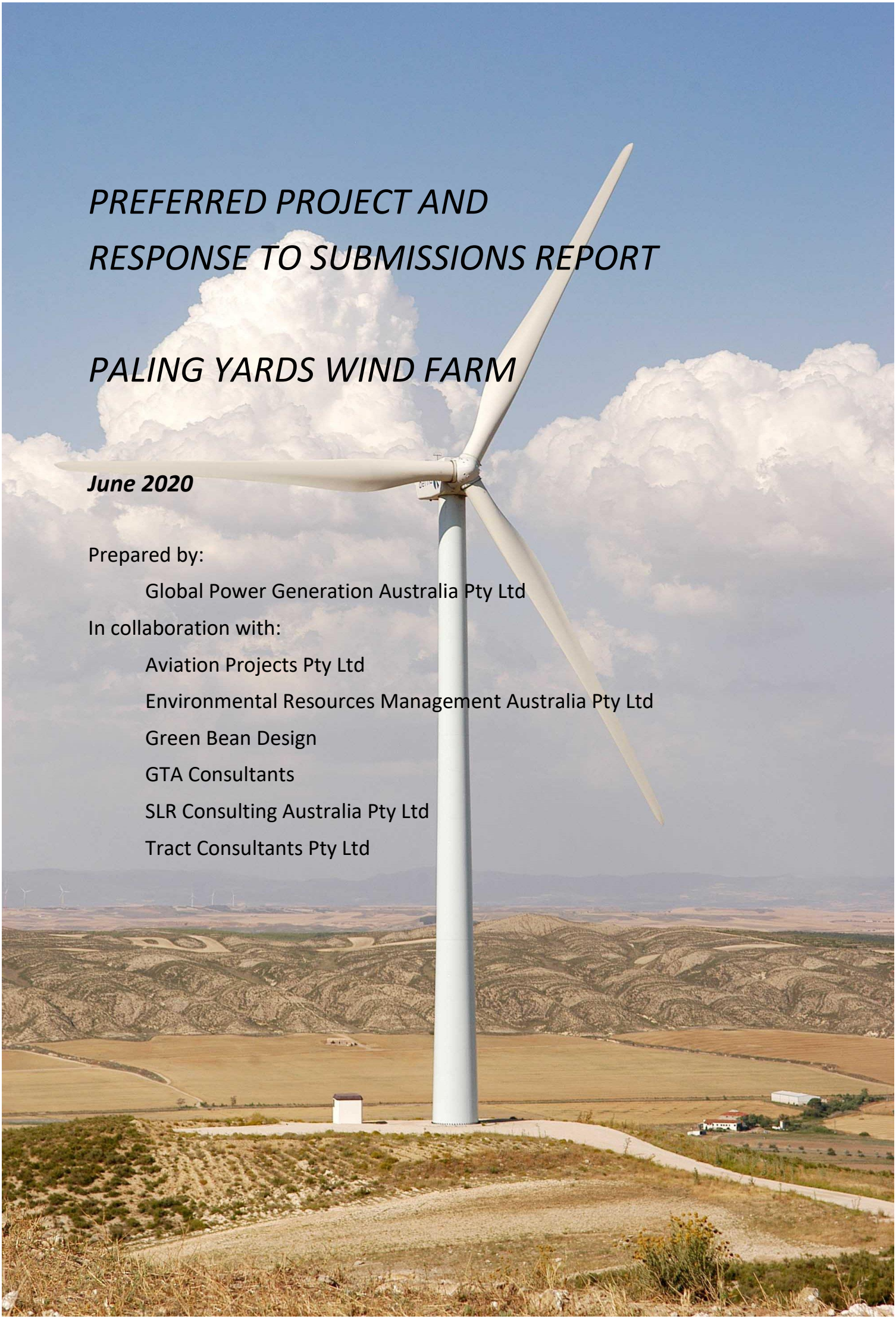

PREFERRED PROJECT AND RESPONSE TO SUBMISSIONS REPORT

PALING YARDS WIND FARM

June 2020

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PALING YARDS WIND FARM

MAJOR PROJECT APPLICATION NUMBER (MP 10_0053)

STATE SIGNIFICANT DEVELOPMENT APPLICATION NUMBER (SSD 6699)

Revision Table:

Revision	Date of Revision	Description	Prepared By
V0	19th December 2014	Initial draft	S.M.
V1	30th December 2014	Final report	S.M.
V2	27th February 2015	Minor amendments	S.M.
V3	15th April 2020	Updated route information and minor amendments.	G.A.
V4	12th June 2020	Cross references and minor changes	G.A.

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Executive Summary

Global Power Generation (GPGA), formerly known as Union Fenosa Wind Australia Pty Ltd (the '**Proponent**') and its successors and assigns, is seeking project approval for the construction and operation of a wind farm facility with up to 55 wind turbines known as the Paling Yards Wind Farm (the '**Project**') located ~60km south of Oberon and in the Oberon Local Government Area.

The Project is a State Significant Development (**SSD**) under Part 4 of the *Environmental Planning and Assessment Act 1979* (**EP&A**). The environmental assessment requirements (EARs) for the Project were issued under Part 3A of the EP&A prior to repeal of Part 3A on 1 October 2011, the Project was then a transitional Part 3A project under Clause 2(1)(c) of Schedule 6A of the EP&A Act. On 21st March 2014 the Project was transitioned to SSD and will be assessed and determined under Part 4 of EP&A Act. The NSW Department of Planning and Infrastructure (DoP&I) stated:

> "*…To minimise any disruption to the assessment process, the actions taken under the Part 3A process to date, including the acceptance of the Environmental Assessment / Environmental Impact Statement (EIS) for public exhibition have been accredited under the SSD process and are taken to have been completed.*"

This updated Preferred Project and Submissions Response Report (the **Report**) has detailed the revised Project proposal to incorporate several design changes and commitments raised in the submission comments from various government agencies.

The Environmental Impact Assessment (**EIS**) and the Report have found that the Project would have a range of positive and negative impacts on the site and region. However, it was found that the benefits of the wind farm would outweigh the undesirable impacts, and with appropriate conditions and mitigation measures detailed, the impacts can be minimised. The Project is compatible with the existing land uses of the area and complies with relevant planning and environmental controls applicable to the site.

The Project if approved would have the following specific economic and environmental benefits:

- total capital investment of $400 million in the economy;
- generate up to 65 full time positions during construction, and up to 11 full time ongoing positions during the operation;
- Stimulation of the economy in the Oberon Council as a result of greater income generation and subsequent expenditure in the region;
- Provision of flow on economic benefits in terms of employment and commercial opportunities from the economic investment;
- Up-skilling of the local workforce within a growing energy market;
- Use of a significant portion of locally sourced materials and employment;

- Increases in the local tourism industry, and in turn, increased expenditure on local services such as accommodation and retail in Oberon and Upper Lachlan Shire Councils;
- Contribute up to $2,500 per turbine per year (escalated annually with CPI) to the Oberon Council Community Enhancement Fund (CEF) that forms part of the Voluntary Planning Agreement (VPA);
- generate up to 633,707 MWh of clean, renewable energy, enough to power up to 98,184 average households;
- contribute to reducing the dangerous impacts of anthropogenic climate change, such as droughts, floods, extreme weather events and sea level rise by displacing up to 616,597 tonnes of greenhouse gases or the equivalent of taking up to 142,401 cars off the road;

The assessment of potential negative impacts arising from the Project found that the wind farm has the potential to have a low to moderate impact on landscape values, a limited impact on local communications facilities, an increase in noise for some residents (mainly host landowners), and result in the clearing of non-significant vegetation.

The impacts of the Project would be minimised by the extensive range of management plans that would be prepared before construction and ongoing monitoring of the compliance of the wind farm post-construction with the established standards.

This Report concludes that the proposed Paling Yards Wind Farm will offer a number of significant benefits and can be constructed with minimal impact to the existing environment by preparing and implementing the mitigation measures detailed in the revised Statement of Commitments.

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ABBREVIATIONS

AGL	Above Ground Level
AQMP	Air Quality Management Plan
ANZECC	The Australian and New Zealand Environment Conservation Council
BBMP	Bird and Bat Management Plan
BBMS	Bird and Bat Monitoring Strategy
BFEMOP	Bush Fire Emergency Management and Operation Plan
CASA	Civil Aviation Safety Authority
CCC	Community Consultative Committee
CEC	Clean Energy Council of Australia
CEF	Community Enhancement Fund
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
CNMP	Construction Noise Management Plan
CPI	Consumer Price Index
dB	Decibel
DCP	Development Control Plan
DECCW	NSW Department of Environment, Climate Change and Water (Now OEH)
DGRs	Director General Requirements / Environmental Assessment Requirements
DoD	Commonwealth Department of Defence
DoP&E	NSW Department of Planning and Environment (Formerly DoP&I)
DoP&I	NSW Department of Planning and Infrastructure (Now DoP&E)
DPI	NSW Department of Primary Industries
DRP	Decommissioning and Rehabilitation Plan
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPHC	Environment Protection and Heritage Council
EPL	Environment Protection Licence

ERM	Environmental Resources Management Australia Pty Ltd
ERP	Ecological Restoration Plan
F&FMP	Flora and Fauna Management Plan
GBD	Green Bean Design
GPGA	Global Power Generation Australia Pty Ltd
HBTs	Hollow Bearing Trees
IPA	Inner Protection Area
LALC	Local Aboriginal Land Council
LGA	Local Government Area
LEP	Local Environmental Plan
LRET	Large-scale Renewable Energy Target
LSALT	Lowest Safe Altitude
LVIA	Landscape & Visual Impact Assessment
MRB	Mineral Resources Branch
MOS	Manual of Standards
MRET	Mandatory Renewable Energy Target
NHMRC	National Health and Medical Research Council
NIA	Noise Impact Assessment
NPW Act	National Parks and Wildlife Act 1974
OC	Oberon Council
OD	Over Dimensional
OEH	NSW Office of Environment & Heritage (Formerly DECCW)
OEMP	Operational Environmental Management Plan
ONMP	Operational Noise Management Plan
PCCR	Pre-Construction Compliance Report
RAAF AIS	Royal Australian Air Force - Aeronautical Information Service
RAF	Restricted Access Vehicle
RECs	Renewable Energy Certificates
RET	Renewable Energy Target
RFS	NSW Rural Fire Service
RMS	NSW Roads and Maritime Services (Formerly RTA)
RSA	Rotor Swept Area
RTA	NSW Road Traffic Authority (Now RMS)

RVMP	Riparian Vegetation Management Plan
SCA	Sydney Catchment Authority
SECP	Sediment and Erosion Control Plan
SER	Supplementary Ecology Report
SISD	Safe Intersection Sight Distance
SoC	Statement of Commitment
SWMP	Soil and Water Management Plan
TCP	Traffic Control Plan
TMP	Transport / Traffic Management Plan
TNSP	Transmission Network Service Provider
TSC Act	NSW Threatened Species Conservation Act 1995
ULSC	Upper Lachlan Shire Council
VPA	Voluntary Planning Agreement
WHO	World Health Organisation
WMA	Water Management Act 2000
WTG	Wind Turbine Generator

1. Introduction

This Preferred Project and Submissions Response Report (the **Report**) has been prepared in response to the submissions received following the public exhibition of the Environmental Impact Statement (**EIS**) (Revision 4, dated January 2014) for the proposed Paling Yards Wind Farm project (the **Project**). It also includes the latest updates to the Project in terms of details of the application, proposed transmission line route and blades transport methodology.

The EIS was publicly exhibited from 28th March 2014 to 30th May 2014 in accordance with the original Section 89F of the *Environmental Planning and Assessment Act 1979* (**EP&A**), now Schedule 1, clause 9. The publicly exhibited EIS received a total of 22 submissions, including 11 government agency submissions. The details of the submissions are shown in Section 3 - Consideration of all the submissions.

1.1. Purpose of this report

This Report addresses legislative requirements of original section 89G(e) of the EP&A Act and section 85A of the EP&A Regulation 2000. Note that as per the recent amendments to the EP&A Act, the legislative requirements are now as per Section 4.39(e) and Section 4.28.

1.2. Structure of the report

In consideration of the community submissions and government agency comments to the publicly exhibited EIS, This Report has been prepared to include:

- Updated details of the project description (Section 2);
- Project Benefits (Section 3);
- Design changes and amendments to the proposed development and infrastructure (Section 4);
- Consideration of the submissions (Section 5);
- Response to Government Agency Submissions and additional feedback comments (Section 6);
- Response to the Community Submissions (Section 7);
- A revised Statement of Commitments (**SoC**) (Section 8);

2. Project Description

This chapter details the proposed Project and all associated buildings and works that support the wind energy facility. It also details the major elements of the construction, operational and decommissioning phases.

2.1. Overview

GPGA, the Proponent, and its successors and assigns, is seeking project approval for the construction and operation of a wind energy facility known as the Paling Yards Wind Farm (the **Project**).

The project comprises a number of elements, including:

- Up to 55 individual wind turbines, refer to Table 2.2.1 for turbine envelope size and rated capacity range;
- Up to 55 individual kiosks for the housing of transformers and switchgears and associated control systems, to be located in the vicinity of the wind turbine towers (in some turbine models the equipment is integrated within the tower or nacelle);
- Upgrades to local road infrastructure including up to six access points from Abercrombie Road;
- Internal unsealed tracks for vehicle access to turbines and infrastructure;
- An underground electrical and communication cable network linking turbines to each other and the proposed on-site substation;
- Up to three wind monitoring masts fitted with various instruments such as anemometers, wind vanes, temperature gauges and potentially other electrical equipment;
- A temporary batching plant to supply concrete for the foundations of the turbines and other associated structures;
- Obstacle lighting to selected turbines (if deemed necessary);
- Removal of native vegetation (if required);
- Vegetation planting to provide screening;
- A viewing platform within the site boundary adjacent to the Abercrombie Road corridor;
- Wind farm and substation control room and facilities buildings;
- An on-site electrical substation and approximately 9km of overhead powerline of up to 500kV;
- Grid connection achieved via an off-site 500kV electrical Terminal Station (including control room and other associated facilities) for the grid cut-in to the Mt Piper to Bannaby 500kV transmission line which bypasses the north-east and east of the site; and
- All associated and ancillary uses and activities.

The overall development footprint is less than 2% of the Site area.

The indicative infrastructure plan is shown in Figure 2.1.1.

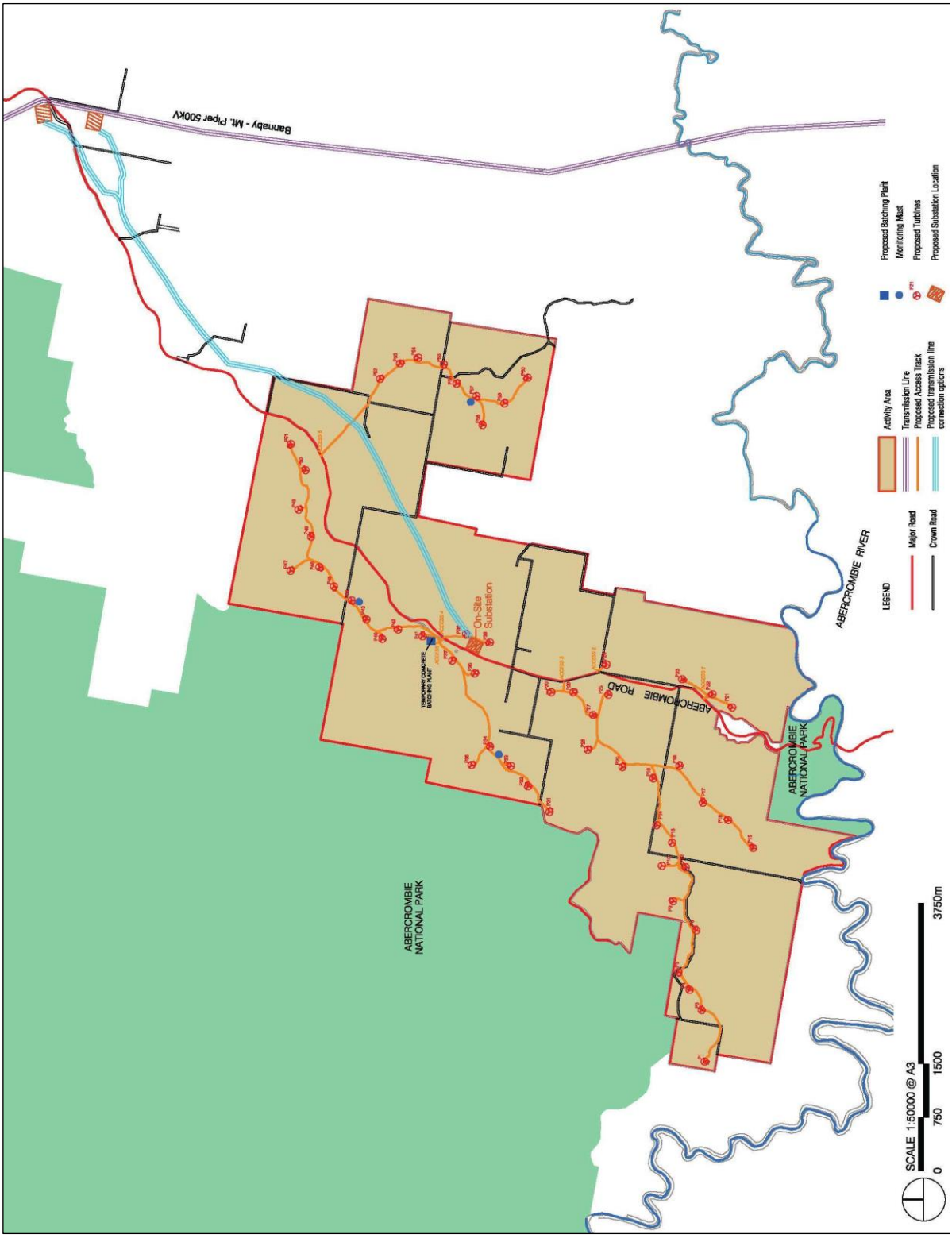


Figure 2.1.1 - Indicative Infrastructure Plan

For more details of site plan and surrounding area refer to Figure 12 of original EIS.

2.2. Turbine Specifications

The most important element in any wind farm is the wind turbine, often referred to as a Wind Turbine Generator (**WTG**). Turbines consist of a tall tower with 3 long blades mounted at the top that capture the wind.

The turbine manufacturing industry is dynamic, with new and updated models regularly released. Existing models are often made redundant only a few years after their release. The industry is rapidly growing and benefits from constant innovation and advancement in the efficiency of the turbines.

The major phase of a wind farm's cost is the initial construction, and turbine selection is a critical determinant of this cost. A turbines cost depends on a number of factors including the current economic climate (i.e. whether other wind farms also require supply in the upcoming period) based on competition between suppliers. In order to maintain competition between suppliers of turbines, and that the most up to date turbines can be used, it is important that a project has flexibility to select from a number of different turbine models from alternative suppliers.

To provide this flexibility, the proponent is seeking approval for a maximum turbine 'envelope' rather than a single turbine model. This envelope represents the largest and widest of the eight turbine models under consideration.

Many of the turbine models under consideration are smaller than the maximum envelope. In general, if any of the smaller turbines are utilised for the Paling Yards Wind Farm, the impacts described and assessed in this report are likely to be less.

The proposed envelope contemplates that, as a maximum, the turbine would have an overall maximum height of 175 metres when constructed. This envelope includes a tower of up to 119 metres in height to the hub, with blades up to 67 metres and a 2-3 metres wide hub.

Accordingly, for the purposes of this EIS, the largest turbine model under consideration (with 175m height to tip of blade) has been assessed in relation to all potential impacts other than noise impacts. The final noise characteristics of the largest turbines has not been available at the time of the preparation of the EIS, therefore the noise impact assessment has been carried out with the noise characteristics of one of the largest turbine models (Vestas V112) currently installed in Australia.

The Project is considering a large spectrum of turbine models, although each wind turbine is different, their physical envelope size and rated capacity has been captured within the range shown in Table 2.2.1.

Table 2.2.1 – Turbine Envelope Size and Capacity Range

Turbine Parameters	Range
No. of Turbines	Up to 55
Tower Hub Heights	Up to 119 metres
Rotor Blade Length	Up to 67 metres
Rotor Diameter	Up to 136 metres
Total Tip Height	Up to 175 metres
Turbine Capacity	*Up to 5.0MW each
Total Wind Farm Capacity	*Up to 275MW

** The largest turbine proposed in the EIS, the Gamesa 4.5MW platform has now been rated at 5.0MW by the manufacturer, hence increasing the theoretical total capacity of the wind farm, this doesn't change the assessments, as the turbine envelope size proposed will remain the same. The noise characteristics is not yet available for this platform, and it will be assessed to demonstrate compliance once it is provided by the manufacturer.*

There are some slight differences in the electrical construction of the turbines under consideration. Some of the turbines under consideration have a 690V / 33kV transformer in the nacelle, and 33kV switchgear either in the base of the tower or next to the tower in a kiosk. Some turbines have the 690V / 33kV transformer and the 33kV switchgear in the base of the tower. Other turbines have the 690V / 33kV transformer and the 33kV switchgear on the ground in a kiosk next to the tower.

The components of each of the turbine models under consideration are as follows;

- Reinforced concrete 'gravity foundations' up to 20 x 20 metres wide and between 1.5 to 3 metres in depth depending on the prevailing ground conditions. A rock anchor foundation is being investigated which would require much smaller concrete footing areas.
- A tubular steel tower, or a full concrete tower, or a Steel-Concrete Hybrid tower with up to 10 metres in diameter at the base (depending on the tower material), tapering to a diameter of approximately 3.0 metres at the top, with a total tower height of up to 119 metres, weighing between 250 and 1,900 tonnes (the full concrete tower is the higher end of the spectrum). The 100+ metre tower options would typically be a full concrete or steel-concrete hybrid with the concrete precast base and an upper steel section. The towers are painted in a non-reflective light grey/off white paint;
- A nacelle at the top of the tower housing the gearbox or a direct drive mechanism, and electrical generator, ensuring that the turbine is always facing into the wind and adjusting the angle of the blades to ensure maximum output of electricity and minimum noise.
- A rotor comprising a hub (attached to the nacelle) with three blades, and a shaft that connects to the generator via the gearbox or direct drive mechanism.

- 3 blades up to 67 metres long (excluding hub), made of lightweight materials.

A safety component incorporated in all models under consideration is a lightning protection system. All blades are manufactured with an anti-lightning protection system which minimises the damage to the turbines in the event of an atmospheric discharge (lightning). In the event of a lightning strike, power is diverted from the lightning to the nacelle which is grounded to the earth.

Other safety components of the turbines include;

- Sufficient standing and working space.
- Full containment of any leakage or spillage, by using dry-type transformers in the nacelle or using an oil-filled transformer in a kiosk adjacent to the tower with oil bunding built into the kiosk;
- Fibreglass weather protector;

The proposed turbines would result in efficient transfer of electricity as they have been chosen to match the local conditions in Paling Yards. As the height above the ground increases the wind resource generally increases and as a result the turbines under consideration are significantly more efficient than previous smaller models. The turbines under consideration are suited to the wind resource at Paling Yards, allowing maximum output capacity to be achieved at significantly lower wind speeds.

The turbines under consideration have a low 'cut-in' speed at nominal wind speeds (i.e. maximum output capacity is achieved at lower wind speeds). Generally, the wind turbines commence operation at a wind speed of approximately 3 to 4 metres per second, gradually increasing to the maximum output rate at 12 to 15 metres per second (depending on the turbine model). From this rate to approximately 20-25 metres per second (depending on the turbine model) the turbine operates at maximum capacity. In order to prevent damage to the turbine and various components, the turbines employ automatic shutdown at speeds above 20-25 metres per second (depending on the turbine model).

As turbines are becoming more technologically advanced, they now incorporate other features which assist in monitoring performance with relevant standards. For example, turbines can employ a low noise mode or wind sector management to reduce the noise output and avoid reaching critical noise levels. These systems act to mitigate any isolated occasions where noise output exceeds the permitted threshold. It should be noted that the wind farm has been designed to prevent the risk of such impacts occurring in the first place, however this offers an additional ability to address impacts created by unusual weather patterns or other circumstances.

2.3. Turbine Layout

A revised indicative wind turbine layout has been prepared that shows 55 turbines. Please refer to Figure 2.1.1 - Indicative Infrastructure Plan. The indicative layout was prepared by the proponent using wind modelling software and the consideration of the issues detailed below.

The indicative locations shown reflect the current understanding of the best location for the turbines given the current knowledge of wind characteristics and presence of vegetation.

The indicative wind turbine layout was based on a number of inputs; principally;

- The site boundary;
- Topographical data;
- The location of significant native vegetation and native fauna;
- Noise assessments at key receiver points;
- Dwelling locations;
- Wind speed data collected on and off site;
- Visual amenity impacts (including shadow flicker at the nearby dwellings); and,
- Distance to adjacent turbines.

A number of draft layouts were provided and reviewed by the consultant team. The feedback provided by the consultant team was incorporated into the current indicative layout plan so as to mitigate the impacts of the proposal.

On a hilly terrain such as the Paling Yards site, the wind speeds vary across the site depending on the elevation and the location of hills around the site. In consideration of the predominant winds in the area and the defined ridgelines the wind turbine micrositing has been designed to take maximum advantage of these flows.

The indicative turbine layout is based on the preferred turbine envelope and capacity shown in Table 2.2.1. If project approval is granted, this proposed layout will be refined at the detailed design stage and once the final turbine has been selected so as to achieve the best energy generation from the selected turbine model. It is estimated that this may result in individual turbines being moved approximately 25-100 metres from the currently nominated location on the site plan.

The determination of the final turbine locations during detailed design is required to address:

- the particular siting characteristics of the final turbine chosen;
- any additional site constraints discovered during detailed site investigations (e.g. a discovery of an unusual geotechnical issue);
- further wind speed analysis; and
- access issues determined during the detailed design phase.
- Approval is sought on terms which allow the determination of the final turbine locations during detailed design subject to the following criteria:

- turbines would not be moved by more than 100m from their indicative locations;
- turbines would not be moved closer to the nearest neighbouring dwelling or any closer than 1.0km to any non-participating dwelling;
- turbines would be located so as to avoid any unnecessary impacts on flora and fauna or heritage items (including items of Aboriginal heritage).

2.4. Access to Site for Over-Dimensional Vehicles

In 2015, it was proposed that Over-Dimensional (OD) vehicles of 70.8m in length be required to transport large wind turbine components (blades, tower sections) to the Wind Farm site. As the final turbine supplier was not yet selected, the EIS adopted a 'worst case scenario' which combined a range of potential vehicles required to transport the various wind turbine components.

With recent wind turbine blade transport vehicle advancement, an 18m long trailer fitter with hydraulic mechanisms to hold the wind turbine blade, with prime mover, has been selected for the purposes of this assessment.

The proposed vehicle will have the following dimensions:

- Maximum Vehicle Length: 31.27m
- Maximum Trailer Length: 18.0m
- Maximum Trailer Width: 4.2m

The road conditions are assumed to be as follow:

- Minimum Road Width: 5.5m
- Maximum Road Gradient: 6%
- Maximum Road Crossfall: 2%

The EIS indicated that Bells Line of Road would be used as the proposed OD Transport Route across the Great Dividing Range. Following consultation with the RMS Special Permits, team it has been confirmed that this route is not supported. As such, the proposed use of the Great Western Highway (Route A32) has been investigated further.

It is likely that the Port Kembla shipping terminals would be the arrival location of the wind farm components. It is however noted that there is the option to use the Port of Newcastle for these activities. Discussion as to the suitability of the routes between these locations and the M7 Motorway were discussed within the EIS. Discussions with RMS officers indicate that there is no concern with transporting oversize loads between the above ports and the M7 Motorway, with such activities having occurred for other projects.

The proposed access route from the M7 Motorway is shown in Figure 2.4.1 and described as follows:

- M7 Motorway,
- Turn onto the M4 Western Motorway (westbound) at Light Horse Interchange,

- Continue onto the Great Western Motorway (A32) for 145 kilometres,
- Turn left into Littlebourne Street (O'Connell Road) at Kelso,
- Turn Right into Abercrombie Road at Oberon,
- Continue for ~70 kilometres to the proposed development site.

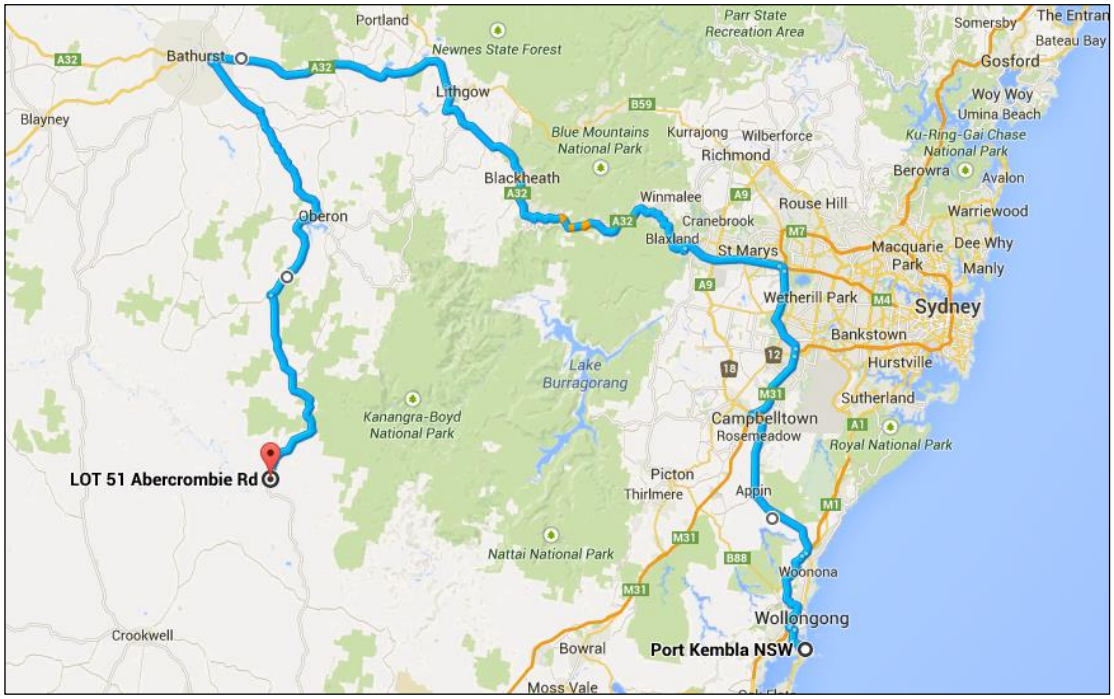


Figure 2.4.1 - OD Transport Route between Port Kembla and Paling Yards Site

The proposed route from Port Kembla to the Paling Yards site can be undertaken in approximately 5 hours by car. It is however noted that it could take up to 15 hours (based in an average speed of 25km/h) for the proposed oversize transport vehicles. Given the weather conditions that are apparent in the Blue Mountains during the winter months (ice / snow), an assessment of the appropriate timing of vehicle movements should be undertaken in the Traffic Management Plan (TMP) to be prepared for the works.

As part of the route investigation, GTA Consultants undertook a "drive-through" and video recording of the route and liaised with the RMS Special Permits team to confirm the sections of the identified route that have been already approved and deemed appropriate for wind farm haulage and/or other oversize load requirements. The additional field investigations were conducted to identify potential areas of concern and take measurements wherever necessary.

Investigations and vehicle swept path analysis on critical corners / horizontal curves, indicate that the proposed route is feasible, with the following restrictions and conflict areas identified.

- The minimum available height clearance for vehicles is 5.5 metres, which is appropriate for the anticipated OD Transport vehicle load dimensions.

- Gradients along the route are in excess of the 6% maximum stated within the Worst-Case OD transport vehicle requirements.
- Road cross-falls on the route are in excess of the 2% maximum stated within the Worst-Case OD transport vehicle requirements.
- Vertical curve radii at several locations are smaller than the minimum 400m radius stated within the EIS 'worst case scenario' OD transport vehicle requirements.

In 2015, RMS had requested that additional details of potential road upgrade works be reviewed prior to approval to ensure that suitable mitigation work are able to be implemented, particularly for the sections below:

- Road widths and small radius curved have been identified at the following locations:
  - Great Western Highway – 2 km west of Mount Victoria,
  - Great Western Highway – East and West of Hartley,
  - O'Connell Road – 12km north of Oberon.
- Temporary intersection modifications would be required at the following intersections:
  - Great Western Highway and Littlebourne Street, Kelso,
  - O'Connell Road and Abercrombie Road, Oberon.
- There are limited passing opportunities on Abercrombie Road south of Oberon.

GTA Consultants in 2020 undertook a swept path analysis at the above locations to review and reassess the proposed Restricted Access Vehicle (RAV) transport route. A copy of the report is attached as Appendix 5 to this document.

The matters raised above do not restrict the use of the proposed route for access to the Wind Farm site. All matters raised can be overcome by vehicle selection or custom vehicle manufacture. Temporary road works would only be required at some locations, only involving removal of barriers but not impact on private land.

The required treatment measures would be developed in consultation with RMS and the respective Councils along the route. These would be documented within a TMP to be prepared for the OD Transport movements and approved by RMS prior to the commencement of works.

It is also noted that RMS has planned road upgrade works along the Great Western Highway at Kelso and the Blue Mountains to be undertaken in the next 5 years. As part of the preparation and implementation of the TMP, the approved contractor would need to consult with RMS and road contractor(s) to maintain a suitable path of travel for the OD transport vehicles.

2.5. Access Road Entrance Points

The proposed wind farm infrastructure is to be located on both sides of Abercrombie Road, to allow access to all turbines and associated infrastructure the proposal includes up to 6 access road entrance points. These locations are detailed below:

Access 1

Access 1 would form a T-intersection with Abercrombie Road approximately 3km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, the anticipated location to be at approximately 340 10'37"S and 149044'36"E. The eastern side of Abercrombie Road in the vicinity of Access 1 has mature non-native pine trees which would require clearing for the proposed intersection.

Access 2

Access 2 would form a T-intersection with Abercrombie Road approximately 4.5km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, the anticipated location to be at approximately 34009'49"S and 149044'49"E. The eastern side of Abercrombie Road in the vicinity of Access 2 has mature non-native pine trees which would require clearing for the proposed intersection unless it is constructed further north into grassland.

Access 3

Access 3 would form a T-intersection with Abercrombie Road approximately 5.2km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, the anticipated location to be at approximately 34009'24"S and 149044'46"E. The land on the western side of Abercrombie Road is elevated with a gradual slope towards the road.

Access 4 and Access 5

Access 4 and Access 5 are located in close proximity to each other on Abercrombie Road and would form two staggered T-intersections approximately 7.5km north of the Abercrombie River crossing. The exact locations would be finalised at the detailed design stage, the anticipated location to be at approximately 34008'19"S and 149045'70"E. Upon visual inspection, it is noted that the Safe Intersection Sight Distance (**SISD**) for the proposed intersections may not be achievable due to presence of a crest in the road to the south. To achieve SISD consideration will be given to move the access points north of the currently proposed locations, so as to benefit from the generally straight road alignment with good visibility. Staggered intersections, in place of a four-way single intersection, is considered to be appropriate at this location so as to avoid any direct through movements between site accesses, which may potentially compromise road safety.

Access 6

Access 6 would form a T-intersection with Abercrombie Road approximately 10.5km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, the anticipated location to be at approximately 34007'32"S and 149046'55"E. Both sides of Abercrombie Road in the vicinity of Access 6 have mature

trees which would require clearing for the proposed intersection It is anticipated that this would be no more than six trees.

For more detail on the access road entrance locations (including photos) and transportation assessment refer to Appendix 4 – GTA Consultants Response to Traffic Related Submissions.

2.6. Access Tracks

The project will include a network of access tracks that lead from the proposed access points from the public roads to the turbines. The access tracks would connect each turbine and allow the safe passage of vehicles to the base of the tower. These access tracks would only intersect with government roads at nominated access points, therefore reducing impacts on public roads, refer to Figure 2.1.1 - Indicative Infrastructure Plan.

Existing farm tracks would be utilised and upgraded where possible to reduce the need for additional soil disturbance and native vegetation removal. During the construction phase of the project, these would be widened up to 10 metres in width to support the extra load of trucks carrying equipment and cranes for the erection of the towers. This width would then be reduced during the operation phase of the project to approximately 5-6m. The tracks would continue to be used by the farmer to access the property and to attend to grazing livestock.

2.7. Electrical Works

Electrical works are required to link the Paling Yards wind turbines to a circuit and then link each circuit (consisting of between 6 to 12 turbines) to the medium voltage switchboard located at the on-site substation.

The electrical works comprise;

- 33 kV electrical cables (comprised of conductive wire surrounded by protective coating) linking the turbines to each other and the substation, installed generally 1m deep underground, surrounded by soft sand with back fill. Cable markers would identify the path of the underground cabling to prevent accidental digging around the cable trenches. Overhead powerlines may be utilised to overcome access and terrain constraints in limited circumstances.
- Control and communication cables linking the turbines to the control room, installed generally underground and adjacent to the 33kV electrical cabling.

All cables would generally follow the same alignment as the access tracks, thereby limiting the development footprint of the project. However, there may be several locations where the cable would diverge from the access tracks to reduce electrical losses and to overcome ground constraints.

The grid connection infrastructure is outlined Section 2.8.

2.8. Substation, Control Rooms and Facilities Building

The Project infrastructure for grid connection includes an on-site substation and an off-site terminal station (located north-east of the site) adjacent to the existing Mt Piper to Bannaby 500kV transmission line, the two locations are connected via 9km of overhead powerline rated for up to 500kV. Refer to Figure 2.1.1 for the indicative route of the powerlines and grid connection locations.

Both the on-site and off-site locations will have their own control room, facilities building, communication tower / pole, and associated ancillary and auxiliary infrastructure.

The transformation to grid connection voltage will either be made at the on-site or off-site locations. The detailed design process and investigation will further inform the configuration of the voltage transformation and powerline configuration, which may include an interim voltage transformation at the on-site substation to reduce the transmission losses on the powerline connecting the locations, and the final transformation will be conducted at the off-site location.

The grid cut-in will be performed by the relevant Transmission Network Service Provider (TNSP), would include augmentation to the existing transmission line assets and may include construction of a new transmission tower.

2.9. Vegetation Removal and Planting

Vegetation Removal

Some vegetation removal is required to facilitate access and allow construction of the turbines. The required clearing is considered to be minimal as the site is already largely cleared and the project has been designed to avoid the need to remove native vegetation.

Approximately 1% of the site is required for wind farm infrastructure during the operation phase of the project.

The key reason for vegetation removal is for the provision of access tracks and potentially electricity easements. The access tracks have been designed to avoid native vegetation; however, some vegetation removal is unavoidable. The areas and types of identified remnant vegetation within the development area are described in Chapter 12 – Flora and Fauna Impacts and in Appendix 8a and Appendix 8b.

A flora and fauna impact assessment for the Project was undertaken, which included an assessment of native vegetation on site. It found that most of the areas where the turbines and access roads/electricity easements are proposed represent cleared grazing paddocks with high levels of disturbance. A total area of approximately 14.0 hectares of remnant vegetation removal would be required for the Project including the transmission line, of which approximately 1.4 hectares is proposed to be rehabilitated post-construction. A draft Biodiversity Offset Strategy is prepared and included in Annex D of Appendix 5.

Once the detailed design for the Project has been finalised, a revised Biodiversity Offset Strategy will be prepared and form part of the Biodiversity Offset Package to be implemented.

Vegetation Planting

Vegetation screen planting can be an effective tool in mitigating the visual impact of wind turbines or other infrastructure. It is employed in the vicinity of nearby residences and along the roadside to screen potential views of turbines. However, screen planting is only effective where the planting can occur in close proximity to the viewing location (i.e. at a nearby dwelling). Planting would involve a variety of dense native vegetation, including both trees and shrubs, to effectively screen views. The flammability of the vegetation would be a key consideration in selecting species.

Many of the dwellings in the locality are already surrounded by vegetation that performs, at least to some extent, a screening role.

While the screening is proposed to be in close proximity to viewing locations, the exact area of screening and provision would depend on detailed design and discussions between an affected land holder and the proponent following the grant of project approval. The planting would be carried out at no cost to the landowner.

2.10. Wind Monitoring Equipment

Three wind monitoring masts have been previously installed on the site to confirm the wind resource and to provide wind speed and direction data, locations are shown in Figure 2.1.1 - Indicative Infrastructure Plan.

The existing monitoring masts are not permanent structures and would be removed and reused elsewhere once the construction phase is complete. Up to three new permanent wind monitoring masts are proposed to be installed across the site at locations to be specified and negotiated with turbine supplier during construction of the wind farm. The purpose of these new permanent masts is to provide an independent validation of the wind regime for the wind turbines and to assist with assessing the overall wind farm performance. The masts consist of a tall, thin tubular or lattice structure and guy wires for support, and the masts are proposed to be up to 119 metres in height, and generally at the turbine hub height level.

2.11. Obstacle Hazard Lighting

Obstacle lighting consists of two flashing red lights mounted on the turbine nacelle to highlight their presence to nearby aircraft.

The obstacle marking and lighting assessment was conducted in accordance with the recently withdrawn guideline document - Obstacle Marking and Lighting of Wind Farms (CASA Advisory Circular AC139-18(0)). Although the document has been withdrawn by CASA for review purposes, it has been used for the purposes of risk mitigation for the proposed wind farm, as recommended by CASA.

An assessment under these guidelines showed that night lighting of 25 of the original 59 proposed turbines may be required, the lighting design was revised for the 55

turbine layout and with this configuration only 23 turbines may be required to have obstacle night lighting, refer to Figure 2.11.1 - Revised Obstacle Night Lighting Design for the lighting locations.

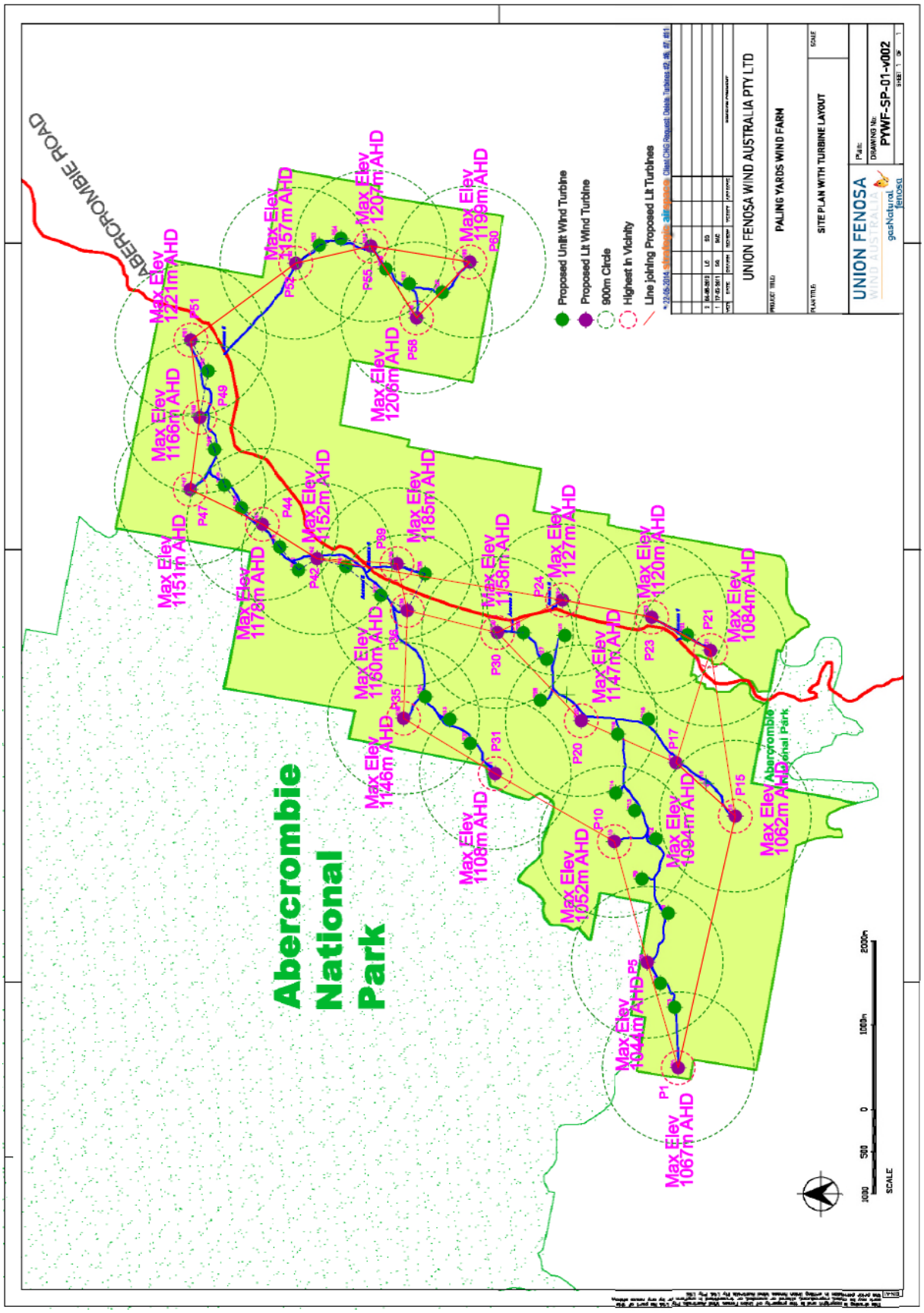


Figure 2.11.1 - Revised Obstacle Night Lighting Design

The characteristics of the lights would be consistent with CASA guidelines, which state;

- Two flashing red medium intensity obstacle lights should be provided;
- Light fixtures to be mounted sufficiently above the surface of the nacelle so that the lights are not obscured by the rotor hub, and at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction.
- Both lights should flash simultaneously;
- Characteristics of the obstacle lights should be in accordance with MOS Pt 139;
- All obstacle lights on a wind farm are to be synchronised to flash simultaneously; and
- An appropriate monitoring, reporting and maintenance procedure is to be established to ensure outages are detected, reported and rectified.

In addition, Department of Defence has requested via their submission for the obstacle lighting installation (if required by CASA) to be NVG compatible that operates at a wavelength range of 655 to 930 nanometres to enable the lighting to be visible to persons using night vision devices.

For more information on aeronautical impacts, please refer to Chapter 13 of the original EIS.

Visual impacts would be minimised by restricting the downward component of the light to either, or both, of the following:

- Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal,
- Such that no light is emitted at or below 10° below the horizontal.

For more information on visual impacts of the lighting, please refer to Chapter 9 of the original EIS.

The need for obstacle lighting for structures of this height is currently under review. It is possible that before construction has commenced, the guidelines would have been revised such that obstacle lighting for structures of this height may no longer be required. The need for obstacle lighting would be reviewed at regular intervals by the proponent and, in the event that the CASA guidelines are revised such that night lighting is no longer required then night lighting would not be installed, or if already installed at the time, they could be turned off.

2.12. Temporary Construction Facilities

A temporary construction area would be required within the Project site. The temporary construction area would contain portable toilets, vehicle parking, assorted construction equipment, a concrete batching plant and vehicle wash down facilities.

A temporary hardstand area of approximately 50 x 50 metres would be required to enable the construction of each tower. The hardstand area would be constructed of compacted soil and gravel to provide a stable platform for construction equipment

and the crane. The hardstand area is only required for the construction phase and would be decreased in size following construction to accommodate maintenance activities. The excess portion of the hardstand area would be reseeded to pasture.

Temporary concrete batching plants would be required for the construction stage of the project to supply concrete for the turbine foundations. Batching plants need to be central to the activity area and well removed from houses due to the occasional generation of noise and dust. In consideration of these matters, the concrete batching plant is proposed to be located west of Abercrombie Road between turbines P37 and P41, Access Road number 5 will service this facility. Refer to Figure 2.1.1 - Indicative Infrastructure Plan for the batching plant location.

The area for the batching plants would be approximately 80m x 80m. This area would incorporate loading bays, hoppers, silos, hardstand areas, water tanks and stockpile areas for the storage of the aggregates, sands and other raw materials.

The concrete batching plant is likely to produce between 250m^3 and 500m^3 of concrete on an average day.

Where possible, raw materials for the concrete batching plant would be sourced on site, with all materials brought in from external sources being as clean as possible to minimise the potential of introducing weeds to the site. The water for the concrete would either be sought on site subject to a separate licence issued by the NSW Office of Water or transported to the site via tanker trucks.

Once complete, the areas affected by temporary construction activities would be rehabilitated to their former agricultural state on completion of the construction stage. Detailed Construction Environmental Management Plan (**CEMP**) would be prepared prior to the grant of construction certificates for the project which would incorporate further detail to manage the impacts of construction activities including the temporary construction facilities.

2.13. Viewing Platform

On request from Oberon Council, the Project will now also include in the proposal a viewing platform within the site boundary adjacent to the Abercrombie Road corridor to allow the public to safely pull over off the road to better view the Paling Yards wind farm from the designated viewing area.

It is anticipated that the viewing platform will be located north of proposed Access Road 4/5; details of the proposed viewing platform and road interface will be determined in consultation with Oberon Council and during detailed design process seeking the relevant approvals in conjunction with the access roads.

2.14. Pre-Construction

If the project is approved, a number of further steps are required to prepare for the construction phase. This process would take approximately 18 – 36 months and includes:

- Detailed design phase of the final wind farm layout, including determination of the final turbine locations in accordance with the principles set out in Section 2.3 – Turbine Layout;
- Finalisation of additional agreements with key agencies;
- Preparation of the Pre-Construction Compliance Report;
- Finalisation and approval of the CEMP;
- Obtaining a construction certificate (if required by the conditions of approval);
- Tendering for wind turbine components and other key infrastructure;
- Tendering for the contracts for construction of the wind farm;
- Securing a grid connection agreement from the relevant TNSP; and.
- Securing an off-take agreement or equivalent mechanism for selling of electricity and Renewable Energy Certificates (**RECs**).

Following this initial period, the full construction phase would commence. This phase would likely take up to 24 months subject to delays due to weather and unforeseen circumstances.

At the peak of construction, the project is likely to be employing 65 people, across the tasks detailed in Table 2.14.1 - Construction Activities shown below.

Table 2.14.1 - Construction Activities

Activity	Works Involved
Site Establishment	Clearing of work areas, levelling and compaction, installation of portable buildings and installation / connection of utility services. Site Survey.
Internal Road Works	Removal of topsoil, levelling, sub-base compaction, gravel, drainage.
External Road Works	Upgrade existing roads where required. Provide new access roads to the site.
Foundations	Removal of topsoil, excavation, screed concrete, reinforcement steel bottom, installation of foundation ring, reinforcement steel top, concreting, concrete ring and conduits, backfilling.
Crane Pad Establishment	Removal of topsoil, base compaction, rock / gravel compaction.
Trenches and Cable Laying	Excavation; sand infill; lay cable; lay protective covering; back filling and compacting; installation of cable route markers.
Overhead Powerline	Installation of overhead powerline from the on-site substation to the off-site switching station adjacent to the Bannaby-Mt Piper 500kV transmission line.
Electrical Works (on-site substation)	Control building switchboards, communications, and Supervisory Control and Data Acquisition (SCADA) systems. Installation of cabling, switchgear, turbine control panels.

Activity	Works Involved
Turbine Supply	Transport of towers, nacelles, hubs and blades to site.
Turbine Erection	Erection of towers, nacelle, blades, installation of cabling.
Electrical Works (off-site substation)	Installation of high voltage switchyard equipment; control and auxiliary buildings; communications pole; new transmission line tower adjacent or in line with existing transmission line; and all other ancillary equipment as required by TransGrid for construction and operation of a new Terminal Station; potential installation for an additional high voltage transformer and switchgear.
Wind Farm Commissioning	Pre-commissioning of turbines, SCADA, cables testing, optical fibre. Testing and commissioning of turbines, switchgear, SCADA.
Electricity Grid Connection Commissioning	Final commissioning by the TNSP prior to connecting the generated electricity on the national electricity grid.
Construction Closure	Site Clean Up, revegetation, landscaping.

The majority of the early work in the construction period is to prepare the site for the arrival of turbine infrastructure. This involves road upgrades, access track and hardstand area preparation.

Once this stage is complete, the turbine components can be transported and erected on site, usually at the rate of one or two per week. This involves transportation to the hardstand area at the base of each turbine and using cranes to lift turbine components to assembly the structure. In most circumstances the turbine blades are assembled into the hub at ground level and are then lifted up to the nacelle by crane as a complete ensemble. In other circumstances the turbine blades are individually lifted and assembled into the hub.

The turbines are anchored using large concrete gravity footings. In areas where granite rocks lie at or just below the surface, the footing is directed attached to the rock which would reduce the amount of concrete required. This may include the potential for rock blasting based on an assessment by the geotechnical engineer. Details of any rock blasting (if any), and associated management techniques, would be provided in the CEMP.

Temporary facilities within a construction area would include portable toilets, vehicle parking, assorted construction equipment, a concrete batching plant and vehicle wash-down facilities. All temporary facilities would be located so as to avoid and minimise vegetation loss and the land would be reinstated to its former state at the conclusion of the construction stage.

While this section provides an overview of the construction process, the construction would be managed by a management plan, which would address matters such as;

- Erosion control and soil protection

- Water quality protection
- Vegetation protection
- Air quality and dust pollution prevention
- Safety
- Public road network access

Standard construction hours would apply to the project, as outlined below,

- Monday to Friday: 7:00am to 6:00pm
- Saturdays: 7:00am to 1:00pm
- Sundays: No construction

The following activities may be carried outside of these hours as required:

- Any works that do not cause noise emissions to be audible at any nearby residence not located on the site;
- The delivery of materials as requested by authorities for safety reasons; and
- Emergency work to avoid the loss of lives, property and / or to prevent environmental harm.

In the event that it is required to undertake other works outside the above construction hours, prior approval would be obtained from the relevant authority.

2.15. Operation

The operation phase of the project reflects the leasing arrangement with landowners. Landowners have agreed to grant the proponent a 30-year lease with the option to extend for another 30 years. Whilst no plan of subdivision will need to be registered as a result of these proposed leases, the project includes the grant of these leases and any deemed subdivision arising as a result.

During operation of the wind farm, all infrastructure associated with the wind farm would remain the property and responsibility of the proponent.

All access tracks used by the proponent would be maintained by proponent as part of the operation of the wind farm but would remain available for host landowners' use.

The wind farm would be controlled by a computerised system. The system would link each turbine by communications (fibre-optic) cables typically laid in the same trench as the electrical cables. The computerised system would log all operating parameters and initiate the most efficient functionality of the turbines according to prevailing atmospheric conditions. The computerised system would also enable the controller to stop the turbine if required.

The system would ensure that rotational speed and the wind turbine angle operate automatically within the wind speed design envelope. Turbines would be disconnected from the grid at very low and very high wind speeds.

Maintenance of the turbines and associated infrastructure would be conducted throughout the operation phase. Maintenance includes a number of activities over different time periods. These are outlined in Table 2.15.1 - Typical Maintenance Schedule, shown below:

Table 2.15.1 - Typical Maintenance Schedule

Interval	Task
Monthly	Inspection of turbine generator and electrical infrastructure.
3-6 Monthly	Inspection of all machinery, greasing of bearings, checking of hydraulic oil.
As required	Periodic painting of tower structure; Replacement of electronic and electrical components; Access track maintenance including erosion control; Substation maintenance inclusive of insulator cleaning, removal of debris and greasing of contacts.

As with any infrastructure project there is potential for equipment breakdown or failure during the lifetime of the project. Whilst most repairs would be likely occur without impacts outside the wind farm site, should any of the raised components (within the nacelle or the blades themselves) need to be replaced, construction equipment such as cranes and other heavy machinery may be required to access the site temporarily. Such equipment may have a temporary impact on the road network but the temporary impact would be likely to be minimal.

As part of the operation phase, a number of monitoring protocols would be implemented. These would include a program to ensure compliance with all approval conditions, including conditions relating to noise, flora and fauna and any other relevant potential impacts. This would also likely include a monitoring program on birds and bats in the vicinity of the site.

Potential refurbishment

Whilst the design life of a wind turbine is typically more than 20-25 years and often extends to 30 years, it could potentially extend to a longer period subject to specific equipment / part replacement program that would allow it to operate efficiently and cost effectively. However, the proposed wind farm has been designed to allow for the possible removal and replacement of turbines during the lifetime of the project. If a turbine needs to be replaced, this process would follow the construction stages outlined above and be consistent with any project approval granted for the project.

Where possible, the existing footings, access tracks and other infrastructure would be reused for any replacement turbine(s) during the operation phase.

2.16. Crown Land

Crown land in the form of unused / ungazetted road reserve is present within the site boundary and along the proposed transmission line route to the north-east. Most of these roads are disused and not evident on the ground.

Where the impacts occur, turbines will be micro-sited to avoid the crown land where practicable, and where necessary the proponent will apply to have the crown roads closed, following the appropriate process for closing these roads, and/or proposing a licensing arrangement, in consultation with the relevant authorities.

2.17. Minerals Titles

The project will not impact upon any minerals titles or mining areas. The formerly considered and assessed southern transmission line route options crossed minerals title boundaries; however, these options are not proposed as part of this application.

2.18. Staging

The estimated timeline of the construction, operation and decommissioning phases of a 30-year (or 60 year) lifespan of the project is shown below in Table 2.18.1 - Construction Staging Timeline. The Proponent may stage the Project in different configurations as required.

Table 2.18.1 - Construction Staging Timeline

Stage	Activity	Timing
Construction	Site establishment	September/October 2021
	Internal road works	30 weeks*
	External road works	24 weeks*
	Foundations	40 weeks*
	Crane pad establishment	41 weeks*
	Trenches and cable laying	45 weeks*
	Overhead powerline	36 weeks*
	Electrical works (on-site substation)	15 months*
	Turbine supply	12 months*
	Turbine erection	17 months*
	Electrical works (off-site substation)	18 months*
	Wind farm commissioning	18 months*
	Electricity grid connection commissioning	19 months*
	Construction closure, site clean up	20 months*
Operation	Inspection of turbine generator and electrical infrastructure	Monthly, as specified by the turbine manufacturer
	Inspection of all machinery, greasing of bearings, checking of hydraulic oil	3-6 monthly as specified by the turbine manufacturer
	Periodic painting of tower structure	As required

Stage	Activity	Timing
	Replacement of electronic and electrical components	As required
	Access track maintenance including erosion control	As required
	Substation maintenance inclusive of insulator cleaning, removal of debris and greasing of contacts	As required
Decommissioning	Permanent cessation of electricity generation	At the end of either 30 or 60 years from commencement of operation**
	Electricity grid connection decommissioning	3 months***
	Removal of turbines	12 months***
	Removal of Electrical Works (on-site substation)	10 months***
	Removal of Electrical Works (off-site substation)	15 months***
	Removal overhead powerline	10 months***
	Removal of foundations	12 months***
	Removal of miscellaneous electrical works	11 months***
	Removal of crane pads	14 months***
	Site rehabilitation	15 months***
	Decommissioning closure	18 months***

** denotes approximate completion timeline for the construction activity from the date of the site establishment activities.*

*** denotes approximate duration for the operation of the wind farm. The proponent has an agreement with the landholders for a minimum 30 years with an option of another 30 years.*

**** denotes approximate completion timeline for the activities from the date of permanent cessation of electricity generation from the wind farm.*

2.19. Decommissioning

GPGA has entered into agreements for lease of land with the landowners who own land within the site. These agreements provide GPGA with leases for a term of 30 years and grant the proponent the opportunity to extend the lease for a further term of 30 years.

Any continuation of the wind farm beyond the first 30-year period may take the form of one of:

- Extended operation of the original turbines;
- Turbine replacement with the similar model that would have newer and more efficient technology; or
- Turbine replacement with a different model that would be subject to the requisite approvals being obtained at that time.

Once the wind farm reaches the end of its useful economic life, the project would be decommissioned.

Decommissioning essentially involves the reverse process to construction. All materials would be removed from the site and recycled appropriately. Access tracks would remain where beneficial to the ongoing use of the land by the owner. Tracks considered surplus to the owners' requirements would be rehabilitated and re-vegetated by introducing soil, mulch and grass seeds of local provenance.

It is a requirement of the Draft NSW Wind Farm Planning Guidelines (December 2011) (draft Guidelines) that the EA for the project includes a Decommissioning and Rehabilitation Plan (DRP). AECOM Australia Pty Ltd as an independent consultant has prepared the DRP in accordance with the draft Guidelines.

The proponent is responsible and committed to the decommissioning of the wind farm infrastructure, and the landowner is not liable for this obligation (this is demonstrated in the land lease agreements with each of the wind farm participating landowners as shown in the DRP).

GPGA seeks to mitigate the potential impacts resulting from the cessation of operation of the facility. This DRP outlines the stakeholder and landowner consultation, expected operational life, dismantling, land rehabilitation, funding arrangements, timeframes and responsibility associated with the decommissioning of the proposed Paling Yards Wind Farm. The proponent has committed to implementing this plan.

In relation to consultation, the relevant landowners have been extensively consulted about the project and the issues of decommissioning and rehabilitation were discussed at the early stages of the project. In particular, the DRP was discussed and agreed with all landowners. Feedback from the landowners was generally positive with no objections to the project.

GPGA has also consulted with the Oberon Council regarding the project in general and aspects of the construction, operation and decommissioning phases. GPGA will undertake further consultation with stakeholders prior to and during the decommissioning process.

3. Project Benefits

The Project benefits are set out in Section 6.5 – Project Benefits in the original EIS.

The Project if approved would have the following specific economic and environmental benefits:

- total capital investment of $400 million in the economy;
- generate up to 65 full time positions during construction, and up to 11 full time ongoing positions during the operation;
- Stimulation of the economy in the Oberon Council as a result of greater income generation and subsequent expenditure in the region;
- Provision of flow on economic benefits in terms of employment and commercial opportunities from the economic investment;
- Up-skilling of the local workforce within a growing energy market;
- Use of a significant portion of locally sourced materials and employment;
- Increases in the local tourism industry, and in turn, increased expenditure on local services such as accommodation and retail in Oberon and Upper Lachlan Shire Councils;
- Contribute up to $2,500[1] per turbine per year (escalated annually with CPI) to the Oberon Council Community Enhancement Fund (CEF) that forms part of the Voluntary Planning Agreement (VPA);
- generate up to 633,707 MWh of clean, renewable energy, which equates to the electricity use of a population up to 255,279 or equivalent to 98,184 average households. This is approximately two-thirds of Canberra's population (400,000) or more than ten times the size of Goulburn (23,835);
- contribute to reducing the dangerous impacts of anthropogenic climate change, such as droughts, floods, extreme weather events and sea level rise by displacing up to 616,597 tonnes of greenhouse gases or the equivalent of taking up to 142,401 cars off the road;

A key determinant in calculating the emission reductions of the Project is the type of energy that is displaced by the wind energy. In NSW wind energy displaces black coal fuelled energy, a co-efficient of 0.97 tonne per MWh of energy has been used to support the calculations below. This pool co-efficient is derived from GGAS (2010). Table 2.19.1 - Greenhouse Gas Savings outlines the savings that would be made as an outcome of the proposal.

[1] Based on the current VPA with Upper Lachlan Shire for the Crookwell 2 Wind Farm The contribution will be for each operating wind turbine and will commence on the anniversary of the commissioning of the wind farm.

Table 2.19.1 - Greenhouse Gas Savings

Parameters	Up to	Source
Number of Turbines	55	GPGA
Total Wind Farm Capacity (MW)	275*	GPGA
Annual Energy Output (MWh)	633,707	GPGA
Greenhouse gas displaced (tonnes)	616,597	Based on NSW GGAS 2010
Number of households supplied electricity	98,184	Based on AGO, 1999
Population supplied electricity	255,279	Based on Vic Sustainable Energy Authority 2003
Equivalent cars off the road	142,401	Based on Vic Sustainable Energy Authority 2003
Equivalent number of trees planted	920,294	Based on Vic Sustainable Energy Authority 2003

** The 275 MW figure is based on 5 MW per turbine, from models currently available in the market which are suitable for the Paling Yards site, whilst meeting the dimensional limits under the Development Application.*

4. Design Changes

Several of the original specialist assessment that formed the EIS were carried out with 59 turbine layout instead of the proposed 55 turbine layout as is shown in the main EIS report, therefore their assessment results are deemed more conservative and the overall impact of the proposal will potentially be less than what has been assessed.

The major changes to the design have been listed below:

Aviation Obstacle Hazard Lighting

As part of this Report, the aviation obstacle hazard lighting design has been revised to accommodate the 55 turbine design which according to the current micrositing layout would include only 23 turbines to have obstacle lighting, refer to Figure 2.11.1 for the proposed lighting locations.

The obstacle hazard lighting would primarily be a requirement from CASA (subject to regulation at the time of the construction), however in lieu of CASA not mandating the lighting of the turbines, the Proponent may elect to install lighting to reduce its risk profile unless a condition of the Development Approval prohibits turbine obstacle hazard lighting to be installed for the Project.

Noise

Clarifications provided for EPA submission comments, and the Noise Impact Assessment (NIA) has been revised to Revision R5, refer to Appendix 3. The NIA in the original EIS contained Appendices A through G, these attachments have not been changed and remain valid, however, to avoid duplication they have not re-issued with this Report.

Flora and Fauna

The proposal now includes a draft Bird and Bat Management Strategy and a draft Biodiversity Offset Strategy as shown in Annex C and D of the Appendix 5 respectively. These documents will be revised in consultation with OEH prior to construction phase.

Traffic and Transport

A revised assessment of the over-dimensional vehicle transportation route from Port to site has been undertaken and constraints and requirements identified, refer to Appendix 5 for further details.

The six access roads for the site have been re-assessed for Safe Intersection Sight Distance (SISD) and native vegetation clearing, and its recommended to relocate Access Road entrance 4 and 5 slightly further north to achieve the required SISD and minor clearing of native vegetation from proximity of Access Road entrance 6 to achieve the required turning area and SISD.

An outline of a Traffic / Transportation Management Plan is prepared and included in Attachment 2 of Appendix 4.

Viewing Platform

On request from Oberon Council, the proposal will now also include a viewing platform within the site boundary adjacent to the Abercrombie Road corridor to allow the public to safely pull over off the road to better view the Paling Yards wind farm from the designated viewing area.

The viewing platform location will be approximately north of proposed Access Roads 4/5, however the final location will be determined in consultation with Oberon Council and during detailed design process.

Statement of Commitments

A revised set of Statement of Commitments has been included in Section 8 of the Report that incorporates comments from various government agencies.

5. Consideration of all the submissions

5.1. Public Exhibition Provisions

The proposed Paling Yards Wind Farm EIS was on public exhibition from Friday 28th March 2014 to Friday 30th May 2014 at the following locations:

- NSW Department of Planning and Infrastructure (Information Centre), 23-33 Bridge Street, Sydney;
- Taralga Community Service Centre, 29 Orchard Street, Taralga;
- Oberon Shire Council, 137-139 Oberon Street, Oberon;
- Oberon Shire Council Library, Corner of Dart and Fleming Streets, Oberon;
- Upper Lachlan Shire Council (Crookwell Office) – 44 Spring Street, Crookwell;
- Crookwell Library – Denison Street, Crookwell;
- Nature Conservation Council – Level 2, 5 Wilson Street, Newtown.

NSW Department of Planning and Environment (**DoP&E**) [formerly called NSW Department of Planning and Infrastructure (**DoP&I**)] directly advertised for the public exhibition period and notified the local community in vicinity of the project site.

In addition to DoP&E notification, GPGA also notified the local community about the public exhibition and the information day to be held during this period through the distribution of the letters on 9th May 2014. These letters were via direct mail to the neighbouring landowners within 5km to 10km of the site boundary which were also included in the original door knock consultation, a few of the immediate neighbouring landowners were also called directly to notify them of the events.

The information day session was held on Tuesday 27th May 2014 which was conducted during the public exhibition. The purpose of the Information Day was to provide community members and other stakeholders with an opportunity to attend, learn more about the Project, and ask questions about the proposed development in order to make a more informed decision about the proposed Project for their submissions. The team of consultants that prepared the EIS reports were available to answer inquiries from all attendees at the Information Day.

5.2. Summary of Submissions

NSW Department of Planning and Environment (**DoP&E**) has received 22 submissions on the publically exhibited EIS for the Project.

Each submission has a unique reference number in the form of (ID xxxxx), this ID has been used in the response to submissions section to provide a reference to the individual submissions.

The submissions form two categories:

- Comments from the government agencies (11 submissions); and
- Comments / Objections from community members (11 submissions);

The summary statistics table for the submissions and their related topic is shown in Table 5.2.1.

