

UNION FENOSA
WIND AUSTRALIA



PALING YARDS WIND FARM
CHAPTER 12

FLORA & FAUNA IMPACTS

12 Flora and Fauna Impacts

12.1 Introduction

Anderson Environmental Consultants Pty Ltd was engaged by UFWA to assess the potential flora and fauna impacts of the project. The flora and fauna impact assessment report can be found at **Appendix 8a**. Following the preparation of Anderson Environmental's report, Environmental Management Resources Australia Pty Ltd (ERM) was engaged by UFWA to undertake additional field surveys and assessments and prepare a supplementary flora and fauna impact assessment report in May 2013 to address adequacy review comments from DoPI. The flora and fauna impact assessment report by ERM can be found at **Appendix 8b**. These reports should be read in combination, and where the same issues are addressed, the ERM report should be considered as the most up to date information which has informed the mitigation measures and requirements, including offset requirements.

The relevant sections of the Anderson Environmental report are summarised in **Chapter 12.2** and the ERM supplementary report is summarised in **Chapter 12.3** below.

The original assessment by Anderson Environmental was undertaken to determine the presence or potential presence within the site, particularly within the development footprint, of any threatened species, populations or endangered ecological communities as listed under the *Threatened Species Conservation Act 1995* (NSW) (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and to address the DGRs relating to flora and fauna. The survey and results of the survey for the Targeted Threatened Species Assessment was undertaken for a range of threatened species as outlined in Appendix E of the flora and fauna report at **Appendix 8a**.

ERM's supplementary flora and fauna assessment of the project was undertaken to specifically address the adequacy review comments from DoPI in May 2013 in relation to methodology, avoidance measures, assessment of impacts, bird and bat impacts, mitigation and offset requirements. The comments have been addressed in the full report at **Appendix 8b** and are summarised in **Chapter 12.3** below.

12.2 Anderson Environmental Assessment

12.2.1 Methodology

A literature review was carried out by Anderson Environmental Consultants Pty Ltd in order to assist in the identification of threatened flora and fauna species and endangered ecological communities listed under the TSC Act and the EPBC Act which have the potential to occur in the area of the site. The literature review was based on database searches of:

- NPWS Wildlife Atlas for the Oberon and Upper Lachlan Local Government Areas;
- EPBC online Protected Matters database search tool for the Oberon and Upper Lachlan Local Government Area; and
- NPWS (2000) Forest Ecosystem Classification and Mapping for the Southern CRA region, Volumes I and II.

The field surveys were based on the following methodology;

- Initial site familiarisation to determine potential ecological issues in relation to turbine cluster sitings, access tracks and access roads.
- Field surveys to identify habitat types, condition and potential level of impacts.

- Field surveys to identify vegetation types, condition and potential level of impacts including targeted threatened plant surveys. This entailed a modified random meander approach of transects through the vegetation and paddock areas. This approach allows for the easy identification of vegetation community types and boundaries and is particularly suited to areas where the quality of vegetation varies. The four Transmission Routes were assessed based on the mapping provided with regard to minimising the ecological impacts.
- Mapping of vegetation community units on aerial photographs. This was undertaken concurrently with the field surveys to identify the vegetation types.
- Mapping of habitat types on aerial photographs. This was undertaken concurrently with the field surveys to identify the vegetation types.

The approach used by ERM in the supplementary flora and fauna impact assessment varies from the methodology outlined above. Refer to ERM's methodology at **Chapter 12.3.1** below, which addresses DoPI comments and the Threatened Species Survey and Assessment Guidelines.

12.2.2 Existing conditions

The assessment by Anderson Environmental Consultants Pty Ltd found that the site is generally cleared for sheep and cattle grazing with remaining native vegetation located mostly on the slopes where the soil condition and quality has no value for grazing activities.

The site contains a combination of good quality agricultural and poorer quality agricultural soils. The type and quality of vegetation present on site and the areas of land cleared for farming reflects these soil types. All of the better quality lands have been cleared and used for agriculture and have been pasture improved. The surrounding poorer quality land has been either cleared with little or no pasture improvement or has been retained as timbered country.

The site is bordered by National Parks and uncleared land to the south-east, all of which are heavily vegetated. The area surrounding the proposed wind farm site consists predominantly of large rural properties and National Parks.

12.2.3 Results

The results of the literature review and background searches by Anderson Environmental Consultants Pty Ltd revealed that a number of endangered ecological communities and threatened flora and fauna species listed under the EPBC Act and/or TSC Act that have the potential to occur at the site.

Refer to the flora and fauna report at **Appendix 8a** for the full list of species with the potential to occur on site.

Each threatened species which was considered likely to have the potential to occur on site and to be potentially impacted by the project was further assessed in accordance with:

- the criteria contained in the EPBC Act in the case of species listed under the EPBC Act; and
- the 7-Part Tests of Significance criteria in the case of species listed under the TSC Act.

The results are outlined in the sections below.

12.2.4 Flora results

The results of the field surveys detected no Endangered Ecological Communities or individual threatened flora species listed under either the EPBC Act or the TSC Act within the site apart from the State 2 (Box Gum Grassy Woodland State and Transition Model) which is protected by the conservation agreement applying in the Paling Yards property.

In order to avoid impacts on the State 2 (Box Gum Grassy Woodland State and Transition Model), it is no longer proposed to construct turbines P2, P6, P7 and their associated access tracks and crane hard stand.

The wind farm has been designed to be situated mainly on cleared grazed paddock areas, therefore avoiding as far as possible potential ecological impacts to the extent practicable.

Refer to the summary of ERM's flora findings at the site, including the Biometric Vegetation Types, in **Chapter 12.3.2** below.

12.2.5 Remnant native vegetation

The areas of native forest vegetation remaining within the site are described in the report at **Appendix 8a** and summarised under the following headings.

Refer to **Figure 45 – Vegetation Site Plan** and **Figure 46 – Vegetation Plan - Changed Area** for the locations of the different remnants, the project infrastructure, and the changes to the project in order to avoid and minimise impacts on flora and fauna. The mapping of remnant native vegetation by Anderson Environmental Consultants Pty Ltd focused on forested and bushland areas, and other areas of recognised flora communities. Refer to the summary of ERM's additional flora findings at the site, including the Biometric Vegetation Types, in **Chapter 12.3.2** below.

Remnant A

Remnant A comprises tracts of bushland to the southeast and west of the Abercrombie River. No removal or disturbance of this vegetation is proposed.

This remnant represents the Box Gum Woodland which is the subject of the conservation agreement and is located in the south-west of the 'Paling Yards' property within the site. The Box Gum Woodland is listed as a Critically Endangered Ecological Community under the EPBC Act.

It was initially proposed to construct turbines P2, P6 and P7 within this remnant. However, in order to minimise impacts on the Box Gum Woodland, it is no longer proposed to construct turbines P2, P6 and P7 and these no longer form part of this application.

Accordingly, the project will not impact on Remnant A or any land subject to the conservation agreement.

Remnants B and C

Remnant B extends along the southern portion of the 'Paling Yards' property boundary within the site to the Abercrombie River. This area generally contains a poor quality soil type. The vegetation within this area is generally dominated by Red Stringybark (*E. macrorhyncha*), Long-leafed Box (*E.goniocalyx*), Brittle Gum (*E.mannifera* ssp *maculosa*) and Scribbly Gum (*E.rossii* with occasional *E.sclerophylla*). This vegetation community is not listed as an Endangered or Threatened vegetation community under either the EPBC Act or the TSC Act.

