



Limondale Sun Farm, NSW:
Biodiversity Management Plan

Prepared for Limondale Sun Farm Pty Ltd

13 March 2018

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1 Introduction

1.1 Project background

Limondale Sun Farm is a large-scale solar photovoltaic (PV) generation facility and associated infrastructure located approximately 14 kilometres south of Balranald within the Balranald Local Government Area (LGA), Parish of Balranald, County of Caira, in south-western NSW (Figure 1). It is bounded by Yanga Way to the east and is surrounded by other large farming properties. The site 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). In early 2017, Biosis Pty Ltd was commissioned by Limondale Sun Farm Pty Ltd to prepare a Biodiversity Assessment Report (BAR) for the project. The Biodiversity Assessment assessed a broader study area (2,049 hectares) with a smaller development site that included an infrastructure footprint of 1,103 hectares located within the study area. The Limondale Sun Farm occurs in the Murray Darling Depression bioregion and Development Consent was issued for the project by the Minister for Planning on 31 August 2017, subject to conditions of consent.

The Limondale Sun Farm will involve the installation of an array of PV panels (modules) on cleared farmland and associated infrastructure, including connection to the existing Balranald substation and road access from Yanga Way. The project will require the construction of electrical connection to the Balranald Substation to export electricity produced at the site to the electricity grid. The connection line (trenches) will run within the existing easement that contains the high voltage power lines that traverse the site and enter the substation. The BAR defined the development site (footprint) as the maximum area to be impacted by the proposal. The study area (i.e. the broader site boundary) was defined as the development site plus the immediately surrounding land investigated during the field surveys (Biosis 2017). The development site is shown in Figure 1 and is the focus of this management plan.

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 (e.g. Yanga Way TSR). Due to the site's relatively flat terrain and predominantly cleared landscape, limited site preparation and civil works will be required.

1.2 Management plan scope and objectives

Condition 11 of the Limondale Sun Farm Development Consent requires the preparation of a Biodiversity Management Plan (to the satisfaction of the Secretary) prior to the commencement of construction. This Biodiversity Management Plan has been prepared to satisfy the requirements of Development Consent Condition 11. The following table lists the requirements of Condition 11 and provides a cross-reference for where these are addressed in the BMP.

Condition of Consent	Report section (Table 1 - Risk or Monitoring Program)	Page number
A description of the measures that would be implemented for:		
Managing the remnant vegetation and fauna habitat on the site	Table 1: Risk 1	13
Minimising clearing and avoiding unnecessary disturbance of vegetation, including the vegetation communities listed in Table 1 that is associated with the construction and operation of the development	Table 1: Risk 1	13
Minimising impacts to fauna on site and implementing fauna management protocols (not including actual fauna salvage at this point)	Table 1: Risk 2	14
Rehabilitating and revegetating temporarily disturbance areas	Table 1: Risk 4	16
Protecting vegetation and fauna habitat outside the approved disturbance areas	Table 1: Risk 3 Appendix 1	15 26
Protecting areas of retained trees and vegetation (including locating stockpiles, parking, boundary fencing and machinery storage within cleared areas or areas proposed for clearing)	Table 1: Risk 1	13
Maximising the salvage of vegetative and soil resources within the approved disturbance area for beneficial reuse in the enhancement or the rehabilitation of the site	Table 1: Risk 4	16
Controlling weeds and feral pests	Table 1: Risk 5	17
Undertaking pre-clearance surveys of all hollow-bearing trees if clearing will be undertaken between July and November (not including actual fauna salvage services at this point).	Table 1: Risk 2 Appendix 1	14 26
A seasonally-based program to monitor and report on the effectiveness of the mitigation measures.	Monitoring Program (Section 5.2)	19
Details of who would be responsible for monitoring, reviewing and implementing the plan, and timeframes for completion of actions	Monitoring Program (Section 5.2)	19

The Plan briefly addresses each of the items listed in Condition 11 above and provides site environmental risks, mitigation measures and monitoring responses in Table 1, which can be used as a reference document during construction and operational phases. Figure 2 also shows areas of vegetation to be retained or removed for the project, as well as the locations of no-go-zones. Table 1 and Figure 2 will be provided to construction personnel during induction sessions, as well as operational staff for use during the ongoing operation of the project.





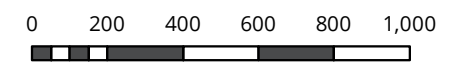
- Legend**
-  Development footprint
 -  Infrastructure area
 -  Local Government Area

Figure 1: Location map - Limondale Sun Farm



Scale: 1:20,000 @ A3
 Coordinate System: GDA 1994 MGA Zone 54



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Matter:
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 Location: P:\26100s\26156\Mapping\26156_F1_Location

2 Habitat management

2.1 Site biodiversity values

The development site 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 internal track or boundary fences or within the road reserves adjacent to the substation. 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 (Biosis 2017). 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.