Table 5.2.1 – Paling Yards Wind Farm Submission Summary

Submission Number	Aviation	Community Enhacement Fund	Crown Land	Cumulative	Electricity Price	EMI/ Telecommunication	Environment	Fire \ Bushfire	Flora & Fauna	Health	Heritage	Hydrology	Landscape and Visual	Mineral Exploration	Noise and Vibration	Property Values	Socio-Economic	Traffic & Roadworks	Transmission Line options	Turbine Layout - Micrositing
100431													🔴						🔴	
100357																				
100349	🟡											🟡								
100347																		🟡		
100345		🟡									🟡				🟡		🟡	🟡		🟡
100343															🟡					
100341							🟡		🟡		🟡									
100329	🟡																			
100327								🟡												
100325			🟡																🟡	🟡
100323														🟡						
99008									🔴	🔴			🔴		🔴	🔴			🔴	
99006							🔴		🔴	🔴			🔴		🔴	🔴	🔴	🔴		
99004						🔴				🟢			🔴		🔴	🔴	🔴			
98994					🔴															
98928																		🟡		
98922							🔴	🔴					🔴		🔴	🔴		🔴		
98920																🔴				
98819													🔴		🔴		🔴			
98743							🔴	🔴	🔴				🔴		🔴	🔴		🔴		
98565				🔴	🔴		🔴		🔴	🔴					🔴					🔴
97952					🔴								🔴			🔴				
TOTAL	2	1	1	1	3	1	5	3	5	4	2	1	8	1	9	7	4	6	3	3

🔴 Indicates objection submission
🟢 Indicates suportive submission
🟡 Indicates comment from government agency

5.3. Government Submissions, Comments on the Project

The government agency submissions covered a vast spectrum of topics, and provided a wide range of comments, including several shown in the following list:

- Support for the EIS assessment and recommended provisions;
- Propose draft conditions of the permit;
- Request for additional information;
- Request for updates to the Statement of Commitment;
- Request for consultation when preparing the various management plans;

Government agency submissions are address in detail in section 6 of this report.

5.4. Community Submissions, Supporting / Opposing the Project

The community submissions covered a range of topics including: Landscape and Visual, Noise, Health, Fire / Bushfire, Environment, Flora & Fauna, Turbine Layout (Micrositing), Transmission Line Options, Electromagnetic Interference, Socio-Economic and Property Value, Electricity Price Subsidies, Traffic and Transport, Cumulative.

Community submissions are addressed in detail in section 7 of this report.

6. Response to Government Agency Submissions

The following Government agencies submitted comments to the Project:

- Oberon Council (OC) – (ID 100345)
- Upper Lachlan Shire Council (ULSC) – (ID 098928)
- NSW Department of Trade & Investment – Resources & Energy - (ID 100232)
- NSW Department of Trade & Investment – Crown Lands – (ID 100325)
- NSW Rural Fire Service (RFS) – (ID 100327)
- Department of Defence - (ID 100329)
- NSW Office of Environment and Heritage (OEH) - (ID 100341)
- NSW Environmental Protection Agency (EPA) – (ID 100343)
- NSW Roads and Maritime Services (RMS) - (ID 100347)
- NSW Department of Primary Industries – NSW Office of Water - (ID 100349)
- Airservices Australia - (ID 100357)

The response to each of the comments raised by these agencies is shown in detail in sections 6.1 to 6.12.

6.1. Response to Oberon Council

The Oberon Council (**OC**) provided a submission (ID 100345) [ref D&B/SSD/Paling Yards GW:JB] dated 30th May 2014, with comments on the one unidentified building within 2km of proposed turbines, Voluntary Planning Agreement, traffic and transport requirements, cultural heritage management plan, viewing platform, 'jet' backup systems, socio-economic and employment within Oberon LGA. The submission comments and GPGA responses are shown in Table 6.1.1 - Response to Oberon Council (OC). For further details on traffic related assessment refer to Appendix 4 – GTA Consultants Response to Traffic Related Submissions.

Table 6.1.1 - Response to Oberon Council (OC)

Category	OC Submission Comments	GPGA Responses
Unidentified building within 2km	(1) Concern is raised over the assessment of dwellings not associated with the development and the proximity of those 'non-identified' dwellings that will be impacted by the development. It has been stated in the EIS that no assessment of these non-identified structures/dwellings has been carried out even though they will be the most affected by the proposed development. This issue requires further investigation. Council records for the most affected ·non-identified dwelling' show that the land is in private ownership however there is no record of any approval for a dwelling. We request the applicant (given the sensitive location of the land) undertake further investigation in relation to this land and we can provide contact details for this purpose.	(1) Noted. The Proponent has undertaken a comprehensive stakeholder consultation process during the environmental assessment process. There are no known non-participating dwellings within 2km of any proposed turbine, although there is a non-identified building located approximately 1.65km from the nearest proposed turbine on the south-east of the Project. During the door-knock consultation process on 30th and 31st May and 1st June 2011, and again during additional consultation process on 5th and 6th July 2011 the property of the non-identified building was visited, however due to the difficultly in accessing the property and the locked gate restricting access to reach the building on the property it was not possible to determine with any accuracy if the building was a dwelling or a shed, etc. Our letters that were left on the locked gate were not answered by the owner of the property, and we provided

Category	OC Submission Comments	GPGA Responses
		two additional letters to our landowner to place on the gate, and again no response was provided. Our landowner informed us that they believe the building is not an official dwelling, and we acknowledge Oberon Council's comment that there has not been any record of any approval for a dwelling on that property. The property is in our mail distribution list however to date we have not had any response from the owners of the property.
Voluntary Planning Agreement (Community Enhancement Fund)	(2) Should the Department give approval for the development, Council will be seeking to enter into a Voluntary Planning Agreement (VPA) in accordance with Section 93F of the Environmental Planning & Assessment Act 1979 (the Act). It is noted that the applicant has offered to enter into an Agreement should approval be recommended.	(2) Noted. The Proponent will commit to enter into a Voluntary Planning Agreement (VPA) with Oberon Council. The VPA will include an annual monetary contribution of amount of $2,500 (adjusted annually to changes in the CPI) per operating turbine forming part of the Paling Yards Wind Farm. These annual contributions will be paid into the Oberon Council Community Enhancement Fund (CEF). The CEF will fund local projects within a radius of 50km of the Paling Yards Wind Farm within the Oberon Local Government Area. The local projects which will eligible for funding from the CEF will be projects aimed at: ▪ Enhancing any aspect of the local environment including, but not limited to, ameliorating any impacts from the Paling Yards Wind Farm; or ▪ Providing any community service or facility.

Category	OC Submission Comments	GPGA Responses
		The $2,500 referred to above is based on the existing Voluntary Planning Agreement between the Proponent and Upper Lachlan Shire Council for the Crookwell 2 Wind Farm. The contribution will be for each operating wind turbine and will commence on the anniversary of the commissioning of the wind farm. The Proponent makes the VPA commitment subject to no other monetary contribution obligation forms part of the Development Consent conditions.
Traffic and Transport	(3) There is no concern about the volume of traffic expected to be generated by this development, given the low traffic volumes currently using Abercrombie Rd (which is the only Council controlled road to be used for access).	(3) Noted.
Traffic and Transport	(4) From Section 3.1 of the EIS it appears that vehicles up to 64.4m long may be required to deliver components to the site. This will require special transport arrangements, presumably involving escort vehicles. Also, the minimum height clearance required is 6 6m, which raises clearance concerns along Abercrombie Rd. The applicant will be required to determine this, and to make appropriate arrangements with Council and all other agencies to rectify any issue raised, including tree removal and	(4) Noted. Standard over-dimensional vehicle procedures (as required by RMS) would be used, including pilot vehicles as appropriate. As discussed in the additional route assessment undertaken by GTA Consultants (refer to Appendix 4 and Appendix 5), the minimum height clearance required for over-dimensional transport vehicles is 5.5 metres. An initial assessment indicates that all major structures provide this minimum clearance. However, a detailed assessment of all potential obstructions would be undertaken during the development of the Traffic Management Plan (TMP), in consultation with the

Category	OC Submission Comments	GPGA Responses
	possible relocation of power lines. If any trees are proposed to be lopped or removed, this will be required to be undertaken in consultation with Council. Any such works required will be at the applicant's cost.	relevant Council and RMS. Approval would be sought from Council before any road modification works are undertaken by the Proponent, at the Proponent's cost.
Traffic and Transport	(5) The EIS states that the maximum gradient permitted is 6%, however some parts of Abercrombie Rd exceed this gradient. The applicant needs to justify how this issue will be dealt with.	(5) A detailed TMP will be prepared in consultation with Council and RMS prior to any over-dimensional wind turbine component movements. The plan will detail measures to manoeuvre the components up grades steeper than 6%. This could include the use of additional prime movers to increase pulling power.
Traffic and Transport	(6) The EIS does not specify the expected vehicle loadings, and whether the loadings may exceed the normal permissible legal loading for Abercrombie Rd or other roads Further information is requested relating to this issue and this may require pavement strength testing. The cost to repair any pavement damage must be borne by the applicant should the Department give approval to the development.	(6) It is noted that Abercrombie Road is currently used by logging trucks to transport timber. A dilapidation assessment will be carried out on O'Connell Road and Abercrombie Road prior to any over dimensional component movements. Pavement strength testing and assessment will be undertaken (if required) once the final turbine supplier and transport contractor are known. The Proponent will consult with Oberon Council and agree on any appropriate pavement upgrades / rehabilitation along Abercrombie Road, based on suitable criteria.

Category	OC Submission Comments	GPGA Responses
Traffic and Transport	(7) The EIS specifies there will be six access points from Abercrombie Rd into the development site; however, the descriptions of the locations are not sufficient to accurately determine them on site. It is requested that they be marked on site to enable sight distances to be checked. Further information is also requested as to whether all six will remain as permanent accesses, or will they be in place only during the construction phase If they are only temporary, sight distance is not considered to be as critical. However, traffic control may be required when they are in use.	(7) Additional details of the access locations have been provided within the assessment undertaken by GTA Consultants (refer to Appendix 4), with detailed designs required to demonstrate appropriate sight distances. This includes the coordinates and photos of each access location. All access locations are to remain accessible post construction to allow for maintenance and inspection of the turbines.
Traffic and Transport	(8) Accurate identification of the access locations is also important to determine if any significant vegetation will need to be cleared and to enable Council to set any conditions on their design.	(8) Additional details of the access locations have been provided within the assessment undertaken by GTA Consultants. This includes the coordinates and photos for each access location. Refer to Appendix 4 for more details. Of the six access points, two will avoid vegetation clearing, another two will require the removal of planted, non-native Pine trees (Pinus radiata), and the remaining two have some native trees nearby and subject to Safe Intersection Sight Distance (SISD) and approval from Council and RMS, vegetation clearing could be avoided.

Category	OC Submission Comments	GPGA Responses
Traffic and Transport	(9) The EIS states that in two locations the new accesses will form a "crossroads" on Abercrombie Rd (accesses are opposite each other). This is not desirable but can be avoided with just a small offset between the two accesses.	(9) Noted. Access 4 and Access 5 would be constructed as staggered T-intersections to improve safety at these locations; details of which will be determined during detailed design.
Cultural Heritage	(10) It is noted that the applicants have stated that a Cultural Heritage Management Plan be provided for the development prior to any construction works. As part of any approval Council will assess the Plan prior to any activity on site. It is considered that this Plan must include how ongoing education for contractors will be undertaken to advise of potential sites and recognition of potential artefacts whilst in the construction phase. Any Plan of this nature will need to be approved by the relevant agency and Council.	(10) Noted. GPGA will consult with Oberon Council and other relevant stakeholders in preparation of the draft Cultural Heritage Management Plan (CHMP). The draft CHMP will include measures for on-going contractor cultural heritage education and awareness to assist recognition of potential sites and places during the construction phase of the Project. The Draft CHMP will be forwarded to the Representative Aboriginal Parties (RAPs) for review and endorsement and submitted to both OEH and the Oberon Council for approval.
Viewing Platform	(11) It is stated in the EIS that the applicant does not propose to provide a viewing area for the development, contravening Councils own Development Control Plan for Wind Developments. Council considers the establishment of an appropriate viewing area for the development as critical, given the width of Abercrombie Road and the significant nature of the development. This would be	(11) Noted. The proposal will now also include a viewing platform within the site boundary adjacent to the Abercrombie Road corridor to allow the public to safely pull over off the road to better view the Paling Yards wind farm from the designated viewing area. It is anticipated that the viewing platform will be located north of proposed Access Road 4/5, details of the proposed viewing platform and road interface will be determined in consultation with Oberon

Category	OC Submission Comments	GPGA Responses
	required separate to any voluntary planning agreement or community fund contribution.	Council and during detailed design process seeking the relevant approvals in conjunction with the access roads.
Noise from 'jet' backup system	(12) In researching other similar developments issues have previously been raised about 'jet' backup systems. Public criticism of these systems concerns substantial noise issues for neighbours. Council considers that these back-up systems should not be considered for the Paling Yards area In assessing the application no evidence has been found to establish these systems however conditions of consent to prohibit these should be included in any consent.	(12) Noted.
Socio-Economic and Employment	(13) Some issues over economic and social impacts have been raised as a consequence of the Information Day held at the Paling Yards Rural Fire Service Shed on 27 May. In response to a question regarding employment opportunities it was stated that about 40% of the workforce will be sourced locally. When questioned further "locally" was defined as "Oberon and surrounding LGA's". Council would encourage the developer to look closely at Oberon for labour hire and accommodation for workers during construction.	(13) Noted. GPGA will focus its efforts associated with advertising employment opportunities for the construction and operation phases within the Oberon locality and in consultation with Oberon Council determine the most effective way to engage with local businesses (including material providers and trades people).

6.2. Response to Upper Lachlan Shire Council

The Upper Lachlan Shire Council (**ULSC**) provided a submission (ID 098928) [ref F11/243 & D2014/2097] dated 28th May 2014, with comments on traffic and transport requirements, and transmission line options. The submission comments and GPGA responses are shown in Table 6.2.1 - Response to Upper Lachlan Shire Council. For further details on traffic related assessment refer to Appendix 4 – GTA Consultants Response to Traffic Related Submissions.

Table 6.2.1 - Response to Upper Lachlan Shire Council

Category	ULSC Submission Comments	GPGA Responses
Traffic & Transport (Roadworks)	(i) Upper Lachlan Shire Council (ULSC) has studied the Environmental Impact Statement and other documentation associated with the Paling Yards Wind Farm Development. Whilst Council acknowledges that the proponent plans to limit its use of the ULSC road network, Council has concerns that even this limited use proposal will have the potential to damage the road assets that are owned by the community in addition to posing a threat to the safety of existing road users.	(i) The current application doesn't propose to use the road between the site and Taralga for the transport of plant and equipment by over-dimensional vehicles, however, may be used by light vehicles for access the proposed development during construction and operation. A minor increase in light vehicle traffic would not impact road condition or safety.
Traffic & Transport (Roadworks)	(1) Council is concerned that the information regarding Over Dimension, Over Mass and Heavy Haulage routes appears to be inconsistent. Council has sought advice from an experienced heavy haulage operator who considers that all of the routes favoured in the report are long, unwieldy, have areas where the heavy haulage parameters would be	(1) Noted. The current application doesn't propose to use the road between the site and Taralga for over-dimensional vehicles. Updated Restricted Access Vehicle (RAV) dimensions have also been provided in the GTA Report in Appendix 5 and shows that the proposed vehicle is much shorter than the original proposed OD.

Category	ULSC Submission Comments	GPGA Responses
	exceeded (in terms of cross fall and longitudinal grades) as well as being uneconomical. The comparison with B-Double routes is unrealistic as each type of vehicle is allowed to use (or restricted from using) particular routes depending on characteristics that are unique to each type of vehicle. The operation of vehicles carrying OD and OM loads is significantly different to both 19m and 26mB-Doubles (19mB-doubles have general access rights that allow them to travel on roads that are used by conventional semi-trailers). It may also be of significant benefit to the developer and the wider community to upgrade the Abercrombie River Bridge, approaches roads and use MR256 for all vehicles to access the site. Should the proponent wish to use the route involving MR256, ULSC will require that the Abercrombie River Bridge be replaced, and the associated roadway upgraded as necessary.	
Traffic & Transport (Roadworks)	(2) ULSC is also concerned with the lack of commitment from the developer in relation to the route that is likely to be used for light traffic to access the site. The Transport Impact Assessment states that 85.9% of the personnel on	(2) It is anticipated the project could generate up to approximately 168 two-way vehicle trips per day associated with site personnel during the construction period. There is also anticipated be an additional 40 two-way vehicle trips per day associated with

Category	ULSC Submission Comments	GPGA Responses
	site each day will travel from the Goulburn/Canberra area. Unfortunately, it fails to identify which route will be used by these people to access the site. Obviously, most staff will be seeking to use MR256 for this purpose. ULSC has concerns regarding the use of MR256 as several areas of substandard road (pavement strength and alignment) exist between Taralga and the Abercrombie River. Table 4.1of the T.I.A. assesses peak light traffic as being 120 movements per day; however, this is assessed in one direction only. The base traffic is shown in two directions. Using this information after it has been corrected (multiplied by two), the light traffic on MR256 will almost double. Whilst, in absolute terms, the additional traffic may not cause problems with intersections and "traffic lights "and the road may have enough theoretical capacity, in relative terms the everyday existing users will have trouble in coping with these changes. This will be exacerbated when the existing traffic and development traffic will travel in opposing directions during the am and pm peaks. This additional traffic has the potential to cause significant conflicts for users of the existing road network.	construction vehicle traffic. Construction vehicle traffic would arrive and depart from the north via Abercrombie Road. Trips associated with personnel could approach from both directions. Based on the assumption that 86% of personnel would approach the site from the south, this equates to an additional 73 trips during any peak hour. It is acknowledged that this could represent a relatively high change in current traffic volumes to the south along Taralga Road and Richlands Road. However, absolute traffic volumes on these roads are anticipated to continue to operate within acceptable bounds. Although this could affect safety and associated risks of crashes on these roads, the relative risk is anticipated to remain low. Appropriate communication with the local community and other existing road users through signage and other media would assist in minimising such risks. Some additional warning signage at specific areas of concern (e.g. locations of substandard alignment) could be installed at the Proponent's expense.

Category	ULSC Submission Comments	GPGA Responses
Traffic & Transport	(3) It may be necessary to impose speed limits on parts of the public road network to ensure that the interaction of construction traffic with existing traffic occurs in a safe manner.	(3) A Traffic Management Plan (TMP) and associated Traffic Control Plans (TCP) will be prepared to manage traffic impacts and safety during construction. The operation of the site access points would be considered as part of this and appropriate measures implemented to maintain safety on Abercrombie Road.
Transmission Line Option	(4) ULSC acknowledges the proponent's intention to connect to the Electricity Supply Grid via a local connection to the Mount Piper - Bannaby transmission line. It is assumed that any changes to this arrangement will require a modification application. Council will certainly be providing comments if this eventuates.	(4) Noted. The current application only proposes the northern transmission line option. The Proponent has lodged a Connection Enquiry with TransGrid for the proposed grid connection option, and TransGrid´s response indicates that such connection configuration is suitable from the network operation/capacity perspective. The proponent intends to progress the Connection Application in the coming months to obtain an Offer to Connect from TransGrid.
Traffic & Transport (Roadworks)	(5) ULSC is concerned that the proponent has not identified potential sources for road making gravels, concreting aggregates, cement and reinforcing steel. The documents assume that these materials will be delivered to the site from the north but fails to provide evidence to indicate how this will be achieved and policed. Unfortunately, the transport of these materials has the greatest potential to damage the local road network (as well as reducing road safety for existing users). Viable suppliers of these materials exist in Goulburn, Crookwell,	(5) All transport of heavy materials is to access the site to and from the north via Abercrombie Road. This would be included as part of the construction contractor's agreement, with a requirement to specifically identify material origins. As such, it is anticipated that no heavy vehicles will access the site via Taralga Road.

Category	ULSC Submission Comments	GPGA Responses
	Berrima and Canberra. In addition to this, the proponent may be able to source gravel for internal roadworks from roadside earthworks involved in improving MR 256 which could provide cost savings for the development as well as road improvements for the benefit of the community.	
Traffic & Transport (Roadworks)	(6) Council does not favour the utilization of "laser car' dilapidation reports in assessing the condition of the roads prior to and after construction. These reports are mainly suited to a broader assessment of a larger scale road network and lack adequate detail to identify smaller pavement repairs that may be required. Instead of this process, Council prefers to have a joint inspection and agreement that relies on photographs to identify pre-existing faults in the pavement.	(6) Noted. It is not expected that dilapidation reports would be required for the use of roads by light vehicles only. However, the applicant will conduct any dilapidation reporting by joint inspection and agreement where necessary.
Traffic & Transport	(7) The proponent shall be required to produce a Transport Management Plan before consent is granted. This is to ensure that the required due diligence (and appropriate consultation with stakeholders) has been carried out in relation to any transport issues that might arise.	(7) Noted. A TMP and associated TCP will be prepared in consultation with RMS and respective Councils. A draft Table of Contents is provided in Attachment 2 of Appendix 4.

6.3. Response to NSW Dep. of Trade & Investment (Resources & Energy)

The NSW Department of Trade & Investment (Resources & Energy) division provided a submission (ID 100232) [ref OUT14/11397] dated 11th April 2014, with comments on impact to state or regional mineral resources. The submission comments and GPGA responses are shown in Table 6.3.1 - Response to NSW Dep. of Trade & Investment (Resources & Energy).

Table 6.3.1 - Response to NSW Dep. of Trade & Investment (Resources & Energy)

Category	DT&I Submission Comments	GPGA Responses
Mineral Resource	(1) The Mineral Resources Branch (MRB) has no concerns with the EIS as the proposed wind farm does not occur in proximity to any recognised state or regionally significant mineral resource.	(1) Noted.

6.4. Response to NSW Dep. of Trade & Investment (Crown Lands)

The NSW Department of Trade & Investment (Crown Lands) division provided a submission (ID 100325) [ref 13/03319] dated 8th May 2014, with comments on their requirements if Crown Roads are to be impacted by the proposed infrastructure. The submission comments and GPGA responses are shown in Table 6.4.1 - Response to NSW Dep. Of Trade & Investment (Crown Lands).

Table 6.4.1 - Response to NSW Dep. Of Trade & Investment (Crown Lands)

Category	Crown Lands Submission Comments	GPGA Responses
Crown Lands	(1) No wind turbines are visibly impacting on Crown roads; however, turbines P5, P8, P12, P14, P24, and P55 are currently placed in close proximity to Crown roads. If the location of any turbine in the detailed design stage, particularly the turbines noted here, are revised and found to impact on a Crown road, then the options for the proponent are: ▪ Relocate the turbine so as to not impact on potential use of the road and therefore breach the provisions of Section 5(1) of the Roads Act 1993; ▪ Or arrange for the adjoining landowner to close and purchase the affected section of Crown road; ▪ Or if any impacted Crown roads are not able to be closed, NSW Trade & Investment, Crown Lands would appraise with a view to authorisation via suitable easements	(1) Noted. The proponent will consider and implement the various options provided by Department of Trade & Investment (Crown Lands) in relation to impact to Crown Roads.

Category	Crown Lands Submission Comments	GPGA Responses
	replicating the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 with compensation and fees assessed in the normal manner; It will always be Crown Lands preferred position that any Crown roads are closed if affected by any wind farm infrastructure.	
	(2) If a Crown road is to be upgraded to provide access of a vehicular standard, NSW Trade & Investment, Crown Lands would require the affected roads to be transferred to the local Council.	(2) Noted.
	(3) The proposed northern transmission line route corridor will be approximately 9 kilometres in length and 70 metre in width. Route sighting is selected to avoid direct with watercourses and Crown land. It should be noted that there remains an incomplete Claim under the NSW Aboriginal Land Rights Act 1983 over Lot 19 DP 753064. This Lot comprise Reserve 190027 notified 30/12/1987. This means that any cabling or transmissions power poles must not impact on this Crown Land because this Office cannot create	(3) Noted.

Category	Crown Lands Submission Comments	GPGA Responses
	an interest or dealing in the land until the Claim is determined and any appeal period expires.	
	(4) The provisions of the Native Titles Act (Cth) would be resolved by virtue of acquisition of suitable easements. The transmission line route is in close proximity to Lot 19 DP 753064 for several hundred metres.	(4) Noted.
	(5) All cables are stated to generally follow the same alignment as the access tracks to limit development footprint; however, this alignment may diverge from access tracks to overcome ground constraints and electrical losses. Any proposed internal access tracks or wind farm cabling crossing Crown roads are to be authorised by suitable easements.	(5) Noted.
	(6) If required, a letter of authority can be issued to the proponent permitting access to the site for the purpose construction and commissioning of the project. Such a letter would be on the premise that the proponent agrees in writing to all consent conditions and to finalise all easements as soon as practicable after construction.	(6) Noted.

Category	Crown Lands Submission Comments	GPGA Responses
	(7) When the final project final design stage is determined and approved by Planning and Infrastructure NSW, the proponent must undertake a status search with the Department to determine the impact of the final design on Crown land and roads. The fee for such a search will be determined on the basis of time taken with any costs to be borne by the proponent.	(7) Noted.
	(8) If the approved final design stage impacts on any Crown assets, Crown Lands reserve the right to seek additional requirements at that time.	(8) Noted.

6.5. Response to NSW Rural Fire Service

The NSW Rural Fire Service (**RFS**) provided a submission (ID 100327) [S10/0006] dated 6th May 2014, with comments use of existing guidelines and standards for preparation of fire prevention and protection measures.

The submission comments and GPGA responses are shown in Table 6.5.1 - Response to NSW Rural Fire Service.

Table 6.5.1 - Response to NSW Rural Fire Service

Category	RFS Submission Comments	GPGA Responses
Bush Fire	(1) At the commencement of building works and in perpetuity the property surrounding the infrastructure to a distance of 10 metres, shall be maintained as an inner protection area (IPA) as outlined within section 4.1.3 and Appendix 5 of *Planning for Bush Fire Protection 2006* and the NSW Rural Fire Service's document *Standards for asset protection zones*.	(1) Noted. The Proponent shall maintain the Inner Protection Area (IPA) for the property surrounding the infrastructure that is within the Project site and for the life of the Project.
	(2) Provision of adequate water supplies shall be made available for firefighting personnel.	(2) Noted. The location and number of tanks or other water supply points will be determined in consultation with the NSW RFS.
	(3) Access throughout the site specifically, to the infrastructure shall be in accordance to 4.1.3 (2) of Planning for Bush Fire Protection 2006.	(3) Noted.

Category	RFS Submission Comments	GPGA Responses
	(4) A bush fire emergency management and operation plan detailing measures to prevent fires igniting during the construction phase and the operation of the wind farm, which include: ▪ Work involving risk of ignition that should not be carried out during total fire bans. ▪ Availability of fire suppression equipment. ▪ Storage and maintenance of fuels and other flammable materials. ▪ Notification of the local NSW Rural Fire Service Fire Control Centre for works proposed to be carried out during high fire danger periods to ensure weather conditions are appropriate. ▪ Bush fire emergency management planning.	(4) Noted. The Proponent will prepare a Bush Fire Emergency Management and Operation Plan (BFEMOP) in consultation with NSW RFS and Local Fire Brigades.

6.6. Response to Department of Defence

The Department of Defence (DoD) provided a submission (ID 100329) [AF17917720] dated 27th May 2014, with comments that it does not object to the proposal subject to their concerns listed below are addressed by the Proponent. DoD requests 'as constructed' details to be provided to RAAF Aeronautical Information Service, and that the wind farm be lit in accordance with Civil Aviation Safety regulation 139 and the Civil Aviation Safety Authority Manual of Standards 139, and to be consulted if there are any subsequent modification to the design. For clarification of the comments about the obstacle lighting, GPGA called Mr Nick Parker of DoD on 18th September 2014 and enquired about their obstacle lighting requirement, Mr Parker confirmed that DoD will require the specific LED light wavelength range only if CASA required obstacle lighting for the Project. The submission comments and GPGA responses are shown in Table 6.6.1 - Response to Department of Defence.

Table 6.6.1 - Response to Department of Defence

Category	DoD Submission Comments	GPGA Responses
Aviation	(1) Department of Defence request that the applicant provides 'as constructed' details of the wind farm to RAAF Aeronautical Information Service (AIS) for aeronautical charting. RAAF AIS has a website with a Vertical Obstruction Report Form at www.raafais.gov.au/obstr_form.htm which can be used to enter the location and height details of tall structures.	(1) Noted. GPGA will provide RAAF Aeronautical Information Service (AIS) with the 'as constructed' details of the wind farm.
	(2) Department of Defence requests that the Wind Farm should be lit in accordance with Civil Aviation Safety Regulation 139 and the Civil Aviation Safety Authority Manual of Standards 139. If Light Emitting Diode (LED) obstruction lighting is applied to the Wind Farm, the	(2) GPGA contacted Mr Nick Parker of DoD on 18th September 2014 and enquired about their obstacle lighting requirement, Mr Parker confirmed that DoD will require the specific LED light wavelength range only if CASA required obstacle lighting for the Project.

Category	DoD Submission Comments	GPGA Responses
	frequency range of the emitted LED light is requested to fall within the wavelength range of 655 to 930 nanometres. This will enable the lighting to be visible to persons using night vision devices.	CASA's advice (dated 4 August 2011), which is consistent with its current view as expressed with respect to other similar projects, was as follows: "*At this time, CASA has no specific authority to require marking or lighting of obstacles that are not at (or in the vicinity of) an aerodrome. Notwithstanding CASA's regulatory authority, owners of structures which could be hazardous to aviation have a duty of care. It is CASA's view that the provision of obstacle marking and lighting is a decision for, and the responsibility of, the project proponent. Any associated requirements for obstacle marking and lighting placed on developers by planning authorities, insurers or financiers are beyond CASA's scope.*" In the event that CASA mandates obstacle lighting on wind turbines for this Project, GPGA will install NVG compatible obstacle lighting that operates at a wavelength of ~855 nanometres (which sits within the range of 655 to 930 nanometres specified by Department of Defence).
	(3) To mitigate potential impacts to Defence activities, Defence requests to be consulted should there be any subsequent modification to the design, scale, location or intensity of the wind farm.	(3) Noted. In the event that there is any significant change to the siting of the turbine towers, GPGA will provide notification and relevant information to the Department of Defence and other relevant aviation authorities.

6.7. Response to NSW Office of Environment and Heritage

The NSW Office of Environment and Heritage (OEH) provided a submission (ID 100341) with comments on quantification of impacts to flora and fauna, avoidance, bird and bat collision, indirect impact, monitoring and mitigations, offset strategy, and on Heritage issues. The submission comments and GPGA responses for the ecology and heritage are shown in Table 6.7.1 - Response to NSW Office of Environmental and Heritage (A) and

Table 6.7.2 - Response to NSW Office of Environmental and Heritage (B) respectively.

Table 6.7.1 - Response to NSW Office of Environmental and Heritage (A)

Category	OEH Submission Comments	GPGA Responses
Flora & Fauna (Quantify Impact)	(1) The area of impact differs between the Environmental Assessment and the SER and requires clarification. The EA reports a total impact of 0.75 ha while the SER reports a total permanent impact of 12.6 ha. A further 1.4 ha is deemed to be temporary impact. The EA states that the entire 0.75 ha impact is of Western Tablelands Dry Forest emphasising the remaining turbines are within improved pasture and "are not representative of Derived Native Grassland". In contrast the SER reports a total of 2.9 ha of Apple Box – Yellow Box dry grassy woodland occurring as Derived Native Grassland within the development Footprint, of which 1.9 ha will be impacted. <u>Recommendation:</u>	(1) The vegetation survey methodology for the most recent survey undertaken by ERM as reported in the Supplementary Ecology Report (SER) was based on with a combination of qualitative field observation and plot/transect data collection according to the BioBanking Assessment Methodology (BBAM) (DECC 2009). The Environmental Assessment (EA) identified remnant vegetation as Western Tablelands Dry Forest which has been further refined and described as four separate communities: ▪ Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands; ▪ Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands; ▪ Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion; and ▪ River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions. The ERM survey confirmed that the majority of the Development Footprint consists of improved pasture although small patches of derived native grassland with scattered Apple Box (*Eucalyptus bridgesiana*) and Yellow Box (*E. melliodora*) trees were confirmed around the periphery. These areas (mapped as Apple Box - Yellow Box dry grassy woodland) constitute the TSC

<table>
<tr><th>Category</th><th>OEH Submission Comments</th><th>GPGA Responses</th></tr>
<tr><td></td><td>(1.1) That the actual area of impact be clearly described and quantified.</td><td>
Act-listed EEC: White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland). These areas are highly modified from their pre-European condition and occur along undulating slopes of the Study Area in discrete patches and are currently used as grazing lands (hence their previous classification in the EA as cleared pasture).

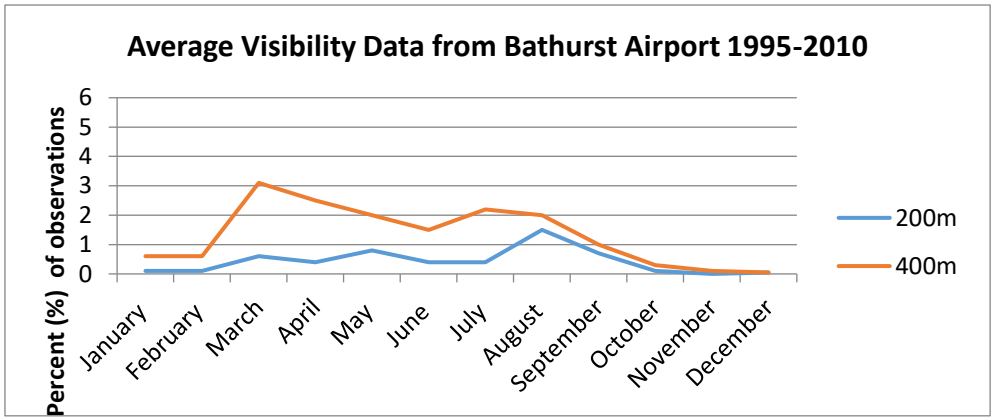
In additional to the more clearly defined vegetation communities, the boundaries of vegetation have also been reassessed during the most recent surveys by ERM and has included detailed mapping along the access tracks and the northern transmission line which were omitted from the original area calculations provided in the EIS.

(1.1) The actual area of vegetation to be removed will be:
<table>
<tr><th></th><th>Veg Type 1</th><th>Veg Type 2</th><th>Veg Type 3</th><th>Veg Type 4</th><th>Veg Type 5</th><th>Veg Type 6</th><th>Veg Type 7</th><th>Total</th></tr>
<tr><td>Turbine Footing and access tracks (permanent clearance)</td><td>1.9</td><td>0.1</td><td>0</td><td>0</td><td>1</td><td>0.2</td><td>0</td><td>3.2</td></tr>
<tr><td>Crane Handstand (temporary clearance)</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0.4</td><td>0</td><td>0</td><td>1.4</td></tr>
<tr><td>Transmission Lines (partial clearance)</td><td>0</td><td>6.8</td><td>0</td><td>2.3</td><td>0</td><td>0</td><td>0.3</td><td>9.4</td></tr>
<tr><td>Total Cleared</td><td>2.9</td><td>6.9</td><td>0</td><td>2.3</td><td>1.4</td><td>0.2</td><td>0.3</td><td></td></tr>
</table>
Veg Type 1: Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands (this vegetation forms part of the TSC Act-listed Box Gum Woodland EEC occurring in the Study Area as Derived Native Grassland)
Veg Type 2: Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Mod
</td></tr>
</table>

Category	OEH Submission Comments	GPGA Responses
		Veg Type 3: *Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Poor-Grassland* *Veg Type 4:* *Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Shrubby* *Veg Type 5:* *Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Mod* *Veg Type 6:* *Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Shrubby* *Veg Type 7:* *River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions_Mod-Good_Poor-Weedy* These calculations are based on: <u>Permanent</u> ▪ 6m wide access tracks ▪ 20m x 20m wide turbine footings ▪ 250m x 210m construction envelope for each substation ▪ 70m wide transmission line easement (partial clearance only) ▪ 7 x 1-1.5m2 for the footings of each wind monitoring mast <u>Temporary</u> ▪ 80 x 80m construction envelope for the concrete batching plant ▪ 50 x 50m wide crane hardstands ▪ 10m wide access tracks (only 6m wide will be permanent)
Flora & Fauna (Avoidance)	(2) The EA does not contain sufficient explanation regarding avoidance measures. Several turbines have been removed from the proposal therefore eliminating impact to Box Gum woodland within existing Commonwealth Conservation agreements.	(2) There are currently no plans or applications for the placement of wind turbines within the areas covered by the Commonwealth Conservation agreements. (2.1) The turbines in the remnant area have been moved closer to the cleared area to reduce the amount of vegetation clearing while keeping the minimum

Category	OEH Submission Comments	GPGA Responses
	While OEH welcomes the avoidance of these Box Gum woodland remnants it is stated several times within the EA that approval for these turbines may be sought at a later date. There are currently no plans or applications for the placement of wind turbines within the areas covered by the Commonwealth Conservation agreements. OEH again reiterates that placement of turbines within firstly an existing conservation agreement and secondly within an area of Box Gum Grassy Woodland Endangered Ecological Community (EEC) should be avoided where possible to do so. An additional turbine within remnant vegetation has been deleted and a further three have been relocated to sites just within the remnant. While this reduces impact there is no discussion regarding why deletion of all four turbines, or further relocation outside the remnant, is not feasible. <u>Recommendations:</u> (2.1) That the proponent ensures that all avoidance measures implemented in finalising the location and design of the facility are provided;	separation distance from other proposed turbines to minimise the wake loss effect on adjacent turbines. The microsited locations are placed on ridgelines that have the benefit of reasonably unobstructed access to the predominant wind direction. In consideration of the extensive grid connection requirement, the proposed project requires as many turbines as feasible to maintain project viability, and therefore turbines P10, P13 and P14 form part of the Project. (2.2) Ecological values have been considered during the design process and various project components have been located to minimise impacts on ecological values as far as practical whilst considering the technical capacity and viability of the project. The fundamental protocol for the final design is to avoid areas of native vegetation where possible. ▪ The proposed micrositing has completely removed all proposed infrastructure (including turbine P2, P6 and P7) to avoid impacts to the Box Gum Woodland conservation area, and ▪ Removed turbine P11 from the outstretched ridgeline to avoid the heavily vegetation area, along with relocating turbines P10, P13 and P14 closer to the edge of the cleared area, which has significantly reduced the vegetation clearing (2.3) The proposal doesn't include the placement of wind turbines within the areas covered by the Commonwealth Conservation agreements, hence turbines P2, P6 and P7 have been removed from the proposed layout.

Category	OEH Submission Comments	GPGA Responses
	(2.2) That the level of avoidance implemented is justified; and (2.3) That the DPE include a condition of consent ensuring that turbines are not placed within existing Commonwealth Conservation agreements containing Box Gum Grassy Woodland EEC.	
Flora & Fauna (Bird & Bat Collision)	(3) The EA has not adequately justified conclusions related to the risk of bird and bat collision and the significance of this impact. The SER provides a more comprehensive assessment of bird & bat strike although concedes that while the expected risk to bats at risk from rotor collision would be small this has yet to be confirmed. Neither assessment adequately discusses the likely influence of weather conditions commonly occurring at the site on bird collisions. Sites which experience poor weather and/or low visibility conditions need to be assessed taking this into account because it is likely to influence flight behaviour and increase the likelihood of impacts.	(3) Bird & Bat Collision (3.1) *Weather conditions* Poor visibility due to weather conditions (fog and rain) is often cited as a factor increasing risk of collision with structures, including wind turbines (Osborne *et al.* 2000; Drewitt and Langston 2006). In an American study (Arnett et al. 2005, cited in Strickland *et al.* 2011) it was found that wind speed and weather were significantly related to bat fatality. Nights with storms accompanied by high wind speeds had fewer fatalities, and nights immediately after storms accompanied by low wind speeds had higher fatalities (Arnett *et al.* 2005, cited in Strickland *et al.* 2011). In a second North American study, Osborn *et al.* (2000) identified that poor visibility may have contributed to two of eight bird mortalities related to collisions with turbines. Drewitt and Langston (2006) acknowledge that the increased risk of collision may be offset to some extent by lower levels of flight activity in poor weather conditions. The nearest available visibility data for the study area was taken from Bathurst Airport, approximately 90 km north of the study area (BoM 2010).

Category	OEH Submission Comments	GPGA Responses
	While the SER raises some additional factors that could potentially influence the susceptibility of bats to rotor strike there is little discussion of them. Additional risk factors relevant to consideration for an adequate impact assessment on all bat species known and likely to occur at the site include: ▪ Tree-roosting species may perceive turbines as potential roost trees; ▪ Ridge-top sites might coincide with availability of insect prey; ▪ Migrating bats may rely on sight (rather than echo-location) to navigate, being drawn to large structures on ridge-tops; ▪ Bats may investigate moving blades as movement may be mistaken as evidence of prey; ▪ Audible sound from turbines may attract bats from considerable distances; and ▪ Mating behaviour of tree-roosting bats may be centred on the tallest prominent feature in landscape. ▪ Risk of concussion from passing through low-pressure areas near turbines. <u>Recommendation:</u>	These data indicate that reduced visibility occurred more frequently in autumn and winter.  While collision risk factors are likely to vary across sites, and between countries (Hull and Cawthen 2012), it is reasonable to expect that poor visibility due to weather conditions may increase the risk of collision within the study area. Based on BoM data displayed above (BoM 2010), reduced visibility coincides with the colder months of the year when both bird and bat activity is reduced. This will reduce the likelihood of any additional impacts to birds and bats, above those already addressed within the SER (ERM 2013). Where possible, the data obtained during the bird and bat monitoring program will attempt to provide further information on the potential correlation between weather patterns and any observed increases in collision rates. *Additional risk factors relevant to bats* Evidence of mechanisms for bat mortality at wind farm sites specific to Australia is limited (Hull and Cawthen 2012) although numerous international

Category	OEH Submission Comments	GPGA Responses
	(3.1) That the Proponent take into account weather in assessing impacts on birds and bats, as well as further consideration of the above-mentioned risk factors.	studies have identified a lack of a relationship between species richness and abundance of bats using a site, and the species richness and abundance of fatalities (Cryan 2010). This suggests that some species of bats are more prone to impacts than others (based on their habitat and/or behavioural characteristics) as outlined below: This has also been reported at the Bluff Point and Studland Bay Wind Farms in Tasmania where analysis of 8 years of monitoring data (2002-2010) has shown that only two of the four species recorded at the site (the Gould's Wattled Bat and Vespadelus sp) have been involved in collisions (Woolnorth Wind Farm Holding, 2013). ▪ Tree-roosting species may perceive turbines as potential roost trees, Cryan (2010) notes that it is plausible that bats could mistake turbines for tall trees. Bats may be attracted to them as a higher number of roosting opportunities may be available in taller trees, partly due to size and also due to the related maturity of the tree and hence likelihood of presence of cavities, loose bark and crevices (Cryan 2010). Cryan (2010) identified this possibility as particularly relevant to migratory bats. In Australia, bats display some migratory behaviour, however migrations are only local (BL&A 2011). Hull and Cawthen (2012) acknowledged that collisions of Goulds Wattled Bat (*Chalinolobus gouldi*), thought to be a tree-roosting species and present within the study area, at two Tasmanian wind farms, may support the theory that bats investigating turbine towers as potential roost sites or gathering sites for mating may contribute to the risk of bat mortality. The Eastern False Pipistrelle and Greater Broad-nosed Bat are both listed as vulnerable and roost in trees. Calls detected during a survey of the study area may be attributed to these species (although unable to be confirmed). There

Category	OEH Submission Comments	GPGA Responses
		is potential for these species to perceive turbines as potential roost trees, thereby increasing the level of interaction with turbines, and consequent risk of collision and barotrauma (Baerwald et al. 2008) [*Baratrauma - moving turbine blades have areas of relatively high and low pressure, with an area at the tip of each blade having a drop in atmospheric pressure sufficient to cause internal injuries and tissue damage to air-containing structures*]. ▪ Migrating bats may rely on sight (rather than echo-location) to navigate, being drawn to large structures on ridge-tops; Bats are thought to rely on visual cues (such as tall trees and turbines) during long-distance navigation, as visual cues may be detectable from greater distances than acoustic cues (Cryan 2010). Cryan and Barclay (2009) note that turbines may attract bats from distances greater than 1 km. In Australia, bats display some migratory behaviour, but migrations are local and not considered to cover significant distances (BL&A 2011). The Eastern Bentwing-bat (listed as vulnerable and assumed to occur in the study area) migrates annually to maternity caves from distances up to approximately 300 km and may travel up to 65 km in a night (OEH undated). It is possible the Eastern Bentwing-bat could exhibit this type of behaviour during long-distance navigation, thereby increasing the risk for collision with turbines, or barotrauma. ▪ Ridge-top sites might coincide with availability of insect prey; Cryan and Barclay (2009) describe 'hilltopping' behaviour by insects, in which flying insects are attracted to the tallest structures in the landscape during the daytime. In this event, bats may learn to use wind turbines as foraging sites. There is limited research into this phenomenon in Australia, however bat carcases found around turbines in Tasmania showed no evidence of them

Category	OEH Submission Comments	GPGA Responses
		having recently been feeding around turbines (Hull and Cawthen 2012). It is currently unclear if insect species would exhibit this hilltopping behaviour, with a consequent effect on bat behaviour, within the study area. ▪ mating behaviour of tree-roosting bats may be centred on the tallest prominent feature in landscape. Cryan (2010) notes that the potential perception of turbines as potential roost sites, the use of tall features (such as turbines) in navigation and the potential availability of insect prey at turbines may have contributed to bats evolving mating behaviours that focus on the tallest trees in the landscape. Cryan (2010) notes that species for which sexes have separate distributions outside of the mating period may be more likely to use the highest trees as rendezvous points during the mating period. Hull and Cawthen (2012) acknowledged that collisions of Goulds Wattle Bat (*Chalinolobus gouldi*), thought to be a tree-roosting species and present within the study area, at two Tasmanian wind farms, may support the theory that bats investigating turbine towers as gathering sites for mating may contribute to the risk of bat mortality. Although, mortality was most prevalent in Autumn, a period of post-reproduction for the species (Hull and Cawthen 2012). ▪ Risk of concussion from passing through low-pressure areas near turbines. Moving turbine blades have areas of relatively high and low pressure, with an area at the tip of each blade having a drop in atmospheric pressure sufficient to cause internal injuries associated with barotrauma, rather than concussion; these aspects are discussed in the SER.

Category	OEH Submission Comments	GPGA Responses
		▪ Bats may investigate moving blades as movement may be mistaken as evidence of prey Thermal images of bats appearing to chase moving blades suggest that bats may be attracted to blades (Cryan and Barclay 2009). It is unknown how prevalent this behaviour is, or if this behaviour would be exhibited by the species present at the study area would, however it is possible this factor could attract species to turbines, thereby increasing the risk of collision or barotrauma. ▪ audible sound from turbines may attract bats from considerable distances There are reports of bats being attracted to the 'swoosh' sound of sticks being waved through the air, suggesting bats may also be attracted to sounds produced by moving blades (Cryan and Barclay 2009). It is unknown how prevalent this behaviour is, or if this behaviour would be exhibited by the species present at the study area, however it is possible this factor could attract species to turbines, thereby increasing the risk of collision or barotrauma. *Summary* Overall, while a number of hypotheses have been presented to describe the causes of bat mortality related to wind turbines, the lack of evidence of these causes, and particularly lack of evidence in an Australian context, makes it difficult to quantify potential impacts to bat species. Hull and Cawthen (2012) found that high-flying, open-air foraging bats are more at risk of fatality at wind turbines than other species. Males and females were impacted similarly, but there was a predominance of adults suggesting that the Tasmanian Windfarms were not resulting in mortality of dispersing juveniles

Category	OEH Submission Comments	GPGA Responses
		and sub-adults. Based on the data available it is unlikely that the impacts to bats would be significant at a population scale and there may be opportunities for the Bird and Bat Monitoring Plan developed as part of this Project to contribute to the understanding of interactions between bats and turbines in an Australian context.
Flora & Fauna (Indirect Impacts)	(4) The EA does not adequately address the potential for indirect impacts to fauna on the development site. There is a growing literature indicating that wind farms can have a detrimental impact on how fauna, particularly migratory species, utilise habitat surrounding turbines. Indirect impacts include, but are not restricted to: ▪ significant alteration of flight paths, ▪ change in habitat use patterns, ▪ changes in occupancy or population densities and ▪ changes in breeding success. The SER acknowledges the potential for indirect impacts in Section 4.2.4 stating that "Careful planning to avoid placement of turbine clusters in or near areas of high habitat value will manage the alienation of habitat to threatened woodland species".	(4) Indirect Impact Considerations *Alteration of flight paths* There is potential for wind farms to act as a barrier to flying birds, causing them to avoid the area and hence take another flight path. While there is little research into avoidance rates exhibited in Australia (Smales 2006), biodiversity monitoring at two wind farms in Tasmania did not provide evidence of a barrier effect (Hull, no date). Bird Utilisation Surveys conducted as part of the SER did not identify any migratory birds, and no species were observed exhibiting direct movement at height over the landscape as would be expected from migrating species. In addition, it is not considered likely that large numbers of species will cross the Study Area. This is due to the Development Footprint being higher than the majority of the surrounding area which would increase energy expenditure required for species flying over the plateau. The open nature of the Study Area is expected to deter species which are vulnerable to predation in open areas. There were no potential movement corridors identified within the Development Footprint such as vegetated corridors or narrow cleared areas or saddles between forested areas. For species that do move through the Study Area, the Paling Yards Project layout provides spaces of approximately 400m between most turbines, which would be expected to allow bird and bat species to move between turbines.

Category	OEH Submission Comments	GPGA Responses
	Although turbines P10, P13 and P14 have been resited they are still situated within remnant woodland and thus have the potential to indirectly impact fauna. OEH suggests that consideration should not be restricted to species listed on the EPBC Act or TSC Act. <u>Recommendation:</u> (4.1) That the Proponent assesses the potential for indirect impacts of turbines on fauna.	*Change in habitat use patterns and changes in occupancy or population densities* There is limited research on changes in habitat use, occupancy and population densities of birds and bats due to wind farms in Australia. The findings of a 10-year monitoring program for two wind farms in Tasmania showed a general reduction in biodiversity across the survey period within both the wind farm site and reference sites, with the decline commencing prior to construction. A synthesis of available research in the United States (The Wildlife Society 2007) summarised the following findings for bird species groups in the United States: ▪ reported grassland bird densities were lower within 80 to 100 m of wind turbines; ▪ in one study, raptors were observed to not nest within a 32km2 wind facility, despite it having similar habitat to a nearby area with 5.94 nests/100km2. However, other studies reported raptors nesting within 800m of wind farms; and ▪ reported densities of some waterfowl were lower within 600 m of wind turbines, however other species appear to experience no displacement effect. While not directly transferrable to Australian conditions and Australian species, these findings can give an indication of the scale of potential displacement of bird species. It is unclear to what extent operation of wind turbines may displace bird and bat species present in the study area, however it is recognised that displacement will reduce the number of birds interacting with turbines, consequently reducing the risk of collision.

Category	OEH Submission Comments	GPGA Responses
		Changes in breeding success Wind farms may indirectly impact breeding success through displacement of fauna from breeding locations, or mortality of individuals which would otherwise breed. A study of two fauna at two Tasmanian wind farms indicated that eagles continued to breed successfully at the wind farm sites, at the same or a higher rate than other areas of Tasmania. Additionally, a study of bat mortality at these sites identified that mortality was highest in autumn, a predominately post-reproduction period, suggesting the timing of bat fatalities would not result in the direct loss of young (Hull and Cawthen 2012).
Flora & Fauna (Monitoring & Mitigation)	(5) The EIS does not provide detail of the monitoring methodology proposed for monitoring the impacts of rotor strike nor does it adequate consider mitigation measures in response to bird and bat strike. The SER states that a monitoring program to monitor impacts of bird and bat strike across the wind farm will be established in consultation with OEH, providing no detail of methodologies that may be adopted <u>Recommendations:</u> (5.1) That the proponent develop a Bird and Bat Monitoring Plan that provides detail of how impacts on bird and bat populations will be monitored, including details on survey locations, parameters to be	(5) Bird and bat monitoring post construction is becoming routine practise both in Australia and overseas. There are no consistent standards in Australia for undertaking monitoring. (5.1) A draft Bird and Bat Monitoring Strategy (BBMS) has been developed (refer to Annex C of Appendix 5 to this Report). The draft BBMS identifies appropriate survey methodologies and frequency and provides guidance on bird and bat management. It provides a framework that can be used for development of a detailed Bird and Bat Management Plan (BBMP) for both the construction and operational phases of the wind farm once approved. (5.2) It outlines an indicative and adaptive program for monitoring the effects of each turbine and provides a sampling strategy specific to the first two years of operation. The details of ongoing monitoring (after the first two years of operation) will be negotiated and established based on the recommendations of the initial monitoring.

Category	OEH Submission Comments	GPGA Responses
	measured, frequency of surveys and analyses and reporting, and contains mitigation measures that will realistically reduce fatalities. (5.2) That the DoP&E include a condition of consent requiring a monitoring program capable of detecting any changes to the population of birds and/or bats that can reasonably be attributed to the operation of the project. This may require data to be collected prior to the commencement of construction. Data relating to mortality rates should be submitted to OEH on an annual basis for the first five years of operation and every two years thereafter.	
Flora & Fauna (Offset Proposal)	(6) As indicated in Issue (1) above, Assessment of Impacts, the EA reports a total impact of 0.75 ha while the SER reports a total permanent impact of 12.6 ha and a further 1.4 ha of temporary impact. Accordingly, the EA proposes no Offset Proposal while the SER includes a BioBanking Credit Calculator Report	(6) A draft Biodiversity Offset Strategy has been prepared for the proposal (refer to Annex D of Appendix 5 of this Report). (6.1) The Proponent will revise the offset strategy in consultation with OEH once the detail design of the layout has been finalised.

Category	OEH Submission Comments	GPGA Responses
	indicating the need for an offset of 289 credits, equating to 31.1 hectares. Statement of Commitment number 59 states that "The proponent will develop an offset package in accordance with the Principles for the use of biodiversity offsets in NSW". <u>Recommendation:</u> (6.1) That the offset requirements be clearly described and quantified and that a biodiversity offset strategy be prepared in consultation with OEH.	

Table 6.7.2 - Response to NSW Office of Environmental and Heritage (B)

Category	OEH Submission Comments	GPGA Responses
Heritage	(1) OEH notes that archaeological sites were identified but only one site (P8) is likely to come within the zone of potential impact by turbine placement and construction. A minimum 100 metre separation is recommended in the Cultural Heritage Impact Assessment although there appears to be some uncertainty as to the extent of the potential surface or sub-surface deposits. OEH recommends that the extent of this site be determined prior to work commencing and ensure micro-siting of turbines to avoid the site.	(1) A Cultural Heritage Management Plan (CHMP) will be developed prior to the construction phase for the project and will include measures for subsurface test excavation at Site P8 to determine the extent of the site. This will allow the proponent to micro-site nearby turbines to avoid potential impacts. The test excavation will be undertaken in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010). Tasks will involve: ▪ Consultation with RAPs and an offer of participation in the subsurface investigation; ▪ At least 14 days written notification to OEH and submission of the sampling strategy to OEH; ▪ Two archaeologists for approximately one to two days fieldwork; ▪ Completion of an Aboriginal Site Impact Recording Form for submission to the NSW Aboriginal and Heritage Information Management System AHIMS Registrar; and ▪ Preparation of an Archaeological Report to document results of the investigation
Heritage	(2) OEH also notes that proposed mitigation measures (Section 18.5) recommend that once proposed access track locations and other	(2) As part of the preparation of the CHMP, prior to construction work and following final footprint design, targeted surveys of pegged access tracks and other disturbance areas will be undertaken in consultation and collaboration

Category	OEH Submission Comments	GPGA Responses
	disturbance areas are pegged on the ground, additional targeted surveys of these areas should be undertaken. This is of particular importance where infrastructure intersects with locations of potential higher use by Aboriginal people in the past, such as watercourses.	with the RAPs to identify potential Aboriginal heritage values at risk of impact by the project. Particular attention will be paid to areas of potential higher use by Aboriginal people in the past, such as watercourses. This will likely be undertaken over two to three days by one archaeologist with participation of RAPs. If additional sites are identified during these surveys, an assessment and strategy for the management of the sites will be included in the CHMP for the project. The CHMP will be provided to the RAPS for review and approval and submitted to OEH and the Oberon Shire Council for approval.

6.9. Response to NSW Environmental Protection Authority

The NSW Environmental Protection Authority (**EPA**) provided a submission (ID 100343) [ref FIL07/8-06: DOC14/38665-02] dated 30th May 2014, with comments about the noise criteria and noise limits, proposed draft conditions of the permit relating to air, noise, vibration and water. The submission comments and GPGA responses are shown in Table 6.9.1 - Response to NSW Environmental Protection Authority (EPA). For more details on the response to EPA refer to Appendix 2 and for the revised Noise Impact Assessment revision R5 refer to Appendix 3.

Table 6.9.1 - Response to NSW Environmental Protection Authority (EPA)

Category	EPA Submission Comments	GPGA Responses
Noise	(1) Wind speed at microphone height was not measured to exclude wind-affected data.	(1) Local wind speed, due to the sheltering by the house and local vegetation, is typically lower than at higher elevations above ground. SLR has previously undertaken the exclusion process (wind logged at microphone height) and has found that almost no points are excluded and the net result on the final curve is negligible. Additionally, as the wind speed is a 10-minute average, and wind seeds at 1.5 m AGL in a typical garden setting are highly variable, then it is that the L90 statistic (quietest 10%) will be affected by wind on microphone disturbance. In any case, the noise limits do not rely on the background + 5 dBA curve for most locations.

Category	EPA Submission Comments	GPGA Responses
Noise	(2) Red dots used by the consultant on photographs of monitoring equipment may have concealed whether or not the wind screens were installed properly.	(2) Red dots were placed over the picture to show the location of the microphone more clearly. They can sometimes be difficult to see, particularly when photos are printed out. The red dots have been removed in the most recent version of the report. The EPA will observe that indeed, some of the microphones were not yet in place or had not yet had their windscreens put on at the time the photos were taken, however SLR can confirm that windscreens were used for all measurements, as is standard practice for all environmental noise logging
Noise	(3) Noise loggers were installed in vegetation at a number of locations, which may have led to elevated background noise curves.	(3) For some of the background monitoring locations, the entire house is surrounded by trees and vegetation. Finding a location that is not influenced by wind in trees would not be representative of the actual noise levels at the house. Sometimes noise logger location is dictated by other constraints including presence of other noise sources, residents' consent, access considerations, security, prevailing wind direction and shelter. In any case, the limit does not rely on the background + 5 dBA curve for most locations.
Noise	(4) The NIA did not specify the height at which wind speed measurements were undertaken, but states that it was adjusted to 100 m height wind speed.	(4) Wind speed measurements were taken at 20, 40 and 60 m above ground level on each wind mast. The hub height wind speed was

Category	EPA Submission Comments	GPGA Responses
		calculated based on the 10-minute shear value calculated from the 20 m and 60 m AGL wind speeds. This information is included in revision 5 of the report.
Noise	(5) The number of valid data points reported for three of the monitoring locations, regression curves may have been affected by the noise floor of the noise logging instrument used, between 22 dBA and 30 dBA (higher than recommended in the draft NSW guidelines.)	(5) The requirements for noise loggers are that they be at least Type 2 certified; no minimum noise floor is given. The loggers used were all Type 1, exceeding this requirement. There is a requirement for Sound Level Meters undertaking frequency analysis measurements to have a noise floor less than 20 dBA, but this does not apply to loggers in the background monitoring campaign. In any case, the limit does not rely on the background + 5 dBA curve for most locations.
Noise	(6) Plotted data for location 128 showed some stratification, and correlation of background noise measurements with wind speed at location 10 was very low (a maximum of 0.26683). This may indicate excessive extraneous noise levels at these locations.	(6) The standard does not require a minimum R2 value, only that the value be stated. Upon investigating this issue, it was discovered that a referencing error had caused some of the scatter plots in the report to be incorrect. The regressed lines and equations used for the technical assessment were not affected, only four of the presented graphs in the report document. This error has been corrected in the new revision of the report.
Noise	(7) Noise generated at the premises must not exceed the noise limit of 35 dBA (for all wind speeds) at any	(7) The Proponent requires clarification from EPA about the 'flat' noise limit, that is, 35 dBA for all wind speeds.

Category	EPA Submission Comments	GPGA Responses
	residential receiver not subject to a negotiated agreement.	SLR Consulting notes that background noise has already been shown to exceed this value at higher wind speeds at some locations and that background noise can also vary on a seasonal basis. Furthermore, we note that the predicted levels of noise at some locations are very low compared with the background noise levels. Thus, when the compliance measurements are conducted, it is possible that the noise levels will have slightly increased and/or be above 35 dBA but not due to noise from the wind farm. It is important that EPA acknowledges that measuring wind farm noise at levels close to or below ambient background noise is technically difficult and that the limit should not be read to literally mean that if the regressed noise line is over 35 dBA that the wind farm is in breach.
Noise	(8) The Proponent shall prepare a revised Noise Impact Assessment (NIA) for the final turbine model and turbine layout selected prior to commissioning of the wind turbines. The revised NIA must demonstrate, through appropriate modelling and in accordance with the Environmental Noise Guidelines: Wind Farms (SA EPA 2003), that the final turbine model and layout can meet the noise limit(s) derived in accordance with those guidelines.	(8) Noted. The Statement of Commitment has been updated accordingly.

Category	EPA Submission Comments	GPGA Responses
Noise	(9) Prior to commissioning of the turbines, the Proponent must prepare and implement a Noise Management Plan that includes the following measures to manage noise emissions from the operation of the project. The Plan must be undertaken generally in accordance with the Environmental Noise Guidelines: Wind Farms (SA EPA 2003) and include, but not necessarily be limited to: a) compliance monitoring, within one year of commissioning, against the noise limits, b) identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible, c) measures to be undertaken to rectify annoying characteristics resulting from the operation of the project such as infrasound, tonality or adverse mechanical noise from component failure, and d) procedures and corrective actions to be undertaken if non-compliance is detected.	(9) Noted. The Statement of Commitment has been updated accordingly.

6.10. Response to NSW Roads and Maritime Services

The NSW Roads and Maritime Services (**RMS**) provided a submission (ID 100347) [ref WST14/00033] dated 30th May 2014, with comments on transportation considerations and requirements. The submission comments and GPGA responses are shown in Table 6.10.1 - Response to NSW Roads and Maritime Services. For further details refer to Appendix 4 – GTA Consultants Response to Traffic Related Submissions.

Table 6.10.1 - Response to NSW Roads and Maritime Services

Category	RMS Submission Comments	GPGA Responses
Traffic & Transport	(1) The selected road transportation routes for materials from Port Kembla and Port of Newcastle to the site assumes access from Sydney using Bells Line of Road (MR 184) and possibly Great Western Highway (HW5). Access across the Great Dividing Range for over size/over mass and some low loader vehicles is not possible using Bells Line of Road and may not be possible using Great Western Highway. Transportation access from east to west by road will need to be obtained, subject to approval, via roads other than Bells Line of Road. In developing new routes, the proponent is strongly encouraged to consult with Roads and Maritime Special Permits Unit.	(1) GTA Consultants further investigated the suitability of the proposed oversize vehicle access route and the site access points on Abercrombie road. RMS Special Permits branch has been consulted and an assessment of the proposed over-dimensional transport route via Great Western Highway (A32) is provided in the additional assessment undertaken by GTA Consultants (refer to Appendix 4). The use of Great Western Highway is feasible; however, a number of potential conflicts have been identified. A route assessment has been completed by GTA (refer to Appendix 5) and contains the details of the smaller Restricted Access Vehicle (RAV). A detailed Traffic Management Plan (TMP) and scope of any further road modification works would be developed in consultation with RMS and respective Council prior to any over-dimensional wind turbine component movements.
Traffic & Transport	(2) The applicant has stated that final transportation routes will be determined as part of the development of	(2) RMS Special Permits branch has been consulted and an assessment of the proposed over-dimensional transport route via Great Western

Category	RMS Submission Comments	GPGA Responses
	and approval of a Traffic Management Plan (TMP). Access to the site, particularly for over size and over mass vehicles, is critical to the establishment of the proposed wind farm and transportation routes for these and other types of vehicles should be determined as part of the development application process.	Highway (A32) is provided in the additional assessment undertaken by GTA Consultants. The use of Great Western Highway is feasible; however, a number of potential conflicts have been identified. A route assessment has been completed by GTA (refer to Appendix 5) and contains the details of the smaller Restricted Access Vehicle (RAV). A detailed Traffic Management Plan (TMP) and scope of any further road modification works would be developed in consultation with RMS and respective Council prior to any over-dimensional wind turbine component movements.
Traffic & Transport	(3) The Transport Impact Assessment (TIA) lacks a robust assessment of alternate methods of transportation of materials to the site (e.g. rail). Partial usage of alternative transport methods would minimise disruption to traffic using the State road network.	(3) Due to the alignment of the rail corridor over the Blue Mountains, the transport of turbine components via rail is not possible. The potential to transport components to the site via air is not considered cost effective at the moment, however such an assessment will be included within the TMP, which will be prepared prior to any over-dimensional component movements.
Traffic & Transport	(4) The TIA does not provide an assessment of tourist traffic generated by the proposed development. Roads and Maritime's previous experience with wind farms has shown that viewing platforms with wind farm information available at strategic locations allows motorists to safely pull off the road to view wind turbines and minimises unsafe viewing and driving practices.	(4) It is not anticipated that significant additional tourist traffic would be generated by the proposed development, due to the site location. However, any existing tourist traffic on Abercrombie Road may desire to stop and view the turbines. As such, a viewing platform is proposed to be provided north of Access 4/5 to allow tourists to safely pull over off the road and view the wind turbines. Details of the proposed viewing platform and road interface will be determined during detailed

Category	RMS Submission Comments	GPGA Responses
		design, seeking the relevant approvals in conjunction with the access roads.
Traffic & Transport	(5) Cumulative impacts provided in the supporting documentation focuses on other wind farms in the region and not on other developments/works such as mining proposals and road upgrades. For example, in the event that the Great Western Highway is proven to be a suitable transportation route, upgrades at Kelso and Forty Bends will impact on transportation of materials, staff, etc to the site.	(5) The cumulative impacts of the project and other developments / works will be assessed as part of the TMP prepared for the transport of over-dimensional wind turbine components. Such an assessment will be more relevant once the project timing is better understood. The approved transport contractor will consult with RMS and relevant contractors undertaking works on the Great Western Highway to maintain a suitable path of travel for the OD transport vehicles during wind farm construction.
Traffic & Transport	(6) No detail of intersection upgrades to accommodate over-size/over-mass vehicles has been provided. The applicant has stated that details of intersection and access upgrades will be provided in the TMP.	(6) Additional assessment of the original proposed OD transport route by GTA Consultants has identified several locations at which modification works may be required, including: ▪ Great Western Highway – 2 km west of Mount Victoria ▪ Great Western Highway – East and West of Hartley ▪ Great Western Highway and Littlebourne Street intersection, Kelso ▪ O'Connell Road – 12km north of Oberon ▪ O'Connell Road and Abercrombie Road intersection, Oberon. Additional details of potential road upgrade works have been reviewed by GTA Consultants and indicates that suitable mitigations works are able to be implemented for the locations listed above with no impact on privately owned land. Refer to Appendix 5 for more detail. Any

Category	RMS Submission Comments	GPGA Responses
		further upgrade works would be undertaken in consultation with RMS and the relevant council and detailed within the Traffic Management Plan to be prepared.
Traffic & Transport	(7) Prior to the commencement of construction works, a Traffic Management Plan (TMP) shall be prepared for the project in consultation with and approved by Oberon Council and Roads and Maritime Services. The TMP shall identify the proposed route(s) and associated impacts (temporary street closures, removal and replacement of road infrastructure, upgrading of road infrastructure, etc.) which will be required in order for necessary materials and machinery to be delivered to the site. The TMP shall include assessment of high-risk locations that prevent safe two-way passage of traffic and how traffic movements are to be negotiated, projected delays experienced by traffic on affected roads (origin to destination), cumulative impacts and mitigating measures to be employed. The applicant is to be accountable for transport operations complying with the TMP as well as the haulage contractor.	(7) Noted. A TMP and associated Traffic Control Plans (TCP) will be prepared in consultation with RMS and respective Councils. A draft Table of Contents is provided in Attachment 2 of Appendix 4.
Traffic & Transport	(8) Prior to any haulage requiring over-size/over mass vehicles and loads the proponent will be required to obtain special permits. To obtain a permit, the proponent	(8) Noted. The Proponent will obtain all permits required to carry out works within the public road.