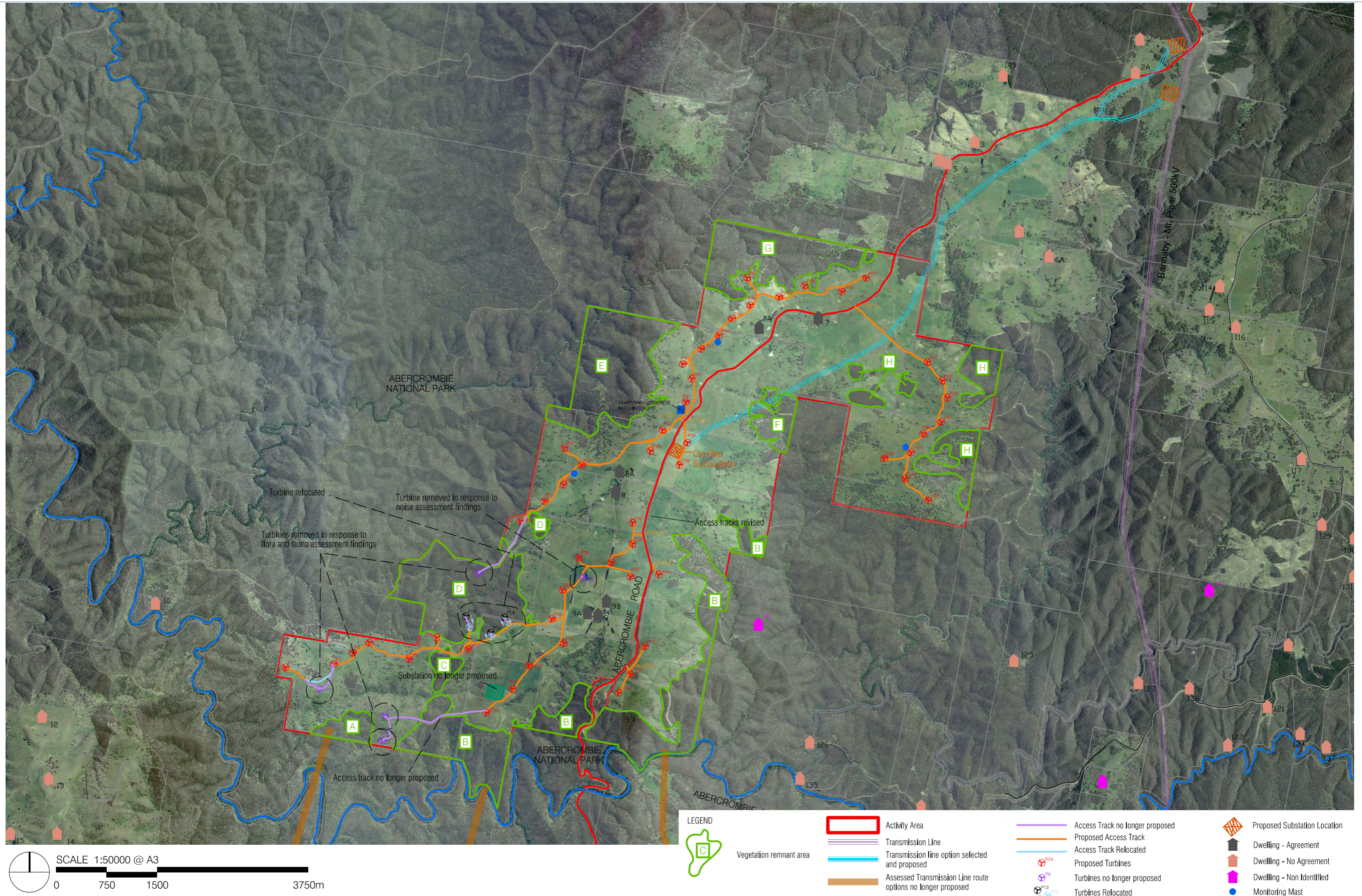
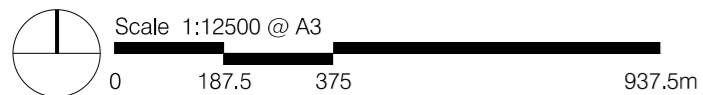
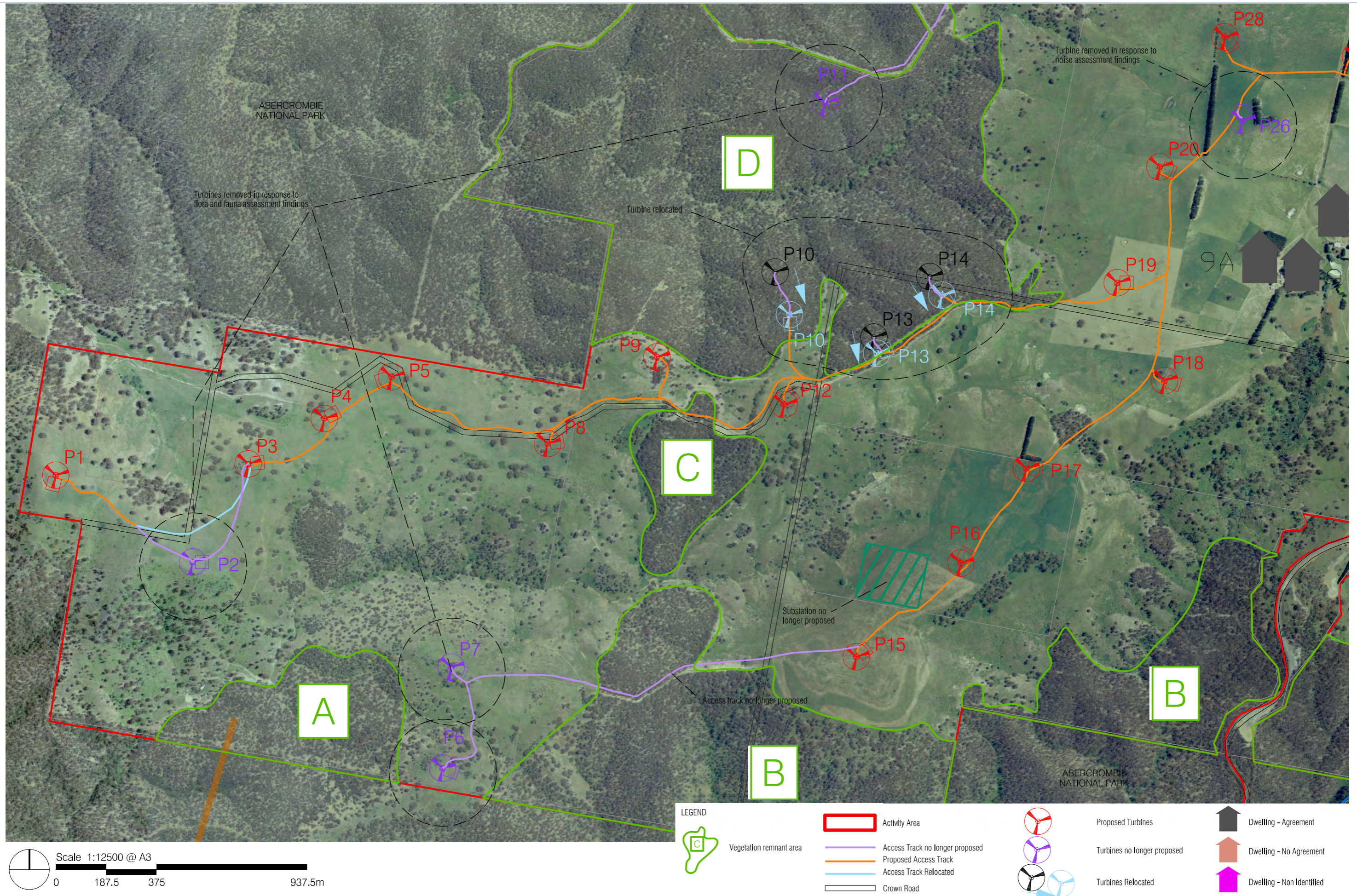


Figure 45 Vegetation Site Plan



LEGEND					
	Vegetation remnant area		Activity Area		Proposed Turbines
	Access Track no longer proposed		Proposed Access Track		Turbines no longer proposed
	Access Track Relocated		Crown Road		Turbines Relocated
					Dwelling - Agreement
					Dwelling - No Agreement
					Dwelling - Non Identified

Figure 46 Vegetation Plan - Changed Area

Remnant C contains the same vegetation type as Remnant B and would not be impacted significantly by the project. An access track would disturb a small part of the northern side of this remnant where there is an existing farm track traversing through the remnant area.

Remnant D

Remnant D comprises one area of vegetation located along the western boundary of the site extending to the west.

Most of this remnant is located on the 'Licking hole Soil Landscape'. This soil type is quite limiting to farming practices as it is extremely poor. It is not often cleared as it is not particularly conducive to agricultural use.

It contains Western Tablelands Dry Forest comprising Red Stringybark (*Eucalyptus macrorhyncha*), Broad-leafed Peppermint (*Eucalytus dives*), Brittle Gum (*Eucalyptus mannifera*), and Candlebark (*Eucalyptus rubida*).

This vegetation is not representative of an Endangered or Threatened vegetation community listed under either the EPBC Act or the TSC Act.

