

Appendix D

BIODIVERSITY ASSESSMENT



Walgett Solar Farm, NSW Biodiversity Assessment Report

FINAL REPORT

Prepared for Geolyse on behalf of Walgett Solar Pty Ltd

6 February 2017

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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 2014).
BA	Birds Australia
DCDB	Land and Property Information(LPI) digital cadastral database
DoEE	Commonwealth Department of the Environment and Energy
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 <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FBA	NSW Framework for Biodiversity Assessment
HBT	Hollow Bearing Tree
LEP	Local Environment Plan
Locality	Area located within 20 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 2014b). The assessment is based on thresholds detailed in Section 9 of the FBA (OEH 2014b). 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 <i>Native Vegetation Act 2003</i>
NW Act	NSW <i>Noxious Weed Act 1993</i>
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
Solar Farm	Walgett Solar Farm
SSD	State Significant Development
study area	The broader area in which the subject site is located, including all direct and indirect impacts
subject site	The area of direct impact for the proposed works including the development site, road access and underground grid connection
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 <i>Threatened Species Conservation Act 1995</i>
VIS	NSW Vegetation Information System
Walgett Solar	Walgett Solar Pty Ltd
WM Act	Water Management Act 2000

Summary

Biosis Pty Ltd was commissioned by Geolyse to prepare a Biodiversity Assessment Report for the proposed Walgett Solar Farm (the project). The proposed solar farm development will involve the installation of an array of photovoltaic panels (PV) within the subject site. The site is located approximately 5 kilometres north of the Walgett town centre and is accessible via the Castlereagh Highway (Figure 1). The study area occupies predominately flat, agricultural land with remnant native vegetation restricted to isolated patches within paddocks, along roadsides and farm tracks, and riparian vegetation associated with the Barwon River along the western boundary of the study area and Two Mile Warrambool through the centre of the study area.

The subject site is defined as the maximum area to be impacted by the proposal and includes the development site, access roads and underground grid connections. The study area is defined as the subject site plus the immediately surrounding land investigated during the field surveys. Both the subject site and study area are shown in detail on Figure 2.

Ecological values

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

- 84.19 hectares of the NA129 *Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion* (PCT39).
- 8.57 hectares of NA130 *Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains* (PCT40).

These vegetation communities equate to Coolabah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions endangered ecological community under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Threatened Species Conservation Act 1995* (TSC Act).

Impact avoidance, minimisation and mitigation

The final footprint of the solar farm infrastructure was refined through consideration of the findings of previous site investigations and identification of constraints and opportunities mapped through the environmental impact assessment process, with the intent of maximising the built footprint over the development site while avoiding impacts on the ecological values present on the site (Figure 4).

Measures to avoid and minimise impacts to vegetation were considered during the planning stage of the project. This has resulted in the layout of the Solar Farm reducing direct impacts to the identified values. As a result, the following residual impacts will arise from the proposed development:

- Removal of 0.63 hectares of NA130 *Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains* (PCT40) including:
 - 0.09 in moderate/good – high condition
 - 0.54 in moderate/good – medium condition

No impacts requiring further consideration were identified. Impacts to 0.09 hectares of NA130 in Moderate/good – high condition will require offsetting. Impacts to NA130 *Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains* (PCT40) in moderate/good – medium condition have a site value score of less than 17 and therefore do not require offsets.

The remainder of the subject site support non-native vegetation and disturbed land. No further consideration of these areas is required.

Biodiversity credits

To offset impacts arising from the development, 2 ecosystem credits for NA130 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT40) are required.

Credits will be retired in accordance with the Biodiversity Offset Strategy outlined in Section 9. This includes purchasing of credits from the open market. If, after undertaking "reasonable steps" Walgett Solar cannot identify like-for-like credits, then the variation rules may be applied or supplementary measures applied.

Conclusion

The proposed Walgett Solar Farm will result in minor impacts to biodiversity values identified. The iterative design process has considered biodiversity values identified on the site and sought to avoid them to the greatest extent possible.

The clearing of native vegetation will not result in a significant impact to threatened species, populations or ecological communities.

Stage 1 – Biodiversity assessment

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Geolyse, on behalf of Walgett Solar Pty Ltd (Walgett Solar), to undertake a biodiversity assessment of the subject site and broader study area for the proposed Walgett Solar Farm (Figure 1).

The project will be assessed under Section 89C of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as State Significant Development (SSD 8095). Secretary's Environmental Assessment Requirements (SEARs) were issued by the NSW Department of Planning and Environment (DPE) on 13 December 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 proposed development are to be 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.

All biodiversity assessment has been undertaken in accordance with the FBA (OEH 2014b). This report has therefore been prepared by Accredited BioBanking Assessor, Nathan Garvey.

1.2 Development proposal

Walgett Solar is proposing to develop a solar Photovoltaic (PV) farm at Walgett. Hereafter this development is referred to as the Solar Farm. The proposed Solar Farm will involve the installation of an array of photovoltaic panels (modules) within the site, with an energy generation capacity of 30 megawatts.

The proposed Solar Farm, associated infrastructure including a grid connection is expected to take nine months to construct. Traffic impacts associated with the proposal are expected to be primarily confined to the construction and decommissioning stages. Access to the Solar Farm is proposed from the Castlereagh Highway via an existing intersection. This intersection will need to be upgraded prior to the commencement of construction works.

Construction will require the use of bull dozers, water trucks, graders, 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.

Walgett Solar plans to develop as much of the 'buildable' site as possible. The final footprint of the solar farm infrastructure was refined through consideration of findings as a result of previous site investigations and identification of constraints and opportunities mapped through the environmental impact assessment process, including biodiversity. The intent, however, is to maximise the built footprint over the development site while avoiding impact on the ecological values present on the site (Figure 2).

The subject site is 61.5 hectares and is defined as the maximum area to be directly impacted by the proposal and includes the proposed development area (58.1 hectares), and proposed access routes and underground grid connection (3.4 hectares). The study area is 187 hectares in size and is defined as the subject site plus the immediately surrounding land investigated during the field surveys and potentially impacted by indirect impacts. Both the subject site and study area are shown on Figure 2.

The subject site is zoned RU1 Primary Production in the Walgett Local Environment Plan 2013 (LEP). Impacts to biodiversity arising from this development are the subject of this assessment.

1.3 Site description

The study area is located approximately 5 kilometres north of Walgett in the Darling Riverine Plains of NSW. The site is located north of Castlereagh Highway and consists of predominantly flat, cleared land used for agricultural purposes (Plate 1). Remnant native vegetation is restricted to isolated patches within paddocks, along roadsides, waterways and farm tracks (Plate 2), but also in more fragmented patches in along the southern boundary of the study area (Figure 2).



Plate 1 Agricultural land in the subject site, looking south from northern boundary



Plate 2 Native vegetation along Two Mile Warrambool, looking west from the proposed crossing

Currently, native vegetation exists as a mix of small remnants in a matrix of agricultural land as well as cleared land forming exotic grasslands and regenerating chenopod shrubland. Vegetation is significantly modified through past and current land practices and weed infestations. Where present, plant communities reflect the underlying geology, soils and floodplain hydrology with areas of *Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion* and *Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains*.

There are two mapped watercourses, or drainage lines located, within or adjacent to the study area. The Barwon River delineates the western boundary of the study area and the Two Mile Warrambool is an effluent channel which links the Namoi and Barwon Rivers (Figure 2). The study area also contains a number of farm dams.

The study area is within the:

- Darling Riverine Plains IBRA Bioregion
- Castlereagh-Barwon-Namoi IBRA Sub Region
- Namoi Catchment
- Walgett Local Government Area (LGA).

1.4 Information sources

1.4.1 Publications and databases

In order to provide a context for the study area, information about flora and fauna from within 20 kilometres (the 'locality') was obtained from relevant public databases. Records from the following databases were collated and reviewed:

- Department of the Environment and Energy (DEE) 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).
- NSW Department of Primary Industries (DPI) predicted distribution maps for *Fisheries Management Act 1994* (FM Act) listed threatened species and populations.
- 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.
 - Refinement of vegetation mapping in the Namoi Catchment: Extant and pre-European (Ecological 2013).
 - Groundwater Dependent Ecosystems Atlas. Australian Government's Bureau of Meteorology (BoM 2016).

The following reports were also reviewed:

- NSW Scientific Committee final determinations for threatened biota, including (but not limited to):
 - *Coolibah - Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* (NSW Scientific Committee 2012).
 - *Approved Conservation Advice for Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions ecological community* (Threatened Species Scientific Committee 2010).
 - *Artesian Springs Ecological Community in the Great Artesian Basin* (NSW Scientific Committee 2001).

1.4.2 Spatial data

Aerial photography was supplied by NSW Land and Property Information (LPI) (dated 14 November 2013).

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.

Basemap 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.

Site plans were supplied by Geolyse (drawing file 217143_01C_EV01-EV03.dwg Polyline) on 23 January 2017. Aerial photography was obtained from DigitalGlobe (Vivid – Australia 2013).