Category	RMS Submission Comments	GPGA Responses
	will need to contact Roads and Maritime's Special Permits Unit in Glen Innes; The requirements outlined in Roads and Maritime's publication Operating Conditions: specific permits for oversize and over mass vehicles and loads are to be followed. This publication is available online at: www.rms.nsw.gov.au/heavyvehicles/oversizeovermass	
Traffic & Transport	(9) If any parts of the proposed transport routes on classified roads are unable to cater for the project related traffic and transport, the proponent is required to improve such part of the road to safely cater for the length, size and volume of vehicles and their loads and to protect the integrity of the classified road network. This may include the proponent constructing stopping bays (suitable hard stand areas) at distances and dimensions determined by Roads and Maritime. These areas would be required along proposed routes to allow following vehicle queues to pass. Upgrades of the road network shall be determined following submission of the TMP and constructed prior the commencement of construction works.	(9) Noted. A TMP and associated TCP will be prepared in consultation with RMS and respective Councils. This would include details of road upgrade works would be carried out at the cost to the proponent. A draft Table of Contents is provided in Attachment 2 of Appendix 4.
Traffic & Transport	(10) Prior to any work on the State classified road network, the proponent will be required enter into a	(10) Noted. The Proponent will enter into a Works Authorisation Deed with the RMS for all works on classified State Roads.

Category	RMS Submission Comments	GPGA Responses
	formal agreement in the form of a Works Authorisation Deed with Roads and Maritime Services.	
Traffic & Transport	(11) Any disturbances to traffic lanes, shoulders, verges or other disturbance within the road reserve of classified roads are to be reinstated to pre-existing or better condition. This includes any impact on the road pavement, culverts, bridges, causeways, signage and traffic islands.	(11) Noted. The Proponent would reinstate all areas disturbed by the transport of wind farm components to pre-existing or better condition.
Traffic & Transport	(12) Prior to the commencement of haulage operations, a full and independent risk analysis and inspection of the transport route(s) is required, and a copy of the analysis is to be supplied to Roads and Maritime Services. Further analysis and reporting to assess possible damage to and repair of the route will be required on a regular basis and at completion of construction works.	(12) Noted. An independent risk analysis and inspection of the transport route will be carried out prior to the commencement of haulage operations (noting that a preliminary assessment has now been carried out by GTA Consultants. Further analysis and reporting would be completed as required to comply with any reasonable request of RMS.
Traffic & Transport	(13) Roads and Maritime requires a commitment from the proponent to provide funding for the maintenance and repair of any affected classified roads for the duration of transportation of over size and over mass vehicles and loads, to the satisfaction of Roads and Maritime. The	(13) Noted. The Proponent will commit to funding the maintenance and repair of any roads damaged through the transport of wind farm components. Details of this commitment would be included as part of the TMP to be prepared for the project.

Category	RMS Submission Comments	GPGA Responses
	commitment to fund maintenance and repairs shall be included in the TMP.	
Traffic & Transport	(14) Vehicles transporting loads will not be permitted to travel in convoys or platoons unless specifically permitted by the relevant roads authority and/or Roads and Maritime.	(14) Noted. The criteria will be included in the TMP.
Traffic & Transport	(15) Convenient and easily accessible areas shall be identified, and appropriate facilities provided for members of the public to safely view wind turbines.	(15) Noted. A viewing platform is proposed to be provided north of Access 4/5 to allow tourists to safely pull over off the road and view the wind turbines. Details of the proposed viewing platform and road interface will be determined during detailed design, seeking the relevant approvals in conjunction with the access roads.
Traffic & Transport	(16) All arrangements for the control of traffic on classified roads are to be in accordance with Roads and Maritime's publication Traffic Control at Work Sites. A Road Occupancy Licence will be required prior to any works commencing within three (3) metres of the traffic lanes of state classified roads and submission of a TMP will be part of Road Occupancy Licence(s).	(16) Noted. The Proponent will obtain a Road Occupancy Licence from the RMS (or Council equivalent) prior to commencing any works on or near public roads. All works will be carried out in accordance with Traffic Control at Work Sites manual, by suitably qualified personnel.

6.11. Response to NSW Dep. of Primary Industries (NSW Office of Water)

The NSW Department of Primary Industries (**DPI**) - NSW Office of Water, provided a submission (ID 100349) (Ref OUT14/15847) dated 10th June 2014, with comments on groundwater and surface water licensing requirement, foundation design considerations, and Soil and Water Management Plan requirement.

The submission comments and GPGA responses are shown in Table 6.11.1 - Response to NSW Dep. Primary Industries (NSW Office of Water).

Table 6.11.1 - Response to NSW Dep. Primary Industries (NSW Office of Water)

Category	NSW Office of Water Submission Comments	GPGA Responses
Hydrology	(1) The EIS indicates water requirements over the 12-month construction period of 30ML. This is to cover concrete production, road construction and dust suppression. A number of water supply options have been identified; however, a secure supply is yet to be determined. This represents a commercial risk to the proponent. The proposal to ensure all regulatory requirements are addressed prior to commencement of activities is supported. The NSW Office of Water advises the information provided in Annex A of Appendix 14 in relation to Part 2 and 5 licensing under the Water Act 1912 has been superseded due to commencement of water sharing plans for both groundwater and surface water. This has been more accurately interpreted in Section 3 of Appendix 14.	(1) Noted. The Proponent will further investigate its options for water sharing plans and temporary transfer of licence from existing licence holders in the area, or alternatively use tankers to import water from external sources.

Category	NSW Office of Water Submission Comments	GPGA Responses
Hydrology	(2) The Geotechnical Assessment indicated no groundwater was observed in the test pits (maximum depth of 3.5m) or boreholes (maximum depth of 20m) however groundwater levels may vary. The final footing design of either a gravity footing or anchored footing may alter the likelihood of groundwater being intercepted. If anchored footings are selected it is recommended an assessment be carried out on the. potential impacts of intercepting groundwater on existing groundwater users and groundwater dependent ecosystems. If appropriate, this assessment should be accompanied by suitable mitigation measures and will need to consider any licensing requirements under the Water Management Act 2000. Dewatering of less than 3ML/yr for construction will generally not require a water access licence, however it is recommended the proponent contact the Office of Water to confirm licensing requirements if groundwater will be intercepted.	(2) Noted. The Proponent will consult with the NSW Office of Water once the preliminary turbine foundation designs have been prepared.
Hydrology	(3) The development of a Construction Environmental Management Plan which is to include a Soil and Water Management Plan is supported in consultation with the Office of Water.	(3) Noted. The Proponent will prepare a Soil and Water Management Plan (SWMP) as part of the CEMP in consultation with NSW Office of Water. The Statement of Commitment has been updated accordingly.

Category	NSW Office of Water Submission Comments	GPGA Responses
Hydrology	(4) The proponent must obtain relevant licensing under the Water Act 1912 or Water Management Act 2000 from the NSW Office of Water before commencing any works which intercept or extract groundwater or surface water.	(4) Noted. The Statement of Commitment has been updated accordingly.
Hydrology	(5) The design of waterway crossings for access roads and cable installations, and any associated instream works is to be included within the Construction Environmental Management Plan. These designs are to be prepared in accordance with NSW Office of Water's "Guidelines for Controlled Activities on Waterfront Land".	(5) Noted. The Statement of Commitment has been updated accordingly.
Hydrology	(6) If rock anchoring is selected for wind tower foundations, the Office of Water requests a groundwater assessment be undertaken and endorsed prior to construction. This is to assess the risk of impact on existing licensed groundwater users and groundwater dependant ecosystems and provide suitable mitigation measures. Any necessary licensing requirements under the Water Management Act 2000 will also need to be obtained.	(6) Noted. The Statement of Commitment has been updated accordingly.

6.12. Response to Airservices Australia

Airservices Australia provided a submission (ID 100357) dated 1st April 2014, with comments on their aeronautical assessment of the Project in July 2011 and in consideration that there have been no amendments to the turbine locations and heights, their advice remains the same and they have no further comments regarding the EIS. The submission comments and GPGA responses are shown in Table 6.12.1 - Response to Airservices Australia.

Table 6.12.1 - Response to Airservices Australia

Category	Airservices Submission Comments	GPGA Responses
Aviation Safety	(1) At a maximum height of 1221m (4006ft) AHD the proposed Wind farm will not affect any sector or circling altitude, nor any approach or departure at any registered aerodrome in the area. It also will not affect any lowest safe altitudes (LSALTS) for air routes in the area. If applicable to the airport, no assessment was conducted in relation to any other procedures made available by another Part 173 Certified Designer. This proposed wind farm to a max height of 1221m AHD will not impact the performance of Precision/Non-Precision Nov Aids, HF/VHF Comms, A-SMGCS, Radar, PRM or Satellite/Links.	(1) Noted, GPGA will ensure the wind farm's maximum height is kept to 1,221m AHD, if there are any micrositing of the turbine locations prior to construction that would encroach above this maximum height, Airservices Australia will be notified of these changes and a further aviation assessment would be undertaken (if required). The Statement of Commitment has been updated accordingly.

7. Response to Community Submissions

Many of the community submission raised similar issues. For ease of reading, the responses to the community submissions have been packaged into categories to avoid unnecessary duplication of responses. The submission categories include: Landscape and Visual, Noise, Health, Fire / Bushfire, Environment, Flora & Fauna, Turbine Layout (Micrositing), Transmission Line Options, Electromagnetic Interference, Socio-Economic and Property Value, Electricity Price Subsidies, Traffic and Transport, Cumulative. The responses are shown in detail in sections 7.1 to 7.13 respectively.

7.1. Landscape and Visual

The responses to the community submissions about landscape & visual concerns are shown in Table 7.1.1.

Table 7.1.1 - Response to Community Submissions (Landscape and Visual)

LANDSCAPE AND VISUAL	
Submissions included (ID 97952, ID 98743, ID 98819, ID 98922, ID 99004, ID 99006, ID 99008, ID 100431) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.]**	
Community Issues raised:	**GPGA Responses:**
Concerns raised with regard to the visual impact of the proposed development and suggestions that the view from privately owned property will be negatively impacted.	The visual impacts of the proposed wind farm were addressed at Chapter 9 of the EIS and a full landscape and visual impact assessment (LVIA), prepared by Green Bean Design, was provided at Appendix 6. The LVIA assessed the visual impacts and documented the process and results. It is important to note that the project is positioned in a relatively isolated location that is further than 2km from a non–project involved, identified dwelling. The LVIA was prepared in accordance with the Australian Wind Energy Association and Australian Council of National Trust's publication *Wind Farms and Landscape Values National Assessment Framework* (2007) (NAF) as well as the Draft NSW Wind Farm Guidelines 2011.

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	The LVIA determined that the landscape surrounding the project has an overall 'medium to high sensitivity' to accommodate change, and that the Landscape Character Areas (LCAs) within the 10 km viewshed represent landscape characteristics that are reasonably typical in the New South Wales Central Tablelands and the NSW/ACT Border Region. It has been noted that some recognisable characteristics of the landscape will be altered by the project and that visually prominent elements will alter some perceived landscape characteristics. However, the main characteristics of the landscape, patterns and combinations of landform, and land cover will still be evident. Photographic montages are provided at Figures 32 – 40 of the LVIA and indicate the visual impacts of the proposal on various locations, up to a distance of 10km from the turbines. Subject to any conditions of approval, the proponent would commit to implementing landscape treatments to screen and mitigate the potential visual impact of the project for individual neighbouring properties within an appropriate distance from the site, subject to consultation and agreement with individual property owners. Those dwellings identified within Table 17 of the LVIA, with an overall medium to high rating in relation to significance of visual impact are likely to be the first to address landscape mitigation measures with the proponent. Testing of the proposed visual mitigation measures will be undertaken after the measures have been implemented for the project, in order to assess and identify any residual impacts. An assessment of each potential residential view location indicated that: ▪ 37 of the 78 residential view locations have been determined to have a nil visual impact; ▪ 11 of the 78 residential view locations have been determined to have a low visual impact; ▪ 19 of the 78 residential view locations have been determined to have a low to medium visual impact; ▪ 5 of the 78 residential view locations have been determined to have a medium visual impact; and ▪ 6 of the 78 residential view locations have been determined to have a medium to high visual impact.

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	The six residential dwellings determined to have a medium to high visual impact are associated residences. The proponent has also approached several surrounding property owners, including [redacted] to discuss the possibility of signing a neighbour benefit sharing agreement. Discussions are still ongoing. Further details regarding consultation with [redacted] can be provided upon request.
Suggestions that colouring the turbines and towers to blend with the environment so that the impacts may be reduced.	Visibility is addressed within the EIS and LVIA, and the visibility of the proposed wind turbines is found to be partially dependent on weather conditions. Chapter 5.1 if the LVIA details climatic and atmospheric conditions, with Figure 7 providing photos to depict visibility in various weather conditions, including clear blue sky, partly cloudy and fog/low cloud cover. Testing of a variety of turbine colours across Australian and internationally suggests that, given fluctuating weather and landscape conditions, off white is the most effective colour to reduce visual impact. It is unlikely that a more appropriate colour than off white will be found to 'blend' the turbines with the environment, when the sky colour is variable and unpredictable. The wind generator blades, tower and nacelle are to be treated/ painted with a non-reflective white, off white or light-grey colour to reduce glare and minimise blade glint.
Concern raised that the number of turbines is yet to be fixed and so the visual impact cannot be accurately assessed.	The number of turbines initially originally proposed was 59. This number was reduced as a consequence of the findings of the final flora and fauna assessment. Turbines numbered P2, P6 and P7 were removed due to the Conservation Agreement in place for the Box Gum Grassy Woodland project as part of the Commonwealth government's Environmental Stewardship program.

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	As part of the adequacy review of this EIS, discussions between DoPI and the flora and fauna specialist have prompted the removal of P11, in order to reduce vegetation clearing for the project. The outcome has resulted in a proposal which now involves a maximum of 55 turbines. The Landscape and Visual Impact Assessment was prepared in consideration of the proposal involving 59 turbines. As a consequence of the reduction of 4 turbines, the impact of the proposal is now reduced from that which was assessed. While the amended proposal involves a reduction in the total number of turbines, the assessment was carried out with regard to landscape and visual impact of the greater number of turbines originally proposed to ensure impact has been assessed at the maximum.
Concern raised that proposed ground lighting may disrupt night-time view.	An obstacle marking and lighting assessment was undertaken in accordance with the guideline document - Obstacle Marking and Lighting of Wind Farms (CASA Advisory Circular AC139-18(0)). An assessment under these guidelines shows that night lighting of 25 of the proposed turbines may be required. This lighting design is subject to confirmation of the final turbine layout. If the wind turbines to be installed have a blade tip height lower than 150 m AGL, no obstacle lighting is necessary. If the wind turbines to be installed will have a blade tip height of 150 m or more AGL, obstacle lighting may be required. Visual impacts could be minimised by restricting the downward component of the light to either, or both, of the following: ▪ No more than 5% of the nominal intensity is emitted at or below 5° below the horizontal; and/or ▪ No light is emitted at or below 10° below the horizontal. The need for obstacle lighting for structures of this height is currently under review. It will also be reviewed at regular intervals by the proponent and, in the event that the CASA guidelines are

LANDSCAPE AND VISUAL	
	revised such that night lighting is no longer required, then night lighting would not be installed, or switched off after installation.
Concern raised that transmission lines will further negatively impact the view.	The LVIA assessed four proposed transmission line options. The potential transmission line corridors were assessed, and it was determined that the northern 500kV transmission line option would result in an overall *Low to Moderate* visual impact, while the southern 330kV transmission line options would result in an overall *Moderate* visual impact, with potential for high impact in certain locations. The southern transmission line options are no longer proposed, and the northern transmission line option has been identified as preferred. Accordingly, approval has been sought for the northern 500 kV transmission line corridor option only. The LVIA found that the proposed 500 kV transmission line to the north of the site would not be significantly visible from any surrounding project involved or non-project involved residential dwellings within or beyond the site due to a combination of topography and scattered tree cover. Some sections of the transmission line would be visible to motorists travelling along Abercrombie Road. However, there would be partial screening provided by roadside scattered tree cover. The LVIA confirmed that the proposed transmission line route would result in a lesser degree of visual impact than the formerly considered and assessed 330 kV transmission line corridors to the south due to: ▪ a shorter distance of constructed and visible transmission line; ▪ a significantly lower number of surrounding residential dwellings located within the vicinity of the transmission line; and ▪ a reduced requirement for vegetation clearing to establish a transmission line easement.

7.2. Noise

The responses to the community submissions about noise concerns are shown in Table 7.2.1.

Table 7.2.1 - Response to Community Submissions (Noise)

NOISE	
Submissions included (ID 98565, ID 98743, ID 98819, ID 98922, ID 99004, ID 99006, ID 99008) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Submitters raised concern with regard to the increased noise which may occur as a result of the proposed turbines being located less than 5 times the rotor diameter abreast and 8 time the rotor diameter down wind.	SLR Consulting Australia have completed a Noise Impact Assessment for the proposal, utilising methodology and criteria supported by the South Australian Environmental Protection Authority (SA EPA) Environment Noise Guidelines for Wind Farms (February 2003), World Health Organization (WHO) limits, construction noise guidelines (DECC Interim Construction Noise Guideline 2009) and blasting impact. The Noise Impact Assessment provides: *"Simultaneous noise monitoring and wind monitoring was conducted at 8 locations during the period 7th June 2011 through to 24th June 2011 to determine baseline conditions and establish criteria for surrounding residential receivers.* *Noise predictions were made for receptors within a 6 km of a proposed WTG. WTG noise has been predicted using an indicative layout of 59 WTG's and an assumed mix of 3 turbine types and assessed against relevant criteria prescribed by the SA EPA Guideline and World Health Organisation (WHO) goals where appropriate.* *All non-project involved receptors were found to be below the relevant noise criteria. Some project involved receptors are predicted to slightly exceed the WHO noise criteria, however, these locations are used for a very limited part of the year only and it is*

NOISE	
	proposed to enter into a noise agreement regulating their use and that these will not be used should post construction noise testing definitively show an exceedance of the criteria. *The project is yet to select and finalise the WTG layout and WTG makes/models. Upon finalising the layout and WTG models a revised noise prediction and assessment will be completed in which the noise impact mitigation techniques listed in Section 9.3 will be investigated thoroughly to produce a fully compliant layout.* *WTG vibration levels have been evaluated and based upon overseas research available were found to be acceptable.* *Construction noise and vibration impacts have been assessed and the 'worst case' scenarios modelled were found to be generally acceptable.* *Blasting impact has been assessed and found to be acceptable. With a maximum instantaneous charge (MIC) of up to 20 kg, the airblast overpressure is anticipated to be below the acceptable level of 115 dB Linear for all existing residences. Similarly, vibration levels are anticipated to be well below the acceptable criteria."* GPGA have made several commitments with regard to noise as detailed within the Statement of Commitments provided at Chapter 24 of the EIS and revised in this Report. The following commitments will ensure noise is limited and mitigation measures are in place. The following commitments relate to operational noise as included in Statement of Commitment (SoC) in Section 8: ▪ *SoC-6.1. When the final turbine model and layout are selected, prepare a revised Noise Impact Assessment (NIA). The NIA will demonstrate, through appropriate modelling and in accordance with the Environmental Noise Guidelines: WindFarms (SA EPA 2003), that the final turbine model and layout can meet the noise limits derived in accordance with those guidelines.*

NOISE	
	▪ *SoC-6.2. Prepare a Construction Noise Management Plan (CNMP) that forms part of CEMP. The CNMP will establish protocols and measures that include:* ▪ Mechanisms to prevent any unreasonable impact of construction noise on sensitive receivers. ▪ *Undertake construction activities associated with the Project that would generate audible noise at any non-involved residence during the standard construction hours as outlined below:* ▪ *Monday to Friday: 7:00am to 6:00pm* ▪ *Saturdays: 7:00am to 1:00pm* ▪ *Sundays: No construction* ▪ *In the event that it is required to undertake other audible works outside the above construction hours, prior approval will be obtained from the relevant authority.* ▪ *Ensure that any blasting complies with the ANZECC guideline. Ensure that during any blasting event the airblast overpressure must not exceed 115dB (Linear Peak) and ground vibration peak particle velocity must not exceed 5 millimeters per second (peak particle velocity) when measured at the nearest residential premise.* ▪ *SoC-6.3. Prepare an Operational Noise Management Plan (ONMP) as part of the OEMP, in consultation with EPA. The OEMP will be undertaken generally in accordance with the Environmental Noise Guidelines: Wind Farms (SA EPA 2003) and include the following provisions:* ▪ *ensure that operational noise levels will comply with the South Australia EPA Environmental Noise Guidelines principal acceptability criteria that the wind farm LA90 (10 min) noise should not exceed the greater of an amenity limit of 35 dBA or the pre-existing background noise by more than 5 dBA at each integer wind speed from cut in to rated power at any non-host property or residential receiver where*

NOISE	
	noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have not been entered into with the property owner; ▪ *ensure that the operational noise levels comply with the World Health Organization (WHO) Guidelines for Community Noise of 45 dBA or the pre-existing background noise by more than 5 dBA (whichever is the higher) for any host property or residential receiver where noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have been entered into with the property owner;* ▪ *during commissioning the actual received turbine noise level will be verified and determined through extensive monitoring;* ▪ *compliance monitoring, within one year of commissioning, against the noise limits;* ▪ *identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible;* ▪ *measures to be undertaken to rectify annoying characteristics resulting from the operation of the project such as infrasound, tonality or adverse mechanical noise from component failure;* ▪ *procedures and corrective actions to be undertaken if non-compliance is detected (i.e. provisions for reasonable response time to alleged noise complaints and mitigation works); and* ▪ *Undertake routine noise monitoring, assessment and reporting at compliance critical locations.* ▪ *SoC-6.4. Implement the approved ONMP during the operation phase.* ▪ *In circumstances where undue turbine noise impacts are identified during operations (i.e. due to temperature inversion, atmospheric stability or other reasons) then an adaptive management measures will be implemented to achieve compliance with the applicable noise limits. This will include:*

NOISE	
	▪ *Receiving and documenting noise impact complaint through telephone hotline or other designated means.* ▪ *Investigating the nature of the reported impact.* ▪ *Identifying exactly what conditions or times lead to undue impacts.* ▪ *Operating selected turbines in a reduced 'noise optimised' mode during identified times and conditions (sector management).* ▪ *Providing acoustic upgrades (glazing, façade, masking noise etc.) to affected dwellings.* ▪ *Turning off turbines that are identified as causing the undue impact during identified times and conditions.*
Concern raised with regard to the increased noise which may result from the turbines being located within the wake of another turbine, and about the variable speed of turbines, which may result in thumping and beating sounds, unlike fixed speed turbines.	CSIRO Land and Water published A Planners Guide, 'Wind Resource Assessment in Australia' in 2003 (Coppin *et al),* which provides background to wind energy and acknowledges that wind is only one resource which must be considered in the development of a wind farm. Coppin provides that the role of a wind turbine is to extract energy from air, which then results in a wake of slower, more turbulent air behind the turbine. This wake is likely to have an impact when there is another turbine placed directly behind the first. Siting of turbines in a direct line is not in the best interests of GPGA. Not only would a direct line interrupt the airflow and result in potentially less energy yield but it would also result in significant wear and tear on the turbines. The noise impact of one turbine being located within the wake of another turbine appears to be due to the amplitude modulation of the aerodynamic noise from blades, which is referred to as a "swish" or "thump". Bowdler, D – 'Amplitude modulation of wind turbine noise: a review of the evidence', 1 July 2008, explores the evidence relating to amplitude modulation and summarizes how the totality of what people experience when listening to wind turbine noise is dependent on

NOISE	
	operating modes, weather, and even the location of the listener with respect of the turbines and the wind. The review concluded: *"It seems probable that there are two distinct mechanisms in operation to create AM. The first is swish which is a function of the observer's position relative to one turbine. The second is thump which is due to turbine blades passing through uneven air velocities as they rotate. In the second case the uneven air may be due to interaction of other turbines, excessive wind shear or topography. These two mechanisms are entirely separate though it is possible that they interact.* *If this is the case, there is little that can be done about swish but further research into thump would help to avoid excessive AM in future developments."* A report by Salford University commissioned by BERR concluded that *"the incidence of AM and the number of people affected is probably too small at present to make a compelling case for further research funding in preference to other types of noise which affect many more people."* SLR Consulting have addressed the issue of excessive amplitude modulation in the response to submission 098565 and provide: *"There has been extensive and wide-ranging study conducted by Renewable UK, which attempts to more accurately explain the phenomenon, its potential causes and highlights the difficulties in quantifying the phenomenon – particularly when there is appreciable distance between the turbines and the receiver.* *The submission implies that infrasound is similar to (or related to) the amplitude modulation of audible sound. This is a common misconception, especially as both terms use 'Hertz' as their unit of measurement. In an effort to clarify the situation, we provide the following advice:* *'Amplitude modulation' refers to the fluctuations of the overall (usually A-weighted) noise level. This fluctuation has its own frequency of modulation, which is usually at the blade pass*

NOISE	
	frequency of the WTG, typically between 0.5 and 2 Hz. This is not an indication of the low frequency characteristics of the noise but a rate of change in overall loudness. *The 'beating' phenomenon is not synonymous with the 'thump' identified earlier and instead refers to where two or more sources have similar (but slightly differing) frequencies. For constant, pure tone noise sources, the small difference in frequency makes the overall noise level vary with a 'beat'. This phenomenon does not occur with broadband sources. WTG's are an inherently varying noise source, with their own rate or variation, which could be said to have its own 'beat'. Therefore, the beat frequency referred to relates to where the variation in noise level from one WTG occurs at almost the same rate as another WTG and the two sources are at a maximum at the same time. How often this alignment occurs is the 'frequency of occurrence' but could also be called a 'beat frequency'. The alignment becomes less likely with an increasing number of turbines. With the natural variation of wind conditions on site, the alignment of turbines becomes increasingly unlikely as the rotational frequencies and phase differences between all the WTGs themselves are varying in nature.* *Where the degree of amplitude modulation is typical, the overall degree modulation does not change with phase alignment of the two noise level waveforms. This is because the 'trough' of the waveform is also energetically summed, leading to an overall net increase in level, rather than an increase in the variation of the noise level. Furthermore, as the phase alignment between two noise level waveforms occurs only briefly, the increase in noise is momentary. As the waveforms shift to be out of phase, the noise level becomes more constant and almost does not modulate at all.* *The claim that the NHMRC study, based on 10 WTGs is invalid does not reflect the true nature of large-scale wind farm sites. Because of the offsets required between WTGs to get maximum output, the site takes up a very large area. This means that noise at a single location is mostly only due to the closest 6 to 10 turbines. The WTGs at greater distances contribute to the overall noise level but their variation of noise level does not contribute to the overall amplitude modulation.*

NOISE	
	Finally, should conditions that increase the prevalence of excessive amplitude modulation occur, it would be possible to implement an adaptive management approach where turbines are put into a noise optimised mode during identified times and conditions (sector management).”
Concerned were raised with regard to infrasound.	The National Health and Medical Research Council (NHMRC) published a report in July 2010 titled Wind Turbines and Health, which provided that: *“there is no reliable evidence that sounds below the hearing threshold produce physiological or psychological effects” (Berglund 1995)* Dr Mark Diesendorf, the Deputy Director of the Institute of Environmental Studies at the University of NSW, provides: *“infrasound was a problem with older wind turbine technology”* (NSW Legislative Council 2009), and that infrasound is *“virtually undetectable at a range of 400 metres”* (NSW Legislative Council 2009). The Project will utilise modern wind turbine technology and is highly unlikely to result in any infrasound. An Independent Expert Panel established by the Massachusetts Department of Environmental Protection (MDEP) and the Massachusetts Department of Public Health (MDPH) found that “*There is insufficient evidence that the noise from wind turbines is directly (i.e. independent from an effect on annoyance or sleep) causing health problems or disease)”* (MDEP & MDPH 2012). The report findings showed that the levels of infrasound produced by modern wind turbines at distances as close as 68 metres are well below the levels required for non-auditory perception (feeling of vibration in parts of the body, pressure in the chest, etc.). Section 11.4.3 of the EIS considers alternate sources of infrasound and provides:

NOISE	
	An Australian study, Infrasound Measurements from Wind Farms and Other Sources (November 2010), was commissioned by Pacific Hydro to measure and compare infrasound levels from wind farms and common environment infrasound sources, both natural and man-made. The noise measurements were recorded for Pacific Hydro by an independent acoustic consulting firm, Sonus Pty Ltd. *Infrasound was measured at two of Pacific Hydro's Australian wind farms, Clements Gap in South Australia and Cape Bridgewater in Victoria (both while operating and while the turbines were switched off). Infrasound was also measured at a beach, a cliff top along the coastline, in the Adelaide CBD close to two busy roads, and in an Adelaide suburb in close proximity to a gas-fired power station.* *The methodology involved measurements being conducted below the ground surface in a test chamber. Testing confirmed that the levels of infrasound above the ground and within the chamber were the same in the absence of surface winds as when measuring a known source of infrasound.* *The results determined that infrasound is not unique to wind farms. Furthermore, the levels of infrasound produced by wind turbines is well below perception thresholds and is also below levels produced by other natural and man-made sources (Pacific Hydro 2010). One of the highest levels of infrasound that was recorded was at a beach.*

7.3. Health

The responses to the community submissions about health impacts concerns are shown in Table 7.3.1.

Table 7.3.1 - Response to Community Submissions (Health)

HEALTH	
Submissions included (ID 98565, ID 98994, ID 99004, ID 99006, ID 100431) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Submitters raised concerns with regard to the potential health implications of living close to a wind farm.	Health impacts associated with living in close proximity to a wind farm were addressed in Chapter 11 of the EIS. Section 11.3.1 provides that the National Health and Medical Research Council (NHMRC) published a landmark study, titled 'Wind Turbines and Health (2010)', which tested the hypothesis that "*there are no direct pathological effects from wind farms and that any potential impact on humans can be minimized by following existing planning guidelines*". The NHMRC is the preeminent national body on health research and is regarded as producing 'gold standard' work. The study investigated scientific data and literature on the effects on human health and found that the hypothesis was tested positive. *"While a range of effects such as annoyance, anxiety, hearing loss, and interference with sleep, speech and learning have been reported anecdotally, there is no published scientific evidence to support adverse effects of wind turbines on health" (NHMRC 2010)."* The World Health Organisation (WHO) provides a similar opinion, with the claim that *"Wind energy is associated with fewer health effects than other forms of traditional energy*

HEALTH	
	generation and in fact would have positive health benefits" and "*In relation to all sources of energy, the health effects associated with wind energy are negligible"* (WHO 2004). The external Project referenced in the WHO study considers wind energy *"to have the lowest level of impacts (health and environmental), of all the fuel cycles considered"* (CIEMAT 1998 cited in WHO 2004). Section 11.4 of the EIS provides: *A key issue amongst the health concerns associated with wind farm developments is impacts relating to noise. Wind turbines produce mechanical noise from the motor gearbox, as well as aerodynamic noise, produced by wind passing over the blade of the wind turbine. As well as the general range of sound emissions, older wind turbines also generate infrasound (NHMRC 2010).* *The NHMRC Report noted that, "there is no reliable evidence that sounds below the hearing threshold produce physiological or psychological effects" (Berglund 1995 cited in NHMRC 2010). The Minnesota Department of Health (2009) found that "if functioning correctly, mechanical noise from modern wind turbines should not be an issue" (MDH 2009 cited in NHMRC 2010). Dr Mark Diesendorf, the Deputy Director of the Institute of Environmental Studies at the University of NSW, states that "infrasound was a problem with older wind turbine technology" (NSW Legislative Council 2009), and that infrasound is "virtually undetectable at a range of 400 metres" (NSW Legislative Council 2009).* Section 11.4.5 provides detail with regard to vibroacoustic impacts on health, as shown following:

HEALTH	
	Scientific evidence details Vibroacoustic Disease as "the clinical manifestation of a systemic disease that develops after long-term exposure to noise (≥1 0 yr) which is characterized by large pressure amplitude (≥90 dB SPL) within the lower frequency bands (≤500 Hz)" (Branco & Rodriguez 1999). *In relation to concerns regarding Vibroacoustic Disease, the NSW Legislative Committee (2009) found that "there does not appear to be any evidence to support the proposition that vibrations from wind turbines can cause this disease" (NSW Legislative Committee 2009). As discussed above, noise produced by wind turbines is less than 90 dB.* The EIS also provides detail with regard to other suggested causes of negative health impacts associated with wind farms, such as wind turbine syndrome, shadow flicker, electromagnetic impacts, impacts on psychological wellbeing and blade throw. Section 11.6 of the EIS details the proposed mitigation measures, including: ▪ *Provide accessible information on wind farm impacts including the benefits, and project details, process and updates.* ▪ *Install warning signs to alert the public against unauthorised site entry.* ▪ *Restrict access to the wind turbines and associated infrastructure to reduce personal injury and public hazards, including locked access to towers and electrical equipment, warning signs with postings of 24-hour emergency numbers, and fenced storage yards for equipment and spare parts.* ▪ *The wind generator blades, tower and nacelle are to be treated/painted with a non-reflective white or off-white colour to reduce glare and minimise blade glint.* ▪ *Noise levels should comply with the applicable noise guidelines, unless an agreement is in place with the effected landowner(s), and in any case should not be more than the*

HEALTH	
	45dB(A) noise limit (for indoors) recommended by the World Health Organisation (WHO) publication Guidelines for Community Noise. ▪ *Shadow flicker at any dwelling should not exceed 30 hours per year unless an agreement is in place with the effected landowner(s).* ▪ *Wind turbines to be equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.* ▪ *Regularly maintain and service all wind turbines.* *In relation to blade throw, a number of measures are proposed for the project. Each turbine model considered for this project would be certified against the relevant standards including:* ▪ *IEC 61400-23 [Wind turbine generator systems, Full-scale structural testing of rotor blades]; and* ▪ *IEC 62305-1 / 3 / 4 [Protection Against Lightning].* *Lighting protection systems are incorporated into the blade designed to reduce the risk of damage from lightning strikes to the blades. The safety systems are designed to initiate a shutdown of the turbine upon detection of failure.* *The operational and maintenance contracts of the turbines provide incentives to maximise the output of the wind farm. The maximum output is achieved through rigorous maintenance regime to ensure the turbines are operating at full efficiency, and this includes mitigating and repairing any degradation to the blades to keep generation at optimum levels.* *Additionally, the use of fencing and signage will discourage unauthorised access to the wind turbines, which would further reduce the risk of blade throw incidences.*

7.4. Fire / Bushfire

The responses to the community submissions about Fire / Bushfire concerns are shown in Table 7.4.1.

Table 7.4.1 - Response to Community Submissions (Fire / Bushfire)

Fire / Bushfire	
Submissions included (ID 98743, ID 98922) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Concern raised with regard to aerial firefighting opportunities as a consequence of the proposed wind farm.	As a result of increased wind farm development in Victoria and NSW, the Victorian Country Fire Authority (**CFA**) and the NSW Rural Fire Service (**RFS**) have extensively studied the implications of wind farms on fire, and the possible mitigation measures to reduce the risk. The Draft NSW Wind Farm Guidelines specify that assessment must detail bushfire hazards and risk, including recommending consultation with the NSW Rural Fire Service. Section 16 of the EIS addressed the fire impacts associated with the proposed wind farm and Section 13 addressed aeronautical impacts. An Aeronautical Impact and Night Lighting Assessment was prepared by Aviation Projects, attached to the EIS and marked Appendix 9. Aviation Projects provided that "*the proposed development does not impose any significant risk to normal flying operations, provided aircraft are operated in compliance with applicable regulatory and operational control requirements and with the application of good airmanship".* While aerial fire-fighting operations may potentially be restricted in the vicinity of the proposed wind farm, Aviation projects note that there is still a valid ground-based means of fighting bushfires.

Fire / Bushfire	
	Consultation with the RFS Development Assessment and Planning Officer, NSW (Mr. Doug Stevens) was undertaken and Mr. Stevens provided that he considered wind farms to be an advantage to RFS operations generally, because they required a cleared area, a water supply, and provided improved access to the property. The CFA have published Emergency Management Guidelines for Wind Energy Facilities (Version 4 - February 2012), which provide wind energy facility operators with CFA's preferred safety measures. CFA recognise firefighting limitations within and adjoining a wind farm footprint; including limitations on aerial support, as well as access and egress conditions. In the planning, design and development of wind farms CFA provides that wind turbines should be located a minimum distance of 300 metres apart. This provides adequate distance for aircraft to operate around a Wind Energy Facility, given the appropriate weather and terrain conditions. "*Fire suppression aircraft operate under "Visual Flight Rules". As such, fire suppression aircraft only operate in areas where there is no smoke and during daylight hours. Wind turbines, similar to high voltage transmission lines, are part of the landscape and would be considered in the incident action plan*." The Indicative Site Plan submitted and identified at Figure 11, maintains around 300m distance between almost all of the turbines. Currently there are approximately 6 turbines which are located with a distance of less than 300m from another turbine and they provide a minimum distance of around 260m, 269m and 295m. The indicative layout is subject to minor alteration and does not provide the final determined location of each turbine. GPGA have provided a Statement of Commitments in association with the proposed wind farm and include a commitment that "*Once the turbine locations are finalised, the proponent will notify the RAAF Aeronautical Information Service (AIS) of the location and height details of the turbines."* Further consultation with local fire authorities will occur prior to construction of the project and as detailed within Table 10 of the EIS, part of the environmental management plan, a bushfire risk management plan will be developed based on the guidelines *Planning for Bushfire Protection 2006*.

Fire / Bushfire	
	Further, the proponent commits to consult with the RFS during periods of high fire danger, and generally to ensure the RFS are familiar with the site. Section 16.4 of the EIS further addressed the mitigation measures proposed and provides that mitigation measures will be detailed in a Fire Management Plan (FMP). The FMP will be prepared in consultation with State and local RFS, as well as the Department of Planning and the Environment, pursuant to the provisions of *Planning for Bushfire Protection 2006*. The FMP will address safety, communication, site access and emergency response protocols. Other mitigation measures detailed within the EIS, which are to be implemented as part of the project include: ▪ *"Consultation and training with the NSW Rural Fire Service in regard to the adequacy of bushfire prevention measures to be implemented on site during construction, operation and decommissioning.* ▪ *Consultation with the NSW PWS on the management of bushfires in the adjacent National Park* ▪ *Consult with the RFS during periods of high fire danger* ▪ *Inform RFS and any aerial agriculture operators on the location of the wind turbines, transmission lines and monitoring masts.* ▪ *Development of workplace health and safety protocols to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities.* ▪ *On-site vegetation management during construction and operation to minimise potential sources of fuel.* ▪ *Re-organisation of construction activities during periods of high fire danger, including ceasing use of explosives, and management of hot work activities such as welding or cutting.* ▪ *Use of materials and equipment during operation that minimise the likelihood of fire.* ▪ *Maintenance of vehicles to minimise sparking from exhaust systems.*

Fire / Bushfire	
	▪ *Automatic shutdown of any overheating turbine mechanism.* ▪ *Shut down of turbines during a bush fire in the area.* ▪ *Lightning protection on each turbine.* ▪ *Under-grounding of electrical and communication cables where practicable.* ▪ *Access to adequate water supply, with water access points be located in safe, easily identifiable areas and accessible in all weather conditions by equipment up to 15 tonnes* ▪ *A turning circle with a minimum radius of 10 metres will be provided for fire appliances at all water access points.* ▪ *The location and number of tanks or other water supply points will be determined in consultation with the NSW RFS.* ▪ *Careful storage and handling of flammable materials and ignition sources brought onto the site, as per manufacturer's instructions.* ▪ *Storage of appropriate firefighting equipment onsite during the construction phase, ensuring that a minimum of one person on site is trained in its use.* ▪ *Periodical inspection of overhead transmission easements to monitor any regrowth of encroaching vegetation.* ▪ *Vehicle turn-around facilities to be provided at every turbine tower site.* ▪ *At least 5-metres wide internal access tracks to be provided that are driveable and permanently clear of vegetation for heavy fire-fighting equipment up to 15 tonnes* ▪ *Provision of wind turbine access tracks that continue onto adjacent paddocks and are not dead ended.* ▪ *Implementing a wide fuel break in accordance with RFS, Council and State Government recommendations to slow the spread of fire.* ▪ *Any vegetation plantings to have low fire resistance.* ▪ *Micro-siting of the turbines following approval will consider bushfire risk."*

7.5. Environment

The responses to the community submissions about Environment concerns are shown in Table 7.5.1.

Table 7.5.1 - Response to Community Submissions (Environment)

ENVIRONMENT	
Submissions included (ID 98565, ID 98743, ID 98922, ID 99006) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Submitters raised concern with regard to potential loss of soil moisture in the wake of the proposed turbines (soil drying effect).	The nature of wind farms is that they take energy from the wind, and as such, it can be expected that some localised weather changes would result. The question is whether the changes are significant and have any negative impacts on surrounding properties. There are many claims with regard to the effect of wind farms on local weather and several studies in America and Europe have indicated that the area immediately surrounding a wind farm may be slightly warmer at night and slightly cooler during the day compared to the rest of the region. Somnath Baidya Roy, Professor of Atmospheric Science at the University of Illinois first proposed a model in 2004 to describe the impact of wind farms on local climate. In 2009 Roy collaborated with Neil Kelley, a principal scientist at the National Wind Technology Centre, who had collected temperature data for a seven-week period in 1989 at a wind farm in San Gorgonio, California. This union provided the first observation-based evidence of daytime cooling and nocturnal warming effects of wind turbines. Roy identified that the temperature change was dependent on the mixing of warm and cool air in the atmosphere in the wake of the turbine rotors. As the rotors turn, they create turbulence, which pulls upper-level air down towards the surface, while surface air is pushed up, causing the warmer and cooler air to mix.

ENVIRONMENT	
	Roy provided that the nocturnal warming effect could be used to provide some frost protection or even slightly extend the growing season in farm areas, such as the Midwestern USA. The researchers provided that one strategy to mitigate the impact on local weather was to locate the turbines in areas that already have a turbulent atmosphere so the consequence of turbulence from the rotors would be minimal. Roy provides that although observed data on wind speed and turbulence in and around operational wind farms are readily available, information on other meteorological variables do not exist in the public domain. *"The only available information is temperature data from a wind farm at San Gorgonio, California, collected during June 18–August 9, 1989 (Fig. 1). To the best of our knowledge, this is the only meteorological field campaign conducted in an operational wind farm. The wind farm consisted of 23-m-tall turbines with 8.5-m-long rotor blades arranged in 41 rows that were spaced 120 m apart."* Accordingly, scientific data in relation to local climate impacts from wind farms are primarily the result of simulations and more research is needed over extended periods. The San Gorgonio example relates to a wind farm comprising very small turbines, located much closer to the ground that current examples and accordingly the effect could be considerably different. This claim was supported in an article published in the Climate Dynamics Journal of 1 January 2013 titled, Diurnal and seasonal variations of wind farm impacts on land surface temperature over western Texas. L. Zhou et al. provided: *"Recent studies have investigated the possible impacts of wind farms on local to global weather and climate. Although debates exist regarding the regional to global scale effects (Keith et al. 2004; Kirk-Davidoff and Keith 2008; Sta Maria and Jacobson 2009; Barrie and Kirk-Davidoff 2010; Wang and Prinn 2010), modelling studies agree that wind farms can significantly affect local-scale meteorology (Baidya Roy et al. 2004; Adams and Keith 2007; Baidya Roy and Traiteur 2010; Baidya Roy 2011; Fielder and Bukovsky 2011). However, these studies are based*

ENVIRONMENT	
	primarily on numerical simulations of regional global models, which due to lack of observations, crudely represent the effects of wind turbines by explicitly increasing either surface roughness length or turbulence kinetic energy. Evidently, more realistic model parameterizations should be developed, and modelling results should be validated against the observations." As discussed by Roy, any impact of wind farms on local agriculture could be beneficial through the reduction in frost and extended growing season. This is a topic which has been further explored by researchers from the Ames Laboratory and the University of Colorado, who spent several months during the Spring of 2010, investigating corn fields in the Midwest to research the interaction of wind turbines on surrounding farmland. Gene Takle and Julie Lundquist used wind measuring instruments to determine the intensity of turbulence and recorded the intensity of turbulence from near the earth's surface to well above the top tip of the turbine blade. In addition to wind turbulence, plant moisture and temperature readings were collected. *"The data collected so far indicates that the turbines may offer more than the sustainable production of electricity, they may also benefit surrounding crops by helping them stay cooler and dryer, fight off attack from fungi and toxins and improve CO2 extraction.* *The instruments placed upwind and downwind recorded persistent increased turbulence up to a quarter of a mile from the turbine. According to Takle and other studies, the turbines channel air downwards, increasing airflow to surrounding crops. This is thought to speed up natural processes such as heat exchange - keeping crops cooler during hot days and stirring up air in the lower atmosphere to make things a little warmer at night, which could help to ward off early frosts in the Fall. The process could also increase carbon dioxide extraction from the air and soil.*

ENVIRONMENT	
	More turbulence may also help dry out dew that settles on crops and therefore limit the time window that fungi toxins have to establish on leaves. Drier crops could also negate the need to artificially dry corn or soy at harvest time. *The researchers say that it's early days for the study, but results obtained so far indicate that turbines could have a subtle impact on crop yield."* Further research into this topic is contained within the American Meteorological Society, Crop Wind Energy Experiment – Observations of surface-layer, boundary layer, and mesoscale interactions with a wind farm, dated May 2013. Rajewski et al provides that the goal of the Crop Wind Energy Experiment (CWEX) was to develop a basic understanding of how wind farms change the energy and crop production systems. The CWEX was launched to investigate if turbines create measurable changes in microclimate over crops. An extensive field programme was carried out during the summer of 2010, with further investigations in 2011. The results *"provided valuable insights into the exchanges over a surface that has been modified by wind turbines".* The investigation was inconclusive and found that the research undertaken provided a good basis for a more comprehensive measurement program, which was planned for the summer of 2014. Consideration of available research consistently points to inconclusive outcomes, dependant on the consideration of additional research, yet to be completed. There remains no evidence that wind turbines cause any significant detrimental impacts on local weather and climatic conditions. While there is possible indication that the local weather and climate could be slightly impacted by a wind farm, the possibility exists that the impact on local and immediate agriculture could be beneficial and not detrimental, as discussed by Roy and Takle. It is also noted that, of the thousands of turbines installed across Australia over decades, there has been little if any recorded negative impacts on surrounding weather or local microclimate conditions.

ENVIRONMENT	
Concerns were raised that the loss in soil moisture would impact the Abercrombie River, and have flow on impacts on the Lachlan River and the Murray River and associated water catchments.	As discussed above, the research with regard to this topic remains inconclusive and so any flow on effect is not able to be accurately considered until it can be established that there is any local impact. Even if the wind farm did reduce soil moisture in the area immediately surrounding turbines, this area is such a small fraction of the Abercrombie River catchment, the impact is considered to be negligible. Hydrological impacts are discussed within Table 7.7.1 and provide that Chapter 20 of the EIS addresses the requirements in relation to the Abercrombie River and provide that Environmental Resources Management Australia (ERM) Pty Ltd was commissioned by GPGA to assess the potential hydrological impacts in relation to the project. The full report undertaken by ERM Pty Ltd was attached to the EIS and marked Appendix 14.
Concerns were raised with regard to the potential for wind farms to impact global climate change.	Findings from the Department of Climate Change (2008) and the International Energy Agency (2007) indicate that "the high emissions intensity of energy use in Australia is mainly the result of our reliance on coal for electricity" as detailed within Section 6.2.1 of the EIS. Chapter 25 describes that the proposed wind farm would generate up to 550,833 Megawatt hours (MWh) of clean, renewable energy per year and displace 535,961 tonnes of greenhouse gases. Claims that wind farms negatively impacting global climate are not scientifically justified. As discussed above, research has suggested that wind turbines may have an impact on localised weather and climate as a consequence of the mixing of warm and cool air in the atmosphere in the wake of the turbine rotors. Research remains inconclusive and suggests that any local climate impact is very minor in nature and not necessarily present in locations with existing turbulent conditions. There is no indication of any widespread negative impact on climate. To the contrary, wind farms displace greenhouse gases emitted from fossil fuel energy sources such as coal, and as such, assist in reducing the harmful and well supported negative impacts of human induced climate change.

7.6. Flora and Fauna

The responses to the community submissions about flora and fauna concerns are shown in Table 7.6.1.

Table 7.6.1 - Response to Community Submissions (Flora and Fauna)

FLORA AND FAUNA	
Submissions included (ID 98565, ID 98743, ID 99006, ID 99008) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Submitters raised concerns with regard to the Abercrombie National Park, which is segmented by the proposed wind farm and may impact avian inhabitants.	The EIS addressed the proximity of the proposed wind farm to Abercrombie National Park, along with the Ecological Assessment prepared by Anderson Environmental Consultants (AEC), attached to the EIS at Appendix 8A, which addressed the potential impact on avian inhabitants. The AEC's assessment provided that "*overall the biodiversity impact risks in relation to wind turbine collisions are usually insignificant compared to the threats associated with other activities and processes. Erickson et. Al. (2001) found that wind turbine collision deaths probably represent 0.001% to 0.02% (1 out of every 5000 to 10000 avian fatalities) of the annual collision fatalities in the United States. Australian studies of wind farms such as Pacific Hydro's Codrington Wind Farm – Victoria which opened in 2001 recorded very low numbers of bird and bat fatalities (4 birds and one bat between 2001 and 2003). Behavioural studies undertaken for this wind farm also indicated that water birds are adept at avoiding the wind farm sites (Fact Sheet 8 – Wind Farms and Bird and Bat Impacts, AusWEA's).*" Environmental Resources Management Australia (ERM) were engaged to prepare a Supplementary Ecological Report, which was attached to the EIS at Appendix 8B and addressed the biodiversity issues raised by DoPI. The assessment addressed the potential impact of the project on native

FLORA AND FAUNA	
	vegetation, birds and bats and the results indicated that the project would not have a significant impact on any threatened ecological communities or species. Following the public exhibition of Paling Yards EIS, ERM were engaged to address relevant community submissions and prepared a Bird and Bat Monitoring Strategy, which provides: *"The potential impacts of wind turbines on birds and bats have been detailed within the Supplementary Ecology Report (SER) (ERM 2014a). The main potential impacts on both bird and bat species from an operational wind farm are:* ▪ *direct mortality associated with rotor collisions and collisions with other associated infrastructure including towers, guy wires and transmission lines; and* ▪ *indirect impacts relating to habitat loss through the effects of installation of wind farm facilities.* *As described by ERM (2014a), collision risk for birds depends on a wide range of factors as summarised below:* ▪ *high collision rates are particularly evident for large soaring raptors, near areas used by large numbers of roosting or foraging birds, migratory flyways or local flight paths or areas with high bird use. No large concentrations of birds were recorded in the Study Area and the area is not known to form part of any significant migratory routes for large numbers of birds. Wedge-tailed Eagles were frequently observed within the Study Area, soaring at RSA height and may be susceptible to rotor strike; and* ▪ *bird collision risk may vary on a seasonal basis due to bird migration or breeding. No birds were recorded exhibiting direct movement at height and no birds listed as Migratory under the EPBC Act were recorded although it is recognised that birds that may visit the Study Area in some years based on spatial and temporal flowering patterns and other resource availability."*

FLORA AND FAUNA	
	"This Bird and Bat Management Strategy (BBMS) identifies appropriate survey methodologies and provides guidance on bird and bat management. It outlines general guidelines on reporting and evaluation and acts to ensure that the Bird and Bat Management Plan (to be developed based on the principals outlined in this strategy) will be consistent with the following guidelines: ▪ *AusWEA Wind Farms and Birds: Interim Standards for Risk Assessment (BL&A 2005);* ▪ *Best Practice Guidelines for the implementation of Wind Energy Projects in Australia (Clean Energy Council 2013); and* ▪ *Environment Protection and Heritage Council National Wind Farm Development Guidelines – Public Consultation Draft – October 2009.* *This BBMS provides a framework that can be used for development of a detailed Bird and Bat Management Plan for the operational phase of the wind farm once approved. It outlines an indicative and adaptive program for monitoring the effects of each turbine and provides a sampling strategy specific to the first two years of operation. The details of ongoing monitoring (after the first two years of operation) will be established based on the recommendations of the initial monitoring."*
Concern was raised with regard to the potential impact on surrounding wildlife and eco-system as a consequence of the clearing involved for development of the wind farm.	As discussed above AEC carried out an Ecological Assessment to determine the presence or potential presence within the Project Site of any threatened species, populations or endangered ecological communities as listed under the *Threatened Species Conservation Act 1995* (TSCA) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBCA). The findings of the report were that the project would be unlikely to have significant impact on any communities, populations or threatened species listed under the TSCA or EPBCA. No Endangered Ecological Communities or threatened species listed under either the EPBCA or TSCA were detected within the project site during the field surveys. However, the project was still

FLORA AND FAUNA	
	assessed in consideration of each threatened species with potential to occur in the area and in accordance with the criteria contained in the EPBCA and the 7-Part Tests of Significance pursuant to the TSCA. The results further concluded that the project is not likely to result in a significant impact on any endangered ecological community or flora species and accordingly, not considered a controlled action. ERM carried out an assessment included in the SER, to address the requirements of the DoPI adequacy review letter, dated 9 May 2013, including biodiversity issues relating to methodology, avoidance, assessment of impacts, bird and bat impact, mitigation and proposal. The ERM SER addressed the biodiversity issues raised using information collected during a 5-day field survey as well as subsequent data analysis. The conclusion found: *"The potential impact of the Project to native vegetation, birds and bats has been assessed. The results indicate 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 development that will compensate for the residual impacts to biodiversity."* ERM have addressed relevant community submissions from public exhibition and prepared a Bird and Bat Monitoring Strategy and draft Biodiversity Offset Strategy which will enable continued monitoring of the Project throughout consent, construction and operation, if approved. Refer to Appendix C of the Report for details of the ERM response to submissions and strategy documents.

FLORA AND FAUNA

Concerns were raised with regard to the potential impacts on the local platypus, trout and other local marine life within the Abercrombie River both during construction and operation of the wind farm.

Section 3.4.1 of the Appendix 8A of Original EIS, included a literature review and background searches, which revealed that a number of threatened species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* and *Threatened Species Conservation Act 1995*, had the potential to occur within the Project site.

Table 6 provides two fish which may occur in the area, being the Murray Cod and Macquarie Perch.

Table 6: Potential Threatened Fauna species - Fish

Common Name	Scientific Name	EPBC	TSC	Data
Murray Cod	*Maccullochella peelii peelii*	V		EPBC search states species or species habitat may occur within Upper Lachlan LGA.
Macquarie Perch	*Macquaria australasica*	E		EPBC search states species or species habitat may occur within Upper Lachlan LGA.

Key: CE= Critically Endangered, E= Endangered, V=Vulnerable.

The NSW Government Industry & Investment included the following matters within the DGRs in order to reflect the view of the Fisheries Division:

Fisheries issues:

"- Details of any direct impacts to the Abercrombie River. If any is proposed or likely, then a Test of Significance for Macquarie Perch should be included

- Proposals for erosion and sediment control across the site to ensure no impact upon water quality in the Abercrombie River

- Details of all access tracks to be upgraded or constructed (both at the wind farm site as well as along the transmission line corridor). Include a map showing these sites in relation to watercourses (creeks and rivers)

FLORA AND FAUNA	
	- The proposed erosion and sediment control practices for the construction of the transmission line component that address its linear nature *- Details of surface runoff and water quality management works proposed for access roads and tracks that will be used to construct and provide ongoing access to the transmission lines* *- Details of the management of any wastewater that is produced during construction and operational stages of the development* *- Details of proposed measures to prevent and manage fuel spills* *- Details the measures, responsibilities and reporting for the management of major incidents involving water quality* *- Demonstrate that the proposed water quality management measures for construction and operational stages of the project are based on SCA-endorsed Current Recommended Practices (CRPs). Where proposed measures are not based on SCA-endorsed CRPs, it needs to be demonstrated that the measures will achieve the same water quality outcomes* *- The sustainability of systems and proposed management measures over the long term, including delineation of ongoing maintenance responsibilities* *- Determine whether a neutral or beneficial effect on water quality of surface will occur during the construction and operational stages of the project."* Chapter 20 of the EIS addressed the requirements in relation to the Abercrombie River and provided that ERM was commissioned by GPGA to assess the potential hydrological impacts in relation to the project. The full report undertaken by ERM was attached to the EIS and marked Appendix 14. Chapter 20 of EIS provides: *"A wind farm in a rural area can potentially impact on the hydrology of the area, notably on streams, drainage lines, dams and water catchments.*

FLORA AND FAUNA	
	This hydrological assessment identifies potential water-related risks and appropriate management and mitigation measures to ensure that construction and operation of the project would not result in any unacceptable hydrological impacts." *"The site is characterised by a prominent elevated plateaux landscape dissected by deep valleys. More than 50 ephemeral first order watercourses are present within the site, including the Abercrombie River. The watercourses flow generally towards the south and west, to the Abercrombie River."* *"The Abercrombie River is present directly south of the site, flowing along the site's south-eastern boundary. It is 130 km in length and commences from Mount Werong in the east to the Wyangala Dam near Cowra to the west. The river is a tributary of the Lachlan, a significant river in central New South Wales, which it joins at Wyangala lake.* *The Goulburn-Oberon (Abercrombie) Road crosses the Abercrombie River in the Abercrombie Gorge."* Chapter 7 of the ERM hydrological assessment provides detail with regard to the projects ability to maintain a neutral or beneficial effect on water quality, pursuant to the provisions of Clause 28(3) of the REP. *"Through appropriate management of construction activities including erosion and sediment control, hazardous materials storage and handling, and spill emergency response and clean-up procedures, potential water-related impacts would be contained on-site and prevented from reaching watercourses. These measures will be outlined in a details Soil and Water Management Plan to be prepared post consent and before commencement of construction."*

7.7. Turbine Layout (Micrositing)

The responses to the community submissions about turbine layout concerns are shown in Table 7.7.1.

Table 7.7.1 - Response to Community Submissions (Turbine Layout - Micrositing)

TURBINE LAYOUT (Micrositing)	
Submissions included (ID 98565) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
The submitter raised concern with regard to the layout presentation of the turbines within the Environmental Assessment due to the lack of topographic detail.	The indicative wind turbine layout plan was prepared for up to 55 turbines. The indicative layout was prepared by the proponent using wind modelling software and reflects the site constraints and the typical spacing required for the wind turbines currently under consideration. The indicative locations shown on the layout plan, reflect the current understanding of the preferred location for the turbines, given the currently proposed turbine models, knowledge of the wind characteristics and the presence of significant vegetation. The indicative wind turbine layout was based on a number of inputs, principally: ▪ The site boundary; ▪ Topographical data; ▪ Wind speed data collected on and off site; ▪ Dwelling locations; ▪ The location of significant native vegetation and native fauna; ▪ Noise assessments at key receiver points; ▪ Visual amenity impacts (including shadow flicker at the nearby dwellings); and ▪ Typical spacing required.

TURBINE LAYOUT (Micrositing)	
	As detailed within the EIS, the turbine layout has been revised on several occasions since 2010, as a consequence of specialist studies, as well as stakeholder input. Layout amendments have included: ▪ Selection of the northern transmission line as the least impact option; ▪ Removal of the southern substation; ▪ Removal of turbine P26 to reduce potential noise impact for landowners; ▪ Removal of turbines P2, P6, and P7 in response to the flora and fauna assessment; ▪ Removal of turbine P11, associated crane pad and access track; ▪ Relocation of turbine P10 by 184m, reduced access track; ▪ Relocation of turbine P13 by 70m, reduced access track and less clearing for crane pad; ▪ Relocation of turbine P14 by 86m, reduced access track and less clearing for crane pad; ▪ Micrositing of the turbines to minimise local impacts; ▪ Changes to the location of several access tracks to further utilise the existing farm tracks and reduce the infrastructure footprint; ▪ More underground cabling to provide more efficient transfer of electricity and reduce the infrastructure footprint; ▪ A new access road to separate the wind farm construction vehicle traffic from the access used by the project involved landowners; ▪ Selecting a smaller wind turbine envelope size for specific locations to reduce potential noise and shadow flicker impact for the project involved landowners; ▪ New substations to reduce length of overhead powerlines; and ▪ Selection of powerline poles for the northern transmission line route to minimise and avoid where possible the removal of native vegetation.

TURBINE LAYOUT (Micrositing)	
	If project approval is granted, this proposed layout will be refined at the detailed design stage and once the final turbine has been selected so as to achieve the best energy generation from the selected turbine model. It is estimated that this may result in individual turbines being moved approximately 25 to 100 metres from the currently nominated location on the site plan. A geotechnical assessment undertaken for the project found that the site topography comprises 'plateau' and 'hillcrest' areas at an elevation of between 900 and 1065 metres surrounded by steeply sloping gullies and creek lines that flow to the Abercrombie River. The gently sloping plateau areas are generally cleared and used for grazing, while the more steeply sloping areas are generally heavily vegetated. Topography was a primary consideration in siting of the turbines, not only with regard to the availability of wind, but also as a consequence of the desire to leave as much vegetation undisturbed as possible.
Concern raised with the location of the proposed turbines being less than 5 times rotor diameter abreast and 8 times rotor diameter downwind.	The submission referrers to a 'rule of thumb' with regard to turbine spacing, however, this 'rule of thumb' varies from source to source and would appear to relate to situations where the wind is blowing from a narrow range of wind directions. Coppin *et al* Wind Resource Assessment in Australia – A Planner Guide, CSIRO Land and Water 2003 references a 'rule of thumb' spacing of 2 blade diameters across and 10 diameters downwind between rows. However, it concludes that 2 across is "visually" very close and 4 blade diameters across seems to be an accepted value. As addressed within Section 6.6.4 of the EIS, the subject site has a total site area of 3,900 hectares, with approximately 1% of the land being directly developed for the proposed turbines, access tracks and supporting infrastructure. Siting of the turbines has been in consideration of the minimum distances required for operational efficiency.

TURBINE LAYOUT (Micrositing)	
	In addition to the noise related conditions contained within the Statement of Commitments, GPGA have committed to the development of a Noise Management Plan, which will ensure noise is limited and mitigation measures are in place, if the location of turbines to one another create additional noise. While we note the submitters concerns with regard to proximity of the turbines to one another, it is important to consider that the subject site is significant in size and the placement of the turbines could have been at greater distances, however, the proposed location of each turbine has been as a consequence of detailed investigation of the site's topography and wind modelling to ensure optimum efficiency. As discussed above, siting of turbines in a direct line is not in the best interests of GPGA. Not only would a direct line interrupt the airflow and result in potentially less energy yield, but it would also result in significant wear and tear on the turbines.

7.8. Transmission Line Options

The responses to the community submissions about transmission line option concerns are shown in Table 7.8.1.

Table 7.8.1 - Response to Community Submissions (Transmission Line Options)

TRANSMISSION LINE OPTIONS	
Submissions included (ID 99008, ID 100431) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Concerns were raised about the proposed powerline options, and also concerns about why some other powerline options were not assessed.	The project proposes an overhead powerline connection of approximately 9km to a proposed off-site electrical Terminal Station, which would connect to the Mt Piper to Bannaby 500kV transmission line (the 'north-eastern options'). Two options were considered for overhead connection to the existing power transmission network. These were a southern and northern connection, with each including sub-options. The North-eastern option, involving an overhead powerline connection of approximately 9km to a proposed off-site electrical Terminal Station that would connect to the Mt Piper to Bannaby 500kV transmission line that passes north-east and east of the site. The Southern option considered a 55km overhead powerline connection to the approved Crookwell 2 Wind Farm substation which connects to the Gullen Range to Bannaby 330kV transmission line. Through the technical assessment and consultation process, it was established that the north eastern transmission line is the least impact route and the most feasible options. On this basis, approval is only being sought for the north eastern option. The proposed transmission line will include the following:

TRANSMISSION LINE OPTIONS	
	▪ A proposed corridor of approximately 9km in length and 70 metres in width, with the aim to avoid removal of native vegetation as much as possible. ▪ Transmission line power poles will be spaced approximately 200 to 250 metres apart. It is proposed that the spacing is flexible so as to minimise impacts on environmental features such as waterways. ▪ Power poles will be located no closer than 40 metres to any watercourse, except where these are only first order "minor streams" as defined by the Water Management Act 2000. ▪ A permanent access track will not be constructed along the length of the transmission line. Instead, access will be gained informally across grassed paddocks using the closest route from existing tracks/roads nearby. The routes which are selected will have the least potential for environmental impact. ▪ There will be no need to construct watercourse crossings for the purpose of vehicle access, whether permanent or temporary, during transmission line construction. This is on the basis that in situations where the lines cross a creek, cables can be pulled from one side of a creek to the other without needing to drive across the creek. The proposed transmission line would be constructed over a maximum of eight or nine parcels of land. The parcels are generally cleared farmland, and the line route has been designed to avoid removal of native vegetation where possible. Although the northern transmission line route has multiple sub-options, the grid connection negotiations with the Transmission Authority will continue to identify the most cost-effective grid connection configuration and transmission line corridor, and if the final preferred location is significantly different to the two sub-option locations proposed in the EIS, GPGA will undertake additional assessment of that location and associated corridor and seek an amendment to the development consent.

7.9. Electromagnetic Interference

The responses to the community submissions about electromagnetic interference concerns are shown in Table 7.9.1.

Table 7.9.1 - Response to Community Submissions (Electromagnetic Interference)

ELECTROMAGNETIC INTERFERENCE	
Submissions included (ID 99004) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Concerns were raised relating to the potential impact on electronic communications (i.e. phone, wi-fi, TV) from electromagnetic interference.	Concerns about impacts arising from EMI around the turbines are addressed in the Electromagnetic Interference Impact Assessment prepared by Garrad Hassan at Appendix 11 of the EIS. The assessment found that in relation to radio and TV reception: ▪ FM signals may be susceptible to interference from wind turbines, which can be mitigated by the installation of a high-quality antenna. ▪ Interference to analogue television could potentially occur at particular houses (listed in the report), however, analogue television has being phased out across Australia, and if digital reception is marginal, residents in the vicinity of the site may be eligible to receive access to the Government-funded satellite television service to view free-to-air television. Mitigation measures proposed to address EMI include: ▪ For any interference with fixed point-to-point links, either the relevant turbines or the communications tower may be slightly relocated, where possible. ▪ Realigning or relocating the householder's TV antenna. ▪ The installation of an external antenna or more directional and/or higher gain antenna at the affected household;

ELECTROMAGNETIC INTERFERENCE	
	▪ The installation of cable/satellite TV at the affected household; and ▪ Installation of a TV relay station. ▪ A person with portable device moving a short distance to a new or higher location until the signal strength improves. In general, Very High Frequency (VHF) and Ultra High Frequency (UHF) band radio signals, and digital voice-based technologies such as cellular phones (often called 3G or NextG mobiles) are essentially unaffected by wind farm development. This includes land mobile repeaters, radio, and the audio component of analogue television, and mobile phones.

7.10. Socio-Economic and Property Value

The responses to the community submissions about Socio-Economic and Property Value concerns are shown in Table 7.10.1.