Turbines P10, P13 and P14 have been relocated from their original proposed locations within this remnant to now occur on the edge of this remnant area. Turbine P11 and its associated access track and temporary crane hard stand have been deleted from the layout. This redesign has considerably reduced the impacts on this vegetation.

Surveys of the proposed turbine location and access tracks detected no listed threatened species or endangered ecological communities. Turbine P11 had potential to cause impact to this remnant however this turbine has been deleted from the proposal and therefore the potential impact has been avoided.

Remnants E, F, G and H

Remnants E and G are one continuous remnant occurring along the western boundary of the property. These will not be impacted by the project. Remnants F and H occur on the eastern side of the property. Remnant F comprises tracts of vegetation to the east. Remnant H comprises several small polygons of vegetation left in the paddock areas.

None of these remnants would be impacted by the proposal.

12.2.6 Native vegetation removal

The extent of vegetation removal on the site required to facilitate the construction of the project infrastructure (including turbines, access tracks, crane hard stands, and substations) would be small relative to the size of the site. The mapping of remnant native vegetation by Anderson Environmental Consultants Pty Ltd focused on forested and bushland areas, and other areas of recognised flora communities.

Native vegetation disturbed as a temporary measure during construction would be rehabilitated as part of a Vegetation Management Plan. Anderson Environmental considers that the impacts of the project are not significantly higher than the levels of impact from the existing farm management practices of sheep grazing, cattle grazing, weed spraying, pasture improvement and low level timber collection. Refer to **Figure 45 – Vegetation Site Plan** and **Figure 46 – Vegetation Plan - Changed Area**.

The native vegetation removal and offset requirements were revised by ERM and are outlined in the supplementary Flora and Fauna report found at **Appendix 8b**. The native vegetation removal and offsets are summarised in **Chapter 12.3** of this report.

12.2.7 Transmission line impacts

The northern transmission route (option 4) represents the shortest path and would create the least ecological impacts of any of the options and is accordingly the proposed option for the construction of the transmission line. This option traverses predominantly cleared farming land which is maintained and consistent with the cleared grazing land found also on the site. Refer to **Figure 45 – Vegetation Site Plan**.

12.2.8 Fauna results

The results of the field surveys detected no threatened fauna within the site apart from the Gang Gang Cockatoo (*Callocephalon fimbriatum*) which is listed under the TSC Act as Vulnerable.

This species was detected in the woodland area near turbine P14. The Wedge-tailed Eagle (*Aquila audax*) was also detected during the surveys (around the area of turbines P1-P8 and flying over the Abercrombie River) and, while not a protected listed species under the TSC Act or the EPBC Act, it represents a significant species.

The targeted surveys and detailed habitat assessment for the Gang Gang Cockatoo indicate that the area represents potential habitat and it is recommended that potential impacts be mitigated by avoiding potential nest hollows where practicable. However, no actual nests were located during the targeted survey.

The targeted surveys and detailed habitat assessment for the Wedge-tailed Eagle did not *identify any nest*. Accordingly, *this species is unlikely to be impacted by any clearing required for the wind farm and its associated infrastructure*. Generally this species was observed soaring well above the maximum turbine height, and often over the forested area to the north and the Abercrombie River area to the south which are not proposed to be impacted by the project.

The project is not considered to result in the breaking of any biodiversity or wildlife corridors and there will be no interruption to gene flow or wildlife movements.

The proposed use of many of the existing farm access tracks significantly reduces the levels of impact and there would be no impacts on riparian or instream habitats. As the land is already cleared where most of the infrastructure is proposed, there are considered to be no biodiversity corridor impacts. An Ecological Restoration Plan will be developed as part of the CEMP and will address the post-construction works to be undertaken to rehabilitate the areas that are disturbed as part of the construction works once construction is finalised.

Refer to the summary of ERM's additional fauna findings at the site in **Chapter 12.3.2** below.

12.2.9 Bird and bat strike

Andersen Environmental acknowledges that there is potential for bird and bat strike to turbine blades as part of any proposed wind farm development.

There are generally only two threatened bat species with potential to be impacted. These are the Common-bent Wing Bat and the Yellow-bellied Sheath-tailed Bat. Due to the characteristics of these species, the potential losses of bats as a result of impacts with turbines are likely to be 'extremely low'.

In relation to potential bird strike the main species with the potential to be impacted are high flying species such as raptors, waterbirds, owls and migratory species. There are no significant habitats for waterbirds present on site and only low quality potential habitat for migratory birds.

Therefore, the risk of collisions to waterbirds and migratory species is unlikely to be significant. No significant flocks of waterbirds were seen during the surveys undertaken.

The turbine blade movements result in lower air pressure being created around the blades, which can potentially cause Barotrauma to the lungs of the migratory bats in the vicinity of this sudden change in air pressure (Baerwald et al, 2008 cited in Anderson Environmental report).

Raptors, such as the Whistling Kite and Wedge-tailed Eagle, and owls have potential to be impacted as they spend time at similar heights to the rotor swept area. These raptors and owls have excellent sight and can detect the smallest of movements at ranges of up to 500 metres, and therefore the likelihood of these species not detecting large movements such as those of turbine blades is considered 'extremely low'.

Refer to the summary of ERM's assessment of potential bird and bat impacts at the site in **Chapter 12.3.2** and **12.3.3** below.

12.2.10 Conclusion

Anderson Environmental concluded that:

- The project is not likely to result in a significant impact on any endangered ecological community or species listed under the EPBC Act. Accordingly, the Project is not considered, for this reason, to require referral or approval under the EPBC Act.
- The project is not likely to result in a significant impact on any species listed under the TSC Act. Accordingly, there is no requirement for a species impact statement to be prepared.

The conclusions of the supplementary flora and fauna report prepared by ERM are summarised at **Chapter 12.3.3** below.

12.2.11 Mitigation

The following recommendations are made in the flora and fauna impact assessment report in relation to the implementation of the project.

Refer to **Chapter 12.3.6** below for the additional mitigation measures proposed by ERM in the supplementary Flora and Fauna report.

Bat Monitoring and Habitat Tree Inspections

Once the access roads and access tracks are pegged by surveyors potential hollow habitat trees (that require removal) should be identified by ecological survey. These trees should be stag watched at dusk using infra-red spotlights and anabat detectors to determine usage by any threatened microchiropteran bats. Accessible tree hollows that require removal should be inspected for fauna by infrared telescopic camera prior to removal to ensure that no species present in the hollow are harmed during removal.

Bird Monitoring and Bat Strike Monitoring

An additional baseline pre-commissioning survey should be undertaken at each turbine site during the spring/summer season. This would provide baseline data for the bird and bat strike monitoring study which should be undertaken during the first year of the operation of the wind farm.

The recording of calls utilising Anabat recorders would enable information such as time of flybys and also if any feeding buzzes are recorded. This would allow area usage

data to be gained (by species) and also active use data through feeding buzz recording. Activity levels can then be used to modify wind farm management if required.

Ecological Restoration Plan

A vegetation/ecological restoration management plan should be undertaken for the areas that are disturbed as part of the construction works so they can be rehabilitated once construction is finalised.

This would include details for the management of any areas of native vegetation to be disturbed and the method and timing for their restoration along with specifics of habitat restoration for fauna and weed management.

The areas should have detailed surveys before any vegetation is removed. This should record any microhabitat features and provide a detailed plan outlining areas of impacts at a micro level. This will allow for placing of sediment and erosion control fence designs to reduce any indirect impacts on vegetation.

Erosion and Sediment Control Plan

To avoid and reduce disturbance to drainage lines within the site, runoffs from work sites should be managed by appropriately designing the wind farm access tracks and other infrastructure by incorporating erosion and sediment control methods during the construction and operational stages. This would be undertaken as part of the engineering design for the implementation of the access and construction tracks. The erosion and sedimentation control plan would consider the soil types and potential for erosion.

Native Vegetation Management Plan

A native vegetation management plan should be prepared to ensure minimal removal of native vegetation for the construction of the wind farm infrastructure, and measures to ensure native vegetation in the vicinity of the development footprint are not affected.

All environmental controls should be audited for compliance regularly during construction and after commissioning.

This would include micro mapping of vegetation around each turbine to avoid any unnecessary removal of vegetation and also the access tracks. This would also allow for vegetation planting species when the wind farm is decommissioned.