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

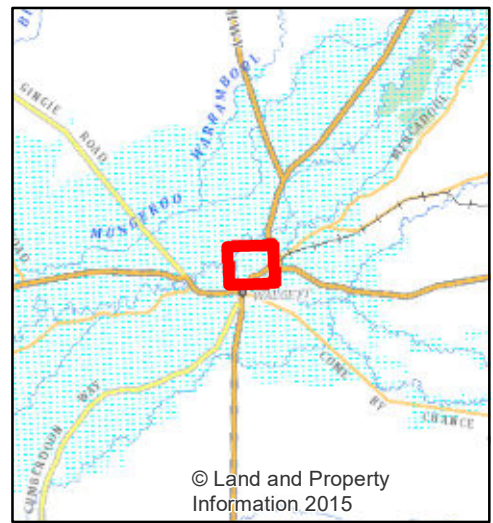
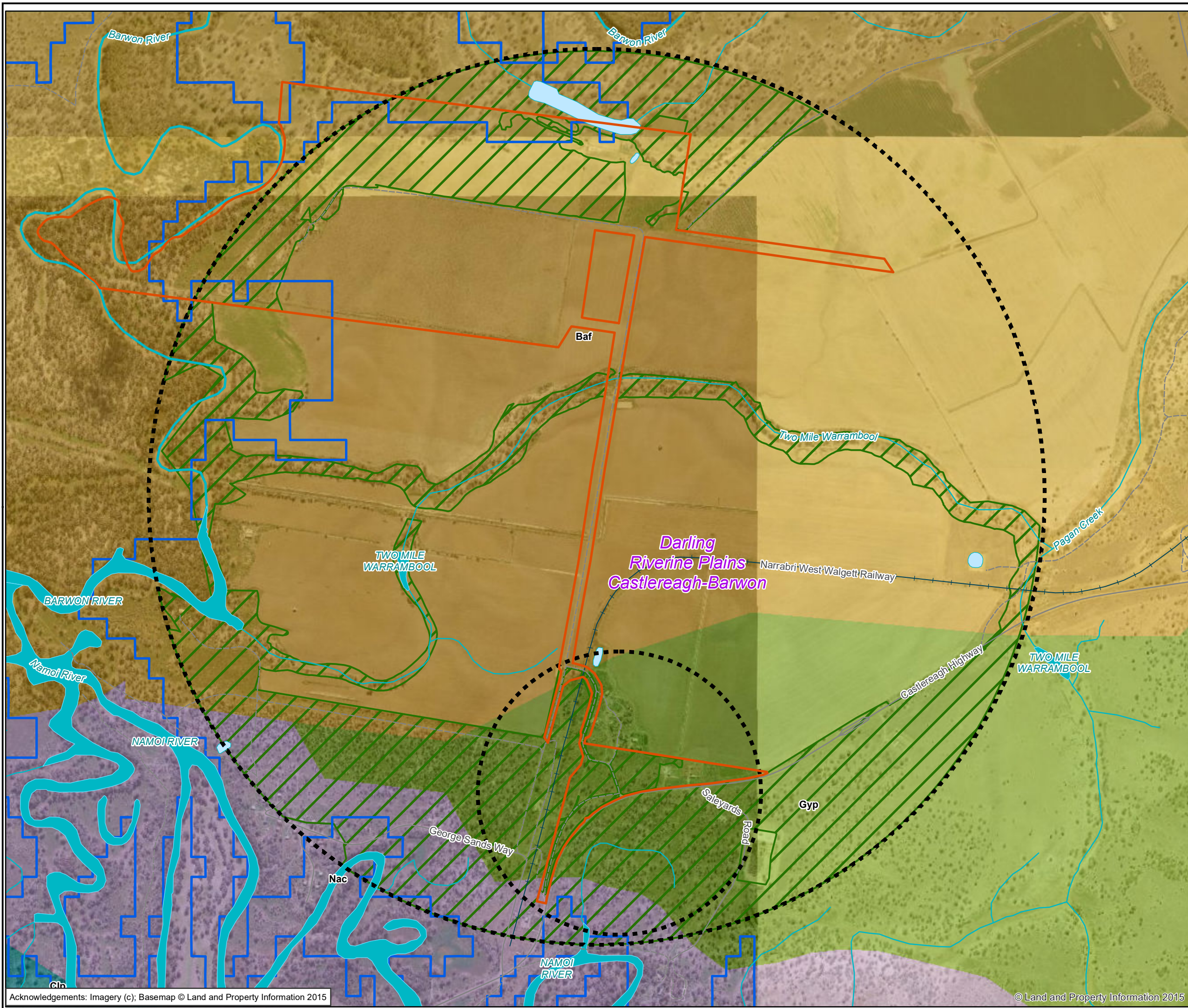
- Catchment data was obtained from the Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DIWA).
- State Environmental Planning Policy (SEPP) 14 Wetlands.
- Spatial data associated with the refinement of vegetation mapping in the Namoi Catchment: Extant and pre-European (Ecological 2013).
- NSW Soil and Land Information System (SALIS).

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

1.5 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)
- Walgett Local Environment Plan 2013.

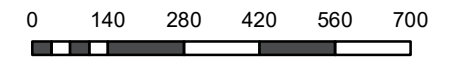


© Land and Property Information 2015

Legend

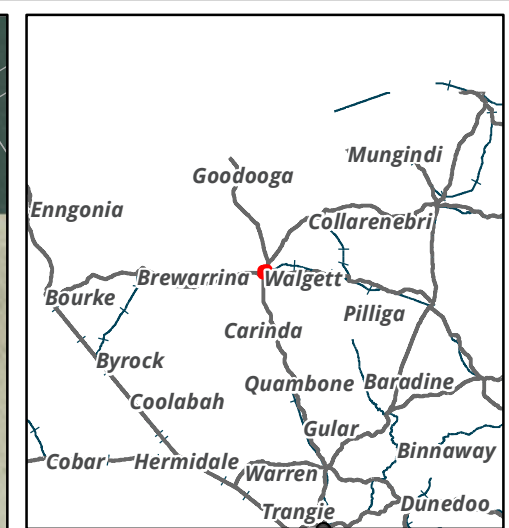
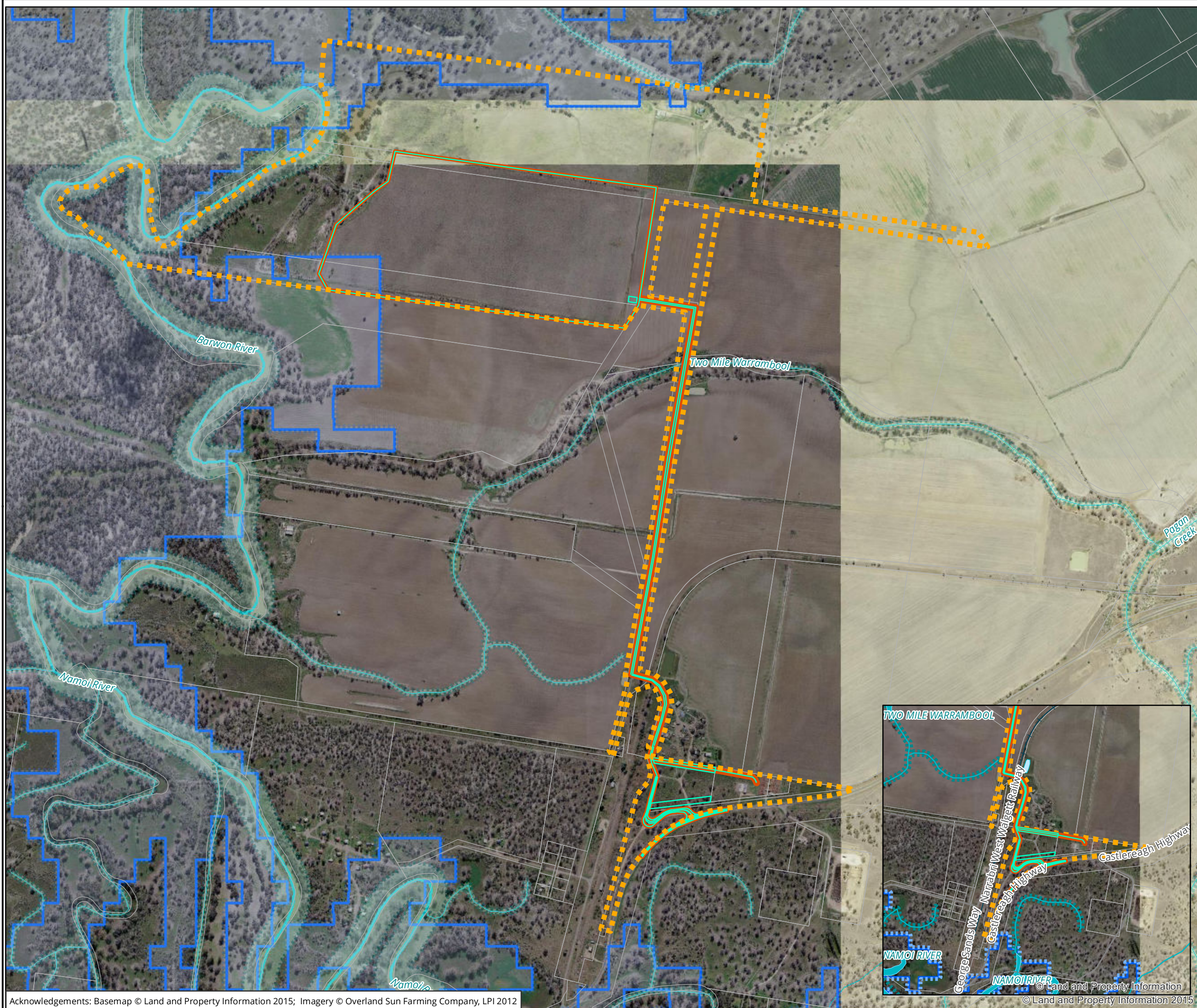
- Study area
- Assessment circles
- IBRA Sub-region
- Native Vegetation
- Wetlands
- Mitchell landscape v3**
- Baf, Barwon Channels and Floodplains
- Clp, Castlereagh Alluvial Plains
- Gyp, Gwydir Alluvial Plains
- Nac, Namoi Channels and Floodplains

