Appendix D

Biodiversity assessment report

Limondale Sun Farm

Overland Sun Farming

Limondale Sun Farm, NSW
Biodiversity Assessment Report

Prepared for Overland Sun Farming Company Pty Ltd

10 April 2017

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Biosis staff involved in this project were:

- Lauren Harley & James Shepherd (mapping)
- Luke Stone & Sarah Allison (background).

Contents

Tables

Figures

Plates

Glossary

Assessment circles	Two circles (the inner and outer assessment circle) in which the percent native vegetation cover in the landscape is assessed, taking into account both cover and condition of vegetation (OEH 2014a).
BA	Birds Australia
DoEE	Commonwealth Department of the Environment and Energy
DCDB	Land and Property Information(LPI) digital cadastral database
DPE	NSW Department of Planning and Environment
DPI	Department of Primary Industries
DTDB	Digital topographic databases
Ecosystem credit species	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development.
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FBA	NSW Framework for Biodiversity Assessment
LSF	Limondale Sun Farm
HBT	Hollow Bearing Tree
LEP	Local Environment Plan
Locality	Area located within 10 kilometres radius from the study area
LPI	NSW Land and Property Information
Matters for further consideration	Impacts that are considered to be complicated or severe that will require further consideration by the consent authority (OEH 2014). The assessment is based on thresholds detailed in Section 9 of the FBA. These can also be included as part of the project SEARs.
Matters of NES	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
NV Act	NSW *Native Vegetation Act 2003*
NW Act	NSW *Noxious Weed Act 1993*
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PV	Photovoltaic panels
RoTAP	Rare or Threatened Australian Plant

SEARs	Secretary's Environmental Assessment Requirements
SEPP 44	NSW State Environmental Planning Policy No. 44 – Koala Habitat Protection
SIS	Species Impact Statement
SSD	State Significant Development
Study area	The broader area in which the development site is located, including all direct and indirect impacts (referred to as the site boundary in the Environmental Impact Statement report)
Development site syn. Footprint)	The area of direct impact for the proposed works including the development site, road access and underground grid connection (referred to as the development site/footprint in the Environmental Impact Statement report)
Tg value	The ability of a species to respond to improvement in site value or other habitat improvement at an offset site with management actions.
TSC Act	NSW *Threatened Species Conservation Act 1995*
VIS	NSW Vegetation Information System
WM Act	*Water Management Act 2000*

Summary

Biosis Pty Ltd was commissioned by Overland Sun Farming Company (Overland) to prepare a Biodiversity Assessment Report for the Limondale Sun Farm, a large-scale solar photovoltaic (PV) generation facility and associated infrastructure in south-western NSW. Overland proposes to develop the project on a site within the Balranald local government area (LGA), approximately 14 kilometres south of the township of Balranald (Figure 1). The proposed solar farm development will involve the installation of an array of photovoltaic panels (PV), road access and substation grid connection within the development site. The site is undulating agricultural land with dune/swale topography. Remnant native vegetation is restricted to isolated patches within cropped paddocks, along roadsides or property boundaries, and in the road reserve adjacent to the existing substation.

The development site (footprint) is defined as the maximum area to be impacted by the proposal. The study area (i.e. the broader site boundary) is defined as the development site plus the immediately surrounding land investigated during the field surveys. Both the development site and study area are shown in Figure 2.

Ecological values

Key ecological values identified within the study area include (Figure 4):

- 11.94 hectares of the PCT 16 *Black Box grassy open woodland of rarely flooded depressions, south western NSW* (MR518).
- 17.81 hectares of the PCT 58 *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion* (MR521).
- 39.5 hectares of the PCT 170 *Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones* (MR542).
- 0.27 hectares of the PCT 23 *Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones* (MR464). This PCT represents the NSW threatened ecological community *Acacia melvillei shrubland in the Riverina and Murray-Darling Depression bioregions*.
- 32 hollow bearing trees across the entire study area (paddock trees).

No threatened flora species were identified within the study area despite targeted surveys being undertaken. Major Mitchell's Cockatoo was observed in the study area and development site foraging amongst cereal crops.

Impact avoidance, minimisation and mitigation

The final development site of the solar farm infrastructure was refined through consideration of the findings of a preliminary ecological study and identification of constraints and opportunities mapped through the environmental impact assessment process. The intent of this process was to establish the built footprint on the development site while avoiding impacts on the ecological values (Figure 4). Avoiding areas of Aboriginal cultural heritage sensitivity was also critical in the design process. To achieve this, there has been compromise between avoiding remnant native vegetation and avoiding Aboriginal cultural heritage sites.

Measures to avoid and minimise impacts on native vegetation were considered during the planning stage of the project and designs were 'workshopped' through an iterative mapping process between Overland and the

project ecologists and archaeologists from Biosis. This has resulted in impacts being largely avoided and minimised where possible. The final impacts have been restricted to small, low quality areas of remnant vegetation. Furthermore, access to the site will be via established roads and tracks that only require minor upgrades. The substation grid connection will be achieved through narrow trenches to be located in an existing disturbed transmission easement that is occupied by the current high voltage lines that traverse the development site. During the design process changes were made to the PV array layout to avoid areas of PCT 23 which represents the NSW threatened ecological community *Acacia melvillei shrubland in the Riverina and Murray-Darling Depression bioregions*. This PCT occurs in the southern part of the study area.

As a result of the design process, the following residual impacts will arise from the solar farm in the development site (footprint):

- Removal of 2.18 hectares of PCT 16 *Black Box grassy open woodland of rarely flooded depressions, south western NSW* (MR518). This vegetation is composed of two small patches surrounded by cropping land.
- Removal of 3.14 hectares of the PCT 58 *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion* (MR521). This vegetation is composed of five small patches surrounded by cropping land and small areas of derived vegetation that will be impacted by ancillary infrastructure.
- Removal of 18 hollow bearing paddock trees across the development site.

No impacts requiring further consideration were identified. Impacts to the two vegetation communities listed above will require offsetting. The remainder of the development site supports non-native vegetation and disturbed land. No further consideration of these areas is required.

Biodiversity credits

To offset impacts arising from the development, 158 ecosystem credits are required. Table 15 in the body of this report provides a summary of the ecosystems credits resulting from the proposed development.

Credits will be retired in accordance with the Biodiversity Offset Strategy outlined in Section 9. This includes the potential for a first party offset on an adjacent property or purchasing of credits from the open market. If, after undertaking "reasonable steps" Overland cannot identify like-for-like credits, then the variation rules or supplementary measures may be applied.

Conclusion

The proposed Limondale Sun Farm will result in minor impacts to the biodiversity values identified. The iterative design process has considered biodiversity values and sought to avoid and minimise impacts on these to the greatest extent possible.

Residual impacts to biodiversity will be offset in accordance with the Biodiversity Offset Strategy.

It is also unlikely that the project will have a significant impact on a Matter of National Environmental Significance listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Stage 1 – Biodiversity assessment

1 Introduction

1.1 Project background

Overland Sun Farming Company Pty Ltd (Overland) proposes to develop the Limondale Sun Farm, a large-scale solar photovoltaic (PV) generation facility and associated infrastructure in south-western NSW (Figure 1) (the project). Overland proposes to develop the project on a site within the Balranald local government area (LGA), approximately 14 kilometres south of the township of Balranald. The project will have a capital investment of greater than $30 million.

The project is a State significant development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). A development application (DA) for the project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The NSW Minister for Planning, or the Minister's delegate, is the consent authority.

An environmental impact statement (EIS) is a requirement of the approval process. This Biodiversity Assessment Report (BAR) forms part of the EIS. It documents the biodiversity assessment methods and results, the initiatives built into the project design to avoid and minimise biodiversity and associated impacts, and the additional mitigation and management measures proposed to address any residual impacts not able to be avoided.

1.2 Assessment guidelines

Secretary's Environmental Assessment Requirements (SEARs) were issued by the NSW Department of Planning and Environment (DPE) on 4 November 2016, including Agency Comments from the NSW Office of Environment and Heritage (OEH) that are relevant to this assessment. The SEARs require that biodiversity impacts related to the project are assessed and documented in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) and *Framework for Biodiversity Assessment* (FBA) (OEH 2014b) by an appropriately accredited person. This report has therefore been prepared by Accredited BioBanking Assessor Nathan Garvey (No. 0103).

A copy of the SEARs is attached to the EIS and below is a list of individual requirements relevant to this BAR:

- Biodiversity – including an assessment of the likely biodiversity impacts of the development (particularly in relation to the Major Mitchell's Cockatoo, *Acacia melvillei* shrubland, a Spear Grass, Black Falcon, Little Eagle, Spotted, Harrier and Bitter Quandong), having regard to the NSW Biodiversity Offsets Policy for Major Projects, and in accordance with the Framework for Biodiversity Assessment

Further biodiversity comments from OEH in regards to the SEARs also state that the EIS should contain:

- An assessment of whether scattered trees on the site meet the definition of a PCT for a woodland or open woodland community where trees can be up to 100 metres apart.

1.3 Development proposal

The proposed Limondale Sun Farm (LSF) will involve the installation of an array of PV panels (modules) within the site and associated infrastructure, including connection to the existing Balranald substation. The solar farm is proposed to include an estimated 850,000 modules generating an estimated 250 MW capacity,

although the precise module count and capacity will be dependent upon the specific PV technology selected. The ultimate decision for the module type and racking system will be dependent upon availability and market conditions at the time of procurement.

The project will require the construction of electrical connection to the Balranald 220 kV Substation to export electricity produced at the site to the electricity grid. The connection line (trenches) will be approximately 650 metres in length and will run within the existing easement that contains the high voltage power lines that traverse the site and enter the substation (Figure 2).

Due to the site's relatively flat terrain and predominantly cleared landscape, limited site preparation and civil works will be required. Site establishment works and preparation for construction will include the establishment of a temporary construction site compound in a fenced off area within the development site including a site office, containers for storage, parking areas and construction of access tracks and boundary fencing. Access to the site will be from Yanga Way (Figure 2). A small control room will include facilities and car parking to allow for limited numbers of maintenance staff. Site access tracks will provide all weather access as required.

The construction stage is estimated to take up to 15 months. The site is expected to require some preparation in advance of installing the PV panel system as it does contain small stands of native and introduced vegetation. A security fence will be installed on the site boundary and construction tracks will be laid down if required.

Construction will require the use of graders, water trucks, flatbed trucks, skid steers, front end loaders, roller compactors, trenchers, backhoes, gravel trucks, water tankers, cranes, and aerial lifts. Deliveries of modules and other equipment will be made via flatbed trucks on the approved route and site entrance.

The final development site of the solar farm infrastructure was refined through consideration of findings of previous site investigations and identification of constraints and opportunities mapped through the environmental impact assessment process, including biodiversity. The intent, however, is to establish the built footprint over the development site for an approximate 250 MW installed capacity while minimising impacts on the ecological values present on the site (Figure 4). Areas of Aboriginal cultural heritage sensitivity were also considered in detail during the design phase of the PV array.

The development site is defined as the maximum area to be directly impacted by the proposal. The study area is defined as the development site plus the immediately surrounding land investigated during the field surveys. Both the development site and study area are shown on Figure 2.

Impacts to biodiversity arising from the project are the subject of this assessment.