Weed Management Plan

A weed management plan should be prepared to ensure that the construction and operation of the project does not contribute or cause an increase in the weed species within the site. The plan should put in place control measures for minimising weed during and after construction.

Generally there are high levels of weeds on the site area however as a precaution wash bays should be sited so trucks and machinery can be washed down to prevent weed seed being spread both onto and off site.

Bat and Avifauna Management Plan

A bat and avifauna management plan should be prepared to manage and mitigate any bird and bat strikes resulting from the operation of the project. Carcass search protocol should be implemented to identify more accurately the mortality rates of the bats and birds within the site.

Identification of any species lost along with the data gained from Anabat recording would enable adaptive management of the project if required.

12.3 ERM Supplementary Assessment

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by UFWA in May 2013 to undertake a Supplementary flora and fauna Assessment. The intent of this work was to build on the investigations into flora and fauna carried out by Anderson Environmental Consultants. It has been prepared in response to elements of the NSW Department of Planning and Infrastructure's adequacy review letter dated 9 May 2013.

In relation to some elements of the ecological investigations, ERM have used different methods and assumptions than Anderson Environmental Consultants, leading to more conservative results.

12.3.1 Methodology

ERM undertook a five day site visit during 20 – 24 May 2013. This section outlines the methods used to undertake the flora and fauna assessment during the site visit and subsequent data analysis and reporting. Surveys included the northern transmission line route, which had not been mapped in detail in the previous surveys.

Vegetation mapping

To prepare the vegetation mapping, ERM undertook the following tasks:

- Review of existing available mapping products
- Review of the NSW Biometric Vegetation Types (BVTs) Database
- Qualitative field observation and plot/transect data collection according to the BioBanking Assessment Methodology (BBAM) (December 2009)
- A total of 15 plot/transects were completed with at least one completed in each of the different vegetation types
- 'Vegetation Zones' were created to represent the diversity of vegetation condition across the site, which was achieved by assigning primary and secondary condition classes to each area of BVT in the site (see **Table 21** below for details on the condition classes)
- Where relevant the Vegetation Zones were equated to Threatened/Endangered Ecological Communities listed under the EPBC Act and TSC Act

The table below provides descriptions of the primary and secondary condition classes for the site, based on the BBAM (December 2009).

Table 21 Condition Class Definitions

Condition Class * (Primary _ Secondary)	Definition
Mod-Good_Poor-Weedy	Native over-story percent foliage covers between 25% of the lower benchmark value and within benchmark value. Groundcover greater than 50% area covered by introduced species
Mod-Good_Poor-Grassland	Over-story percent foliage cover less than 25% of the lower benchmark value, however groundcover greater than 50% area covered by indigenous species
Mod-Good_Shrubby	Over-story percent foliage cover less than 25% of the lower benchmark value; and although shrubby, mid-story below benchmark value however groundcover greater than 100% of benchmark value appearing as a response to recent clearing
Mod-Good-Mod	Over-story percent foliage cover greater than 50% of the lower benchmark value; and Mid-story and groundcover affected by grazing or other agricultural impact however benchmark community structure and species composition partially represented
* Primary condition class definition is that for woody vegetation types in the BBAM (DECC 2009)	

Flora

A floristic inventory was collected through the identification of all flora species encountered in the BBAM plot/transects or incidentally in the field, either in-situ or by collecting a sample for later identification.

ERM undertook the flora surveys in accordance with the Threatened Species Survey and Assessment Guidelines and the BBAM, in terms of the techniques used the level of effort and the information recorded. The quadrats were not undertaken during the appropriate season for optimal detection of threatened species and therefore, ERM assessed the potential for threatened species to occur based on the available habitat and the information provided in previous studies of the area.

Habitat

The site was firstly assessed through interpretation of satellite imagery, and then areas supporting native vegetation and potential fauna habitat were located and surveyed by vehicle and on foot.

Fauna habitats were quantified using biometric plots, which were undertaken in each BVT.

Fauna

Bat surveys were undertaken using static Songmeter bat detectors to sample the echolocation calls of free-flying bats at the site. These Songmeter surveys were conducted at five locations (of varying habitat conditions) between 20 and 24 May 2013. All Songmeter units were placed in close proximity to the proposed turbines, and commenced operation approximately 30 minutes before dusk and ceased approximately 30 minutes after dawn. The total survey equated to 18 Songmeter nights in total. It is noted that there were timing restrictions for the field surveys and the late

autumn survey was not optimal for microbats, and therefore it is anticipated that the abundance and diversity of the microbats detected will be lower than during spring and summer months.

ERM's fauna surveys included habitat survey, targeted surveys for birds and bats and opportunistic sightings. ERM undertook these surveys in accordance with *Threatened Species Survey and Assessment Guidelines*, however, not all the techniques outlined in the Guidelines were considered appropriate for the site or the season (late autumn). Harp trapping was not conducted for several reasons including the season and cold temperatures. ERM notes that "*Due to the cold temperatures and late autumn survey period, it was anticipated that fauna activity would be low and any captured fauna would be subjected to an elevated chance of mortality due to the cold*". During ERM's surveys, temperatures dropped below freezing on two of the survey nights, with the minimum temperature at Taralga at -5°C. *These issues were discussed with David Geering (OEH Dubbo, 16/05/13)*".

The analysis of bat cells was undertaken by Narawan Williams (consultant ecologist, Clarence Town, NSW). Bat species were given a 'Definite', 'Probable' or 'Possible' status, depending on the identification during the analysis.

Bird Utilisation Surveys (BUS) were undertaken on 20 and 21 May 2013 to assess species prone to rotor strike. All birds observed incidentally throughout the field surveys were also identified and it was noted if they were flying within the Rotor Swept Area (RSA) height range (between 25 and 200 metres).

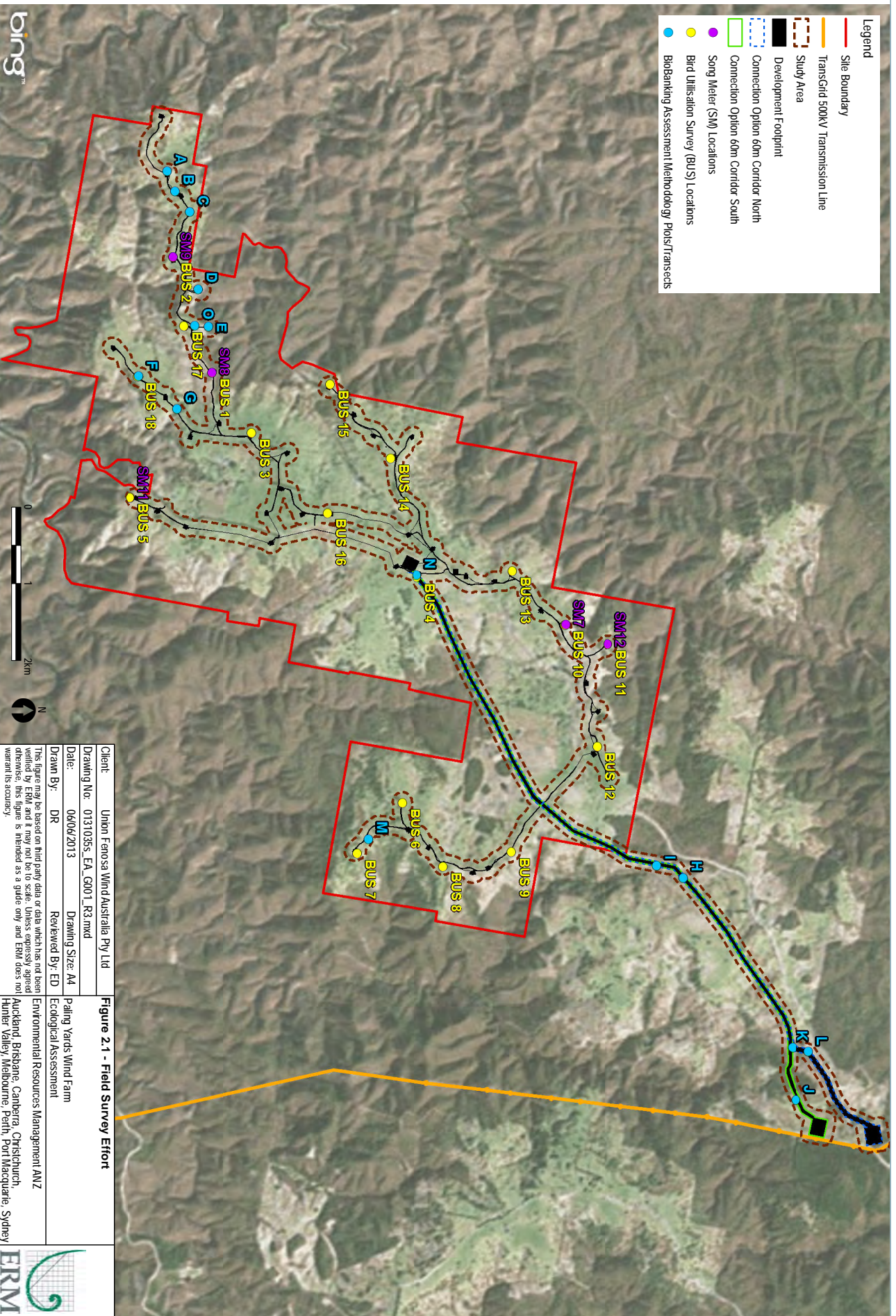
The methods adopted for the BUS were consistent with the requirements for a "Level One" bird risk assessment endorsed in the AusWEA (2007) Best Practice Guidelines. Eighteen survey points were established across the site at proposed wind turbine locations (refer to **Figure 47 – BUS Survey Effort**). The BUS method involved two observers stationed at a fixed survey point for 15 minutes, recording the abundance of all large bird species observed within 800 metres and all small birds within 100 metres. Using a conservative approach, bird flight heights were identified and classified as: 'below RSA height' (less than 30 metres), 'at RSA height' (30 to 175 metres), or 'above RSA height' (above 175 metres).