Figure: 1 Location map - Walgett Solar Farm



Scale: 1:14,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

Matter: 23647
Date: 03 February 2017.
Checked by: NMG, Drawn by: SSK, Last edited by: skumar
Location: P:\23600s\23647\Mapping\23647_BioBanking_F1_LocationMap_20170203

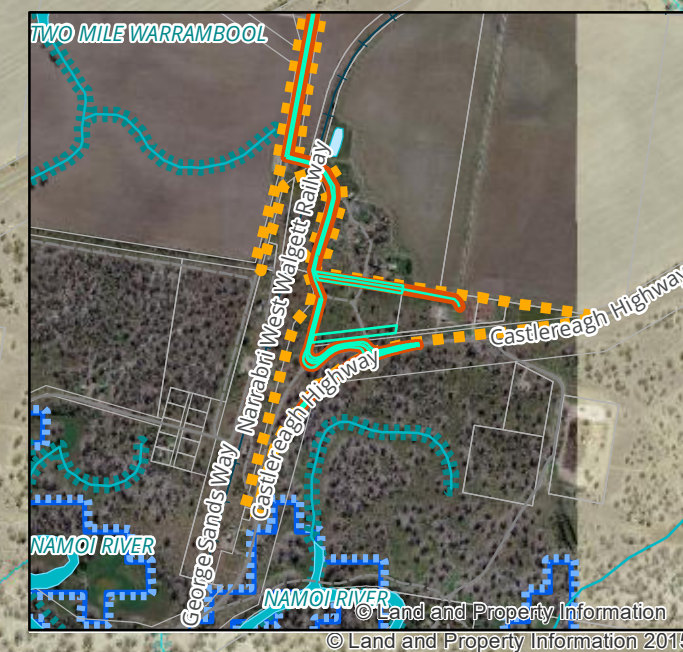


- Legend**
- Study area
 - Subject site
 - Development Footprint
 - Stream Buffers
 - Wetland Buffers
 - Wetlands
 - Cadastre

Figure 2: Site map - Walgett Solar Farm

0 130 260 390 520 650
 Metres
 Scale: 1:13,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 55

Biosis Pty Ltd
 Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong



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 Sections 4.3, 5.5 and 5.6. 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 Solar Farm 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 (OEH 2014b).

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 Parkes 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.

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 Walgett LGA, a Schedule 1 listed Council. Therefore SEPP 44 is relevant to the current assessment and is discussed further in Section 8.2.2.

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 (OEH 2014b).

2.2.3 Fisheries Management Act 1994

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 likelihoods of impacts to waterways in relation to their sensitivity (TYPE) and waterway class (CLASS).

The Barwon River, located along the western boundary of the study area, will not be impacted by the Solar Farm; therefore no further consideration is required.

Two Mile Warrambool, located along the proposed access route for the Solar Farm, is mapped as habitat for the Olive Perchlet *Ambassis agassizii* and Silver Perch *Bidyanus bidyanus* on the DPI predicted distribution maps for FM Act listed threatened species and populations. The proposed access route currently provides access to the property on which the Solar Farm will be located, as well as other landowners. This access is occasionally inundated, and requires periodic, extensive maintenance. To enable access to the development site an upgrade to this existing crossing structure is proposed. This waterway provides connectivity between the Barwon River and Pagan Creek to the East and as such could provide habitat for numerous flow dependant fish species that require unimpeded passage. Currently, this waterway only provides such passage during high flows. The proposed crossing will provide unimpeded fish passage between these two major waterways.

Aquatic environments are outlined in Section 5.3, with an assessment of potential impacts to all FM listed species provided in Section 8.3.

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 8.4.

3 Landscape

3.1 Bioregions and landscapes regions

The study area occurs within the Darling Riverine Plains IBRA bioregion and the Castlereagh-Barwon-Namoi IBRA subregion. The Castlereagh-Barwon-Namoi IBRA subregion covers the entire study area and is the subregion used in this assessment. Both the inner and outer assessment circles (Figure 3) are also located entirely within this subregion.

Most of the study area occurs within the Barwon Channels and Floodplains Mitchell Landscape with a small section in the southern end located within the Gwydir Alluvial Plains Mitchell Landscape (Figure 1). The Barwon Channels and Floodplains Mitchell Landscape was used in this assessment as it covers the majority of the study area.

3.2 Waterways and wetlands

The study area is located within the Namoi Catchment, in north-western New South Wales. The Namoi catchment borders Gwydir and Castlereagh catchments and is bound by the Great Dividing Range in the east, the Liverpool Ranges and Warrumbungle Ranges in the south, and the Nandewar Ranges and Mount Kaputar to the north.

There are two mapped watercourses within and adjacent to the study area (Figure 2). The Barwon River is a perennial river which runs along the western boundary of the study area. Two Mile Warrambool is a non-perennial effluent stream which connects the Namoi and Barwon Rivers. Barwon River and Two Mile Warrambool are mapped as habitat for the Sliver Perch and Olive Perchlet by DPI.

The study area also contains several farm dams.

3.3 Native vegetation extent

The smallest inner and outer assessment circles (100 hectare and 1000 hectare) were used, as the outer assessment circle was sufficient to fit the subject site (Figure 3). The inner assessment circle is centred on the areas where the greatest impacts to native vegetation will result, near the intersection with the Castlereagh Highway, while the outer assessment circle has been centred on the subject site.

Mapping of vegetation within the inner and outer assessment circles was undertaken using the *Refinement of vegetation mapping in the Namoi Catchment: Extant and pre-European* VIS ID 4028 (Ecological 2013), which is considered the most reliable and comprehensive local vegetation mapping study. This mapping was modified using vegetation extent as assessed by Biosis (see Section 4). Vegetation in the inner and outer assessment circles is shown in Figure 3.

Ecological (2013) map four native vegetation communities within the outer assessment circle, including:

- Black Box woodland on floodplains, mainly Darling Riverine Plains.
- Coolibah - River Coobah - Lignum woodland of frequently flooded channels, mainly Darling Riverine Plains.
- River Red Gum riverine woodlands and forests, Darling Riverine Plains, Brigalow Belt South and Nandewar.

- Derived grasslands, Darling Riverine Plains and western Brigalow Belt South.

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 1 provides 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	363.55	36	362.92	36
Inner assessment circle	67.75	68	67.13	67

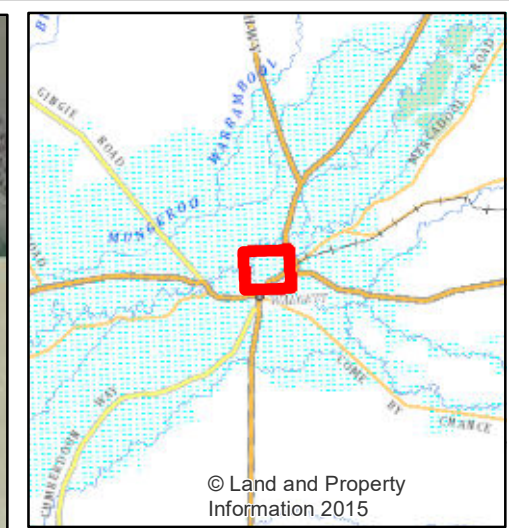
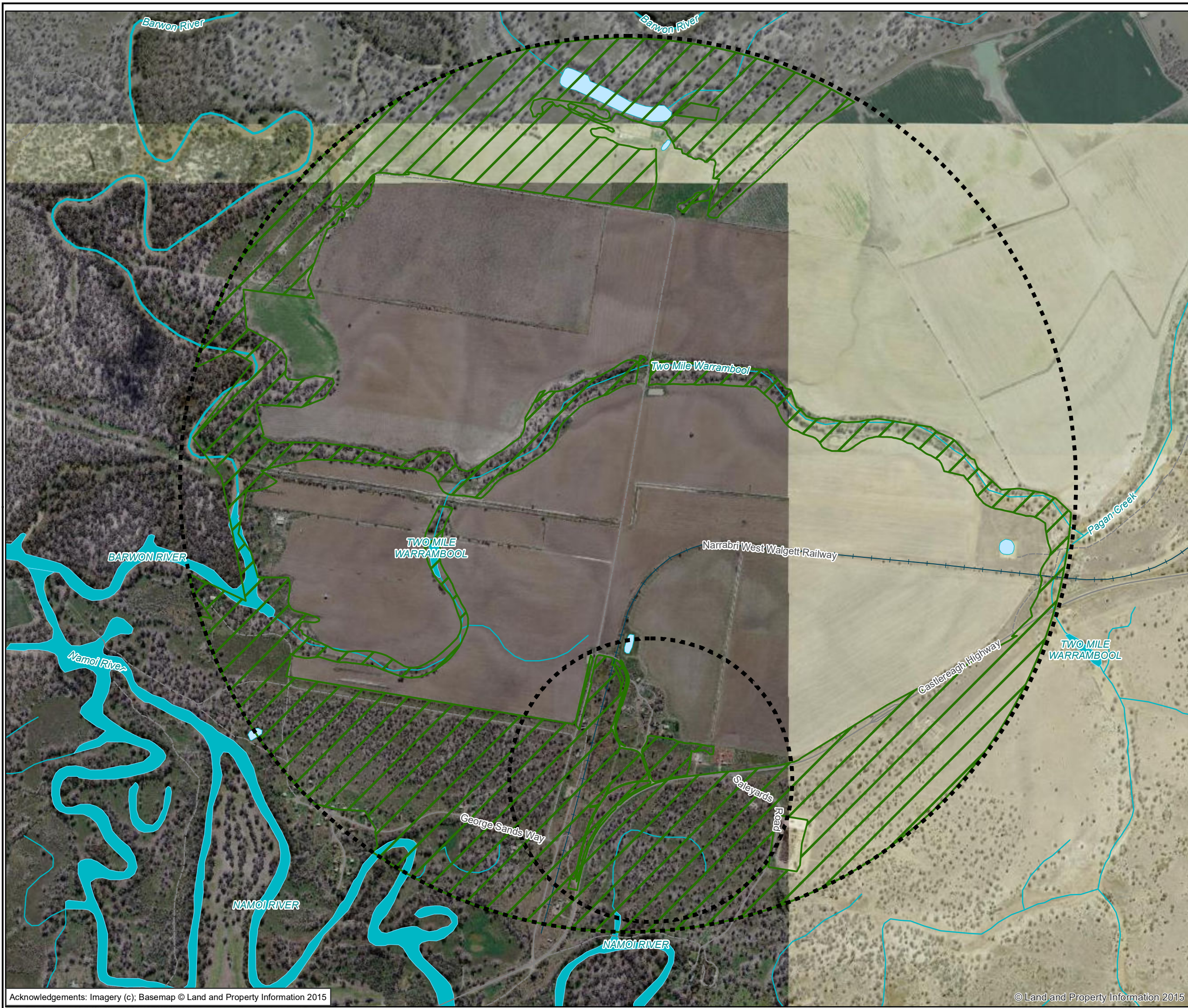
3.4.2 Assessment of connectivity value