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.

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 are limited to areas of remnant patch vegetation, scattered trees and mistletoe. No permanent or semi-permanent wetlands are present within the development site. 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. No threatened flora species were identified within the development site despite targeted surveys being undertaken. 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.

2.2 Vegetation and fauna management

Removal of vegetation is limited to small, isolated patches within cropped paddocks or small corridors through previously disturbed areas. Site access for construction and operation will be from Yanga Way. Access points will be through existing farm gates and along existing tracks currently used for agricultural purposes. Mitigation measures are outlined in Section 4 to avoid and minimise indirect impacts from construction and operation on remnant vegetation and fauna habitat on the site. These measures include

minimising clearing and avoiding unnecessary disturbance of vegetation, including the vegetation communities listed in Table 1 of the Development Consent that are associated with the construction and operation of the development. Other measures are outlined in Section 4, which involve minimising impacts to fauna.

3 Specific management actions

Construction management activities for the development are discussed briefly below. A description of the mitigation measures to be implemented is also provided in Section 4.

3.1 Site inductions

The Project Manager and Construction Site Supervisor are to undertake a biodiversity induction prior to commencing construction. Supervisors are required to brief construction staff on all potential environmental impacts and implement and maintain control measures, procedures and constraints accordingly. Site specifics include the presence of threatened species habitat and significant vegetation communities. General site inductions must also include strict hygiene protocols to reduce the potential the introduction of invasive species or disease into the protected vegetation on the subject site. The site inductions will be prepared and delivered by a suitably qualified environmental advisor.

3.2 Exclusion fencing

Areas of vegetation to be retained (no-go-zones) are shown on Figure 2. Prior to the commencement of earthworks, exclusion fencing will be installed along the boundaries of vegetated areas to be retained. The alignment of this fencing will be in accordance with the Australian Standard *Protection of Trees on Development Sites (AS4970-2009)* and incorporate the relevant tree protection zones for trees and vegetation to be retained.

The fencing will be constructed of, as a minimum, capped star pickets and high visibility para webbing and have appropriate signage stating that it is an environmentally sensitive area to alert construction personnel to avoid the area. Exclusion zones will be clearly marked and labelled on design drawings issued for construction and will be displayed in prominent places (e.g. site offices) and provided in site inductions.

No storage of materials or machinery is allowed within exclusion zones or retained vegetation. There is also to be no preparation of chemicals or concrete in these exclusion areas, or adjacent areas, and care must be taken to avoid the compaction of soils.

3.3 Erosion and sediment control

Earthworks are not to commence until sediment and erosion controls have been installed as per standards outlined in the "Blue Book" (Landcom 2004) and in accordance with conditions 22 (a) & (b) in the Development Consent. Erosion and sediment control will be observed and monitored for the entire construction phase of the development. Limondale Sun Farm Pty Ltd will provide OEH with a copy of all construction related plans prior to commencing construction.

3.4 Rehabilitation works

The development area is highly disturbed and has a long history of cropping. Due to this history of on-going soil disturbance, it is likely that the soil has experienced changes to the natural soil flora and the structure has already experienced significant decline. Given the past and current land use of the development site, encouraging the natural regeneration of pre-existing vegetation is an effective form of achieving ground cover to protect soil from wind and water erosion. Temporarily disturbed areas will be left to naturally regenerate with a mix of local native colonisers and non-native pastures following the reinstatement of the original

topsoil. This approach will apply to the access road to Yanga Way and electricity trench that runs through the TSR to the substation. If there is a risk of erosion of the bare soil, jute matting or straw will be used to stabilise the area while natural regeneration occurs. It is not practical to actively revegetate via direct seeding or planting under the solar panel infrastructure. Seeds and propagules exist within the seed bank and re-establishment of the community will follow natural patterns of re-colonisation and succession.

4 Environmental mitigation measures

This section outlines the biodiversity risks and impact mitigation measures associated with construction and operation of the Limondale Sun Farm. Figure 2 shows areas of vegetation to be retained or removed for the project, as well as the locations of no-go-zones. Table 1 describes the management practices and mitigation measures to be implemented to reduce the risks and potential direct and indirect impacts on biodiversity. Table 1 also describes the monitoring responses and responsibility for implementing these measures. Management protocols and actions for vegetation clearance and fauna salvage are also provided in Appendix 1. Figure 2, Table 1 and Appendix 1 will be provided to construction and operational staff during site induction and will guide implementation of biodiversity protection controls.

The intent of Figure 2, Table 1 and Appendix 1 is to describe the measures to be implemented for biodiversity protection in the *development site* and protect retained areas in broader *study area* or on adjacent public land.