It is noted that the BUS surveys represent a snapshot of activity during late autumn, rather than a seasonal variation of bird utilisation within the site. The BUS survey data (undertaken over two days in May 2013) represents a small sample size, and varying activity levels or changes in the abundance of birds seasonally is therefore not taken into account. Increased survey effort in a variety of seasons may pick up other species of birds flying at RSA height which could then be assessed using the model.

ERM undertook bird and bat field surveys and habitat assessments in relation to bird and bat collision risk. The data collected was input into a collision risk model for birds and informed consideration of the potential impacts to bats. Mitigation measures have been provided to reduce the potential impacts to birds and bats.

Offsets

The area of offset required (as well as vegetation types) for the project was determined through a BioBanking Assessment, undertaken by an accredited BioBanking assessor Evelyn Craigie (Accreditation Number 0089). It was largely undertaken in accordance with the BBAM and Credit Calculator Operational Manual (DECC 2009), however, a simplified approach was adopted, with one 1,000 ha assessment circle and one 100 ha assessment circle used. This covered an area that was representative of native vegetation cover across the development footprint (not the entire site). This approach



Client:	Union Fenosa Wind Australia Pty Ltd
Drawing No:	01310355_EA_G001_R3.rnd
Date:	06/06/2013
Drawn By:	DR
Reviewed By:	ED
Drawing Size:	A4

Figure 2.1 - Field Survey Effort

Palling Yards Wind Farm
Ecological Assessment

Environmental Resources Management ANZ
Auckland, Brisbane, Canberra, Christchurch,
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



FIGURE 47 BUS Survey Effort

has been used in previous indicative BioBanking assessments for wind farm projects and was considered appropriate for this project.

Limitations

The field surveys undertaken by ERM during May 2013 focused on vegetation mapping, flora, habitat, bird and bat survey. ERM note that while the surveys were undertaken in accordance with the *Threatened Species Survey and Assessment Guidelines*, the limited extent and timing of the surveys has resulted in divergence from the Guidelines in some instances (see *Fauna* section above). Where a divergence was necessary, ERM liaised with OEH to confirm the suitability of this approach.

12.3.2 Results

Areas of exotic pasture are widespread across the site, which is predominantly used for cattle and sheep grazing. The majority of the land within the development footprint of the proposed wind farm “*consists of improved pasture with scattered Eucalypt trees and small patches of derived native grassland around the periphery*”. These areas of pasture improvement are dominated by exotic pasture species. Field investigations identified 83 flora taxa within the site, 55 (66.3%) of which were indigenous and 28 (33.7%) are introduced.

The field investigations did not identify any threatened flora species nor any optimal or sub optimal habitat for any threatened flora species.

Four Biometric Vegetation Types (BVTs) were identified at the site. The BVT code, vegetation name/description, condition class and area of this BVT within the development footprint are summarised in the table below.

Table 22 Biometric Vegetation Types

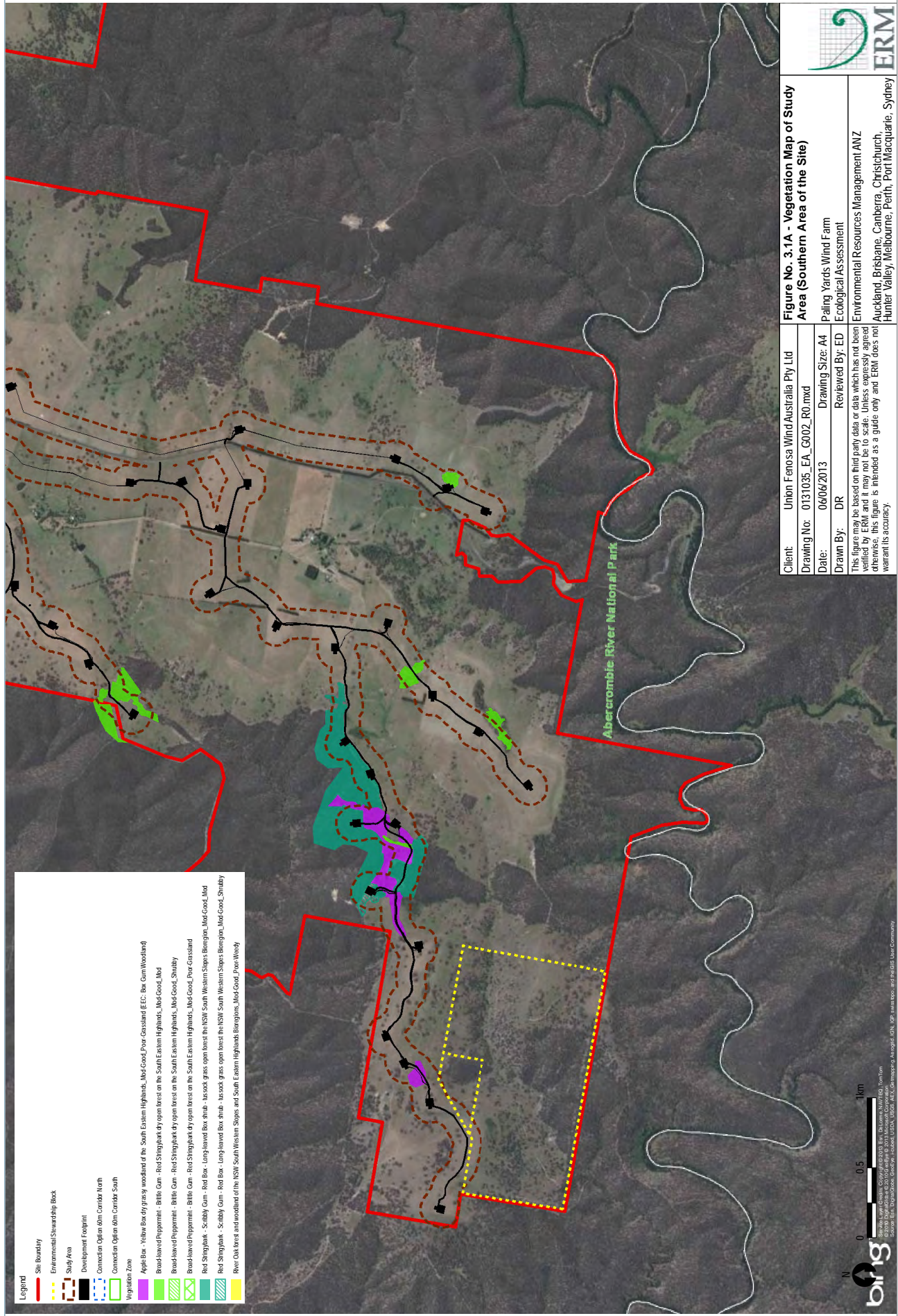
BVT code	Vegetation zone	Condition class	Area within development footprint *(ha)	Permanent impact area
LA103	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands (Box Gum Woodland occurring as Derived Native Grassland under TSC Act)	Mod-Good_Poor-Grassland	2.9	1.9
LA124	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	Mod-Good_Mod	6.9	6.9
		Mod-Good_Poor-Grassland	0.0	0.0
		Mod-Good_Shrubby	2.3	2.3
LA182	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion	Mod-Good_Mod	1.4	1.0
		Mod-Good_Shrubby	0.2	0.2
LA186	River Oak forest and woodland of the NSW South Western	Mod-Good_Poor-Weedy	0.3	0.3