The Barwon River, located along the western boundary of the study area, is a 6th order stream at this location. Therefore, the proposed development was assessed as being within the 50 metre buffer of a 6th order stream. The proposed development is assessed as being part of a state significant biodiversity link.

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 study area forms part of a relatively large patch of connecting vegetation with a patch size larger than 200 hectares.

The Barwon Channels and Floodplains Mitchell Landscape is estimated to be 34 per cent cleared. For Mitchell Landscapes between 30-70 per cent cleared a patch size of greater than 200 hectares is deemed to fit into the 'Extra Large' patch size class.





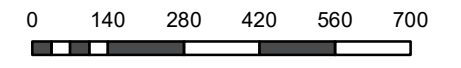
- Legend**
-  Assessment circles
 -  Native vegetation

Figure: 3 Vegetation in the inner and outer assessment circles - Walgett Solar Farm



Scale: 1:14,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 55



Matter: 23647
 Date: 03 February 2017
 Checked by: NMG, Drawn by: SSK, Last edited by: skumar
 Location: P:\23600s\23647\Mapping\23647_BioBanking_F3_Assess_veg

4 Native vegetation

The extent of native vegetation within the study area was determined using Section 5 of the FBA (OEH 2014b).

4.1 Background review

A review of regional vegetation mapping by Ecological (2013) was undertaken to inform the site investigation (see below). Ecological (2013) identifies four vegetation communities within the study area, as outlined in Section 3.3, including:

- River Red Gum riverine woodlands and forests, Darling Riverine Plains, Brigalow Belt South and Nandewar along the main channels of the Barwon and Namoi Rivers.
- Coolibah - River Coobah - Lignum woodland of frequently flooded channels, mainly Darling Riverine Plains on the floodplains of the major rivers.
- Black Box woodland on floodplains, mainly Darling Riverine Plains on floodplains near watercourses.
- Derived grasslands, Darling Riverine Plains and western Brigalow Belt South as an intergrade to agricultural development.

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

A review of the Groundwater Dependent Ecosystems Atlas (BoM 2014) was undertaken to determine if any groundwater dependent ecosystems (GDEs) were mapped in the study area.

4.2 Methods

4.2.1 Site investigation

An assessment of the study area was undertaken by Biosis from 22 – 24 November 2016. The purpose of this assessment was to undertake detailed vegetation mapping and an assessment of vegetation condition of all vegetation in accordance with the requirements of the FBA (OEH 2014b).

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 validly be assigned were identified and delineated in the field, and their condition determined. Identification of PCTs within the study area was confirmed with reference to the community profile descriptors (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 (OEH 2014b). 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 (OEH 2014b). A total of seven plots/transects were completed within the study area with three plots/transects relevant to the subject site (Figure 4).

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.

4.3 Results

4.3.1 Vegetation description

The study area supports 92.76 hectares of native vegetation with varying levels of disturbance (Figure 4). Across the study area, ongoing cropping activities were noted with 88.43 hectares of disturbed and cropped land and 0.64 hectares of weeds and exotics mapped. Five hectares south of the Castlereagh Highway was not mapped in the current assessment

Native vegetation within the subject site is composed of patches of vegetation in an agricultural matrix. These isolated patches have heavy weed infestations, with some patches showing evidence of previous cropping and soil disturbance. This has prevented recruitment of native shrubs and eucalypts. The vegetation is therefore characterised by a canopy of mature and semi mature native trees over an understorey of mostly chenopod shrubs, exotic herbs and grasses. Resilience in the understorey was low in areas away from watercourses, with a low diversity of native grasses.

Areas of native vegetation outside the subject site, but within the study area, are in better condition, with a relatively high diversity of native species and much lower levels of disturbance evident, particularly close to watercourses. This includes areas of native vegetation along the Barwon River along the western boundary and along the Castlereagh Highway in the southern section of the study area.

4.3.2 Plant community types

Site investigations, including determination of PCTs using the methodology outlined in Section 4.2.1, identified the presence of two PCTs within the study area. The PCTs, vegetation formation, vegetation class (Keith 2004) and area of each PCT are described in Table 2 and shown in Figure 4.

Table 2 Plant community types of the study area and corresponding formation and class (Keith 2004).

Plant community type (PCT)	Vegetation formation	Vegetation class	Area (ha)
NA129 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (PCT 39)	Semi-arid Woodland (Grassy sub-formation)	North-west Floodplain Woodlands	84.19
NA130 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT 40)	Semi-arid Woodland (Grassy sub-formation)	North-west Floodplain Woodlands	8.57
TOTAL			92.76

The vegetation of the study area was assessed as being in low and moderate/good condition in accordance with the FBA (OEH 2014b). Vegetation was further stratified based on the level of disturbance and resultant condition using three ancillary codes to identify areas of the same broad condition state, in accordance with the FBA (OEH 2014b).

Through detailed design, and consideration of the biodiversity values present within the study area, impacts to native vegetation have been restricted to access off the Castlereagh Highway (see Section 6.1). Therefore, to determine the vegetation zones the area of each PCT within the subject site was then determined. This resulted in two vegetation zones being identified within the southern section of the study area (Table 3 and Figure 4).

Table 3 Vegetation zones mapped within the subject site

Vegetation zone (VZ)	Plant community type	Condition	Ancillary code	Area (ha)
VZ1	NA130 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT 40)	Moderate/Good	High	0.09
VZ2			Medium	0.54
TOTAL				0.63

A detailed description of the Vegetation Zones is provided in Table 4.

Table 4 Vegetation zones descriptions

Vegetation zone 1 and 2 – Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains	
PCT ID	40
Biometric vegetation type ID	NA130
Common name	Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains
Condition	Moderate/good – High (0.09 ha) Moderate/good – Medium (0.54 ha)
Extent within study area	Subject site – 0.63 ha of this PCT was recorded and mapped in two patches of Moderate/Good Medium and Moderate/Good High. This PCT is located at the intersection with the Castlereagh Highway and along the proposed underground grid connection in the southern section of the study area (Figure 4).
Description	The canopy is mainly dominated by sparse Black Box <i>Eucalyptus largiflorens</i> and Coolabah <i>Eucalyptus coolabah</i> . Belah <i>Casuarina cristata</i> , Eurah <i>Eremophila bignoniiflora</i> and Warrior Bush <i>Apophyllum anomalum</i> are also present in the tall shrub and shrub layer. The ground cover is dominated by chenopods and grasses. Chenopods shrubs include <i>Atriplex</i> spp. and <i>Sclerolaena</i> spp. Grass species include Native Millet <i>Panicum decompositum</i> , Curly Windmill Grass <i>Enteropogon acicularis</i> , <i>Austrostipa nitida</i> and Warrego Grass <i>Paspalidium jubiflorum</i> . Sedges include <i>Carex</i> spp. Forbs includes <i>Oxalis chnoodes</i> , Flat Billy-buttons <i>Leiocarpa brevicompta</i> ,

Vegetation zone 1 and 2 – Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains

