecological community. No assessments of significance under section 7.3 of the BC Act are required for matters likely to be impacted (see section 1.6.7).

Species / Communities	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Ecological communities				
Grey Box (*Eucalyptus microcarpa*) 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, *Eucalyptus microcarpa* (Inland Grey Box), is often found in association with *E. populnea* subsp. *bimbil* (Bimble or Poplar Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii* (Bulloak) or *E. melliodora* (Yellow Box), and sometimes with *E. albens* (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 *Eucalyptus bridgesiana, E. polyanthemos, E. rubida, E. pauciflora, E. cinerea, E. mannifera, E. macrorhyncha, E. microcarpa* and others.	**Recorded -** The ecological community is present within the study area due to the presence of White Box and Yellow Box trees, however it does not meet the classification criteria of the EPBC Act community due to the dominance of introduced groundcover. The proposal would remove 0.2 ha of the community. Due to the proposal site being located in the biocertified area of the Wagga Wagga LEP, no assessment of significance is required to be completed for impacts to Box-Gum Woodland.
Plants				
A Spear Grass *Austrostipa wakoolica*	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.	**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		
			The species has not been recorded in the locality.	
Claypan Daisy *Brachyscome muelleroides*	V	V	The Claypan Daisy occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with Pycnosorus globosus, Agrostis avenacea and Austrodanthonia duttoniana. Also recorded from the margins of lagoons in mud or water, and in association with Calotis anthemoides. 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.
Greencomb Spider-orchid *Caladenia tensa*	E	-	The Greencomb Spider-orchid grows on red-brown sandy loams on rises in open woodland dominated by Yellow Gum (*Eucalyptus leucoxylon* sens. lat.) and Rottnest Island Pine (*Callitris preissii*). 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.
Small Purple-pea *Swainsona recta*	E	E	Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx.* Grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, Poa tussocks *Poa* spp. and spear-grasses *Austrostipa* 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 *Prasophyllum petilum*	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	**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		
			River Tussock *Poa labillardieri*, Black Gum *Eucalyptus aggregata* and tea-trees *Leptospermum* 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). The species has not been recorded in the locality.	
Woolly Ragwort *Senecio garlandii*	-	V	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. 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.	**Low -** Suitable habitat limited within the study area due to the dominance of introduced species and previous disturbance.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Birds				
Australasian Bittern *Botaurus poiciloptilus*	E	E	This species favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* 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 *Rostratula australis*	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 *Ninox connivens*	-	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 species may forage within the study area but the removal of isolated paddock trees is not likely to impact the species.
Black-chinned Honeyeater (eastern subspecies) *Melithreptus gularis gularis*	-	V	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*E. sideroxylon*), White Box (*E. albens*), Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*) and Forest Red Gum (*E. tereticornis*). 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. The study area contains woodland dominated by White Box and Yellow Box, preferred habitat trees for the species.	**Low –** The species may forage within the study area but the removal of isolated paddock trees is not likely to impact the species.
Black Falcon	-	V	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there	**Low –** The species may utilise woodland in the study area as foraging, roosting