- Legend**
- Development footprint
 - Infrastructure area
 - Hollow-bearing tree**
 - To be retained
 - To be removed
 - Native vegetation to be removed
 - No Go fence
 - Acacia melvillei* Shrubland EEC
 - Plant community 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 2 Areas of vegetation to be retained or removed, Limondale Sun Farm

0 200 400 600 800 1,000
Metres

Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 MGA Zone 54



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Matter: 26156
Date: 16 February 2018,
Checked by: RC, Drawn by: SKM, Last edited by: mlooby
Location: P:\26100s\26156\Mapping\26156_F2_VegImpacts

Table 1 Site environmental risks, mitigation measures and monitoring responses

Risk to be managed	Mitigation measures	Monitoring response	Responsibility
<p>1. Native vegetation removal, retention and disturbance</p>	<p>Managing vegetation removal, retention and disturbance:</p> <p>1.1 The principle of minimising removal of native vegetation will be applied to all approved clearing activities in the development site.</p> <p>1.2 Access/egress to the development site will be via existing roads and vehicle access tracks or via approved new access points.</p> <p>1.3 Vegetation to be removed in the development site will be clearly marked under the supervision of the project environmental advisor to ensure only the approved vegetation is removed. A spray-painted 'X' or standard marker will be placed on trees and patches to be removed.</p> <p>1.4 All areas of retained vegetation in or near the development site will be clearly marked by means of high visibility temporary fencing to be installed under the supervision of the project environmental advisor. High visibility temporary fencing (using high visibility bunting and star pickets) must be installed before clearing of other vegetation and construction work commences. These areas will be treated as no-go zones and installed using the following principles:</p> <ul style="list-style-type: none"> - 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 will 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' must be installed. - Identify the location of any 'No Go Zones' in site inductions and on site plans. <p>1.5 Vegetation removal protocols and fauna salvage will be discussed in detail at the site induction.</p>	<ul style="list-style-type: none"> • Daily visual inspection of pre and post construction clearing (during clearing). • Twice weekly inspection and maintenance of exclusion fencing (check for wind damage etc.). • Maintain a diary and photo-log of any issues and actions taken to remedy breaches of exclusion areas. • Include inspection results in regular reporting to OEH. 	<p>Site Supervisor Project Environmental Advisor</p>

Risk to be managed	Mitigation measures	Monitoring response	Responsibility
<p>2. Direct impacts on flora, fauna and ecological communities as a result of clearing activities</p>	<p>Managing direct impacts on flora and fauna, especially threatened biota:</p> <p>2.1 The stand of the threatened ecological community <i>Acacia melvillei shrubland in the Riverina and Murray-Darling Depression bioregions</i> that occurs adjacent to the south-west corner of the development site will be fenced and protected according to the principles outlined in this table.</p> <p>2.2 Environmental Advisor to undertake pre-clearance surveys of all hollow-bearing trees if clearing will be undertaken between July and November, this will focus on identifying nesting trees for hollow-dependent species such as Major Mitchell's Cockatoo.</p> <p>2.3 A licenced wildlife salvage team will be on-site during vegetation removal to catch and relocate (if appropriate) any wildlife encountered in vegetation or hollow-bearing trees.</p> <p>2.4 If any footings or trenches are required to be left open overnight, they must be inspected (daily) prior to the commencement of construction or pouring concrete.</p> <p>2.5 If injured wildlife is encountered the project manager will be immediately notified by the site supervisor and a licenced wildlife handler/carer or local veterinarian will be consulted (phone WIRES on 1300 094 737, NSW rescue line)</p> <p>2.6 Where practical, all scattered hollow-bearing trees to be removed will be sensitively placed in areas of retained vegetation in the broader study area to provide additional fauna habitat.</p> <p>2.7 Security fence construction and associated materials storage must be located within the development footprint.</p>	<ul style="list-style-type: none"> • Visual inspections to ensure vegetation removal is carried out in accordance with development consent. Inspections will be carried out as required at construction area mark out and when construction / vegetation clearing commences. • Maintain a log of salvaged animals and actions taken to relocate them. • Daily visual inspections during construction where footings have been left open over-night and prior to re-commencing or back filling. • Include inspection and salvage results in regular reporting to OEH. 	<p>Project Manager Site Supervisor Environmental Advisor Wildlife Handler</p>