1.4 Site description

The study area is located approximately 14 kilometres south of Balranald within the Balranald Local Government Area (LGA), Parish of Balranald, County of Caira (see Figure 1). The study area encompasses 2,049 hectares of private land and the adjacent road reserves as shown in Figure 2. It is bounded by Yanga Way to the east and is surrounded by other large farming properties. The study area is zoned RU1 Primary Production with portions of the site identified as having high conservation values under the Balranald Local Environmental Plan 2010 (Balranald LEP).

The study area consists of undulating dune/swale agricultural land with remnant native vegetation in isolated patches within cropped paddocks, along roadsides or boundary fences or within the road reserves adjacent to the substation. There are no mapped watercourses or drainage lines located within the study area, although there are two farm dams. The study area occurs between three river systems; the Wakool and Murray River systems occur approximately 10 kilometres to the southwest and the Murrumbidgee River

occurs approximately 5 kilometres to the northwest of the study area. Yanga Lake occurs approximately 5 kilometres to the northeast. Overland plans to develop as much of the 'buildable' site as possible, with a 1,103 hectare development site siting within the 2,049 hectare study area.

The study area is within the:

- Murray Darling Depressions Interim Biogeographic Regionalisation for Australia (IBRA) Region
- South Olary Plain IBRA subregion
- Murrumbidgee Catchment Management Area
- Balranald Shire Council Local Government Area (LGA).

1.5 Information sources

1.5.1 Publications and databases

In order to provide a context for the study area, information about flora and fauna from within 10 kilometres (the 'locality') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Department of the Environment and Energy (DoEE) Protected Matters Search Tool for matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NSW BioNet - the database for the Atlas of NSW Wildlife, Office of Environment and Heritage (OEH).
- PlantNET (The Royal Botanic Gardens and Domain Trust) for Rare or Threatened Australian Plants (RoTAP).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015 (BA).
- Other sources of biodiversity information:
  - The NSW Plant Community Types, as held within the Vegetation Information System (VIS) Classification 2.1 database.
  - Relevant vegetation mapping, accessed through the OEH VIS mapping through the Spatial Information eXchange (SIX) Vegetation Map Viewer.

The following reports were also reviewed:

- Biosis 2016. Balranald sun farm site: Ecological constraints assessment
- Limondale Sun Farm (SSD 8025) Secretary's Environmental Assessment Requirements
- NSW Scientific Committee final determinations for threatened biota, including (but not limited to):
  - *Acacia melvillei* shrubland in the Riverina and Murray-Darling Depression bioregions (NSW Scientific Committee 2008).

1.5.2 Spatial data

Aerial photography was supplied by NSW Land and Property Information (LPI) (dated 1/2/2008) and by Overland.

Mapping was conducted using hand-held (uncorrected) GPS units (GDA94), mobile tablet computers running Collector for ArcGIS™ and aerial photo interpretation. The accuracy of this mapping is therefore subject to the

accuracy of the GPS units (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Base map data was obtained from LPI 1:25,000 digital topographic databases (DTDB), with cadastral data obtained from LPI digital cadastral database (DCDB). Mapping of stream order was undertaken manually, using the Hydroline layer within the DTDB.

Aerial photography was obtained from NearMap (date: February 2008), LPI January 2014 and Overland's independently captured aerial imagery (2016/2017).

The following spatial datasets were utilised during the development of this report:

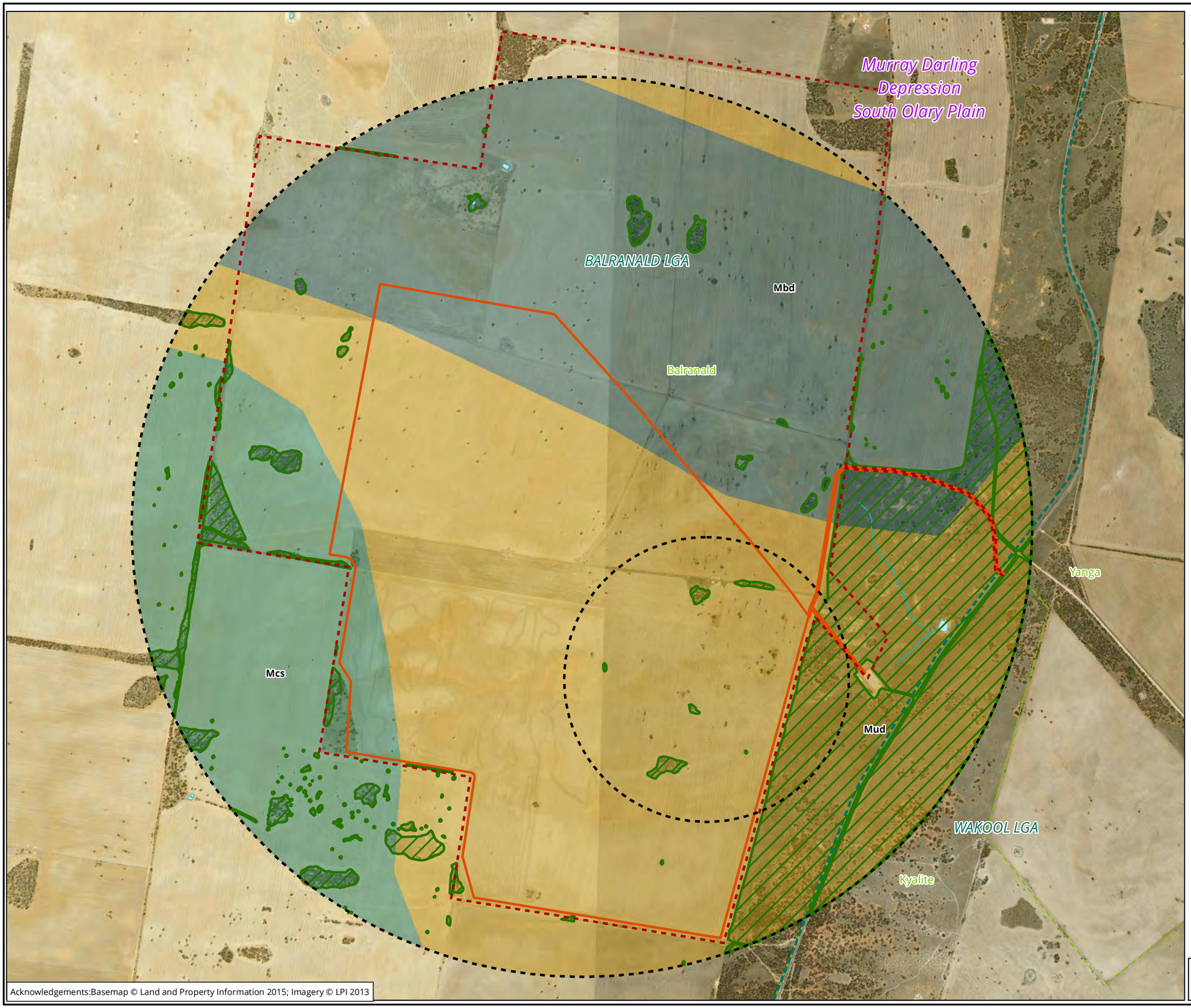
- Catchment data was obtained from the Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DIWA).
- State Environmental Planning Policy (SEPP) 14 Wetlands.
- NSW Soil and Land Information System (SALIS).

Mapping has been produced using a Geographic Information System (GIS).

1.6 Additional legislative requirements

The project has been assessed against key biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Threatened Species Conservation Act 1995* (TSC Act)
- *Fisheries Management Act 1994* (FM Act)
- *Noxious Weeds Act 1993* (NW Act)
- Balranald Local Environment Plan 2010.



Acknowledgements:Basemap © Land and Property Information 2015; Imagery © LPI 2013

Legend

- Study area
- Development site
- Assessment circles
- Local Government Area
- IBRA Sub-region
- Native vegetation extent

MItchell landscape v3

- Mbd, Murrumbidgee Scalded Plains
- Mcs, Mallee Cliffs Sandplains
- Mud, Murrumbidgee Depression Plains

Figure 1: Location map - Limondale Sun Farm

0 200 400 600 800 1,000

Metres

Scale: 1:24,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

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Matter:
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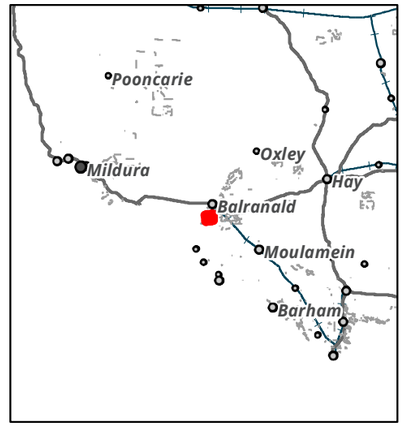

Legend

- Study area
- Development site

Strahler stream order

- 1st
- 2nd
- Stream buffers

Figure 2: Site map - Limondale Solar Farm

0 240 480 720 960 1,200

Metres

Scale: 1:24,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

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Checked by: , Drawn by: , Last edited by: mlooby
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2 Legislative context

This section provides an overview of key biodiversity legislation and government policy considered in this assessment. Where available, links to further information are provided. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (NES) protected under the Act.

Nine Matters of NES are identified under the EPBC Act:

- world heritage properties
- national heritage places
- wetlands of international importance (also known as 'Ramsar' wetlands)
- nationally threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- a water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, activities that have potential to result in significant impacts on Matters of NES must be referred to the Commonwealth Minister for the Environment for assessment.

Matters of NES relevant to the current project include nationally threatened species and ecological communities, migratory species and Ramsar wetlands. Threatened species and ecological communities protected by the EPBC Act are outlined in Section 8.1. An assessment of potential impacts to all Matters of NES under the provisions of the EPBC Act is provided in Section 8.1.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

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

The LSF has been deemed SSD and will be assessed under Section 89C of the EP&A Act. Biodiversity impacts arising from SSD projects are assessed in accordance with the FBA.

The EP&A Act provides the overarching structure for planning in NSW; however is supported by other statutory environmental planning instruments. Sections of the EP&A Act of primary relevance to the natural environment are outlined further below.

Local Environment Plans (Part 3 Division 4)

Local Environment Plans (LEP) apply either to the whole, or part of, a local government area and make provision for the protection or utilisation of the environment through zoning of land.

The study area is subject to the Balranald Local Environment Plan and is zoned RU1 Primary Production. This zoning provides for:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To encourage eco-tourism enterprises that minimise any adverse effect on primary industry production.
- To permit non-agricultural uses that supports the primary production purposes of the zone.
- To permit small scale rural tourism uses associated with primary production and environmental conservation with minimal impact on primary production and the scenic amenity of the area.
- To encourage the provision of tourist accommodation in association with agricultural activities.
- To provide opportunities for employment-generating development that adds value to local agricultural production and integrates with tourism.

Elements of the LEP objectives are relevant to this assessment and are discussed further in Section 8.2.1.

State Environmental Planning Policies (Part 3 Division 2)

State Environmental Planning Policies (SEPPs) outline policy objectives relevant to state wide issues. The SEPP relevant to the current development is:

SEPP No. 44 Koala Habitat Protection

SEPP 44 aims to encourage the conservation and management of natural vegetation areas that provide habitat for koalas to ensure permanent free-living populations will be maintained over their present range and to reverse the current trend of koala-population decline. It applies to areas of native vegetation greater than one hectare and in Councils listed in Schedule 1 to the SEPP.