Table 7.10.1 - Response to Community Submissions (Socio-Economic and Property Value)

SOCIO-ECONOMIC AND PROPERTY VALUE	
Submissions included (ID 97952, ID 98743, ID 98920, ID 98922, ID 98994, ID 99004, ID 99006, ID 99008) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Concern raised in relation to a reduction in property values, particularly for lifestyle properties.	The submitted Environment Impact Assessment (EIS) and associated Socio-Economic Impact Assessment prepared by ERM addressed the issue of property value associated with the proposed wind farm. However, concern has been raised that the information provided does not detail relevant or credible research in relation to the impact of wind farms on property values. Section 8.3.2 of the EIS considered property values within the 'Indirect Impacts' section of the assessment and referenced a 2006 study by Henderson and Horning Property Consultants, which looked at wind farms and property values over a 15-year period. The study assessed 78 property sales around the operating Crookwell wind farm between 1990 and 2006 and found no impact of the wind farm on property values close to the site. A separate study by the NSW Department of Lands in 2009 looked at properties located near eight wind farms and found no evidence that wind turbines caused property values to drop or increase at a slower rate than comparable properties. The report found that wind farms "do not appear to have negatively affected property values in most cases". The report also found that "no reductions in sale price were evident for rural properties or residential properties located in nearby townships with views of the wind farm". Further reference was made to a land evaluation report, which was presented to Pyrenees Shire Council, Victoria in August 2012. As home to one of Australia's largest wind farms, Waubra, the

SOCIO-ECONOMIC AND PROPERTY VALUE	
	report considered property prices from 2010 to 2012 and found that residential properties in the Waubra area increased in value by 10.1 percent during the period, an increase which was the largest of any town in the shire. Additional investigation has now been undertaken to explore the effect that wind farm visibility has on property values. McCarthy, I.; Balli, H. O. 2014. Wind farms and residential property values, *International Journal of Strategic Property Management 18(2): 116-124* provides a study, which examines the effect that wind farm visibility has on residential property values using a hedonic regression model. The study area was Ashhurst, New Zealand, where the township comprises approximately 900 dwellings and is located within 8 km of two separate wind farms, comprising a total of 189 turbines (103 x 660Kw, 31 x 3MW, 55 x 1.65MW). The two wind farms were developed between 1998 and 2007 and the analysis used 945 open market house sales that occurred between 1995 and 2008. The methodology adopted provides that the price a house sells for depends on its unique combination of physical, location and environmental characteristics. Distance to turbines was not considered a variable in the model as all houses are sited within 2.5 to 3.5km from the closest turbine. The viewshed was determined at a radius 8km from the wind farm, established by Hoen, B. 2006, in a study which concluded that there was no statistically significant relationship between sale price of residential property and view of, or distance to, the wind farm. This study is addressed in greater detail following. Another study, which adopted a radius of 8km from the wind farm as the outer limit of the viewshed was Sterzinger, *et al.* 2003.

SOCIO-ECONOMIC AND PROPERTY VALUE	
	The visual impact was studied by McCarthy, I.; Balli, H. O. 2014 using GIS viewshed analysis and field inspection. The models in each case indicated that the turbines located between 2.5km and 6km from the township had no significant impact on property value. It found that *"the results indicate that the Tararua and Te Apiti turbines had no significant impact on sale price of Ashhurst residential property*." There have been several studies into this topic over the last decade, the most extensive of which Hoen *et al.* (2011), based on almost 7,500 dwellings sales within 16km of 24 existing wind farms in nine different states in the United States. The study involved four models and extensive field work to ensure accurate view variables, considering both turbine view and vista. They concluded that neither view of the turbines nor the distance of the home to the turbine has a significant effect on house price sales. Hoen, B. (2006), conducted an earlier study which considered 280 bona fide residential property sales in the United States, using a hedonic regression model and concluded that in the community studied, there was no statistically significant relationship between sale price of residential property and view of, or distance to, the wind farm. One study which indicates some correlations between distance from a wind farm and value, involved the analysis of 1,052 property sales in Cornwall, United Kingdom (Sims and Dent (2007)), however, the study concluded that other variables, not included in the analysis may be the main driver of price. A further study in relation to Cornwall investigated 199 property sales between 2000 and 2007 since the construction of the wind farm. Sims *et al*. (2008) used GIS and site visits to gather data on distance to turbines and turbine visibility from the front and rear of the house on each lot, also considering vistas for each sale and found no relationship between the number of wind turbines visible and property value.

SOCIO-ECONOMIC AND PROPERTY VALUE	
	Having considered the EIS, ERM assessment and available research in relation to dwelling prices, it would appear that property values will not be negatively affected by proximity to, or view to the proposed wind turbines.
Concern raised that DoPI requirements, as outlined in a letter dated 18 April 2012, were not addressed: *"Consider any potential impacts upon property values consistent with the draft guidelines, including properties within 2km."* In addition, reference was made to the Draft NSW Wind Farm Planning Guidelines, which provides: *"Property Value* *The potential for a proposed wind farm to impact on the value of surrounding properties that do no host the wind farm facility, including properties within 2km of a proposed wind turbine should be considered."*	All properties within 2km of any proposed wind turbine are associated with the Paling Yards project. The Landscape and Visual Impact Assessment (LVIA) considered the *Draft NSW Wind Farm Guidelines* (Draft Guidelines), which set out a comprehensive framework for the assessment of landscape and visual impacts including residential dwellings within a 2km distance of any proposed wind turbine. It is important to note that there is no non-project involved, identified residential dwellings within 2km of any proposed wind turbines. For those properties located outside a 2km radius of any proposed turbine, the previous considered research indicates an established viewshed of 8km in relation to any wind farm development. There is no evidence to suggest property prices will be negatively impacted by the proposed wind farm and the research of McCarthy and Balli (2014), Hoen *et al.* (2011), Sims *et al*. (2008), Sims and Dent (2007), Hoen, B. (2006) and Sterzinger, *et al.* (2003) indicate no reduction in property value within the 8km viewshed of a wind farm within any of the localities investigated. The submitted EIS and LVIA provide consideration of any dwellings within a 10km viewshed and provide a total of 48 residential dwellings are located within the stipulated viewshed. Pursuant to the provisions of Oberon Local Environmental Plan 2013, the majority of the land within the viewshed is zoned E1 National Parks and Nature Reserves or RU1 Primary Production and provides for a minimum lot size of 100 hectares. The stipulated minimum lot size confirms that there is little opportunity for land fragmentation or significant development within the locality in the short to medium term. Oberon LEP was commenced on 20 December 2013 and accordingly, provides a recent and current decision of the Council to maintain the 100 ha minimum lot size and rural landscape of the area.

SOCIO-ECONOMIC AND PROPERTY VALUE	
	Consideration of the zoning and minimum lot size confirms that there is unlikely to be any significant increase in the number of dwellings located within the 10km viewshed of the proposed wind farm and so there is little opportunity for the proposal to effect property value, when subdivision and development potential is unlikely to result in any substantial increase in dwellings in the short to medium term.
Concern raised that property value was addressed at Chapter 8.2.3 'Indirect Impacts', and not considered a direct impact.	The submitted EIS identifies direct impacts of the proposal at section 8.3.1 and identifies a number of direct economic impacts, including; ▪ design and development of the project; ▪ construction of the project; ▪ construction and commissioning of the project; and ▪ expenditure and employment associated with the management, operation and maintenance and decommissioning of the project. Some direct impacts for the local economy are also identified, including; ▪ employment; ▪ capital investment; and ▪ land use and revenue. The Socio-Economic Impact Assessment prepared by ERM emphasises that the value of rural land in the area surrounding the site is determined by a range of economic factors such as commodity prices, interest rates, and the supply of land and /or availability of similar land for sale. Therefore, the establishment of the project on rural lands would be only one consideration in determining land value and accordingly, property value would be an indirect impact and not a direct impact. It is important to consider the findings of relevant research, discussed above, within the EIS and ERM report, which found no correlations between property value and proximity to a wind farm.

SOCIO-ECONOMIC AND PROPERTY VALUE	
Concern raised why the socio-impact report prepared by ERM did not address property value in more detail and why a study of all properties within a 10km radius was not carried out. The submission further questioned the relevance of the studies referenced in the EA, which were considered too old (2003).	In accordance with the requirements of the Department of Planning and Infrastructure Checklist, dated 18 April 2012, GPGA were required to *"Consider any potential impacts upon property values consistent with the draft guidelines, including properties within 2km."* In addition, the Draft NSW Wind Farm Planning Guidelines require the assessment of property value and "*The potential for a proposed wind farm to impact on the value of surrounding properties that do no host the wind farm facility, including properties within 2km of a proposed wind turbine should be considered."* ERM carried out an assessment in relation to property value, in consideration of the requirements of DoPI and the Draft NSW Wind Farm Planning Guidelines, which both require assessment of the impact on properties within 2km. In this instance, all of properties within 2km of a wind turbine are associated with the proposal.
Concern raised that there may be loss of tourism to the area as a result of Paling Yards Wind farm and the resultant financial impact for the local tourism operators.	Section 8.3.2 of the EIS addressed the issue of tourism impacts and provides that the project has the potential to increase local tourism and correspondingly increase expenditure on local services. It found that "large numbers of tourists visit wind farms every year in Australia, including: ▪ 50,000 visitors per year to Codrington Wind Farm in Victoria, ▪ 30,000 visitors in three months to the Windy Hill Wind Farm in the Atherton Tablelands, and ▪ 400-500 people to an open day at the existing Crookwell Wind Farm" (AusWEA, 2003). Crookwell 1 Wind Farm in NSW is advertised by both Oberon Tourism and NSW Tourism websites as one of the 'top tourist activities' in Crookwell. These figures indicate that the local tourism market, particularly local accommodation providers, could in fact benefit from the development of the proposed wind farm.

SOCIO-ECONOMIC AND PROPERTY VALUE	
Concern raised with regard to the potential road widening, which may involve private land and suggested that any road widening upon private land should result in financial compensation.	It is important to note that any proposed road widening, if required, would involve the consent of the landowner and could not be carried out without the written consent of the subject landowners. URS Australia Pty Ltd (URS) was commissioned by GPGA to assess the transport related impacts arising from the project. The Transport Impact Assessment identifies and considers the traffic impact of the project both during the construction and operational phases. It also identifies the likely measures required to improve conditions of the access routes to the site. In 2014, the transport requirement for the identified 'worst-case scenario' for OD vehicle movements, taking into account the requirements of all assessed wind turbine manufacturers, was defined as follows: ▪ Maximum OD Vehicle Length: 64.4 metres ▪ Minimum Height Clearance: 6.6 metres ▪ Minimum Road Width: 5.5 metres ▪ Maximum slope gradient: 6% ▪ Maximum slide inclination: 2% A number of haulage route options were identified for OD vehicles between Port Kembla and the site, and between the Port of Newcastle and the site. URS advised that a detailed Transport Management Plan, in consultation with local councils and RMS, should be developed to outline the finalised transport details and include management and mitigation measures for the project. URS recommended that this document be prepared before the construction phase of the project, to form the foundations for all traffic related activities for the project. GTA Consultants (GTA) were commissioned by GPGA in October 2014 to further investigate the suitability of the proposed (oversize) heavy vehicle access route and the site access points on Abercrombie Road.

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	Further investigations were undertaken by GTA as part of the assessment, using additional data provided by possible suppliers, with the following revised 'worst case scenario' defined: ▪ Maximum OD Vehicle Length: 66.5 metres ▪ Minimum Height Clearance: 5.5 metres ▪ Minimum Road Width: 5.5 metres ▪ Maximum Road Gradient: 6% ▪ Maximum Road Crossfall: 2% As part of the route investigation, GTA undertook a "drive-through" and video recording of the route and liaised with the RMS Special Permits team to confirm the sections of the identified route that have been already approved and deemed appropriate for wind farm haulage and/or other oversize load requirements. The field investigations were conducted on Tuesday, 28 October 2014 to identify potential areas of concern and take measurements wherever necessary. In March 2020 GTA undertook a detailed "route assessment" to review and reassess the proposed Restricted Access Vehicle (RAV) transport route for the proposal. This was done as per the RMS request in 2015 to review additional details of potential road upgrade works prior to approval. The investigations and vehicle swept path analysis on critical corner/horizontal curves indicated that the proposed route was feasible. The RAV to be used for delivery of the turbine components to the project area is much smaller than the original proposed OD. The maximum total length of the RAV vehicle is 31.27m, with the trailer transporting the turbine blade with 18.0m in length – fitted with hydraulic mechanisms to hold the blade. The maximum width of the vehicle and trailer will not exceed 4.2m. This latest report demonstrates that no privately-owned land is affected as a result of the blades transport GTA have confirmed that all heavy vehicle activity associated with the proposal will be to and from the site via Abercrombie Road to the north. It is not anticipated that any heavy vehicles will use Taralga Road, and as such, Taralga Road will not require upgrade. A detailed Traffic Management Plan (TMP)

SOCIO-ECONOMIC AND PROPERTY VALUE	
	and scope of any further road modification works would be developed in consultation with RMS and respective Council prior to any over-dimensional wind turbine component movements.
Concern raised with regard to loss of future income as a consequence of the wind farm, i.e. loss of tourism market and loss of soil moisture, which would result in higher agriculture related costs.	As discussed above, it is likely that the development of the wind farm may result in increased tourist activity within the region as a consequence of the significant number of visitors every year wind farms attract. The matter of soil moisture and the impact of the wind farms is detailed in Section 7.6, with research inconclusive in respect of local climate change as a consequence of wind turbines.

7.11. Electricity Price

The responses to the community submissions about electricity price concerns are shown in Table 7.11.1.

Table 7.11.1 - Response to Community Submissions (Electricity Price)

ELECTRICITY PRICE	
Submissions included (ID 97952, 98565, ID 98994) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Concern raised that electricity prices would be increased.	Chapter 6 of the EIS details the Project Justification, including: ▪ Climate Change ▪ Renewable Energy ▪ Wind Power Context ▪ Community Attitudes ▪ Project Benefits ▪ Consideration of Alternatives Chapter 6 contains a strategic assessment of the justification for the project and discusses the environmental, economic and social benefits, as well as exploring alternatives to the project in relation to type, location and scale. Sections 6.3.2 and 6.3.3 of the EIS address the Australian and NSW context and provides: *"The Renewable Energy Target (RET) scheme outlines the Australian Government's commitment to reducing greenhouse gas emissions and expanding the use of renewable sources from 2020 and beyond. On 20 August 2009, the Renewable Energy (Electricity) Amendment Bill 2009 was passed in the Commonwealth Parliament, which expanded the MRET (Mandatory Renewable Energy Target) scheme into a single national scheme, called*

ELECTRICITY PRICE	
	the RET. This scheme places a legal liability on wholesale purchasers of electricity to proportionately contribute towards the generation of renewable energy (Sustainability Victoria, 2010). In June 2010, the Government passed an enhanced RET scheme, which created new categories for renewable energy to encourage commercial scale energy development. *The aim of the RET is to ensure that "20 per cent of Australia's electricity comes from renewable sources by 2020" (Commonwealth of Australia, 2013). The RET achieves this by "the creation of online certificates by eligible renewable energy sources based on the amount of electricity in megawatt hours (MWh)" and "placing a legal obligation on liable entities (usually electricity retailers) to purchase and surrender a certain amount of these certificates each year" (Clean Energy Regulator,2012). The RET places an obligation on electricity retailers and large users of electricity to purchase 20% of their electricity from renewable energy sources by 2020 (Minister for Climate Change, Energy Efficiency and Water, June 2010).* *On 1 January 2011 the RET split into two separate schemes, and the 'Large-scale Renewable Energy Target' (LRET) and the 'Small-scale Renewable Energy Scheme' (SRES) became effective. The LRET encourages large scale energy generation to be produced using technologies such as hydro, biomass, solar, tidal and wind power.* *The LRET will drive investment in renewable energy projects like wind farms, commercial solar and geothermal, which will deliver the majority of the 2020 target.* *The annual targets for the LRET increase each year up to 41,000 GWh by 2020 (DCCEE 2010).* *To achieve this target, Australia will require significant investment in renewable generation.* *Billions of dollars of investment of additional wind generation capacity will be required to meet the RET target by 2020 (Infigen Energy, 2012, Origin Energy, 2013). Wind power remains the renewable technology leader in cost competitiveness and is expected to play a significant role in meeting the large-scale target.*

ELECTRICITY PRICE	
	In NSW, more than 90% of electricity is generated from coal, and one third of NSW's total greenhouse gas emissions are due to the generation of electricity (NSW Government 2010b). Most of NSW's electricity is sourced from black coal fired power Stations. *Governments have recognised that renewable energy sources should be encouraged in order to reduce the greenhouse gas emissions resulting from increased generation. In lieu of the RET legislation, the NSW government introduced the draft NSW Renewable Energy Target (NRET) in 2007. This scheme required 10% of NSW's electricity to be sourced from renewable energy by 2010, and 15% by 2020 (NSW Government 2006).* *The NSW scheme's target, which applied to all electricity retailers required electricity retailers to purchase 10% of their electricity supply from accredited renewable generation sources (NSW Government 2006)."* A move towards meeting renewable energy targets by 2020 requires a significant investment in power generation from alternative sources. The Clean Energy Council provides that wind power is currently the cheapest source of large-scale renewable energy and in 2013, Australia's wind farms produced over a quarter of the country's clean energy. On a general level, the addition of extra electricity generating capacity, such as the Paling Yards Wind Farm, is expected to add to supply and therefore have a moderating effect on prices. Wind power supplied 4 per cent of Australia's overall electricity during 2013, with $1.5 billion of new investment in wind power, which was almost double that in 2012. The Climate Institute Policy Brief – Electricity Prices: The Facts, provides: *"Australian electricity prices have risen over recent years and will continue to rise in coming years, with or without a price-tag on pollution. However, despite the recent increases, when adjusted for inflation, electricity prices are about the same as they were 25 years ago. Compared to other countries, Australia still enjoys very low electricity prices, with the average household paying around half as much as households in other developed countries."*

ELECTRICITY PRICE	
	"The existing 20 per cent Renewable Energy Target (RET), which is supported by both the Government and the Opposition, currently accounts for a relatively small fraction of weekly energy bills – around $1.25 a week for the average Sydney household. The RET is also a very minor factor behind current electricity price rises, accounting for around 10 per cent of the regulated price rise in NSW between 2009/10 and 2012/13. The RET is projected to unlock $19 billion in new investment in clean energy and create tens of thousands of new jobs in the process." The renewable energy target at the current time is under review, with a variety of options publicly canvassed. If and when this review leads to any legislative change, the current policy setting and support for renewable remain unchanged.

7.12. Traffic and Transport

The responses to the community submissions about Traffic and Transport (Including Road Upgrades) concerns are shown in Table 7.12.1.

Table 7.12.1 - Response to Community Submissions (Traffic and Transport)

TRAFFIC AND TRANSPORT	
Submissions included (ID 98743, ID 98922, ID, 99006) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
Concerns raised for unsuitability of roads between Taralga and the site for large transport vehicles through the winding and narrow section of this road.	The Project is not proposing to use the road between Taralga and the site for the transport of plant and equipment by heavy and over-dimensional vehicles, however, may be used by light vehicles for access to the proposed development during construction and operation. A minor increase in light vehicle traffic would not impact road condition or safety.

7.13. Cumulative

The responses to the community submissions about cumulative (geographic dispersion) concerns are shown in Table 7.13.1.

Table 7.13.1 - Response to Community Submissions (Cumulative)

CUMULATIVE	
Submissions included (ID 98565) **[Please note that not every submission raised every issue, however for ease of reading all issues are addressed.**	
Community Issues raised:	**GPGA Responses:**
One submission raised concerns with regard to the geographic dispersion of wind farms as a consequence of the placement of several wind farms in certain geographically suitable locations.	The cumulative effects are discussed within the EIS at Chapter 21 and describe the proposed location in the NSW Central Tablelands and NSW/ACT Border Region, which has been identified as highly suitable for wind turbines and the generation of renewable energy. Paling Yards is identified in one of the NSW Governments designated renewable energy precincts (Precinct 4), where several wind farms are located/ proposed. The precincts have been identified due to their suitability for the technology. Two wind farms are located within 30km of Paling Yards and are identified as Golspie Wind Farm (proposed) and Taralga Wind Farm (existing). Any other wind farm, either proposed or approved, is located greater than 30km from the subject site. The generally anticipated cumulative impacts associated with wind farms include flora and fauna impacts, and visual impacts. As a consequence of the closest wind farm being 25km from the subject site, it is not anticipated that there will be any cumulative impacts with regard to these matters. The submitter relates geographic dispersion specifically to the amount of wind in the precinct and the direct impact on multiple wind farms in the locality. Section 6.2.3. of the EIS addresses the role wind energy plays in the total energy network and provides:

CUMULATIVE	
	Considerable research is underway within the energy industry to improve the management of different types of energy generators as part of the overall modern power generation network. For example, improvements in wind forecasting can increase the ability of grid operators to schedule and accommodate generation from wind, whilst reducing the generation from polluting sources of base load generation. Furthermore, wind generation can be combined with other renewable sources such as hydroelectricity to improve its ability to supply base load power when required. Additionally, advances in energy battery technologies also offer the potential for short term storage of energy to be utilised when the wind is not blowing. Wind power is seen as a key component of a modern energy network that also includes solar, hydro and gas. *As technology advances, the role of wind power in Australia's energy mix is increasing. The University of Melbourne Energy Research Institute team has established an organisation, Beyond Zero Emissions, a non-profit, independent climate change solutions research and advocacy group that has developed the Zero Carbon Australia 2020 Project. The Zero Carbon Australia 2020 Project is a "costed, detailed blueprint for a transition of Australia to a Zero Emissions Economy by 2020 using proven, commercialised technology" (University of Melbourne, 2010).* While there will not always be ideal wind incidence to produce maximum output, the University of Melbourne has found that at least 15% of the installed wind capacity would always be producing power, with the same reliability as conventional 'base load' power.

8. Revised Statement of Commitments

The revised Statement of Commitment (**SoC**) has been prepared to accommodate additional mitigation tasks recommended by consultants working on the project, and to also incorporate the comments provided by government agencies as part of the public exhibition submission process.

The SoC in Table 8.1.1 - Revised Statement of Commitment, outlines a comprehensive list of mitigation and control measures to avoid or minimise potential environmental impacts from the Project through the Project life cycle. Each of the mitigation tasks are proposed for one or more specific phase(s) of the Project, the phases are classified and designated as:

- Detail Design and Pre-Construction phase (P)
- Construction and Site Restoration phase (C),
- Operation and Monitoring phase (O), and
- Decommissioning and Site Rehabilitation phase (D)

The Proponent has the responsibility for delivering the SoC either directly or through its contractual structure for the relevant commitments.

Table 8.1.1 - Revised Statement of Commitment

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
1.0	**General**		
1.1	Minimising harm to the environment	Ensure that micrositing or any minor changes to the Project do not create any material increase in overall environmental impact. In the event of any significant changes to the proposed wind turbine layout, an updated noise assessment and visual impact assessment will be submitted prior to construction.	P
1.2	Compliance with Statutory Requirements	Ensure that Paling Yards Wind Farm activities are compliant with all relevant environmental requirements and ensure all necessary licences and permits are obtained and kept up to date as required through the different phases of the development.	P / C / O / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
2.0	**Pre-Construction Compliance**		
2.1	Pre-Construction Compliance Report	Prepare and submit a **Pre-Construction Compliance Report** (**PCCR**) for each stage of the Project to the Secretary of DoP&E at least two weeks prior to commencement of construction of that stage (or such later time agreed to by the Secretary of DoP&E). The PCCR will include details of the compliance with all pre-construction conditions of approval that are relevant for the specific stage(s) of the Project.	P
2.2	Construction Environmental Management Plan	Prepare a **Construction Environmental Management Plan** (**CEMP**) for each stage of the Project, in consultation with Office of Water, Office of Environment and Heritage, Sydney Catchment Authority, and submit it as a draft for approval to the Secretary of DoP&E at least two weeks prior to the commencement of construction of that stage (or such later time agreed to by the Secretary of DoP&E). The CEMP will address the construction impacts of the relevant stage of the Project including the specific matters set out below and outlining the roles and responsibilities of those involved in the implementation of the control measures. The CEMP as approved by the Secretary of DoP&E, will be implemented in each stage of the construction phase of the Project.	P / C
3.0	**Pre-Operational Compliance**		
3.1	Operation Environmental Management Plan	Prepare an **Operation Environmental Management Plan** (**OEMP**) in consultation with Office of Water, Office of Environment and Heritage, Sydney Catchment Authority, and submit it as a draft for approval to the Secretary of DoP&E at least one month prior to the commencement of operation (or such later time agreed to by the Secretary of DoP&E). The OEMP will address the operational impacts of the Project including the specific matters set out below and outlining the roles and responsibilities of those involved in the implementation of the control measures. The OEMP as approved by the Secretary of DoP&E, will be implemented in the operational phase of the Project.	C / O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
4.0	**Socio-Economic**		
4.1	Effect on local economy	Full time jobs and contractors for the construction and future decommissioning will be sourced locally where economical and if the skills and available labour exist within the community.	C / O / D
4.2	Economy and livelihoods	Assess the viability of conducting aerial agricultural operations on properties adjacent to the site, particularly by the use of helicopters. In the event the immediate neighbouring landowner(s) would require aerial agriculture spraying of their land adjacent to the Project and there is an increase in cost associated with the proximity to turbines, the Proponent will cover the reasonable cost increase for the aerial agriculture activity. The landowner seeking compensation for the cost increase must demonstrate and justify this increase with previous records.	O
4.3	Community Consultation	Develop and maintain a community consultation and engagement program aimed at: ▪ Providing the community with factual information about the Project; and ▪ Gathering feedback from the community and stakeholders about their concerns and interest, which can be subsequently addressed in the approvals process. A dedicated email address, website and free call 1800 number will be available and responded to for the life of the Project.	P / C / O / D
4.4	Community Consultative Committee	Establish a **Community Consultative Committee (CCC)** in accordance with the Draft Guidelines. The purpose of the CCC is to provide a forum for discussion between the Proponent, the community, Council and other stakeholders about the Project, if the Project is approved. The CCC would provide a forum for ongoing communication with the community during the life cycle of the Project, the frequency of the CCC meetings is expected to be more regular during the Construction phase.	P / C / O / D
4.5	Community Enhancement Fund	Contribute an annual monetary contribution of amount of $1,900 (adjusted annually to changes in the CPI) per operating turbine forming part of the Paling Yards Wind Farm. These annual contributions will be paid into the Oberon Council **Community Enhancement Fund** (**CEF**) [to be established by Oberon	O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		Council] that forms part of the **Voluntary Planning Agreement** (**VPA**) which will fund local projects within a radius of 50km of the Paling Yards Wind Farm within the Oberon Local Government Area. GPGA proposes that the local projects which will eligible for funding from the CEF will be projects aimed at: ▪ Enhancing any aspect of the local environment including, but not limited to, ameliorating any impacts from the Paling Yards Wind Farm; or ▪ Providing any community service or facility.	
5.0	**Visual**		
5.1	Visual impact to nearby properties	Undertake screening planting in locations agreed between the Proponent and local landowners within 5km of the proposed turbines where the planting is seen as effective and is desired by the landowner to limit the view to the proposed wind turbines. It will involve a variety of dense native vegetation, including both trees and shrubs, and will be carried out at the cost to the Proponent. The maintenance and upkeep of the planted vegetation is the responsibility and at the expense of the respective landowner.	C / O
5.2	Visual impact to nearby properties	The wind generator blades, tower and nacelle will be treated / painted with a non-reflective white or off white colour and matt finish to reduce glare and minimise blade glint.	C
5.3	Visual impact to nearby properties	No advertising, signs or logos will be mounted on turbine structures, except those required for safety purposes.	P / C
5.4	Visual impact to nearby properties	Substations, site control building and facilities will be designed and constructed sympathetically with the nature of the locality and landscaped to minimise direct views from roads and residential dwellings.	P / C
5.5	Visual impact to nearby properties	Transmission line route selection process will avoid sensitive view locations and loss of existing vegetation where possible.	P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
5.6	Visual impact to nearby properties	Transmission lines infrastructure angle positions will be selected in strategic locations (where possible) to minimise potential visual impact and to provide a maximum setback from residential dwellings and road corridors and use of tree or shrub planting where deemed necessary between view locations and the transmission line.	P / C
5.7	Visual impact to nearby properties	Suitable component materials with low reflective properties will be selected for the substation and transmission lines.	C
5.8	Visual impact to nearby properties	The height of earth stockpiles will be restricted to minimise visibility from outside the site.	C
5.9	Visual impact to nearby properties	Cut and fill for site tracks will be minimised and disturbed soils will be revegetated as soon as practicable to ensure effective cover is achieved.	C
5.10	Visual impact to nearby properties	Consult with local residence and authorities to plan and implement the reasonable options for planting screening vegetation in the vicinity of nearby residences and along roadsides to ameliorate any identified visual impacts from turbines and associated infrastructure.	P / C / O
5.11	Visual impact to nearby properties	Suitable storage areas for materials will be selected with minimum visibility from residences and roads, with plant screening used where necessary.	C
5.12	Visual impact to nearby properties	Activities that require nighttime lighting will be minimised, and low lux (intensity) lighting designed with the light projecting inwards will be used where necessary to minimise glare at night.	C / O / D
5.13	Visual impact to nearby properties	Should obstacle lighting be required, the lighting will comply with CASA standards to minimise unnecessary light spill. The downward component of light will be restricted to either, or both, of the following: ▪ Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal; and ▪ Such that no light is emitted at or below 10° below the horizontal.	O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
5.14	Cumulative visual impact to nearby properties	Should obstacle lighting be required, the flashing of obstacle lights of wind farms within close proximity will be synchronised to each other (wherever possible) to minimise visual impact.	O
6.0	**Noise**		
6.1	Operational Noise	When the final turbine model and layout are selected, prepare a revised **Noise Impact Assessment (NIA)**. The NIA will demonstrate, through appropriate modelling and in accordance with the Environmental Noise Guidelines: WindFarms (SA EPA 2003), that the final turbine model and layout can meet the noise limits derived in accordance with those guidelines.	P

6.2	Construction Noise	Prepare a **Construction Noise Management Plan (CNMP)** that forms part of CEMP. The CNMP will establish protocols and measures that include:
		▪ Mechanisms to prevent any unreasonable impact of construction noise on sensitive receivers.
		▪ Undertake construction activities associated with the Project that would generate audible noise at any non-involved residence during the standard construction hours as outlined below:
		  ▪ Monday to Friday: 7:00am to 6:00pm
		  ▪ Saturdays: 7:00am to 1:00pm
		  ▪ Sundays: No construction
		▪ In the event that it is required to undertake other audible works outside the above construction hours, prior approval will be obtained from the relevant authority.
		▪ Ensure that any blasting complies with the ANZECC guideline. Ensure that during any blasting event the airblast overpressure must not exceed 115dB (Linear Peak) and ground vibration peak particle velocity must not exceed 5 millimeters per second (peak particle velocity) when measured at the nearest residential premise.
			P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
6.3	Operational Noise	Prepare an **Operational Noise Management Plan (ONMP)** as part of the OEMP, in consultation with EPA. The OEMP will be undertaken generally in accordance with the Environmental Noise Guidelines: Wind Farms (SA EPA 2003) and include the following provisions: ▪ ensure that operational noise levels will comply with the South Australia EPA Environmental Noise Guidelines principal acceptability criteria that the wind farm LA90 (10 min) noise should not exceed the greater of an amenity limit of 35 dBA or the pre-existing background noise by more than 5 dBA at each integer wind speed from cut in to rated power at any non-host property or residential receiver where noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have not been entered into with the property owner; ▪ 3nsure that the operational noise levels comply with the **World Health Organization (WHO)** Guidelines for Community Noise of 45 dBA or the pre-existing background noise by more than 5 dBA (whichever is the higher) for any host property or residential receiver where noise agreements (in accordance with Section 2.3 of the SA EPA Guidelines) have been entered into with the property owner; ▪ during commissioning the actual received turbine noise level will be verified and determined through extensive monitoring; ▪ compliance monitoring, within one year of commissioning, against the noise limits; ▪ identification and implementation of best practice management techniques for minimisation of noise emissions where reasonable and feasible; ▪ measures to be undertaken to rectify annoying characteristics resulting from the operation of the project such as infrasound, tonality or adverse mechanical noise from component failure; ▪ procedures and corrective actions to be undertaken if non-compliance is detected (i.e. provisions for reasonable response time to alleged noise complaints and mitigation works); and ▪ Undertake routine noise monitoring, assessment and reporting at compliance critical locations.	C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
6.4	Operational Noise	Implement the approved ONMP during the operation phase. In circumstances where undue turbine noise impacts are identified during operations (i.e. due to temperature inversion, atmospheric stability or other reasons) then an adaptive management measures will be implemented to achieve compliance with the applicable noise limits. This will include: ▪ Receiving and documenting noise impact complaint through telephone hotline or other designated means. ▪ Investigating the nature of the reported impact. ▪ Identifying exactly what conditions or times lead to undue impacts. ▪ Operating selected turbines in a reduced 'noise optimised' mode during identified times and conditions (sector management). ▪ Providing acoustic upgrades (glazing, façade, masking noise etc.) to affected dwellings. ▪ Turning off turbines that are identified as causing the undue impact during identified times and conditions.	O
7.0	**Air Quality**		
7.1	impact to local amenities	Prepare an **Air Quality Management Plan (AQMP)** as part of the CEMP. The AQMP will include protocols and mitigations measure to: ▪ minimise potential air quality impacts on local amenities during the construction phase; ▪ the use of water spraying for dust suppression; and ▪ implement safeguards to control and minimise fugitive dust emissions. The approved AQMP will be implemented in the construction phase.	P / C
8.0	**Health & Safety**		
8.1	Health and safety of persons	Provide accessible information to the public on wind farm impacts including the benefits, and project details, process and updates.	P / C / O / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
8.2	Health and safety of persons	Warning signs will be installed to alert the public to the risk of unauthorised site entry.	C / O
8.3	Health and safety of persons	Access to the wind turbines and associated infrastructure will be restricted to reduce personal injury and public hazards, including: ▪ Locked access to towers and electrical equipment. ▪ Warning signs with postings of 24-hour emergency numbers. ▪ Fenced storage yards for equipment and spare parts.	C / O
8.4	Health and safety of persons	Wind turbines will be equipped with sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.	C / O
8.5	Health and safety of persons	Cable markers will identify the path of the underground cabling to prevent accidental digging around the cable trenches.	C
8.6	Health and safety of persons	The turbines and associated infrastructure will be regularly maintained as part of the operation of the wind farm.	O
8.7	Health and safety of persons	Noise levels will comply with the applicable noise guidelines, unless an agreement is in place with the effected landowner(s), and in any case should not be more than the 45dB(A) noise limit (for indoors) recommended by the World Health Organisation (WHO) publication Guidelines for Community Noise.	O
8.8	Health and safety of persons	Shadow flicker at any dwelling will not exceed 30 hours per year unless an agreement is in place with the effected landowner(s).	O
8.9	Blade Throw	The turbine model considered will have rotor over-speed protection and built-in redundancies, and be certified against the relevant standards including: ▪ IEC 61400-23 [Wind turbine generator systems, Full-scale structural testing of rotor blades]; ▪ IEC 62305-1 / 3 / 4 [Protection Against Lightning];	P / C / O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
8.10	Blade Throw	Incorporate lighting protection and safety shutdown systems.	P / C
8.11	Blade Throw	Repair any degradation to the blades.	O
9.0	**Flora and Fauna**		
9.1	Impact to Environment	Prepare a **Flora and Fauna Management Plan (F&FMP)** as part of the CEMP and OEMP. The F&FMP will establish protocols and measures to minimise the potential impacts during the construction and operation of the Project. The F&FMP will include the following sub-plans: ▪ Vegetation Clearing Plan (VCP) ▪ Native Vegetation Management Plan (NVMP) ▪ Bat Monitoring and Habitat Tree Inspections Plan (BMHTIP) ▪ Bird and Bat Monitoring Strategy (BBMS) ▪ Bird and Bat Management Plan (BBMP) ▪ Riparian Vegetation Management Plan (RVMP) ▪ Ecological Restoration Plan (ERP) ▪ Weed Management Plan (WMP) ▪ Biodiversity Offset Strategy (BOS) ▪ Biodiversity Offset Package (BOP)	P
9.2	Impact to biodiversity	Prepare a **Vegetation Clearing Plan (VCP)** as part of the F&FMP. The VCMP will include the following measures: ▪ 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;	P

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ 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 metres 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; no 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	

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ rehabilitation of internal access roads that are not required following construction to be undertaken.	
9.3	Impact to Native Vegetation	Prepare a **Native Vegetation Management Plan (NVMP)** as part of F&FMP. The NVMP will 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. ▪ Where trees are removed the relevant landowner will be consulted and a suitable native species which does not affect the wind resource will be planted in place of the removed vegetation. ▪ All environmental controls will 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.	P
9.4	Impact to biodiversity	Prepare a **Bat Monitoring and Habitat Tree Inspections Plan (BMHTIP)** as part of the F&FMP. The BMHTIP will include provisions: ▪ Once the access roads and access tracks are pegged by surveyors, potential habitat trees (that require removal) will be identified by an ecological survey. ▪ These trees will be stage watched at dusk using infra-red spotlights and Anabat detectors to determine usage by any threatened microchiropteran bats. ▪ Accessible tree hollows that require removal will be inspected for fauna by infrared telescopic camera prior to removal to ensure that no species are present in the hollow are harmed during removal.	P
9.5	Impact to birds and bats	Prepare a **Bird and Bat Monitoring Strategy (BBMS)** as part of F&FMP in consultation with OEH. The BBMS will be based on the draft provided in Annex C of Appendix 5 to this Report. The BBMS will establish appropriate survey methodologies and frequency and provides guidance on bird and bat management. It provides a framework that can be used for development of a detailed **Bird and Bat**	P

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		Management Plan (BBMP) for both the construction and operational phases of the wind farm once approved. The BBMS outlines an indicative and adaptive program for monitoring the effects of each turbine and provides a sampling strategy specific to the first two years of operation. The details of ongoing monitoring (after the first two years of operation) will be negotiated and established based on the recommendations of the initial monitoring.	
9.6	Impact to birds and bats	Prepare a **Bird and Bat Management Plan (BBMP)** as part of F&FMP in consultation with OEH. The BBMP will establish protocols to manage and mitigate any bird and bat strikes resulting from the operation of the Project. Carcass search protocol will be implemented to identify more accurately the mortality rates of the bats and birds within the site. The BBMP will: ▪ 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; ▪ determine the frequency of report strike data during the preparation of the monitoring programme. The adaptive management measures that could be implemented will be negotiated with OEH when significant strike rates are detected. Bird and bat strike monitoring will be undertaken with consideration for the monitoring guidelines provided by the Australian Wind Energy Association.	P
9.7	Impact to riparian vegetation	Prepare a **Riparian Vegetation Management Plan (RVMP)** as part of the F&FMP. The RVMP will address the issues associated with the proposed creek crossings where any native vegetation is proposed to be disturbed.	P
9.8	Impact to biodiversity	Prepare an **Ecological Restoration Plan (ERP)** as part of F&FMP. The ERP 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.	P / C / O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		The ERP will include provisions: ▪ detailed surveys before any vegetation is removed will 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; ▪ 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 sited in native vegetation should be mechanically loosened with machinery to alleviate compaction, enhancing seed germination potential in loose soil and microtopography to enhance seed retention from surrounding woodland areas.	
9.9	Increase in spread of weeds	Prepare a **Weed Management Plan (WMP)** as part of F&FMP 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 WMP will establish control measures for minimising weed during and after construction including: ▪ staff induction / training for prevention of spread of weeds and animals. All construction staff and sub-contractors educated on noxious weeds present at the site and ways to prevent spread; ▪ 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;	P / C / O / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ 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.	
9.10	Impact to biodiversity	Once the detail design of the Project has been finalised, prepare a revised **Biodiversity Offset Strategy (BOS)** as part of F&FMP and in consultation with OEH. The BOS will be based on the draft provided in Annex D of Appendix 5 to this Report. The BOS will be established with aim to: ▪ provide a summary of the project's ecological impacts; ▪ introduce the OEH principles of biodiversity offsetting; ▪ identify options available to offset the project's biodiversity impacts; ▪ discuss the viability of options including the consideration of separation distances between impacts and offsets; and ▪ provide an outline of the proposed Biodiversity Offset Package (BOP).	P
9.11	Impact to biodiversity	Prepare a **Biodiversity Offset Package (BOP)** as part of F&FMP in consultation with OEH. The BOP will be based on the approved BOS.	P / C / O
9.12	Impact to Box-Gum Grassy Woodland	Avoid placing any turbines within the existing Commonwealth Conservation Agreements containing Box Gum Grassy Woodland EEC located in south-west portion of the Project site boundary.	P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
9.13	Impacts from temporary facilities	All temporary and construction facilities will be located so as to avoid vegetation loss and the land will be rehabilitated to its former state at the conclusion of the construction stage.	P / C
9.14	Impacts from temporary facilities	Where possible, raw materials for the concrete batching plant will be sourced on site, with all materials brought in from external sources being as clean as possible to minimise the potential of introducing weeds to the site. The water for the concrete will either be sought on site subject to a separate licence issued by the NSW Office of Water or transported to the site via tanker trucks.	C
10.0	**Aviation**		
10.1	Creation of hazard	Once the turbine locations are finalized, the proponent will notify the RAAF Aeronautical Information Service (AIS) of the location and height details of the turbines.	P / C / O
10.2	Creation of hazard	Prior to construction, and when once the final approved turbine layout and design turbine height are known, an aeronautical study will be prepared in the form of a detailed and thorough risk assessment using internationally recognised standards, in consultation with the applicable stakeholders to determine whether obstacle lighting will be required to enhance the level of aviation safety.	P
10.3	Creation of hazard	The rotor blades, nacelle and the supporting mast of the wind turbines will be painted white, off-white or a light grey colour.	P / C
10.4	Creation of hazard	If required, medium intensity obstacle lighting will be installed: ▪ To identify the perimeter of the wind farm; ▪ At longitudinal intervals not exceeding 900m; ▪ So that they are synchronised to flash simultaneously (both within the wind farm and with other wind farms in the vicinity); and ▪ So that any wind turbines of significantly higher elevation are also identified. The obstacle lights will have the characteristics specified in MOS 139, Chapter 9.	P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
10.5	Creation of hazard	A monitoring, reporting and maintenance program will be established in accordance with the requirements set out in MOS 139, Chapter 9 to ensure the ongoing availability of obstacle lights.	P / C / O
10.6	Creation of hazard	The obstacle lighting layout (if required) will meet the CASA objectives of: ▪ Defining the "general definition and extent of the objects" for each cluster or linear array; ▪ Lighted turbines to be spaced "at longitudinal intervals not exceeding 900 m" for each cluster or linear array; and ▪ Lighting the most prominent (highest for the terrain) turbine in each cluster or linear array. In the event that obstacle lighting is required on wind turbines for this Project, NVG compatible obstacle lighting will be installed that operates at a wavelength of ~855 nanometres (which sits within the range of 655 to 930 nanometres specified by Department of Defence).	P / C / O
10.7	Creation of hazard	Marking the wind monitoring towers according to the requirements set out in MOS 139 Section 8.10 will be considered.	C / O
10.8	Creation of hazard	Marking of electricity transmission lines: ▪ Overhead transmission lines and/or supporting poles that are located where they could adversely affect aerial application operations will be marked in accordance with MOS 139 Section 8.10, or ▪ Alternatively, the AAAA endorsed power line marker reportedly developed in conjunction with Country Energy will be installed.	C / O
10.9	Creation of hazard	Wind farm's maximum height will be kept to 1,221m AHD, if there are any micrositing of the turbine locations prior to construction that would encroach above this maximum height, Airservices Australia will be notified of these changes and a further aviation assessment would be undertaken (if required).	P / C
10.10	Creation of hazard	The need for obstacle lighting will be reviewed at regular intervals by the Proponent.	O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
10.11	Creation of hazard	In the event the immediate neighbouring landowner(s) would require aerial agriculture spraying of their land adjacent to the wind farm and there is an increase in cost associated with the proximity to turbines, the proponent will cover the reasonable cost increase for the aerial agriculture activity. The landowner seeking compensation for the cost increase must demonstrate and justify this increase by reference to previous records.	O
11.0	**Transport**		
11.1	Safety and asset protection	Prepare a **Traffic / Transport Management Plan (TMP)** as part of the CEMP and in consultation with appropriate road authorities. The TMP will include: ▪ traffic generation numbers; ▪ transport route details (including other modes of transport); ▪ pre-construction road survey to determine existing condition of local roads; ▪ roadside vegetation assessment; ▪ design of access roads and access tracks; ▪ additional management and mitigation measures as may be required; for the Project. This will be prepared before the construction phase of each stage of the Project and will form the foundations for all traffic related activities.	P / C
11.2	Safety and asset protection	A road profile assessment (road dilapidation report) will be carried out prior to movement of heavy and oversize vehicles for the construction phase and any deterioration in pavement quality as a result of the project's road usage will be fixed.	P / C
11.3	Safety and asset protection	Prepare a **Traffic Control Plan (TCP)** as part of the TMP. The TCP will establish protocol for the transport route through major townships in consultation with relevant council and road authorities, and will include: ▪ code of practice for heavy vehicle drivers;	P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ speed limit details on all local rural roads and surrounding the wind farm sites;	
11.4	Safety and asset protection	Access tracks will only intersect with government roads at nominated access road entrance locations.	P / C
11.5	Safety and asset protection	Implement the approved TMP to ensure local roads are not adversely impacted by heavy vehicles. Provide prior notification to the local community of changed traffic conditions and proposed road works, and any night-time deliveries via a newsletter or information line.	C
11.6	Safety and asset protection	Carry out any necessary upgrades and strengthening works along the access road and access track network to provide safe access for the construction vehicles.	C
11.7	Safety and asset protection	Carryout intersection and road upgrades along OD route (as required in approved TMP) to safely accommodate the maneuverability of OD vehicles.	C
11.8	Safety and asset protection	The haulage contractor will be confirmed, and Haulage Transport Plan prepared, prior to the finalisation of the relevant stage of the TMP for delivery of the OD deliveries.	C
11.9	Safety and asset protection	Regular road inspections will be conducted and compared against the existing conditions (and which representatives are to be present).	C / D
11.10	Safety and asset protection	In consultation with Oberon Council and RMS, nominate and design a viewing platform within the site boundary adjacent to Abercrombie Road reserve.	P / C
12.0	**Tele-communications**		
12.1	Interference with television broadcasting	Pre- and post-construction surveys will be conducted to determine the signal strength and quality of the television signal received at dwellings identified as having the potential to experience television interference.	P / O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
12.2	Interference with television broadcasting	Where necessary to address any impacts on resident's television reception as a result of the project, the proponent will undertake one or more of the following measures as agreed with the resident at the proponent's cost: ▪ Realigning the householder's TV antenna directly towards their existing transmitter. ▪ Tuning householder's antenna into alternative sources of the same or suitable TV signal. ▪ The installation of more directional and/or higher gain antenna at the affected residence. ▪ Relocating the antenna to a less affected position. ▪ The installation of a digital set top box (and UHF antenna if required). ▪ The installation of cable/satellite TV at the affected residences. ▪ Installation of a TV relay station.	O
12.3	Potential interferences to NSW RFS P2P link	The proponent will consult with NSW RFS to confirm whether the final micrositing will interfere with the NSW RFS P2P link, and whether the tower or interfering turbine(s) should be relocated.	P / C
13.0	**Fire**		
13.1	Firefighting systems, and risk of fire ignition or spread	Prepare a **Bush Fire Emergency Management and Operation Plan (BFEMOP)** as part of the CEMP and OEMP in consultation with State and local rural fire services, and DoP&E, and in accordance with '*Planning for Bushfire Protection*' (RFS, 2006). This would address safety, communication, site access and emergency response protocols including: ▪ Workplace health and safety protocols to minimise the risk of fire for workers during construction, operation, and decommissioning phases; ▪ consult with the RFS during periods of high fire danger, and generally to ensure the RFS are familiar with the development; ▪ consult with the RFS in regard to the adequacy of bushfire prevention measures to be implemented on site during construction, operation and decommissioning;	P / C / O / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ consult with the NSW PWS on the management of bushfires in the adjacent National Park; ▪ Lightning protection will be fitted on each turbine blade; ▪ Vegetation plantings for landscaping purposes to have low fire resistance; ▪ Electrical and communication cables will be under-ground where practicable; ▪ The location and number of tanks or other water supply points will be determined in consultation with the NSW RFS; ▪ Access to adequate water supply, with water access points be located in safe, easily identifiable areas and accessible in all weather conditions by equipment up to 15 tonnes; ▪ A turning circle with a minimum radius of 10 metres will be provided for fire appliances at all water access points; ▪ 5-metres wide internal access tracks to be provided that are driveable and permanently clear of vegetation for heavy firefighting equipment up to 15 tonnes; ▪ Vehicle turn-around facilities will be provided at every turbine tower site. ▪ Provision of wind turbine access tracks that continue onto adjacent paddocks and are not dead ended where possible; ▪ Careful storage and handling of flammable materials and ignition sources brought onto the site, as per manufacturer's instructions; ▪ Implementing a wide fuel break in accordance with RFS, Council and State Government recommendations to slow the spread of fire; ▪ On-site vegetation management to minimise potential sources of fuel; ▪ Maintenance of vehicles to minimise sparking from exhaust systems; ▪ Construction activities to be re-organised during periods of high fire danger, including ceasing use of explosives, and management of hot work activities such as welding or cutting;	

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ Storage of appropriate firefighting equipment on-site during the construction phase, ensuring that a minimum of one person on site is trained in its use; ▪ Use of materials and equipment during operation that minimise the likelihood of fire; ▪ Automatic shutdown of any overheating turbine mechanism; ▪ Shut down of turbines during a bush fire in the area; ▪ Periodical inspection of overhead transmission easements to monitor any regrowth of encroaching vegetation. The approved **BFEMOP** will be implemented during the construction, operation, and decommissioning phases accordingly.	
14.0	**Shadow Flicker**		
14.1	Impacts on persons / dwellings	Screening structures or planting of trees to block shadows cast by the turbines will be installed where needed.	O
14.2	Impacts on persons / dwellings	Use of non-reflective paint on turbine blades.	O
14.3	Impacts on persons / dwellings	Turbine control strategies which shut down turbines as necessary will be used.	O
15.0	**Heritage**		
15.1	Impact on heritage items	Prepare a **Cultural Heritage Management Plan (CHMP)** in consultation and collaboration with the Registered Aboriginal Parties (RAPs) and OEH to reduce and mitigate the impacts of the Project on any artefacts which may be detected within disturbance zones. The CHMP will establish protocols and	P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		measures to avoid, minimise and/or mitigate any impact the construction of the Project may have on the indigenous heritage sites, these include: ▪ Once the proposed access track locations and other disturbance areas are pegged on the ground, additional targeted surveys of these areas will be undertaken. Where these additional targeted surveys identify any further sites, test pits will be undertaken in order to determine the extent of significance of any sites which would be potentially impacted. ▪ The final micrositing of the proposed infrastructure will be undertaken in consideration of utilising and upgrading as much as possible the existing farm access tracks where possible to achieve an overall site plan which minimises unnecessary new soil disturbance. ▪ A minimum distance or separation buffer of 100 meters will be maintained from any turbine and site P8. If the separation distance is not practical, then a sub-surface investigation should be undertaken for any turbine proposed within 100m of site P8. ▪ The movement of identified objects is considered to be a suitable mitigation measure in most cases as the distances involved would not be significant, and many of the objects may have been moved in the past via water movement, erosion or vehicle/tractor movements such as road grading and cultivation of the ground. ▪ Avoid, as far as practicable, impacts on the known archaeological sites. If it is not practicable to locate infrastructure so as avoid objects / artefacts, then cooperation with the RAPs and OEH will be undertaken to determine the management option for these objects / artefacts (i.e. collection for education purposes or moving the objects / artefacts slightly to outside the zone of disturbance). This may include further investigation in the form of sub-surface digs and analysis. ▪ Outline strategies for the management of any potential unrecorded sites which are identified within the site during construction of the Project. In accordance with the *Draft NSW Wind Farm Planning Guidelines 2011*, the construction program control measures will include provision to temporarily halt the excavation of a specific site in the event that a previously unidentified Aboriginal object(s) and historic relic is uncovered. All works likely to affect the object/relic	

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		would cease and the OEH officers and the RAPs notified. Works will not recommence at the specific area of site until an appropriate strategy for managing the object/relic has been determined in consultation with OEH and the Aboriginal stakeholders and a permit or written authorisation has been obtained from OEH.	
16.0	**Land Resources and Geotechnical**		
16.1	Soil loss and stability of landform	Prepare a **Sediment and Erosion Control Plan (SECP)** as part of the CEMP in consultation with NSW Office of Water and relevant Catchment Authority. The SECP will detail the measures and techniques to preserve soil resources including: ▪ Further detailed subsurface geotechnical investigation and analysis will be conducted to provide information for the detailed design of footings, access road, access track, slope stability, and other associated infrastructure. ▪ Designing access tracks to stay on the ridge crests where possible and remain clear of potential land slips. If crossing a potential land slip is required, then the road formation will be designed to remove any potentially unstable material and found on stable bedrock. ▪ Scheduling site works, including excavation and filling, to reduce the risk of high concentrated surface water runoff. ▪ Remove any soft, wet, and highly compressible material or topsoil material and organics. ▪ Assess moisture contents of the bulk excavated soils and weathered rock. For compaction of any materials other than free draining sands, the moisture content will be in range OMC +/- 2% (wet/dry), where OMC is the optimum moisture content at Standard Compaction. ▪ The complete surface of the sub-grade will be test rolled in order to detect the presence of any soft or loose zones, which will be excavated out and replaced with approved filling. Test rolling will be carried out with a smooth drum roller with a minimum static weight of 8 tonnes.	P / C / O / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ For pavements, the natural foundation soil will be compacted to a minimum dry density ratio of 98% Standard for clay soils or a minimum density index of 75% for sand soils. ▪ For pavements, approved filling excavated from site, will be placed in layers not exceeding 250mm loose thickness, with each layer compacted to a minimum dry density ratio of 98% Standard or a minimum density index of 75% for filling greater than 0.5m below top of finished subgrade level. The final upper 0.5m of filling sub-grade will be compacted to a minimum dry density ratio of 100% Standard or 80% density index. Where filling has a clay content, moisture content within the filling will be maintained within OMC -2% (dry) to OMC +2% (wet) during and after compaction. ▪ All filling beneath structures and footings will be compacted to a dry density ratio of at least 100% Standard or relative density index of at least 80%. This compaction will apply to all filling extending from a nominal horizontal distance of 2m at the edge of each structure with a nominal zone of influence of 1H:1V down and away from the proposed subgrade level. ▪ Any compaction of silty or sandy clay foundation soils at or close to footing formation level will be sealed or covered as soon as practicable, to reduce the opportunity for occurrence of desiccation and cracking. ▪ Level 1 testing and supervision of filling, in accordance with AS3798, is recommended where the filling is to be used for support of structural loads, within the 2m horizontal distance and spread from structures. ▪ All weathered rock, excavated from site for re-use beneath structures and as pavement sub-grade filling, will be processed so that individual particles are in the order of 100mm or less. ▪ Approved rock filling excavated from site will be placed in layers not exceeding 300mm loose thickness with care taken to minimise the occurrence of voids. Fine sands and dispersive clays will not be included in the fill due to the susceptibility to erosion.	

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ Where pavements are proposed over bulk rock filling, it is recommended that the rock fill will be covered with a nonwoven, needle punched, continuous filament polyester geofabric of sufficient strength to avoid punching failure. ▪ Place a minimum 0.5m thick cover of granular bridging on the geofabric in two layers of 250mm loose thickness, to provide sub-grade support for the pavement. The bridging layers will be compacted to a minimum dry density ratio of 100% Standard or 80% density index (Granular bridging or sub-grade filling will comprise engineered fill material). The approved SECP will be implemented during the construction phase.	
17.0	**Hydrology**		
17.1	Deterioration of water quality	Prepare a **Soil and Water Management Plan (SWMP)** as part of the CEMP and OEMP in consultation with NSW Office of Water and relevant Catchment Authority. The SWMP will establish protocols and measures to control risks to water quality associated with construction and operation and detail the range of techniques used to prevent land and water degradation. The protocols and measures will include: ▪ Vehicles on site will be restricted to established tracks to concentrate any discharge from vehicles and minimise run off into water bodies. ▪ Maintenance or re-fuelling of machinery will be carried out on hard-stand areas. ▪ Concrete batching plants will be designed to capture all concrete wash. ▪ Minimise discharge into creeks, rivers or drainage lines. ▪ Infrastructure will be bundled with silt fencing/hay bales or similar to reduce runoff from these areas and ensure that oil and other chemicals could not escape. ▪ Access roads and access tracks will be completed within the construction phase and will be maintained to avoid any erosion. ▪ The wind farm and transmission line will be designed and constructed to minimise land disturbance and therefore reduce the erosion hazard.	P / C / O

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ Disturbance during transmission line construction will be minimised by using existing access tracks and roads, and avoiding construction of a permanent access track along the transmission line easement. ▪ The construction activities will be staged to minimise the duration and extent of land disturbance. ▪ Topsoil resources will be managed to minimise the risk of erosion and sedimentation, and maximise reuse of topsoil during rehabilitation. ▪ Upslope (clean) stormwater will be diverted around the disturbed site capture sediment-laden runoff from within the disturbed site for diversion to sediment control devices. ▪ The site will be promptly and progressively rehabilitated as works progress. ▪ The construction of new vehicle watercourse crossings will be avoided where possible. ▪ Any water crossings would be designed to minimise impacts on existing banks, water flow, animal passage and on the movement of flows. ▪ Land disturbance within 20 m of minor streams (first and second order watercourses) and 40 m of third order or higher watercourses will be avoided where possible. ▪ Water will be reused where possible to reduce water consumption. ▪ Appropriate stormwater, collection, treatment and recycling at the concrete batch plant will occur in accordance with relevant best practice guidelines and any requirements of the NSW Office of Environment and Heritage.	
17.11	Deterioration of water quality	Prepare a **Sediment and Erosion Control Plan (SECP)** as part of the CEMP in consultation with NSW Office of Water and relevant Catchment Authority. This plan will detail the necessary management controls and techniques during construction and operation of the wind farm, including: ▪ Revegetating disturbed soils. ▪ Sediment traps to prevent sediment entering waterways.	P / C / O / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
		▪ Erosion and sediment control devices will be inspected and maintained for the duration of the Project. The control plans implemented during the construction phase along the access tracks will be monitored and maintained during the operation phase.	
17.2	Deterioration of water quality	Prepare a **Hydrocarbon & Hazardous Substances Management Plan** (HHSMP) as part of the CEMP to protect the quality of surface water and groundwater. The HHSMP will include: ▪ Appropriate procedures will be in place for the transport, storage and handling of fuels, oils and other hazardous substances, including availability of spill cleanup kits.	P
17.10	Deterioration of water quality	Safeguards in the AQMP will be enforced to control and minimise fugitive dust emissions. Dust suppression will be carried out as required through either watering or chemical means (environmentally friendly polymer based additives to the water).	C
17.13	Deterioration of water quality	The water course crossings for access roads and cable installations and any associated instream works will be designs appropriately in consultation with hydrological engineers and consider the flow pattern of the drainage lines and ensure that sufficient allowance is made for unaffected flows for most rain events, and to minimize impacts on existing banks, animal passage, and on the movement of flows. This will be managed through the SECP forming part of the CEMP. The designs to be prepared in accordance with NSW Office of Water's: ▪ *'Guidelines for Controlled Activities on Waterfront Land',* ▪ *'Guidelines for Watercourse Crossings (July 2012)', and* ▪ *'Guidelines for laying pipes and cables in watercourses (July 2012)'*	P / C
17.15	Deterioration of water quality	If rock anchoring is selected for wind tower foundations, a groundwater assessment will be undertaken and endorsed prior to construction. Any necessary licensing requirements under the Water Management Act 2000 will be obtained as required.	P / C

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
17.17	Water extraction	Prior commencing construction that intercepts or extracts groundwater or surface water, the relevant licensing under the Water Act 1912 or Water Management Act 2000 will be obtained from the NSW Office of Water.	P / C
17.19	Water extraction	Obtain any required licence for water sharing plans and temporary transfer of licence from existing licence holders in the area, or alternatively use tankers to import water from external sources. Over-extraction of surface water or groundwater will be avoided to prevent adverse impacts on environmental flows and water availability for existing licensed users.	C
18.0	**Resource Impacts**		
18.1	Waste Generation	Portable toilets will be provided in the temporary construction area.	C
18.2	Building Materials	The existing 60m and 40m monitoring masts will be removed and reused elsewhere once the construction phase is complete.	O
18.3	Building Materials	Where possible, the existing footings, access tracks and other infrastructure would be reused for any replacement turbine(s) during the operation phase.	O
19.0	**Decommissioning & Rehabilitation**		
19.1	Wind Farm not dismantled after permanent cessation of wind turbine operation	The Proponent is responsible for the decommissioning of the wind farm infrastructure, and the landowner is not liable for this obligation (this is demonstrated in the land lease agreements with each of the wind farm participating landowners as shown in the **Decommissioning and Rehabilitation Plan (DRP)** in Appendix 4 of the EIS.	P / D

SoC No.	Issue / Impact Description	Commitment / Mitigation Task	Project Phase
19.2	Not enough funds allocated to decommission the wind farm	The DRP will be reviewed and revised as required every 5 years for the duration of the project. During each review, the effectiveness of the plan will be re-assessed against its objectives, and cost estimates and funding arrangements will also be reviewed by an independent consultant.	O
19.3	Wind Farm not dismantled after permanent cessation of wind turbine operation	The proponent commits to undertaking all decommissioning and rehabilitation works outlined in the DRP within the 18 months after the end of the wind farm's operational life (including any replacement of the turbines as contemplated by commitment 19.5 below).	O / D
19.4	Wind Farm not dismantled after permanent cessation of wind turbine operation	During the operational life of the project, any turbine that cannot be repaired and is deemed permanently unworkable (due to environmental, social, economic or other unforeseen issues) will be decommissioned and dismantled, and its location rehabilitated within 18 months.	O
19.5	Deterioration of landscape from decommissioning	At the completion of the wind farm's operating life, the turbines will either be replaced or the land will be rehabilitated to its previous or better condition.	D
19.6	Deterioration of landscape from decommissioning	Access tracks considered surplus to the farmers' requirements will be rehabilitated and revegetated by introducing soil, mulch and grass seeds or local provenance.	D
19.7	Recycling	During decommissioning, all materials will be removed from the site and recycled appropriately.	D

9. Conclusions

Global Power Generation Australia Pty Ltd (GPGA), formerly known as Union Fenosa Wind Australia Pty Ltd (the '**Proponent**') and its successors and assigns, is seeking project approval for the construction and operation of a wind farm facility with up to 55 wind turbines known as the Paling Yards Wind Farm (the '**Project**') located ~60km south of Oberon and in the Oberon Local Government Area.

The project is a State Significant Development (**SSD**) under Part 4 of the *Environmental Planning and Assessment Act 1979* (**EP&A**).

This Preferred Project and Submissions Response Report (the **Report**) has detailed the revised Project proposal to incorporate several design changes and commitments raised in the submission comments from various government agencies.

The Environmental Impact Assessment (**EIS**) and the Report have found that the Project would have a range of positive and negative impacts on the site and region. However, it was found that the benefits of the wind farm would outweigh the undesirable impacts, and with appropriate conditions and mitigation measures detailed, the impacts can be minimised. The Project is compatible with the existing land uses of the area and complies with relevant planning and environmental controls applicable to the site.

The Project if approved would have the following specific economic and environmental benefits:

- total capital investment of $400 million in the economy;
- generate up to 65 full time positions during construction, and up to 11 full time ongoing positions during the operation;
- Stimulation of the economy in the Oberon Council as a result of greater income generation and subsequent expenditure in the region;
- Provision of flow on economic benefits in terms of employment and commercial opportunities from the economic investment;
- Up-skilling of the local workforce within a growing energy market;
- Use of a significant portion of locally sourced materials and employment;
- Increases in the local tourism industry, and in turn, increased expenditure on local services such as accommodation and retail in Oberon and Upper Lachlan Shire Councils;
- Contribute up to $2,5002 per turbine per year (escalated annually with CPI) to the Oberon Council Community Enhancement Fund (CEF) that forms part of the Voluntary Planning Agreement (VPA);

[2] Based on the existing VPA between the Proponent and Upper Lachlan Shire Council for the Crookwell 2 Wind Farm. The contribution will be for each operating wind turbine and will commence on the anniversary of the commissioning of the wind farm.

- generate up to 633,707 MWh of clean, renewable energy, enough to power up to 98,184 average households;
- contribute to reducing the dangerous impacts of anthropogenic climate change, such as droughts, floods, extreme weather events and sea level rise by displacing up to 616,597 tonnes of greenhouse gases or the equivalent of taking up to 142,401 cars off the road;

The assessment of potential negative impacts arising from the Project found that the wind farm has the potential to have a low to moderate impact on landscape values, a limited impact on local communications facilities, an increase in noise for some residents (mainly host landowners), and result in the clearing of non-significant vegetation.

The impacts of the Project would be minimised by the extensive range of management plans that would be prepared before construction and ongoing monitoring of the compliance of the wind farm post-construction with the established standards.

This Report concludes that the proposed Paling Yards Wind Farm will offer a number of significant benefits and can be constructed with minimal impact to the existing environment by preparing and implementing the mitigation measures detailed in the revised Statement of Commitments.

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APPENDIX 1 – SLR Consulting Response to EPA Submission

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19 December 2014

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Union Fenosa Wind Australia Pty Ltd
Suite 4.03, 68 York Street
Sydney NSW 2000

Attention: Shaq Mohajerani

Dear Shaq

Paling Yards Wind Farm
Response to EPA

SLR Consulting Australia Pty Ltd (SLR) is the acoustic consultant for Paling Yards Wind Farm and has prepared the noise impact assessment report for the project (Report No **640.10127-R1R3**). The following is a response to each of the questions/queries from the EPA and a summary of any action taken. The changes made apply to the latest revision of the report, number **640.10127-R1R5.**

Submission 100343 – NSW EPA

EPA Submission	SLR Response
Wind speed at microphone height was not measured to exclude wind-affected data.	Local wind speed, due to the sheltering by the house and local vegetation, is typically lower than at higher elevations above ground. SLR has previously undertaken the exclusion process (wind logged at microphone height) and has found that almost no points are excluded and the net result on the final curve is negligible. Additionally, as the wind speed is a 10 minute average, and wind seeds at 1.5 m AGL in a typical garden setting are highly variable, then it is that the L_{90} statistic (quietest 10%) will be affected by wind on microphone disturbance. In any case, the noise limits do not rely on the background + 5 dBA curve for most locations.
Red dots used by the consultant on photographs of monitoring equipment may have concealed whether or not the wind screens were installed properly.	Red dots were placed over the picture to show the location of the microphone more clearly. They can sometimes be difficult to see, particularly when photos are printed out. The red dots have been removed in the most recent version of the report. The EPA will observe that indeed, some of the microphones were not yet in place or had not yet had their windscreens put on at the time the photos were taken, however SLR can confirm that windscreens were used for all measurements, as is standard practice for all environmental noise logging.
Noise loggers were installed in vegetation at a number of locations, which may have led to elevated	For some of the background monitoring locations, the entire house is surrounded by trees and vegetation. Finding a location that is not influenced by wind in trees would not be

EPA Submission	SLR Response
background noise curves.	representative of the actual noise levels at the house. Sometimes noise logger location is dictated by other constraints including presence of other noise sources, residents consent, access considerations, security, prevailing wind direction and shelter. In any case, the limit does not rely on the background + 5 dBA curve for most locations.
The NIA did not specify the height at which wind speed measurements were undertaken, but states that it was adjusted to 100 m height wind speed.	Wind speed measurements were taken at 20, 40 and 60 m above ground level on each wind mast. The hub height wind speed was calculated based on the 10-minute shear value calculated from the 20 m and 60 m AGL wind speeds. This information is included in revision 5 of the report.
The number of valid data points reported for three of the monitoring locations, regression curves may have been affected by the noise floor of the noise logging instrument used, between 22 dBA and 30 dBA (higher than recommended in the draft NSW guidelines.)	The requirements for noise loggers are that they be at least Type 2 certified; no minimum noise floor is given. The loggers used were all Type 1, exceeding this requirement. There is a requirement for Sound Level Meters undertaking frequency analysis measurements to have a noise floor less than 20 dBA, but this does not apply to loggers in the background monitoring campaign. In any case, the limit does not rely on the background + 5 dBA curve for most locations.
Plotted data for location 128 showed some stratification, and correlation of background noise measurements with wind speed at location 10 was very low (a maximum of 0.26683). This may indicate excessive extraneous noise levels at these locations.	The standard does not require a minimum R^2 value, only that the value be stated. Upon investigating this issue, it was discovered that a referencing error had caused some of the scatter plots in the report to be incorrect. The regressed lines and equations used for the technical assessment were not affected, only four of the presented graphs in the report document. This error has been corrected in the new revision of the report.