	Slopes and South Eastern Highlands Bioregions			
TOTAL			14 hectares	12.6 hectares
*This area includes the northern transmission line impact area				

Note: Development footprint includes areas of existing cleared farm track, covering approximately 0.4 ha
Source: Based on Table 4.3 in flora and fauna impact assessment report at Appendix 8b

The four BVTs and their areas within the proposed development footprint of the wind farm are shown on **Figure 48 – BVT Vegetation Map (Southern Area)** and **Figure 49 – BVT Vegetation Map (Northern Area)**. Each BVT is summarised below:

- *LA103: Apple Box - Yellow Box Dry Grassy Woodland of the South Eastern Highlands:*
 - Exists in small patches at the site and consists of native grasses occurring in pasture; scattered Apple Box (*Eucalyptus bridgesiana*), Yellow Box (*E. melliodora*) and Manna Gum (*E. viminalis*) trees occur throughout the pasture, but not in the patches of native grass.
 - The native grass patches in the west of the site are dominated by Red Grass (*Bothriochloa macra*) and the patch in the centre part of the site is dominated by Weeping Grass (*Microlaena stipoides*) (these patches are subject to ongoing stock grazing).
 - The Vegetation Zone does not constitute the EPBC-Act listed condition of Box Gum Woodland as the patches have no mature trees (including no regeneration) and very low herb species richness.
- *LA124: Broad-Leaved Peppermint - Brittle Gum - Red Stringybark Dry Open Forest On The South Eastern Highlands:*
 - A woodland dominated by Broad-leaved Peppermint (*Eucalyptus dives*) and Red Stringybark (*E. macrorhyncha*) with occasional Bundy (*E. goniocalyx*) and Black Sally (*E. stellulata*).
 - Grass species characteristic of this BVT are Small-flowered Wallaby-grass (*Rytidosperma setaceum*) and Snowgrass (*Poa sieberiana*).
 - Occurs mostly around the fringes of the site however some patches occur within the site.
 - The BVT is widespread in the development footprint area in two modified forms: cleared recently and allowed to regenerate with a thinned tree canopy layer and more densely distributed *Cassinia* shrubs and grasses; and cleared except for some scattered trees that have been retained amongst the native grasses used as pasture.
- *LA182: Red Stringybark - Scribbly Gum - Red Box - Long-Leaved Box Shrub - Tussock Grass Open Forest The NSW South Western Slopes Bioregion:*
 - Woodland dominated by Inland Scribbly Gum (*Eucalyptus rossii*) and Red Stringybark.
 - Occurs on crests and slopes in the south west of the site.



- Legend**
- Site boundary
 - Environmental Stewardship Block
 - Study Area
 - Development Footprint
 - Connection Option 40m Consider North
 - Connection Option 40m Corridor South
 - Vegetation Zone
 - Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands_Med Good_Poor Grassland (EEC: Box Gum Woodland)
 - Broadleaved Peppermint - 80% Gum - Red Stringybark dry open forest on the South Eastern Highlands_Med Good_Med
 - Broadleaved Peppermint - 80% Gum - Red Stringybark dry open forest on the South Eastern Highlands_Med Good_Stubby
 - Broadleaved Peppermint - 80% Gum - Red Stringybark dry open forest on the South Eastern Highlands_Med Good_Poor Grassland
 - Red Stringybark - Scabby Gum - Long leaved Box shrub - tussock grass open forest the NSW South Western Slopes Benelong_Med Good_Med
 - Red Stringybark - Scabby Gum - Long leaved Box shrub - tussock grass open forest the NSW South Western Slopes Benelong_Med Good_Stubby
 - River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Benelong_Med Good_Poor/Woody

Client:	Union Fenosa Wind Australia Pty Ltd
Drawing No:	0131035_EA_G002_R0.mxd
Date:	06/06/2013
Drawn By:	DR
Reviewed By:	ED
<p>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>	

Figure No. 3.1A - Vegetation Map of Study Area (Southern Area of the Site)

ERM

Paling Yards Wind Farm
Ecological Assessment
Environmental Resources Management ANZ
Auckland, Brisbane, Canberra, Christchurch,
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

FIGURE 48

BVT Vegetation Map (Southern Area)

- The BVT is widespread in the development footprint area. Occurs with a thinned tree canopy layer and more densely distributed shrubs such as Hoary Guinea Flower, Heath Wattle (*Acacia brownii*), Ploughshare Wattle (*A. gunnii*), Daphne Heath (*Brachyloma daphnoides*) and Purple Wiregrass (*Aristida ramosa*).
- *LA186: River Oak Forest and Woodland of The NSW South Western Slopes And South Eastern Highlands Bioregions:*
 - Woodland along some ephemeral drainage lines dominated by Blakely's Red Gum (*Eucalyptus blakelyi*) and Manna Gum (*E. viminalis*).
 - Willow trees (*Salix* spp.) present along these drainage lines.
 - Very few native species in the mid and ground layer with a major abundance of Blackberry (*Rubus fruticosus* agg. spp.) shrubs.
 - No River Oaks were observed.

During the field surveys over a five-day period, a total of five native mammals and two exotic mammals were observed. Forty bird species were recorded incidentally during the field surveys; including two species listed as Vulnerable under the TSC Act, the Flame Robin and the Scarlet Robin. Refer to **Figure 50 – Threatened Fauna Species Record Locations** for the locations where threatened fauna was recorded within the projects site.

During the BUS undertaken over a two day period, a total of 125 birds were recorded from 18 surveys. There were 13 different species identified, with the Australian Raven, Australia Magpie (*Cracticus tibicen*) and the Wedge-tailed Eagle being the most predominant species. One threatened species was recorded: Scarlet Robin (this species is unlikely to fly at RSA height). No migratory species were recorded. Wedge-tailed Eagles were recorded flying at RSA height nine times during the BUS, which is 7% of the total number of birds recorded. No threatened species were observed flying at RSA height during the BUS.