Risk to be managed	Mitigation measures	Monitoring response	Responsibility
<p>3. Indirect impacts on biodiversity values outside the development site.</p>	<p>Managing impacts outside the development site:</p> <p>3.1 The infrastructure area will be fenced to contain all works and any areas of adjacent native vegetation or fauna habitat will be treated as no go zones as per the principles for exclusion areas outlined in this table.</p> <p>3.2 All material stockpiles, vehicle parking and machinery storage will be located within cleared areas or areas proposed for clearing in the development site, and not in areas of adjacent retained native vegetation.</p> <p>3.3 Sediment and erosion control measures will be implemented as outlined in this plan and the project specific sediment management plan.</p> <p>3.4 Avoid contamination of stockpiles from bedding material, gravel, or imported fill. Bund, cover and wet down stockpiles if left for more than one month.</p>	<ul style="list-style-type: none"> • Visual inspections to ensure vegetation removal is carried out in accordance with development consent and no impacts occur outside the development site. Inspections will be carried out as required at construction area mark out and when construction / vegetation clearing commences. • Daily visual inspections of stockpiles and storage areas to ensure that are not impacting areas outside the development site. • Include results in regular reporting to OEH. 	<p>Project Manager Site Supervisor</p>

Risk to be managed	Mitigation measures	Monitoring response	Responsibility
<p>4. Soil erosion, sedimentation and rehabilitation of temporarily disturbed areas</p>	<p>Managing soils and rehabilitation of temporary disturbance:</p> <p>4.1 Where appropriate native vegetation cleared from the development site will be mulched for re-use on the site, to stabilise bare ground within the development site. This mulch must not be placed in areas of retained vegetation outside the development site.</p> <p>4.2 Dust suppression measures will be implemented during construction including use of a water truck, where appropriate. <i>Refer to sediment and erosion controls standards outlined in the “Blue Book” (Landcom 2004).</i></p> <p>4.3 Implementation of temporary stormwater controls during construction is necessary to ensure that discharge to local drainage lines are consistent with existing conditions. <i>Refer to sediment and erosion controls standards outlined in the “Blue Book” (Landcom 2004).</i></p> <p>4.4 Sediment and erosion control measures will be implemented prior to construction works commencing (e.g. install silt fences, sediment traps), to protect drainage channels to the west and to the south. These will conform to relevant guidelines, will be maintained throughout the construction period and will be carefully removed following the completion of works. <i>Refer to sediment and erosion controls standards outlined in the “Blue Book” (Landcom 2004).</i></p> <p>4.5 If topsoil is required to be stockpiled for more than a week, stockpiles will be banded and sprayed / wetted down with water; or covered with jute matting to maintain soil microbe viability if stockpiled for more than one month.</p> <p>4.6 Soil stripped from areas to be temporarily disturbed (e.g. electricity trench to sub-station) will be stockpiled in the development site for reinstatement over the trench/disturbed ground. The top 100-200 mm of soil will be stockpiled and re-instated as soon as practicable. This will enhance site rehabilitation.</p> <p>4.7 Temporarily disturbed areas will be left to naturally regenerate after reinstatement of top soil. If there is a risk of wind or water erosion, high risk parts of these areas will be covered with an organic weed free material (e.g. straw or jute/coir matting) for stabilisation.</p> <p>4.8 <i>On completion of construction as soon as practicable the land will be re-instated to the condition as per the contractual agreement with the project landowner.</i></p> <p>4.9 <i>All monitoring and inspection to be implemented as per timing outlined in monitoring response column.</i></p>	<ul style="list-style-type: none"> • Sediment control measures and rehabilitation areas will be checked and maintained at regular intervals (daily during construction and after rainfall events greater than 10 mm in a 24 hour period). • Daily visual inspections of construction progress including maintaining the construction area, stockpile/lay down areas and installation/maintenance of sediment control devices. • Weekly follow up visual inspections of rehabilitation works during construction to assess the success of soil and vegetation stabilisation. • Quarterly inspections of rehabilitated areas for two years after works and implement appropriate responses if rehabilitation fails. • Include monitoring results in regular reporting to OEH. 	<p>Site Supervisor Environmental Advisor</p>