The study area is located in the Balranald LGA, which is not a listed Council. Therefore, SEPP 44 is not relevant to the current assessment and is not discussed further.

2.2.2 Threatened Species Conservation Act 1995

The TSC Act is the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species, populations and ecological communities and the declaration and mapping of their critical habitats, as well as the identification of key threatening processes.

The TSC Act also establishes a system for biodiversity certification and establishes the Biodiversity Banking and Offsets Scheme. For all major projects, impacts to biodiversity are assessed in accordance with the FBA.

2.2.3 Fisheries Management Act

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through the Assessment of Significance process under Section 220ZZ of the FM Act and Section 5A of the EP&A Act.

Two key objectives of the FM Act are to; conserve fish stocks and key fish habitats, and conserve threatened species, populations and ecological communities of fish and marine vegetation. When reviewing applications the Department of Primary Industries (DPI) will assess the likelihood of impacts to waterways in relation to their sensitivity (TYPE) and waterway class (CLASS).

The Murrumbidgee River to the north-west and Wakool and Murray Rivers to the south-east and Yanga Lake to the east of the study area, are mapped as Key Fish Habitat by DPI. No drainage lines or watercourses run from or through the study area to any Key Fish Habitat.

No impacts to these waterways will result from the LSF, no further consideration is required.

2.2.4 Noxious Weeds Act 1993

The NW Act was enacted to provide for the identification, classification and control of noxious weeds. The NW Act aims to reduce the negative impact of weeds on the economy, community and environment of NSW by:

- Establishing control mechanisms to prevent the establishment of significant new weeds in NSW.
- Preventing, eliminating or restricting the spread of particular significant weeds in NSW.
- Effectively managing widespread significant weeds in NSW.

Plants declared as noxious weeds are currently listed under *Noxious Weeds (Weed Control) Order 2014* published in the NSW Government Gazette No. 23. The NW Act is supported by a number of regulations and is administered by the DPI.

Noxious weeds are discussed further in Section 8.3.

3 Landscape

3.1 Bioregions and landscapes

The study area occurs within the Murray Darling Depressions IBRA bioregion and the South Olary Plain IBRA subregion. The South Olary Plain IBRA subregion covers the entire study area and is the subregion used in this assessment.

Most of the study area occurs within the Murrumbidgee Depression Plains Mitchell Landscape bordering the Murrumbidgee Scalded Plains in the north and Mallee Cliffs Sandplains in the west (Figure 1). The Murrumbidgee Depression Plains Mitchell Landscape was used in this assessment as it covers most of the development site.

3.2 Waterways and wetlands

The study area is located within the Murrumbidgee catchment, in western NSW and west of the Great Dividing Range. The Murrumbidgee catchment borders the Lachlan catchment and Peacock Creek catchments to the north and Murray catchment to the south.

There are no mapped watercourses or drainage lines within the development site (Figure 2). The closest mapped watercourse is an unnamed non-perennial creek, located (at its closest point) approximately 130 metres from the eastern boundary of the study area. There are farms dams in the broader study area. Yanga Lake is located five kilometres east of the study area.

3.3 Native vegetation extent

The smallest inner and outer assessment circles (300 hectares and 3,000 hectares) were used, as the 3,000 hectare assessment circle was sufficient to fit the whole the development site (Figure 3). The assessment circles were centred on the area of native vegetation that is most impacted by the project.

Mapping of vegetation within the inner and outer assessment circles was undertaken using aerial mapping interpretation and Vegetation Map of the Riverina Bioregion (VIS_ID 981) (DECCW 2010). This mapping was modified using vegetation extent as assessed by Biosis (see Section 4). Vegetation in the inner and outer assessment circles is shown Figure 3.

Regional mapping of native vegetation communities within the outer assessment circle includes:

- Cleared and/or cropped land
- Dillon Bush/Black Bluebush
- Black Box Woodland Scattered
- Black Bluebush Old Man Saltbush
- Cleared and/or Cropped (Dune-Crest Mallee/Linear Dune Mallee).

3.4 Assessment of landscape value

Landscape value has been calculated using the method for site-based developments, outlined in Appendix 4 of the FBA (OEH 2014b).

3.4.1 Assessment of the current extent of native vegetation cover

The extent of native vegetation cover before development for both outer and inner assessment circles was determined as the sum of areas of each of the native vegetation map units listed above.

To determine the extent of native vegetation cover after development, the extent of vegetation required for removal is subtracted from the extent of native vegetation cover before development. Table 1provides a summary of the extent of native vegetation cover within the inner and outer assessments circles, before and after development.

Table 1 Extent of native vegetation cover before and after development

Assessment circle	Before development		After development	
	Area (ha)	%	Area (ha)	%
Outer assessment circle	464.50	15	459.19	15
Inner assessment circle	43.12	14	37.81	12

No major change in the extent of native vegetation in either the inner or outer assessment circle will result from the development.

3.4.2 Assessment of connectivity value

The development site does not support any of the following:

- An area identified as being part of a state significant biodiversity link.
- A riparian buffer 50 metres either side of a 6th order stream.
- A riparian buffer 50 metres around an important wetland or estuarine area.
- An area identified as being part of a regionally significant biodiversity link.
- A riparian buffer 20 metres either side of a 4th or 5th order stream,

Therefore, the proposed development will not impact on any state significant biodiversity links or regionally significant biodiversity links.

The development site was assessed as being part of a single connective link (Figure 3). Native vegetation in the Yanga Way road reserve provides a north-south connective link along the eastern boundary of the development site. No connective links will be affected by the LSF. The connectivity width category before and after development will remain more than 500 metres. The development will not result in linkage width threshold crossed.

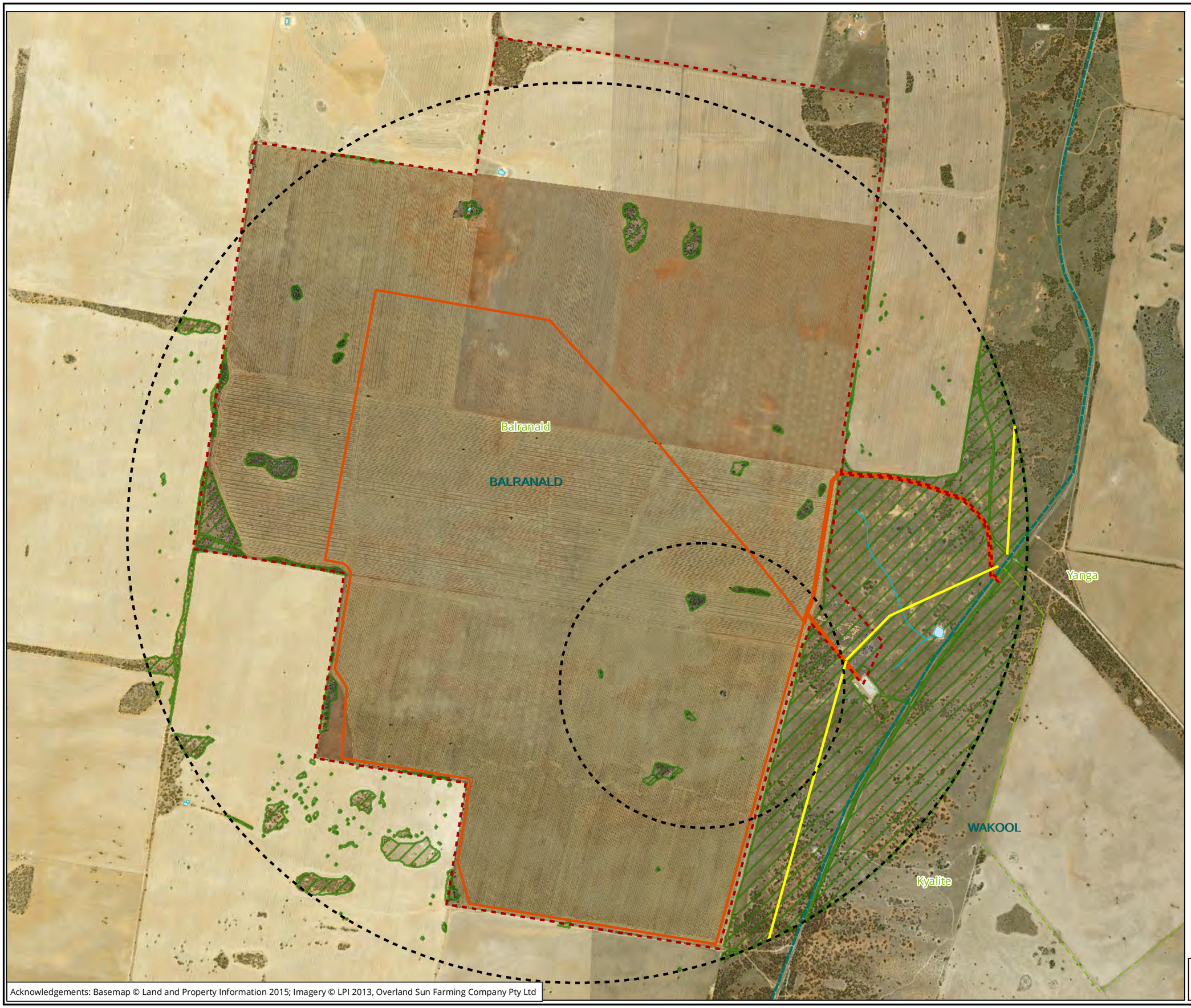
Overstorey condition for the connective link was assessed based on aerial photo interpretation and on-ground assessment. Overstorey vegetation within the connective link was assessed as being in benchmark condition. No change in overstorey condition will result from the LSF. Midstorey/groundcover condition was assessed based on a rapid assessment of vegetation within the locality, with vegetation reviewed from roadsides. Midstorey vegetation within the connective link was assessed as being less than 50 per cent of benchmark condition. No change to midstorey/groundcover condition will result from the LSF.

The proposed development will not result in any change in linkage condition classes.

3.4.3 Assessment of patch size

Patch size was assessed using a select process in ArcGIS. All vegetation not defined as low condition and separated by a distance of less than 100 metres (woody vegetation types) and 30 metres (non-woody vegetation types) was mapped sequentially. Using this method, the vegetation within the development site forms part of a relatively large patch of connecting vegetation with a patch size larger than 1,000 hectares.

The Murrumbidgee Depression Plains Mitchell Landscape is estimated to be 93 per cent cleared. A patch size of 50 hectares fits into the 'Extra Large' patch size class. The patch size is Extra Large.



Legend

- Study area
- Development site
- Assessment circles
- Connective links
- Native vegetation extent

Figure 3: Vegetation in the inner and outer assessment circles including connective links

0 240 480 720 960 1,200

Metres

Scale: 1:24,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

N

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Matter: 24031
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4 Native vegetation

The extent of native vegetation within the development site was determined using Section 5 of the FBA.

4.1 Background review

A review of regional vegetation mapping by Scott (1992) was undertaken to inform the site investigation. Scott (1992) identifies four vegetation communities within the study area, as outlined in Section 3.3, including:

- Dillon Bush/Black Bluebush
- Black Box Woodland Scattered
- Black Bluebush Old Man Saltbush
- Cleared and/or Cropped (Dune-Crest Mallee/Linear Dune Mallee).

Detailed mapping of vegetation within the development site was undertaken for this assessment (Figure 4). The methodology is outlined in Section 4.2 and results presented in Section 4.3.