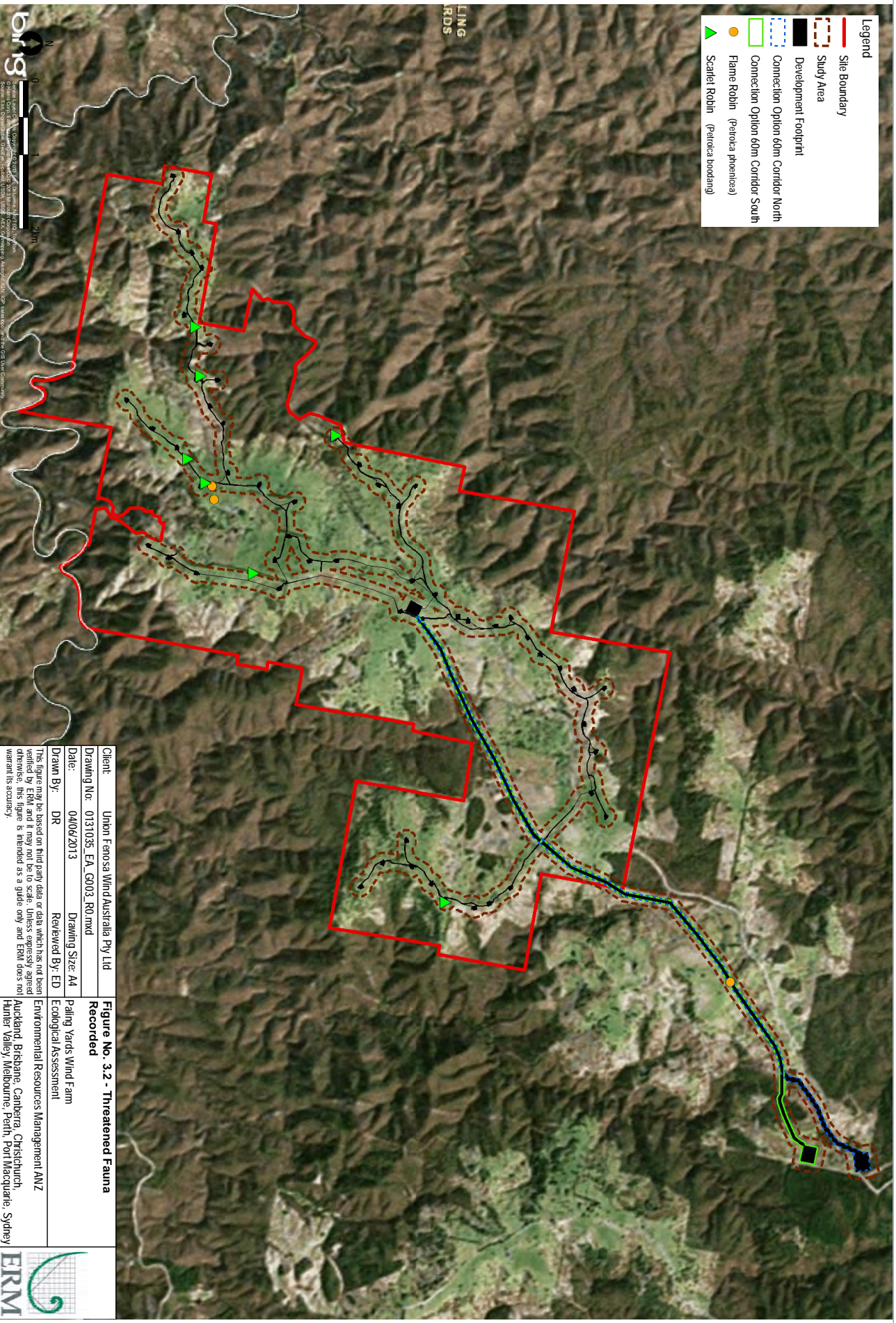
A total of 2,981 bat calls were analysed. Twelve microbat species were identified with varying levels of confidence (five definite, one probable, three possible and three that could be one of two species). This included three threatened species, none of which were a definite identification.

12.3.3 Assessment of impacts

The project comprises a number of components that would impact on flora and fauna features, including permanent and temporary components. However, ERM concludes that:

“The project would not have a significant impact on any threatened ecological communities or species. The majority of the development footprint consists of improved pasture with scattered Eucalypt trees and small patches of derived native grassland around the periphery. Measures have been provided to manage impacts, including avoidance and mitigation measures. An offsets package is proposed to be developed that will compensate for the residual impacts to biodiversity”.

In regards to matters of national significance, the Department of Environment and Heritage (now Department of Environment) decided in March 2005 that the proposed ‘action’ under the EPBC Act is not a ‘controlled action’ and therefore, approval under Part 9 of the EPBC Act is not required (EPBC Reference 2005/2018).



- Legend**
- Site Boundary
 - - - Study Area
 - - - Development Footprint
 - - - Connection Option 60m Corridor North
 - - - Connection Option 60m Corridor South
 - Flame Robin (*Petroica phoenicea*)
 - ▲ Scalded Robin (*Petroica boodang*)

Client: Union Fenosa Wind Australia Pty Ltd
 Drawing No: 0131035_EA_G003_R0.mxd
 Date: 04/06/2013
 Drawing Size: A4
 Drawn By: DR
 Reviewed By: ED

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure No. 3.2 - Threatened Fauna Recorded
 Palling Yards Wind Farm
 Ecological Assessment
 Environmental Resources Management ANZ
 Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney



FIGURE 50

Threatened Fauna Species Record Locations

ERM notes that since this decision, the potential impacts to 'Matters of National Environmental Significance' associated with the project have not changed, and therefore recommends that further assessment under the EPBC Act is not required.

The specific impacts that are considered in ERM's Flora and Fauna Impact Assessment (supplementary report) are:

- vegetation clearance;
- collision-related mortality;
- barotrauma; and
- avoidance of habitat (specific to birds and bats).

The potential impacts of the projects components on the flora and fauna within the site are outlined under the relevant headings below.

Vegetation clearance

ERM note that vegetation clearance is required to install the components of the wind farm, including temporarily cleared areas during the construction phase (rehabilitated upon completion of the construction works), and the permanently cleared areas. The potential impacts of vegetation clearance include:

- reduction in the extent of native vegetation
- loss of habitat
- introduction of weeds
- modification of surrounding areas of native vegetation

The project's development footprint covers a total area of 106.5 hectares, including:

- a permanent impact area of 33.1 hectares,
- a temporary impact area of 13.0 hectares, and
- an impact area of 60.4 hectares associated with the northern transmission line.

The clearing for the northern transmission line will be limited to the pole locations and the electrical safety clearance envelope for conductors.

Of the total development footprint, 92.5 hectares comprises exotic pasture, cropping, planted vegetation or bare ground, thereby reducing the extent of native vegetation clearance.

The remaining 14.0 hectares of the development footprint comprises areas of native vegetation (of which 12.6 hectares is permanent clearing). Therefore, 14.0 hectares of native vegetation is proposed to be removed for the project infrastructure (including the northern transmission line), with 1.4 hectares proposed to be rehabilitated.

ERM concludes that the proposed vegetation removal would not impact on the viability of ecological communities or native flora species within the site or the wider locality, as the majority of vegetation to be removed is not unique in the site or locality. The project is unlikely to impact seed dispersal, animal movements or remove habitat features that are essential to species survival.

Collision-related mortality

The Wedge-tail Eagle was the most frequently observed bird species flying at RSA height (9 sightings). The other species observed at RSA, the Australian Raven and Australian Magpie, were recorded infrequently. ERM found that significant collision-related mortality is not likely within the site due to the project, given the abundance and wide distribution of the species recorded flying at RSA height. No threatened bird species were recorded flying at RSA height.

A 99% avoidance rate was applied to the model and the results indicate that the Wedge-tailed Eagle has a collision risk which would result in 0.052 birds per month or 0.62 birds per annum colliding with rotors once the project is operational.

In relation to bats, the proportion of bats that would be at risk of rotor collision impacts at the site was assessed as relatively low, as the species recorded are likely to be dispersed over a wide area. However, ERM note that it was difficult to assess utilisation of the site without surveys throughout the summer and spring months and therefore the potential for collision impacts may be higher.

ERM recommends the monitoring of birds and bats during the operation of the wind farm, to determine the impact of the turbines. This monitoring should include bat and bird mortality, including that caused by collision and barotrauma for bats. This is valuable in order to determine which species are vulnerable to rotor impact and the abundance of animals affected.

Barotrauma

The bat species that may be at risk of mortality due to the effects of barotrauma are the Eastern False Pipistrelle, Eastern Bent-wing Bat and the Greater Broad-nosed Bat. In particular, the Eastern False Pipistrelle and the Eastern Bent-wing Bat forage near to RSA and have the potential fly into the low pressure areas created by moving turbine blades.

Avoidance of habitat (specific to birds and bats)

Careful turbine siting within the site to avoid areas of high habitat values assist in reducing the risk of alienation of habitat. The potential impact upon the Scarlet Robin and Flame Robin is unknown, as these species were recorded in areas of open pasture and may be displaced or remain largely unaffected by the presence of the turbines. ERM therefore adopted a precautionary approach in consideration of impacts to these species.

Wedge-tailed Eagles were observed frequently flying at RSA height and it is anticipated that they will avoid areas containing turbines (Smales 2005 cited in ERM report). It is noted that higher habitat for the species is widespread within the surrounding area. ERM found that there is unlikely to be a significant impact on this species.

12.3.4 Assessment of significance

The additional field surveys by ERM identified patches of Box-Gum Woodland derived native grassland within the proposed access track areas (refer to **Figure 48 – BVT Vegetation Map (Southern Area)**). Two threatened birds (Scarlet Robin and Flame Robin) and three threatened bats (Eastern False Pipistrelle, Greater Broad-nosed Bat and the Eastern Bent-wing Bat) were recorded during the May 2013 field surveys.

ERM assesses that the proposal is unlikely to have a significant impact on either the Scarlet or Flame Robin, the three threatened bats or the ecologically endangered community (Box Gum Woodland) and therefore, it is not considered necessary to undertake further assessment under the NSW TSC Act for the project.