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
Falco subniger			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). The species has been recorded along the Murrumbidgee River, about 5.4 kilometres south of the study area.	and nesting habitat but the removal of isolated paddock trees is not likely to impact the species due to its high mobility.
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	-	V	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. The species has been previously recorded about 800 metres south of the proposal site.	**Low –** The species may utilise woodland in the study area as foraging, roosting and nesting habitat but the removal of isolated paddock trees is not likely to impact the species.
Diamond Firetail *Stagonopleura guttata*	-	V	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. Previously recorded in 1994, about 7.7 kilometres south-west of the study area.	**Low -** The species may forage within the study area but the removal of isolated paddock trees and minimal introduced groundcover is not likely to impact the species.
Dusky Woodswallow *Artamus cyanopterus cyanopterus*	-	V	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. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt 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	**Low –** The species may utilise woodland in the study area as foraging, roosting and nesting habitat but the removal of isolated paddock trees is not likely to impact the species.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			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.	
Flame Robin *Petroica phoenicea*	-	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.	**Moderate -** The species is known to forage in the study area (previous GHD staff observations). The species may be impacted by the removal of isolated paddock trees and planted vegetation.
Fork-tailed Swift *Apus pacificus*	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 in 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) *Pomatostomus temporalis temporalis*	-	V	The eastern subspecies (temporalis 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 species may utilise woodland in the study area as foraging, roosting and nesting habitat but the removal of isolated paddock trees is not likely to impact the species, which is more likely to occur in woodland patches due to their laborious nature.
Hooded Robin (south-eastern form) *Melanodryas cucullata cucullata*	-	V	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.	**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		
			The species has not been previously recorded in the locality.	
Little Eagle *Hieraaetus morphnoides*	-	V	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. Recorded most recently in 1980, about 3.2 kilometres south-west of the study area.	**Low –** The species may utilise woodland in the study area as foraging, roosting and nesting habitat but the removal of isolated paddock trees is not likely to impact the species due to its high mobility.
Little Lorikeet *Glossopsitta pusilla*	-	V	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. 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.	**Low –** The species may utilise woodland in the study area as foraging, roosting and nesting habitat but the removal of isolated paddock trees is not likely to impact the species.
Painted Honeyeater *Grantiella picta*	-	V	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. The species has not been previously recorded in the locality.	**Low** – The study area does not have an abundance of mistletoes and the species is unlikely to occur.
Regent Honeyeater *Anthochaera phrygia*	E	E	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.	**Low** – Species is very unlikely to utilise the study area due to lack of records and habitat features such as mistletoes.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			The species has been recorded once in the locality, in 1980, about 6.6 kilometres south-west of the study area.	
Satin Flycatcher *Myiagra cyanoleuca*	Mi	-	Satin Flycatchers are mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as Brown Barrel, *Eucalypt fastigata*, Mountain Gum, *E. dalrympleana*, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash, *E. regnans*. Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood, *Acacia melanoxylon*. The species may also occur in woodlands such as Box-Gum Woodland. The species has not been previously recorded in the locality.	**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 *Petroica boodang*	-	V	Primarily a resident in dry forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. The species has previously been recorded about 7.7 kilometres south-west of the study area.	**Low -** The species may forage within the study area but the removal of isolated paddock trees is not likely to impact the species.
Speckled Warbler *Chthonicola sagittata*	-	V	The Speckled Warbler lives in a wide range of *Eucalyptus* 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. The species has not been previously recorded in the locality.	**Low -** The species is more likely to utilise diverse habitats outside of the study area and therefore unlikely to be impacted.
Superb Parrot *Polytelis swainsonii*	V	V	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.	**Moderate** – 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 may inhabit hollows in the trees in the study area. The removal of trees and groundcover from the study area may reduce roosting, nesting and foraging habitat for the species.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			The species has been previously recorded, nearest to the proposal site about 800 metres to the south.	
Swift Parrot *Lathamus discolor*	E	E	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 *Eucalyptus robusta*, Spotted Gum *Corymbia maculata,* Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box E. *moluccana* and Blackbutt *E. pilularis*. The species has previously been recorded about 5.4 kilometres west of the study area, in 2002.	**Low -** The species is more likely to utilise woodland habitats outside of the study area where profuse flowering occurs, and is therefore unlikely to be impacted by the removal of isolated paddock trees.
Turquoise Parrot *Neophema pulchella*	-	V	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. The species has been recorded once in the locality, in 2007, about 3.8 kilometres south of the study area.	**Low -** The species may forage within the study area but the removal of isolated paddock trees and minimal introduced groundcover is not likely to impact the species.
Varied Sittella *Daphoenositta chrysoptera*	-	V	Occurs in eucalypt woodlands and forests throughout their range. They prefer rough-barked trees e.g. stringybarks and ironbarks The species has not been previously recorded in the locality.	**Low -** The species is unlikely to inhabit the study area due to lack of recent records and preferred tree species.
White-throated Needletail *Hirundapus caudacutus*	Mi	-	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. The species was previously recorded within the proposed transmission line easement of the proposal site in 1992	**Low** – The species may occasionally forage above the study area and use trees as roosting habitat. The proposal is unlikely to have an impact on the aerial resources of the species.
Mammals				
Bilby *Macrotis lagotis*	V	E	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	**None –** Presumed extinct in NSW.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			greatly reduced and today the species is nationally listed as vulnerable, and is presumed extinct in NSW. One historic record from 1912 exists for this species in the locality.	
Koala *Phascolarctos cinereus*	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the western region. Inhabits eucalypt woodlands and forests. One historic record from 1966 exists for this species in the locality.	**Low –** The species no longer inhabits the Wagga Wagga LGA.
Spotted-tailed Quoll *Dasyurus maculatus maculatus* (SE mainland population)	E	V	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. One historic record from 1980 exists for this species in the locality.	**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 habitats.
Squirrel Glider population in the Wagga Wagga Local Government Area *Petaurus norfolcensis*	-	EP	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. Inhabits a wide range of open forest, woodland and riverine forest 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.	**Low** – The species is unlikely to inhabit the study area due to a lack of woodland connectivity to known areas of habitat. The removal of isolated paddock trees is unlikely to impact on the species.
Bats				
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*	-	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.	**Low** – The species is more likely to inhabit woodland outside of the study area, where roosting habitat is available.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			The species has been recorded once in the locality, in 2007, about 3.8 kilometres south of the study area, along the Murrumbidgee River.	
Grey-headed Flying-fox *Pteropus poliocephalus*	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 isolated paddock trees is unlikely to impact on the species due to its high mobility.
Southern Myotis *Myotis macropus*	-	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.
South-eastern Long-eared Bat *Nyctophilus corbeni*	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. The species has not been previously recorded in the locality.	**Low** – More suitable habitat available within the locality. The removal of isolated paddock trees is unlikely to impact on the species due to its high mobility.
Reptiles				
Pink-tailed Worm Lizard *Aprasia parapulchella*	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayer, particularly those dominated by Kangaroo Grass (*Themeda australis*). 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 rocky habitats dominated by native grasses.
Striped Legless Lizard *Delma impar*	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	**None** – The species has not been recorded in the locality and is unlikely to occur due to lack of native grassland.