	<p>Tufted Bluebell <i>Wahlenbergia communis</i>, Sprawling Bluebell <i>Wahlenbergia gracilis</i>, Pale Goodenia <i>Goodenia glauca</i> and Common Nardoo <i>Marsilea drummondii</i>.</p> <p>This community is more open than the Coolabah community near rivers (NA129) and generally occurs on higher floodplains more distant from watercourses. It occurs on grey cracking clay or brown clays on higher floodplains mainly in the Darling Riverine Plain Bioregion from Macquarie Marshes in the south to beyond the Queensland border in the north.</p>
<p>Survey effort (Figure 4)</p>	<p>One plot/transect (Q5) was undertaken in vegetation zone 1 (Moderate/good – High). Two plots/transects (Q4, and Q7) were undertaken in vegetation zone 2 (Moderate/good – Medium).</p>
<p>Condition</p>	<p>This PCT shows low to moderate levels of modification, fragmentation and disturbance, with minimal levels of shrub cover, and ground cover mostly dominated by opportunistic chenopod shrubs and exotic species. Disturbance is primarily the result of weed invasion, agricultural activity, access tracks and past clearing. Regeneration is inhibited by the past soil disturbance, weed invasion and crop grass germination. In some sections of the study area, particularly along Castlereagh Highway, the condition of this PCT is generally higher with a higher structural integrity and species diversity with some exotic species encroachment due to tracks disturbance and edge effect.</p> <p>No declared noxious weeds were identified in the study area. However, several exotic species were present in the ground cover layer including Fleabane <i>Conyza bonariensis</i>, Prickly Lettuce <i>Lactuca serriola</i>, Common Sowthistle <i>Sonchus oleraceus</i>, Giant Mustard <i>Rapistrum rugosum</i> and Common Verbena <i>Verbena officinalis</i></p>
<p>Characteristic species used for identification of PCT</p>	<p>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 characterizing for this PCT include Black Box, Coolabah and Belah. Aligning mid-storey and ground layer species recorded include Eurah, Warrior Bush, Black Rolypoly, Climbing Saltbush, Eastern Flat-top Saltbush <i>Atriplex lindleyi</i>, Pop Saltbush, Mueller's Saltbush <i>Atriplex muelleri</i>, Native Millet, Common Couch <i>Cynodon dactylon</i>, Warrego Grass and Curly Windmill Grass.</p>
<p>Justification of evidence used to identify the PCT</p>	<p>Apart from species composition, the stated distribution in north-western NSW mostly in the eastern section of the Darling Riverine Plains Bioregion and Castlereagh-Barwon IBRA Subregion; the occurrence on higher floodplains more distant from watercourses on brown clays is consistent with Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains. The main diagnostic feature is a canopy dominated Black Box and Coolabah. The mid-storey commonly includes Eurah and Warrior Bush. The ground layer is sparse and contains chenopod shrubs like Black Rolypoly, Climbing Saltbush, Eastern Flat-top Saltbush, Pop Saltbush, Mueller's Saltbush,. Grass species includes Native Millet, Common Couch, Warrego Grass and Curly Windmill Grass. These features are highly 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. Previous mapping in the area (Ecological 2013) identified this vegetation as Black Box woodland on floodplains, mainly Darling Riverine Plains (NA105). However, the diagnostic species and landscape position have a better match with Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (NA130).</p>

Vegetation zone 1 and 2 – Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains

Status Commonwealth EPBC Act: Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions endangered ecological community.
 NSW TSC Act: Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregion endangered ecological community.

Estimate of percent cleared value of PCT in the major catchment area 80%

Plate 3 Coolabah open woodland wetland in Moderate/Good Medium condition in the subject site Q4



Vegetation zone 1 and 2 – Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains

Plate 4 Coolabah open woodland wetland in Moderate/Good High condition (plot Q5)



4.3.3 Site value scores

Plots and transect survey data was entered into the Biobanking credit calculator for major projects to determine site value scores. Plot and transect survey data is presented in Table 14 of Appendix 2. Current site value for each Vegetation Zone is outlined in Table 5.

Table 5 Site value score for the Vegetation Zone

Vegetation zone (VZ)	Plant community type	Condition	Ancillary code	Area (ha)	Site value score
VZ1	NA130 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT 40)	Moderate/Good	High	0.09	27.32
VZ2			Medium	0.54	15.85

4.3.4 Groundwater dependent ecosystems

An assessment of the potential for the study area to support groundwater dependent ecosystems (GDEs) was undertaken using the Australian Government's Bureau of Meteorology, Groundwater Dependent Ecosystems Atlas (BoM 2016).

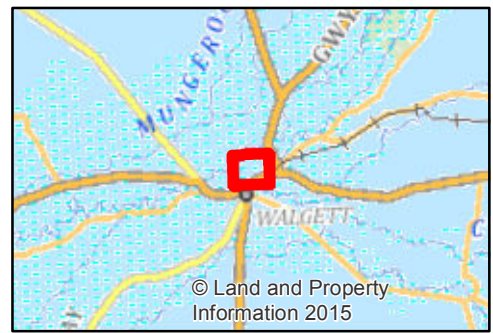
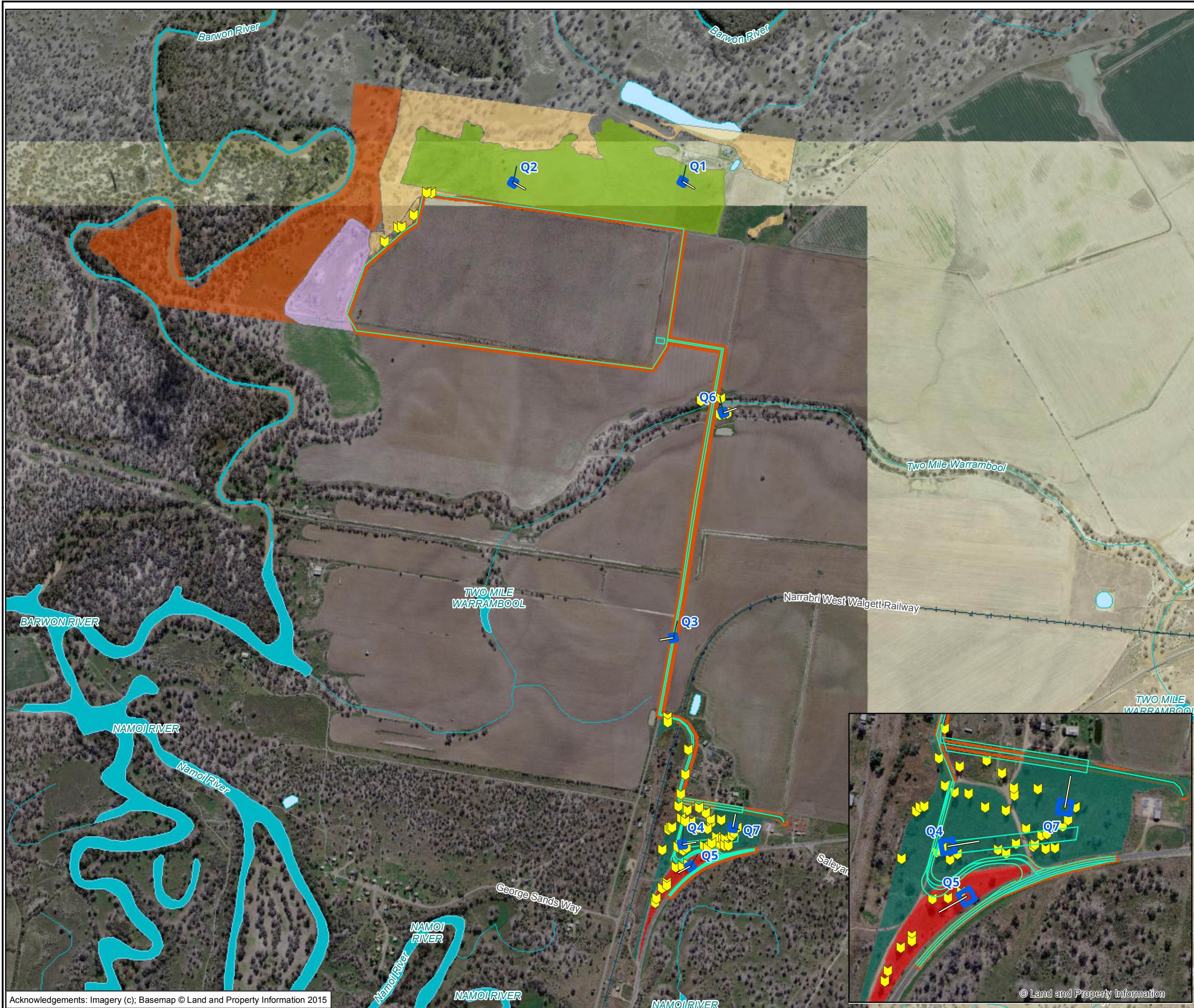
Large areas reliant on the surface expression of groundwater are mapped within and adjacent to the study area. These areas are largely associated with the Barwon River and are mapped as floodplain water bodies.

Vegetation reliant on the subsurface expression of groundwater is mapped within and adjacent to the study area. Again, these areas are largely associated with the Barwon River, and are listed as vegetation associated with Black Box *Eucalypts largiflorens*.

All the native vegetation mapped within the study area during the current assessment are floodplain wetlands, and all vegetation is likely to be associated with and reliant on the surface and subsurface expression of groundwater to some degree.

However, the Solar Farm will not result in any significant changes to surface or subsurface hydrology, and no impacts to GDEs are predicted to result from the project.

GDEs are not considered further in this assessment.



- Legend**
- Subject site
 - Development footprint
 - Quadrats
 - Transects
 - ↘ Habitat trees

- Plant community types**
- PCT 39 - Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion , Low , (NA129)
 - PCT 39 - Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion , Moderate/good , High (NA129)
 - PCT 39 - Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion , Moderate/good , Medium (NA129)
 - PCT 39 - Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion , Moderate/good , Poor (NA129)
 - PCT 40 - Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains , Moderate/good , Derived grassland (NA130)
 - PCT 40 - Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains , Moderate/good , High (NA130)
 - PCT 40 - Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains , Moderate/good , Medium (NA130)

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

0 130 260 390 520 650
 Metres
 Scale: 1:13,000 @ A3
 Coordinate System: GDA2020 MGA Zone 55



5 Threatened species

5.1 Methods

Flora and fauna assessments of the study area were undertaken from 22 November to 24 November 2016. Weather observations for each survey date are shown in Table 7.

Table 6: Weather observations during flora and fauna surveys (Walgett NSW).