Risk to be managed	Mitigation measures	Monitoring response	Responsibility
<p>5. Weeds, feral pests and soil pathogens</p>	<p>Managing weeds, pathogens and pests:</p> <p>5.1 Prior to works commencing, undertake a weed assessment / mapping to provide a baseline for monitoring actions.</p> <p>5.2 Prior to works commencing any machinery, equipment and PPE will be washed down off-site to remove soil and weed seeds.</p> <p>5.3 Ensure any imported construction materials area weed and pathogen free.</p> <p>5.4 Weed control will be undertaken in temporarily disturbed areas with aim of eliminating annual/short-lived high threat herbaceous species that inhibit natural regeneration, target weed species include:</p> <ul style="list-style-type: none"> - <i>Carrichtera annua</i> Ward's Weed, <i>Centaurea melitensis</i> Maltese Cockspur, <i>Conyza bonariensis</i> Fleabane, <i>Echium plantagineum</i> Patterson's Curse, <i>Erodium cicutarium</i> Common Crowfoot, <i>Lactuca serriola</i> Prickly Lettuce, <i>Limonium lobatum</i> Winged Sea Lavender, <i>Malva parviflora</i> Small-flowered Mallow, <i>Onopordum acaulon</i> Stemless Thistle, <i>Psilocaulon tenue</i> Wiry Noon-flower, <i>Sisymbrium erysimoides</i> Smooth Mustard and <i>Solanum nigrum</i> Blackberry Nightshade <p>5.5 Sterile exotic crops or native ground cover species will be considered, where practical, if plantings are required beneath solar panels to minimise the impact of weed incursion into retained native vegetation adjacent to the development site.</p> <p>5.6 Control of weeds, including African Boxthorn <i>Lycium ferocissimum</i> and Horehound <i>Marrubium vulgare</i>, will occur in retained native vegetation directly adjacent to the development site.</p> <p>5.7 Weed control methods must be selected to ensure that retained native vegetation is not subjected to off-target impacts</p> <p>5.8 Undertake regular monitoring of feral pests and implement appropriate adaptive management responses as required:</p> <ul style="list-style-type: none"> - Undertake hand collapse, ripping or fumigation of warrens when established. - Integrate local fox control methods. - Trapping, poisoning, trapping or shooting feral pigs. 	<ul style="list-style-type: none"> • Follow up visual inspections to detect weed germination and signs of soil pathogen infection – weekly during construction and monthly for 1 year after construction completion. • On-going weekly inspections to detect presence of feral pests. • Include results in regular report to OEH during construction period. 	<p>Project Manager</p>

5 Compliance management

The environmental risks associated with construction will be monitored on a regular basis. The Project Manager and Site Supervisor will be responsible for undertaking regular assessments (daily to weekly) of positive and negative impacts during the construction program and appropriate photographic records will be kept. Specialist advice on environmental issues will be sought as required from a suitably qualified environmental professional during the construction period (e.g. a project Environmental Advisor).

5.1 Roles and responsibilities

The Project Manager is responsible for ensuring all activities in this Plan are carried out prior to and during construction, along with reporting any incidents to OEH and formulating responses to incidents. The Project Manager is responsible for ensuring that other construction and operational management plans correlate with the BMP and that actions in other plans do not contradict those listed in the BMP. The Project Manager will also identify actions that are likely to overlap with other construction management plans and ensure consistency with responsibilities and reporting.

The Construction Site Supervisor must comply with the activities outlined in this Plan and any deviation to activities outlined must be reported to the OEH.

Prior to the commencement of construction, the Project Manager and Site Supervisor must conduct an induction with the Environmental Advisor that will include the following:

- A description of the ecological values of the site, including the presence of threatened species habitat and locally significant vegetation communities.
- A description of the biodiversity to be retained and the vegetation to be removed.
- The mitigation measures included in this Plan (Section 4).
- Appropriately scaled maps and GPS data as appropriate.

Supervisors are required to identify to construction staff all potential environmental impacts and implement and maintain control measures, procedures and constraints accordingly.

Table 2 Roles and contact details

Name	Role	Contact details
Niccolo Segato	Project Manager	
Russell Briggs	Construction Site Supervisor	
Ross Greenham	Operational Site Manager	0428 543 150
Thomas Huber	Environmental Advisor	0447 143 526

5.2 Monitoring program

The Project Manager, Site Supervisor and Environmental Advisor will all be responsible for various monitoring and reporting actions prior to, during and following construction. The table below outlines a monitoring program that will be implemented, as well as decision triggers and adaptive responses for the risks (and mitigation measures) described in Table 1. All actions and outcomes from monitoring and adaptive responses will be included in the reporting process.

Table 3 Monitoring Program

Risk (Table 1)	Monitoring action	Timing / frequency	Responsibility	Decision trigger / adaptive response	Reporting
Pre-construction					
1, 2, 3	Visual inspection of vegetation clearance activities	Daily inspections during clearing activities	Site Supervisor with the Environmental Advisor – report to Project Manager	Vegetation is being cleared in accordance with the development consent. If not, stop work and follow process for reporting an incident outlined in Section 5.4.	Site Supervisor and Environmental Advisor to undertake monitoring and report to Project Manager. Report incidents to OEH immediately as per Section 5.4. Include details in OEH informal monthly report as well as a summary and details of any incidents in OEH annual report.
1, 2	Inspection of exclusion fencing	Twice weekly inspections, or after wind events	Site Supervisor with the Environmental Advisor – report to Project Manager	Exclusion fencing is damaged or not being maintained. Exclusion fencing to be re-instated and maintained as per mitigation measures described in Table 1. If lack of exclusion fencing leads to damage to retained vegetation, stop work and follow process for reporting an incident outlined in Section 5.4. Reinstate exclusion fencing as required.	Site Supervisor and Environmental Advisor to undertake monitoring and report to Project Manager. Report incidents to OEH immediately as per Section 5.4. Include details in OEH informal monthly report as well as a summary and details of any incidents in OEH annual report.