4.2 Methods

4.2.1 Site investigation

An initial assessment of the study area (the site) was undertaken by Biosis in July 2016. The purpose of this assessment was to undertake vegetation mapping and a preliminary assessment of vegetation condition in accordance with the requirements of the FBA. Additional assessments were undertaken by Biosis in November 2016 that included targeted surveys and biometric data collection in accordance with the requirements of the SEARs and FBA methodology.

Through an iterative design process, which considered the biodiversity values outlined in these assessments, Overland decided to reduce the initial area of the proposed development and restrict it to the current development site. Biosis used the data collected in the previous assessments to inform the current biodiversity assessment.

Detailed mapping of vegetation communities was conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab 3) using the ArcGIS Collector application and aerial photo interpretation. Areas of native vegetation for which a Plant Community Type (PCT) could accurately be assigned were identified and delineated in the field, and vegetation condition determined. Identification of PCTs within the study area was confirmed with reference to the community profile descriptions (and diagnostic species tests) held within the NSW Vegetation Information System (VIS): Classification Version 2.1.

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type (or PCT), with vegetation type the finest grouping. The grouping referred to in this report is PCT. PCTs were stratified into Vegetation Zones based on condition (low or moderate/good) and ancillary code.

Following stratification of Vegetation Zones, site value was assessed using data obtained via a series of plots and transects, as per the methodology outlined in Section 5 of the FBA. Plot and transect data was collected from the study area in November 2016 and included:

- A 20 metre x 50 metre quadrat and 50 metre transect for assessment of site attributes.

- A 20 metre x 20 metre quadrat, nested within the quadrat outlined above, for full floristic survey to determine native plant species richness.

The minimum number of plots/transects per Vegetation Zone was determined using Table 3 of the FBA. A total of eight plots/transects were completed within the study area (Figure 4).

Floristic data, including plot and transect data, is provided in Appendix 1. A list of flora species was compiled for each vegetation type. Records of all flora species will be submitted to OEH for incorporation into the Atlas of NSW Wildlife.

It should be noted that condition scores for the proposed access off Yanga Way were determined using the same condition score as the electricity connection corridor as the road access design is still preliminary and subject to confirmation with NSW Roads and Maritime Service.

4.3 Results

4.3.1 Vegetation description

The study area is currently used for dryland cereal and legume cropping. Native vegetation and fauna habitats have been modified by past disturbances associated with land clearing, cropping, livestock grazing and weed invasion. Native vegetation occurs in isolated patches within cropped paddocks, along roadsides or boundary fences or within the road reserves adjacent to the substation. The study area supports 59.75 hectares of native vegetation patches with varying levels of disturbance (Figure 3). The following PCTs were identified within the study area but outside of the development site and will not be impacted:

- PCT170 *Chenopod sandplain mallee woodlands/shrublands of the arid and semi-arid (warm) zones* was identified in along the northern, western and southern boundaries of the study area with total area of 39.5 hectares.
- PCT 23 *Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones* (MR646) was identified along the southern boundary of the study area and extents 0.27 hectares.

These PCTs are not discussed further.

There are 5.32 hectares of native vegetation within the development site composed of eight small isolated patches and vegetation in the adjacent road reserve. The small patches are surrounded by an agricultural matrix resulting in high levels of isolation, heavy weed infestations, soil disturbance and vegetation damage by the surrounding land use (e.g. physical damage, herbicide drift). This has resulted in the limited recruitment of native shrubs and eucalypts. The vegetation is characterised by a canopy of mature and semi-mature native trees with an understorey of chenopod shrubs, disturbance tolerant native species and exotic herbs and grasses.

The cleared cropping land is regularly cultivated and is sown to winter cereal and legume crops. One small stand of planted vegetation dominated by introduced Pepper Trees *Schinus molle* occurs near an old homestead within the development site. This area will be retained and not impacted by the solar farm.

Ecological features of the development site and photographs of each community are provided below in Table 4. The extent of these communities is mapped in Figure 4.

4.3.2 Plant community types

Site investigations, including determination of vegetation communities using the methods outlined in Section 4.2.1, identified the presence of two PCTs within the development site. The PCT, vegetation formation and vegetation class (Keith 2004) are described in Table 2.

Table 2 Plant community types of the development site and corresponding formation and class (Keith 2004)

Plant community type	Vegetation formation	Vegetation class	Area (ha)
PCT 16 Black Box grassy open woodland of rarely flooded depressions, south western NSW (MR518)	Semi-arid Woodland (Grassy sub-formation)	Inland Floodplain Woodland	2.18
PCT 58 Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, Moderate/good, (MR521)	Semi-arid Woodland (Shrubby sub-formation)	Semi-arid Sand Plain Woodland	3.14

The vegetation of the development site was assessed as being in moderate/good condition in accordance with the FBA. Vegetation was further stratified based on the level of disturbance and resultant condition using one ancillary code to identify areas of the same broad condition state, in accordance with the FBA (OEH 2014b). This has resulted in three vegetation zones being identified within the southern section of the study area (Table 3 and Figure 4).

Table 3 Vegetation zones mapped within the development site

Vegetation zone (VZ)	Plant community type	Condition	Ancillary code	Area (ha)
1	PCT 16 Black Box grassy open woodland of rarely flooded depressions, south western NSW (MR518)	Moderate/Good	-	2.18
2	PCT 58 Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, Moderate/good, (MR521)		-	1.92
3			Derived grassland	1.22

Descriptions of each vegetation zone are provided in Table 4 to Table 6.

Table 4 Vegetation zone 1 description

Vegetation zone 1 - *Black Box grassy open woodland of rarely flooded depressions, south western NSW*	
PCT ID	16
Biometric vegetation type ID	MR518
Common name	*Black Box grassy open woodland of rarely flooded depressions, south western NSW*
Condition	Moderate/good (2.18 ha)
Extent within study area	Development site – 2.18 ha of this PCT was recorded and mapped in isolated patches surrounded by land cleared for cropping. This PCT is located in the centre of the development site (Figure 4).
Description	Black Box *Eucalyptus largiflorens* is the dominant canopy species to 25 metres tall. Species present in the mid stratum include a medium cover of chenopods such as Nitre Goosefoot *Chenopodium nitrariaceum*, Thorny Saltbush *Rhagodia spinescens* and Short-leaf Bluebush *Maireana brevifolia.* The ground cover is dominated by introduced pasture species including Barley Grass *Hordeum* spp. and Rye Grass *Lolium rigidum*. Some native grass cover is present in the ground layer and includes Knotty Spear-grass *Austrostipa nodosa* and Curly Windmill Grass *Enteropogon acicularis.* This community is found on the brown to grey sandy/loam to clay soils in dune swales or depressions.
Survey effort	One plot/transect within development site (Q5). Two plot/transects within study area (Q2 and Q3).
Condition	The community is generally in poor condition with a high cover of introduced plant species due to surrounding land use and associated edge impacts.
Characteristic species used for identification of PCT	According with the NSW VIS: Classification Version 2.1, the overstorey species recorded within the study area that align with the dominant species listed as characterising this PCT include Black Box generally with an open understorey dominated by forbs, grasses and low growing chenopods. Aligning mid-storey cover species include Thorny Saltbush, Ruby Saltbush *Enchylaena tomentosa* and Rolypoly *Salsola tragus*
Justification of evidence used to identify the PCT	Apart from species composition, the stated distribution in south-western NSW mostly in the eastern section of the Murray Darling Depressions Bioregion and South Olary Plain IBRA Subregion; the occurrence on alluvial plains on clays is consistent with Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW. The main diagnostic feature is a canopy dominated by Black Box and the very periodic inundation. The mid-storey commonly includes Thorny Saltbush. The ground layer is sparse and contains chenopod shrubs like Rolypoly and Ruby Saltbush. These features are consistent with the PCT structure and growth forms and dominant species particularly within the less disturbed and modified parts of the community adjacent to the study area.
Status	Commonwealth EPBC Act: Not listed NSW TSC Act: Not listed

Vegetation zone 1 - *Black Box grassy open woodland of rarely flooded depressions, south western NSW*	
Estimate of percent cleared value of PCT in the major catchment area	60%
Plate 1: Black Box grassy open woodland Q2 (photo taken 12/07/2016)	
Plate 2: Black Box grassy open woodland Q5 (photo taken 11/11/2016)	

Table 5 Vegetation zone 2 description

Vegetation zone 2 - *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*	
PCT ID	58
Biometric vegetation type ID	MR521
Common name	*Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*
Condition	Moderate/good (1.92 ha)
Extent within study area	Development site – 1.92 ha of this PCT was recorded and mapped in isolated patches surrounded by land cleared for cropping. This PCT is located in the centre of the development site (Figure 4).
Description	Black Oak *Casuarina pauper* is the dominant canopy tree to 12 metres tall with Western Rosewood *Alectryon oleifolius* subsp. *canescens* also occurring as isolated canopy trees. Species characteristic of the mid stratum include Thorny Saltbush, Creeping Saltbush *Atriplex semibaccata*, Short-leaf Bluebush and Limestone Copperburr *Sclerolaena obliquicuspis*. The ground cover is dominated by introduced pasture species including Barley Grass and Rye Grass. Some native ground cover is present and includes Ruby Saltbush, Curly Windmill Grass and Slender Groundsel *Senecio glossanthus*. This community is found on brown to orange sandy/loam soils in level and inter-swale areas within the study area.
Survey effort	One plot/transect within development site (Q6). One plot/transects within study area (Q1).
Condition	The community is generally in poor condition with a high cover of introduced plant species due to surrounding land use and associated edge impacts.
Characteristic species used for identification of PCT	According with the NSW VIS: Classification Version 2.1, the overstorey species recorded within the study area that align with the dominant species listed as characterising this PCT include Black Oak and Western Rosewood with either a shrubby or grassy understorey. Aligning mid-storey and ground cover species include Thorny Saltbush, Short-leaf Bluebush, Limestone Copperburr and Rolypoly.
Justification of evidence used to identify the PCT	Apart from species composition, the stated distribution in south-western NSW mostly in the eastern section of the Murray Darling Depressions Bioregion and South Olary Plain IBRA Subregion; the occurrence on level to undulating sandplains, sandy rises and inter-dune swales on sandy/loam soils is consistent with Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion. The main diagnostic feature is a canopy dominated by Black Oak and Western Rosewood. The mid-storey commonly includes Thorny Saltbush and Short-leaf Bluebush. The ground layer is sparse and contains chenopod shrubs like Rolypoly and Limestone Copperburr. These features are consistent with the PCT structure and growth forms and dominant species particularly within the less disturbed and modified parts of the community adjacent to the study area.