The EPA recommended Conditions of Project Consent are in keeping with the assessment procedure laid out in SA EPA Guidelines, with the exception of the 'flat' noise limit, that is, 35 dBA for all wind speeds. SLR notes that background noise has already been shown to exceed this value at higher wind speeds at some locations and that background noise can also vary on a seasonal basis. Furthermore, we note that the predicted levels of noise at some locations are very low compared with the background noise levels. Thus, when the compliance measurements are conducted, it is possible that the noise levels will have slightly increased and/or be above 35 dBA but not due to noise from the wind farm. It is important that NSW EPA understands that measuring wind farm noise at levels close to or below ambient background noise is technically difficult and that the limit should not be read to literally mean that if the regressed noise line is over 35 dBA that the wind farm is in breach.

We trust this letter addresses all the issues satisfactorily.

Yours sincerely,

Philip Setton
Project Consultant

APPENDIX 2 – SLR Consulting Response to Community Submission

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19 December 2014

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Union Fenosa Wind Australia Pty Ltd
Suite 4.03, 68 York Street
Sydney NSW 2000

Attention: Shaq Mohajerani

Dear Shaq

Paling Yards Wind Farm
Response to Community

SLR Consulting Australia Pty Ltd (SLR) is the acoustic consultant for Paling Yards Wind Farm and has prepared the noise impact assessment report for the project (Report No 640.10127-R1-R3)

Submission 098565

Issue: Thumping and beating turbines

This submission has made a lengthy case with respect to thumping and beating turbines. The phenomenon described is one of excessive amplitude modulation. There has been extensive and wide ranging study conducted by Renewable UK, which attempts to more accurately explain the phenomenon, its potential causes and highlights the difficulties in quantifying the phenomenon – particularly when there is appreciable distance between the turbines and the receiver.

The submission implies that infrasound is similar to (or related to) the amplitude modulation of audible sound. This is a common misconception, especially as both terms use 'Hertz' as their unit of measurement. In an effort to clarify the situation, we provide the following advice:

'Amplitude modulation' refers to the fluctuations of the overall (usually A-weighted) noise level. This fluctuation has its own frequency of modulation, which is usually at the blade pass frequency of the WTG, typically between 0.5 and 2 Hz. This is not an indication of the low frequency characteristics of the noise but a rate of change in overall loudness.

The 'beating' phenomenon is not synonymous with the 'thump' identified earlier and instead refers to where two or more sources have similar (but slightly differing) frequencies. For constant, pure tone noise sources, the small difference in frequency makes the overall noise level vary with a 'beat'. This phenomenon does not occur with broadband sources. WTG's are an inherently varying noise source, with their own rate or variation, which could be said to have its own 'beat'. Therefore the beat frequency referred to relates to where the variation in noise level from one WTG occurs at almost the same rate as another WTG and the two sources are at a maximum at the same time. How often this alignment occurs is the 'frequency of occurrence' but could also be called a 'beat frequency'. The alignment becomes less likely with an increasing number of turbines. With the natural variation of wind conditions on site, the alignment of turbines becomes increasingly unlikely as the rotational frequencies and phase differences between all the WTGs themselves are varying in nature.

Where the degree of amplitude modulation is typical, the overall degree modulation does not change with phase alignment of the two noise level waveforms. This is because the 'trough' of the waveform is also energetically summed, leading to an overall net increase in level, rather than an increase in the variation of the noise level. Furthermore, as the phase alignment between two noise level waveforms occurs only briefly, the increase in noise is momentary. As the waveforms shift to be out of phase, the noise level becomes more constant and almost does not modulate at all.

The claim that the NHMRC study, based on 10 WTGs is invalid does not reflect the true nature of large scale wind farm sites. Because of the offsets required between WTGs to get maximum output, the site takes up a very large area. This means that noise at a single location is mostly only due to the closest 6 to 10 turbines. The WTGs at greater distances contribute to the overall noise level but their variation of noise level does not contribute to the overall amplitude modulation.

Finally, should conditions that increase the prevalence of excessive amplitude modulation occur, it would be possible to implement an adaptive management approach where turbines are put into a noise optimised mode during identified times and conditions (sector management).

Submission 098743

Issue: Noise up to a 10km radius

The claim that wind turbines can be heard "for up to a 10 km radius" is potentially misleading. The noise modelling indicates that at distances greater than 5 km, the wind farm when operating at full capacity will be less than 20 dBA. This would typically be significant below background noise for such wind conditions and likely be inaudible. The measure of noise impact from wind farms is not inaudibility but comparison to a limit derived from annoyance studies.

Issue: Impact on fauna

No noise impact has been determined for native fauna as the assessment guideline is intended solely for assessing impacts to humans, however we note that no impact to fauna is anticipated as wind farm noise levels will be lower than many existing noise sources.

Submission 098819

Issue: Number of turbines

The objection regarding the final number of WTGs falling between 55 and 60 in number is not correct. The original noise impact assessment was carried out with up to 59 WTGs which is generally more conservative than the final EIS main report that includes up to 55 WTGs of those locations (excluding turbines P2, P6, P7 and P11 that were removed from the layout due to ecological considerations).The current proposed design is indicative and if there are any significant changes to the layout, a revised noise impact assessment with the final layout and specific WTG model types would be prepared to ensure that the noise limits are being met.

Issue: Humming noise

The concern relating to any 'hum' from the wind farm would likely be due to transformer infrastructure on site. Wind Turbines typically do not hum and produce a broadband noise which is typically 'masked' by local, natural noise sources such as wind in trees. When there is absolutely no wind the wind farm would not operate, making it inaudible. At other times the wind farm may be slightly audible, or even audible but not so high above the background noise to make it intrusive. At times when the wind farm is audible, the noise predictions have determined that the level of noise would not be unacceptably high. The challenge to produce transparent, accessible data does not recognise the diligent work that has already been conducted to quantify noise levels. The noise impact assessment is a comprehensive document that describes site measurements to establish existing noise levels across the site, predictions of noise levels at all relevant residential receptors at all relevant wind speeds and produces a noise contour plot for graphical visualisation purposes. The report considers the prevalence of conditions that may enhance propagation of noise and explains how our modelling uses inputs regarding the frequencies of noise generated and makes conservative (worst case) assumptions, in line with current best practice for wind farms.

Submission 098922

Issue: Buffer distance

The submission makes a claim that there is no buffer distance between them and the wind turbines but states that their property is located up to 5 kilometres from the proposed Wind Farm site. This distance of 5 km between the submitter and the wind farm would greatly reduce the noise exposure to the dwelling.

Concerns about 'thumping' turbines have been addressed in the noise impact assessment (Section 10.2.3), an excerpt of which follows:

> *"Research evidence would suggest that excessive AM has only been confirmed at a small number of wind farm sites and when it occurs it is relatively infrequent. Nevertheless, should excessive AM be found to be a problem with the wind farm, it would be possible to limit the impact on the residents through adaptive management techniques."*

Furthermore, it is unlikely that at a distance of several kilometres that the degree of amplitude modulation would be above acceptable limits as the noise level would already be close to or below ambient background masking noise.

Submission 099004

Issue: Noise impact

With regards to the audibility of the wind farm, we cannot guarantee that wind farms will be inaudible at all times at all locations or under all meteorological conditions. However, we would stress the importance of distinguishing between audibility and noise impact. In this case, noise impacts are defined as breaching the limits in the SA EPA Guideline. The noise impact assessment under SA EPA Guideline aims to balance the needs of the community and broader society, local residents and the need to develop alternative energy sources. Times when the area is very quiet would probably be when wind speeds are calm or very low. In these conditions, the wind turbines may not be operating at all, due to a minimum cut-in speed required, and the ambient environment may not be any different from that experienced now.

With various wind speeds and directions, meteorological conditions and local sources of noise, quantifying the audibility is impossible, however, we can state that at times when the wind farm is audible, it would most likely be a broadband (non-tonal) and would blend in with naturally occurring noise sources (wind in trees, distant cars etc) and would unlikely be subjectively intrusive.

Submission 099006

Issue: Noise impact

With regards to the 'potential' audibility of the wind farm, it is difficult to characterise or quantify this without visiting the site. The noise level is predicted to be below 30 dBA, this is a reasonably low level of sound, which may be 'masked' by the noise of wind in trees or other foliage. Should the wind farm be audible at times, due to local background noise sources being low, then the maximum predicted level is still 5 dBA below the minimum criteria of 35 dBA and would not be deemed intrusive or annoying. Wind turbine noise is a typically broadband (non-tonal) source and is variable with wind conditions.

Issue: Health impact

With regards to health impacts, the statement has used provides:*"…We reject the proposal due to potential issues caused to health due to their existence…"*The rhetoric surrounding wind farm noise contends that inaudible noise can have an effect on health; there is no scientific evidence to show that this is the case. If the existence of the wind farm is what causes the ill-health, and not an emission of noise from it, then the health impacts are due to the nocebo effect.

There is no statistical evidence that wind farms affect rates of epilepsy, tinnitus or imbalance in exposed populations. With regards to wind from north and north-westerly directions, the noise model assumes downwind propagation from all sources to the receiver, a situation that would not actually occur but is assumed for conservatism. The predicted noise level when winds were lower or when wind was blowing in another direction would be lower than those shown in the model and would be even more likely to be inaudible.

Submission 099008

Issue: Health impact

With regards to health impacts, we advise that there is no evidence to causally link wind turbines with adverse health effects (National Health and Medical Research Council) as discussed above. This issue is still being studied however in the absence of any demonstrable links between wind turbines and health effects we would recommend that all stakeholders be quite sceptical of claims to the contrary.

We trust this letter addresses all issues raised by the community satisfactorily.

Yours sincerely,

Philip Setton
Project Consultant

APPENDIX 3 – SLR Consulting Revised Noise Impact Statement

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global environmental solutions

Paling Yards Wind Farm

Noise Impact Assessment

Report Number 640.10127-R1

18 December 2014

Union Fenosa Wind Australia Pty Ltd
Suite 403, 68 York Street
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Version: Revision 5

Paling Yards Wind Farm

Noise Impact Assessment

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
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640.10127-R1	Revision 4	7 October 2014	Philip Setton	Gustaf Reutersward	Gustaf Reutersward
640.10127-R1	Revision 3	20 November 2012	Philip Setton	Gustaf Reutersward	Gustaf Reutersward
640.10127-R1	Revision 2	19 November 2012	Philip Setton	Gustaf Reutersward	Gustaf Reutersward
640.10127-R1	Revision 1	9 November 2012	Philip Setton	Gustaf Reutersward	Gustaf Reutersward
640.10127-R1	Revision 0	8 November 2012	Philip Setton	Gustaf Reutersward	Gustaf Reutersward

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR Consulting) has completed a noise impact assessment of Paling Yards Wind Farm. The methodology and criteria used in the assessment are supported by the South Australian Environmental Protection Authority (SA EPA) *Environment Noise Guidelines for Wind Farms (February 2003)*, World Health Organization (WHO) limits, construction noise guidelines (DECC Interim Construction Noise Guideline 2009) and blasting impact.

Simultaneous noise monitoring and wind monitoring was conducted at 8 locations during the period 7th June 2011 through to 24th June 2011 to determine baseline conditions and establish criteria for surrounding residential receivers.

Noise predictions were made for receptors within a 6 km of a proposed WTG. WTG noise has been predicted using an indicative layout of 59 WTG's and an assumed mix of 3 turbine types and assessed against relevant criteria prescribed by the SA EPA Guideline and World Health Organisation (WHO) goals where appropriate.

The final layout submitted for approval consists of 55 WTG's after the removal of turbines P2, P6, P7 and P11 for ecological considerations. The removed turbines were not close to any of the assessment receptors and therefore the 59 WTG layout considered in this Noise Impact Assessment is sufficiently representative and perhaps slightly conservative at locations to the west of the wind farm.

All non-project involved receptors were found to be below the relevant noise criteria. Some project involved receptors are predicted to slightly exceed the WHO noise criteria, however, these locations are used for a very limited part of the year only and it is proposed to enter into a noise agreement regulating their use and that these will not be used should post construction noise testing definitively show an exceedance of the criteria.

The project is yet to select and finalise the WTG layout and WTG makes/models. Upon finalising the layout and WTG models a revised noise prediction and assessment will be completed in which the noise impact mitigation techniques listed in **Section 9.3** will be investigated thoroughly to produce a fully compliant layout.

WTG vibration levels have been evaluated and based upon overseas research available were found to be acceptable.

Construction noise and vibration impacts have been assessed and the 'worst case' scenarios modelled were found to be generally acceptable.

Blasting impact has been assessed and found to be acceptable. With a maximum instantaneous charge (MIC) of up to 20 kg, the airblast overpressure is anticipated to be below the acceptable level of 115 dB Linear for all existing residences. Similarly, vibration levels are anticipated to be well below the acceptable criteria.

Construction traffic noise impact has been assessed and the 'worst case' maximum construction traffic generated scenario would increase existing traffic noise levels along local roads by up to 4-7 dBA but due to the typically large setback of dwellings from the road network would result in noise level that would be considered acceptable under the ECRTN and RNP.

Subsequent to a request by the Department of Planning, due consideration has been paid to a number of the additional requirements of the proposed *Draft NSW Planning Guidelines Wind Farms – Appendix B: NSW Wind Farm Noise Guidelines* released in December 2011. These include consideration to separate daytime and night-time periods and alternative methods of evaluation for Special Audible Character.

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting), has been engaged by Union Fenosa Wind Australia Pty Ltd (Union Fenosa) as the acoustical consultants for the proposed Paling Yards Wind Farm.

This report describes the methodology and findings of the Noise Impact Study (NIS) for the proposed Paling Yards Wind Farm forming part of the Environmental Impact Assessment for the proposed project.

Detailed in this report are the main aspects of the proposed wind farm project, the acoustic criteria, the background noise measurements and the predicted noise levels at all potentially impacted receivers from the operation of the proposed wind farm. It also addresses the acoustic impact of the wind farm during the construction phase, including blasting and transportation noise.

2 THE PROJECT

The proposed Paling Yards Wind Farm will comprise a number of elements, including:

- → Up to 55 individual wind turbines, although a 59 WTG layout is evaluated in this Noise Impact Assessment;
- → Internal unsealed tracks for turbine access;
- → Upgrades to local road infrastructure;
- → An underground electrical and communication cable network linking turbines to each other and the proposed substation;
- → A temporary concrete batching plant to supply concrete for the foundations of the turbines and other associated structures;
- → Potential for obstacle lighting to selected turbines;
- → Removal of small portions of native vegetation within the site and en route to the substation;
- → A wind farm and substation control room and facilities building;
- → An electrical substation and overland connection to the transmission line; and
- → A connection to the Mt Piper to Bannaby 500 kV transmission line which bypasses the north and east of the site.

A full description of the Wind Farm layout, including all turbine and receptor locations, can be found in **Section 5.**

3 WIND FARM ASSESSMENT METHODOLOGY

3.1 Acceptability Limit Criteria

The methodology and acceptability limit criteria that have been applied to this study are based upon the *South Australia Environment Protection Authority (SA EPA) Noise Guidelines for Wind Farms (February 2003)* (SA EPA Guidelines). The principal acceptability limit criteria is that the wind farm $L_{A90(10\ min)}$ noise should not exceed the greater of an amenity limit of 35 dBA or the pre-existing background noise by more than 5 dBA (for any given wind speed).

The project requirements and wind farm acceptability limit criteria are discussed in more detail in **Section 7.3**.

3.2 Wind Farm Noise Level Prediction

The noise emission model used in this study to predict wind farm noise levels at sensitive receptors is based on ISO 9613-2:1996 as implemented in the SoundPLAN computer noise model. The model predicts noise levels through spherical spreading and includes the effect of air absorption (as per ISO 9613), ground attenuation and shielding.

Predicted L_{Aeq} noise levels were calculated based upon sound power levels determined in accordance to the recognised standard IEC-61400-11:2002 *(Wind Turbine Generator Systems - Part 11: Acoustic Noise Measurement Techniques)*, where available, for the wind range 6 to 10 m/s.

The noise character of Wind Turbine Generator (WTG) noise emissions is also assessed for any special audible characteristics, such as tonality or low frequency content, which would be deemed more annoying or offensive. If characteristics such as tonality are identified then the predicted noise level would be penalised by the addition of 5 dBA. It should be noted that the characteristic noise level modulation of WTGs, commonly referred to as 'swish', is considered to be a fundamental part of wind farm noise and is taken into account by the SA EPA Guideline assessment procedure.

3.3 Ambient Noise Monitoring

In order to establish the intrusive noise limit, background noise monitoring is required to establish the pre-existing ambient noise environment as a function of wind speed. As wind speed increases the ambient noise level at most receivers generally also increases as natural sources such as wind in trees begin to dominate. The variation of background noise with wind speed is usually quite site specific and related to various physical characteristics such as topographic shielding and the extent and height of exposed vegetation.

Noise monitoring is completed for a period of approximately 2 weeks and correlated to synchronous wind speed and direction data at the wind farm monitoring mast. The captured data is screened for validity, with data monitored during periods of rain or where the average wind speed at the microphone position likely exceeded 5 m/s being discarded from the data set. Other data that was obviously affected by external noise sources (eg. pond pumps, grass mowing, birds at dawn, frogs etc) was also removed from the data set. A regression analysis of all valid data is used to determine a line of 'best fit' from which the noise limit is established.

3.4 Assessment Procedure

In general, the assessment procedure contains the following steps:

1 Predict and plot the L_{Aeq} 35 dBA noise level contour from the wind farm under reference conditions. Receivers outside the contour are considered to be within acceptable wind farm noise levels.

2 Establish the pre-existing background noise level at each of the relevant assessment receivers within the L_{Aeq} 35 dBA noise level contour through background noise monitoring.

3 Predict wind farm noise levels at all relevant assessment receivers for the wind range from cut-in of the WTG to approximately 10 m/s.

4 Assess the acceptability of wind farm noise at each relevant assessment receiver to the established limits.

In addition, where the assessment of a receiver has predicted unacceptable wind farm noise levels, a process of noise mitigation and alternative wind farm layouts is considered and Steps 3 and 4 are repeated until an acceptable arrangement is developed.

A brief explanation and description of the acoustic terminology used in this report is included in **Appendix D.**

4 ENVIRONMENTAL NOISE CRITERIA

4.1 Introduction

The New South Wales (NSW) Government Department of Planning and Infrastructure (DPI) has issued information on the required inputs into the Environmental Assessment (EA). The environmental assessment requirements issued by the Director-General (**DGRs**) in relation to the noise impacts of the proposed Paling Yard Wind Farm are as follows:

→ Include a comprehensive noise assessment of all phases and components of the project including, but not limited to turbine operation, the operation of the electrical substation, corona and/or Aeolian noise from the transmission line, construction noise (focusing on high noise-generating activities and any works proposed outside of standard construction hours), traffic noise during construction and operation, and vibration generating activities (including blasting) during construction and/or operation. The assessment must identify noise/vibration sensitive locations (including approved but not yet developed dwellings), baseline conditions based on monitoring results, the levels and character of noise (eg tonality, impulsiveness etc) generated by noise sources, noise/vibration criteria, modelling assumptions and worst case and representative noise/vibration impacts;

→ In relation to wind turbine operation, determine the noise impacts under operating meteorological conditions (ie wind speeds from cut in to rated power), including impacts under meteorological conditions that exacerbate impacts (including varying atmospheric stability classes and the Van den Berg effect for wind turbines). The probability of such occurrences must be quantified;

→ Include monitoring to ensure that there is adequate wind speed/profile data and ambient background noise data that is representative for all sensitive receptors;

→ Provide justification for the nominated average background noise level used in the assessment process, considering any significant difference between day time and night time background noise levels;

→ Identify any risks with respect to low frequency or infra-noise;

→ If any noise agreements with residents are proposed for areas where noise criteria cannot be met, provide sufficient information to enable a clear understanding of what has been agreed and what criteria have been used to frame any such agreements;

→ Clearly outline the noise mitigation, monitoring and management measures that would be applied to the project. This must include an assessment of the feasibility, effectiveness and reliability of the proposed measures and any residual impacts after these measures have been incorporated; and

→ Include a contingency strategy that provides for additional noise attenuation should higher noise levels than those predicted result following commissioning and/or noise agreements with landowners not eventuate.

The assessment must be undertaken consistent with the following guidelines for each aspect of the project.

4.2 Applicable Noise Policies and Guidelines

To address the DGR's, this report assesses the proposed Paling Yards Wind Farm against the requirements of each of the following:

→ *Wind Turbines - the South Australian Environment Protection Authority's Wind Farms - Environmental Noise Guidelines (2003);*
→ *Electrical Substation – NSW Industrial Noise Policy (EPA 2000)*
→ *Site Establishment and Construction – Interim Construction Noise Guidelines (DECC, 2009);*
→ *Traffic Noise – Environmental Criteria for Road Traffic Noise (NSW EPA, 1999); and*

→ *Vibration – Assessing Vibration: A Technical Guideline (DECC, 2006).*

Wind turbine noise has also been assessed against the World Health Organisation Guidelines for project involved locations.

Further, in December 2011, the NSW Department of Planning and Infrastructure (DPI) released the *Draft NSW Planning Guidelines Wind Farms – Appendix B: NSW Wind Farm Noise Guidelines* (Draft Guidelines). Whilst no supplementary DGRs have been issued for the Paling Yards Wind Farm requiring consideration of the Draft Guidelines, this assessment also considers the requirements of the Draft Guidelines to the extent practicable (See **Section 10**).

4.3 SA EPA Wind Farm Noise Guidelines

The South Australia EPA Noise Guidelines for Wind Farms (SA EPA Guidelines) recommends the following noise criteria for new wind farms,

> "*The predicted equivalent noise level ($L_{Aeq,\ 10min}$), adjusted for tonality in accordance with these guidelines, should not exceed:*
>
> - 35 dBA, or
> - the background noise level by more than 5 dBA,
>
> *whichever is the greater, at all relevant receivers for each integer wind speed from cut-in to rated power of the WTG.*"

The SA EPA Guidelines also provide information on measuring the background noise levels, locations and requirements on the number of valid data points to be obtained and the methodology for excluding invalid data points. It also outlines the process for determining lines of best fit for the background data, and determination of the noise limit.

The SA EPA Guidelines explicitly state that the "swish" or normal modulation noise from wind turbines is a fundamental characteristic of such turbines; however, it specifies that tonal or annoying characteristics of turbine noise should be penalised.

A 5 dBA penalty should be applied to the measured noise level if an "authorised" officer determines that tonality is an issue and that tonality should be assessed in a way acceptable to the EPA.

The SA EPA Guidelines do not require an assessment for the potential of low frequency noise or infrasound, but states that recent turbine designs do not appear to generate significant levels of infrasound, as the earlier turbine models did.

The SA EPA Guidelines accept that wind farm developers commonly enter into agreements with private landowners in which they are provided compensation. The SA EPA Guidelines are accordingly only intended to be applied to premises that do not have an agreement with the wind farm developers. The guideline lists that there is unlikely to be unreasonable interference if:

- a formal agreement is documented between the parties
- the agreement clearly outlines to the landowner the expected impact of the noise from the wind farm and its effect on the landowner's amenity
- the likely impact of exposure will not result in adverse health impacts (e.g. the level does not result in sleep disturbance)

The proponent Union Fenosa has discussed the possible noise implications with the involved residents on whose property the turbines would be located (project involved properties). The following dwellings are located on the project involved properties 7, 7A, 8, 8A, 9, 9A and 9B. Of these, dwellings 7A, 8A, 9A and 9B are secondary dwellings within the project involved properties of Paling Yards, Quobleigh and Mingary Park, respectively (the secondary dwellings). Based on discussions between Union Fenosa and the landowners it is understood these secondary dwellings are not permanent residences and are only used for part of the year as rental cottages or as temporary houses during shearing season.

The owners of the project involved properties have been provided copies of this Noise Impact Assessment for their information, and have been advised that SA EPA Guidelines may be exceeded under certain turbine configurations.

Union Fenosa proposes to enter into noise agreements with the owners of the project involved properties prior to construction. These agreements would specify that:

a Union Fenosa would ensure that the properties met the World Health Organisation noise guidelines (see **Section 4.5**); and,

b Union Fenosa would implement an adaptive management approach which could include the use of building treatments and turbine operation / management strategies if operational noise causes significant impact to the amenity of involved residents.

In addition, it is proposed that the noise agreements will make specific provision for 'secondary dwellings' so as to ensure that no adverse health impacts result to any person as a result of turbine noise impacts. Based on discussions between Union Fenosa and the landowners it is understood these secondary dwellings are not permanent residences and are only used for part of the year as rental cottages or as temporary houses during shearing season. Specific provisions may include documenting the agreement of the landowners to not to allow any of the secondary dwellings to be occupied if post construction noise testing show that the turbine noise is in breach of the WHO criteria. As an alternative, acoustic treatments to the secondary dwellings or adaptive management techniques may be considered. These are discussed further in **Section 9.3.**

The noise agreements would only be required for those turbine configurations where the SA EPA Guidelines would be exceeded for a particular project involved property.

4.4 NSW Industrial Noise Policy (INP)

The NSW Industrial Noise Policy (INP) requirements include site selection for background measurements, description of the site, the equipment used, graphing of results and amenity noise criteria during each of the three periods (Day, Evening and Night).

The proposed site for the Paling Yards Wind Farm is in a rural area and therefore the Amenity Criteria for rural residential receivers, as detailed in Table 2.1 in the NSW INP, is applicable.

The criteria vary as a function of time of day. The Day, Evening and Night Periods are defined as,

Day Period	7:00 am - 6:00 pm 8:00 am - 6:00 pm (Sundays and Public Holidays)
Evening Period	6:00 pm - 10:00 pm
Night Period	10:00 pm - 7:00 am 10:00 pm - 8:00 am (Sundays and Public Holidays)

The Amenity Criteria (L_{Aeq} level) for the residential noise sensitive locations for the Paling Yards Wind Farm project are,

Day Period	50 dBA
Evening Period	45 dBA
Night Period	40 dBA

The Intrusiveness Criterion in the INP is based on the rating background level (RBL), where the Criterion is,

$L_{Aeq,\ 15\ min} \leq$ RBL + 5 dBA

This is almost identical to the SA EPA Guidelines (**Section 4.3**), the difference being the measurement interval (15 and 10 minute) and the determination of the background noise level (rating level, based on the 10th percentile of measured background levels, or using a line of best fit through the data points).

The INP states where the measured RBL is less than 30 dBA, then the RBL is considered to be 30 dBA.

In summary it is evident that the non project involved residential receivers assessed under the *SA EPA Wind Farm Guideline* will generally comply to INP amenity criteria. Furthermore, intrusiveness is covered by the *SA EPA Wind Farm Guideline.*

4.5 World Health Organisation Guidelines

As discussed in **Section 4.3**, the proponent intends to enter into noise agreements with the owners of project-involved residences in accordance with World Health Organisation (WHO) guidelines, as it is necessary to ensure that the project does not result in an 'unreasonable interference' with the amenity of these areas or cause any adverse health effects.

The WHO publication '*Guidelines for Community Noise'* identifies the main health risks associated with noise and derives acceptable environmental noise limits for various activities and environments.

The appropriate guideline limits are listed in **Table 1** below**.**

Table 1 WHO Guideline values for environmental noise in specific environments

Specific Environment	Critical Health Effect(s)	LAeq (dBA)	Time base (hours)	LAMax (dBA, Fast)
Outdoor living area	Serious Annoyance, daytime & evening	55	16	-
	Moderate annoyance, daytime & evening	50	16	-
Dwelling indoors	Speech Intelligibility & moderate annoyance, daytime & evening	35	16	
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance – window open, night-time	45	8	60

For the assessment of the dwellings on the project involved properties the adopted external criteria of 45 dBA or the level given by the SA EPA Guideline criteria, where higher, will be adopted. Effectively this becomes 45 dBA or background + 5 dBA, whichever is the higher.

4.6 Construction Noise Guidelines

The Department of Environment, Climate Change and Water (DECCW) issued the "*Interim Construction Noise Guideline"* in July 2009. The main objectives of the guideline are stated in Section 1.3, a portion of which is presented below:

- promote a clear understanding of ways to identify and minimise noise from construction works.
- focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts.
- encourage construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours.

The guideline sets out Noise Management Levels (NMLs) at residences, and how they are to be applied, as presented in **Table 2**. This approach intends to provide respite for residents exposed to excessive construction noise outside the recommended standard hours whilst allowing construction during the recommended standard hours without undue constraints.

Table 2 Noise at Residences Using Quantitative Assessment

Time of Day	Management Level $L_{Aeq(15minute)}$[1]	How to Apply
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence.

4.7 Vibration Guidelines

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, it will follow that compliance will be achieved with the building damage objectives.

The DECCW's *Assessing Vibration: A Technical Guideline* provides acceptable values for continuous and impulsive vibration based upon guidelines contained in BS 6472–1992, *Evaluation of human exposure to vibration in buildings (1–80 Hz)*.
Both preferred and maximum vibration limits are defined for various locations and are shown in **Table 3**, with the preferred night-time PPV criteria of 0.2 mm/s being the most relevant to the project.

Table 3 Preferred and maximum values for continuous and impulsive vibration

Location	Assessment period[1]	Preferred values RMS acceleration m/s^2		Maximum values RMS acceleration m/s^2		Peak Velocity PPV mm/s	
		z-axis	x- and y-axes	z-axis	x- and y-axes	Preferred	Maximum
Continuous vibration							
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Daytime	0.010	0.0071	0.020	0.014	0.28	0.56
	night-time	0.007	0.005	0.014	0.010	0.20	0.40
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028	0.56	1.1
Workshops	Day- or night-time	0.04	0.029	0.080	0.058	1.1	2.2
Impulsive vibration							
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Daytime	0.30	0.21	0.60	0.42	8.6	17.0
	night-time	0.010	0.0071	0.020	0.014	2.8	5.6
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92	18.0	36.0
Workshops	Day- or night-time	0.64	0.46	1.28	0.92	18.0	36.0

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am

2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472–1992

These limits relate to a long-term (16 hours for daytime), continuous exposure to vibration sources. Where vibration is intermittent, a higher level of vibration is typically acceptable.

In regard to potential building damage, the German Standard DIN4150 recommends a limit of 10 mm/s PPV within any building and the British Standard BS7385: Part 2 - 1993 sets a limit within buildings which depends upon the vibration frequency, but is as low as 7.5 mm/s PPV (at 4.5Hz). For the purposes of ensuring a reasonable factor of safety a conservative limit of approximately 5 mm/s PPV has been applied for this project.

4.8 Blasting Criteria

The ground vibration and airblast levels which cause concern or discomfort to residents are generally lower than the relevant building damage limits.

The DECCW advocates the use of the Australian and New Zealand Environment Conservation Council (ANZECC) guideline *"Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration"* for assessing potential residential disturbance arising from blast emissions. The ANZECC guidelines for control of blasting impact at residences are as follows:

- → The recommended maximum level for airblast is 115 dB Linear. The level of 115 dB Linear may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 120 dB Linear at any time.
- → The recommended maximum for ground vibration is 5 mm/s, Peak Vector Sum (PVS) vibration velocity. It is recommended however, that 2 mm/s (PVS) be considered as the long term regulatory goal for the control of ground vibration. The PVS level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time.
- → Blasting should generally only be permitted during the hours of 9:00 am to 5:00 pm Monday to Saturday. Blasting should not take place on Sundays and public holidays.
- → Blasting should generally take place no more than once per day.

The Australian Standard 2187.2-1993 "*Explosives - Storage, Transport and Use. Part 2: Use of Explosives*" does not present human comfort criteria for ground vibration from blasting. It does however make mention of human comfort level for airblast in saying "a limit of 120 dB for human comfort is commonly used". This is consistent with the ANZECC guidelines.

AS 2187.2-1993 nominates building damage assessment criteria as presented in **Table 4**.

Table 4 Blast Emission Building Damage Assessment Criteria (AS 2187)

Building Type	Vibration Level	Airblast Level (dB re 20 µPa)
Sensitive (and Heritage)	PVS 5 mm/s	133 dB(Linear) Peak
Residential	PVS 10 mm/s	133 dB(Linear) Peak
Commercial/Industrial	PVS 25 mm/s	133 dB(Linear) Peak

4.9 Traffic Noise

The NSW *Environmental Criteria for Road Traffic Noise* (ECRTN May 1999) as required by the Director General Requirements presents guidelines for the assessment of road traffic noise arising from new or redeveloped roads.

Subsequent to the issuing of the DGR's the Department of Environment, Climate Change and Water NSW (DECCW) superseded ECTRN with the publication of NSW Road Noise Policy (RNP) in March 2011. The document provides road traffic noise guidelines for a range of road or residential developments, as well as guidelines that apply for other nominated sensitive land uses.

The road traffic guidelines recommended are based on the functional categories of the subject roads, as applied by the Roads and Maritime Services (RMS) previously called Roads Traffic Authority (RTA).

The functional categories are as follows:

→ Arterial roads (including freeways) carrying predominantly through-traffic from one region to another, forming principal avenues of communication for urban traffic movements.

→ Sub-arterial roads connecting the arterial roads to areas of development and carrying traffic from one part of a region to another. They may also relieve traffic on arterial roads in some circumstances.

→ Local roads, which are the subdivisional roads within a particular developed area. These are used solely as local access roads

For this project, traffic associated with the construction stage has the potential to increase noise levels on existing arterial and local roads during the day (no night period construction proposed). As such, the relevant traffic noise criteria, as provided in Table 3 of the NSW RNP, are provided in **Table 5** below.

Table 5 Road Traffic Noise Criteria

Type of Development	**Criteria**	
	Day 7am - 10pm (dBA)	**Where Criteria are Already Exceeded**
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 dBA	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dBA.
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 dBA	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dBA.

5 GENERAL SITE DESCRIPTION

The proposed Paling Yards Wind Farm site is located approximately 60 km north of Goulburn and 35 km north-east of Crookwell, in NSW. To the west lies the Abercrombie River National Park and to the east is Mount Werong State Forest. The proposed wind farm covers approximately 3893 hectares.

The location of Paling Yards Wind Farm is shown in **Figure 1** below.

Figure 1 Location of proposed Paling Yards Wind Farm

5.1 Characteristics of the site

The proposed project site incorporates 2 landowners. A noise assessment has been carried out for all dwellings within 6 kilometres of a turbine under SA EPA Guidelines.

For project involved receptor locations, those who have agreements with Union Fenosa about turbines on their land, a noise assessment has been carried out under WHO Guidelines to ensure there is no unreasonable impact on amenity. (See Section **4.2** below for details of each of these assessment methodologies)

Topographically, the proposed site runs along a plateau, bisected by Goulburn Oberon Rd. This plateau is approximately 800 m to 1000 m above sea level. The surrounding district is primarily used for agricultural (grazing) purposes with areas surrounding project site covered in native vegetation.

The Abercrombie River is to the south of the project site and plateaus in a steep gully. All properties surrounding the proposed Wind Farm site have an ambient background noise environment that is determined by pre-dominantly natural sources which are largely wind influenced.

Prevailing winds are easterlies and westerlies. The district receives approximately 700 mm – 800 mm of rainfall annually.

5.2 Dwelling Locations

Properties are situated on either side of Goulburn-Oberon Rd (Also known as Abercrombie Rd) and predominantly to the south, as well as a cluster on a plateau to the east of the wind turbines.

The assessment locations include all dwellings located within 6 km of a proposed WTG. **Figure 2** shows the nearby dwellings assessed for the project in white and locations where baseline noise monitoring was completed are denoted in blue. The indicative turbine positions are shown in red, wind masts locations are shown in orange.
(Refer to **Section 8.1 - Measurement Locations**)

Figure 2 Dwelling Locations and Indicative WTG Layout

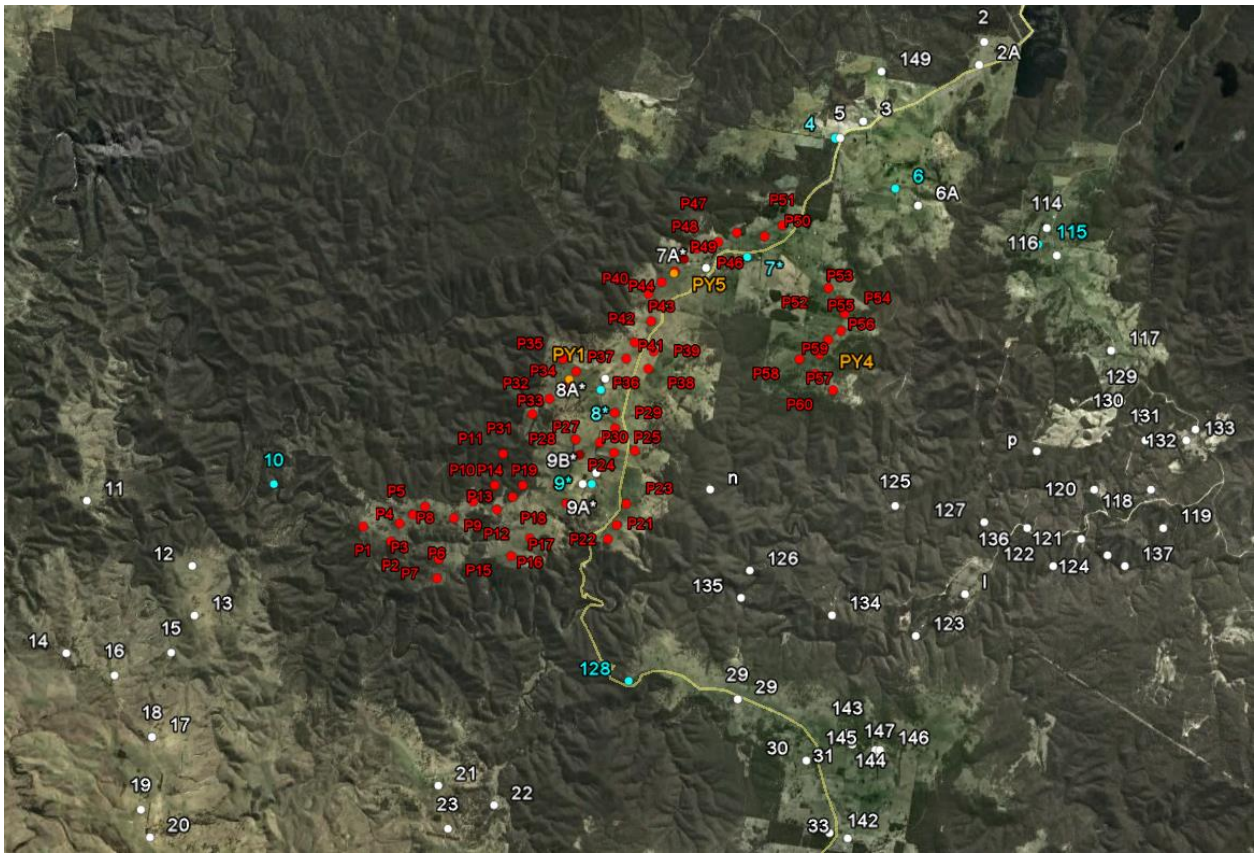


Table 6 lists all receiver locations, their positions and identifies those that are project involved. Other dwellings located beyond 6 km of a proposed WTG are not considered within this assessment, primarily as WTG noise is unlikely to be audible at these distances and compliance to noise criteria is more critical at closer receivers.

Table 6 Surrounding Receivers (Map Datum and Coordinate System Zone 55, GDA94)

Location	East (m)	North (m)	Location	East (m)	North (m)
1	759405	6228570	115	761553	6220052
2	760521	6224074	116	761946	6219796
2A	760453	6223577	117	762928	6217831
3	758065	6222550	118	763826	6215060
4	757528	6222283	119	764059	6214251
5	757652	6222233	120	762729	6215059
6	758725	6221219	121	762418	6214140
6A	759168	6220843	122	761829	6213571
7*	755733	6219927	123	759010	6212248
7A*	754852	6219783	124	762906	6213740
8*	752720	6217349	125	758644	6214826
8A*	752775	6217645	126	755608	6213611
9*	752455	6215508	127	760498	6214494
9A*	752297	6215538	128	753128	6211506
9B*	752581	6215711	129	763229	6216854
10	745869	6215678	130	763712	6216648
11	742104	6215447	131	763704	6216081
12	744181	6213996	132	764803	6216225
13	744279	6213071	133	764539	6215996
14	741601	6212297	134	757264	6212656
15	743708	6212250	135	755459	6213072
16	742570	6211923	136	761256	6214418
17	743420	6210570	137	763294	6213540
18	743420	6210570	142	757075	6208414
19	743160	6209175	143	757485	6210384
20	743375	6208668	144	757915	6209813
21	749190	6209529	145	757995	6209968
22	750230	6208962	146	758156	6210003
23	749326	6208543	147	758097	6209945
29	755333	6211123	149	758486	6223537
30	756669	6209876	l^	759962	6213024
31	757574	6210107	n^	754842	6215362
33	757449	6208284	p^	761552	6215874
114	761708	6220400			

Note: * Denotes that the location is involved with the project

Note: ^ Denotes that the location is not identified as an official dwelling

The distances between the surrounding receivers and WTG's are compiled in **Appendix C.**

6 PROPOSED WIND FARM LAYOUT

6.1 WTG Type and Details

The WTG manufacturer and model has not yet been finalised, and accordingly it is necessary to evaluate a selection of models that may comprise a layout. The final layout submitted for approval consists of 55 WTG's after the removal of turbines P2, P6, P7 and P11 for ecological considerations, however, the layout assessed in this report is a 59 turbine layout and comprises of the following turbine types which are currently under consideration by the proponent.

→ 14 X Vestas V90 1.8/2.0MW

→ 14 X Vestas V100 1.8/2.0MW

→ 31 X Vestas V112 3.0MW

The number of each type of turbine was determined from iterative predictive assessments of preliminary layouts. All turbines are three bladed, upwind, pitch regulated and active yaw. A detailed description of the layout, including which turbine type is assumed for each location is provided in **Appendix E.**

→ Should an alternative selection of turbines be ultimately made and/or the final layout of the Wind Farm differ from that assessed in this report, a revised noise impact assessment prediction will be completed prior to construction commencing.

Table 7 and **Table 8** summarise the relevant turbine input data used for noise level prediction.

Table 7 WTG Manufacturers Data

Make, model, power	**Vestas V90 1.8/2.0MW**	**Vestas V100 1.8/2.0MW**	**Vestas V112 3.0MW**
Rotor diameter	90 m	100 m	112 m
Hub height	95 m	95 m	94 m
Cut-in wind speed	4 m/s	3 m/s	3 m/s
Rated wind speed	12 m/s	20 m/s	12 m/s
Rotor speed	9.0 – 14.9 rpm	14.9 rpm	4.4 – 17.7 rpm
'Standard Mode' Sound Power Level, $L_{WA,ref}$	103.7 dBA	105.0 dBA	106.0 dBA

Table 8 WTG Sound Power Curves

Wind Turbine Model	**Wind speed Vs (10m AGL) (m/s)**									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Vestas V90 2.0MW		94.3	99.7	102.2	104.0	103.7	103.5	103.5		
Vestas V100 1.8MW	94.0	96.2	100.1	103.9	105.0	105.0	105.0			
Vestas V112 3MW		96.8	100.4	104.8	106.9	106.5	105.9	105.5	105.4	105.5

Noise emissions for the proposed WTG's have been provided by the WTG manufacturers and have either been independently tested according to International Standard IEC 61400-11 or are warranted noise levels calculated in accordance with the International Standard. Copies of the certification test or manufacturers documentation that give the sound power level variation with wind speed, frequency spectra and tonality assessment have been provided by Union Fenosa and will be made available to the DP&I on request**.**

6.2 Assessment of Tonality and Infrasound

WTG manufacturers are obliged to conduct independent tests in accordance with IEC 61400-11. A part of this assessment is to conduct a tonal audibility test. The tonal audibility $\Delta L_{t,a}$ is typically assessed using the methodology outlined in *Joint Nordic Method Version 2 – Objective Method for Assessing the Audibility of Tones in Noise*.

The warranted tonal audibility data $\Delta L_{A,k}$ values have been supplied by the WTG manufacturers as follows:

Table 9 Audible tonality assessment to IEC 61400-11

Wind speed m/s	**Tonality $\Delta L_{A,k}$ for turbine type**		
	Vestas V90	**Vestas V100**	**Vestas V112**
3			
4			
5		-3.9	
6	-5.26	-10.4	-1.97
7	-8.36	-10.7	-3.04
8	-6.79	-10.2	-13.27
9	-5.7	-5.2	-11.88
10	-7.32	-5.2	-9.19
11		-9.3	

A more detailed assessment of tonality has been undertaken for the V112 model, which has the highest $\Delta L_{A,k}$ values for this layout. This analysis is presented in **Section 7.3**.

Infrasound is not tested as an obligatory part of IEC 61400-11. It is noted that, in general, modern WTG's do not exhibit significant infrasound emissions. Refer to **Section 7.4.2** for a more detailed discussion.

7 OPERATION NOISE LEVELS

7.1 Introduction

As discussed in **Section 3.2**, a three-dimensional computer noise model was used to predict L_{Aeq} noise levels from all WTG's at all surrounding residential dwellings.

The ISO 9613 noise model incorporates a 'hard ground' assumption and includes one-third octave band calculated effects for air absorption, ground attenuation and topographic shielding. It is noted that ISO 9613 equations predict for average downwind propagation conditions and also hold for average propagation under a well-developed moderate ground-based temperature inversion.

The estimated accuracy of the prediction model is approximately ±3 dBA.

7.2 Wind Turbine Noise

For indicative purposes the WTG noise levels from the proposed WTG layout was calculated for the reference wind condition of 8 m/s at 10m AGL. The resulting WTG noise levels for each receiver are listed in **Table 10.** The predicted noise contour plot is presented in **Figure 3.**

Table 10 WTG L_{Aeq} noise level (dBA) at $V_{ref,10m}$ = 8 m/s, V_{100m} = 11.5m/s

Receiver Name	Predicted Noise Level	Receiver Name	Predicted Noise Level
1	-	115	22.3
2	-	116	17.1
2A	-	117	-
3	25.6	118	-
4	30.2	119	-
5	30.8	120	-
6	30.9	121	-
6A	27	122	-
7*	45	123	-
7A*	48.1	124	-
8*	44.7	125	21.3
8A*	45.3	126	22.1
9*	44.9	127	15.3
9A*	45.6	128	25
9B*	45.5	129	-
10	27.5	130	-
11	-	131	-
12	20.7	132	-
13	23.5	133	-
14	-	134	21.2
15	5.1	135	22.1
16	-	136	16.8
17	-	137	-
18	-	142	-
19	-	143	-

Receiver Name	Predicted Noise Level	Receiver Name	Predicted Noise Level
20	-	144	-
21	18.3	145	-
22	8	146	-
23	-	147	-
29	14.2	149	16.5
30	-	I^	7.6
31	-	n^	34.1
33	-	p^	24.2
114	18.3		

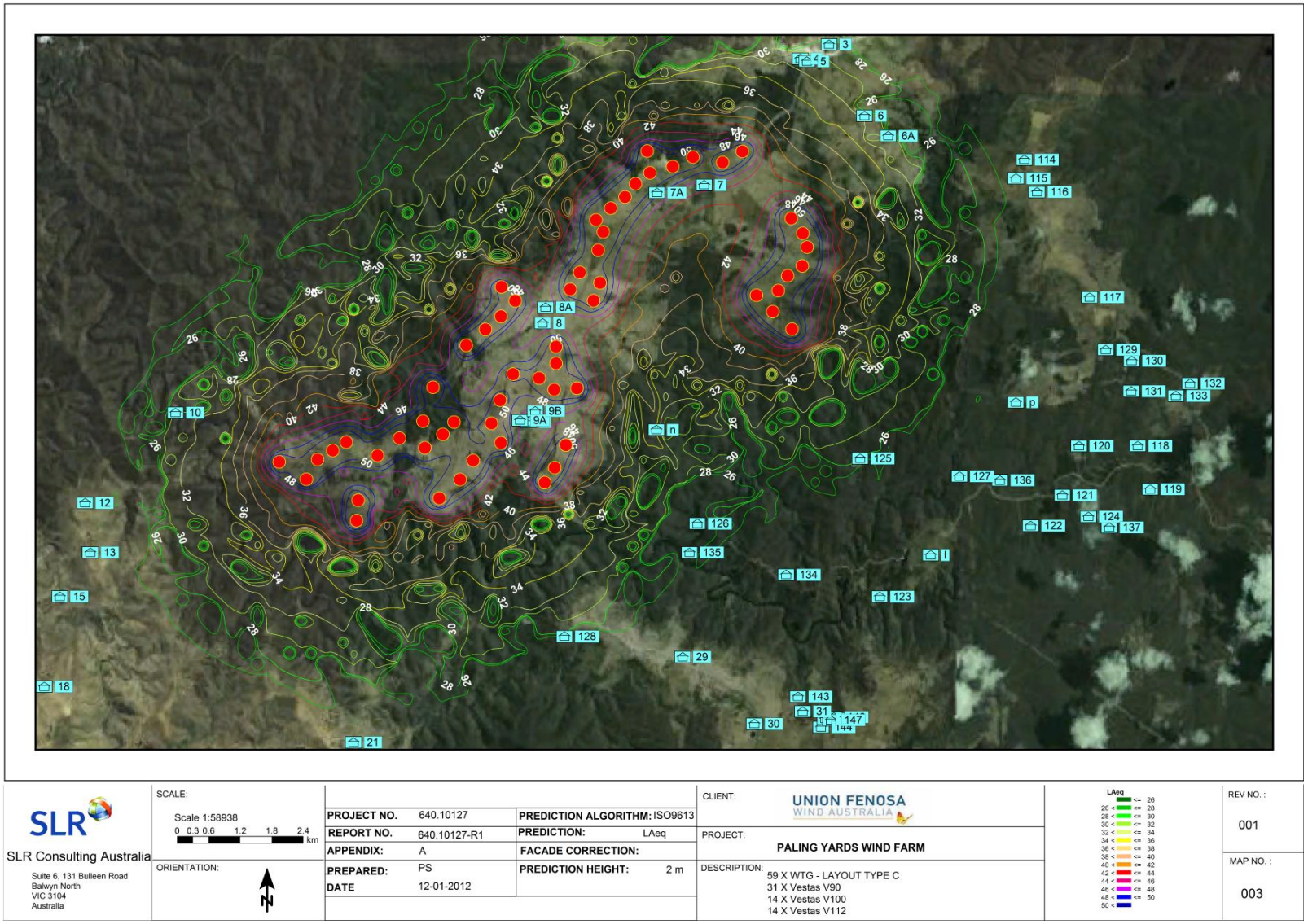
Note that '*' denotes a project involved property
Note that '-' denotes a result lower than 0 dB i.e. is below the normal range of hearing
Note that '^' denotes a location of building not identified as an official dwelling

Furthermore, noise levels from the proposed wind farm were calculated for all integer wind speeds in the range of 5 to 10 m/s (at 10m AGL) at all surrounding assessment receivers within 6 km of a turbine. Whilst the rated wind speed of the WTG's is typically 13 to 14 m/s, published manufacturers sound power level test data (IEC 61400-11) has only been generated as high as 10 m/s. It should be noted that noise produced by WTG's begins to 'plateau off' at higher wind speeds and because of the higher masking background noise level at higher wind speeds, noise impacts and compliance are not critical at these speeds. The assessed wind range sufficiently covers the most noise critical operational conditions.

To compare predicted noise levels with the assessment criteria, the wind speed data, normally measured at 10 m AGL, was extrapolated to a hub height of 100 m using the logarithmic profile law.[1] (Refer to Section **9.1**) The assessment graphs of WTG operational noise levels were prepared for and are depicted in **Appendix A.**

[1] (Section 8 Data reduction procedures, page 20, International Standard IEC61400-11 ©IEC:2002+A1:2006 (E) *'Wind Turbine Generator Systems – Part 11: Acoustic noise measurement techniques'*).

Figure 3 Predicted Noise Levels Contour Map, L_{Aeq}, v_{ref}=8m/s



7.3 Vestas V112 Detailed Tonality assessment

IEC 61400-11:2002 is the measurement standard used for determining the sound power in one-third octave bands for wind turbines, as measured in the near field. In addition, the standard uses narrow band analysis to quantify tones in the measured sound power spectrum. The result of this test is the tonal audibility criterion $\Delta L_{A,k.}$ In general, $\Delta L_{A,k}$ values greater than -3 should be reported as per the standard.

The origin of the $\Delta L_{A,k}$ test can be found in the *Objective Method for Assessing the Audibility of Tones in Noise, Joint Nordic Method* developed by DELTA. While not fully explained in the IEC 61400-11 standard, the tonality penalty is determined according to the following formula.[2]

$$for\ \Delta L_{ta} < 4dB: k = 0\ dB$$

$$for\ 4 \leq \Delta L_{ta} \leq 10dB: k = \Delta L_{ta} - 4$$

$$for\ \Delta L_{ta} > 10dB: k = 6dB$$

Note: k is not restricted to integer values

Examining the Vestas V112 data provided by the manufacturer[3] $\Delta L_{A,k}$ is less than 4 dB at all wind speeds and therefore does not attract a penalty under the Joint Nordic Method.

In addition to this test a one-third octave band test was completed using the noise levels as predicted by the model. Levels were assessed against the description of tonality as defined in the NSW Industrial Noise Policy. The policy states that the presence of excessive tonality is defined as when the level of one-third octave band measured in the equivalent noise level L_{eq}(10 minute) exceeds the level of the adjacent bands on both sides by:

→ **5 dB or more** if the centre frequency of the band containing the tone is above 400Hz

→ **8 dB or more** if the centre frequency of the band containing the tone is 160 to 400Hz inclusive

→ **15 dB or more** if the centre frequency of the band containing the tone is below 160Hz

The predicted noise level in one third octave bands did not meet the descriptions as stated above and would therefore be deemed 'non tonal' in the field.

[2] Source: Equation 4 from Objective Method for Assessing the Audibility of Tones in Noise. Joint Nordic Method – Version 2. AV 1952/99 14 April 2000, pg 5.

[3] Source: Garad Hassan report, GLGH-4286 12 09255 258-A-00001-B dated 20 August 2012

8 BACKGROUND LEVELS AND NOISE LIMITS

8.1 Measurement Locations

The locations for the background noise measurements were selected based on the potential for acoustic impact to the nearest receivers, as recommended by Table 3.1 of the NSW INP. The SA EPA Guidelines recommend that the measurement locations should be located at least 5 metres from a reflecting surface (other than the ground) and within 20 metres of a residence.

Monitoring equipment was generally placed in the vicinity of the residence at a suitable location that would be protected from the prevailing wind direction in order to protect the microphone from excessive wind induced noise effects. Care was taken not to place the equipment in locations that would be adversely affected by extraneous noise sources.

Background noise monitoring locations were selected based on the predicted wind farm noise level from the preliminary layout at reference conditions.

The relative proximity of some receiver locations to one another and their similar wind exposure and surrounding environment meant that background noise monitoring could be conducted at one representative location and be considered indicative of other similar locations.

Monitoring was commenced at 8 locations around the proposed wind farm site. For the purposes of assessment, receivers nearest to a particular background monitoring site were allocated to that location. The background noise monitoring locations, along with locations allocated to that site, are listed in **Table 11**. Refer to **Figure 4** for a map showing background locations.

Table 11 Measurement Locations

Location	Indicative of		Notes / Similar Characteristic for wind induced noise
9	9 9A 9B 11 12 13 14	15 16 17 18 19 20 n	Geographic proximity, similar region, exposure to wind
8	8 8A		Geographic proximity, similar region, exposure to wind
7	7 7A		Geographic proximity, similar region, exposure to wind
4	1 2 2A 3	4 5 149	Geographic proximity, similar region, exposure to wind
6	6 6A		Geographic proximity, similar region, exposure to wind

115	114 115 116 117 118 119 120 121 124	129 130 131 132 133 136 137 p	Geographic proximity, similar region, exposure to wind
128	21 22 23 29 30 31 33 128	134 142 143 144 145 146 147 l	Geographic proximity, similar region, exposure to wind
10	10 122 123 125	126 127 135	Geographic proximity, similar region, exposure to wind

It is anticipated that further baseline background noise monitoring will be conducted before project commissioning in order to obtain further comprehensive and representative data.

At each location noise monitoring equipment was placed in the vicinity of the residence and the position of the monitoring equipment was documented with photographs.

A weather station was deployed at Location 9 for the period of the survey. This data was used to identify and exclude any data collected during rain periods, which may have affected the background noise levels. The measured data for rain confirmed that the monitoring period was generally dry and as a result only a small number of data points were rejected due to rain.

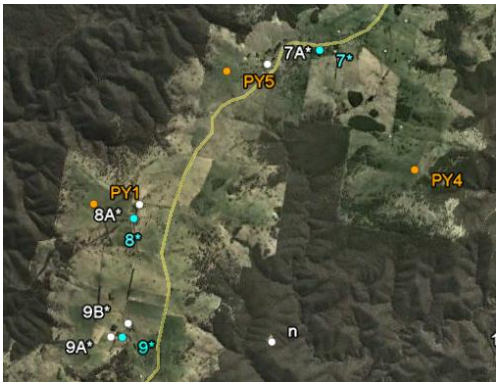
Any periods of data that were clearly affected by extraneous noise sources (eg pumps, insects, birds, etc) were removed from the analysis data set.

The SA EPA Guidelines require measurements to be conducted in 10 minute intervals, while the NSW INP request 15 minute interval data. Given that almost all wind data, including the wind farm site monitored data, is in 10 minute intervals, this period was used for all measurements.

Simultaneous noise monitoring and wind monitoring was conducted during the period 7th June 2011 through to 24th June 2011. Wind speed was monitored 3 wind masts throughout the proposed site. Wind speed for a given background monitoring location was allocated to the wind mast nearest to that location. Where the receptor was approximately equidistant to two wind masts, the background noise was correlated to the wind mast with the highest correlation coefficient (R^2 value).

Table 12 Wind mast details

Wind Mast	Easting	Northing	Nearest Background Locations
PY1	752098	6217660	9,8,10,128
PY4	757109	6218007	7,4,6,115
PY5	754257	6219651	-



Wind speed at a height of 100 m AGL was derived using the wind profile power law from the data measured on each wind mast at 20 m and 60 m AGL. Wind shear for each 10-minute period was used to calculate this value. Local noise data was then correlated to the 100 m AGL extrapolated wind speed.

8.2 Measurement Details

The measurement location, monitoring period, equipment type and serial number of the noise loggers used for all testing are summarised in **Table 13**, along with the number of valid data points for each location.

The SA EPA Guidelines require a set of approximately 2,000 valid data points. All data points below the cut-in wind speed of the proposed turbines and any adversely affected data should be excluded. The cut-in wind speed for the proposed turbines is 3 m/s.

The measured background noise levels (L_{A90}) are then plotted against the extrapolated 100 metre wind speed to obtain a background versus wind speed characteristic for each location.

The line of best fit for the data set is then determined, as required by the SA EPA Guideline, using a linear, second order (quadratic) or third order (cubic) polynomial. The Guideline requires that the correlation coefficient (R^2 value) for each line type be reported and the line of best fit with the highest correlation coefficient used. At each location the cubic polynomial gave the highest correlation and was therefore used for the line of best fit. The SA EPA Guideline does not specify a minimum acceptable correlation coefficient, although we note that almost all correlation coefficients are between 0.52 and 0.65 which is reasonably consistent and in our experience suggests reasonably good correlation.

Table 13 Measurement Details for each Location

Measurement Location	Measurement Period	Noise Logger Model # Serial number	Total No. of monitoring intervals	No. of valid data points		Correlation Coefficient (R^2)		
				All	Night	Linear	Quad.	Cubic
Location 9	7th June 2011- 24th June 2011	ARL EL-316 16-203-530	2439	2264	865	0.5325	0.5348	0.5372
Location 8	7th June 2011- 24th June 2011	ARL EL-316 16-004-033	2438	2264	865	0.5324	0.5354	0.5354
Location 7±	7th June 2011- 19th June 2011	ARL EL-316 16-306-044	1680	1585	637	0.5828	0.5836	0.5836
Location 4±	7th June 2011- 23th June 2011	ARL EL-316 16-306-040	2258	1061	374	0.524	0.526	0.5288
Location 6	7th June 2011- 24th June 2011	ARL EL-316 16-203-528	2415	2233	859	0.5215	0.5223	0.5236

Measurement Location	Measurement Period	Noise Logger Model # Serial number	Total No. of monitoring intervals	No. of valid data points		Correlation Coefficient (R^2)		
				All	Night	Linear	Quad.	Cubic
Location 115±	7th June 2011-15th June 2011	ARL NGARA 878049	1108	1064	417	0.6292	0.6521	0.6521
Location 128	7th June 2011-24th June 2011	ARL EL-316 16-207-041	2436	2264	865	0.5475	0.5514	0.5515
Location 10	7th June 2011-24th June 2011	ARL EL-316 16-203-526	2432	2244	865	0.242	0.2661	0.2683

Note that '±' denotes a location with fewer than 2000 monitoring intervals

Measurement data at three of the monitoring locations fell short of the preferred 2000 intervals (due to battery depletion or muffling of the measurement microphone for part of the measurement period) however, as more than 50% of the data had been collected and the correlation coefficient was relatively good (greater than 58%) the result for the full period was deemed as still statistically relevant.

8.3 Night Period Analysis

A reduced data set was created for the night period (10:00 pm to 7:00 am). The resulting data sets typically included 400 to 800 data points and were fitted with a cubic polynomial regression line of best fit.

The regression line for night-only data is generally lower than that for all data by between 1 dB to 5 dB and varies considerably from location to location. Lower night data is attributed to two main factors. Firstly that extraneous noise sources (animals, traffic etc) are lower during the night period and secondly that the wind shear for the night period is usually greater compared to the day period. This results in lower ground level wind speeds for a given hub height reference wind speed, when compared to that during the day period., and hence lower wind related background noise levels.

The resulting effect on project involved receptors' criteria with consideration to only the lower night period background data is generally minimal with the criteria being exactly the same (criteria is a constant 35 dBA as background noise regression lines are always less than 30 dBA) or marginally higher at high wind speeds where compliance is more easily achieved.

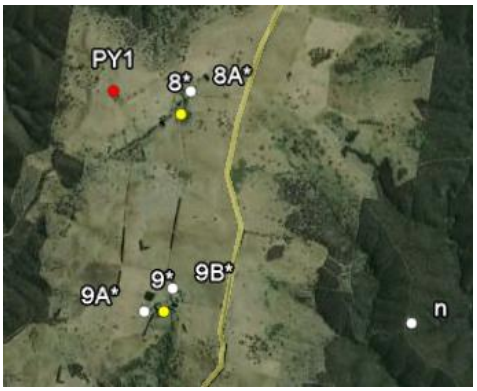
The criteria for project uninvolved receptors with consideration to only the night period background data is generally marginally lower at higher wind speeds. As this is typically not the most critical wind range for compliance the net effect of night data based criteria is negligible with regards to compliance.

8.5 Location 9 – Paling Yards

The property of Paling Yards is located within the proposed wind farm site. The residence is set back approximately 500 m from Golburn-Oberon Rd. The nearest proposed turbine to this location is approximately 620 m away.

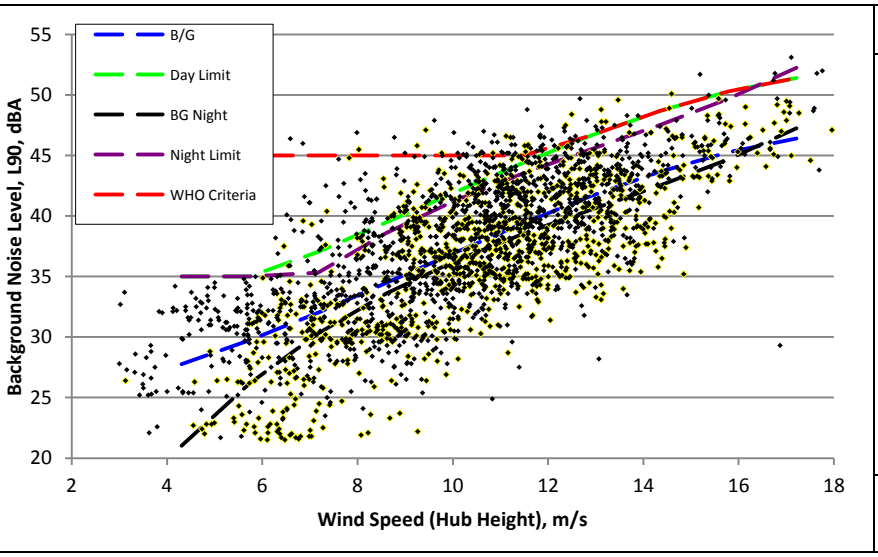
This residence is occupied by one of the landowners that make up part of the proposed Paling Yards Wind Farm site and is therefore considered 'project involved'.

Figure 4 Paling Yards Measurement Location



The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 5**.

Figure 5 Background Noise Measurements and Noise Criteria Curve – Location 9



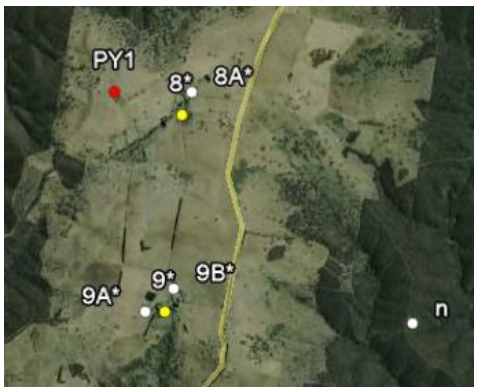
Order	Equation	R^2
Linear	$y = 1.5648x + 21.093$	0.5325
Quadratic	$y = -0.0269x^2 + 2.1216x + 18.429$	0.5348
Cubic	$y = -0.0062x^3 + 0.1734x^2 + 0.1239x + 24.509$	0.5372
Order Used:	**Cubic**	

8.6 Location 8 – Quobleigh

The property of Quobleigh is located within the proposed wind farm site. The residence is located near Golburn Oberon Rd, north of location 9. The nearest proposed turbine to this location is 500 m away.

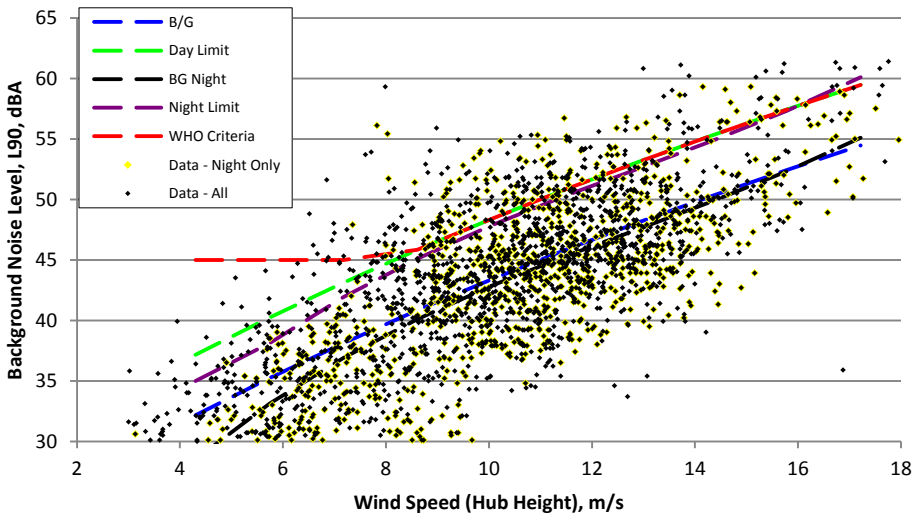
This residence is occupied by one of the landowners that make up part of the proposed Paling Yards Wind Farm site and is therefore considered 'project involved'.

Figure 6 Quobleigh Background Noise Measurement Location



The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 7**.

Figure 7 Background Noise Measurements and Noise Criteria Curve – Location 8



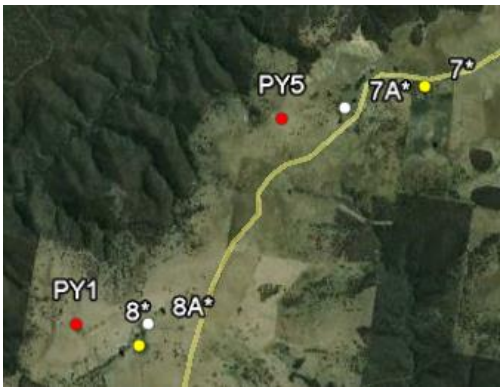
Order	Equation	R^2
Linear	y = 1.7238x + 25.757	0.5325
Quadratic	y = -0.033x2 + 2.4012x + 22.547	0.5348
Cubic	y = 0.0009x3 - 0.0602x2 + 2.6712x + 21.732	0.5372
Order Used:	**Cubic**	

8.7 Location 7 – Mingary Park

The property of Mingary Park is located within the proposed wind farm site. The residence is located near Golburn Oberon Rd, north east of location 8. The nearest proposed turbine to this location is 540m away.