Risk (Table 1)	Monitoring action	Timing / frequency	Responsibility	Decision trigger / adaptive response	Reporting
1, 2	1.3 Maintain a diary and photo-log of any issues and actions taken to remedy breaches of exclusion areas.	As required.	Site Supervisor – report to Project Manager	If exclusion areas are breached or incidents occur.	Site Supervisor to undertake recording and report to Project Manager. Include the diary / photo-log in OEH monthly report.
4	Inspect all sediment and erosion control measures implemented prior to works	Prior to earthworks and clearing activities commencing	Site Supervisor with the Environmental Advisor – report to Project Manager	Control measures to be implemented as per Blue Book standards.	Site Supervisor and Environmental Advisor to undertake monitoring and report to Project Manager. Include details in OEH informal monthly report.
During construction					
1, 2, 3	Visual inspection of vegetation clearance activities	Daily inspections during clearing activities	Site Supervisor with the Environmental Advisor	Vegetation is cleared in accordance with the development consent. If not, stop work and follow process for reporting an incident outlined in Section 5.4.	Report incidents to OEH immediately as per Section 5.4.
2	Maintain a log of salvaged animals and actions taken to relocate them.	As required prior to and during vegetation clearance and construction.	Environmental Advisor / Wildlife Handler	If any animals are identified during pre-clearance surveys or construction and are salvaged. Follow pre-clearance, clearance and fauna salvage protocols.	Environmental Advisor to provide log to Site Supervisor and Project Manager to be included in informal monthly reporting as well as in annual report.
2	Inspections for fauna where footings have been left open overnight.	Every morning where left open overnight and prior to recommencing or back filling.	Environmental Advisor / Wildlife Handler	If footings or trenches have been left open overnight. Follow fauna salvage protocol.	Environmental Advisor to include details in salvage log to be provided to Site Supervisor and Project Manager for inclusion in OEH reporting.

Risk (Table 1)	Monitoring action	Timing / frequency	Responsibility	Decision trigger / adaptive response	Reporting
3, 4	Inspections of stockpiles and storage areas to ensure no impact outside development site.	Daily inspections required at construction area mark out and during construction.	Site Supervisor to undertake inspections and report to Project Manager	If stockpiles and / or storage areas encroach on areas outside the development site or onto areas for retained vegetation, stop work and follow process for reporting an incident outlined in Section 5.4. See further guidance from OEH regarding reinstatement.	Site Supervisor to undertake monitoring and report to Project Manager. Report incidents to OEH immediately as per Section 5.4. Include details in OEH informal monthly report as well as a summary and details of any incidents in OEH annual report.
4	Check and maintain sediment control measures	Daily during construction and as required.	Site Supervisor to undertake inspections and report to Project Manager	Maintain daily and after rainfall events greater than 10 mm in a 24 hour period. Reinstate measures as required. Bund and wet down stockpiles if left for longer than one week. Cover stockpiles with jute matting if left for longer than one month.	Site Supervisor to undertake monitoring and report to Project Manager. Report incidents to OEH immediately as per Section 5.4. Include details in OEH informal monthly report as well as a summary and details of any incidents in OEH annual report.

Risk (Table 1)	Monitoring action	Timing / frequency	Responsibility	Decision trigger / adaptive response	Reporting
4	Inspection of rehabilitation works during construction	Weekly inspections	Site Supervisor to undertake inspections and report to Project Manager	Following reinstatement of topsoil in areas of disturbance (as soon as practicable) to assess the success of soil and vegetation stabilisation. This will occur through natural regeneration, with a target of 50% plant cover (mix of native colonising species and non-native pasture species) within 12 months of reinstatement. Implement appropriate responses if rehabilitation fails (contact OEH for further guidance).	Site Supervisor to undertake monitoring and report to Project Manager. Include details in OEH informal monthly report as well as a summary in OEH annual report. Contact OEH if rehabilitation / soil stabilisation fails.
5	Inspections to detect weed germination and signs of soil pathogen infection	Weekly during construction.	Site Supervisor with the Environmental Advisor and report to Project Manager	Implement weed / soil pathogen control measures if weed germination or pathogen infection is detected. 10% cover weed control to be undertaken at rosette stage / prior to flowering.	Environmental Advisor to advise Site Supervisor and Project Manager. Report incidents to OEH immediately as per Section 5.4. Include details in OEH informal monthly report as well as a summary and details of any incidents in OEH annual report.