Vegetation zone 2 - *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*	
Status	Commonwealth EPBC Act: Not listed NSW TSC Act: Not listed
Estimate of percent cleared value of PCT in the major catchment area	75%
Plate 3: Black Oak – Western Rosewood open woodland Q6 (photo taken 12/07/2016)	

Table 6 Vegetation zone 3 description

Vegetation zone 3 - *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*	
PCT ID	58
Biometric vegetation type ID	MR521
Common name	*Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*
Condition	Moderate/Good Derived grassland (1.22 ha)
Extent within study area	Development site – 1.22 ha of this PCT was recorded and mapped adjacent to the substation located along the eastern boundary of the development site within the Yanga Way road reserve (Figure 4).
Description	This community occurs adjacent to the substation in the Yanga Way road reserve and around the margins of cropped paddocks and is made up of treeless derivatives of the PCTs found in the study area. The community could also be derived from other Semi-arid Shrubland formations that have been extensively cleared or modified. Species characteristic of this vegetation include Berrigan *Eremophila longifolia,* Leafless Ballart *Exocarpos aphyllus,* Nitre Bush *Nitraria billardierei*, Grey Copperburr *Sclerolaena diacantha* and several *Acacia* species. The ground cover is a mix of native and introduced species including Curly Windmill Grass, Elegant Spear-grass *Austrostipa elegantissima,* Dwarf Brachyscome *Brachyscome lineariloba* and Bush Minuria *Minuria cunninghamii*, Barley Grass, Rye Grass and Paterson's Curse *Echium plantagineum.* This community is found on brown to orange loam/clay soils on flat areas within the study area.
Survey effort	Two plot/transects within study area (Q7 and Q8).
Condition	The community is generally in medium to poor condition with a moderate cover of weeds due to historical canopy tree removal, surrounding land use and associated edge impacts. Livestock grazing has also altered the floristics and habitat quality of these areas.
Characteristic species used for identification of PCT	According with the NSW VIS: Classification Version 2.1, the species recorded within the study area that align with the species listed as characterising this PCT include Leafless Ballart, Grey Copperburr and Elegant Spear-grass.
Justification of evidence used to identify the PCT	Apart from species composition, the stated distribution in south-western NSW mostly in the eastern section of the Murray Darling Depressions Bioregion and South Olary Plain IBRA Subregion; the occurrence on level to undulating sandplains, sandy rises and inter-dune swales on sandy/loam soils is consistent with Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion. The diagnostic feature is the presence of Leafless Ballart, Grey Copperburr, Quena *Solanum esuriale* and Elegant Spear-grass. These features are consistent with the derived form of the PCT.

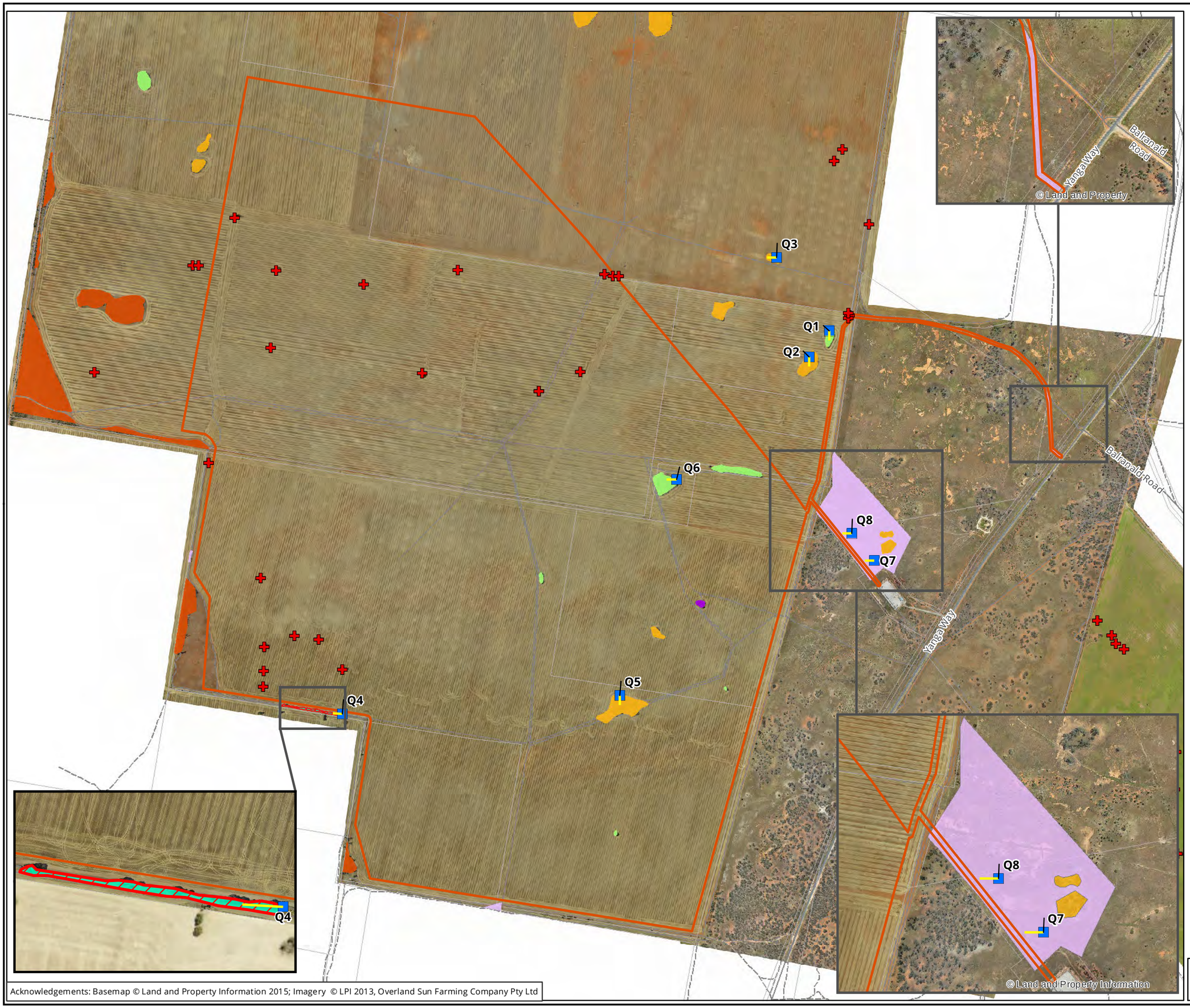
Vegetation zone 3 - *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*	
Status	Commonwealth EPBC Act: Not listed NSW TSC Act: Not listed
Estimate of percent cleared value of PCT in the major catchment area	75%
Plate 4: Derived *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion* near the sub-station Q8 (photo taken 11/11/2016)	
Plate 5: Derived *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion* within the development site near sub-station (photo taken 11/11/2016)	

4.3.3 Site value scores

Site value scores for each vegetation zone are presented in Table 7.

Table 7 Site value score for the Vegetation Zone

Vegetation zone	Plant community type	Area (ha)	Site value score
1	PCT 16 Black Box grassy open woodland of rarely flooded depressions, south western NSW (MR518)	2.18	48.67
2	PCT 58 Black Oak - Western Rosewood open woodland on deep sandy loams of Murray-Darling Depression and Riverina Bioregions (MR521)	1.92	26.04
3		1.22	50.52



Legend

- Development site
- Hollow-bearing trees
- Quadrat
- Transect
- Acacia melvillei Shrubland EEC

Plant communiy types

- PCT 16 - Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion), Moderate/good, (MR518)
- PCT 170 - Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones, Moderate/good, (MR542)
- PCT 23 - Yarran tall open shrubland of the sandplains and plains of the semi-arid (warm) and arid climate zones, Moderate /good, (MR464)
- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, Moderate/good, (MR521)
- PCT 58 - Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, Moderate/good, Derived grassland(MR521)
- Woody weeds / planted vegetation

Figure 4: Native vegetation within the study area, including flora survey effort

0 180 360 540 720 900

Metres
Scale: 1:18,373 @ A3
Coordinate System: GDA 1994 MGA Zone 54

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Matter: 24031
Date: 10 April 2017,
Checked by: ABM, Drawn by: LH, Last edited by: ngarvey
Location:P:\24000s\24031\Mapping
24031_F4_VegStudyArea_20170410

5 Threatened species

5.1 Methods

Flora and fauna assessments of the study area were undertaken on 12 July 2016 and targeted surveys on 11 November 2016. Weather observations for each survey date are shown in Table 8.

Table 8 Weather observations during flora and fauna surveys (Balranald, NSW)

Survey date	Temperature (°C)		Rainfall to 0900 hrs (mm)
	Minimum (recorded at 0900 hrs)	Maximum (recorded at 1500 hrs)	
12 July 2016	8	13.5	0
11 November 2016	15.8	31.8	0

Flora survey methods are outlined above, included mapping of vegetation and condition assessment and targeted surveys. Targeted threatened flora surveys were undertaken for the following threatened species:

- A spear-grass *Austrostipa metatoris*
- Bitter Quandong *Santalum murrayanum*
- Winged Peppercress *Lepidium monoplocoides*
- *Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions*

Targeted surveys were undertaken in accordance with OEH (2016) and involved walking parallel transects approximately 5 to 10 metres apart through all native vegetation within the development site (see Figure 5). Targeted survey of the proposed access off Yanga Way was not undertaken as this is a design feature proposed by Roads and Maritime Service to Overland after the surveys.

Fauna assessment was habitat-based, seeking to identify the following fauna habitat features of the study area:

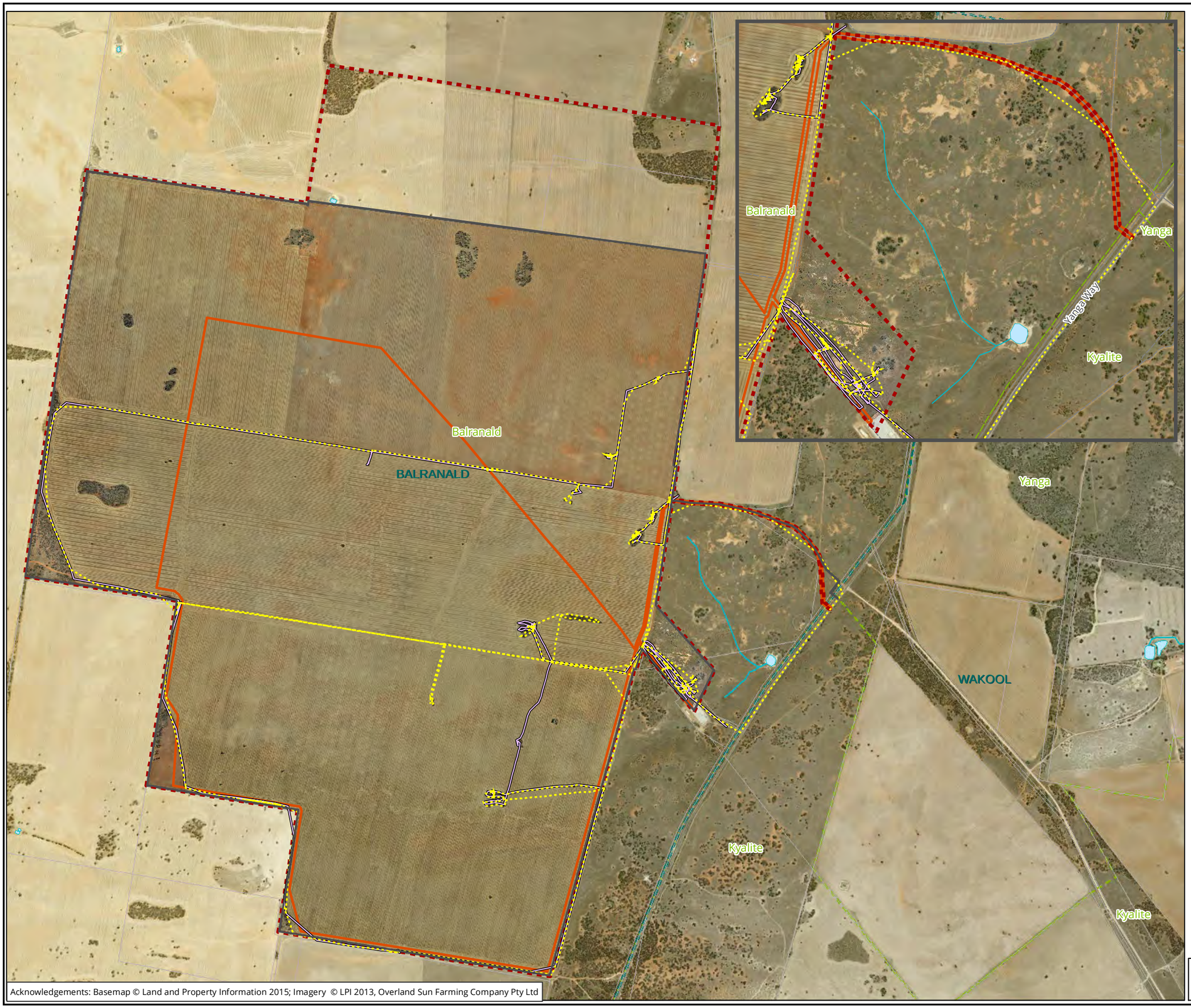
- Habitat trees including large hollow-bearing trees, availability of flowering shrubs and feed tree species.
- Waterbody condition.
- Quantity of ground litter and logs.
- Searches for indirect evidence.