Species	Status		Habitat requirements	Likelihood of occurrence in study area and likelihood of impact
	National	NSW		
			and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa* spp. and poa tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* 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.	
Amphibians				
Southern Bell Frog *Litoria raniformis*	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 C – Significance assessments

EPBC Act significance assessments

1) Are there any matters of national environmental significance located in the area of the proposed action?

- Superb Parrot (*Polytelis swainsonii*) (Vulnerable)

2) Considering the proposed action at its broadest scope, is there potential for impacts on matters of national environmental significance?

The proposal would involve the removal of 16 remnant trees, including 10 hollow-bearing trees, and about 0.77 hectares of native tree plantings, which includes about 0.2 hectares classified as Box-Gum Woodland under the BC Act. The 10 hollow-bearing trees to be removed contain a total of 54 hollows, 32 of which are suitable as potential breeding habitat by Superb Parrots. The species may also use the tree plantings as foraging and movement habitat. The removal of this vegetation has the potential to affect the Superb Parrot. Vegetation to be removed provides roosting, movement and foraging habitat for the species. The removal of a relatively small area of habitat is unlikely to substantially affect the species due to the presence of much greater areas of habitat in the study area and locality.

3) Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance?

Safeguards and mitigation measures have been prepared with the aim of minimising impacts of the proposal on the ecology of the study area and on matters of NES. These are detailed in section 5.2 of this report.

4) Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts?

Vulnerable Species –Superb Parrot

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

- **Lead to a long-term decrease in the size of an important population of a species;**

In accordance with the Significant Impact Guidelines (DoE 2013), an 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

In the absence of specific information on whether important populations of these species are likely to occur in the study area, it is assumed that an important population of this species is likely to occur.

The woodland in the study area may provide potential nesting and breeding habitat for the Superb Parrot.