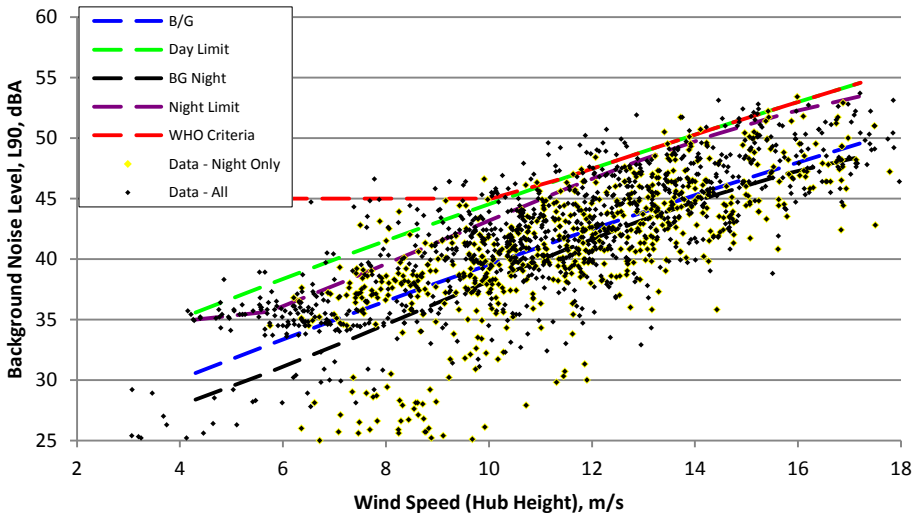
This residence is occupied by one of the landowners that make up part of the proposed Paling Yards Wind Farm site and is therefore considered 'project involved'.

Figure 8 Mingary Park Background Noise Measurement Location



The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 9**.

Figure 9 Background Noise Measurements and Noise Criteria Curve – Location 7



Order	Equation	R^2
Linear	$y = 1.4609x + 24.824$	0.5828
Quadratic	$y = -.0142x^2 + .7731x + 23.235$	0.5836
Cubic	$y = 9E\text{-}5x^3 - 0.0171x^2 + 1.803x + 23.142$	0.5836
Order Used:	**Cubic**	

8.8 Location 4 – Lucas Grove

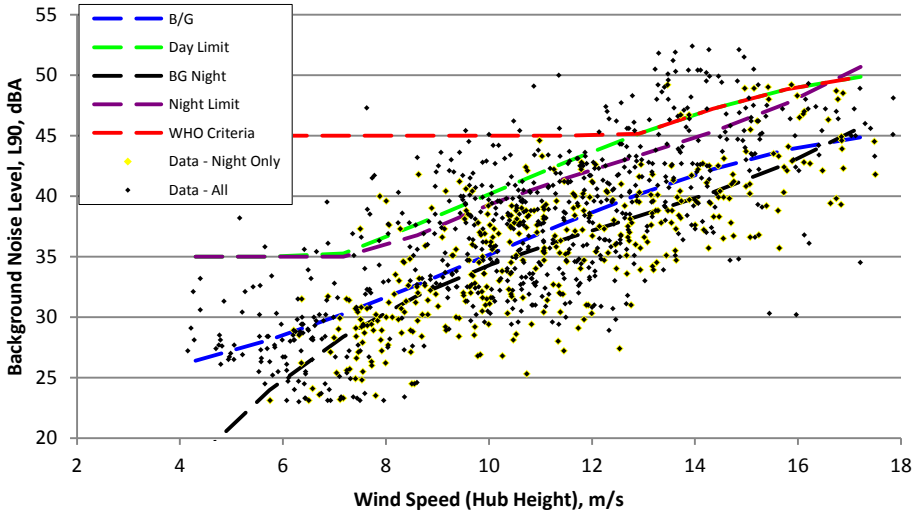
The property of Lucas Grove is located near Golburn Oberon Rd, north east of location 7. It sits atop of same ridgeline as the proposed wind farm. The nearest turbine to this location is 2 km away.

The time trace of background noise for Location 4 showed a sharp decrease in level after the 15th of June 2011 (Refer to **Appendix F**).The resulting noise data clearly did not correlate to the wind speed data and did not vary in a manner typical of background noise measurements. It is presumed that the logger's microphone was muffled or blocked for this period and as such this section of data has been excluded from the regression analysis.

Figure 10 Lucas Grove Background Noise Measurement Location

The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 11**.

Figure 11 Background Noise Measurements and Noise Criteria Curve – Location 4

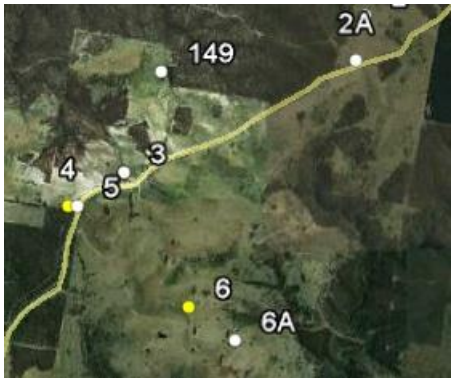


Order	Equation	R^2
Linear	1.5971x + 19.187	0.524
Quadratic	$-0.0299x^2$ + 2.2539x + 15.833	0.5264
Cubic	$-0.0082x^3$ + $0.2436x^2$ - 0.6209x + 25.209	0.5288
Order Used:	**Cubic**	

8.9 Location 6

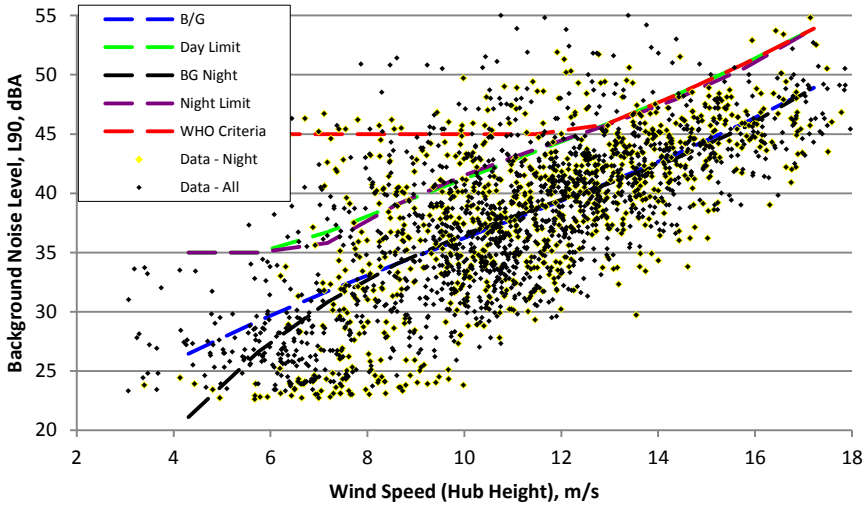
Location 6 is located near Golburn Oberon Rd, south east of Location 4, north of the proposed wind farm. The nearest proposed turbine to this location is 2.3 km away.

Figure 12 Location 6 Background Noise Measurement Location



The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 13**.

Figure 13 Background Noise Measurements and Noise Criteria Curve – Location 6



Order	Equation	R^2
Linear	1.6847x + 19.359	05215
Quadratic	0.0165x^2 + 1.312x + 21.307	0.5223
Cubic	0.0046x^3 - 0.142x^2 + 3.0064x + 15.764	0.5236
Order Used:	**Cubic**	

8.10 Location 115 – Maxwelton

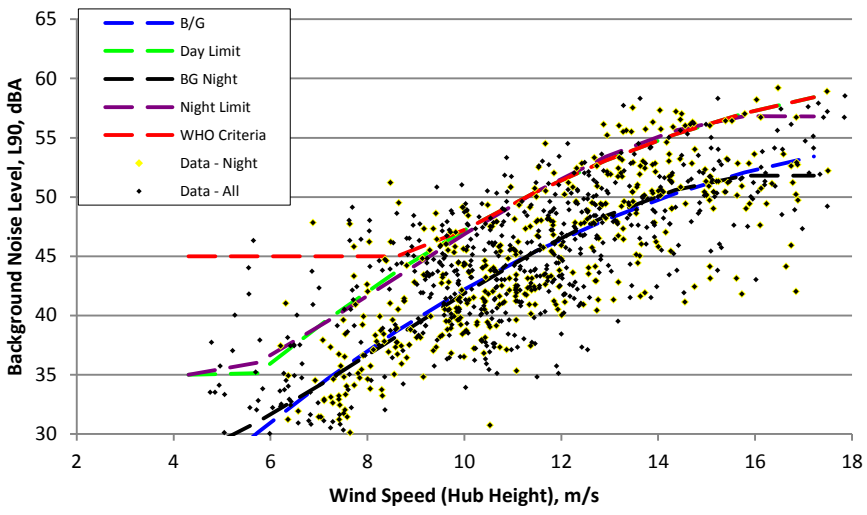
The property of Maxwelton is located off Jerrong Rd, east of location 7. It sits at the top of the ridgeline that runs parallel to the north end of the proposed wind farm. The nearest proposed turbine to this location is 4.1 km away.

Due to a premature battery depletion at Location 115, data was only recorded until the 15th of June 2011 at which point the logger ceased to function. While this yielded fewer than 2000 data points (refer to **Table 13**), the existing data shows good correlation between background noise and wind speed (R^2>0.65).

Figure 14 Maxwelton Background Noise Measurement Location

The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 15.**

Figure 15 Background Noise Measurements and Noise Criteria Curve – Location 115



Order	Equation	R^2
Linear	y = 2.1157x + 20.167	06292
Quadratic	y = 0.1114x^2 +4.5764x + 7.545	0.6521
Cubic	y = 0.0005x^3 - 0.1276x^2 +4.7461x + 6.9904	0.6521
Order Used:	**Cubic**	

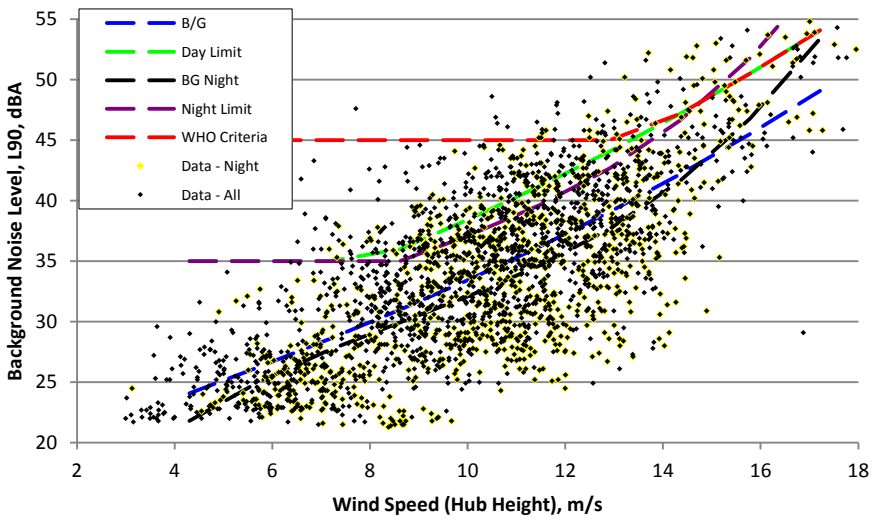
8.11 Location 128

Location 128 is located off Taralga Rd, south of location 9. It sits at the top of the ridgeline south of the proposed wind farm. The nearest proposed turbine to this location is 2.9 km away.

Figure 16 Location 128 Background Noise Measurement Location

The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 17**.

Figure 17 Background Noise Measurements and Noise Criteria Curve – Location 128

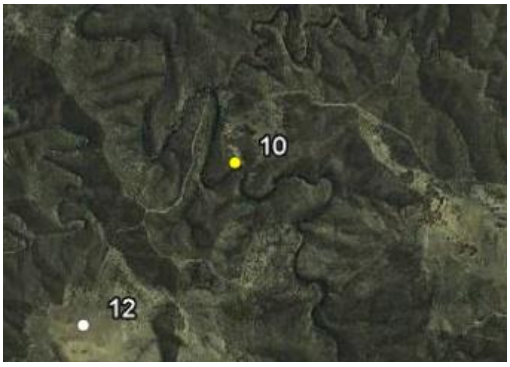


Order	Equation	R^2
Linear	$y = 1.8587x + 15.112$	0.5475
Quadratic	$y = 0.0404x^2 + 1.0312x + 19.027$	0.5514
Cubic	$y = 0.0014x^3 - 0.0034x^2 + 1.4653x + 17.717$	0.5515
Order Used:	**Cubic**	

8.12 Location 10

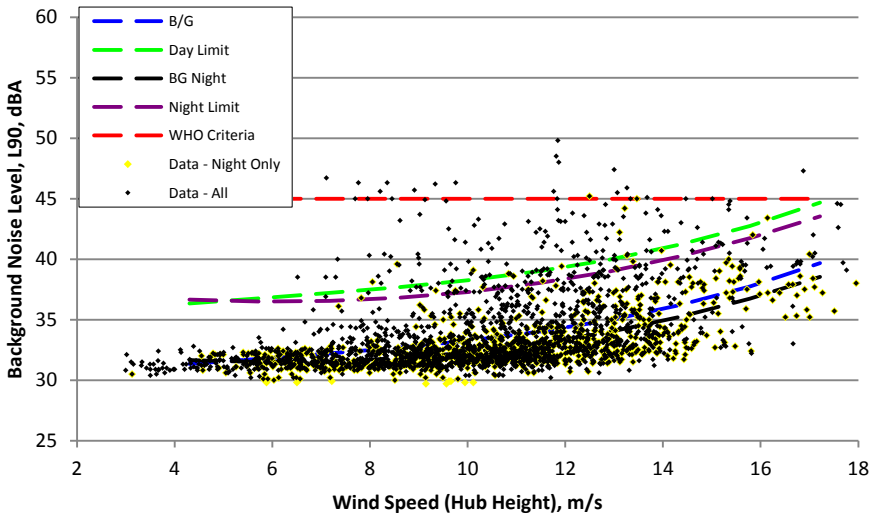
Location 10 is located near the river that runs south of the proposed wind farm site, west of location 9. It is near the bottom of a steep valley and is accessed through the property to the north (location 9). The nearest proposed turbine to this location is 2.1 km away.

Figure 18 Location 10 Background Noise Measurement Location



The results of the background noise monitoring taken in June 2011, showing the data points, line of best fit and criteria curve for that group is shown in **Figure 19**.

Figure 19 Background Noise Measurements and Noise Criteria Curve – Location 10



Order	Equation	R^2
Linear	y = 0.5556x + 28.012	0.242
Quadratic	y = 0.045x^2 - 0.3763x + 32.478	0.2661
Cubic	y = 0.0031x^3 - 0.0548x^2 + 0.62x + 29.446	0.2683
Order Used:	**Cubic**	

We note that for this location, background noise did not strongly correlate with wind speed, decreasing the R^2 value. This may be due to shielding effects or differences between wind speed measured at the wind mast and at this location.

9 ACOUSTIC ASSESSMENT OF PROPOSED WIND FARM

An assessment of the acceptability of wind farm noise levels at all receivers located within a distance of 6 km of the proposed wind farm was made in accordance with the SA EPA Guideline criteria and the pre-existing background noise level regression analysis detailed in **Section 7.3**.

As outlined in **Section 4.3**, the proponent Union Fenosa intends to enter into noise agreements with some project involved residences prior to construction. Under the SA EPA Guidelines these project involved residences are not required to comply to the 35 dBA or 'background + 5 dBA' limits. However, it is necessary to ensure that the project does not result in an 'unreasonable interference' with the amenity of these areas or cause any adverse health effects. Therefore for the assessment of the project involved residences the external criteria of 45 dBA (as per the WHO guidelines) or the level given by the SA EPA Guideline criteria, where higher, will be adopted. Effectively this becomes 45 dBA or background + 5 dBA, whichever is the higher. (See **Section 4.5** for details)

Predicted external noise levels will be further mitigated by the shielding effects of the building, with the anticipated internal noise levels similarly reduced by the façade of the dwelling.

It should be further noted that all predicted noise levels are considered to be conservative with the model assuming 'hard ground', average downwind propagation from all WTG's to each receiver or a well-developed moderate ground based temperature inversion, a scenario which is not able to be re-created in reality.

Predicted noise levels for a wind speed of 8 m/s are shown in **Table 10** (See **Section 7.2**.)

The assessment figures contained in **Appendix A** depict the predicted WTG noise level curves for the proposed WTG layout, superimposed over SA EPA Guideline Criteria and WHO based noise limits.

All non-project involved receivers were below the SA EPA Guideline criteria and are therefore deemed to comply. Furthermore, all receptors (including the project involved receivers) would achieve their respective criteria with consideration to the night-time only regression line based limits. In addition, most non project involved receivers are predicted to be below the background noise regression line.

For project involved residences, **Table 14** below shows the exceedances for each location.

Table 14 Noise Criteria Exceedances

Location	Exceedance at Hub Height Wind Speed										MAX
	4.3	5.7	7.2	8.6	10.0	11.5	12.9	14.3	15.8	17.2	
7A*				2.4	3.4	3.3	3.1	3.0	2.0	0.6	3.4
9A*					0.8	0.6	0.4	0.4	0.4	0.1	0.8
9B*					0.7	0.5	0.4	0.3	0.3	0.1	0.6
8*					0.3						0.3
8A*					0.2						0.2
9*					0.1						0.1
7*					0.1						0.1

For locations 7, 8 and 9, the exceedance occurs only at one wind speed and is less than 0.5 dB in magnitude. This can be considered a minor exceedance and is unlikely to cause any additional effect on the amenity of the area or health of the occupants.

As outlined in **Section 4.3**, locations, 7A, 8A, 9A and 9B are project involved secondary dwellings and it is proposed that the noise agreements will make specific provision for these secondary dwellings to ensure that no adverse health impacts to any person as a result of WTG noise.

9.1 Atmospheric stability and wind profile

The wind velocity at a location can be represented by a vertical profile (gradient) that generally is at a minimum at ground level and increases with altitude. The wind velocity profile is primarily determined by physical factors such as surface roughness and topographic (relief) effects, which are reasonably constant over time, however can also be affected by more variable local atmospheric conditions including atmospheric stability and turbulence.

Atmospheric stability is determined by the total heat flux to the ground, primarily being the sum of incoming solar and outgoing thermal radiation and heat exchanged with the air. During clear summer days (incoming radiation dominates) air is heated from below and rises, causing significant thermal mixing, vertical air movements and turbulence. This process limits large variations in the vertical wind velocity profile.

During clear nights when outgoing radiation dominates, air is cooled from below, air density is greatest closer to the ground and minimal thermal mixing occurs. This leads to a stable atmosphere where horizontal layers of air are largely decoupled and allows for a higher wind velocity gradient.

The noise assessment methodology outlined in the SA EPA Guidelines, as in many other similar wind farm noise assessment methodologies, by necessity rely on the independently verified reference sound power data available for specific wind turbines measured at a manufacturer's test site. The measurement procedure has been standardised (IEC 61400-11) to require sound power data to be measured coincidentally with reference wind speed measurements at an altitude of 10 metres.

As discussed in **Section 7.2** the SA EPA Guideline methodology has been adapted to the alternative reference wind speed at a height of 100 metres AGL which is more representative of hub height wind speed. Accordingly the turbine sound power level data has been amended to the appropriate 100 m AGL wind speed. This approach goes some way to alleviating the variability that changing wind profiles has with respect to a 10 metre reference height.

While the assessed layout meets the requirements of the SA EPA Guidelines, some uncertainty remains as to the likely noise conditions that will result under specific atmospheric conditions over time. The SA EPA Guidelines noise limits are generally set within the requirements of the WHO Guidelines that relate to health impacts, and it is highly unlikely that the remaining uncertainty could lead to health impacts. However, it is possible that under certain conditions the amenity of existing dwellings could be reduced notwithstanding compliance with SA EPA Guidelines. These conditions are likely to be variable and intermittent, and not result in a long-term loss in amenity.

An adaptive management approach could be implemented if undue noise impacts are identified during WTG operation that are related to elevated WTG noise levels during stable atmosphere conditions. Refer to **Section 4.3** for more details.

9.2 Temperature Inversions

Temperature inversion is an atmospheric condition in which temperature increases with height above ground. Such conditions may increase noise levels by focussing sound wave propagation paths at a single point. Temperature inversions occurring within the lowest 50m to 100m of atmosphere can affect noise levels measured on the ground. Temperature inversions are most commonly caused by radiative cooling of the ground at night leading to cooling of the air in contact with the ground. Such conditions are especially prevalent on cloudless nights with little wind.

The SA EPA Guidelines do not require or suggest temperature inversions be included during wind farm noise assessments. The NSW INP states that temperature inversions be included in an assessment if they are deemed to be a prevalent feature of the environment, which generally requires they occur for greater than 30% of the total night-time during winter (approximately two nights per week between 6:00 pm and 7:00 am). Currently there is insufficient data available to accurately determine the prevalence of temperature inversions.

Conventional approaches to assessing noise propagation under temperature inversion conditions require knowledge of the temperature gradient and assume that the noise source is located below the temperature inversion, typically near to the ground. The effect of temperature inversions on noise propagation from highly elevated noise sources, such as WTG's is therefore not typical of other sources.

WTG's for the Paling Yards Wind Farm project are located on top of elevated ridges. The hub height (assumed acoustic centre of the WTG) is located typically located 80 m (or more) higher than receiver locations on the surrounding area. It is therefore unlikely that conventional temperature inversion conditions, in the lower 100m of the atmosphere, would significantly affect noise propagation from such an elevated source.

A further consideration must be that temperature inversions require little to no wind in order to minimise atmospheric mixing and hence develop. During calm conditions the WTGs are unlikely to operate, as their cut-in speed is typically 3m/s.

Notwithstanding the above, an adaptive management approach (See **Section 9.3**) could be implemented if undue noise impacts are identified during WTG operation that are related to temperature inversion effects.

9.3 Adaptive Management

If undue WTG noise impacts are identified during operations due to temperature inversion, atmospheric stability or other reasons, then an 'adaptive management' approach can be implemented to mitigate or remove the impact. This process could include;

→ Receiving and documenting noise impact complaint through 'hotline' or other means.

→ Investigating the nature of the reported impact.

→ Identifying exactly what conditions or times lead to undue impacts.

→ Operating WTG's in a reduced 'noise optimised' mode during identified times and conditions (sector management).

→ Providing acoustic upgrades (glazing, façade, masking noise etc) to affected dwellings.

→ Turning off WTG's that are identified as causing the undue impact.

9.4 Wind Turbine Vibration

Vibration or more specifically the oscillatory movement of receptor structures could potentially propagate from a source (in this case a wind farm) through either a ground path (ground borne vibration) or an airborne path as sound which could couple with lightweight structures and produce a movement in the structure.

9.4.1 Ground borne

Ground borne vibration levels attenuate with distance with varying amounts dependant upon such variables as frequency and geotechnical parameters. There are a few documented research reports with regards to wind farm generated ground vibration.

The Snow Report (*Low Frequency Noise & Vibration Measurements at a Modern Wind Farm*, ETSU W/13/01392/REP, D J Snow, 1997) describes measurements taken at a wind farm consisting of eleven 450 kW WTG's, where noise and vibration measurements were taken at increasingly distant points up to 1 kilometre. Low frequency vibration was determined down to 0.1 Hz with varying wind speeds and on/off operation. The research found that the absolute level of vibration signals measured at any frequency at 100 metres from the nearest WTG were significantly below the most stringent criteria given by BS 6472:1992 *Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).* Furthermore vibration in the 0.5Hz to 1Hz range remained at similar levels when the wind farm was not operating, suggesting that the vibration measured may have been due to other (ambient) sources.

Detailed *Microseismic and Infrasound Monitoring of Low Frequency Noise and Vibrations from Wind Farms* were undertaken by the Applied and Environmental Geophysics Group of Keele University as part of a comprehensive report giving '*Recommendations on The Siting of Wind Farm in the Vicinity the Eskdalemuir, Scotland*'. The Eskadelmuir Seismic Array (EKA) is in the southern uplands of Scotland and is sited on a very quiet magnetic and seismic environment with twin 9 km long lines of seismometer instrumentation which are sensitive enough to pick up nuclear explosions from up to 15,000 km away. It should be noted that the objective of the study was to measure vibration levels many orders of magnitude lower than project criteria detailed in **Section 0**

The Eskdalemuir report details results taken from St Breock Downs wind farm (possibly the same measurements taken in the Snow Report). From the documented seismic vibration measurements taken at 25 metres from a single WTG a peak particle velocity (PPV) of approximately $8x10^{-5}$ mm/s has been calculated. This is approximately 2500 orders of magnitude lower than project criteria. Whilst we note that turbines proposed for Paling Yards Wind Farm are larger than those measured above we are confident that ground vibration will be completely imperceptible at surrounding receptors. Furthermore, our own experience and observations at other operating wind farms has not indicated perceptible ground vibration at any distance from turbines.

9.4.2 Air borne

A good deal of misunderstanding and attention has been given in recent times to low frequency noise and infrasound generated by wind farms. Infrasound at sufficient levels has the potential to be perceived as vibration or alternatively cause the movement of lightweight structures which then in turn are perceived as vibration. It should be noted that the sometimes audible cyclical modulation of aerodynamic noise, the '*swish swish'* of blades, is often mistakenly identified as low frequency noise, where it actually is the low frequency modulation of audible noise.

The subject is most complex, dealing with frequencies that are sub audible, requiring alternative frequency weighting scales, specialist measurement equipment and techniques, and evaluating the variance of hearing sensitivity in a population at low frequency. Furthermore, it will depend on many variables including turbine type and size, wind conditions (including turbulence), propagation distance, building structure and materials, room sizing and positioning within room.

Comprehensive review, measurement testing and evaluation are offered in numerous technical reports investigating infrasound and low frequency noise from wind farms including;

- *A Review of Published Research on Low Frequency Noise and its Effects* - Report for Defra by Dr Geoff Leventhall assisted by Dr Peter Pelmear and Dr Stephen Benton - 2002 (refer http://www.defra.gov.uk/environment/quality/noise/research/lowfrequency/documents/lowfreqnoise.pdf)
- *The Measurement of Low Frequency Noise at Three UK Wind Farms* - report for DTI by Hayes McKenzie Partnership – 2006 (refer http://www.berr.gov.uk/files/file31270.pdf)
- *Wind turbines & Infrasound 2006* - Report for Canadian Wind Energy Association (CanWEA) by Howe Gastmeier Chapnik Limited (HGC Engineering) - 2006
  (refer http://www.canwea.ca/images/uploads/File/CanWEA_Infrasound_Study_Final.pdf)
- *Wind Farms Technical Paper – Environmental Noise* – report for Clean Energy Council Australia by Sonus Pty Ltd – 2010 (refer http://www.cleanenergycouncil.org.au/cec/mediaevents/media-releases/November2010/sonus-report.html)

The consensus drawn by all investigations is that infrasound noise emissions from modern WTG's are significantly below the recognised threshold of perception for acoustic energy within this range.

9.5 Substation Transformer Noise Levels

The appropriate noise criteria for Substation Noise are provided in *NSW INP* (See **Section 4.2** and **4.4**). Australian Standard AS 60076 Part 10 2009: *"Power Transformers – Determination of sound*

levels" indicates that the 200 MVA transformer facility may produce sound power levels up to 99 dB. The dominant frequency of such a transformer is 100 Hz.

Noise predictions for transformer substations have been made using CONCAWE algorithms assuming an absolute 'worst case' meteorology enhancement condition of downwind 3 m/s and Pasquill Stability Class F temperature inversion. The results are presented in **Table 15** for the nearest receptor locations, along with the appropriate NSW INP limit (See **Section 10** for RBL derivation).

Table 15 Predicted 'worst case' 200 MVA switching substation noise

		NSW Industrial Noise Policy Criteria		
Location	**Predicted Noise Level, Leq dB(A)**	**RBL (Night)**	**Noise Limit (Amenity Criteria)**	**Complies?**
8A	35.3	40	45	Yes
8	33.4	40	45	Yes
2A	29.5	28	33	Yes
7A	27.8	37	42	Yes
9	26.8	35	40	Yes
9A	26.7	35	40	Yes

9.6 Transmission Line Noise (Corona Noise)

Corona noise is caused by the partial breakdown of the insulation properties of air surrounding the conducting wires. It generally only occurs in humid conditions, as provided by fog or rain. A minimum line potential of 70 kV or higher is required to generate corona noise depending on the electrical design. Corona noise does not occur on domestic distribution lines.

Corona noise has two major components, a low frequency tone associated with the frequency of the AC supply (100 Hz for 50 Hz source) and broadband noise. The tonal component of the noise is related to the point along the electric waveform at which the air begins to conduct. This varies with each cycle and consequently the frequency of the emitted tone is subject to great fluctuations. Corona noise can be characterised as broadband 'crackling' or 'buzzing' and is generally only a feature during foggy or raining conditions.

We have previously measured corona noise (reference GEHA Report 045-109/2 dated 9 November 2004) at a site near Officer in outer Melbourne, Victoria. We found it possible to measure corona noise at close distances, at high frequencies only, as other noise sources, namely traffic and birds, caused some interference at times. A 500 kV line was measured during damp foggy conditions.

At a distance of 30m along the ground from the line an L_{eq} noise level of approximately 44 dBA was measured. At a distance of 100m the corona noise was calculated to be approximately 39 dBA.

Assuming a minimum RBL value of 30 dBA, the minimum intrusive criteria as determined by the NSW Industrial Noise Policy (INP) would be 35 dBA. We therefore conservatively estimate that the minimum criteria level of 35 dBA would be complied with at a distance of 240 metres.

The proposed route for the transmission lines has not been finalised but it is expected that it will traverse largely remote and uninhabited land. It is anticipated that sufficient buffer distances will render the occasional corona noise inaudible at residential receivers.

10 NSW DRAFT WIND FARM GUIDELINES

In December 2011 the NSW Department of Planning and Infrastructure released the *Draft NSW Planning Guidelines Wind Farms – Appendix B: NSW Wind Farm Noise Guidelines.*

Whilst the guidelines are yet to be finalised (and may be subject to change) and no supplementary DGRs have been issued requiring consideration of the proposed draft guidelines, the Department of Planning and Infrastructure has that during the interim period due consideration should be given to a number of the additional requirements of the proposed draft guideline. These are presented below.

10.1 Daytime vs. Night-time Background Noise

The background noise data was reprocessed to define background noise curves for the daytime period (7.00 am to 10.00 pm) and night-time period (10.00 pm to 7.00 am) as defined by the draft guideline. The corresponding 3rd order regression curve and correlation coefficient are presented in **Table 16** below.

Table 16 Background Noise Regression Curves and Correlation Coefficient

Location	Daytime	Daytime R^2	Night-time	Night-time R^2
Location 9	-0.0072x^3 + 0.2096x^2 - 0.368x + 27.401	R² = 0.538	0.0115x^3 - 0.4504x^2 + 7.252x - 2.7754	R² = 0.6022
Location 8	0.0015x^3 - 0.0811x^2 + 2.8258x + 22.128	R² = 0.546	0.0088x^3 - 0.3386x^2 + 5.9214x + 8.6209	R² = 0.5443
Location 7	0.0058x^3 - 0.2184x^2 + 3.9291x + 17.384	R² = 0.6598	-0.0047x^3 + 0.1255x^2 + 0.6831x + 23.498	R² = 0.5417
Location 4	-0.004x^3 + 0.098x^2 + 0.9419x + 20.74	R² = 0.538	0.0162x^3 - 0.6073x^2 + 8.8977x - 10.159	R² = 0.5951
Location 6	0.0019x^3 - 0.0462x^2 + 1.9084x + 19.844	R² = 0.5268	0.0162x^3 - 0.587x^2 + 8.4844x - 5.8308	R² = 0.5231
Location 115	0.0053x^3 - 0.2857x^2 + 6.3246x + 2.2794	R² = 0.6613	-0.0139x^3 + 0.3565x^2 - 0.4233x + 24.338	R² = 0.6245
Location 128	-0.0008x^3 + 0.034x^2 + 1.401x + 17.703	R² = 0.5775	0.0174x^3 - 0.4591x^2 + 5.5582x + 5.0001	R² = 0.5604
Location 10	0.0026x^3 - 0.0444x^2 + 0.6459x + 29.228	R² = 0.2725	0.0007x^3 + 0.0364x^2 - 0.5221x + 33.175	R² = 0.4057

Daytime regression curves were typically 0.5 to 1dB higher than the regression curve based on the full data set. Night-time regression curves were typically 1 to 2 dB lower than the regression curves based on the full data set.

The new background noise curves were used to update the noise limit curves for all receptors and all predicted results were assessed against these criteria. There were no exceedances of the daytime only or night-time only criteria for non-project involved receivers. The maximum exceedance for project-involved receivers was determined by the 45 dBA criteria, rather than the Background + 5 criteria and so is identical to the maximum exceedance presented in **Table 14 (See Section 9).**

Table 17 below shows the exceedances for project involved locations for the night-time criteria. Note that this is determined as 45 dBA or Background + 5 dBA, as per WHO guidelines.

Table 17 NSW Draft Wind Farm Guidelines Exceedances – Night-time Criteria

Location	Exceedance at Hub Height Wind Speed										MAX
	4.3	5.7	7.2	8.6	10.0	11.5	12.9	14.3	15.8	17.2	
7A*				2.4	3.4	3.3	3.1	3.0	3.0	1.4	3.4
9A*					0.8	0.6	0.4	0.4	0.4	0.4	0.8

9B*		0.7	0.5	0.4	0.3	0.3	0.3	0.6
8*		0.3						0.3
8A*		0.2						0.2
9*		0.1						0.1
7*		0.1						0.1

The maximum exceedance for each of these locations is the same as for the original assessment; however, the exceedances at other wind speeds have very slightly increased. Comments regarding noise levels at these locations with respect to their use throughout the year can be found in **Section 9**.

10.2 Special Audible Characteristics

The Draft NSW Guidelines have been developed with the fundamental characteristics of wind turbine noise taken into consideration including reasonable levels of swish, modulation, discrete tones and low frequency noise.

The Draft NSW Guidelines introduce recommendations for procedures to assess excessive levels of special audible character and these procedures (if adopted) are to be used to evaluate noise character from an operational wind farm. Notwithstanding the above, the proposed procedures have been adapted to evaluate the predicted likelihood of excessive levels of special audible character.

10.2.1 Low Frequency Noise

An assessment of the potential for low frequency noise was completed with C-weighted noise levels predicted for the assessed layout.

A criteria of 65 dBC daytime and 60 dBC night-time as proposed by the Draft NSW Guidelines was used to determine if further investigation into low frequency noise was warranted.

The results from the SoundPlan model predict that wind turbine noise would only exceed 60 dBC for one receiver location, Location 7A, the predicted exceedance was 0.8 dBC. A full set of results for this analysis is shown in **Appendix G.** This is a relatively small exceedance of the critera, however, as post-construction monitoring is already planned for this location **(See Section 9),** it is recommended that low frequency noise is investigated at that time.

10.2.2 Tonality

The simplified 1/3 octave band method for assessing tonality as proposed by the Draft NSW Guidelines was completed for the assessed layout using the same method evaluated in **Section 7.3.**

The tonality tests showed no presence of tonality in the predicted results. A full set of results for this analysis is shown in **Appendix G.**

10.2.3 Amplitude Modulation

Amplitude modulation (AM) refers to the cyclical modulation of audible aerodynamic noise from WTGs. The modulation typically occurs at rate corresponding to blade passing frequency which is approximately once per second (i.e. ~1 Hz). This is not to be confused with infrasound, that is, sound waves at frequencies below the range of human hearing; rather it refers to the fluctuation of noise level in the audible range.

Noise from a wind turbine typically includes an inherent level of amplitude modulation, often referred to as ‘swish’ and the criteria in the Draft NSW Guidelines have been determined with the inherent characteristics of wind turbine noise – including reasonable levels of amplitude modulation – taken into consideration. The Draft NSW Guidelines propose an excessive level of modulation is taken to be a variation of greater than 4 dBA at the blade passing.

The issue of AM of WTG noise is now the subject of considerable research and investigation and whilst 'normal' amplitude modulation (swish) is generally well characterised and the source mechanism better understood, the hypothesised potential causes of excessive (Other) AM are somewhat more complex and not well understood.

Research into AM undertaken by Salford University in 2007, found that out of the total number of operational wind farms investigated (133) in the UK approximately 20% at some point had registered a noise complaint(s); but AM was considered to be a factor in noise complaints at only 3% of the sites and a possible factor at 6% of the sites. Furthermore, the periods when AM complaints were registered at four wind farms determined that the necessary conditions were relatively infrequent. From this it appears that whatever the actual number of occurrences of potential excessive AM, it only occurs at a minority of wind farm sites for a small amount of the time.

There currently is no means to predict the eventuality, severity or frequency of occurrence of excessive AM and the proposed Draft NSW Guideline methodology is limited to the assessment of operational wind farms. Research evidence would suggest that excessive AM has only been confirmed at a small number of wind farm sites and when it occurs it is relatively infrequent.

Nevertheless, should excessive AM be found to be a problem with the wind farm, it would be possible to limit the impact on the residents through adaptive management techniques (See also **Section 9.3**).

11 ASSESSMENT OF CONSTRUCTION NOISE & VIBRATION LEVELS

11.1 Project Construction Noise

The appropriate criteria for construction noise are provided in the Interim Construction Noise Guidelines (DECC, 2009) (See **Sections 4.2** and **4.6**).

Construction activities include;

→ construction of access roads,

→ establishment of turbine tower foundations and electrical substation,

→ digging of trenches to accommodate underground power cables,

→ erection of turbine towers and assembly of WTG's.

The equipment required to complete the above tasks will typically include:

→ bucket loader, rock breaker, drill rig, excavator/grader, bulldozer, dump trucks,, vibratory roller flat bed truck, concrete truck

→ cranes, fork lift, and various 4WD and service vehicles.

The anticipated construction period is anticipated to be less than 18 to 24 months, with civil works expected to span approximately 12 to 15 months, however, due to the large area of the wind farm site, intensive works will be located within a distance of potential impact for each surrounding residential receiver for only very short and intermittent periods of time.

It is anticipated that most construction will occur during standard construction hours and it is therefore considered appropriate that construction noise levels up to 10 dBA above the RBL's would be acceptable. Construction noise levels greater than 10 dBA above RBL could be considered as 'noise affected' as defined by the Policy. At levels greater than 75 dBA receptors would be considered 'highly noise affected' by construction noise as defined by the Policy.

11.2 Ambient Background Noise Levels

Noise monitoring data presented in **Section 7.3** was used to determine the RBL for each period in accordance with the DECCW Guidelines. **Table 18** shows the RBL for each monitoring location.

Table 18 Summary of Rating Background Levels (RBL's) for Monitoring Locations

	RBL (dBA)		
Measurement Location	**Day (0700 h – 1800 h)**	**Evening (1800 h – 2200 h)**	**Night (2200 h – 0700 h)**
9	33	34	35
8	41	41	40
7	38	39	37
4	28	29	28
6	32	36	34
115	40	43	41
128	30	30	28
10	32	31	32

11.3 Noise Modelling Parameters

In order to calculate the noise levels at the various noise sensitive receiver locations from construction equipment associated with the project, a SoundPLAN (Version 7) environmental computer model was developed.

The computer model predicts noise levels by taking into account such factors as the source sound power levels and locations of sound, distance attenuation, ground absorption, air absorption and shielding attenuation, as well as meteorological conditions, including wind effects. The noise model uses prediction algorithms in accordance with the Conservation of Clean Air and Water Europe (CONCAWE) prediction methodology which allows for conservative 'worst case' meteorological propagation conditions.

Sound power levels used to derive the predicted construction noise were based on data provided in the SLR Consulting noise source database. Computer noise models of typical construction scenarios were developed which included all anticipated mobile equipment for the activity operating simultaneously at full load. **Table 19** shows typical sound power levels of equipment used in wind farm construction.

Table 19 Typical Construction Equipment

Equipment	Octave band mid frequency - L_{eq} Sound Power Levels dB							
	63	125	250	500	1 K	2 k	4 K	dBA
Excavator	121	126	111	107	106	101	96	113
Grader	118	124	115	114	115	114	113	120
Dump Truck	111	105	108	106	107	104	99	111
Rock Breaker	113	115	117	122	121	120	118	126
Concrete Truck	104	101	96	95	94	93	91	100
Front End Loader	120	117	101	101	92	88	88	104
Crane	108	105	109	107	111	105	97	113
Bulldozer	113	119	110	109	110	109	108	115
Concrete Batching	100	97	92	91	90	89	87	96
Delivery Trucks	118	110	99	104	99	95	91	105
4WD vehicles	96	92	88	84	84	80	75	88

To examine the possible worst case construction noise impacts for all nearby receivers, four different construction scenarios were modelled at each turbine location and the highest noise levels for each receiver predicted. These are:

→ Construction of Access Roads

→ Establishment of Turbine Foundations

→ Trench Excavation

→ WTG Erection and Assembly

11.4 Normal Working Hours Operation

Table 20 shows the predicted construction level for those receivers who are deemed noise affected, together with the Rating Background Level (RBL) obtained during the background noise monitoring campaign and applicable noise limit for the daytime period.

Table 20 Construction Noise Levels – Noise Affected Receivers

Location	Construction Activity				RBL	Limit
	Construction of Access Roads	Establishment of Turbine Tower Foundations	Trench Excavation	WTG Erection & Assembly	Day	Day (RBL+10)
7A	56	48	62	50	41	51
8A	51	45	58	46	41	51
9B	53	46	59	47	33	43
9A	52	45	58	46	33	43
9	50	44	57	44	33	43
8	49	42	56	44	41	51
7	52	45	58	46	41	51

The highlighted cells would be classified as 'noise affected' when turbine foundation civil works are located nearby and should the operation of a rock breaker be necessary, however, due to the anticipated short period of localised works this would likely be considered acceptable. Operation of the rock-breaker is dependent upon the geotechnical conditions of the foundation site and would be operated intermittently at most. Consideration for mitigation measures such as localised shrouding may be needed if adverse conditions are experienced if and when operating the rock-breaker at the most exposed positions.

No predicted levels exceed 75 dBA and therefore no receptors would be considered as being 'highly noise affected' as defined by the policy.

In consideration that the predicted levels represent 'worst case' construction scenarios and are within limits which would be considered acceptable, it is unlikely that construction noise within normal operating hours will cause any unnecessary impact.

11.5 Outside Normal Operating Hours Operation

The only operation likely to occur at night is the erection of WTG's, as low wind conditions are preferable while the towers are being erected by large cranes. **Table 23** below shows all noise affected receivers for this construction activity for the night period.

Table 21 Night Construction Noise Levels – Noise Affected Receivers

Location	Construction Activity	RBL	Limit
	WTG Erection & Assembly	Night	Night (RBL+ 5)
7A	50	40	45
8A	46	40	45
9B	47	35	40
9A	46	35	40
9	44	35	40
7	46	40	45

While no predicted levels exceed 75 dBA and therefore no receptors would be considered as being highly noise affected, tower erection near these locations should occur during the daytime, if possible. We note that the affected locations are the secondary dwellings discussed in **Section 4.3** and as such may not be occupied during this stage of construction.

11.5.1 Concrete Batching Plants

A portable concrete batching plant (combined Sound Power Level of 115 dBA) will be required to supply concrete onsite. The proposal location of this batching plant is shown in **Figure 20** below.

Figure 20 Concrete Batching Plant Location

Using the existing SoundPlan noise model, predicted noise levels for the proposed batch plant site at the nearest affected properties were calculated under worst case conditions. These results are shown in **Table 22**, along with the RBL and night-time limit (the lowest noise limit) for each location.

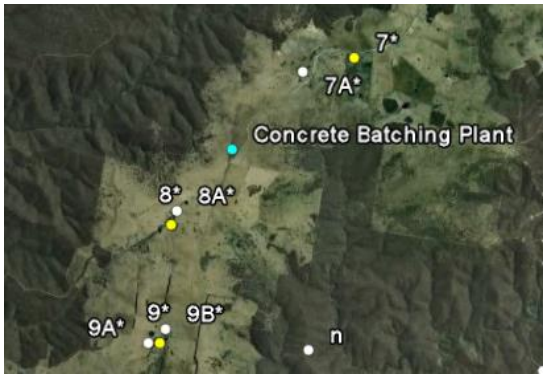


Table 22 Concrete Batch Plant Noise Level Prediction

Location	Predicted Noise Level, dBA	RBL - Night	Night Limit
8A	41	40	45
8	39	40	45
7A	37.7	40	45
7	32.7	40	45
9	28.7	35	40
9A	28.6	35	40
n	26.7	35	40
9B	20.5	35	40

All locations are predicted to be below the night-time noise limit and most locations are predicted to be below the relevant rating background level for that location.

11.6 Construction Vibration Assessment

The activities and equipment with the potential to generate the highest levels of ground vibration are the operation of the vibratory roller during construction of access roads and the operation of the rock breaker during establishment of turbine tower foundations. Typical vibration levels from these sources are presented in **Table 23**.

Table 23 Typical Vibration Emission Levels from Construction Plant

Activity	PPV Vibration Level (mm/s) at Distance		
	10m	20m	30m
4-Tonne Vibratory Roller	2.0 - 2.4	0.4 - 1.2	0.2 - 0.8
Hydraulic Hammer (30t)	3	1.5	1.0

It is evident that given the large distances between receptors and structures where construction works are likely to be undertaken (refer to **Appendix C**), the building damage and human comfort vibration criteria will easily be met during construction.

11.7 Blasting

11.7.1 Blasting Assessment

Blasting may be required in some areas to clear large rock outcrops to prepare turbine foundations.

The proposed wind farm site is a green field site where no previous blasting or blast monitoring has been conducted and therefore no specific site laws exist. We have therefore adopted a site law derived from measurement data at a different site to give an indicative result.

The 5% site laws for ground vibration and airblast are:

Ground Vibration PVS (5%) = 16202 $(SD_1)^{-2.03}$

Airblast SPL(5%) = 189.3 - 31.8 log (SD_2)

where PVS (5%) and SPL (5%) are the levels of ground vibration (Peak Vector Sum - mm/s) and airblast (dB Linear) respectively, above which 5% of the total population (of data points) will lie, assuming that the population has the same statistical distribution as the underlying measured sample.

SD_1 and SD_2 are the ground vibration and airblast scaled distances, where:

$$SD_1 = \frac{\text{Distance}}{\sqrt{\text{MIC}}} = \left(\text{m.kg}^{-0.5}\right) \text{ and } SD_2 = \frac{\text{Distance}}{\sqrt[3]{\text{MIC}}} = \left(\text{m.kg}^{-0.33}\right)$$

Based on the blast emissions site laws, calculations were also conducted to indicate the allowable MIC's for compliance with the general EPA Human Comfort criteria of 115 dB Linear (airblast) and 5 mm/s (ground vibration).

The closest anticipated distance between blasting and residences would be approximately 400 metres (7A). At this distance, based on a site constant K_a of 15, the predicted maximum MIC of up to 20 kg is likely to produce an airblast overpressure below the acceptable level of 115 dB Linear. An MIC of 20 kg is expected to result in a vibration level (Peak Vector Sum) of 0.011 mm/s, well within the recommended maximum level of 5 mm/s in the ANZECC Guidelines.

It is evident that the anticipated blasting is likely to meet all human comfort limits and building damage assessment criteria are easily met. All other sources of vibration would be less then above.

11.8 Traffic Noise

Traffic generated by the project during its construction phase has been evaluated in *Paling Yards Wind Farm, Transport Impact Assessment* prepared by URS Australia Pty Ltd. A key finding of this report was as follows:

> *"It is evident that no significant impact will occur to the performance of the road network from the vehicles generated during the peak construction period of the Paling Yard wind Farm Development."*

Project construction traffic for Paling Yards Wind Farm will primarily utilise the Golburn-Oberon Road which runs north-south through the site. The projected maximum construction traffic on proposed access roads represent in some cases a significant increase in traffic movements as shown in **Table 24.**

The projected increase in road traffic noise levels on all local roads is expected to be greater than 2 dBA during peak construction periods, however, road traffic noise levels are anticipated to meet the *Environmental Criteria for Road Traffic Noise (ECRTN) and subsequent Road Noise Policy (RNP)* target for a local road of daytime $L_{Aeq(1\ hour)}$ = 55 dBA at modest setback distances. We note that being a rural farming community, most receptors are at much greater setback distances from their road frontage and therefore will easily meet the ECRTN requirement.

Table 24 Construction Traffic Noise

Proposed Access Road	VPD Current	VPD Projected Maximum Construction Traffic	Projected increase in existing road traffic noise level	ECRTN/RNP classification	ECRTN/RNP requirement
Abercrombie Road 5km north of river crossing	205	329	3 dBA	Local	Local
Abercrombie Road 1km south west of intersection with Rupert Street, Oberon	1968	2036	0.5 dBA	Local	Local
Abercrombie Road, east of Black Springs	1036	1086	1 dBA	Local	Local

11.8.1 Night-time deliveries

There could potentially be deliveries of equipment scheduled for out of hours, necessitated by traffic congestion considerations and safe passage of heavy vehicle convoys or especially long loads. Night-time traffic has the potential to cause sleep disturbance to residential receivers along the route. This potentially affects receivers situated closer to the road such as locations 5, 115 and 29.

Preliminary calculations indicate that maximum noise levels at a residence approximately 10 metres from the road as a result of a heavy vehicle pass-by would be in the range 45-80 dBA. We would anticipate that night-time background noise levels along affected routes could be as low as 30 dBA and as such maximum noise levels from pass-bys may have the potential for sleep disturbance.

To minimise potential noise impacts associated with night-time deliveries some potential measures to be considered are:

→ Prior notification of affected public where night-time convoys are scheduled

→ Restricted use of exhaust/engine brakes in built up areas

12 CONCLUSION

Noise from wind turbines for the proposed Paling Yards Wind Farm has been predicted and assessed against the relevant criteria prescribed by the SA EPA Guideline and World Health Organisation (WHO) goals where appropriate using the indicative layout and an assumed mix of turbines. An evaluation of night-time baseline data was also included.

All non-project involved receptors were found to be below the noise criteria stipulated in SA EPA Guidelines. Some project involved receptors are predicted to slightly exceed the WHO noise criteria, however these locations are used for part of the year only and it is proposed to enter into a noise agreement regulating their use and that these will not be used should post construction noise testing definitively show an exceedance of the criteria.

The project is yet to select and finalise the WTG layout and WTG makes/models. Upon finalising the layout and WTG models a revised noise prediction and assessment will be completed in which the noise impact mitigation techniques listed in **Section 9.3** will be investigated thoroughly to produce a fully compliant layout.

WTG vibration levels have been evaluated and based upon overseas research available were found to be acceptable.

Construction noise and vibration impacts have been assessed and the 'worst case' scenarios modelled were found to be generally acceptable.

Blasting impact has been assessed and found to be acceptable. With a maximum instantaneous charge (MIC) of up to 20 kg, the airblast overpressure is anticipated to be below the acceptable level of 115 dB Linear for all existing residences. Similarly, vibration levels are anticipated to be well below the acceptable criteria.

Construction traffic noise impact has been assessed and the 'worst case' maximum construction traffic generated scenario would increase existing traffic noise levels along local roads by up to 4-7 dBA but due to the typically large setback of dwellings from the road network would result in noise level that would be considered acceptable under the ECRTN and RNP.

Subsequent to a request by the Department of Planning, due consideration has been paid to a number of the additional requirements of the proposed *Draft NSW Planning Guidelines Wind Farms – Appendix B: NSW Wind Farm Noise Guidelines* released in December 2011. These include consideration to separate daytime and night-time periods and alternative methods of evaluation for Special Audible Character.

13 CLOSURE

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Union Fenosa Wind Australia Pty Ltd. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

APPENDIX 4 – GTA Consultants Response to Traffic Related Submissions

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GTAconsultants

Reference: 15S1176000

26 November 2014

Union Fenosa Wind Australia
Suite 403, 68 York Street
SYDNEY NSW 2000

Attention: Mr. Shaq Mohajerani

Dear Shaq

RE: PALING YARDS WIND FARM – RESPONSE TO TRAFFIC RELATED SUBMISSIONS

The Transport Impact Assessment for the Paling Yards Wind Farm project was submitted as Appendix 10 of the Environmental Impact Statement (EIS), lodged by Union Fenosa Wind Australia[1]. The EIS was placed on public exhibition by the Department of Planning and Environment on 28 March 2014. In total, 22 submissions were received during the public exhibition period, some of which were related to traffic matters. The traffic related submissions were as follows:

- Oberon Council (ID 100345)
- Roads and Maritime Services (ID 100347)
- Upper Lachlan Shire Council (ID 098928)
- Community Submission (ID 98743)
- Community Submission (ID 98922)
- Community Submission (ID 99006)

GTA Consultants (GTA) was commissioned by Union Fenosa Wind Australia in October 2014 to further investigate the suitability of the proposed (oversize) heavy vehicle access route and the site access points on Abercrombie Road. This assessment is detailed below, with specific responses to transport related submissions included as Attachment 1.

Over-Dimensional Vehicle Transport Route

The use of Over-Dimensional (OD) vehicles would be required to transport large wind turbine components (blades, tower sections) to the Wind Farm site. As the final turbine supplier has not yet been selected, the EIS adopted a 'worst case scenario' which combined a range of potential vehicles required to transport the various wind turbine components. Further investigations have been undertaken as part of this assessment, using additional data provided by possible suppliers, with the following revised 'worst case scenario' defined:

- Maximum OD Vehicle Length: 66.5 metres
- Minimum Height Clearance: 5.5 metres

[1] Paling Yards, Transport Impact Assessment, URS Australia Pty Ltd, 10 April 2012

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- Minimum Road Width: 5.5 metres
- Maximum Road Gradient: 6%
- Maximum Road Crossfall: 2%

The EIS indicated that Bells Line of Road would be used as the proposed OD Transport Route across the Great Dividing Range. Following consultation with the RMS Special Permits, team it has been confirmed that this route is not supported. As such, the proposed use of the Great Western Highway (Route A32) has been investigated further.

It is likely that the Port Kembla shipping terminals would be the arrival location of the wind farm components. It is however noted that there is the option to use the Port of Newcastle for these activities. Discussion as to the suitability of the routes between these locations and the M7 Motorway were discussed within the EIS. Discussions with RMS officers indicate that there is no concern with transporting oversize loads between the above ports and the M7 Motorway, with such activities having occurred for other projects.

The proposed access route from the M7 Motorway is shown in Figure 1 and described as follows:

- M7 Motorway
- Turn onto the M4 Western Motorway (westbound) at Light Horse Interchange
- Continue onto the Great Western Motorway (A32) for 145 kilometres
- Turn left into Littlebourne Street (O'Connell Road) at Kelso
- Turn Right into Abercrombie Road at Oberon
- Continue for approximately 70 kilometres to the proposed development site.

The proposed route from Port Kembla to the development site can be undertaken in approximately 5 hours by car. It is however noted that it could take up to15 hours (based in an average speed of 25km/h) for the proposed oversize transport vehicles. Given the weather conditions that are apparent in the Blue Mountains during the winter months (ice/ snow), an assessment of the appropriate timing of vehicle movements should be undertaken in the Traffic Management Plan to be prepared for the works.

Figure 1: OD Transport Route between Port Kembla and Paling Yards

Source: Google Maps

As part of the route investigation, GTA undertook a "drive-through" and video recording of the route and liaised with the RMS Special Permits team to confirm the sections of the identified route that have been already approved and deemed appropriate for wind farm haulage and/or other oversize load requirements. The field investigations were conducted on Tuesday, 28 October 2014 to identify potential areas of concern and take measurements wherever necessary.

Investigations and vehicle swept path analysis on critical corners/ horizontal curves, indicate that the proposed route is feasible, with the following restrictions and conflict areas identified:

- The minimum available height clearance for vehicles is 5.5 metres, which is appropriate for the anticipated OD Transport vehicle load dimensions.
- Gradients along the route are in excess of the 6% maximum stated within the Worst Case OD transport vehicle requirements
- Road cross-falls on the route are in excess of the 2% maximum stated within the Worst Case OD transport vehicle requirements
- Vertical curve radii at several locations are smaller than the minimum 400m radius stated within the EIS 'worst case scenario' OD transport vehicle requirements
- Road widths and small radius curved have been identified at the following locations:
  - Great Western Highway – 2 km west of Mount Victoria
  - Great Western Highway – East and West of Hartley
  - O'Connell Road – 12km north of Oberon
- Temporary intersection modifications would be required at the following intersections:

- Great Western Highway and Littlebourne Street, Kelso
- O'Connell Road and Abercrombie Road, Oberon.

- There are limited passing opportunities on Abercrombie Road south of Oberon.

The matters raised above do not restrict the use of the proposed route for access to the Wind Farm site. However, further detailed consideration will be analysed once the turbine supplier and transport contractor has been selected. The majority of the matters raised could be overcome by vehicle selection or custom vehicle manufacture. Temporary road works would be required at a several locations, as identified above. This could involve the removal of barriers and/or trees, or the construction of temporary pavement/ roads.

The required treatment measures would be developed in consultation with RMS and the respective Councils along the route. These would be documented within a Traffic Management Plan to be prepared for the OD Transport movements and approved by RMS prior to the commencement of works. GTA has prepared an overview Table of Contents for a Traffic Management Plan, providing a brief description of the discussion under each Chapter. The Table of Contents has been included as Attachment 2.

It is also noted that RMS has planned road upgrade works along the Great Western Highway at Kelso and the Blue Mountains to be undertaken in the next 5 years. As part of the preparation and implementation of the Traffic Management Plan, the approved contractor would need to consult with RMS and road contractor(s) to maintain a suitable path of travel for the OD transport vehicles.

Site Access Locations

Further to the site access assessment provided with in EIS, an initial assessment of sight distances has been undertaken for all proposed access roads. It is noted that *Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections* sets out the sight distance requirements for intersections. The minimum sight distance required for a major road on approach to an intersection is defined by Safe Intersection Sight Distance (SISD). This is measured from the driver's eye height (1.1 metres) to the top of a car (1.25 metres) approaching on the major road or stopped at the intersection on the side road and is based on the existing posted speed limit on the major road. The Guide states a minimum SISD of 248m and 262m (for reaction times of 2 seconds and 2.5 seconds respectively) for the existing posted 100kph speed limit on the access roads to subject site.

An assessment for each access is outlined below and also shown graphically shown in Attachment 3.

Access 1

Access 1 would form a T-intersection with Abercrombie Road approximately 3km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, however it is anticipated to be at approximately 34^0 10'37"S and 149^{0}44'36"E. The eastern side of Abercrombie Road in the vicinity of Access 1 has mature non-native pine trees which would require clearing for the proposed

intersection. Upon visual inspection, it is anticipated that the SISD for the proposed intersection would be achievable. However, the final intersection location will need to consider the proximity of a horizontal curve to the north on Abercrombie Road as it may compromise the required SISD. Figure 2 and Figure 3 show Abercrombie Road in the vicinity of Access 1.

Figure 2: Access 1 (looking north)

Figure 3: Access 1 (looking south)

Access 2

Access 2 would form a T-intersection with Abercrombie Road approximately 4.5km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, however it is anticipated to be at approximately 34°09'49"S and 149°44'49"E. The eastern side of Abercrombie Road in the vicinity of Access 2 has mature non-native pine trees which would require clearing for the proposed intersection unless it is constructed further north into grassland. Upon visual inspection, it is anticipated that the SISD for the proposed intersection would be achievable. However, the presence of a steep horizontal curve followed by a gradual dip in the road to the north should be considered during detailed design. Figure 4 and Figure 5 show Abercrombie Road in the vicinity of Access 2.

Figure 4: Access 2 (looking north)

Figure 5: Access 2 (looking south)

Access 3:

Access 3 would form a T-intersection with Abercrombie Road approximately 5.2km north of the Abercrombie River crossing. The exact location would be finalised at the

detailed design stage, however it is anticipated to be at approximately 34°09'24"S and 149°44'46"E. The land on the western side of Abercrombie Road is elevated with a gradual slope towards the road. Upon visual inspection, it is anticipated that the SISD for the proposed intersection would be achievable. However, the final intersection location will need to take into consideration proximity of a horizontal curve followed by a gradual dip northwards on Abercrombie Road as it may compromise the required SISD. Figure 6 and Figure 7 show Abercrombie Road in the vicinity of Access 3.

Figure 6: Access 3 (looking north)

Figure 7: Access 3 (looking south)

Access 4 and Access 5:

Access 4 and Access 5 are located in close proximity to each other on Abercrombie Road and would form two staggered T-intersections approximately 7.5km north of the Abercrombie River crossing. The exact locations would be finalised at the detailed design stage, however they are anticipated to be at approximately 34°08'19"S and 149°45'70"E. Upon visual inspection, it is noted that the SISD for the proposed intersections may not be achievable due to presence of a crest in the road to the south. It is recommended that consideration be given to moving the accesses north of the currently proposed locations, so as to benefit from the generally straight road alignment with good visibility. Staggered intersections, in place of a four-way single intersection, is considered to be appropriate at this location so as to avoid any direct through movements between site accesses, which may potentially compromise road safety. Figure 8 and Figure 9 show Abercrombie Road in the vicinity of Accesses 4 and 5.

Figure 8: Access 4/5 (looking north)

Figure 9: Access 4/5 (looking North)

Access 6

Access 6 would form a T-intersection with Abercrombie Road approximately 10.5km north of the Abercrombie River crossing. The exact location would be finalised at the detailed design stage, however it is anticipated to be at approximately 34°07'32"S and 149°46'55"E. Both sides of Abercrombie Road in the vicinity of Access 6 have mature trees which would require clearing for the proposed intersection. It is anticipated that this would be no more than six trees. Upon visual inspection, it is anticipated that the SISD for the proposed intersection would be achievable. However, the final intersection location will need to take into consideration proximity of a gradual dip to the south on Abercrombie Road. Figure 10 and Figure 11 show Abercrombie Road in the vicinity of Access 6.

Figure 10: Access 6 (looking north)

Figure 11: Access 6 (looking south)

I trust the above assessment clearly sets out the proposed OD transport route and addresses concerns in relation to the proposed access locations. Naturally, should you have any questions or require any further information, please do not hesitate to contact me in our Sydney office on (02) 8448 1800.

Yours sincerely

GTA CONSULTANTS

B.T. Maynard.

Brett Maynard
Director

encl.

Attachment 1 – Responses to Transport Related Comments
Attachment 2 – Overview Traffic Management Plan Table of Contents
Attachment 3 – Site Access Locations

GTAconsultants

Attachment 1

Responses to Transport Related Comments

Table 1: EIS Submission Table

EIS Submission from (ID)	EIS Submission Comments	Response
Community (98743)	Unsuitability of Roads The main road between the town of Taralga and the Paling Yards proposed site is totally unsuitable for large transportation vehicles. The road is narrow, windy and has a very narrow creek crossing. The road surface is poor and there are often accidents due to the numerous blind spots in the road. It would [sic] negligent of the NSW Planning Authority to authorise the use of the road for the transportation of materials and turbine components. An examination of the road from Goulburn to Taralga will reveal the level of damage caused by transportation vehicles in the construction phase of the Taralga Wind Farm. Any development proposal should include the cost of a full road upgrade and replacement at the end of the construction phase.	Noted. Taralga Road would not be used for the transport of plant and equipment by over-dimensional vehicles, however may be used by light vehicles for access to the proposed development during construction and operation. A minor increase in light vehicle traffic would not impact road condition or safety.
Community (98922)	Unsuitability of Roads The main road between the town of Taralga and the Paling Yards proposed site is totally unsuitable for large transportation vehicles. The road is narrow, windy and has a very narrow creek crossing. The road surface is poor and there are often accidents due to the numerous blind spots in the road. It would [sic] negligent of the NSW Planning Authority to authorise the use of the road for the transportation of materials and turbine components.	Noted. Taralga Road would not be used for the transport of plant and equipment by over-dimensional vehicles, however may be used by light vehicles for access to the proposed development during construction and operation. A minor increase in light vehicle traffic would not impact road condition or safety.
Community (99006)	We have been advised that due the construction requirements of the building materials being delivered from the Goulburn Direction to the proposed development site that there is a requirement to have the road widened down the step decent of Taralga Road which borders our property. As the nature of the landscape is very steep, we have been advised that earth moving works will be required to cut into the boundary of our property to allow the road to be widened – this of course will take months or development work of jack hammering and cutting of the rock to sufficiently widen the road to accommodate trucks to pass. We've been advised that the legal descent for trucks to descend is 4 degrees however the decent on Taralga Road is current 5 degrees. Any development work will definitely have an impact on us while living there and the impact to our property boundaries to accommodate this requirement. We reject any access or use of our property in the event land is required to widen the road; suitable compensation should be discussed in the event this is required moving forward.	All heavy vehicle activity associated with the site would be to and from the north via Abercrombie Road. This will be included as part of the construction contractor's agreement, with a requirement to specifically identify appropriate material origins. As such, it is anticipated that no heavy vehicles will access the site via Taralga Road. Taralga Road may however be used by light vehicles for access to the proposed development during construction and operation. A minor increase in light vehicle traffic would not impact road condition or safety and would therefore not require any upgrade of Taralga Road.
Oberon Council (100345)	There is no concern about the volume of traffic expected to be generated by this development, given the low traffic volumes currently using Abercrombie Rd (which is the only Council controlled road to be used for access).	Noted.

EIS Submission from (ID)	EIS Submission Comments	Response
Oberon Council (100345)	From Section 3.1 of the EIS it appears that vehicles up to 64.4m long may be required to deliver components to the site. This will require special transport arrangements, presumably involving escort vehicles. Also the minimum height clearance required is 6 6m, which raises clearance concerns along Abercrombie Rd. The applicant will be required to determine this, and to make appropriate arrangements with Council and all other agencies to rectify any issue raised, including tree removal and possible relocation of power lines. If any trees are proposed to be lopped or removed, this will be required to be undertaken in consultation with Council. Any such works required will be at the applicant's cost.	Noted. Standard over-dimensional vehicle procedures (as required by RMS) would be used, including pilot vehicles as appropriate. As discussed in the additional route assessment undertaken by GTA Consultants, the minimum height clearance required for over-dimensional transport vehicles is 5.5 metres. An initial assessment indicates that all major structures provide this minimum clearance. However, a detailed assessment of all potential obstructions would be undertaken during the development of the Traffic Management Plan, in consultation with the relevant Council and RMS. Approval would be sought from Council before any road modification works are undertaken by the applicant, at the applicant's cost.
Oberon Council (100345)	The EIS states that the maximum gradient permitted is 6%, however some parts of Abercrombie Rd exceed this gradient. The applicant needs to justify how this issue will be dealt with.	A detailed Traffic Management Plan will be prepared in consultation with Council and RMS prior to any over-dimensional wind turbine component movements. The plan will detail measures to manoeuvre the components up grades steeper than 6%. This could include the use of additional prime movers to increase pulling power.
Oberon Council (100345)	The EIS does not specify the expected vehicle loadings, and whether the loadings may exceed the normal permissible legal loading for Abercrombie Rd or other roads Further information is requested relating to this issue and this may require pavement strength testing. The cost to repair any pavement damage must be borne by the applicant should the Department give approval to the development.	It is noted that Abercrombie Road is currently used by logging trucks to transport timber. A dilapidation assessment will be carried out on O'Connell Road and Abercrombie Road prior to any over dimensional component movements. Pavement strength testing and assessment will be undertaken (if required) once the final turbine supplier and transport contractor are known. The Applicant will consult with Council and agree on any appropriate pavement upgrades/ rehabilitation along Abercrombie Road, based on suitable criteria.
Oberon Council (100345)	The EIS specifies there will be six access points from Abercrombie Rd into the development site; however the descriptions of the locations are not sufficient to accurately determine them on site. It is requested that they be marked on site to enable sight distances to be checked. Further information is also requested as to whether all six will remain as permanent accesses, or will they be in place only during the construction phase If they are only temporary, sight distance is not considered to be as critical. However traffic control may be required when they are in use.	Additional details of the access locations have been provided within the assessment undertaken by GTA Consultants, with detailed designs required to demonstrate appropriate sight distances. This includes the coordinates and photos of each access location. All access locations are to remain accessible post construction to allow for maintenance and inspection of the turbines.
Oberon Council (100345)	Accurate identification of the access locations is also important to determine if any significant vegetation will need to be cleared and to enable Council to set any conditions on their design.	Additional details of the access locations have been provided within the assessment undertaken by GTA Consultants. This includes the coordinates and photos for each access location.
Oberon Council (100345)	The EIS states that in two locations the new accesses will form a "crossroads" on Abercrombie Rd (accesses are opposite each other). This is not desirable, but can be avoided with just a small offset between the two accesses.	Access 4 and Access 5 would be constructed as staggered T-intersections to improve safety at these locations; details of which will be determined during detailed design.