Survey date	Temperature (°C)		Rain (mm)
	Minimum	Maximum	
22 November 2016	15.3	35.9	0
23 November 2016	20.2	37.6	0
24 November 2016	11.9	27.6	0

Flora survey methodology is outlined above, and was included mapping of vegetation and condition assessment, as well as some limited targeted survey in key areas. Vegetation along the southern boundary was traversed during the assessment using a random meander method, with much of the southern section of the study area traversed.

Fauna assessment was largely 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.
- Creekline condition.
- Quantity of ground litter and logs.
- Searches for indirect evidence.

Indirect evidence, including chew marks and scratches on trees, chewed cones of *Allocasuarina* spp., diggings, burrows, dens, and tracks in wet mud on access tracks, nests and signs of wear around tree-hollows were also recorded during the habitat assessment.

Targeted searches were undertaken for the Koala *Phascolarctos cinereus* and Five-clawed Worm-skink *Anomalopus mackayi*. Koala searching was undertaken using the Spot Assessment technique (SAT [Phillips and Callaghan 2011]). Searches for the Five-clawed Worm-skink included over 5 hours of active searching in suitable habitats, including rolling logs and woody debris searching moist niches.

5.2 Fauna habitat assessment results

The study area has an extensive history of use for agricultural purposes; as a result the study area provides limited refuge or habitat for fauna.

Fauna habitat features were limited to areas of remnant vegetation, as outlined above, and scattered trees. Areas of remnant vegetation provide a number of trees with hollows, with a Chocolate Wattle Bat

Chalinolobus morio observed roosting in a hollow in the southern section of the study area (Plate 5). No hollow-bearing trees will be removed as a result of the project (Figure 4).



Plate 5 Chocolate Wattled Bat observed roosting in a hollow

Areas of remnant of native vegetation along the Two Mile Warambool and in the southern section of the study area contain a moderate level of fallen timber and leaf litter, providing habitat for ground-dwelling reptiles. Soils in the study area consist of deep cracking grey and brown clays (Plate 6).



Plate 6 Cracking grey – brown clays soils in the study area

There are a number of waterbodies and waterways within the study area. The proposed access route will traverse Two Mile Warrambool, which provides a range of aquatic habitats. Aquatic environments are discussed further in Section 5.3.

5.3 Aquatic environments

Aquatic environments within and adjacent to the study area are typical of lowland rivers within the Murray-Darling Basin, characterised by broad channels, complex floodplain features and highly variable seasonal flows. Two-Mile Warrambool is a connecting channel between the Namoi and Barwon River Basins. This waterway is semi-permanent and holds ponding water for extended periods as a result of the existing crossing structure. As a result, a wetland environment exists and contains a tight clay matrix substrate, high quantities of coarse particulate organic matter, patchy emergent macrophytes and sparse large woody debris (Plate 7). Areas to the east and west of the crossing structure were found to be largely dry at the time of the assessment.



Plate 7 Two Mile Warrambool looking west towards the existing crossing

Connectivity between the Namoi and Barwon Rivers occurs during periods of high rainfall when the existing structure has blow outs or overtops. Two-Mile Warrambool is considered a highly valuable movement pathway between these two major river basins.

5.4 Geographic /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 Solar Farm. The results of this assessment, along with the species generated by the calculator associated with the FBA are outlined in Table 7.

Table 7 Assessment of geographic habitat features within the subject site

Common name	Scientific name	Feature	Present in subject site	Justification
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts	Yes	Riparian woodland occurs adjacent to the subject site (within 40 m). No direct impacts will result from the development of the Solar Farm. Riparian environments will not be impacted, with impacts restricted to the southern section of the subject site to allow access off Castlereagh Highway.
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber	Yes	Watercourses containing hollow-bearing trees, loose bark and/or fallen timber occur adjacent to the study area (within 40 m), particularly where the access route crosses Two Mile Warrambool. However, no impact will result on hollow-bearing trees or fallen logs from the development of the Solar Farm. Impacts restricted to the southern section of the subject site to allow access off Castlereagh Highway.
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	land within 40 m freshwater or saline wetlands (eg saltmarsh, mangroves, mudflats, swamps, billabongs, floodplains, watercourse pools, wet heathland and/or farm dams)	Yes	The access route will result in upgrade of a crossing over Two Mile Warrambool. However, no impact no impact to wetland habitat will result. Impacts restricted to the southern section of the subject site to allow access off Castlereagh Highway.
Five-clawed Worm-skink	<i>Anomalopus mackayi</i>	land containing soil cracks or fallen timber and litter	Yes	The study area and subject site support grey – brown cracking clays and fallen timber and leaf litter. However, through iterative design impacts will be restricted to existing track edges where previous disturbance has resulted in change to soil structure and compacting of soils. A conservative assessment is provided.

Further consideration is given to these species in Section 5.6.

5.5 Ecosystem credit species

A list of ecosystem credit species predicted to occur within the study area, based on the PCTs present and generated by the calculator associated with the FBA, along with an assessment of whether they occur within the study area, is provided in Table 8. The potential for these species to occur within the study area was assessed in accordance with Section 6.3 of the FBA (OEH 2014b).

Table 8 Assessment of ecosystem credit species within the study area.

Scientific name	Common name	TS offset multiplier	Habitat on site
Australian Bustard	<i>Ardeotis australis</i>	2.6	Yes
Australian Painted Snipe	<i>Rostratula australis</i>	1.3	Yes
Barking Owl	<i>Ninox connivens</i>	3	Yes
Brolga	<i>Grus rubicunda</i>	1.3	Yes
Bush Stone-curlew	<i>Burhinus grallarius</i>	2.6	Yes
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3	Yes
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis</i> subsp. <i>temporalis</i>	1.3	Yes
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata</i> subsp. <i>cucullata</i>	1.7	Yes
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4	Yes
Little Pied Bat	<i>Chalinolobus picatus</i>	2.1	Yes
Magpie Goose	<i>Anseranas semipalmata</i>	1.3	Yes
Major Mitchell's Cockatoo	<i>Lophochroa leadbeateri</i>	1.9	Yes
Masked Owl	<i>Tyto novaehollandiae</i>	3	Yes
Painted Honeyeater	<i>Grantiella picta</i>	1.3	Yes
Red-tailed Black-Cockatoo (inland subspecies)	<i>Calyptorhynchus banksii</i> subsp. <i>samueli</i>	1.8	Yes
Spotted Harrier	<i>Circus assimilis</i>	1.4	Yes
Square-tailed Kite	<i>Lophoictinia isura</i>	1.4	Yes
Stripe-faced Dunnart	<i>Sminthopsis macroura</i>	2.6	Yes
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3	Yes
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	2.2	Yes

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 study area.

The Masked Owl has the lowest Tg value and therefore the highest threatened species offset multiplier. No adjustment of the TS offset multiplier value has been undertaken. As the vegetation in the subject site is part of an endangered ecological community all vegetation has an automatic threatened species offset multiplier of 3.

5.6 Species credit species

A list of species credit species predicted to occur within the study area, based on the PCTs present, along with an assessment of whether the subject site provides suitable habitat and whether the species will be impacted by the proposed Solar Farm is provided in Table 9. The potential for a species to occur within the subject site was assessed in accordance with Section 6.5 of the FBA (OEH 2014b).

Table 9 Species credit species and status within the subject site

Scientific name	Common name	Habitat present in the study area	Recorded during field surveys	Impacted by development	Justification
Flora					
<i>Sida rohlenae</i>	Shrub Sida	Yes	No	No	There are no records of the species in the IBRA Subregion; however the species is predicted to occur. The species is a conspicuous shrub to 1 m which grows on flood-out areas, creek banks and at the base of rocky hills. NSW specimens have been found along roadsides in hard red loam to sandy-loam soils. Habitat is present in the subject site; however, given the size of this shrub it would have been noted if present.
<i>Swainsona murrayana</i>	Slender Darling Pea	Yes	No	No	There are a number of records in the Darling Riverine Plains IBRA region. The species is a slender prostrate to erect perennial forb to 25 cm which grows in a variety of vegetation types on clay based soils. The species is known to occur in paddocks that have been moderately grazed or occasionally cultivated. Suitable habitat is present in the subject site; however, if present in the subject site it is likely this species would have been noted if present.
Fauna					
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	Yes	No	No	There are several records of this species from the Darling Riverine Plains IBRA region and recent surveys by Spark (2010) have confirmed the presence of the species from sites to the north-east and south of Walgett. This study also confirmed that suitable habitats include cracking clay floodplain soils supporting native woodland and grassland communities (Spark 2010). While suitable habitat is present in the study area, impacts to such suitable habitat will largely be restricted to track edges where disturbance, including ripping for road construction and compaction of soils, has occurred.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	No	N/A	N/A	There is one record of the species east of the study area, within the IBRA subregion. This species is found in floodplain wetlands (swamps, billabongs, watercourses and dams). Major coastal rivers are the key habitat in NSW, with floodplains providing secondary