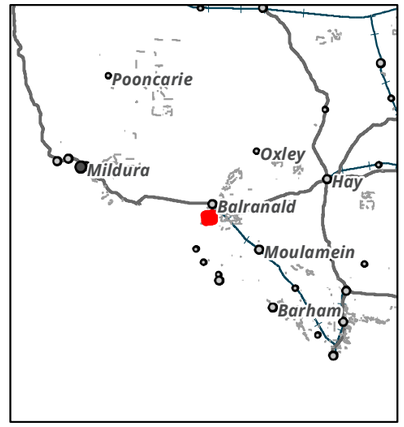
5.2 Fauna habitat assessment results

The study area has an extensive history of use for agricultural purposes, and has recently been used for extensive cropping. Areas of native vegetation are present within the development site and may provide habitat for large mammals or highly mobile avian species capable of disbursing across the fragmented landscape.

Fauna habitat features were limited to areas of remnant patch vegetation, as outlined above, scattered trees and mistletoe. No permanent or semi-permanent wetlands are present within the development site.

The development site contains 18 hollow-bearing scattered paddock trees. Large old trees generally provide good habitat for a range of threatened species; however, due to the fragmented and isolated nature of these trees it is unlikely they provide key habitat for any listed threatened species. Major Mitchell's Cockatoo *Lophochroa leadbeateri* may occasionally utilise trees as a foraging and nesting. Major Mitchell's Cockatoo may utilise crops and crop weeds, such as Wild Melon *Citrullus* sp., as a food source but this vegetation does not provide key habitat for listed species. Black Falcon was not recorded on the site during the flora and fauna surveys.





Legend

- Study area
- Development site
- Stream buffers
- Survey track 1
- Survey track 2

Figure 5: Targeted survey effort

0 240 480 720 960 1,200

Metres

Scale: 1:24,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

N

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Matter:
Date: 10 April 2017,
Checked by: , Drawn by: , Last edited by: mlooby
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5.3 Geographical habitat features

An assessment of the occurrence of geographic habitat features, in accordance with Section 6.3 of the FBA was undertaken, along with a determination of whether impacts to these habitat features will result from the proposed LSF. The results of this assessment, along with the species generated by the calculator associated with the FBA are outlined in Table 9.

Table 9 Assessment of geographical habitat features within the development site

Common name	Scientific name	Feature	Present in development site	Justification
Winged Peppercress	*Lepidium monoplocoides*	Land containing seasonally damp or waterlogged sites	Yes	The development site contains sites that occasionally seasonally damp or waterlogged on heavy soils. Minor impacts will result from the development of the project. Areas of impact will be restricted to small patches and narrow strips of native vegetation within the development area.
Grey Falcon	*Falco hypoleucos*	Land within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses	No	The study area is not within 100 m of riparian woodland or inland rivers or isolated paddock trees overhanging water or dry watercourses.

Further consideration is given to these species in Section 5.6.

5.4 Targeted survey results

No target species were recorded within the study area during targeted survey. One TSC Act listed species, Major Mitchell's Cockatoo was recorded within the study area and on the southern edge of the development site.

5.5 Ecosystem credit species

A list of ecosystem credit species predicted to occur within the development site, based on the PCTs present and generated by the calculator associated with the FBA is provided in Table 10. The potential for these species to occur within the development site was assessed in accordance with Section 6.3 of the FBA.

Table 10 Assessment of ecosystem credit species within the development site

Scientific name	Common name	TS offset multiplier
Anseranas semipalmata	Magpie Goose	1.3
Ardeotis australis	Australian Bustard	2.6
Burhinus grallarius	Bush Stone-curlew	2.6
Certhionyx variegatus	Pied Honeyeater	1.3
Circus assimilis	Spotted Harrier	1.4
Daphoenositta chrysoptera	Varied Sittella	1.3
Grantiella picta	Painted Honeyeater	1.3
Grus rubicunda	Brolga	1.3
Hieraaetus morphnoides	Little Eagle	1.4
Lophochroa leadbeateri	Major Mitchell's Cockatoo	1.9
Melanodryas cucullata* subsp. *cucullata	Hooded Robin (south-eastern form)	1.7
Nyctophilus corbeni	Corben's Long-eared Bat	2.1
Pachycephala inornata	Gilbert's Whistler	1.3
Polytelis anthopeplus* subsp. *monarchoides	Regent Parrot (eastern subspecies)	1.8
Pomatostomus temporalis* subsp. *temporalis	Grey-crowned Babbler (eastern subspecies)	1.3
Stagonopleura guttata	Diamond Firetail	1.3
Vespadelus baverstocki	Inland Forest Bat	2.2

The presence of these species could not be discounted using the methodology outlined in Section 6.3 of the FBA (OEH 2014b). It was therefore assumed that these species may occur within the development site.

The Bush Stone-curlew and Australian Bustard have the lowest Tg value and therefore the highest threatened species offset multiplier. No adjustment of the TS offset multiplier value has been undertaken.

5.6 Species credit species

A list of species credit species predicted to occur within the development site, based on the PCTs present, along with an assessment of whether the development site provides suitable habitat and whether the species will be impacted by the development is provided in Table 11. The potential for a species to occur within the development site was assessed in accordance with Section 6.5 of the FBA.

Table 11 Species credit species and status within the development site

Scientific name	Common name	Habitat present in the development site	Recorded during field surveys	Impacted by development	Justification
Flora					
Austrostipa metatoris	A spear-grass	Yes	No	No	There are no records of the species in the IBRA Subregion; however the species is predicted to occur. The species grows in tussocks to one metre tall which prefer sandy areas of the Murray Valley. Habitats include sand hills, sand ridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soil. NSW specimens have been recorded in populations as locally frequent or dominant only in scattered patches. Limited habitat was identified within the development site. If present the species is likely to be restricted to Mallee vegetation in the north-west and north-east corners of the study area and Yanga Way road reserve and outside the development site. Not recorded during targeted surveys.
Santalum murrayanum	Bitter Quandong	No	N/A	N/A	There are no records of the species in the IBRA Subregion; however the species is predicted to occur. The species is a shrub up 5 m tall that occurs on mallee communities. Generally grows in gravely and sandy loam soils on dunes, in open woodland and tall shrubland. No habitat present within the development site. Not recorded during targeted surveys.

Scientific name	Common name	Habitat present in the development site	Recorded during field surveys	Impacted by development	Justification
Lepidium monoplocoides	Winged Peppercress	Yes	No	No	There is one record north of the development site outside the IBRA subregion. The species is an erect annual herb or perennial forb (15-20 cm) which grows on seasonally moist to waterlogged sites, on heavy fertile soils. This species usually occurs on open woodland dominated by Black Box and Poplar Box. The species is highly dependent on seasonal conditions. The number of plants at each site varies greatly with seasonal conditions tending to be small in area with local concentrations of the plant. Suitable habitat is present in the study area in areas of Black Box grassy open woodland. Not recorded during the targeted surveys.

No threatened flora species were recorded during targeted surveys.

Stage 2 – Impact assessment (biodiversity values)

6 Impact assessment (biodiversity values)

This section identifies the potential impacts of proposed LSF on the biodiversity values of the development site. Measures taken to date to minimise impacts are summarised and recommendations to assist Overland to design a development that further avoids and minimises impacts on are provided.

6.1 Impact summary

6.1.1 Potential impacts

Potential direct and indirect impacts arising from the development are outlined below. Potential direct impacts arising from the project include:

- Removal of 5.32 hectares of native vegetation within the development site.
- Removal of 18 hollow bearing trees.

Potential indirect impacts arising from the project include:

- Decreased viability of retained vegetation due to edge effects and use of retained areas of native vegetation due to disturbance and degradation of habitat, including erosion and/or compaction of soils, as well as damage to seedlings and new growth.
- Further encroachment of invasive exotic weeds species, leading to loss of habitat and suppression of native seedling establishment resulting in changes to vegetation communities over time.
- Temporary increased noise levels from construction equipment, leading to disturbance of fauna, especially during breeding seasons.

6.1.2 Recommendations to avoid, minimise and mitigate impacts

The principal means to reduce impacts on biodiversity values within the study area has been to avoid and minimise removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered.

Recommendations are broken down into site selection and planning, construction and operation.

Site selection and planning

The site has been selected due to its suitability, previous disturbance and location adjacent to an electricity substation.

During the design of the LSF, Overland has considered all biodiversity values identified by Biosis and have designed the layout of the LSF to avoid, where possible, direct impacts to the identified values. As a result, removal of native vegetation is limited to small isolated patches within cropped paddocks or small corridors through previously disturbed areas. The footprint of the LSF will be restricted to the development site identified in Figure 4.

Site access for construction and operation will be from Yanga Way. In identifying access points, Overland has located access to minimise vegetation removal. Access points will be through existing farm gates and along existing tracks currently used for agricultural purposes. To connect the PV array to the substation, 0.92 hectares of native vegetation will be removed to allow for trenching and laying of power cables. For site access, 0.3 hectares of native vegetation will be removed to upgrade the Yanga Way-Balranald Road

intersection. This is a preliminary road access design only and will be subject to further detailed surveys as part of conditional approval.