EIS Submission from (ID)	EIS Submission Comments	Response
RMS (100347)	The selected road transportation routes for materials from Port Kembla and Port of Newcastle to the site assumes access from Sydney using Bells Line of Road (MR 184) and possibly Great Western Highway (HW5). Access across the Great Dividing Range for over size/over mass and some low loader vehicles is not possible using Bells Line of Road and may not be possible using Great Western Highway. Transportation access from east to west by road will need to be obtained, subject to approval, via roads other than Bells Line of Road. In developing new routes, the proponent is strongly encouraged to consult with Roads and Maritime Special Permits Unit on 1300 656 371.	RMS Special Permits branch has been consulted and an assessment of the proposed over-dimensional transport route via Great Western Highway (A32) is provided in the additional assessment undertaken by GTA Consultants. The use of Great Western Highway is feasible, however a number of potential conflicts have been identified. A detailed Traffic Management Plan and scope of any road modification works would be developed in consultation with RMS and respective Council prior to any over-dimensional wind turbine component movements.
RMS (100347)	The applicant has stated that final transportation routes will be determined as part of the development of and approval of a Traffic Management Plan (TMP). Access to the site, particularly for over size and over mass vehicles, is critical to the establishment of the proposed wind farm and transportation routes for these and other types of vehicles should be determined as part of the development application process.	RMS Special Permits branch has been consulted and an assessment of the proposed over-dimensional transport route via Great Western Highway (A32) is provided in the additional assessment undertaken by GTA Consultants. The use of Great Western Highway is feasible, however a number of potential conflicts have been identified. A detailed Traffic Management Plan and scope of any road modification works would be developed in consultation with RMS and respective Council prior to any over-dimensional wind turbine component movements.
RMS (100347)	The Transport Impact Assessment (TIA) lacks a robust assessment of alternate methods of transportation of materials to the site (e.g. rail). Partial usage of alternative transport methods would minimise disruption to traffic using the State road network.	Due to the alignment of the rail corridor over the Blue Mountains, the transport of turbine components via rail is not possible. The potential to transport components to the site via air is not considered cost effective at the moment; however such an assessment will be included within the Traffic Management Plan, which will be prepared prior to any over-dimensional component movements.
RMS (100347)	The TIA does not provide an assessment of tourist traffic generated by the proposed development. Roads and Maritime's previous experience with wind farms has shown that viewing platforms with wind farm information available at strategic locations allows motorists to safely pull off the road to view wind turbines and minimises unsafe viewing and driving practices.	It is not anticipated that significant additional tourist traffic would be generated by the proposed development, due to the site location. However, any existing tourist traffic on Abercrombie Road may desire to stop and view the turbines. As such, a viewing platform is proposed to be provided north of Access 4/5 to allow tourists to safely pull over off the road and view the wind turbines. Details of the proposed viewing platform and road interface will be determined during detailed design, seeking the relevant approvals in conjunction with the access roads.

EIS Submission from (ID)	EIS Submission Comments	Response
RMS (100347)	Cumulative impacts provided in the supporting documentation focuses on other wind farms in the region and not on other developments/works such as mining proposals and road upgrades. For example, in the event that the Great Western Highway is proven to be a suitable transportation route, upgrades at Kelso and Forty Bends will impact on transportation of materials, staff, etc to the site.	The cumulative impacts of the project and other developments/ works will be assessed as part of the Traffic Management Plan prepared for the transport of over-dimensional wind turbine components. Such an assessment will be more relevant once the project timing is better understood. The approved transport contractor will consult with RMS and relevant contractors undertaking works on the Great Western Highway to maintain a suitable path of travel for the OD transport vehicles during wind farm construction.
RMS (100347)	No detail of intersection upgrades to accommodate over-size/over-mass vehicles has been provided. The applicant has stated that details of intersection and access upgrades will be provided in the TMP.	Additional assessment of the proposed OD transport route has identified several locations at which modification works may be required, including: Great Western Highway – 2 km west of Mount Victoria Great Western Highway – East and West of Hartley Great Western Highway and Littlebourne Street intersection, Kelso O'Connell Road – 12km north of Oberon O'Connell Road and Abercrombie Road intersection, Oberon. The extent of the upgrade works required will not be known until the final wind turbine supplier and transport contractor is known. The upgrade works would be undertaken in consultation with RMS and the relevant council and detailed within the Traffic Management Plan to be prepared.
RMS (100347)	Prior to the commencement of construction works, a Traffic Management Plan (TMP) shall be prepared for the project in consultation with and approved by Oberon Council and Roads and Maritime Services. The TMP shall identify the proposed route(s) and associated impacts (temporary street closures, removal and replacement of road infrastructure, upgrading of road infrastructure, etc.) which will be required in order for necessary materials and machinery to be delivered to the site. The TMP shall include assessment of high risk locations that prevent safe two-way passage of traffic and how traffic movements are to be negotiated, projected delays experienced by traffic on affected roads (origin to destination), cumulative impacts and mitigating measures to be employed. The applicant is to be accountable for transport operations complying with the TMP as well as the haulage contractor.	Noted. A Traffic Management Plan and associated Traffic Control Plans will be prepared in consultation with RMS and respective Councils. A draft Table of Contents is provided in Attachment 2.

EIS Submission from (ID)	EIS Submission Comments	Response
RMS (100347)	Prior to any haulage requiring over-size/over mass vehicles and loads the proponent will be required to obtain special permits. To obtain a permit, the proponent will need to contact Roads and Maritime's Special Permits Unit in Glen Innes on 1300 656 371; The requirements outlined in Roads and Maritime's publication Operating Conditions: specific permits for oversize and over mass vehicles and loads are to be followed. This publication is available online at: www.rms.nsw.gov.au/heavyvehicles/oversizeovermass.	Noted. The Applicant will obtain all permits required to carry out works within the public road.
RMS (100347)	If any parts of the proposed transport routes on classified roads are unable to cater for the project related traffic and transport, the proponent is required to improve such part of the road to safely cater for the length, size and volume of vehicles and their loads and to protect the integrity of the classified road network. This may include the proponent constructing stopping bays (suitable hard stand areas) at distances and dimensions determined by Roads and Maritime. These areas would be required along proposed routes to allow following vehicle queues to pass. Upgrades of the road network shall be determined following submission of the TMP and constructed prior the commencement of construction works.	Noted. A Traffic Management Plan and associated Traffic Control Plans will be prepared in consultation with RMS and respective Councils. This would include details of road upgrade works would be carried out at the cost of the Applicant. A draft Table of Contents is provided in Attachment 2.
RMS (100347)	Prior to any work on the State classified road network, the proponent will be required enter into a formal agreement in the form of a Works Authorisation Deed with Roads and Maritime Services.	Noted. The Applicant will enter into a Works Authorisation Deed with the RMS for all works on classified State Roads.

EIS Submission from (ID)	EIS Submission Comments	Response
RMS (100347)	Any disturbances to traffic lanes, shoulders, verges or other disturbance within the road reserve of classified roads are to be reinstated to pre-existing or better condition. This includes any impact on the road pavement, culverts, bridges, causeways, signage and traffic islands.	Noted. The Applicant would reinstate all areas disturbed by the transport of wind farm components to pre-existing or better condition.
RMS (100347)	Prior to the commencement of haulage operations, a full and independent risk analysis and inspection of the transport route(s) is required and a copy of the analysis is to be supplied to Roads and Maritime Services. Further analysis and reporting to assess possible damage to and repair of the route will be required on a regular basis and at completion of construction works.	Noted. An independent risk analysis and inspection of the transport route will be carried out prior to the commencement of haulage operations (noting that a preliminary assessment has now been carried out by GTA Consultants. Further analysis and reporting would be completed as required to comply with any reasonable request of RMS.
RMS (100347)	Roads and Maritime requires a commitment from the proponent to provide funding for the maintenance and repair of any affected classified roads for the duration of transportation of over size and over mass vehicles and loads, to the satisfaction of Roads and Maritime. The commitment to fund maintenance and repairs shall be included in the TMP.	Noted. The Applicant will commit to funding the maintenance and repair of any roads damaged through the transport of wind farm components. Details of this commitment would be included as part of the Traffic Management Plan to be prepared for the project.
RMS (100347)	Vehicles transporting loads will not be permitted to travel in convoys or platoons unless specifically permitted by the relevant roads authority and/or Roads and Maritime.	Noted. This condition will be included in the Traffic Management Plan to be prepared for the project.
RMS (100347)	Convenient and easily accessible areas shall be identified and appropriate facilities provided for members of the public to safely view wind turbines.	Noted. A viewing platform will be provided north of Access 4/5 to allow tourists to safely pull off the road and view the wind turbines.
RMS (100347)	All arrangements for the control of traffic on classified roads are to be in accordance with Roads and Maritime's publication Traffic Control at Work Sites. A Road Occupancy Licence will be required prior to any works commencing within three (3) metres of the traffic lanes of state classified roads and submission of a TMP will be part of Road Occupancy Licence(s).	Noted. The proponent will obtain a Road Occupancy Licence from the RMS (or Council equivalent) prior to commencing any works on or near public roads. All works will be carried out in accordance with Traffic Control at Work Sites manual, by suitably qualified personnel.
Upper Lachlan Shire Council (98928)	Upper Lachlan Shire Council (ULSC) has studied the Environmental Impact Statement and other documentation associated with the Paling Yards Wind Farm Development. Whilst Council acknowledges that the proponent plans to limit its use of the ULSC road network, Council has concerns that even this limited use proposal will have the potential to damage the road assets that are owned by the community in addition to posing a threat to the safety of existing road users.	Taralga Road would not be used for the transport of plant and equipment by over-dimensional vehicles, however may be used by light vehicles for access the proposed development during construction and operation. A minor increase in light vehicle traffic would not impact road condition or safety.

EIS Submission from (ID)	EIS Submission Comments	Response
Upper Lachlan Shire Council (98928)	Council is concerned that the information regarding Over Dimension, Over Mass and Heavy Haulage routes appears to be inconsistent. Council has sought advice from an experienced heavy haulage operator who considers that all of the routes favoured in the report are long, unwieldy, have areas where the heavy haulage parameters would be exceeded (in terms of cross fall and longitudinal grades) as well as being uneconomical. The comparison with B-Double routes is unrealistic as each type of vehicle is allowed to use (or restricted from using) particular routes depending on characteristics that are unique to each type of vehicle. The operation of vehicles carrying OD and OM loads is significantly different to both 19m and 26mB-Doubles (19mB-doubles have general access rights that allow them to travel on roads that are used by conventional semi-trailers). It may also be of significant benefit to the developer and the wider community to upgrade the Abercrombie River Bridge, approaches roads and use MR256 for all vehicles to access the site. Should the proponent wish to use the route involving MR256, ULSC will require that the Abercrombie River Bridge be replaced and the associated roadway upgraded as necessary.	Noted, Taralga Road would not be used by over-dimensional vehicles.
Upper Lachlan Shire Council (98928)	ULSC is also concerned with the lack of commitment from the developer in relation to the route that is likely to be used for light traffic to access the site. The Transport Impact Assessment states that 85.9% of the personnel on site each day will travel from the Goulburn/Canberra area. Unfortunately, it fails to identify which route will be used by these people to access the site. Obviously, most staff will be seeking to use MR256 for this purpose. ULSC has concerns regarding the use of MR256 as several areas of substandard road (pavement strength and alignment) exist between Taralga and the Abercrombie River. Table 4.1of the T.I.A. assesses peak light traffic as being 120 movements per day; however this is assessed in one direction only. The base traffic is shown in two directions. Using this information after it has been corrected (multiplied by two), the light traffic on MR256 will almost double. Whilst, in absolute terms, the additional traffic may not cause problems with intersections and "traffic lights "and the road may have enough theoretical capacity, in relative terms the everyday existing users will have trouble in coping with these changes. This will be exacerbated when the existing traffic and development traffic will travel in opposing directions during the am and pm peaks. This additional traffic has the potential to cause significant conflicts for users of the existing road network.	It is anticipated the project could generate up to approximately 168 two-way vehicle trips per day associated with site personnel during the construction period. There is also anticipated be an additional 40 two-way vehicle trips per day associated with construction vehicle traffic. Construction vehicle traffic would arrive and depart from the north via Abercrombie Road. Trips associated with personnel could approach from both directions. Based on the assumption that 86% of personnel would approach the site from the south, this equates to an additional 73 trips during any peak hour. It is acknowledged that this could represent a high relative change in current traffic volumes to the south along Taralga Road and Richlands Road. However, absolute traffic volumes on these roads are anticipated to continue to operate within acceptable bounds. Although this could affect safety and associated risks of crashes on these roads, the relative risk is anticipated to remain low. Appropriate communication with the local community and other existing road users through signage and other media would assist in minimising such risks. Some additional warning signage at specific areas of concern (e.g. locations of substandard alignment) could be installed at the Applicant's expense.

EIS Submission from (ID)	EIS Submission Comments	Response
Upper Lachlan Shire Council (98928)	It may be necessary to impose speed limits on parts of the public road network to ensure that the interaction of construction traffic with existing traffic occurs in a safe manner.	A Traffic Management Plan and associated Traffic Control Plans will be prepared to manage traffic impacts and safety during construction. The operation of the site access points would be considered as part of this and appropriate measures implemented to maintain safety on Abercrombie Road.
Upper Lachlan Shire Council (98928)	ULSC is concerned that the proponent has not identified potential sources for road making gravels, concreting aggregates, cement and reinforcing steel. The documents assume that these materials will be delivered to the site from the north, but fails to provide evidence to indicate how this will be achieved and policed. Unfortunately, the transport of these materials has the greatest potential to damage the local road network (as well as reducing road safety for existing users). Viable suppliers of these materials exist in Goulburn, Crookwell, Berrima and Canberra. In addition to this, the proponent may be able to source gravel for internal roadworks from roadside earthworks involved in improving MR 256 which could provide cost savings for the development as well as road improvements for the benefit of the community.	All transport of heavy materials is to access the site to and from the north via Abercrombie Road. This would be included as part of the construction contractor's agreement, with a requirement to specifically identify material origins. As such, it is anticipated that no heavy vehicles will access the site via Taralga Road.
Upper Lachlan Shire Council (98928)	Council does not favour the utilization of 'laser car' dilapidation reports in assessing the condition of the roads prior to and after construction. These reports are mainly suited to a broader assessment of a larger scale road network and lack adequate detail to identify smaller pavement repairs that may be required. Instead of this process, Council prefers to have a joint inspection and agreement that relies on photographs to identify pre-existing faults in the pavement.	Noted. It is not expected that dilapidation reports would be required for the use of roads by light vehicles only. However, the applicant will conduct any dilapidation reporting by joint inspection and agreement where necessary.
Upper Lachlan Shire Council (98928)	The proponent shall be required to produce a Transport Management Plan before consent is granted. This is to ensure that the required due diligence (and appropriate consultation with stakeholders) has been carried out in relation to any transport issues that might arise.	Noted. A Traffic Management Plan and associated Traffic Control Plans will be prepared in consultation with RMS and respective Councils. A draft Table of Contents is provided in Attachment 2.

Attachment 2

Overview Traffic Management Plan Table of Contents

Transport Management Plan

Table of Contents

Chapter 1: Introduction

An introduction to the proposal and subject site followed by the need for Transport Management Plan. The description would entail particulars such as vehicle and load details and anticipated project timelines - construction, operation and dismantling.

Chapter 2: Existing Site Conditions

An overview of existing road network and its condition, introduction to RMS heavy vehicle access route network in the vicinity of subject site, identification of available vehicle access routes and review of reported casualty accident history.

Chapter 3: Construction Arrangements

Detailed description pertaining to anticipated project timelines, construction material source locations, site layout, site access routes, anticipated internal site road network and car parking arrangements.

Chapter 4: Vehicle Access to Subject Site

Description of types of vehicles (over-dimensional, other heavy and light) anticipated to access site, estimated trips generation at construction, operation and dismantling stages. An assessment of likely impact on additional trips generated on existing road network.

Chapter 5: Survey of Proposed Route

Tabular representation of potential hazard locations with their approximate chainage, photograph and recommended traffic management measures.

Chapter 6: Mitigation Measures and Maintenance Schedule

An overview of anticipated road works on proposed route/s, mitigation measures for any vegetation and overhead utility obstructions and identification of requisite over-dimensional vehicle loads. A brief insight on recommended monitoring and maintenance schedule.

Chapter 7: Communication and Consultation

Detailed information pertaining to anticipated rest locations, contact details, emergency procedure, communication protocol and consultation process with affected community.

Appendix A: Photographic evidence of existing road conditions (potholes, deterioration, etc.) and surrounding environs (overhanging vegetation, developments, etc.)

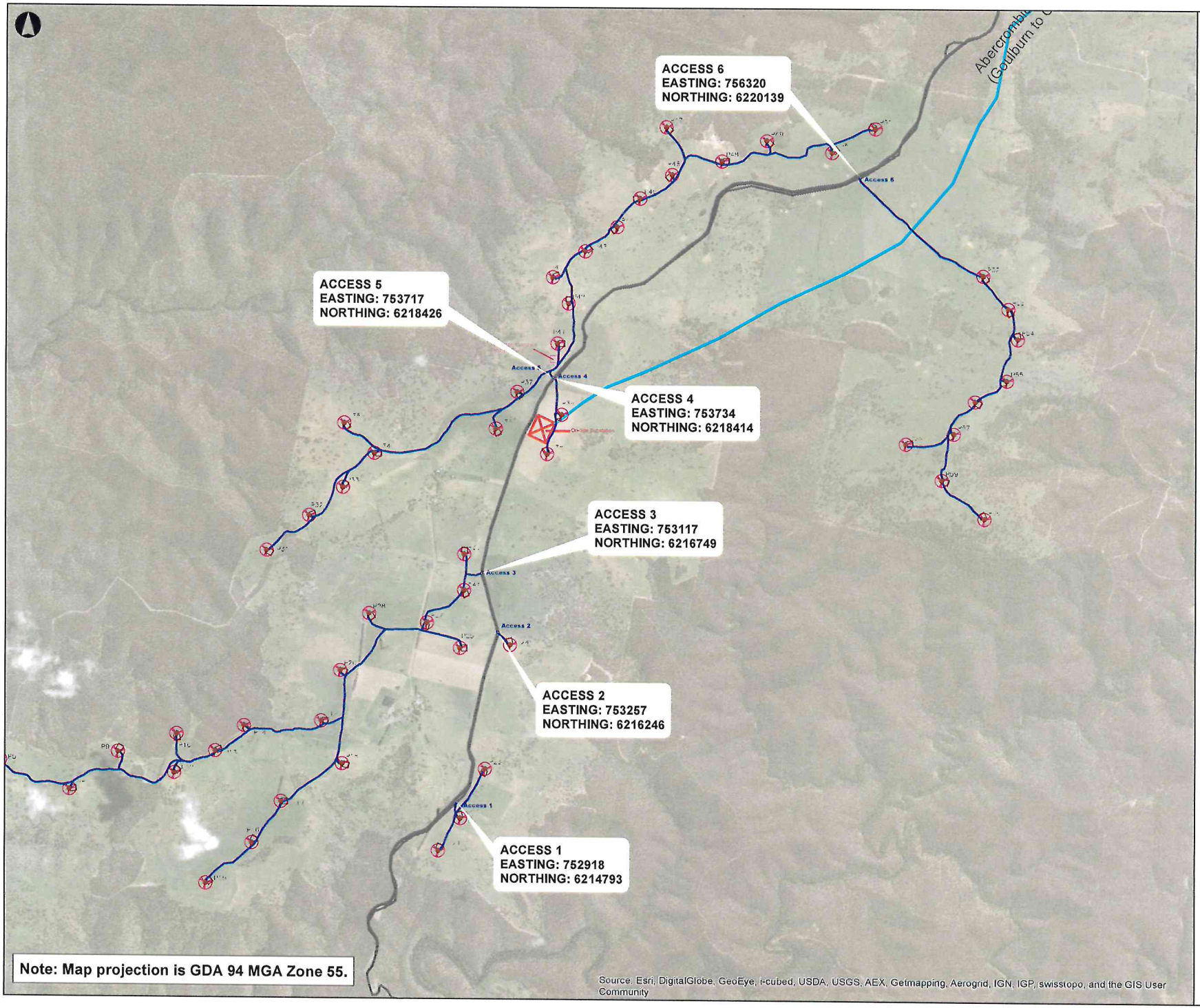
Appendix B: Swept Path Analysis plans at major intersections and pinch points.

Appendix C: Traffic Control Plans

Appendix D: Letters of concurrence and consultation with RMS, and respective Councils.

Attachment 3

Site Access Locations



Legend

Issue	Date	By	Chkd	Appd
P1	31-10-14	BLL	CDW	BDM

Metres
0 400 800 1,600

GTAconsultants
www.gta.com.au

Client
Union Fenosa Wind Australia Pty Ltd

Job Title
Paling Yards Wind Farm

Drawing Title
Access Locations

Scale at A3
1:30,000

Drawing Status
Preliminary

Job No	Drawing No	Issue
15S1176000	001	P1

APPENDIX 5 – GTA Route Assessment

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REF: N188670

DATE: 27 March 2020

Global Power Generation Australia Pty Ltd
Suite 4, Level 3, 24 Marcus Clarke Street
CANBERRA ACT 2600

Attention: Guillermo Alonso (Engineering Manager)

Dear Guillermo,

RE: PALING YARDS WIND FARM – ROUTE ASSESSMENT

Global Power Generation Australia commissioned GTA Consultants (GTA) in March 2020 to review and reassess the proposed Restricted Access Vehicle (RAV) transport route for the proposed Paling Yard Wind Farm project location south of Oberon, NSW.

An initial review of possible transport routes was carried out by GTA Consultants in November 2014. The outcome of this was the selection to use the transport route from the M7 Motorway as follows:

- M7 Motorway
- Turn onto the M4 Western Motorway (westbound) at Light Horse Interchange
- Continue onto the Great Western Motorway (A32) for 145 kilometres
- Turn left into Littlebourne Street (O'Connell Road) at Kelso
- Turn Right into Abercrombie Road at Oberon
- Continue for approximately 70 kilometres to the proposed development site.

Investigations and vehicle swept path analysis on critical corner/s horizontal curves indicated that the proposed route was feasible, however there were several restrictions and conflict areas which would need to be further investigated once the final transport vehicle was selected.

In 2015, RMS had requested that additional details of potential road upgrade works be reviewed prior to approval to ensure that suitable mitigations work are able to be implemented, in particular at the following locations:

- Road widths and small radius curves have been identified at the following locations:
  - Great Western Highway – 2 km west of Mount Victoria
  - Great Western Highway – East and West of Hartley
  - O'Connell Road – 12km north of Oberon
- Temporary intersection modifications would be required at the following intersections:
  - Sydney Road and Littlebourne Street, Kelso
  - O'Connell Road and Abercrombie Road, Oberon.

This letter outlines the detailed swept path analysis at these locations and potential mitigations works based on the new transport vehicle transport route reassessment.

It is noted that a Traffic Management Plan (TMP) would be prepared prior to the transport of any blades. This would be done in consultation with Transport for NSW (formerly

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SYDNEY NSW 2000
t// +612 8448 1800
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www.gta.com.au

Road and Maritime Services) and affected Councils. To minimise the impacts of the blade delivery, the TMP would set out strategies and processes to maintain the safety and performance of the local road networks. The TMP would also include commentary on escort vehicles (including by police) and temporary restrictions required to manage conflicts so all intersections are clear from parking and oncoming traffic.

Restricted Access Vehicles (RAVs)

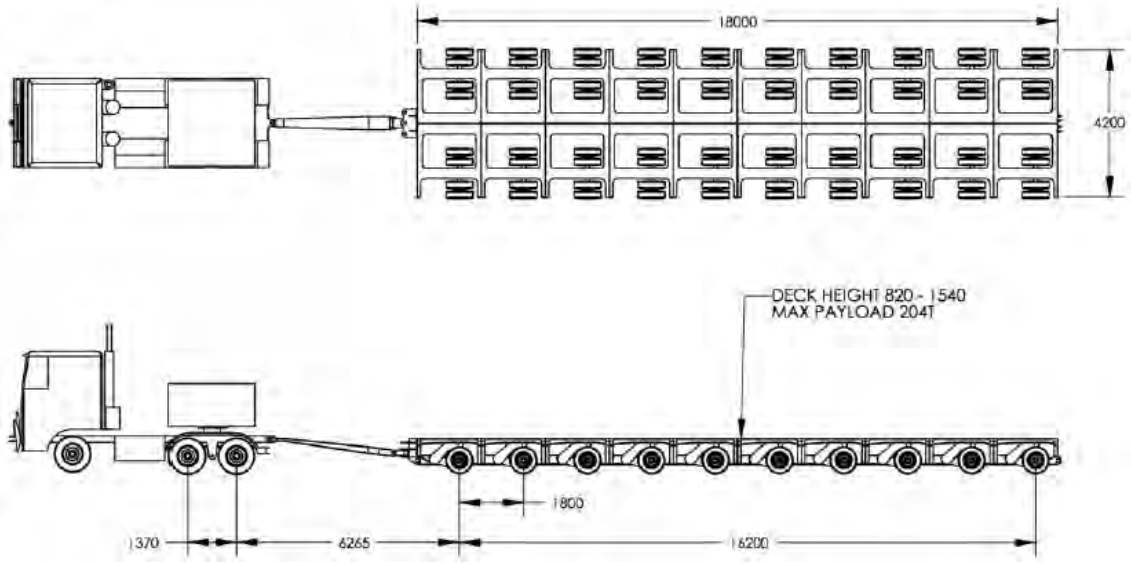
RAVs (i.e. oversize and overmass vehicles) will be used to deliver the turbine components to the project area.

Whilst RAVs will contribute the smallest percentage of trips to the project area during the construction period, they will be the most critical from a vehicle access perspective. As the final turbine supplier has not yet been selected, a 'worst case scenario' which combines a range of potential vehicles required to transport the various wind turbine components has been adopted.

For the purpose of this assessment, a vehicle configuration for transporting a 67 metres long blade has been assumed. GTA previously conducted a swept path assessment in 2015 with a 70.8 metre vehicle which consisted of a fixed axle pair approximately two thirds along the blade's length. With recent wind turbine blade transport vehicle advancement, an 18 metres long trailer fitted with hydraulic mechanisms to hold the wind turbine blade, with a prime mover has been selected for the purpose of this assessment. The dimensions of the vehicle used for this assessment is shown in Figure 1 and has a total length of 31.27 metres. This has been developed based on haulage supplier specifications.

It is understood this vehicle is available through a number of haulage contractors

Figure 1: Proposed Design Vehicle



Vehicle swept paths, contained in Attachment 1, have been developed using AutoTURN with the following line colours for the vehicle profile:

- Black: centreline of tractor body
- Grey: vehicle tyre paths
- Blue: outer body envelope path
- Orange (dashed): 0.6m clearance envelope

Swept Path Analysis and Mitigation Works

GTA has undertaken swept path assessments using AutoTURN of the following key locations along nominated transport route. This section summarises the assessment, which has identified existing constraints that would need to be temporarily removed or require mitigation measures to allow the RAV safe passage:

- Great Western Highway – 2 km west of Mount Victoria
- Great Western Highway – East and West of Hartley
- O'Connell Road – 12km north of Oberon
- Great Western Highway and Littlebourne Street intersection, Kelso
- O'Connell Road and Abercrombie Road intersection, Oberon.

Given the amount of road space that the RAVs require to pass through critical horizontal curves, they will be accompanied by pilot vehicles, with affected road sections to include appropriate traffic management measures. The swept path assessments are detailed in the following sections and provided in Attachment 1.

Great Western Highway – 2km west of Mount Victoria

An assessment of the RAV swept path travelling from Mount Victoria to Hartley on the Great Western Highway indicates the following:

- For the majority of the route, the RAV would be able to travel on the appropriate side of the road.
- At the first hairpin turn, just north of the Mitchell Ridge Lookout, the wind turbine blade will protrude around the bend.
- The RAV encroaches on the opposite lane along the horizontal curve located approximately 700 metres west of the first hairpin turn.
- It should be noted that this section of the highway has gradients of up to 1:8.

Great Western Highway – East and West of Hartley

This section of the route assessed indicates that the RAV would be able to travel through Great Western Highway without the need for mitigations works.

O'Connell Road – 12km north of Oberon

This section of the route assessed indicates that the RAV would be able to travel through O'Connell Road without the need for mitigations works.

Sydney Road and Littlebourne Street Intersection (Roundabout) – Kelso

The intersection of Sydney Road and O'Connell Street in Kelso is a roundabout with an approximate 58 metre diameter inscribed circle. Swept paths indicate that the RAV would be able to travel through the roundabout without the need for mitigations works.

Abercrombie Road and O'Connell Street Intersection (Roundabout) – Oberon

The intersection of O'Connell Road and Abercrombie Road to the west of Oberon is a roundabout with an approximate 32 metre diameter inscribed circle. Swept paths indicate that the RAV would be able to travel through the roundabout without the need for mitigation works.

I trust this assessment appropriately details the swept path analysis of the Restricted Access Vehicle for the 67m blade at key locations along the proposed transport route.

Naturally, should you have any questions or require any further information, please do not hesitate to contact me on (02) 8448 1800.

Yours sincerely

GTA CONSULTANTS

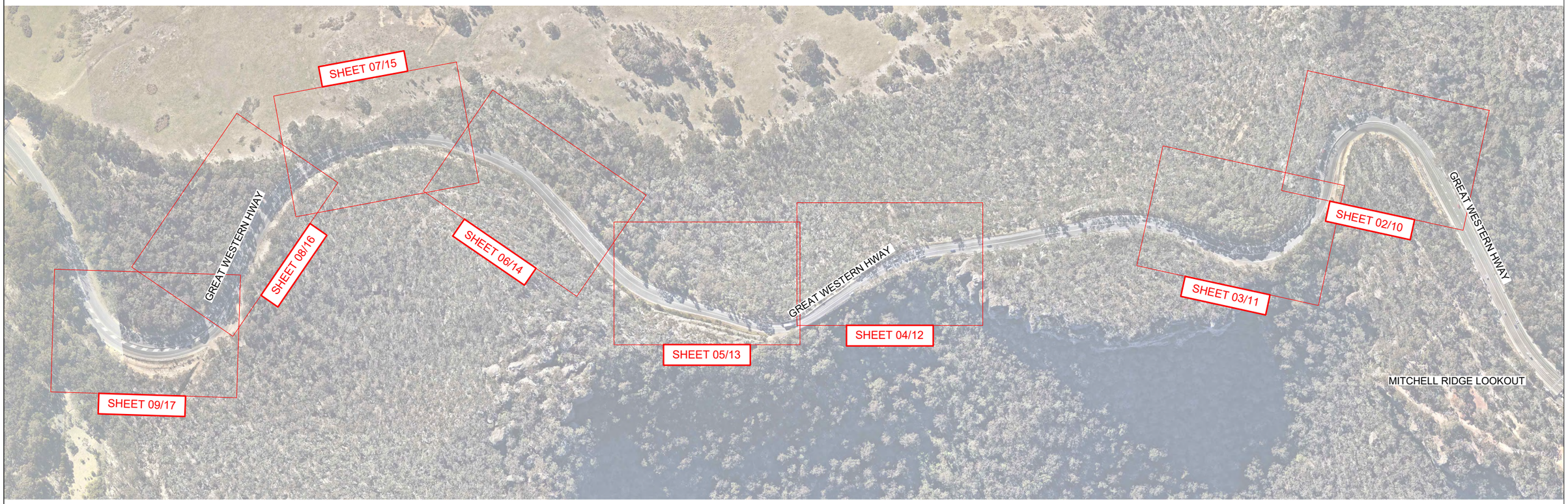
Dora Choi
Associate Director

encl.

Attachment 1 - Swept Path Assessment

ATTACHMENT 1

Swept Path Assessment



\\GTA.COM.AU\PROJECTFILES\PROJECTFILESSYD\N18600-18899\N188670 PALING YARDS WIND FARM - UPDATED\CAD\N188670-SK01-P1.DWG PLOTTED BY GRETCHEN PANIEL ON 17/03/2020 AT 15:04

GTA consultants
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Adelaide	08 8334 3600
Perth	08 6169 1000

nearmap.com

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY
SUBJECT TO CHANGE WITHOUT NOTIFICATION

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED	G. PANIEL
DESIGN CHECK	D. CHOI
APPROVED BY	D. CHOI
DATE ISSUED	12 MARCH '20
SCALE	A3 - N/A
CAD FILE NO.	N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
COVER SHEET - KEY PLAN

DRAWING NO. N188670-SK01-01 SHEET 1 OF 17 ISSUE P1

WIND TURBINE BLADE
PROTRUDED AROUND BEND

960 Series 10x8 Platform Trailer
Custom

GREAT WESTERN HWAY

960 Series 10x8 Platform Trailer
Custom

N

SWEPT PATH KEY

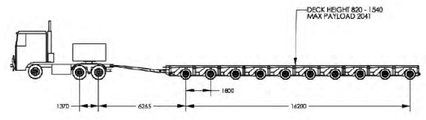
VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE
FROM VEHICLE BODY

ASSUMED SPEED 15km/h



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SUBJECT TO CHANGE WITHOUT NOTIFICATION

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED G. PANIEL
DESIGN CHECK D. CHOI
APPROVED BY D. CHOI
DATE ISSUED 12 MARCH '20

SCALE A3 0 2.5 5 10 1:500

CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-02 SHEET 02 OF 17 ISSUE P1

\\GTA.COM.AU\PROJECTFILES\PROJECTFILESSYD\N18800-18899\N188670 PALING YARDS WIND FARM - UPDATED\CAD\N188670-SK01-P1.DWG PLOTTED BY GRETCHEN PANIEL ON 17/03/2020 AT 15:04

SWEPT PATH KEY

VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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SCALE A3 0 2.5 5 10 1:500

CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-03 SHEET 03 OF 17 ISSUE P1

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SWEPT PATH KEY

VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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APPROVED BY D. CHOI
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SCALE A3 0 2.5 5 10 1:500
CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-04 SHEET 04 OF 17 ISSUE P1

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SWEPT PATH KEY

VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

\\GTA.COM.AU\PROJECTFILES\PROJECTFILESSYD\N18600-18899\N188670 PALING YARDS WIND FARM - UPDATED\CAD\N188670-SK01-P1.DWG PLOTTED BY GRETCHEN PANIEL ON 17/03/2020 AT 15:04

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DESIGNED	G. PANIEL
DESIGN CHECK	D. CHOI
APPROVED BY	D. CHOI
DATE ISSUED	12 MARCH '20

SCALE A3 0 2.5 5 10 1:500

CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-05 SHEET 05 OF 17 ISSUE P1

\\GTA.COM.AU\PROJECTFILES\PROJECTFILESSYD\N1800-1899\N1886?0 PALING YARDS WIND FARM - UPDATED\CAD\N188670-SK01-P1.DWG PLOTTED BY GRETCHEN PANIEL ON 17/03/2020 AT 15:04

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 15km/h

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SCALE A3 0 2.5 5 10 1:500

CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-06 SHEET 06 OF 17 ISSUE P1

SWEPT PATH KEY

VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-07 SHEET 07 OF 17 ISSUE P1

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-08 SHEET 08 OF 17 ISSUE P1

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SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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CAD FILE NO. N188670-SK01-P1.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK01-09 SHEET 09 OF 17 ISSUE P1

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SCALE A3 0 25 50 100 1:5000
CAD FILE NO. N188670-SK02-P1_FINAL.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
COVER SHEET - KEY PLAN

DRAWING NO. N188670-SK02-01 SHEET 1 OF 15 ISSUE P1

SWEPT PATH KEY

VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 15km/h

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PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-02 SHEET 02 OF 15 ISSUE P1

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SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-03 SHEET 03 OF 15 ISSUE P1

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GREAT WESTERN HWAY

N

960 Series 10x8 Platform Custom Trailer

SWEPT PATH KEY

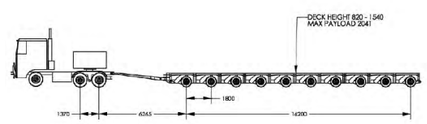
VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h



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PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-04 SHEET 04 OF 15 ISSUE P1

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SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 15km/h

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CAD FILE NO. N188670-SK02-P1_FINAL.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-05 SHEET 05 OF 15 ISSUE P1

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SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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CAD FILE NO. N188670-SK02-P1_FINAL.DWG

PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-06 SHEET 06 OF 15 ISSUE P1

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SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-07 SHEET 07 OF 15 ISSUE P1

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SWEPT PATH KEY

VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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PALING YARDS WIND FARM

GREAT WESTERN HIGHWAY
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK02-08 SHEET 08 OF 15 ISSUE P1

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SYDNEY ROAD

SYDNEY ROAD

LITTLEBOURNE STREET

960 Series 10x8 Platform Trailer

960 Series 10x8 Platform Trailer Custom

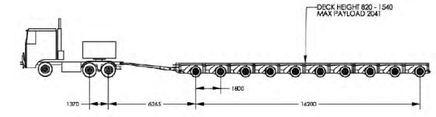
960 Series 10x8 Platform Trailer

N

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h



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APPROVED BY D. CHOI
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SCALE A3 0 5 10 20 1:1000

CAD FILE NO. N188670-SK03-P1.DWG

PALING YARDS WIND FARM

VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK03-01 SHEET 01 OF 02 ISSUE P1

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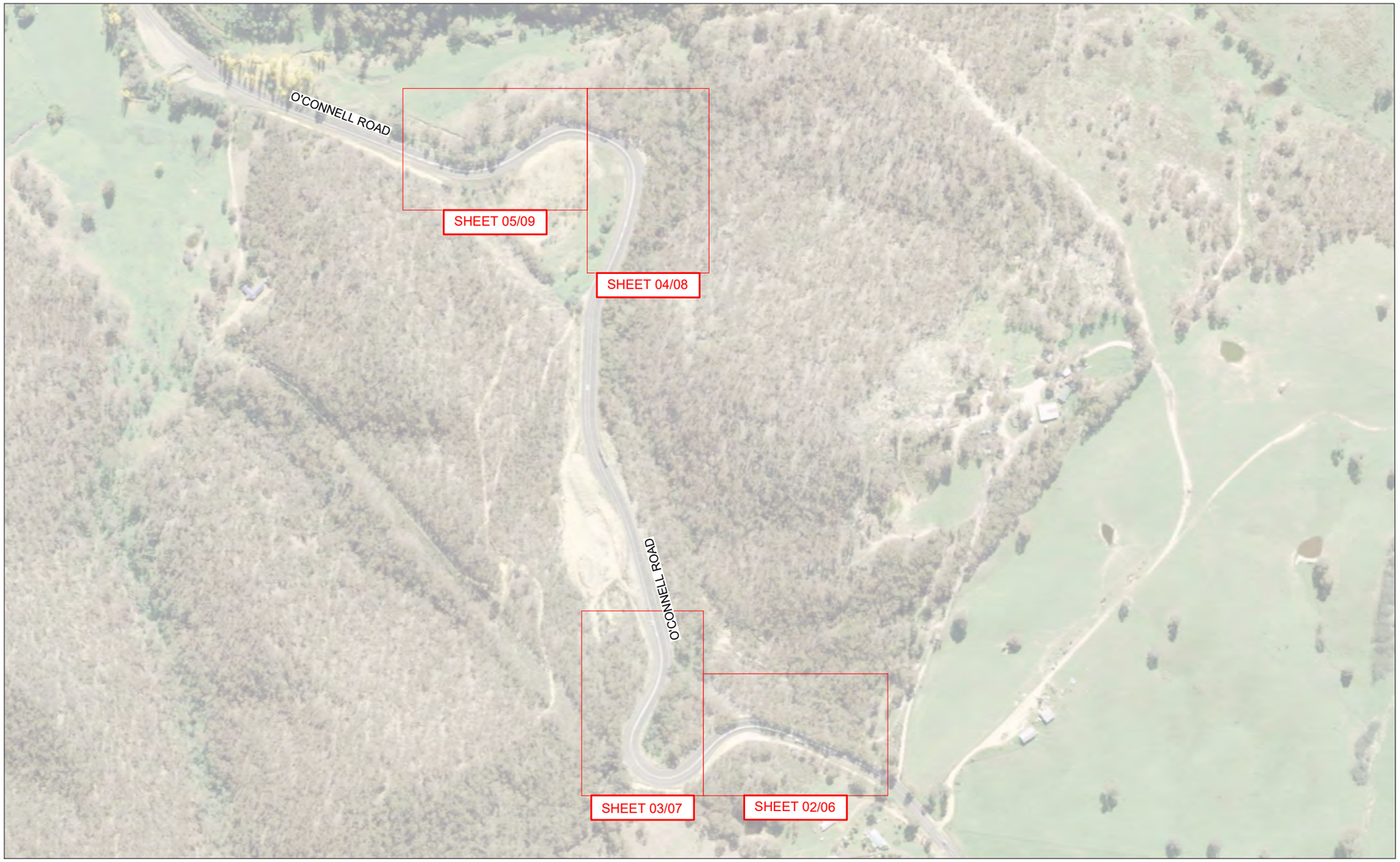

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DESIGNED G. PANIEL	DESIGN CHECK D. CHOI
APPROVED BY D. CHOI	DATE ISSUED 12 MARCH '20

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CAD FILE NO. N188670-SK04-P1.DWG

PALING YARDS WIND FARM

O'CONNELL ROAD, KELSO
COVER SHEET - KEY PLAN

DRAWING NO. N188670-SK04-01 SHEET 01 OF 09 ISSUE P1

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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PALING YARDS WIND FARM

O'CONNELL ROAD, KELSO
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK04-02 SHEET 02 OF 09 ISSUE P1

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SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 15km/h

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PALING YARDS WIND FARM

O'CONNELL ROAD, KELSO
VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK04-03 SHEET 03 OF 09 ISSUE P1

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960 Series 10x3 Platform Custom Trailer

O'CONNELL ROAD

N

SWEPT PATH KEY

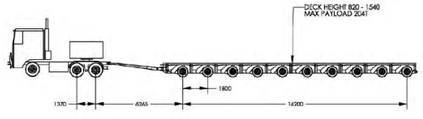
VEHICLE CENTRE LINE

VEHICLE TYRE PATH

VEHICLE BODY PATH

600mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h



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VEHICLE SWEPT PATH ASSESSMENT

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SWEPT PATH KEY

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- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- **600**mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED **15**km/h

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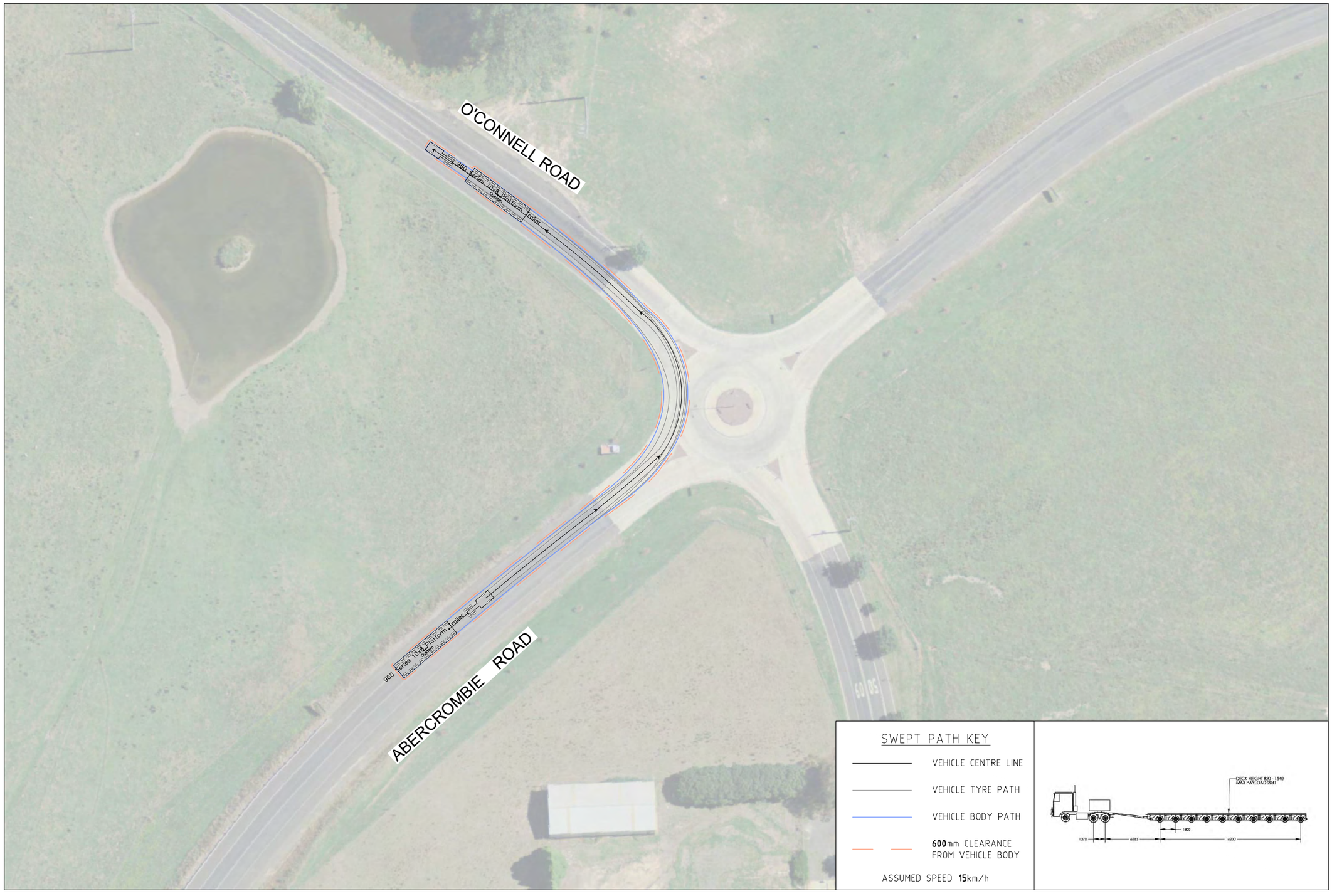

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PALING YARDS WIND FARM

VEHICLE SWEPT PATH ASSESSMENT

DRAWING NO. N188670-SK05-01 SHEET 01 OF 02 ISSUE P1

APPENDIX 6 – ERM Response to Ecology and Heritage Submissions

The ERM response includes the following annexures:

- Annex A - Ecology Response to Submissions
- Annex B - Heritage Response to Submissions
- Annex C - Bird and Bat Monitoring Strategy
- Annex D - Offset Strategy

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Environmental Resources Management Australia

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12 December, 2014

Shaq Mohajerani
Union Fenosa Wind Australia Pty Ltd
Suite 403, 68 York Street
SYDNEY NSW 2000

Our Reference:20141210_PYWF_0131035_Response to Submission Cover Letter_Final.docx

Dear Shaq,

RE: PALING YARDS WIND FARM RESPONSE TO SUBMISSION

Please find attached our finalised responses to the ecology and heritage focused public and agency submissions you had requested ERM consider, following the public exhibition of the Paling Yards Wind Farm Environmental Assessment Report (EAR).

These were provided to Union Fenosa Wind Australia (UWFA) as draft documents for review and comment on 7 November 2014. UFWA provided marked up documents with tracked changes for ERM's finalisation on 9 December 2014. ERM has now finalised these documents for UWFA's Preferred Project and Response to Submissions Report (PPRSR).

Please do not hesitate to contact the undersigned if you have any further questions, or if we can assist further with progressing the Paling Yards porject.

Yours sincerely,
for Environmental Resources Management Australia Pty Ltd

Matthew Flower
Project Manager

Steve Laister
Partner

Annex A - Ecology response to submissions
Annex B - Heritage response to submissions
Annex C - Bird and bat monitoring strategy
Annex D - Offset strategy

Annex A

ECOLOGY RESPONSE TO SUBMISSIONS

Table A1 Ecology - Response to Submissions

Submission ID.	Main Issue	Detailed Submission	ERM Response
98743	Increased Bushfire Risk	The proposed Paling Yard Wind Farm site is surrounded by the Abercrombie National Park. There is an increased risk of bush fire due to the increase in dry fuel from the drying effect. This increased risk affects everyone in the district.	The EA recognises that the presence of dense areas of native vegetation to the west (Abercrombie National Park) and to the east on private land, combined with the steep topography to the south of the site, increase the risk of bushfire in this region. A detailed literature search has not sourced scientific information on the drying effect of wind farms resulting in increases to dry fuel loads. In terms of bushfire risk, a Fire Management and Emergency Response Plan will be prepared as part of the site management plans following project approval, in consultation with State and local RFS, and the State Planning Department. This plan will include a detailed risk assessment (using ISO 31000 risk management standard or similar) and should be conducted for the project across all stages of the development and operation to evaluate the fire risk and to guide mitigation requirements, including emergency response. This process will aim to ensure that appropriate measures are in place to prevent fire and minimise damage in the unlikely event of an emergency.
		There is also an increased risk from the number of vehicles accessing the property to perform the construction phase and ongoing maintenance. If fire were to spread into the Abercrombie National Park, the effect would be catastrophic. The park is some of the most difficult terrain in NSW and connects through to other national parks, which form the largest area of bushland in NSW.	A Fire Management and Emergency Response Plan will be prepared as part of the site management plans following project approval, in consultation with State and local RFS, and the State Planning Department, including an assessment of the existing road network and adequacy of the existing fire breaks. This plan will also be consistent with the 'Abercrombie River National Park Fire Management Strategy' prepared for the adjacent land by the NSW Parks and Wildlife Service (2005) and will include considerations of vehicle management during construction and operational periods. In addition to the management actions already stated within Chapter 16 of the EA, all site vehicles during the construction phase will have diesel engines and will use the site access roads to minimise the likelihood of igniting dry grass. Construction and maintenance staff will also be trained in the basic first response fire-fighting techniques including: • communication and reporting requirements such as alerting emergency crews (000) and reporting details of location, size, proximity to assets and access capabilities. Reporting procedures and mechanisms should be efficient and simple to ensure that potential issues are identified, inspected and rectified in a timely manner;

Submission ID.	Main Issue	Detailed Submission	ERM Response
			• maintaining provision for mobile telephone (or satellite telephone if required) and UHF radio communications; • use of a dedicated 10,000 litre tanker (to be available on site daily during the construction phase of the development, particularly during the bushfire season or when high risk activities such as welding are being undertaken). The bushfire season (or Fire Danger Period) runs from 1 October 1 to 31 March, however it may vary due to local conditions and will be declared by the NSW RFS for each Local Government Area; and • use and location of extinguishers, knapsacks and hoses.
		Wind farms mean that bushfire cannot be fought with aircraft. Therefore any outbreak of fire will develop into a potentially large fire because of the inability to jump onto an outbreak quickly with aircraft. Local land owners would have no protection from such a large and devastating fire. There would be mass destruction of wildlife, farm animals, dwellings and other farm improvements. There is great potential for loss of human life as there are very few roads in and out of the district; most of these roads are surrounded by bush.	Wind farms do not generally prevent the use of aircraft to fight bushfires. In relation to fire-fighting methods, any fire-fighting activities in the vicinity of the proposed wind farm by either fixed or rotary wing aircraft would need to be conducted in consideration of the location of the wind turbines and monitoring masts. Therefore, the location of the wind turbines and monitoring masts will be made available to New South Wales Rural Fire Service (RFS) and aerial agriculture operators.. Wind turbines, similar to high voltage transmission lines, are part of the landscape and would be considered in the incident action plan. Turbines are treated like any other obstacle and aerial bombing will not be restricted within surrounding properties or the National Park. The expanded road network and road condition upgrades may benefit the locality in terms of access and egress in the event of a fire. Whilst aerial fire-fighting operations will potentially be restricted in the immediate vicinity of the proposed wind farm itself, as confirmed by Aviation Projects (2012), there is still a valid (ground-based) means of fighting bushfires on and near the properties on which the wind farm is proposed to be located. Wind farms can also be an advantage to RFS operations, because they require a cleared area, a water supply, and provide improved access to the property.
98743	Impacts to birds	There has been no consideration given to the effects on nearby properties, the National Park and wildlife. Any birds trying to fly from one side of the Abercrombie National	The surrounding forested areas will provide higher value habitat for the majority of fauna than the Development Footprint and will contain higher abundances and diversity of species. This may increase the collision risk within the Development Footprint, if birds and bats traverse the development area from forest to forest. Whilst such traverses may occur to some extent, it is not

Submission ID.	Main Issue	Detailed Submission	ERM Response
		Park through a natural flight path to the other side of the National Park will most certainly be shred to pieces.	considered likely that large numbers of species will cross the Study Area, because the Development Footprint is higher than the majority of the surrounding area which would increase energy expenditure required for species flying over the plateau area. In addition, the open nature of the site will deter species which are vulnerable to predation in open areas. There were no potential movement corridors identified within the Development Footprint such as vegetated corridors or narrow cleared areas or saddles between forested areas. For species that do move through the Study Area, the Paling Yards Project layout provides spaces of approximately 400 m between turbines, which would be expected to allow bird and bat species to move between turbines. There is also potential for wind farms to act as a barrier to flying birds, causing them to avoid the area and hence take another flight path. While there is little research into avoidance rates exhibited in Australia (Smales 2006), biodiversity monitoring at two wind farms in Tasmania did not provide evidence of a barrier effect (Hull, undated).
98922	Increased Bushfire Risk	The proposed Paling Yard Wind farm site is surrounded by the Abercrombie National Park. There is an increased risk of bush fire due to the increase in dry fuel from the drying effect.	As above
		There is also an increased risk from the number of vehicles accessing the property to perform the construction phase and ongoing maintenance. If fire were to spread into the Abercrombie National Park, the effect would be catastrophic. The park is some of the most difficult terrain in NSW and connects through to other national parks, which forms the largest area of bushland in NSW.	As above

Submission ID.	Main Issue	Detailed Submission	ERM Response
100431	Location of transmission line not assessed	The map on public exhibition only shows one route for the line - not two as shown on maps supplied by Union Fenosa. Both lines cross my properties 'Hilltop' and "The Brothers'. I ask that both proposed transmission lines sites be environmentally impact assessed.	The Northern Transmission Line Route has multiple options, the grid connection negotiations with the Transmission Authority will continue to identify the most cost-effective grid connection configuration and transmission line corridor, and if the final preferred location is different to the two locations proposed in the EIS, Union Fenosa Wind Australia will undertake additional assessment of that location and associated corridor and seek an amendment to the development consent.
100345 - Oberon Shire Council	Accurate identification of the access locations	Accurate identification of the access locations is also important to determine if any significant vegetation will need to be cleared.	Access points to the site are off Abercrombie Road (refer *Figure 1A and 1B*). Of the six access points, two will require the removal of planted, non-native Pine trees (*Pinus radiata*), and the remaining four will avoid trees that are present (only two of these four have native trees nearby and these will be avoided).
100341 _ OEH	Assessment of Impacts	The area of impact differs between the Environmental Assessment and the SER and requires clarification. The EA reports a total impact of 0.75 ha while the SER reports a total permanent impact of 12.6 ha. A further 1.4 ha is deemed to be temporary impact. The EA states that the entire 0.75 ha impact is of Western Tablelands Dry Forest emphasising the remaining turbines are within improved pasture and "are not representative of Derived Native Grassland". In contrast the SER reports a total of 2.9 ha of Apple Box – Yellow Box dry grassy woodland occurring as Derived Native Grassland within the development	The vegetation survey methodology for the most recent survey undertaken by ERM as reported in the Supplementary Ecology Report (SER) was based on with a combination of qualitative field observation and plot/transect data collection according to the BioBanking Assessment Methodology (BBAM) (DECC 2009). The Environmental Assessment (EA) identified remnant vegetation as Western Tablelands Dry Forest which has been further refined and described as four separate communities: • Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands; • Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands; • Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion; and • River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions. The ERM survey confirmed that the majority of the Development Footprint consists of improved pasture although small patches of derived native grassland with scattered Apple Box (*Eucalyptus bridgesiana*) and Yellow Box (*E. melliodora*) trees were confirmed around the periphery. These areas

Submission ID.	Main Issue	Detailed Submission	ERM Response
		Footprint, of which 1.9 ha will be impacted. Recommendation: 1.1 That the actual area of impact be clearly described and quantified.	(mapped as Apple Box - Yellow Box dry grassy woodland) constitute the TSC Act-listed EEC: White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland). These areas are highly modified from their pre-European condition and occur along undulating slopes of the Study Area in discrete patches and are currently used as grazing lands (hence their previous classification in the EA as cleared pasture). In additional to the more clearly defined vegetation communities, the boundaries of vegetation have also been reassessed during the most recent surveys by ERM, and has included detailed mapping along the access tracks and the northern transmission line which were omitted from the original area calculations provided in the EA. The actual area of vegetation to be removed will be:

	Veg Type 1	**Veg Type 2**	**Veg Type 3**	**Veg Type 4**	**Veg Type 5**	**Veg Type 6**	**Veg Type 7**	**Total**
Turbine Footing and access tracks (permanent clearance)	1.9	0.1	0	0	1	0.2	0	**3.2**
Crane Handstand (temporary clearance)	1	0	0	0	0.4	0	0	**1.4**
Transmission Lines (partial clearance)	0	6.8	0	2.3	0	0	0.3	**9.4**
Total Cleared	**2.9**	**6.9**	**0**	**2.3**	**1.4**	**0.2**	**0.3**	

Veg Type 1: Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands (this vegetation forms part of the TSCAct-listed Box Gum Woodland EEC occurring in the Study Area as Derived Native Grassland)

Submission ID.	Main Issue	Detailed Submission	ERM Response
			Veg Type 2: *Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Mod* *Veg Type 3:* *Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Poor-Grassland* *Veg Type 4:* *Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Shrubby* *Veg Type 5:* *Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Mod* *Veg Type 6:* *Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Shrubby* *Veg Type 7:* *River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions_Mod-Good_Poor-Weedy*
			These calculations are based on: <u>Permanent</u> • 6m wide access tracks • 20 x 20m wide turbine footings • 250m by 210m construction envelope for the substation • 70m wide transmission line easement (partial clearance only) • 1 x 1m wind monitoring masts (x7) <u>Temporary</u> • 80 x 80m construction envelope for the batching plant • 50 x 50m wide crane hardstands • 10m wide access tracks (only 6m wide will be permanent)

Submission ID.	Main Issue	Detailed Submission	ERM Response
	Avoidance	The EA does not contain sufficient explanation regarding avoidance measures. Several turbines have been removed from the proposal therefore eliminating impact to Box Gum woodland within existing Commonwealth Conservation agreements. While OEH welcomes the avoidance of these Box Gum woodland remnants it is stated several times within the EA that approval for these turbines may be sought at a later date.	There are currently no plans or applications for the placement of wind turbines within the areas covered by the Commonwealth Conservation agreements.
		OEH again reiterates that placement of turbines within firstly an existing conservation agreement and secondly within an area of Box Gum Grassy Woodland Endangered Ecological Community should be avoided where possible to do so. An additional turbine within remnant vegetation has been deleted and a further three have been relocated to sites just within the remnant. While this reduces impact there is no discussion regarding why deletion of all four turbines, or further relocation outside the remnant, is not feasible. Recommendations: 2.1 That the proponent ensures that all avoidance measures implemented in finalising the location and design of the	2.1 The turbines in the remnant area have been moved closer to the cleared area to reduce the amount of vegetation clearing while keeping the minimum separation distance from other proposed turbines to minimise the wake loss effect on adjacent turbines. The microsited locations are placed on ridgelines that have the benefit of reasonably unobstructed access to the predominant wind direction. In consideration of the extensive grid connection requirement, the proposed project requires as many turbines as feasible to maintain project viability, and therefore turbines P10, P13 and P14 form part of the project. 2.3 Ecological values have been considered during the design process and various project components have been located to minimise impacts on ecological values as far as practical whilst considering the technical capacity and viability of the project. The fundamental protocol for the final design is to avoid areas of native vegetation where possible. 2.3 The proposed micrositing has completely removed all proposed infrastructure (including turbine P2, P6 and P7) to avoid impacts to the Box Gum Woodland conservation area, and has removed turbine P11 from the outstretched ridgeline to avoid the heavily vegetation area, along with relocating turbines P10, P13 and P14 closer to the edge of the cleared area, which has significantly reduced the vegetation clearing.

Submission ID.	Main Issue	Detailed Submission	ERM Response
		facility are provided; 2.2 That the level of avoidance implemented is justified; and 2.3 That the DPE include a condition of consent ensuring that turbines are not placed within existing Commonwealth Conservation agreements containing Box Gum Grassy Woodland EEC.	
	Bird and Bat Collision	The EA has not adequately justified conclusions related to the risk of bird and bat collision and the significance of this impact. The SER provides a more comprehensive assessment of bird & bat strike although concedes that while the expected risk to bats at risk from rotor collision would be small this has yet to be confirmed. Neither assessment adequately discusses the likely influence of weather conditions commonly occurring at the site on bird collisions. Sites which experience poor weather and/or low visibility conditions need to be assessed taking this into account because it is likely to influence flight behaviour and increase the likelihood of impacts. While the SER raises some additional factors that could potentially influence the	*Weather conditions* Poor visibility due to weather conditions (fog and rain) is often cited as a factor increasing risk of collision with structures, including wind turbines (Osborne *et al*. 2000; Drewitt and Langston 2006). In an American study (Arnett *et al*. 2005, cited in Strickland *et al*. 2011) it was found that wind speed and weather were significantly related to bat fatality. Nights with storms accompanied by high wind speeds had fewer fatalities, and nights immediately after storms accompanied by low wind speeds had higher fatalities (Arnett *et al*. 2005, cited in Strickland *et al*. 2011). In a second North American study, Osborn *et al*. (2000) identified that poor visibility may have contributed to two of eight bird mortalities related to collisions with turbines. Drewitt and Langston (2006) acknowledge that the increased risk of collision may be offset to some extent by lower levels of flight activity in poor weather conditions. The nearest available visibility data for the study area was taken from Bathurst Airport, approximately 90 km north of the study area (BoM 2010). These data indicate that reduced visibility occurred more frequently in autumn and winter.

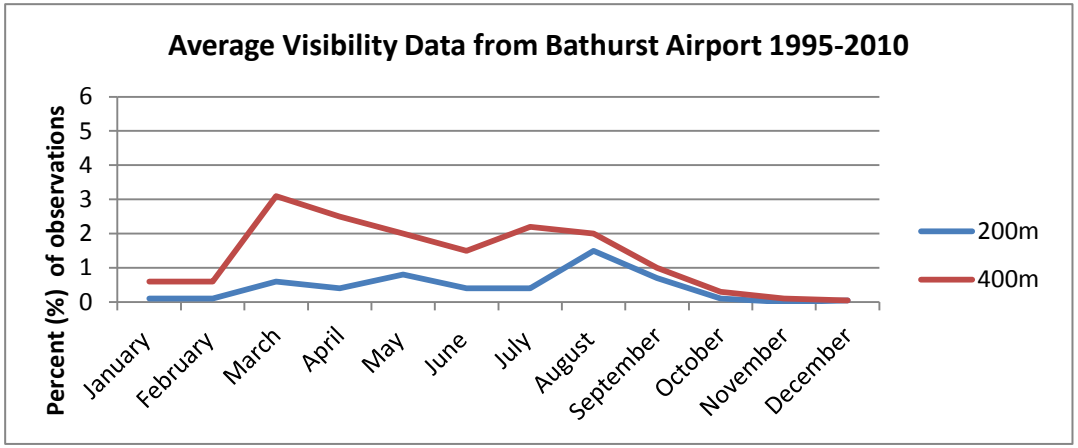
Submission ID.	Main Issue	Detailed Submission	ERM Response

susceptibility of bats to rotor strike there is little discussion of them. Additional risk factors relevant to consideration for an adequate impact assessment on all bat species known and likely to occur at the site include.

- Tree-roosting species may perceive turbines as potential roost trees;
- Ridge-top sites might coincide with availability of insect prey;
- Migrating bats may rely on sight (rather than echo-location) to navigate, being drawn to large structures on ridge-tops;
- Bats may investigate moving blades as movement may be mistaken as evidence of prey;
- Audible sound from turbines may attract bats from considerable distances; and
- Mating behaviour of tree-roosting bats may be centred on the tallest prominent feature in landscape.
- Risk of concussion from passing through low-pressure areas near turbines.

<u>Recommendation:</u>

3.1 That the Proponent take into account weather in assessing impacts on birds and bats, as well as further consideration of the above mentioned risk factors.



While collision risk factors are likely to vary across sites, and between countries (Hull and Cawthen 2012), it is reasonable to expect that poor visibility due to weather conditions may increase the risk of collision within the study area. Based on BoM data displayed above (BoM 2010), reduced visibility coincides with the colder months of the year when both bird and bat activity is reduced. This will reduce the likelihood of any additional impacts to birds and bats, above those already addressed within the SER (ERM 2013).

Where possible, the data obtained during the bird and bat monitoring program will attempt to provide further information on the potential correlation between weather patterns and any observed increases in collision rates.

Additional risk factors relevant to bats

Evidence of mechanisms for bat mortality at wind farm sites specific to Australia is limited (Hull and Cawthen 2012) although numerous international studies have identified a lack of a relationship between species richness and abundance of bats using a site, and the species richness and abundance of fatalities (Cryan 2010). This suggests that some species of bats are more prone to impacts than others (based on their habitat and/or behavioural characteristics) as outlined bdelow:

Submission ID.	Main Issue	Detailed Submission	ERM Response
			This has also been reported at the Bluff Point and Studland Bay Wind Farms in Tasmania where analysis of 8 years of monitoring data (2002-2010) has shown that only two of the four species recorded at the site (the Gould's Wattled Bat and Vespadelus sp) have been involved in collisions (Woolnorth Wind Farm Holding, 2013). • Tree-roosting species may perceive turbines as potential roost trees, Cryan (2010) notes that it is plausible that bats could mistake turbines for tall trees. Bats may be attracted to them as a higher number of roosting opportunities may be available in taller trees, partly due to size and also due to the related maturity of the tree and hence likelihood of presence of cavities, loose bark and crevices (Cryan 2010). Cryan (2010) identified this possibility as particularly relevant to migratory bats. In Australia, bats display some migratory behaviour, however migrations are only local (BL&A 2011). Hull and Cawthen (2012) acknowledged that collisions of Goulds Wattled Bat (*Chalinolobus gouldi*), thought to be a tree-roosting species and present within the study area, at two Tasmanian wind farms, may support the theory that bats investigating turbine towers as potential roost sites or gathering sites for mating may contribute to the risk of bat mortality. The Eastern False Pipistrelle and Greater Broad-nosed Bat are both listed as vulnerable and roost in trees. Calls detected during a survey of the study area may be attributed to these species (although unable to be confirmed). There is potential for these species to perceive turbines as potential roost trees, thereby increasing the level of interaction with turbines, and consequent risk of collision and barotrauma. *[Baratrauma - moving turbine blades have areas of relatively high and low pressure, with an area at the tip of each blade having a drop in atmospheric pressure sufficient to cause internal injuries and tissue damage to air-containing structures].* • Migrating bats may rely on sight (rather than echo-location) to navigate, being drawn to large structures on ridge-tops; Bats are thought to rely on visual cues (such as tall trees and turbines) during long-distance navigation, as visual cues may be detectable from greater distances than acoustic cues (Cryan 2010). Cryan and Barclay (2009) note that turbines may attract bats from distances greater than 1 km.