Scientific name	Common name	Habitat present in the study area	Recorded during field surveys	Impacted by development	Justification
					habitat. The species forages in in water 5-30 cm deep for vertebrate and invertebrate prey. While the species may utilise habitats adjacent to the subject site on occasion, no habitat present in the subject site.
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	No	N/A	N/A	There no records of the species in the IBRA subregion; however, the species is predicted to occur. The Black-breasted Buzzard lives in a range of inland habitats. Timbered watercourses are preferred breeding habitat, but the species forages over grasslands and timbered woodlands. No breeding habitat is present within the subject site. The majority of the subject site is heavily disturbed and provides limited, sub-optimal foraging habitat.
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	No	N/A	N/A	There are eight records of the species in the IBRA subregion. The Pale-headed snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest close to riparian areas. The subject site does not support suitable habitat in riparian environments.
<i>Petaurus norfolcensis</i>	Squirrel Glider	No	N/A	N/A	There are no records of the species in the IBRA subregion and the species is not predicted to occur. The Squirrel Glider inhabits stands of mature Box forest with a shrubby understorey and requires abundant tree hollows for refuge and nest sites. The species feeds on variety of nectar producing species, including <i>Acacia</i> spp., as well as manna and invertebrates. Potential habitat is not present in the subject site.
<i>Phascolarctos cinereus</i>	Koala	Yes	N/A	No	There are several records of the Koala from the IBRA subregion, including records to the south and east of the study area / subject site. However, many of these records are older than 10 years and the status of the Koala in the Walgett area remains uncertain (Paull and Hughes 2016). The study area supports River Red Gum and Poplar Box, which are Koala feed tree species listed under SEPP44. Paull and Hughes (2016) state that in the Darling Riverine Plains the preferred tree species are the River Red Gum, Coolabah, Black Box and Bimble Box. All species are present in the study area. Targeted searches under feed trees

Scientific name	Common name	Habitat present in the study area	Recorded during field surveys	Impacted by development	Justification
					<p>did not record any evidence of Koalas in the study area. No suitable feed trees will be removed as a part of the proposed Solar Farm.</p>

The Project will result in removal of 0.63 hectares of native vegetation, including 0.09 hectares of NA130 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT 40) in moderate/good – high condition and 0.54 hectares in moderate/good – medium condition. No impacts to threatened species will result from the Solar Farm.

Stage 2 – Impact assessment (biodiversity values)

6 Impact assessment (biodiversity values)

This section identifies the potential impacts of the proposed Solar Farm on the biodiversity values of the study area and includes measures taken to date and additional recommendations to assist Geolyse and Walgett Solar to design a development that avoids and minimises impacts on biodiversity within and surrounding the study area.

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 0.63 hectares of native vegetation within the subject site.
 - Through iterative design, impacts to 92.13 hectares of vegetation within the broader study area will be avoided.
- Direct mortalities and injuries to native fauna during vegetation clearing procedure.

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.
- 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 will be to avoid and minimise removal of native vegetation and fauna habitat. Additional recommendations may 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 proximity to a power substation.

During the design of the Solar Farm, Geolyse and Walgett Solar have considered all biodiversity values identified by Biosis and have designed the layout of the Solar Farm to avoid direct impacts to the identified values. As a result, impacts are restricted to those required to gain access to the site off Castlereagh Highway. Access design has had to consider the ability of B-double trucks to navigate the turns, thus the need for wide turning circles (Figure 2).

In other areas, the development will be restricted to existing access tracks or other disturbed areas, with the development footprint for photovoltaic panels restricted to cropped areas.

Construction

During construction, upgrades to the crossing of Two Mile Warrambool will be required. Currently, this crossing consists of debris piled into the creek, restricting the ability of water to flow through this crossing. During floods, the crossing is washed away and into the Barwon River. The upgrade will include the installation of a culvert, allowing flow under the roadway. Installation of these culverts should consider the following recommendations:

- Multi-celled box culverts should be used.
- The base of the culverts should be recessed to just below the existing bed of the waterway.
- Adequate light penetration should be provided during nominal conditions.
- Align culverts in the direction of stream flow.
- Augment the roughness of the bed surface, within the culvert, by incorporating rock/cobble etc.
- Consider the use of wing-walls to deflect debris during high flow scenarios.

If followed, this will result in minimal impacts and an overall improvement to Two Mile Warrambool, including increased flow passage and fish passage.

No additional direct impacts are expected to occur as a result of the construction phase. However, indirect impacts may result to retained biodiversity values. Additional mitigation measures recommended to avoid and minimise impacts include:

- Installation of appropriate exclusion fencing around trees and vegetation to be retained in the study area.
 - The radius of the tree protection zone (TPZ) is calculated for each tree by multiplying its diameter at breast height (DBH) by 12. ($TPZ = DBH \times 12$) in accordance with the Standards Australia Committee (2009).
 - A TPZ should not be less than 2 metres nor greater than 15 metres, except where crown protection is required (Standards Australia Committee 2009).
 - This would include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'.
 - Identify the location of any 'No Go Zones' in site inductions and a Construction Environmental Management Plan.
- All material stockpiles, vehicle parking and machinery storage will be located within cleared areas proposed for clearing, and not in areas of native vegetation that are to be retained.
- Where appropriate native vegetation cleared from the study area should be mulched for re-use on the site, to stabilise bare ground.
- Wet down areas to reduce dust generation during construction.
- Implementation of temporary stormwater controls during construction 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 the drainage channels to the Barwon River and Two Mile Warrambool. These should conform to relevant guidelines, should be maintained

throughout the construction period and should be carefully removed following the completion of works.

- If landscape plantings are undertaken, these should use species indigenous to the local area and consistent with the native vegetation communities identified. A list of species recorded in the study area is provided in the species list (Appendix 1).

Prescriptions for mitigation of potential impacts of construction activities on retained native vegetation and habitat should be addressed in a site-specific Construction Environmental Management Plan (CEMP). The CEMP should include all measures outlined above.

Operation

The impacts arising from the operation of the Solar Farm are expected to be negligible. As a result, no additional mitigation measures are recommended.

6.1.3 Residual impacts

As a result of the avoidance, minimisation and mitigation measures outlined above, residual impacts arising from the Solar Farm are restricted to removal of 0.63 hectares of native vegetation. No trees will be removed from these areas.

6.2 Thresholds for assessment and offsetting

This section outlines the thresholds for assessment and offsetting in accordance with Section 9 of the FBA (OEH 2014b).

6.2.1 Impacts requiring further consideration

This section provides an assessment of impacts requiring further consideration in accordance with Section 9.2 of the FBA (OEH 2014b).

Landscape features

Two Mile Warrambool is a 6th order stream in the subject site. The crossing over this waterway will not result in a reduction in the width of vegetation in the buffer zone of this waterway.

The study area does not support any other 4th order or greater 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

No critically endangered ecological communities have been mapped in the study area. No endangered ecological communities' were nominated in the SEARs.

There are no impacts to native vegetation requiring further consideration.

Species and populations

The study area does not include any areas of critical habitat. No impacts to critically endangered or endangered species will result from the proposed Solar Farm.

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

6.2.2 Impacts requiring offsets

Impacts native vegetation

This section provides an assessment of the impacts to native vegetation requiring offset in accordance with Section 9.3.1 of the FBA (OEH 2014b).

The proposed access off the Castlereagh Highway will result in removal of 0.09 hectares of NA130 Coolabah open woodland wetland (PCT40) in Moderate/good – High condition and 0.54 hectares in Moderate/good – Medium condition.

Impacts to species and populations

This section provides an assessment of the impacts to species and populations requiring offsets in accordance with Section 9.3.2 of the FBA (OEH 2014b).

The Solar Farm will not result in removal of habitat for threatened species and populations. No offsets for species or populations are required.

6.2.3 Impacts not requiring offsets or not requiring further assessment

Since areas of NA130 in Moderate/good – Medium condition have a site value score of less than 17, no offsets will be required. However, 0.09 hectares of Coolabah open woodland wetland (NA130) in Moderate/good – High condition scored more than 17, and will require offsets.

The remainder of the subject site supports non-native vegetation and disturbed land. No further consideration of these areas is required.

7 Biodiversity credits

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

Table 10 provides a summary of ecosystem credits resulting from the proposed development. The full credit profile is provided in Appendix 2.

Table 10 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
VZ1	NA130	Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT 40)	0.09	24.00	27.32	3.0	2	Masked Owl	3.0	2
VZ2			0.54	24.00	15.85	3.0	5	Barking Owl	3.0	0

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 11.

Table 11 Assessment of the project against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	<p>One flora species and 11 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.</p> <p>There is some potential for the Five-clawed Wormskink to occur within the broader study area, but impacts from the proposed works are considered unlikely to result. Given this, the activity is considered low risk in line with Commonwealth of Australia (2011).</p>	Significant impact unlikely to result from the proposed development.
Threatened ecological communities	<i>Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions</i> endangered ecological community was mapped within the study area.	The impacted moderate/good condition vegetation within the subject site does not meet the minimum condition threshold as the percentage cover of non-native perennial plant species exceeds the percentage cover of native plant species in the ground layer (TSSC 2011; see Appendix 1). Therefore, a significant impact unlikely to result from the proposed development.
Migratory species	Nine 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.

On this basis, the EPBC Act is unlikely to be triggered and referral of the Project to the Australian Government Minister for the Environment will not be required.

8.2 Environmental Planning and Assessment Act 1979

8.2.1 Walgett LEP

The project will result in the removal of 0.63 hectares native vegetation within the subject site. The project is consistent with the biodiversity related objectives of the RU1 Primary Production zoning in the Walgett LEP.

8.2.2 SEPP No. 44

Several Koala feed tree species as 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 would not be considered potential Koala habitat as defined under the SEPP.

8.3 Fisheries Management Act 1994

Based on the proposed impact area, and the lack of impact on waterways, no FM Act KTPS were considered to be relevant to the Project. However, the proposal will reduce the operation of a KTP, instream structures and other mechanisms that alter natural flow.

8.4 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 study area, their control class and legal requirements for each are outlined in Table 12. Treatment for the noxious weeds listed above is recommended within NSW DPI (2011).

Table 12 Noxious weeds recorded within the study area.