Due to the mobility and large range of the species, and the relatively small amount of habitat to be affected compared to that present in the study area and locality, it is unlikely that the proposal would lead to a long-term decrease in the size of a population of the Superb Parrot. The species is known to breed in River Red Gum trees along the Murrumbidgee River, about three kilometres to the south of the proposal site, and in Box-Gum Woodland in the locality where substantial areas of habitat are available.

Sixteen remnant trees, including 10 hollow-bearing trees, and about 0.77 hectares of native tree plantings would be removed. The 10 hollow-bearing trees to be removed contain a total of 54 hollows, 32 of which are suitable as potential breeding habitat by Superb Parrots. Vegetation to be removed is located in introduced grassland areas. Better quality and known breeding habitat for the species is located outside the study area.

- **Reduce the area of occupancy of an important population;**

The proposal would remove 16 remnant trees, including 10 hollow-bearing trees, and about 0.77 hectares of native tree plantings. This represents a small fraction of the hollow-bearing trees and tree planting available in the locality. Hollows are used by the Superb Parrot for nesting and roosting, with tree plantings potentially used as foraging and movement habitat. Good quality habitat for this species is present in other parts of the locality.

Vegetation to be removed is located in previously degraded and introduced grassland areas. Better quality and known breeding habitat for the species is located outside the study area. Vegetation removal is not likely to affect the area of occupancy for this species.

- **Fragment an existing important population into two or more populations;**

The removal of isolated paddock trees and tree plantings would not fragment an important population of this species into two populations due to the relatively small scale of tree removal and the location of the trees in introduced grassland areas. Connectivity of vegetation for this mobile species would not be substantially altered.

- **Adversely affect habitat critical to the survival of a species;**

Woodland habitats are important to the survival of the Superb Parrot. The national recovery plan for the Superb Parrot identifies breeding and foraging habitat types that are critical to the survival of the species. Box-Gum Woodland, which is present in the study area, is identified as breeding habitat critical to the survival of the species. Box-Gum Woodland to be removed by the proposal is only present in the form of a relatively young tree planting and would not be used by the species for breeding due to the absence of hollows.

- **Disrupt the breeding cycle of an important population;**

The Superb Parrot may use hollow-bearing trees in the study area for nesting. About 32 of the hollows to be removed are potential breeding habitat for the species. This represents a small fraction of hollows available in the locality, with better quality and known breeding habitat for the species located outside the study area.

The removal of hollow-bearing trees would likely occur outside the breeding season for this species. Although no Superb Parrots were observed in the trees during field surveys, removal of trees outside the breeding season would avoid any potential disruption to breeding for to this species. If tree removal is required during the breeding season, an ecologist would investigate if any of the hollows are being used for breeding by the species during pre-clearing surveys.

- **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

The proposed removal of hollo-bearing trees and tree plantings would reduce the amount of potential roosting, movement and nesting habitat for the Superb Parrot. Habitat would be removed as described in 2) above. Areas of high quality habitat value exist in patches outside the study area in the locality. The proposal would therefore be unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Superb Parrot is likely to decline.

- **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

The study area is already heavily dominated by introduced flora species and weeds. The proposal would be unlikely to affect the Superb Parrot through spread of introduced weed species in the study area. The species is known to forage in groundcover vegetation with a large introduced component.

Due to the existing dominance of introduced weed species in the study area and implementation of safeguards to minimise the spread of weeds, the effects of weed introduction to the study area would be unlikely to significantly affect the species.

- **Introduce disease that may cause the species to decline; or**

All machinery and equipment would be cleaned prior to conducting the proposed works. The proposal would be unlikely to introduce disease that may cause the Superb Parrot to decline.

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

The relatively small amount of vegetation to be removed by the proposal, compared to the area of habitat in the study area and locality would be unlikely to significantly interfere with the recovery of the Superb Parrot.

Conclusion

The proposal would be unlikely to have a significant effect on the vulnerable Superb Parrot as:

- *The area of habitat to be removed is relatively small in relation to available habitat in the locality*
- *Tree removal would be limited to isolated paddock trees and plantings in introduced grassland*
- *There are areas of higher quality habitat value in patches outside the study area.*

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		Name	Signature	Name	Signature	Date
0	M. Cotterill	R. Robinson	On file	P. Carson	On file	18/01/2018

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