12.3.5 Avoidance

Throughout the course of the project and planning process, the project design has undergone a series of amendments to take account of environmental, social and economic factors.

The amendments related to flora and fauna features considered the following factors outlined in the table below:

Table 23 Avoidance measures applied to site selection

Project feature	Original location	Adjusted location	Reason
Overhead transmission line	South from the PAA to the Crookwell 2 Wind Farm substation	North-east of the PAA to the Mt Piper to Bannaby 500kV transmission line	To avoid removal or modification of a large area of remnant native vegetation.
WTG: P2, P6 and P7 and their associated access tracks and crane pads	Within the Box Gum Woodland Environmental Stewardship Block	Removed	To avoid removal or modification of an area of Box Gum Woodland that is being managed under the Environmental Stewardship Program.
WTG P11 and its associated access tracks and crane pads	Within remnant native woodland	Removed	To reduce removal of areas of remnant native woodland.
WTG: P10, P13 and P14 and their associated access tracks and crane pads	Within remnant Red Stringybark Woodland and Broad-leaved Peppermint Woodland	Closer to the edge of the remnant	To reduce removal or modification of areas of remnant native woodland.

The above avoidance measures were taken in relation to the following flora and fauna considerations:

- areas of native vegetation, particularly those that are in good condition and / or meet the description of a TEC or EEC;
- habitat features for native fauna, including hollow bearing trees, exposed rock and native tussock grassland; and
- wildlife corridors.

The avoidance measures have been informed by ERM's analysis of the flora survey results and the extent to which native vegetation will be impacted by the project, as well as the results of the habitat and fauna surveys and potential fauna movements.

The project components have been sited predominantly within areas that do not support native vegetation or key habitat features. ERM considers that *"the level of avoidance is appropriate to the scale of the project and the ecological features of the area"*.

12.3.6 Additional mitigation measures

Additional flora and fauna impact mitigation measures are proposed for the project in the ERM report. These should be read in conjunction with the mitigation measures proposed by Anderson Environmental. The mitigation measures presented by ERM relate specifically to:

- native vegetation within the site; and
- bird and bat collision risk.

As part of the mitigation measures, ERM recommends a series of additions to the Construction Environmental Management Plan (CEMP), Operational Environmental Management Plan (OEMP), and Bird and Bat Monitoring Plan. They also recommend the preparation of an Ecological Restoration Plan.

Further ERM recommends that the proponent “*select the southern sub-option for the northern transmission line as this option would minimise clearing of native vegetation*” and “*develop an offset package in accordance with the Principles for the use of biodiversity offsets in NSW*” (OEH 2011).

These, as well as the native vegetation and bird and bat collision risk mitigation measures outlined below, have been added the Statement of Commitments at **Chapter 24**.

ERM recommends the following mitigation measures to minimise impacts on native vegetation and birds and bats within the site:

Vegetation Clearing

- all site staff are to be inducted on the procedures of the CEMP in relation to flora and fauna;
- the area to be cleared at the site will be clearly demarcated using flagging or fencing, and mapped on construction plans, to prevent breaches of the construction boundary;
- laydown or temporary disturbance areas will be located in already disturbed areas to avoid any unnecessary clearing of native vegetation and habitat;
- vehicles will remain on formed roads or tracks designed specifically for the purposes of the wind farm construction where possible;
- care will to be taken when working near wooded areas to prevent damage to adjacent tree roots and indirect impact to habitat areas;
- trenches will be excavated at least 15 m away from the base of trees where possible to prevent root damage;
- where practical, suitable fencing to be erected along trenches to prevent fauna falling in;
- habitat features such as logs, large rocks and fallen hollows within the proposed clearance footprint will be relocated to adjacent areas to supplement habitat where possible;
- any individual hollows removed will be replaced with artificial hollows within adjacent suitable habitat;
- Environmental Compliance Manager or field officer qualified in the handling of fauna to be present on-site during clearing to capture and re-release fauna (where appropriate);

- regular checking of trenches by the Environmental Compliance Manager to ensure any captured fauna are released according to the CEMP;
- pre-clearance surveys (including diurnal and nocturnal) undertaken to determine if roosts, nests or dens are present in any trees proposed for clearing;
- implement a two stage approach to clearing works;
 - o non-hollow bearing trees will be cleared before habitat trees to allow fauna an opportunity to move from the hollow bearing trees and allow time to concentrate rescue efforts on the trees that are most likely to be inhabited; and
 - o hollow bearing trees will be felled after a minimum 24 hour delay after clearing of non-habitat trees.
- native vegetation that is removed will be chipped and mulched for on-site use where practical;
- where practical, native vegetation greater than 3 m in height to be retained during transmission line construction; and
- rehabilitation of internal access roads that are not required following construction to be undertaken.

Weed Management

- where a specific weed risk has been identified, all machinery, equipment and vehicles are to be washed down before entry and egress of the site;
- piling of soil that may contain seeds of exotic species at least 50 m away from creeks, drainage lines and other areas of native vegetation, to prevent spread into adjacent areas during rainfall or wind events;
- topsoil recovery will be undertaken in areas that have a high proportion of native vegetation and few weeds in the ground layer of vegetation;
- all construction staff and sub-contractors educated on noxious weeds present at the site and ways to prevent spread;
- where practical, topsoil that has very few weeds to be harvested to salvage the native soil seed bank and reintroduced into disturbed areas. Otherwise, revegetate with locally native endemic species characteristic of the cleared vegetation type;
- control of perennial weed grasses within the disturbance zone for 3 to 5 years after construction;
- where practical, and in consultation with host landowners, manage stock access during periods of revegetation; and
- imported soil and rubble to be certified as free of weeds and weed seeds.

Ecological Restoration Plan

ERM recommends that an Ecological Restoration Plan be developed that outlines the specific measures for rehabilitation, including:

- revegetation (including use of locally occurring species);
- instructions for how to reuse cleared vegetation in situ (including the spreading of mulched vegetation over cleared areas);
- areas of pasture should be re-seeded with pasture grass species removed; and
- areas where crane pads have been sighted in native vegetation should be mechanically loosened with machinery to alleviate compaction, enhancing seed germination potential in loose soil and micro-topography to enhance seed retention from surrounding woodland areas.

Birds and Bats

ERM recommend that a specific Bird and Bat Monitoring Plan be developed. The Bird and Bat Monitoring Plan should:

- outline the required monitoring measures, key thresholds for determining permissible impacts and corrective actions that are required in order to achieve the objectives of the plan
- outline the roles and responsibilities for the proponent, operator and agencies in implementing, assessing and enforcing the plan.
- be developed in consultation with OEH
- determine the frequency of report strike data during the preparation of the monitoring programme.

ERM also recommends that the adaptive management measures that could be implemented should be negotiated with OEH when significant strike rates are detected. Bird and bat strike monitoring should be undertaken with consideration for the monitoring guidelines provided by the Australian Wind Energy Association.

12.3.7 Offset measures

The vegetation analysis and mapping indicated that vegetation offsets will be required for the project. ERM recommends that an offset strategy be developed in accordance with the principles for the use of biodiversity offsets in NSW (OEH 2011 cited in ERM report).

ERM proposes that offsets will be secured on-site within areas of Box Gum Woodland, Red Stringybark Woodland, Broad-leaved Peppermint Woodland and River Oak Forest. The *“areas of native grassland derived from these vegetation types will be offset into open forest / woodland areas comprising the original equivalent vegetation type”*, to achieve the ‘improve or maintain’ principle.

The area of offset required that was calculated by ERM using the BioBanking Assessment Methodology (BBAM) and the credit to hectare converter is shown in the table below.

Table 24 Credit requirements and their equivalent in hectares

BVT code	BVT name	Area in permanent footprint* (ha)	Required credits	Equivalent hectares required
LA103	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands	1.9	36	3.9
LA124	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	9.2	181	19.5
LA182	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion	1.2	66	7.1
LA186	River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions	0.3	6	0.6
Total		12.6	289	31.1
*this area includes the northern transmission line impact area				

As outlined above, 31.1 equivalent hectares are required to be provided as offsets for the project.

These offsets will be used to inform the preparation of an offset strategy in consultation with OEH and DoPI, which is to be consistent with the NSW Offsets Policy. The offset strategy will be prepared and its approval sought prior to commencement of works.

The location, management and securing mechanism will be included in the offset strategy to the satisfaction of OEH.