Scientific name	Common name	Control class	Legal requirement
<i>Xanthium occidentale</i>	Noogoora Burr	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

As stated in Section 7, 2 ecosystem credits for NA130 *Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains* (PCT40) are required to offset the impacts on that vegetation type due to the proposed development.

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:

- Try and 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. Offset 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.

Given the small number of credits required, Walgett Solar has elected to seek retirement of the credits by purchasing them on the open market, subject to availability. Given the small number of credits required to offset impacts the identification of a suitable offset site from which to obtain the credits, including potential purchase and / or assessment, is not considered feasible.

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 was placed on the OEH 'Credits Wanted Register' on 21 December 2016. This can be viewed at <http://www.environment.nsw.gov.au/bimsprapp/SearchCWR.aspx?ID=90>.

Biosis, on behalf of Walgett Solar, will contact OEH and Walgett Shire Council to ascertain whether any suitable credits or land held by Council are available. As outlined above, given the small number of credits required acquisition of land or development of a BioBanking agreement is considered unfeasible.

Should a period of six months elapse 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 of 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). NA130 is from the Semi-arid Woodlands (Grassy sub-formation) vegetation formation. A review of the credit register shows that, at this stage, there are no credits listed under this vegetation formation.

10 Conclusion

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 Geolyse and their client, Walgett Solar.

The site assessment identified substantial areas of NA129 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion (PCT39) and NA130 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT40) within the study area. These PCTs align with Coolabah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions endangered ecological community listed under NSW TSC Act and Commonwealth EPBC Act.

Through an iterative design process, which considered the biodiversity values outlined in this report, the proposed development will limit its impacts to the removal 0.63 hectares of native vegetation.

Measures to avoid and minimise impacts to vegetation were considered during the design and planning stage of the project, resulting in almost complete avoidance 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 2 biodiversity credits, as outlined in Table 13.

Table 13 Summary of ecosystem credits.

PCT code	Plant community type name	Ecosystem credits required
NA130	Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains (PCT 40)	2

The clearing of this vegetation will not result in a significant impact to threatened species, populations or ecological communities.

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Appendices

Appendix 1 Native vegetation data (BioBanking)

A1.1 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 14 Flora species recorded from the study area and BioBanking plot.

Family	Scientific name	Common Name	Stratum	Growth Form	BioBanking Plot	Cover %	Count
Aizoaceae	<i>Tetragonia tetragonioides</i>	New Zealand Spinach	GC	C	6	3	20
			GC	C	5	1	7
	<i>Conyza bonariensis</i> *	Fleabane	GC	H	7	1	1
	<i>Euchiton sphaericus</i>	Star Cudweed	GC	H	7	1	2
	<i>Gamochaeta</i> sp*	Cudweed	GC	H	3	1	5
	<i>Lactuca serriola</i> *	Prickly Lettuce	GC	H	7	1	3
			GC	H	5	1	6
Asteraceae	<i>Leiocarpa brevicompta</i>	Flat Billy-buttons	GC	H	7	1	1
			GC	H	6	1	4
			GC	H	3	3	50
	<i>Sonchus oleraceus</i> *	Common Sowthistle	GC	H	7	1	7
			GC	H	6	1	7
			GC	H	4	1	10

Family	Scientific name	Common Name	Stratum	Growth Form	BioBanking Plot	Cover %	Count	
Brassicaceae			GC	H	3	1	2	
			GC	H	1	1	1	
		<i>Xanthium occidentale</i> *	Noogoora Burr	GC	H	6	1	2
		<i>Brassica juncea</i> *	Indian Mustard	GC	H	7	60	500
				GC	H	6	10	100
				GC	H	4	40	1000
				GC	H	2	1	5
		<i>Lepidium africanum</i> *	Common Peppergrass	GC	H	4	1	1
		<i>Rapistrum rugosum</i> *	Giant Mustard	GC	H	7	2	10
				GC	H	4	10	100
			GC	H	2	1	6	
			GC	H	1	3	20	
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell	GC	H	3	1	1	
	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell	GC	H	3	1	5	
Capparaceae	<i>Apophyllum anomalum</i>	Warrior Bush	GC	S	6	1	2	
Casuarinaceae	<i>Casuarina cristata</i>	Belah	O	T	4	25	1	
Chenopodiaceae	<i>Atriplex holocarpa</i>	Pop Saltbush	GC	C	6	1	5	
			GC	C	5	1	5	
	<i>Atriplex lindleyi</i>	Eastern Flat-top Saltbush	GC	C	4	5	50	
	<i>Atriplex muelleri</i>	Mueller's Saltbush	GC	C	7	1	1	
	<i>Dissocarpus biflorus</i> var. <i>cephalocarpus</i>	Many-horned Copperburr	GC	C	6	5	50	
	<i>Einadia nutans</i>	Climbing Saltbush	GC	C	6	3	50	
			GC	C	5	3	7	
			GC	C	4	20	500	
			GC	C	2	1	1	
	<i>Maireana aphylla</i>	Cotton Bush	GC	C	7	1	4	
			GC	C	6	1	1	
	<i>Sclerolaena muricata</i>	Black Rolypoly	GC	C	7	15	20	

Family	Scientific name	Common Name	Stratum	Growth Form	BioBanking Plot	Cover %	Count
			GC	C	6	20	100
			GC	C	5	10	10
			GC	C	4	10	20
			GC	C	3	1	2
			GC	C	2	40	100
			GC	C	1	25	50
Cyperaceae	<i>Carex appressa</i>	Tall Sedge	GC	V	7	1	10
			GC	V	1	1	1
Fabaceae (Faboideae)	<i>Medicago polymorpha</i> *	Burr Medic	GC	H	1	5	50
Fabaceae (Mimosoideae)	<i>Acacia stenophylla</i>	River Cooba	M	T	6	10	7
			M	T	5	3	3
Goodeniaceae	<i>Goodenia glauca</i>	Pale Goodenia	GC	H	5	1	1
Marsileaceae	<i>Marsilea drummondii</i>	Common Nardoo	GC	E	7	30	1000
Myoporaceae	<i>Eremophila bignoniiflora</i>	Eurah	M	T	5	5	1
	<i>Myoporum montanum</i>	Western Boobiella	M	T	6	1	1
			M	T	5	10	3
Myrtaceae	<i>Eucalyptus coolabah</i>	Coolibah	O	T	6	50	3
			O	T	5	20	1
			O	T	4	2	1
	<i>Eucalyptus largiflorens</i>	Black Box	O	T	7	10	1
			O	T	5	35	2
			O	T	4	3	1
Oxalidaceae	<i>Oxalis chnoodes</i>		GC	H	6	1	1
Poaceae	<i>Austrostipa nitida</i>		GC	G	5	1	1
	<i>Avena barbata</i> *	Bearded Oats	GC	G	3	1	1
	<i>Cenchrus setigerus</i> *		GC	G	3	15	500
			GC	H	3	1	10
	<i>Cynodon dactylon</i>	Common Couch	GC	G	6	3	100

Family	Scientific name	Common Name	Stratum	Growth Form	BioBanking Plot	Cover %	Count
			GC		5	1	4
	<i>Enteropogon acicularis</i>	Curly Windmill Grass	GC	G	7	5	20
			GC	G	5	1	3
			GC	G	4	3	20
			GC	G	1	1	1
			GC	G	6	1	2
	<i>Eriochloa crebra</i>	Cup Grass	GC	G	6	1	2
			GC	G	6	4	50
	<i>Panicum decompositum</i>	Native Millet	GC	G	7	2	20
			GC	G	6	1	3
			GC	G	5	2	10
	<i>Paspalidium jubiflorum</i>	Warrego Grass	GC	G	7	1	1
	<i>Triticum aestivum</i> *	Wheat	GC	G	3	2	20
Polygonaceae	<i>Polygonum aviculare</i> *	Wireweed	GC	C	3	40	100
	<i>Rumex conglomeratus</i> *	Clustered Dock	GC	C	6	1	2
GC			C	3	1	1	
Verbenaceae	<i>Verbena officinalis</i> *	Common Verbena	GC	H	7	1	1
			GC	H	7	1	1

A1.2 Plot and transect summary

Table 15 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	3	0	0	0	26	0	84	0	0	0
Plot 2	2	0	0	0	32	0	86	0	0	0
Plot 3	4	0	0	0	2	0	98	0	0	0
Plot 4	7	4	0	6	52	2	58	0	0	0
Plot 7	11	0	0	8	14	40	82	0	0	0
Plot 5	14	17	1	2	26	0	36	0	0	0
Plot 6	16	29	11	14	42	2	12	7	0	12

Appendix 2 Credit profile report

Biodiversity credit report



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

Date of report: 1/02/2017

Time: 2:41:08PM

Calculator version: v4.0

Major Project details

Proposal ID: 0103/2016/4086MP

Proposal name: Walgett Solar Farm

Proposal address: 54 George Sands Way Walgett NSW 2832

Proponent name: Epuron Island GP Management Pty Ltd

Proponent address: Level 11, 75 Miller Street North Sydney NSW 2060

Proponent phone: 02 8456 7400

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
Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains	0.38	2.38
Total	0.38	2

Credit profiles

1. Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains, (NA130)

Number of ecosystem credits created

2

IBRA sub-region

Castlereagh-Barwon - Namoi

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains, (NA130)</p> <p>Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions., (NA102)</p> <p>Black Box woodland wetland on NSW central and northern floodplains including the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion., (NA105)</p> <p>Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion, (NA129)</p> <p>Poplar Box - Coolabah floodplain woodland on light clay soil mainly in the Darling Riverine Plains Bioregion, (NA183)</p>	<p>Castlereagh-Barwon - Namoi</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

Summary of species credits required