Construction

No additional direct impacts are expected to occur as a result of the construction phase. However, indirect impacts may occur on retained biodiversity values. Additional mitigation measures to avoid and minimise impacts should be outlined in a Construction Environmental Management Plan (CEMP) and include:

- Installation of appropriate exclusion fencing around trees and vegetation to be retained in, or directly adjacent to, the development site:
  - The radius of the tree protection zone (TPZ) is calculated for each tree by multiplying its diameter at breast height (DBH) by 12 (i.e. *TPZ = DBH x 12*) in accordance with the Standards Australia Committee (2009).
  - A TPZ should not be less than 2 metres or greater than 15 metres, except where crown protection is required (Standards Australia Committee 2009).
  - Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed.
  - Identify the location of any 'No Go Zones' in site inductions.
  - Fencing should be star pickets with high visibility bunting.
- All material stockpiles, vehicle parking and machinery storage will be located within cleared areas or areas proposed for clearing, and not in areas of retained native vegetation.
- A licenced wildlife salvage team should be on-site during vegetation removal to catch and relocate (if appropriate) any wildlife encountered in vegetation or hollow-bearing trees.
- Where practical, all scattered hollow-bearing trees to be removed should be placed in areas of retained vegetation to provide additional fauna habitat.
- Where appropriate native vegetation cleared from the development site should be mulched for re-use on the site, to stabilise bare ground.
- Dust suppression measures should be implemented during construction.
- Implementation of temporary stormwater controls during construction is necessary to ensure that discharges to the drainage channels are consistent with existing conditions.
- Sediment and erosion control measures should be implemented prior to construction works commencing (e.g. silt fences, sediment traps), to protect drainage channels to the west and to the south. These should conform to relevant guidelines, should be maintained throughout the construction period and should be carefully removed following the completion of works.

Operation

The impacts arising from the operation of the LSF are expected to be negligible.

6.1.3 Residual impacts

Residual impacts arising from the LSF include loss and further fragmentation of native vegetation and species habitat, loss of scattered paddock trees, potential for species, including TSC Act listed species Major Mitchell's Cockatoo to no longer be resident.

6.2 Thresholds for assessment and offsetting

This section outlines the thresholds for assessment and offsetting in accordance with Section 9 of the FBA.

6.2.1 Impact requiring further consideration

This section provides an assessment of impacts requiring further consideration in accordance with Section 9.2 of the FBA.

Landscape features

The study area does not support any 4th, 5th or 6th order streams, estuarine areas, important wetlands, or state or regional biodiversity links. The study area does not support any important wetlands.

There are no impacts to landscape features requiring further consideration.

Native vegetation

One TSC Act listed EEC, *Acacia melvillei shrubland in the Riverina and Murray-Darling Depression bioregions*, has been mapped in the study area but will be avoided by the development site. No impact on this community will result from the proposed LSF. No other EECs nominated in the SEARs were mapped in the study area.

Species and populations

The study area does not include any areas of critical habitat.

No impacts on critically endangered or endangered species will result from the proposed LSF.

There are no impacts on species or populations requiring further consideration.

6.2.2 Impacts requiring offsets

Impacts on native vegetation

This section provides an assessment of the impacts on native vegetation requiring offset in accordance with Section 9.3.1 of the FBA.

The proposed development site will result in removal of the following:

- Removal of 2.18 hectares of PCT 16 *Black Box grassy open woodland of rarely flooded depressions, south western NSW* (MR518).
- Removal of 3.14 hectares of the PCT 58 Black Oak – *Western Rosewood open woodland on deep sandy loams of Murray-Darling Depression and Riverina Bioregions* (MR521).
- Removal of 18 isolated hollow bearing paddock trees.

Impacts on these two PCTs will require offsetting. The remainder of the development site supports non-native vegetation and disturbed land. No further consideration of these areas is required.

Impacts on species and populations

This section provides an assessment of the impacts on species and populations requiring offsets in accordance with Section 9.3.2 of the FBA. The project will not result in removal of habitat for threatened species and populations. No offsets for species or populations are required.

7 Biodiversity credits

This section provides a summary of biodiversity credits required from impacts on the biodiversity values within the development site, following consideration of measures to avoid, minimise and mitigate impacts.

Table 12 provides a summary of ecosystem credits resulting from the proposed development. The full credit profile is provided in Appendix 2.

Table 12 Summary of ecosystem credits for all management zones.

Vegetation Zone	PC type code	Plant community type name	Management zone area (ha)	Loss in landscape value	Loss in site value score	EEC offset multiplier	Credits req for TS	TS with highest credit req	TS offset multiplier	Ecosystem credits required
1	MR518	Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	2.18	12	48.67	1	76	Australian Bustard	2.6	76
2	MR521	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	1.92	12	26.04	1	38	Australian Bustard	2.6	38
3			1.22	12	50.52	1	44	Bush Stone-curlew	2.6	44

8 Assessment of biodiversity legislation

8.1 Environment Protection and Biodiversity Conservation Act 1999

An assessment of the impacts of the proposed development on Matters of NES, against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. Matters of NES relevant to the project are summarised in Table 13.

Table 13 Assessment of the project against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	Four flora species and 15 fauna species have been recorded or are predicted to occur in the locality. The majority of these species are considered unlikely to occur within the study area.	Significant impact unlikely to result from the proposed development.
Threatened ecological communities	No Threatened Ecological Community were mapped in the study area.	Significant impact unlikely to result from the proposed development.
Migratory species	Two migratory species have been recorded or are predicted to occur in the locality. The study area does not provide important habitat for an ecologically significant proportion of any of these species.	Significant impact unlikely to result from the proposed development.
Wetlands of international importance (Ramsar sites)	The study area does not flow directly into a Ramsar site and the development is not likely to result in a significant impact.	Significant impact unlikely to result from the proposed development.

8.2 Environmental Planning and Assessment Act 1979

8.2.1 Balranald LEP

The project will result in the removal of 5.32 hectares of native vegetation within the development site. However, by avoiding impact on 54.75 hectares of native vegetation across the broader study area, the project is consistent with the biodiversity related objectives of the RU1 Primary Production zoning in the Balranald LEP.

8.2.2 SEPP No. 44

Several Koala feed tree species defined in Schedule 1 of the SEPP were identified within the study area. However, they do not make up greater than 15 per cent of the tree species in any area. Therefore, the vegetation within the study area is not considered potential Koala habitat as defined under the SEPP.

8.3 Noxious Weeds Act 1993

The NW Act was enacted to provide for the identification, classification and control of noxious weeds. Plants declared as noxious weeds are currently listed under Weed Control Order No. 28 Declaring Certain Plants to be Noxious Weeds published in the New South Wales Government Gazette No. 97 (Department of Premier and Cabinet 2011).

Declared noxious weeds identified in the development site, their control class and legal requirements for each are outlined in Table 14. Treatment for the noxious weeds listed below is recommended within NSW DPI (2011).

Table 14 Noxious weeds recorded within the development site.

Scientific name	Common name	Control class	Legal requirement
Lycium ferocissimum	African Boxthorn	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread

9 Biodiversity Offset Strategy

One hundred and fifty eight (158) ecosystem credits are required to offset the impacts arising from the Limondale Sun Farm.

The proposed Biodiversity Offset Strategy will follow Section 7 of the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a). This will include the following steps:

- Attempt to identify like-for-like offsets. Like-for-like offsets are identified in the Policy as the same PCT, or a PCT in the same vegetation class that has been cleared to an equal or greater extent. Offsets must be provided in the same or an adjacent IBRA subregion.
- If, after undertaking "reasonable steps", a proponent is unable to identify like-for-like credits, then the variation rules may be applied. The variation rules allow:
  - Impacts on a PCT to be offset with a PCT from the same vegetation formation that has been cleared to an equal or greater extent anywhere in NSW.
- Supplementary measures may apply where offsets are not feasible and other options are needed.

Overland has elected to seek retirement of the credits by first party offset or purchasing them on the open market, subject to availability.

In the first instance, every effort to obtain like-for-like offsets has been, or will be, pursued. In the preparation of this Biodiversity Offset Strategy the BioBanking public register has been checked for the availability of credits of the same PCT as that being impacted or those listed in the credit profile report (Appendix 2). There are no matching credits currently available on the public register.

In line with the recommendations outlined in Appendix A of OEH (2014a), an expression of interest for the required credits will be placed on the OEH 'Credits Wanted Register'. Biosis, on behalf of Overland, will contact OEH and Balranald Shire Council to ascertain whether any suitable credits or land held by Council are available.

Should a period of six months lapse since the expression of interest was placed on the public register, with no positive outcome, and all other reasonable steps have been exhausted, then a variation to the offset rules will be applied in which credits can be sought from a PCT in the same vegetation formation as the PCT to which the required ecosystem credits relate (OEH 2014b). PCT 16 is from the Semi-arid Woodlands (Grassy sub-formation) vegetation formation and PCT 58 from the Semi-arid Woodlands (Shrubby sub-formation) vegetation formation. A review of the credit register shows that, at this stage, there are no credits listed under these vegetation formations.

Overland is also currently liaising with two neighbouring landholders to assess the suitability of native vegetation offsets on their properties. This work is ongoing and will involve collection of biometric data, vegetation mapping and input of data into the FBA calculator to determine the suitability of these offset sites, i.e. whether or not they meet like for like requirements. Overland will keep DPE and OEH informed of the progress of these offset investigations during the EIS assessment process.

10 Conclusions

This assessment has been completed in accordance with the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a) and FBA (OEH 20146) on behalf of Overland.

The site assessment identified areas of *PCT 16 – Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)* (MR518) and *PCT 58 Black Oak – Western Rosewood open woodland on deep sandy loams of Murray-Darling Depression and Riverina Bioregions* (MR521) within the development site. These PCTs do not represent any EEC listed under NSW TSC Act and Commonwealth EPBC Act.

Through an iterative design process, which considered the biodiversity and Aboriginal cultural heritage values, the impact of the solar farm layout and ancillary infrastructure will be limited to removal of 5.32 hectares of native vegetation and 18 isolated hollow-bearing paddock trees.

Measures to avoid and minimise impacts to vegetation were considered during the design and planning stage of the project, resulting in significant minimisation of impacts on native vegetation. Additional recommendations to mitigate any minor residual impacts are provided in Section 6.1.2.

Residual impacts to native vegetation will require retirement of 158 biodiversity credits, as outlined in Table 15.

Table 15 Summary of ecosystem credits.

PCT code	Plant community type name	Ecosystem credits required
MR518	Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	76
MR521	Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	82
	Total	158

Residual impacts will be offset in accordance with the Biodiversity Offset Strategy.

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Appendices

Appendix 1 Native vegetation data (BioBanking)

A.1 Plot and transect field data

Notes to table:

*	Indicates an exotic species, including non-indigenous to NSW
Cover	Recorded according to FBA (2014)
Stratum	O = Overstorey; G = Ground layer
Growth form	T = Tree; S = Shrub; H = Herb; G = Grass
Numerous species native to NSW, including those that are locally native in the above list, have been artificially planted on site.	