Risk (Table 1)	Monitoring action	Timing / frequency	Responsibility	Decision trigger / adaptive response	Reporting
Post construction					
4	Inspection of rehabilitation / soil stabilisation following construction	Quarterly for 2 years following construction	Site Supervisor with the Environmental Advisor and report to Project Manager	Following reinstatement of topsoil in areas of disturbance (as soon as practicable) to assess the success of soil and vegetation stabilisation. This will occur through natural regeneration, with a target of 50% plant cover (mix of native colonising species and non-native pasture species) within 12 months of reinstatement. Quarterly inspections of rehabilitated areas for two years following works and implement appropriate responses if rehabilitation fails (contact OEH for further guidance).	Environmental Advisor to advise Site Supervisor and Project Manager. Include details in OEH informal monthly report as well as a summary in OEH annual report. Contact OEH if rehabilitation / soil stabilisation fails.
5	Inspections to detect weed germination and signs of soil pathogen infection	Monthly for 1 year following construction completion.	Site Supervisor with the Environmental Advisor and report to Project Manager	Implement weed / soil pathogen control measures if weed germination or pathogen infection is detected. 10% cover weed control to be undertaken at rosette stage / prior to flowering.	Environmental Advisor to advise Site Supervisor and Project Manager. Report incidents to OEH immediately as per Section 5.4. Include details in OEH informal monthly report as well as a summary and details of any incidents in OEH annual report.

Risk (Table 1)	Monitoring action	Timing / frequency	Responsibility	Decision trigger / adaptive response	Reporting
5	On-going inspections to detect presence of feral pests	Weekly during operations	Project Manager	Undertake regular (weekly) monitoring of feral pests and implement adaptive management responses if pests are detected: <ul style="list-style-type: none"> - Undertake hand collapse, ripping or fumigation of warrens when established. - Integrate local fox control methods. - Trapping, poisoning, trapping or shooting feral pigs. 	Project Manager to include details of any pest management in informal monthly report as well as a summary in OEH annual report.

5.3 Reporting and record keeping

The Project Manager will supply an informal monthly report to OEH during the construction period. This report will take the form of an email or phone call, and cover issues such as:

- Construction progress
- Timelines
- Any environmental issues encountered
- Responses implemented to address issues
- Dated photographs of key issues and responses.
- The construction monitoring program for identified environmental risks is outlined in Table 1.

The reports will be provided to the OEH South West Branch based in Albury, NSW. The reports will be submitted to rog.southwest@environment.nsw.gov.au

An annual report will be provided to OEH summarising results of monitoring, identifying opportunities for improvement or recommended changes to the program, and including relevant monitoring data. All logs and monitoring data will be available to OEH on request. Copies of all reports will also be supplied to DPE as the consent authority in addition to OEH.

To meet the conditions of consent, biodiversity management will continue through operation of the development. The post construction monitoring actions outlined in the Monitoring Program will be implemented during the operational phase of the development.

5.4 Incidents

The Applicant must immediately notify the Secretary and any other relevant agencies of any incident on site. Within 7 days of the date of the incident, the Applicant must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

If an incident occurs that results in actual or potential impacts on retained biodiversity the OEH will be informed immediately.

The report to OEH **will** also be sent to the Project Manager and include the following information:

- Any contravention to the measures outlined in the Plan.
- The nature of the incident.
- The actual or likely impact of the incident on retained biodiversity.
- The measures which have been taken or will be taken to remedy the issue and prevent a recurrence of the incident.

5.5 Adaptive management

An adaptive management approach will be employed in respect to the works forming part of this Plan. An adaptive management approach involves an integrated process of the ongoing evaluation of environmental management performance. The purpose of this is to:

- Identify opportunities for the improvement of environmental management and performance.

- Determine the cause or causes of non-conformance and deficiencies.
- Development and implementation of a plan of corrective and preventative actions to address any non-conformance in this Plan.

Adaptive management responses are outlined in the Monitoring Program in Section 5.2. Update and amendment of this Plan will occur as required. A copy of the updated Plan will be distributed to all relevant stakeholders. Adaptive management responses as a result of decision triggers outlined in the Monitoring Program will be included in the reporting to OEH.

It is expected that management of failures associated with rehabilitation can be addressed, if and as necessary, to achieve the desired objectives in response to regular monitoring of progress. Regular monitoring will be qualitative through observations by the Project Manager, Site Supervisor and Environmental Advisor. The cycle of 'do, monitor, evaluate and respond' is the foundation of adaptive management and is widely applied to in land rehabilitation and restoration of natural systems. Consistent with adaptive management, monitoring results will be reviewed and actions revised from time to time, or where on ground evidence supports a change in rehabilitation trajectory. This plan will be followed prior to and during construction, as well as during the on-going operation of the development. The plan will be updated accordingly in consultation with OEH.

6 References

Biosis 2017. Limondale Sun Farm, NSW: Biodiversity Assessment Report. Report for Limondale Sun Farm Pty Ltd. Authors: E Kelly, A Barreto, M Looby & C Wharfe, Biosis Pty Ltd. Project no 24031.