Table 16 Flora species recorded from the development site and Biobanking plot

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
Aizoaceae	*Psilocaulon tenue**	Wiry Noon-flower	1								60	100	G	H
				2							5	500		
					3						50	1000		
						4					5	100		
							5				20	1000		
								6			40	500		
	Tetragonia tetragonioides	New Zealand Spinach	1								1	5	G	H
				2							1	10		
								6			1	10		
Asphodelaceae	*Bulbine semibarbata*	Wild Onion			3						1	1	G	H
							5				2	100		
								6			1	1		
Asteraceae	*Actinobole uliginosum*	Flannel Cudweed							7		1	50	G	H
	Brachyscome lineariloba								7		1	100	G	H
	Brachyscome lineariloba	Hard-headed Daisy					5				2	1000	G	H
	*Centaurea melitensis**	Maltese Cockspur							7		2	100	G	H
										8	1	5		
	Chrysocephalum apiculatum	Common Everlasting							7		1	1	G	H
	*Conyza bonariensis**	Fleabane	1								1	5	G	H
	Euchiton sphaericus	Star Cudweed	1								1	1	G	H
	Hedypnois rhagadioloides subsp. *cretica**	Cretan Weed							7		1	10	G	H
	Hyalosperma demissum	Moss Sunray							7		1	1000	G	H

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
	*Hypochaeris glabra**	Smooth Catsear					5				1	2	G	H
	*Lactuca serriola**	Prickly Lettuce				4					1	1	G	H
	Leiocarpa websteri								7		1	1	G	H
	*Onopordum acaulon**	Stemless Thistle	1								1	1	G	H
	Rhodanthe corymbiflora	Small White Sunray			3						1	10	G	H
						4					1	5		
									7		2	500		
										8	1	20		
	Rhodanthe floribunda	Common White Sunray					5				2	500	G	H
								6			1	20		
									7		1	50		
	Senecio glossanthus	Streaked Poverty Bush					5				1	1	G	H
	Senecio runcinifolius	Tall Groundsel	1								1	1	G	H
	*Sonchus asper**	Prickly Sowthistle	1								1	5	G	H
				2							1	5		
						4					1	20		
							5				2	100		
								6			1	10		
	*Sonchus oleraceus**	Common Sowthistle			3						2	100	G	H
						4					2	100		H
									7		1	10		H
										8	1	10		H
	Vittadinia cervicularis					4					1	50	G	H
Boraginaceae	*Echium plantagineum**	Patterson's Curse							7		1	20	G	H
										8	1	5		H
Brassicaceae	*Carrichtera annua**	Ward's Weed					5				1	5	G	H

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
									7		5	1000		H
										8	10	1000		H
	Menkea australis	Fairy Spectacles							7		1	20	G	H
	*Sisymbrium erysimoides**	Smooth Mustard	1								1	10	G	H
				2							10	1000		
						4					1	50		
							5				10	1000		
								6			5	500		
Caryophyllaceae	*Silene* spp.*			2							2	50	G	H
										8	2	100		
	*Spergularia diandra**	Lesser Sand-spurry							7		1	5	G	H
Casuarinaceae	*Casuarina pauper*	Black Oak	1								20	50	O	T
							5				2	1		
								6			25	10		
Chenopodiaceae	*Atriplex leptocarpa*	Slender-fruit Saltbush		2							1	5	G	H
					3						1	20		
								6			1	10		
	Atriplex lindleyi	Eastern Flat-top Saltbush		2							2	100	G	H
								6			2	100		
	Chenopodium nitrariaceum	Nitre Goosefoot					5				2	5	M	S
	Dissocarpus paradoxus	Cannonball Burr								8	1	10	G	H
	Einadia nutans	Climbing Saltbush				4					1	20	G	H
							5				1	10		

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
	Enchylaena tomentosa	Ruby Saltbush	1								2	20	M	S
				2							2	50		
					3						2	20		
						4					5	100		
							5				5	100		
								6			5	50	G	H
										8	1	5		
	Maireana brevifolia				3						2	20	M	S
						4					1	5		
								6			1	5		
	Maireana decalvans	Black Cotton Bush	1								1	2	M	S
	Rhagodia spinescens	Thorny Saltbush	1								1	5	M	S
				2							5	50		
					3						5	50		
						4					10	50		
							5				2	10		
								6			2	5		
	Salsola tragus	Buckbush, Soft Rolypoly, Saltwort		2							2	100	G	H
							5				1	10		
								6			2	500		
										8	1	5		
	Sclerolaena diacantha	Grey Copperburr							7		1	5	G	H
										8	1	20		
	Sclerolaena obliquicuspis								7		1	5	G	H
	Sclerolaena stelligera	Star Copperburr							7		5	100	G	H

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
	Sclerolaena tricuspis	Giant Redburr					5				20	1000	G	H
								6			2	100		
Convolvulaceae	*Convolvulus* sp.		1								1	1	G	H
									7		1	1		
										8	1	1		
	Cressa australis								7		1	500	G	H
Crassulaceae	*Crassula* sp.		1								1	100	G	H
				2							2	500		
							5				1	1000		
								6			1	500		
Fabaceae (Faboideae)	*Medicago polymorpha**	Burr Medic	1								1	50	G	H
				2							2	500		
					3						1	50		
							5				2	500		
								6			1	50		
									7		1	50		
										8	15	1000		
	*Medicago truncatula**	Barrel Medic								8	1	5	G	H
Fabaceae (Mimosoideae)	*Acacia melvillei*	Yarran				4					20	20	O	T
	Acacia oswaldii	Miljee	1								1	1	M	S
							5				1	1		
								6			1	1		
Geraniaceae	*Erodium cicutarium**	Common Crowfoot								8	1	1	G	H
Goodeniaceae	*Goodenia pusilliflora*								7		2	1000	G	H
										8	1	100		
	Goodenia sp.									8	1	5	G	H

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
Lamiaceae	*Marrubium vulgare**	White Horehound		2							1	1	G	H
						4					1	5		
Loranthaceae	*Lysiana exocarpi* subsp. *exocarpi*							6			1	1	O	S
Malvaceae	*Malva parviflora**	Small-flowered Mallow			3						1	1	G	H
							5				1	1		
	Sida corrugata	Corrugated Sida				4					1	50	G	H
										8	1	5		
	Sida intricata								7		1	1	G	S
Marsileaceae	*Marsilea drummondii*			2							1	5	G	H
Myoporaceae	*Eremophila longifolia*	Emubush					5				1	1	M	S
										8	1	1		
Myrtaceae	*Eucalyptus largiflorens*	Black Box		2							15	5	O	T
					3						30	4		
Myrtaceae							5				10	20		
Nitrariaceae	*Nitraria billardierei*	Dillon Bush					5				1	1	M	S
								6			2	5		
									7		10	10		
										8	1	1		
Pittosporaceae	*Pittosporum angustifolium*	Butterbush			3						1	1	M	S
						4					1	5		
Plantaginaceae	*Plantago cunninghamii*	Sago-weed					5				1	50	G	H
									7		1	1000		
										8	2	500		
	Plantago drummondii	Dark Sago-weed							7		1	1000	G	H
Plumbaginaceae	*Limonium lobatum**	Winged Sea Lavender			3						1	5	G	H

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
									7		1	10		
										8	1	50		
Poaceae	*Austrostipa elegantissima*	Feather Speargrass							7		2	100	G	G
	Austrostipa eremophila					4					2	50	G	G
									7		1	20		
	Austrostipa scabra	Speargrass		2							1	5	G	G
						4					5	100		
							5				2	100		
								6			1	10		
									7		5	500		
										8	2	50		
	*Avena fatua**	Wild Oats	1								1	10	G	G
	*Bromus diandrus**	Great Brome								8	1	1	G	H
	*Bromus rubens**	Red Brome	1								1	50	G	G
						4					1	50		
								6			1	50		
									7		1	10		
										8	40	1000		
	Enneapogon sp.	Bottle Washers				4					1	50	G	H
	Enteropogon acicularis	Curly Windmill Grass				4					1	20	G	G
								6			1	10		
									7		2	100		
										8	5	100		
	Hordeum sp.*	A Barley Grass	1								1	1	G	G
				2							1	100		
					3						1	100		

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
						4					2	500		
							5				1	100		
								6			1	100		
	*Lolium rigidum**	Wimmera Ryegrass	1								1	50	G	G
	Lolium sp.*	A Ryegrass				4					1	100	G	G
							5				1	100		
	Paspalidium gracile	Slender Panic				4					1	20	G	G
	*Phalaris paradoxa**	Paradoxa Grass							7		1	10	G	G
	Rytidosperma caespitosum	Ringed Wallaby Grass				4					1	50	G	G
									7		1	10		
	Rytidosperma setacea var. *setacea*	Bristly Wallaby-grass				4					1	50	G	G
									7		2	100		
	*Schismus barbatus**	Arabian Grass				4					1	100	G	G
							5				1	1000		
									7		1	20		
										8	5	1000		
	*Vulpia bromoides**	Squirrel Tail Fesque							7		1	100	G	G
										8	5	1000		
Portulacaceae	*Calandrinia* sp.							6			2	1000	G	H
Rutaceae	*Geijera parviflora*	Wilga						6			2	1	O	S
Santalaceae	*Exocarpos aphyllus*	Leafless Ballart	1								1	1	M	S
Sapindaceae	*Alectryon oleifolius*	Western Rosewood						6			5	3	O	T
Solanaceae	*Lycium ferocissimum**	African Boxthorn		2							1	1	M	S
					3						5	20		
						4					5	20		

Family	Scientific name	Common name	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Cover	Abundance	Stratum	Growth Habit
							5				2	5		
	Solanum esuriale	Quena		2							1	5	G	H
						4					1	20		
									7		1	50		
										8	1	50		
	*Solanum nigrum**	Black-berry Nightshade			3						1	1	G	H
Zygophyllaceae	*Zygophyllum eremaeum*	Climbing Twinleaf								8	1	5	G	H

A.2 Plot and transect summary

Table 17 Plot scores for each vegetation zone within the development site

Plot name	Native plant species	Native over-storey cover	Native mid-storey cover	Native ground cover (grass)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Over-storey regen	Total length of fallen logs
Plot 1	9	4	0	0	8	6	90	0	1.0	170
Plot 2	10	5	0	0	24	22	94	9	1.0	137
Plot 3	8	9	0	0	44	2	88	6	0.0	215
Plot 4	16	18	0	18	62	16	54	0	1.0	0
Plot 5	17	1	0	6	60	28	80	9	0.5	75
Plot 6	18	4	0	0	64	38	96	0	0.5	43
Plot 7	24	0	0	64	42	80	56	0	None	0
Plot 8	14	0	0	42	14	22	100	0	None	0

Appendix 2 Credit profile report

Credit profile report

Biodiversity credit report

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

Date of report: 10/04/2017 Time: 6:18:44PM Calculator version: v4.0

Major Project details

Proposal ID:	0103/2016/4032MP
Proposal name:	Limondale Solar Farm
Proposal address:	Yanga Way Balranald NSW 2715
Proponent name:	Overland Sun Farming Ltd Pty
Proponent address:	PO Box 589 Burwood VIC 3125
Proponent phone:	+61 428 327 372
Assessor name:	Nathan Garvey
Assessor address:	8 Tate Street WOLLONGONG NSW 2500
Assessor phone:	4229 5222
Assessor accreditation:	0103

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	2.18	76.00
Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	3.13	82.00
Total	5.31	158

Credit profiles

1. Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion), (MR518)

Number of ecosystem credits created	76
IBRA sub-region	South Olary Plain, MU Basin Sands (Part A) - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Black Box grassy open woodland wetland of rarely flooded depressions in south western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion), (MR518) Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion), (MR517) Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion), (MR519)	South Olary Plain, MU Basin Sands (Part A) - and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, (MR521)

Number of ecosystem credits created	44
IBRA sub-region	South Olary Plain, MU Basin Sands (Part A) - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, (MR521) Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion, (MR515)	South Olary Plain, MU Basin Sands (Part A) - and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, (MR521)

Number of ecosystem credits created	38
IBRA sub-region	South Olary Plain, MU Basin Sands (Part A) - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion, (MR521) Belah/Black Oak - Western Rosewood - Wilga woodland of central NSW including the Cobar Peneplain Bioregion, (MR515)	South Olary Plain, MU Basin Sands (Part A) - and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required