Landcom 2004. Managing Urban Stormwater: Soils and Construction (4th Edition). New South Wales Government.

RTA 2011. Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects. Roads and Traffic Authority of New South Wales.

7 Appendices

Table A. 1 Management protocols and actions for vegetation removal adapted from Biodiversity Guidelines (RTA 2011)

Management protocol	Objectives	Triggers and legislation	Management steps for Environmental Advisor
<p>Pre-clearing process (To be conducted by a qualified and experienced ecologist)</p>	<p>The pre-clearing process is designed to be a final site assessment before commencement of construction to reduce the impact of construction activities on biodiversity. This involves identifying any threatened flora and fauna, as well as hollow-dependent fauna that may have moved into the study area since the initial flora and fauna surveys that formed part of the environmental assessment for the development. This process guides the location of exclusion zones and the potential need for staged habitat removal where hollow-bearing trees will be removed.</p>	<p>The pre-clearing process is triggered when:</p> <ul style="list-style-type: none"> • threatened populations of flora occur or have potential to occur on site (according to initial flora and fauna surveys) • hollow-bearing trees will be removed or disturbed • bushrock will be removed or disturbed • substantial potential threatened fauna habitat or potential microbat roosting sites will be removed or disturbed. <p>'Clearing of native vegetation', 'loss of hollow-bearing trees', 'bushrock removal' and 'removal of dead wood and dead trees' are key threatening processes under the NSW BC Act.</p> <p>'Land clearing' is a key threatening process under the EPBC Act.</p>	<ol style="list-style-type: none"> 1. Review initial environmental assessment to determine known location of threatened flora, fauna, populations and communities. 2. Identify suitable habitat for relocation of displaced fauna. 3. Incorporate any additional management controls for biodiversity identified during the pre-clearing assessment into the BMP. 4. Confirm locations and mark biodiversity features. Check for presence of threatened flora or fauna deemed likely to occur on site during flora and fauna surveys and identify any fauna at risk of disturbance or mortality during construction. Record habitat features and the location of hollow-bearing trees and trees providing habitat for threatened flora or fauna. 5. Follow BMP Mitigation Measures and check installation of no go zones and exclusion fencing. 6. 24 hours before commencement of clearing a licensed wildlife carer or ecologist will relocate any fauna that is likely to be impacted by construction activities to pre-determined sites for fauna release.

Management protocol	Objectives	Triggers and legislation	Management steps for Environmental Advisor
<p>Clearing of vegetation and removal of bushrock (A qualified and experienced ecologist or wildlife carer on site during removal)</p>	<p>Management steps will be implemented during clearing of vegetation to minimise damage to native flora and fauna, and habitat. This involves staged clearing to allow an opportunity for affected fauna to relocate to alternative suitable habitat prior to removal of utilised habitat, as well as fauna salvage during vegetation and bushrock removal to minimise injuries/fatalities.</p>	<p>The management steps for clearing of vegetation and removal of bushrock applies to construction activities that involve the removal of hollow-bearing trees, habitat trees or bushrock.</p> <p>'Clearing of native vegetation', 'loss of hollow-bearing trees', 'bushrock removal' and 'removal of dead wood and dead trees' are key threatening processes under the NSW BC Act.</p> <p>'Land clearing' is a key threatening process under EPBC Act.</p>	<ol style="list-style-type: none"> 1. Alert vets and wildlife carers prior to commencing works to gauge willingness to provide assistance in treating injured wildlife, and contact details provided to site manager. All fauna fatalities/injuries/relocations recorded. 2. Confirm timing of works to minimise impact on flora and fauna, e.g. avoiding seasonal impacts such as breeding times. 3. Guide habitat removal in two or more stages, e.g. clear non-habitat trees in the first stage, followed by habitat tree clearance. 4. A licensed wildlife carer and/or ecologist will be on site during habitat removal. Fauna encountered during the clearing process will be handled only by a licensed ecologist or wildlife carer. Displaced fauna to be relocated to pre-determined fauna release sites. 5. Remove non-habitat vegetation first (e.g. shrubs, regrowth, ground cover and non-habitat trees). Allow fauna at least 24 hours to vacate remaining habitat. Wildlife carer and/or ecologist to inspect trees before and after felling. Capture and relocate non-injured fauna identified in felled trees to pre-determined fauna release sites. 6. Fell habitat trees carefully using equipment that allows habitat trees to be lowered to the ground with minimal impact (e.g. claw extension). Do not fell trees towards exclusion zones. Relocate felled habitat trees in areas of retained vegetation. 7. Records of the habitat removal process and fauna relocation will be kept and included in monthly reporting to OEH (Section 5.3). Any fauna mortality will be recorded and OEH will be notified if significant species are impacted, or as per the ecologists and wildlife handler's permit.