Submission ID.	Main Issue	Detailed Submission	ERM Response
			In Australia, bats display some migratory behaviour but migrations are local and not considered to cover significant distances (BL&A 2011). The Eastern Bentwing-bat (listed as vulnerable and assumed to occur in the study area) migrates annually to maternity caves from distances up to approximately 300 km, and may travel up to 65 km in a night (OEH undated). It is possible the Eastern Bentwing-bat could exhibit this type of behaviour during long-distance navigation, thereby increasing the risk for collision with turbines, or barotrauma. • Ridge-top sites might coincide with availability of insect prey; Cryan and Barclay (2009) describe 'hilltopping' behaviour by insects, in which flying insects are attracted to the tallest structures in the landscape during the daytime. In this event, bats may learn to use wind turbines as foraging sites. There is limited research into this phenomenon in Australia, however bat carcases found around turbines in Tasmania showed no evidence of their having recently been feeding around turbines (Hull and Cawthen 2012). It is currently unclear if insect species would exhibit this hilltopping behaviour, with a consequent effect on bat behaviour, within the study area. • mating behaviour of tree-roosting bats may be centred on the tallest prominent feature in landscape. Cryan (2010) notes that the potential perception of turbines as potential roost sites, the use of tall features (such as turbines) in navigation and the potential availability of insect prey at turbines may have contributed to bats evolving mating behaviours that focus on the tallest trees in the landscape. Cryan (2010) notes that species for which sexes have separate distributions outside of the mating period may be more likely to use the highest trees as rendezvous points during the mating period. Hull and Cawthen (2012) acknowledged that collisions of Goulds Wattle Bat (*Chalinolobus gouldi)*, thought to be a tree-roosting species and present within the study area, at two Tasmanian wind farms, may support the theory that bats investigating turbine towers as gathering sites for mating may contribute to the risk of bat mortality. Although, mortality was most prevalent in Autumn, a period of post-reproduction for the species (Hull and Cawthen 2012). • Risk of concussion from passing through low-pressure areas near turbines.

Submission ID.	Main Issue	Detailed Submission	ERM Response
			Moving turbine blades have areas of relatively high and low pressure, with an area at the tip of each blade having a drop in atmospheric pressure sufficient to cause internal injuries associated with barotrauma, rather than concussion; these aspects are discussed in the SER. • Bats may investigate moving blades as movement may be mistaken as evidence of prey Thermal images of bats appearing to chase moving blades suggest that bats may be attracted to blades (Cryan and Barclay 2009). It is unknown how prevalent this behaviour is, or if this behaviour would be exhibited by the species present at the study area would, however it is possible this factor could attract species to turbines, thereby increasing the risk of collision or barotrauma. • audible sound from turbines may attract bats from considerable distances There are reports of bats being attracted to the 'swoosh' sound of sticks being waved through the air, suggesting bats may also be attracted to sounds produced by moving blades (Cryan and Barclay 2009). It is unknown how prevalent this behaviour is, or if this behaviour would be exhibited by the species present at the study area, however it is possible this factor could attract species to turbines, thereby increasing the risk of collision or barotrauma. *Summary* Overall, while a number of hypotheses have been presented to describe the causes of bat mortality related to wind turbines, the lack of evidence of these causes, and particularly lack of evidence in an Australian context, makes it difficult to quantify potential impacts to bat species. Hull and Cawthen (2012) found that high-flying, open-air foraging bats are more at risk of fatality at wind turbines than other species. Males and females were impacted similarly, but there was a predominance of adults suggesting that the Tasmanian Windfarms were not resulting in mortality of dispersing juveniles and sub-adults. Based on the data available it is unlikely that the impacts to bats would be significant at a population scale and there may be opportunities for the Bird and Bat Monitoring Plan developed as part of this Project to contribute to the understanding of interactions between bats and turbines in an Australian context.

Submission ID.	Main Issue	Detailed Submission	ERM Response
	Indirect Impacts	The EA does not adequately address the potential for indirect impacts to fauna on the development site. There is a growing literature indicating that wind farms can have a detrimental impact on how fauna, particularly migratory species, utilise habitat surrounding turbines. Indirect impacts include, but are not restricted to: • significant alteration of flight paths, • change in habitat use patterns, • changes in occupancy or population densities and • changes in breeding success. The SER acknowledges the potential for indirect impacts in Section 4.2.4 stating that "Careful planning to avoid placement of turbine clusters in or near areas of high habitat value will manage the alienation of habitat to threatened woodland species". Although turbines P10, P13 and P14 have been resited they are still situated within remnant woodland and thus have the potential to indirectly impact fauna. OEH suggests that consideration should not be restricted to species listed on the EPBC Act or TSC Act. <u>Recommendation:</u>	*Alteration of flight paths* There is potential for wind farms to act as a barrier to flying birds, causing them to avoid the area and hence take another flight path. While there is little research into avoidance rates exhibited in Australia (Smales 2006), biodiversity monitoring at two wind farms in Tasmania did not provide evidence of a barrier effect (Hull, no date). Bird Utilisation Surveys conducted as part of the SER did not identify any migratory birds, and no species were observed exhibiting direct movement at height over the landscape as would be expected from migrating species. In addition, it is not considered likely that large numbers of species will cross the Study Area. This is due to the Development Footprint being higher than the majority of the surrounding area which would increase energy expenditure required for species flying over the plateau. The open nature of the Study Area is expected to deter species which are vulnerable to predation in open areas. There were no potential movement corridors identified within the Development Footprint such as vegetated corridors or narrow cleared areas or saddles between forested areas. For species that do move through the Study Area, the Paling Yards Project layout provides spaces of approximately 400 m between most turbines, which would be expected to allow bird and bat species to move between turbines. *Change in habitat use patterns and changes in occupancy or population densities* There is limited research on changes in habitat use, occupancy and population densities of birds and bats due to wind farms in Australia. The findings of a 10 year monitoring program for two wind farms in Tasmania showed a general reduction in biodiversity across the survey period within both the wind farm site and reference sites, with the decline commencing prior to construction. A synthesis of available research in the United States (The Wildlife Society 2007) summarised the following findings for bird species groups in the United States: • reported grassland bird densities were lower within 80 to 100 m of wind turbines; • in one study, raptors were observed to not nest within a 32km^2 wind facility, despite it having similar habitat to a nearby area with 5.94 nests/100km^2. However, other studies reported raptors nesting within 800 m of wind farms; and

Submission ID.	Main Issue	Detailed Submission	ERM Response
		4.1 That the Proponent assesses the potential for indirect impacts of turbines on fauna.	• reported densities of some waterfowl were lower within 600 m of wind turbines, however other species appear to experience no displacement effect. While not directly transferrable to Australian conditions and Australian species, these findings can give an indication of the scale of potential displacement of bird species. It is unclear to what extent operation of wind turbines may displace bird and bat species present in the study area, however it is recognised that displacement will reduce the number of birds interacting with turbines, consequently reducing the risk of collision. *Changes in breeding success* Wind farms may indirectly impact breeding success through displacement of fauna from breeding locations, or mortality of individuals which would otherwise breed. A study of two fauna at two Tasmanian wind farms indicated that eagles continued to breed successfully at the wind farm sites, at the same or a higher rate than other areas of Tasmania. Additionally, a study of bat mortality at these sites identified that mortality was highest in autumn, a predominately post-reproduction period, suggesting the timing of bat fatalities would not result in the direct loss of young (Hull and Cawthen 2012).
	Monitoring & Mitigation	<u>Recommendations:</u> 5.1 That the proponent develop a Bird and Bat Monitoring Plan that provides detail of how impacts on bird and bat populations will be monitored, including details on survey locations, parameters to be measured, frequency of surveys and analyses and reporting, and contains mitigation measures that will realistically reduce fatalities. 5.2 That the DPE include a condition of consent requiring a monitoring program capable of detecting any changes to the	A Bird and Bat Monitoring Strategy has been developed (draft attached). Bird and bat monitoring post construction is becoming routine practise both in Australia and overseas. There are no consistent standards in Australia for undertaking monitoring and this draft strategy provides a framework that can be used for development of a detailed Bird and Bat Management Plan for the operational phases of the wind farm once approved. It outlines an indicative and adaptive program for monitoring the effects of each turbine and provides guidance on bird and bat management in general.

Submission ID.	Main Issue	Detailed Submission	ERM Response
		population of birds and/or bats that can reasonably be attributed to the operation of the project. This may require data to be collected prior to the commencement of construction. Data relating to mortality rates should be submitted to OEH on an annual basis for the first five years of operation and every two years thereafter.	
	Offset Proposal	As indicated in Issue 1 above, Assessment of Impacts, the EA reports a total impact of 0.75 ha while the SER reports a total permanent impact of 12.6 ha and a further 1.4 ha of temporary impact. Accordingly, the EA proposes no Offset Proposal while the SER includes a BioBanking Credit Calculator Report indicating the need for an offset of 289 credits, equating to 31.1 hectares. Statement of Commitment number 59 states that "The proponent will develop an offset package in accordance with the Principles for the use of biodiversity offsets in NSW". Recommendation: 6.1 That the offset requirements be clearly described and quantified and that a biodiversity offset strategy be prepared in consultation with OEH.	Offset Strategy (draft attached)

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Annex B

HERITAGE RESPONSE TO SUBMISSIONS

Table B1 Heritage - Response to Submissions

Agency	Submission Comment	ERM Response
Oberon Shire Council (ID 100345) Item 10	It is noted that the applicants have stated that a Cultural Heritage Management Plan (CHMP) be provided for the development prior to any construction works. As part of any approval, Council will assess the Plan prior to any activity on site. It is considered that this Plan must include how on-going education for contractors will be undertaken to advise of potential sites and recognition of potential artefacts whilst in the construction phase. Any Plan of this nature will need to be approved by the relevant Agency and Council.	A CHMP will be developed as part of the site management plans following project approval. The draft CHMP will include measures for on-going contractor cultural heritage education and awareness to assist recognition of potential sites and places during the construction phase of the project. The Draft CHMP will be forwarded to the Representative Aboriginal Parties (RAPs) for review and endorsement and submitted to both OEH and the Oberon Shire Council for approval.
Office of Environment and Heritage (OEH)	OEH notes that archaeological sites were identified but only one site (P8) is likely to come within the zone of potential impact by turbine placement and construction. A minimum 100 metre separation is recommended in the Cultural Heritage Impact Assessment although there appears to be some uncertainty as to the extent of the potential surface or sub-surface deposits. OEH recommends that the extent of this site be determined prior to work commencing and ensure micro-siting of turbines to avoid the site.	A CHMP will be developed prior to the construction phase for the project and will include measures for subsurface test excavation at Site P8 to determine the extent of the site. This will allow the proponent to micro-site nearby turbines to avoid potential impacts. The test excavation will be undertaken in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). Tasks will involve: • Consultation with RAPs and an offer of participation in the subsurface investigation; • At least 14 days written notification to OEH and submission of the sampling strategy to OEH; • Two archaeologists for approximately one to two days fieldwork; • Completion of an Aboriginal Site Impact Recording Form for submission to the NSW Aboriginal and Heritage Information Management System AHIMS Registrar; and • Preparation of an Archaeological Report to document results of the investigation.

Agency	Submission Comment	ERM Response
Office of Environment and Heritage	OEH also notes that proposed mitigation measures (Section 18.5) recommend that once proposed access track locations and other disturbance areas are pegged on the ground, additional targeted surveys of these areas should be undertaken. This is of particular importance where infrastructure intersects with locations of potential higher use by Aboriginal people in the past, such as watercourses.	As part of the preparation of the CHMP, prior to construction work and following final footprint design, targeted surveys of pegged access tracks and other disturbance areas will be undertaken in consultation and collaboration with the RAPs to identify potential Aboriginal heritage values at risk of impact by the project. Particular attention will be paid to areas of potential higher use by Aboriginal people in the past, such as watercourses. This will likely be undertaken over two to three days by one archaeologist with participation of RAPs. If additional sites are identified during these surveys, an assessment and strategy for the management of the sites will be included in the CHMP for the project. The CHMP will be provided to the RAPS for review and approval and submitted to OEH and the Oberon Shire Council for approval.

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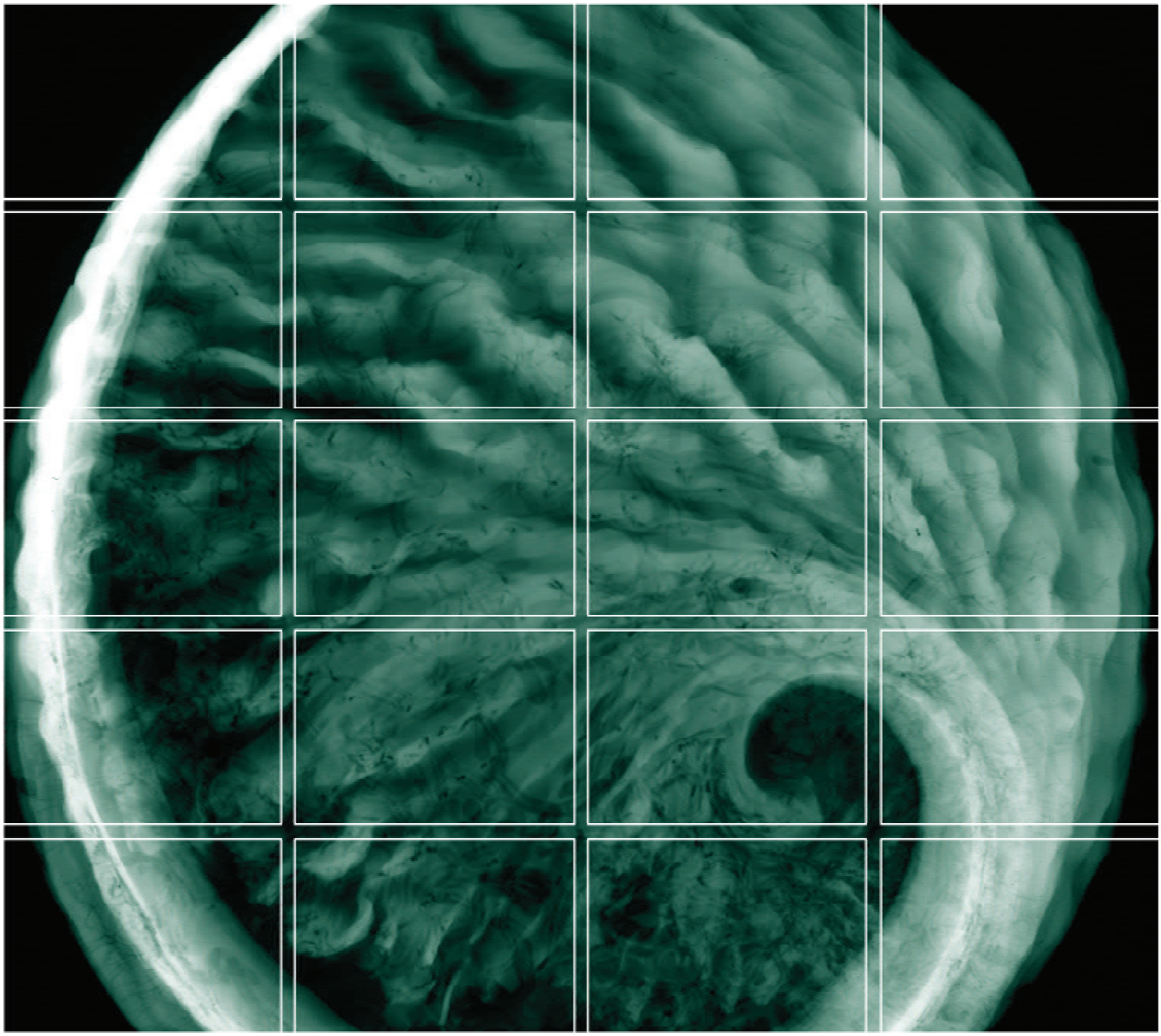
Annex C

BIRD AND BAT MONITORING STRATEGY



Paling Yards Wind Farm

Bird and Bat Monitoring Strategy

Union Fenosa Wind Australia

December 2014

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Paling Yards Wind Farm

Bird and Bat Monitoring Strategy

Approved by:	*Matthew Flower*
Position:	Project Manager
Signed:	
Date:	*12 December 2014*
Approved by:	*Steve Laister*
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Union Fenosa Wind Australia Pty Ltd

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1 INTRODUCTION

This Bird and Bat Management Strategy (BBMS) identifies appropriate survey methodologies and provides guidance on bird and bat management. It outlines general guidelines on reporting and evaluation and acts to ensure that the Bird and Bat Management Plan (to be developed based on the principals outlined in this strategy) will be consistent with the following guidelines:

- AusWEA Wind Farms and Birds: Interim Standards for Risk Assessment (BL&A 2005);
- Best Practice Guidelines for the implementation of Wind Energy Projects in Australia (Clean Energy Council 2013); and
- Environment Protection and Heritage Council National Wind Farm Development Guidelines – Public Consultation Draft – October 2009.

This BBMS provides a framework that can be used for development of a detailed Bird and Bat Management Plan for the operational phase of the wind farm once approved. It outlines an indicative and adaptive program for monitoring the effects of each turbine and provides a sampling strategy specific to the first two years of operation. The details of ongoing monitoring (after the first two years of operation) will be established based on the recommendations of the initial monitoring.

1.1 AIM AND OBJECTIVES

The BBMS aims to:

- clearly identify 'at risk' bird and bat groups;
- set out monitoring requirements to assess the impact of the wind farm on local populations of birds and bats;
- outline a decision making framework and a range of feasible and practical mitigation/management actions; and
- setting out reporting requirements.

The objectives of the detailed Bird and Bat Management Plan (to be developed based on the principals outlined in this strategy) will be to:

- monitor local populations of birds and microbats, including utilisation of habitat within the wind farm area and mortalities as a result of collision with turbine blades;

- monitor behaviour of local bird and microbat populations in relation to their interaction with the wind farm, including avoidance behaviour around turbines;

- monitor natural and human changes in the environment surrounding the wind farm;

- analyse and assess the impact of the wind farm upon local bird and microbat populations;

- provide a mechanism to identify trigger points or thresholds for a management response;

- utilise an adaptive management approach to identify and implement appropriate management actions and strategies to reduce impacts as necessary; and

- monitor and evaluate the effectiveness of such measures.

2 OVERVIEW OF BIRD AND BAT SITE UTILIZATION

2.1 MICROBATS RECORDED WITHIN THE SITE

Based on the field surveys to date and as reported by ERM (2013), 12 microbat species (see *Table 2.1*) were identified with varying levels of confidence. This included three threatened species, none of which were a definite identification (for more information on the survey results refer to ERM 2013).

Table 2.1 ***Bat Species Recorded***

Scientific Name	Common Name	Status TSC Act[1]	Status EPBC Act[2]	Forage behaviour[3]	Tree Roosting
Chalinolobus gouldi	Gould's Wattled Bat	-	-	Within canopy and sub canopy, selecting for gaps in the canopy. May also be attracted to turbine lighting.	Yes
Chalinolobus morio	Chocolate Wattled Bat	-	-	Below the canopy	Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Flight pattern is high and fast and they forage within or just below the tree canopy	Yes
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	-	Forages above and below the canopy.	No
Nyctophilus species (N. gouldi or *geoffroyi)*	Lesser Long-eared Bat or Gould's Long-eared Bat	-	-	Both species forage below canopy and often close to the ground (2-5m).	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Flies slowly along forest edges and or streams.	Yes
Scotorepens orion	Eastern Broad-nosed Bat	-	-	Within the canopy.	Yes
Tadarida australis	White-striped Freetail-bat	-	-	Above canopy.	Yes
Vespadelus darlingtoni	Large Forest Bat	-	-	Below canopy, within canopy and forest floor.	Yes
Vespadelus species (*V. vulturnus* or *regulus*)	Little Forest Bat or Southern Forest Bat	-	-	Both species forage below canopy.	Yes

1. TSC = NSW Threatened Species Conservation Act
2. EPBC = Commonwealth Environment Protection and Biodiversity Conservation Act
Note that for the status listed above under both Acts, V – Vulnerable
3. Menhorst and Knight (2001) or OEH (2014) Threatened Species Profiles

Those species that forage above the canopy (see *Table 2.1*) have been identified as 'at risk' species as they may be susceptible to rotor strike and/or barotrauma. Tree roosting species may mistake turbines for a roost, also making them susceptible to impact.

2.2 *BIRDS RECORDED WITHIN THE SITE*

A total of 125 birds were recorded in May 2013 (as reported by ERM 2013, with the most abundant being the Australian Raven (*Corvus coronoides*), Australia Magpie (*Cracticus tibicen*) and the Wedge-tailed Eagle (*Aquila audax*). Two threatened species were recorded: Flame Robin and the Scarlet Robin (see *Table 2.2*).

Table 2.2 Bird Species Recorded

Common Name	Scientific Name	Status TSC Act	Status EPBC Act	Likely to Fly at RSA Height?
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	-	-	No
Grey Teal	*Anas gracilis*	-	-	No
Pacific Black Duck	*Anas superciliosa*	-	-	No
Australasian Pipit	*Anthus novaeseelandiae*	-	-	No
Wedge-tailed Eagle	*Aquila audax*	-	-	Yes
Hardhead	*Aythya australis*	-	-	No
Sulphur-crested Cockatoo	*Cacatua galerita*	-	-	Yes
Muscovy Duck*	*Cairina moschate**	-	-	No
Australian Wood Duck	*Chenonetta jubata*	-	-	No
White-winged Chough	*Corcorax melanorhamphos*	-	-	No
White-throated Treecreeper	*Cormobates leucophaea*	-	-	No
Australian Raven	*Corvus coronoides*	-	-	Yes
Pied Butcherbird	*Cracticus nigrogularis*	-	-	No
Australian Magpie	*Cracticus tibicen*	-	-	Yes
Black Swan	*Cygnus atratus*	-	-	No
Laughing Kookaburra	*Dacelo novaeguineae*	-	-	No
Emu	*Dromaius novaehollandiae*	-	-	No
White-faced Heron	*Egretta novaehollandiae*	-	-	No
Black-shouldered Kite	*Elanus axillaris*	-	-	Yes
Galah	*Eolophus roseicapillus*	-	-	Yes
Brown Falcon	*Falco berigora*	-	-	Yes
Nankeen Kestrel	*Falco cenchroides*	-	-	Yes
Eurasian Coot	*Fulica atra*	-	-	No
Magpie-lark	*Grallina cyanoleuca*	-	-	No
Welcome Swallow	*Hirundo neoxena*	-	-	No
Superb Fairy-wren	*Malurus cyaneus*	-	-	No
Noisy Miner	*Manorina melanocephala*	-	-	No
Little Pied Cormorant	*Microcarbo melanoleucos*	-	-	No
Jacky Winter	*Microeca fascinans*	-	-	No
Scarlet Robin	*Petroica boodang*		V	No
Flame Robin	*Petroica phoenicea*		V	No

Common Name	Scientific Name	Status TSC Act	Status EPBC Act	Likely to Fly at RSA Height?
Common Bronzewing	*Phaps chalcoptera*	-	-	No
Crimson Rosella	*Platycercus elegans*	-	-	Possible
Eastern Rosella	*Platycercus eximius*	-	-	Possible
Willie Wagtail	*Rhipidura leucophrys*	-	-	No
Pied Currawong	*Strepera graculina*	-	-	No
Common Starling*	*Sturnus vulgaris**	-	-	No
Australasian Grebe	*Tachybaptus novaehollandiae*	-	-	No
Banded Lapwing	*Vanellus tricolor*	-	-	No
Masked Lapwing	*Vanellus miles*	-	-	No

The majority of birds were observed flying short distances between trees and then perching. Often the peak activity was on arrival to site when birds were flushed from the immediate area into the surrounding trees. The majority of birds were observed individually or in small groups. The majority of birds recorded were seen to hug the contours and rarely flying directly above ridge tops where the turbines are proposed (ERM 2013).

Few birds were recorded flying at RSA height. The Sulphur-crested Cockatoo, Australian Magpie and Australian Raven were recorded infrequently flying close to the lower limit of RSA height at between 25m and 35m.

Wedge-tailed Eagles were recorded across the study area flying at RSA height and were observed soaring at a range of heights from 10m to over 250m. The species is not likely to be restricted to particular habitat types and were observed using ridges and hills within the Development Footprint to gain altitude, before moving away and exhibiting foraging behaviour over the surrounding forested areas (ERM 2013).

Those species likely to fly at RSA height (*Table 2.2*) have been identified as 'at risk' species as they may be susceptible to rotor strike and/or avoidance behaviours.

3 *SUMMARY OF POTENTIAL IMPACTS*

The potential impacts of wind turbines on birds and bats have been detailed within the Supplementary Ecology Report (SER) (ERM 2013). The main potential impacts on both bird and bat species from an operational wind farm are:

- direct mortality associated with rotor collisions and collisions with other associated infrastructure including towers, guy wires and transmission lines; and

- indirect impacts relating to habitat loss through the effects of installation of wind farm facilities.

As described by ERM (2013), collision risk for birds depends on a wide range of factors as summarised below:

- high collision rates are particularly evident for large soaring raptors, near areas used by large numbers of roosting or foraging birds, migratory flyways or local flight paths or areas with high bird use. No large concentrations of birds were recorded in the Study Area and the area is not known to form part of any significant migratory routes for large numbers of birds. Wedge-tailed Eagles were frequently observed within the Study Area, soaring at RSA height and may be susceptible to rotor strike; and

- bird collision risk may vary on a seasonal basis due to bird migration or breeding. No birds were recorded exhibiting direct movement at height and no birds listed as Migratory under the EPBC Act were recorded although it is recognised that birds that may visit the Study Area in some years based on spatial and temporal flowering patterns and other resource availability.

Several hypotheses have been suggested in an attempt to determine how and why bats are killed by wind turbines (BL&A 2011). These include:

- sensory failure where bats are unable to visually or acoustically detect moving turbine blades (non-echo locating bats are less able to avoid collision);

- roost attraction where bats may mistake turbines for a roost;

- acoustic attraction where bats are attracted to sounds generated by turbines;

- insect concentration such that bats are attracted to lit areas such as wind farms because of higher insect activity;

- food resources, in that wind farms tend to be built in areas where insects are concentrated (eg hilltops and ridges), thus in prime foraging habitat for bats. Open spaces around turbines may also create favourable foraging habitats; and

- decompression – sudden changes in air pressure created by turbine turbulence which can cause barotraumas in some species (BL&A 2011).

In Australia, bats display some migratory behaviour but migrations are local and not considered to cover significant distances (BL&A 2011). Hull and Cawthen (2012) found that high-flying, open-air foraging bats are more at risk of fatality at wind turbines than other species. Males and females were impacted similarly, but there was a predominance of adults suggesting that the Tasmanian Windfarms were not resulting in mortality of dispersing juveniles and sub-adults.

Based on the data available it is unlikely that the impacts to birds and bats would be significant at a population scale and there may be opportunities for the Bird and Bat Monitoring Plan developed as part of this Project to contribute to the understanding of interactions between birds/bats and turbines in an Australian context.

4 PRE-CONSTRUCTION MONITORING PROGRAM

Monitoring during the pre-construction period and comparison of the results against detailed baseline data (pre-construction monitoring) allows for:

- refinement of prediction methods;
- allows regulatory compliance monitoring (eg whether a project is fulfilling the terms of its approval by planning authorities); and
- permits proponents to monitor their own environmental performance and to adaptively manage the operation of the wind farm to minimise risk.

Monitoring involves repeated surveys, the data from which can be used to detect trends over time (Gregory *et al*. 2004). Two types of survey would be undertaken to provide the baseline data. The purpose of each survey is provided in *Figure 4.1*.

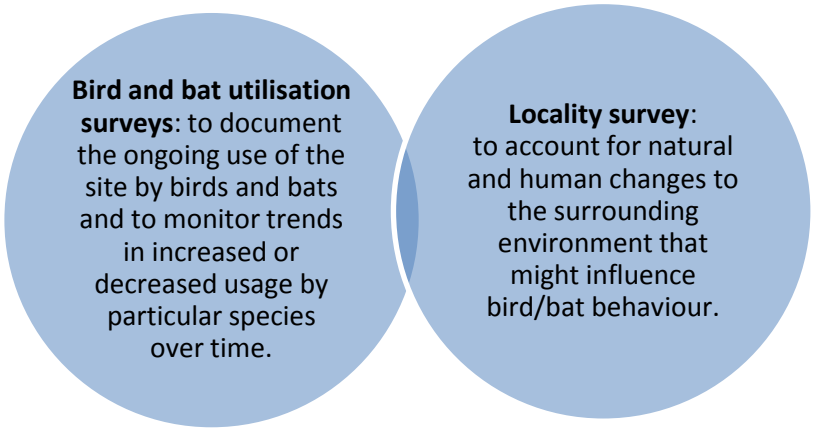

Figure 4.1: Overview of Baseline Bird and Bat Monitoring Methods

4.1 PROTOCOL FOR BIRD AND BAT UTILISATION SURVEYS

Bird Utilisation Survey

Additional seasonal baseline data would be collected over the 2015 summer, autumn, winter and spring periods using the methodology described below and in ERM (2013). Bird survey locations (x18) would be replicated as per ERM (2013). This will result in an additional 72 bird surveys over the twelve month period.

As outlined in BL&A (2005), the bird utilisation survey is the most commonly used method for generating quantitative data on bird use of a potential wind farm site. This can be used to estimate potential collision rates and provide a ranked abundance of species use of the site at varying heights.

These pre-construction surveys will supplement the data already provided in the EIS and can potentially confirm or supplement the existing data sets including:

- what bird species use the site?
- with what frequency does each species occur at the site?
- at what height do birds of each species fly? and
- what is the distribution of bird species across the site?

Bird utilisation surveys are therefore a significant component of any bird risk assessment and long term monitoring at a wind farm. The data set standards (survey methodology) as noted by BL&A (2005) and ERM (2013) are outlined below.

Data set standards (survey methodology)

- two observers stationed at a fixed survey point for a minimum of 15 minutes (up to 45 minutes), recording the abundance of all large bird species observed within 800m and all small birds within 100m. Species detection tables for appropriate time intervals within the survey period should be generated;
- the height at which each bird flies when passing through the survey area should be estimated to the nearest 20m and related back to the height of the RSA;
- the direction that each bird sighted is flying should be recorded to the nearest 45 degrees of the compass;
- to obtain a representative picture of birds on a site, each fixed point survey site should be counted during at different times of day (eg early morning, late morning, early afternoon and late afternoon) to account for diurnal differences in bird activity; and
- the number of points surveyed on a site and their locations should be selected to be representative of site conditions and consistent with the ERM 2013 survey methodology.

A suitable number of reference sites (to be determined) should be counted with the same survey effort, to provide a comparison with on-site bird usage. Reference sites are also an important component of any further pre-operational and operational phase impact monitoring. They should be between 500m and 1500m from the nearest wind turbine site, and located in similar habitats and landscape settings to the wind farm (impact) sites.

Bat Utilisation Survey

Additional seasonal baseline data would be collected over the 2015 summer, autumn, winter and spring periods using the methodology and survey effort described in ERM (2013) in order to facilitate direct comparison of pre- and post-operational data.

The Bat Utilisation Survey methodology will use static Songmeter (or similar) bat detectors to sample the echolocation calls of free-flying bats in the Study Area. Songmeter units are to be programmed to commence operation approximately 30 minutes before dusk, and to cease approximately 30 minutes after dawn and be left in the field for a minimum for three consecutive nights. Survey locations (x5) would be replicated as per ERM (2013) and will equate to at least 15 survey nights per season.

Note: No bird or bat utilisation surveys will be undertaken during the construction period of the wind farm because the data collected during this period is unlikely to be representative, due to the disturbance effect on birds and bats. However, the construction site should be checked regularly during the construction period to determine if any birds or bats have collided with partially or fully erected towers.

As outlined by the Clean Energy Council (2013), it is important that the post-construction monitoring includes:

- the identification of clear and measurable objectives;
- the development of scientifically rigorous methods that will obtain data that addresses the objectives (see *Figure 5.1*); and
- input from experts (eg ecologists and statisticians) to assist with the design and completion of surveys.

Post-construction monitoring will need to satisfy the requirements of any conditions that are placed on the wind farm by the development approval.

The indicative program provided here can be adjusted to take into consideration seasonality issues when the wind farm becomes operational so that activity levels and detectability of birds and bats are not at their lowest when sampling intensity is at its highest. For example, intensive monitoring planned for the early stages of the program would either be extended or delayed if the wind farm is commissioned in winter.

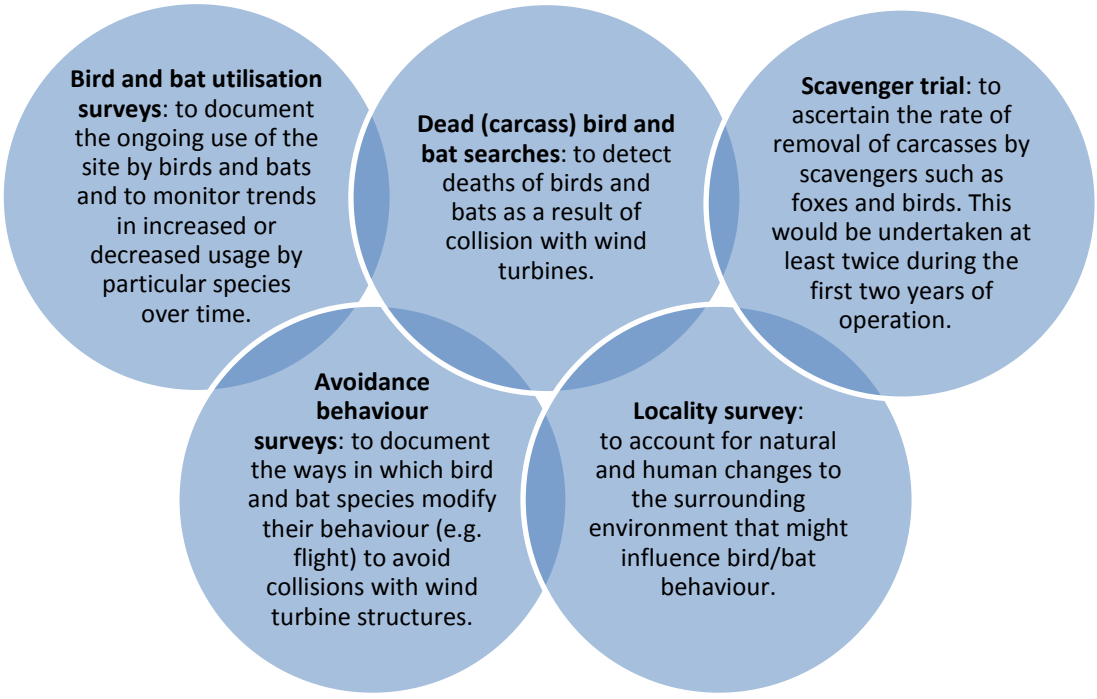

Figure 5.1: Overview of Bird and Bat Monitoring Methods (Operational Phase)

5.1 MONITORING FREQUENCY

This BBMS does not stipulate the total duration of on-ground monitoring but highlights that the program must be capable of detecting change. At this stage, the monitoring strategy is for the initial two years of operational monitoring. The frequency of monitoring events after this period would be considered in light of the results obtained throughout the program and the ongoing monitoring requirement will be negotiated with the NSW Department of Planning and Environment (DoPE).

5.2 PROTOCOL FOR DEAD (CARCASS) BIRD AND BAT SEARCHES

Carcass surveys identify the number of birds and/or bats killed per turbine over a known period of time. This value represents a minimum estimate of mortality and is adjusted for carcass removal rates (ie how quickly a carcass will decay and/or be removed by a scavenger) and searcher efficiency (ie number of carcasses present that are actually detected by the surveyor).

Three techniques are employed:

- Standardised Search: number of carcasses found around the specific turbines during peak activity periods;
- Carcass Removal Trials: monitoring of carcasses removed by scavengers to estimate the length of time that carcasses remain in the field for possible detection; and
- Searcher Efficiency Trials: percentage of carcasses found by searchers in the varying habitats throughout the wind farm facility.

Over such a large area it would not be possible to undertake a 'true census' by attempting to count all birds (or bats) within the site boundary on a weekly basis. Instead, surveys will be undertaken in a selection of representative sample areas.

Birds and bats are not distributed evenly across the landscape i.e. there are areas where habitat resources are clustered and accordingly birds and bats are more abundant in these areas. Areas where bird and bat collisions are considered more likely to occur are the 'focus areas'; the remaining areas are the 'non-focus areas' (yet to be determined – will be based on final turbine design).

The searches would involve intensive effort over a short period of time in order to gather a comprehensive dataset. For example, every turbine within the focus areas would be monitored weekly. Turbines in non-focus areas would be monitored on a rotational sampling basis.

Survey frequency and intensity would be reviewed at regular hold points (such as every three months) and a decision made as to whether survey effort should remain steady, increase or decrease.

The following strategy is recommended:

- in the first instance, searches must be centred on the turbine and should cover an area out to a distance equivalent to the height of the wind turbine for dead bird and/or bat remains and feather spots. This distance can be altered if carcass locations indicate this;

- turbines with no vegetation or sparse vegetation should be searched for a minimum of one person hour. Search times for vegetated search areas will vary, but should be slow enough to thoroughly search the area and result in high searcher efficiency;

- information on each carcass found should be recorded as follows:

    - date;
    - species;
    - signs of injury and likelihood of death due to collision;
    - signs of scavenging;
    - distance and bearing from turbine tower base; and
    - ground conditions (eg height and density of vegetation, presence of stock, etc).

- each search should involve thoroughly searching by transects within the search area. All searchers should be appropriately inducted to ensure that they understand and implement the search protocol consistently.

Evaluation would be undertaken of the stratification units and where necessary, turbines would be added or removed from focus areas. Periodic reviews would allow further evaluation where necessary.

Searchers or workers may discover bat carcasses incidental to formal searches. If these carcasses are found outside a scheduled search area they should be processed using the above protocol (eg collected, recorded, etc), and fatality data should be included with the calculation of fatality rates. If an incidentally discovered carcass is found within a search plot area, they should be photographed and their location recorded but left for the designated search team to maintain integrity of search efficiency and carcass removal rates.

5.3 PROTOCOL FOR A SCAVENGING AND SEARCHER EFFICIENCY TRIAL

5.3.1 Scavenging Trial

A scavenging trial should be undertaken at least twice over the initial (two year) monitoring period, during conditions of differing ground vegetation cover and season, to determine the rate of removal by scavenging animals. The objective of these trials is to estimate the percentage of bat and/or bird fatalities that are scavenged from study areas. Estimates of carcass removal rates will be used to adjust the number of carcasses found during surveys to correct for removal bias.

Each trial should use a minimum of 25 carcasses distributed across the range of different habitats types present. In order to avoid confusion with mortality surveys, trial carcasses should be discreetly marked with a unique identification number.

Carcasses must be placed within the surveyed area underneath turbines after sunset using gloves to avoid scents that might bias trial results (ie attract or repel scavengers) and monitored for removal every 24 hours. If possible, fresh carcasses or ones frozen for a limited amount of time should be used. The use of older/dried out carcasses may bias the results because they might not be scavenged at the same rate as fresh ones. Trials should continue until all the carcasses are removed or until the end of the carcass removal trial period (minimum 14 days).

The mean carcass persistence will be derived from the carcass persistence trials and will be used to adjust the search interval. Estimates of the probability that a carcass was not removed in the interval between searches (probability of persistence) and therefore was available to be found by searchers, will be used to adjust carcass counts for removal bias (Huso 2011).

5.3.2 Searcher Efficiency Trials

Searcher efficiency is another important factor in creating an accurate estimate of total bird and bat mortality. Searcher efficiency trails are to be conducted as part of post-construction monitoring.

Searcher efficiency trials require a known number of discreetly marked carcasses to be randomly planted around a wind turbine and their location recorded for retrieval if they are not found during the trial. Seasonality should be considered when designing searcher efficiency trials to account for potentially different scavenging rates, species, and rates of decomposition. Searchers examine the wind turbine area, and the number of carcasses detected is compared to the number of carcasses placed in the field. If searcher efficiency is low (<30%) based on initial trials then the search time should be increased, distance between transects reduced, or additional staff training should be conducted.

5.4 *PROTOCOL FOR ONGOING BIRD AND BAT UTILISATION SURVEYS*

Bird and bat utilisation surveys would be undertaken during the carcass search events, with a minimum of 18 bird and five bat surveys per month using the methodology outlined in *Section 5.2*. This would mean that each of the bird and bat utilisation survey sites (as mapped in ERM 2013) would be surveyed once each month. Survey frequency and intensity would be reviewed at regular hold points (such as every three months) and a decision made as to whether survey effort should remain steady, increase or decrease.

5.5 *PROTOCOL FOR ASSESSMENT OF INDIRECT DISTURBANCE (LOCALITY SURVEY)*

Periodic (ie every three months) locality surveys should be undertaken to document any changes in the local environment and provide a basis upon which to judge whether any observed changes in bird and/or bat behaviour can be reasonably attributable to factors other than the operation of the wind farm, including seasonal factors. The survey may include, but not be limited to, the following:

- seasonal changes, including evidence of nesting activity by key species;
- changes in land use practices;
- significant changes in water levels in nearby water bodies;
- significant weather events; and
- anecdotal information from land owners, land managers, wind farm staff and the local community.

5.6 *STUDYING AVOIDANCE BEHAVIOUR*

Avoidance behaviour includes a number of behaviours, defined by the Interim Standards (BL&A 2005) as set out below.

Avoidance involves birds and bats remaining on a wind farm site but flying around, over or under operating wind turbines and it is a commonly observed behaviour at wind farms.

Diversion involves birds and bats remaining within the area around a wind farm but avoiding the wind farm site entirely.

Displacement involved birds and bats being displaced through disturbance from the area around the wind farm.

Avoidance surveys should be undertaken in conjunction with the bird and bat utilisation surveys and should note the following:

- bird and bat species observed, heard or recorded;
- flight height & direction of bird species when first observed;
- flight behaviour (ie soaring, hovering, gliding, flapping, etc);
- any feeding buzzes (recorded using Anabat) and
- avoidance behaviour observed (eg change of flight behaviour in close proximity to turbines), if any.

6 INDICATIVE MONITORING SCHEDULE

An indicative monitoring program (schedule) has been prepared assuming commissioning of the Wind Farm in January. The calendar below provides an indication of the monitoring program stages by year and by season. The intensive monitoring planned for the early stages of the program would either be extended or delayed if the wind farm is commissioned in winter.

In order to gain an understanding of the impact of the wind farm upon local bird and bat populations, surveys must be taken across a range of seasons; particularly during periods of higher activity such as spring and summer.

Table 6.1 Indicative Monitoring Schedule – Operational

Monitoring Action	Year 1												Year 2											
	Summer		Autumn			Winter			Spring				Summer		Autumn			Winter			Spring			
Internal reporting and evaluation of survey effort (every 3 months)																								
Bird and Bat Utilisation Surveys (in conjunction with the carcass surveys)							Survey effort to be evaluated every 3 months																	
Avoidance Behaviour (in conjunction with bird and bat utilisation surveys)							Survey effort to be evaluated every 3 months																	
Dead (carcass) bird and bat searches – Focus Area (weekly)																								
Dead (carcass) bird and bat searches – Non-focus Area (weekly on rotational basis)																								
Locality Survey (every 3 months)																								
Carcass Removal Trials (at least 2 trials in different seasons)																								
Searcher Efficiency Trials (at least 2 trials in different seasons)																								
Annual Reporting																								

The details of ongoing monitoring (after the first two years of operation) will be will be negotiated with the DoPE.

7 *REPORTING*

Internal reporting should be undertaken every three months to identify any trends of concern that may trigger a management response or the need for changes in survey protocol. Triggers and performance criteria will be developed following final design of the wind farm and will be based on approval conditions and best practice guidelines.

An annual report will provide a detailed analysis of the data and should seek to answer the following questions:

- Has the species assemblage changed (presence/absence)?
- What differences in species assemblage, abundance and habitat utilisation have occurred and can these be linked to any aspect of the wind farm operation? (eg shadow flicker, noise, blade-strike);
- Are there other environmental factors that could contribute to any detected changes in species assemblage, abundance and habitat utilisation? (eg changes in surrounding landuse);
- What types of avoidance behaviours were directly observed (eg flight manoeuvres to avoid blades) and by which species?
- What types of avoidance behaviours can be inferred (eg diversion and displacement) and by which species? and
- Have there been any statistical changes in species abundance (birds) or activity levels (bats)? If yes, is there any potential for a local population level impact for a given species?

Specific details on statistical analyses to be conducted have not been provided in this Strategy as they will depend on the quality and quantity of data collected and whether data assumptions for a given statistical test can be met. As a minimum, analysis of trends is likely to include:

- raw numbers of mortalities (plotted or tabulated by turbine, month, season);
- analysis of type of species directly impacted relative to flight behaviour and any avoidance behaviour observed;
- decline in species presence when compared with pre-operational monitoring results;
- comparison of bird and bat usage (abundance and richness) before and after construction; and
- comparison of bird and bat usage (abundance and richness) over time since operation commenced.

In accordance with the Interim Standards (BL&A 2005), reports of dead bird and bat search programs should provide the following.

- a detailed account of the methods of the dead bird search program, including the total number of sites counted (turbine sites and reference sites, their locations, including coordinates, whether they represent all or randomly selected turbine sites, and whether any fixed search sites were included);

- mortality estimates should be provided for birds (in total and by species) as the number of dead birds per turbine per year, including application of correction factors for scavenging and observer efficiency;

- the estimate of mortality rates by species should be compared with any pre-operational bird utilisation survey results (at RSA height) to determine which species are at greatest risk from the wind farm;

- the estimated mortality rates should be compared with the results of the regional population assessments and population viability analyses undertaken, where relevant; and

- the requirement for continued monitoring should be reviewed, together with the monitoring methodology. The estimate of mortality rates by species should be compared with any pre-operational bird utilisation survey results (at RSA height) to determine which species are at greatest risk from the wind farm.

8 *CONCLUSION*

This Bird and Bat Management Strategy (BBMS) identifies appropriate survey methodologies and frequency, and provides guidance on bird and bat management. It provides a framework that can be used for development of a detailed Bird and Bat Management Plan for both the construction and operational phases of the wind farm once approved.

It outlines an adaptive program for monitoring the effects of each turbine and provides a sampling strategy specific to the first two years of operation. The details of ongoing monitoring (after the first two years of operation) will be negotiated and established based on the recommendations of the initial monitoring.

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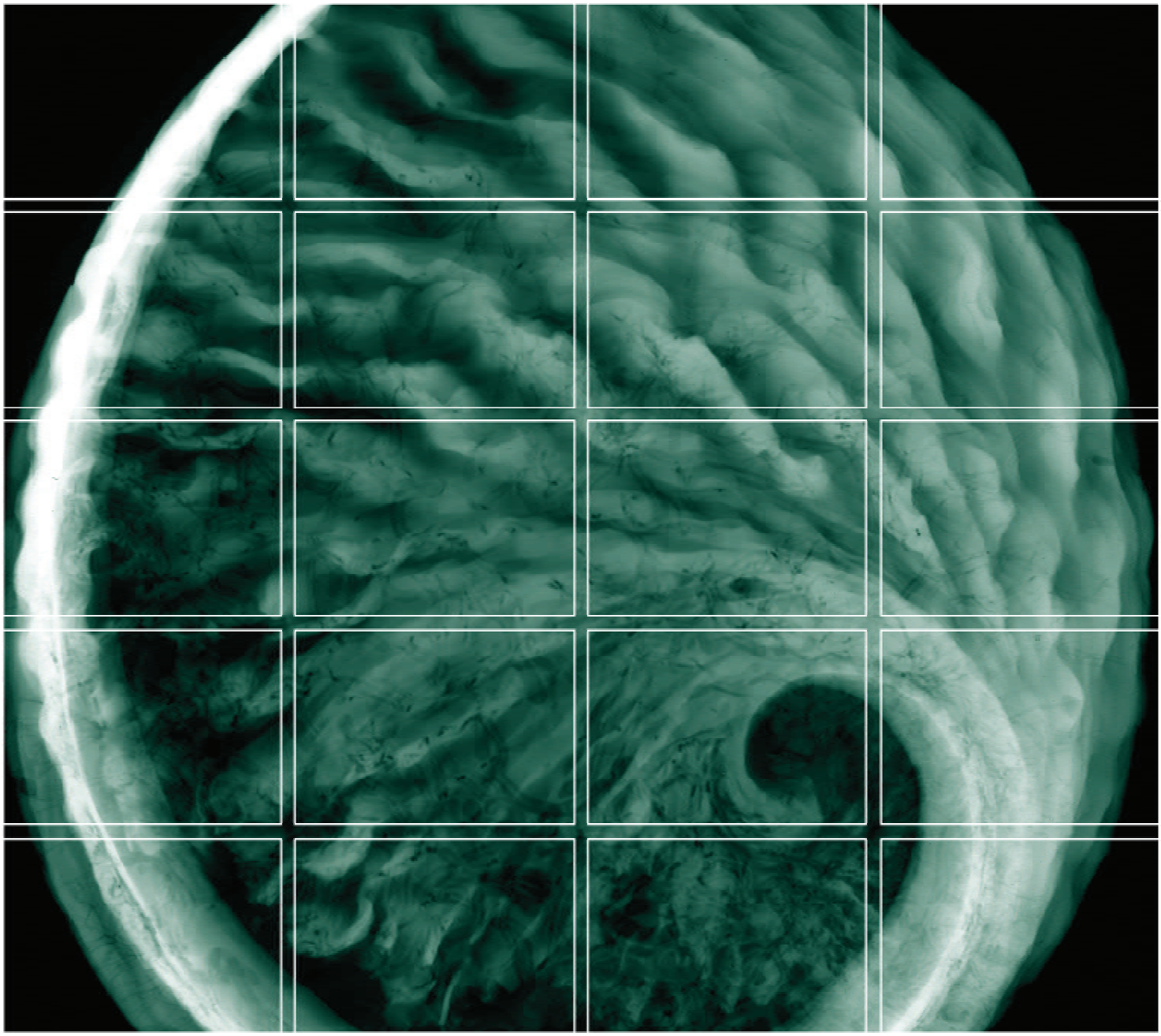
Annex D

OFFSET STRATEGY



Paling Yards Wind Farm

Biodiversity Offset Strategy

Union Fenosa Wind Australia

December 2014

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Biodiversity Offset Strategy

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INTRODUCTION

This Offset Strategy has been prepared as part of the response to submissions for the Paling Yards Wind Farm Environmental Assessment. It has been prepared to outline the general methods by which the Project's ecological impacts will be offset, taking account of:

- the NSW Office of Environment and Heritage (OEH) *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014);
- the principles and resources provided by the BioBanking Scheme including the BioBanking Credits Register and the BioBank sites Expressions of Interest (EOI); and
- OEH advice provided during a teleconference on 21 October 2014.

The Strategy provides a framework that can be used following project approval for the development of a detailed Offset Management Plan for the project's ecological impacts.

AIMS AND OBJECTIVES

This Offset Strategy aims to:

- provide a summary of the project's ecological impacts;
- introduce the OEH principles of biodiversity offsetting;
- identify options available to offset the project's biodiversity impacts;
- discuss the viability of options including the consideration of separation distances between impacts and offsets; and
- provide an outline of the proposed biodiversity offset.

The term 'Study Area' has been adopted from the Supplementary Ecological Report (SER) (ERM 2014) and refers to the area that was the subject of the ecological assessment, including (refer *Annex A*):

- the area within 100 metres (m) of the Development Footprint; and
- areas of potential habitat for threatened birds and bats within the Project Application Area.

BIOMETRIC VEGETATION TYPES IN THE STUDY AREA

Four Biometric Vegetation Types (BVTs) were identified in the Study Area[1], as shown in *Table 2.1.* Whilst it is inherently difficult to identify vegetation types where there has been modification by agriculture (eg the tree densities may have been reduced and grass species composition may have been altered from the pre-European condition for pasture improvement), in these cases, the biometric vegetation type most in keeping with vegetation on the ground was selected based on available site observations such as remnant tree species type present.

Table 2.1 Biometric Vegetation Types in the Study Area

BVT Code	Biometric Vegetation Type
LA103	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands
LA124	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands
LA182	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion
LA186	River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions
ERM (2014)	

Condition classes were applied to each of the BVTs mapped in the Study Area to create 'Vegetation Zones' (see ERM 2014 for more details). The vegetation zones present in the Study Area and their area within the Development Footprint are shown in *Table 2.2* and *Annex A.* Full vegetation descriptions are provided in the SER (ERM 2014).

[1] The term 'Study Area' has been adopted from the Supplementary Ecological Report (SER) (ERM 2014) and refers to the area that was the subject of the ecological assessment, including (refer *Annex A*):

- the area within 100 metres (m) of the Development Footprint; and
- areas of potential habitat for threatened birds and bats within the Project Application Area.

Table 2.2 Type of Vegetation Zone in the Study Area and Area within Development Footprint

BVT Code	Vegetation Zone	Area in Development Footprint (ha)	Equivalent Endangered Ecological Community Type
LA103_MG_PG	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands_Moderate-Good (Mod-Good)_Poor-Grassland	2.9	Box Gum Woodland occurring as Derived Native Grassland (TSC Act)
LA124_MG_M	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Mod	6.9	None
LA124_MG_PG	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Poor-Grassland	0.0	None
LA124_MG_Shrubby	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Shrubby	2.3	None
LA182_MG_M	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	None
LA182_MG_Shrubby	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Shrubby	0.2	None
LA186_MG_PW	River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions_Mod-Good_Poor-Weedy	0.3	None
Total		**14.0**	

1. The BVT Code is provided here with a suffix which is an abbreviation of the condition class
2. Sections of the development footprint include areas of existing cleared farm track, covering approximately 0.4 ha.

1.1 PROPOSED DEVELOPMENT IMPACTS

The Project comprises a number of components, permanent and temporary, that would impact on ecological values. Those project components that were accounted for in calculations of the impacts of the project on ecological values as provided in the SER (ERM 2014) are listed in *Table 2.3* and discussed further in the following sections.

Table 2.3 Project Components

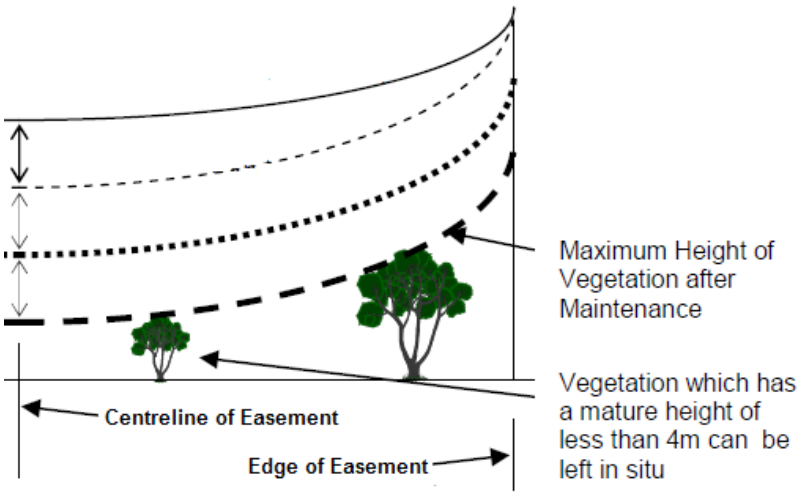
Project Component	Number	Maximum Dimensions
Permanent		
Wind Turbine Generators (WTG)	Up to 55	20m x 20m
Access tracks	-	6m wide x 26.04km
Substations	2	250m x 210m
Transmission lines (including power poles)	-	60m wide x 9000m*
Wind monitoring mast footings	Up to 3	$6m^2$
Crane pads at WTGs	Up to 55	50m x 50m
Temporary		
Construction access tracks	-	10m wide x 26.04km
Batching plant	1	80m x 80m
Construction disturbance areas	-	2m around the footprint of each WTG, crane pad, batching plant and monitoring tower

*This length indicated in this table includes both sub-options of the northern transmission line, of which only one will be selected.

1.1.1 Native Vegetation

The Development Footprint covers a total area of 106.5 hectares (ha). This includes a permanent impact area of 33.1ha, temporary impact area of 13.0ha and 60.4ha of limited impact associated with the northern transmission line option. The 60.4ha associated with establishment of the northern transmission line option would not require clearance of all vegetation within the identified corridor as this may be achieved through limiting clearing to vegetation at each power pole structure and for establishment of an access track within the easement. Outside of the power pole locations, vegetation up to four metres in height would remain and vegetation up to 15m in height at the edges of the easements would remain (see *Figure 2.1*).

Figure 2.1 Vegetation Clearance within the Transmission Line Easement



Source: ERM (2014)

Of the total Development Footprint, 92.5ha comprises exotic pasture, cropping, planted vegetation or bare ground. The remaining 14.0ha comprises native vegetation, as shown in *Table 2.4*. *Table 2.4* also provides a breakdown of areas for both permanent and temporary impacts for each BVT.

Table 2.4 Area of Each Vegetation Zone in Development Footprint

BVT Code[1]	Vegetation Zone	Area in Study Area (ha)	Total Area in Development Footprint (ha) (including transmission line)	Permanent Impact Area (ha)	Temporary Impact Area (ha)	Partial Clearance (transmission line) (ha)
LA103_MG_PG	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands_Mod-Good_Poor-Grassland*	21.9	2.9	1.9	1.0	0.0
LA124_MG_M	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Mod	47.0	6.9	0.1	0.0	6.8
LA124_MG_PG	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Poor-Grassland	11.2	0.0	0.0	0.0	0.0
LA124_MG_Shrubby	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands_Mod-Good_Shrubby	11.7	2.3	0.0	0.0	2.3
LA182_MG_M	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Mod	23.1	1.4	1.0	0.4	0.0
LA182_MG_Shrubby	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion_Mod-Good_Shrubby	1.0	0.2	0.2	0.0	0.0
LA186_MG_PW	River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions_Mod-Good_Poor-Weedy	1.2	0.3	0.0	0.0	0.3
	Total	**117.1**	**14**	**3.2**	**1.4**	**9.4**

1. The BVT Code is provided here with a suffix which is an abbreviation of the condition class

2 * indicates this vegetation forms part of the TSC Act-listed Box Gum Woodland EEC occurring in the Study Area and Development Footprint as Derived Native Grassland.

Source: ERM (2014)

Offset Measures

The vegetation zone areas used in the BioBanking assessment are based on the permanent Development Footprint and the northern transmission line option (which includes two options for a short section of which the southern sub-option has been used) (see *Table 2.4*).

The indicative area of offset that was calculated using the BioBanking Assessment Methodology (BBAM) and the credit to hectare converter is shown in *Table 2.5*.

Table 2.5 Credit requirements and their equivalent in hectares

BVT Code	BVT name	Area in Permanent Footprint and Transmission Line Southern Sub-Option (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**

1. Data is based on the Credit Report provided in Annex B and the BioBanking Credit Converter

PROPOSED OFFSET STRATEGY

OEH BIODIVERSITY OFFSETS POLICY FOR MAJOR PROJECTS

In mid-2014 OEH released a biodiversity offsets policy for major projects. This is in a transitional phase. There are six principles underpinning the biodiversity offsets policy (OEH 2014).

- Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts;
- Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains;
- Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities;
- Principle 4: Offsets must be additional to other legal requirements;
- Principle 5: Offsets must be enduring, enforceable and auditable; and
- Principle 6: Supplementary measures can be used in lieu of offsets.

OFFSET OPTIONS

A number of options exist through which a biodiversity offset can be achieved. These include:

- BioBanking Credits through the formal use of the BioBanking system that involves the purchase of credits to offset the calculated impacts. The credits are generally available for purchase from a landholder who has undertaken investigations and quantification of the ecological value of their land and created them for sale;
- Land contribution to existing conservation lands where in negotiation with the NSW National Parks and Wildlife Service (NPWS), a landholder can turn over a piece of what is currently privately owned land to the ownership and control of the NPWS. The appropriate land must be negotiated with the NPWS and is likely to be a piece of land adjacent to a national park that is of strategic value to the NPWS for regional ecological value. A third party (ie Union Fenosa Wind Australia) could work with a private landholder to assist this piece of land to be made available. The land would then come under the ownership of NPWS; and
- Voluntary conservation agreements whereby a private landholder can set aside a piece of land to be managed in a manner that will enhance the biodiversity values of that piece of land. This is similar to the concepts of BioBanking, however the rules governing the offset site may be less

stringent than those for BioBanking. The piece of land will need to be set aside and managed for conservation in perpetuity.

AVOIDANCE OF INDIRECT IMPACTS

During the teleconference on 21 October 2014, OEH raised the issue of the separation distance between an offset site and the proposed wind farm infrastructure. The distance between the offset site and the nearest wind turbine must be sufficient so that the ecological values of the offset site are not influenced by the wind turbines. OEH provided guidance on 31 October 2014 by email that a desirable separation distance is about 1km.

PROPOSED OFFSET

It is anticipated that Union Fenosa Wind Australia will adopt the voluntary conservation agreement path, and work with a private landholder to have the landholder manage a suitable area of land for conservation. The location, management actions and other associated specific detail guiding the management of the Paling Yards biodiversity offset will be detailed in an *Offset Management Plan* that will be prepared should the proposed Paling Yards Wind Farm be approved and construction is to go ahead. The extent of the offset will satisfy the *NSW Biodiversity Offsets Policy for Major Projects* (refer *Section 3.1*) to the satisfaction of OEH.

This section outlines the proposed location options identified at this stage, that will subsequently be subject to the appropriate level of ecological investigation to determine their suitability as offset areas (to be determined through quantification of the ecological values present and in liaison with OEH to confirm their suitability). It then provides examples of management actions that could be used if necessary to enhance the biodiversity of the offset site, the offset security and outlines the funding arrangement that could be used.

PROPOSED OFFSET LOCATION

Three options have been initially identified for the proposed offset location within the project site boundary, in consultation with the host landowner. The specific vegetation types contained in these marked areas will be investigated as part of the offset identification process. All three options are close to the locations of the impacts, and although the separation distance between the nearest turbines and the nearest edge of the proposed offset areas are less than the recommended 1km separation distance, the centre of options 1 and 3 are approximately 1km from the nearest turbine. Selection of the appropriate offset site will seek to maximise the separation distances, along with considerations of other parameters of ecological suitability (ie presence of the required or suitable vegetation types, condition of the vegetation and proposed management measures that could be employed). The following is a summary of each location (see *Annex C* for the locations):

Region 1:

- Total area of region is approximately 112ha;
- This region is adjacent to the Abercrombie River National Park;
- Closest turbine tower (P40) to centre of region is approximately 1,000m;
- Closest turbine tower (P40) to edge of eastern boundary of region is approximately 600m;

- Closest turbine tower (P37) to edge of south-eastern boundary of region is approximately 600m; and
- Closest turbine tower (P35) to edge of southern boundary of region is approximately 600m.

Region 2:

- Total area of region is approximately 43ha;
- This region is adjacent to the Abercrombie River National Park;
- Closest turbine tower (P31) to edge of north-eastern boundary of region is approximately 600m;
- Closest turbine tower (P20) to edge of eastern boundary of region is approximately 670m;
- Closest turbine tower (P14) to edge of south-eastern boundary of region is approximately 630m; and
- Closest turbine tower (P10) to edge of southern boundary of region is approximately 750m.

Region 3:

- Total area of region is approximately 44ha;
- This region is adjacent to another land area under a conservation agreement;
- Closest turbine tower (P15) to edge of north-eastern boundary of region is approximately 600m;
- Closest turbine tower (P8) to edge of north-western corner of region is approximately 860m; and
- Closest turbine tower (P15) to centre of region is approximately 950m.

Should none of these three options be identified as suitable to be used as an offset for the project, further investigations will be undertaken by Union Fenosa Wind Australia of alternative land areas on the properties near the proposed development and, where possible, adjoining the Abercrombie River National Park. Other alternatives may include using the BioBanking system to secure credits equivalent to the project impacts.

Management Strategy for the Offset

The main aim of management actions at the offset site will be to improve the biodiversity values at the site. These actions will typically be more onerous at the instigation of the offset site and reduce over time, however it is important to note that they will be required in perpetuity. Such management actions may include: Fencing to exclude stock;

- fencing to exclude feral animals;
- feral animal removal;
- weed removal;
- controlled burning;
- revegetation; and
- erosion control.

The management action plan will detail the specific actions required and their timing/frequency, and will also include a recommended monitoring and auditing program to measure the improvements in biodiversity values at the site and provide an opportunity to make improvements to the management actions.

Security of the Site

It is proposed that the offset site will be secured through a Voluntary Conservation Agreement between the landholder and the NSW Government.

Funding Arrangements

It is proposed that the management actions will be financed through the provision of funds from Union Fenosa Wind Australia on an annual basis for management actions and landuse compensation, in accordance with agreements between Union Fenosa Wind Australia and the landholder.

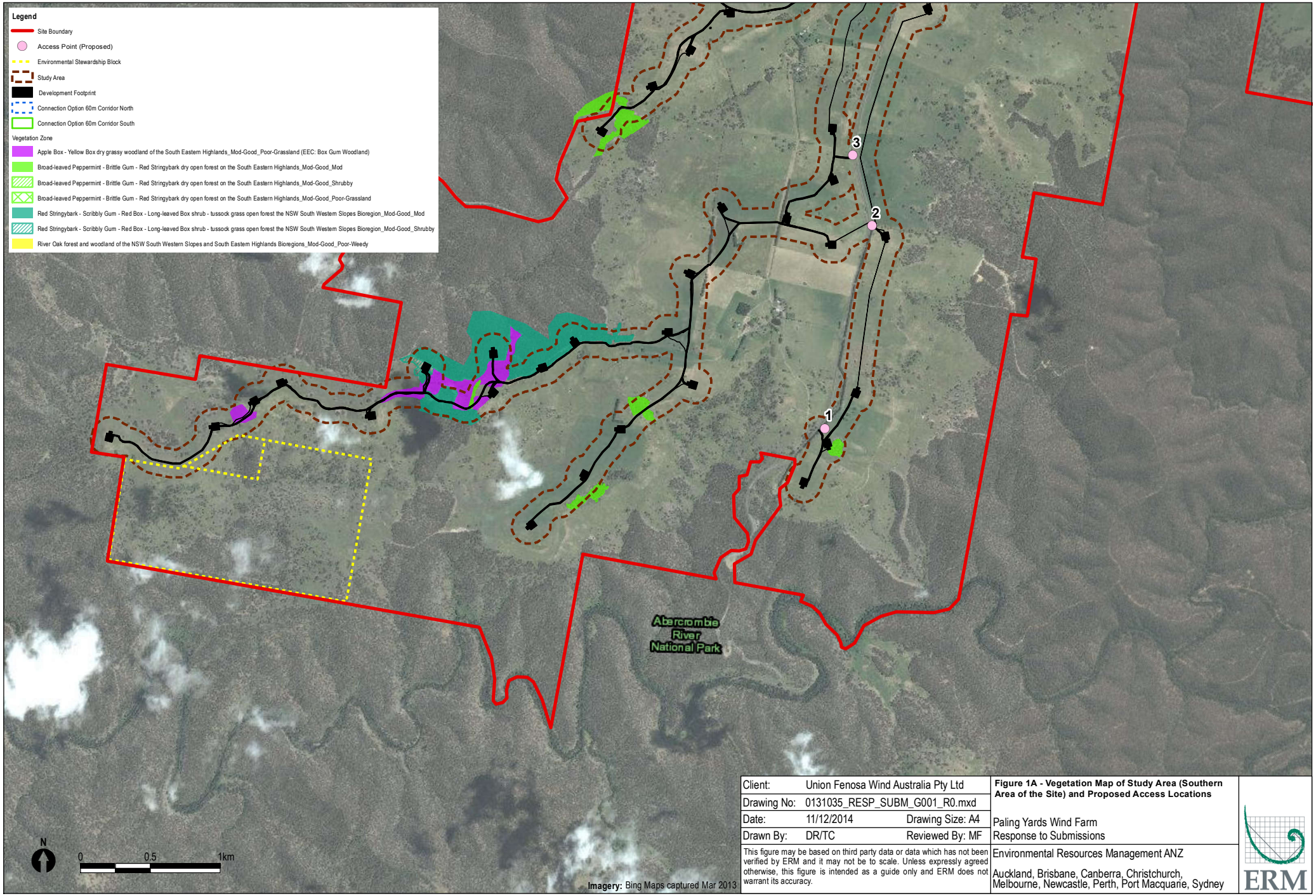
REFERENCES

ERM (2014) *Paling Yards Wind Farm: Supplementary Ecology Report*. Report Prepared for Union Fenosa Wind Australia Pty Ltd by ERM Australia Pty Ltd. 14 January 2014.

OEH (2014) *NSW Biodiversity Offsets Policy for Major Projects*. NSW Office of Environment and Heritage. Sydney. Accessed: 3/11/2014 http://www.environment.nsw.gov.au/resources/biodiversity/140672biopolicy.pdf.

Annex A

Figures



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Date:	11/12/2014	Drawing Size: A4
Drawn By:	DR/TC	Reviewed By: MF

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Figure 1A - Vegetation Map of Study Area (Southern Area of the Site) and Proposed Access Locations

Paling Yards Wind Farm
Response to Submissions

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM

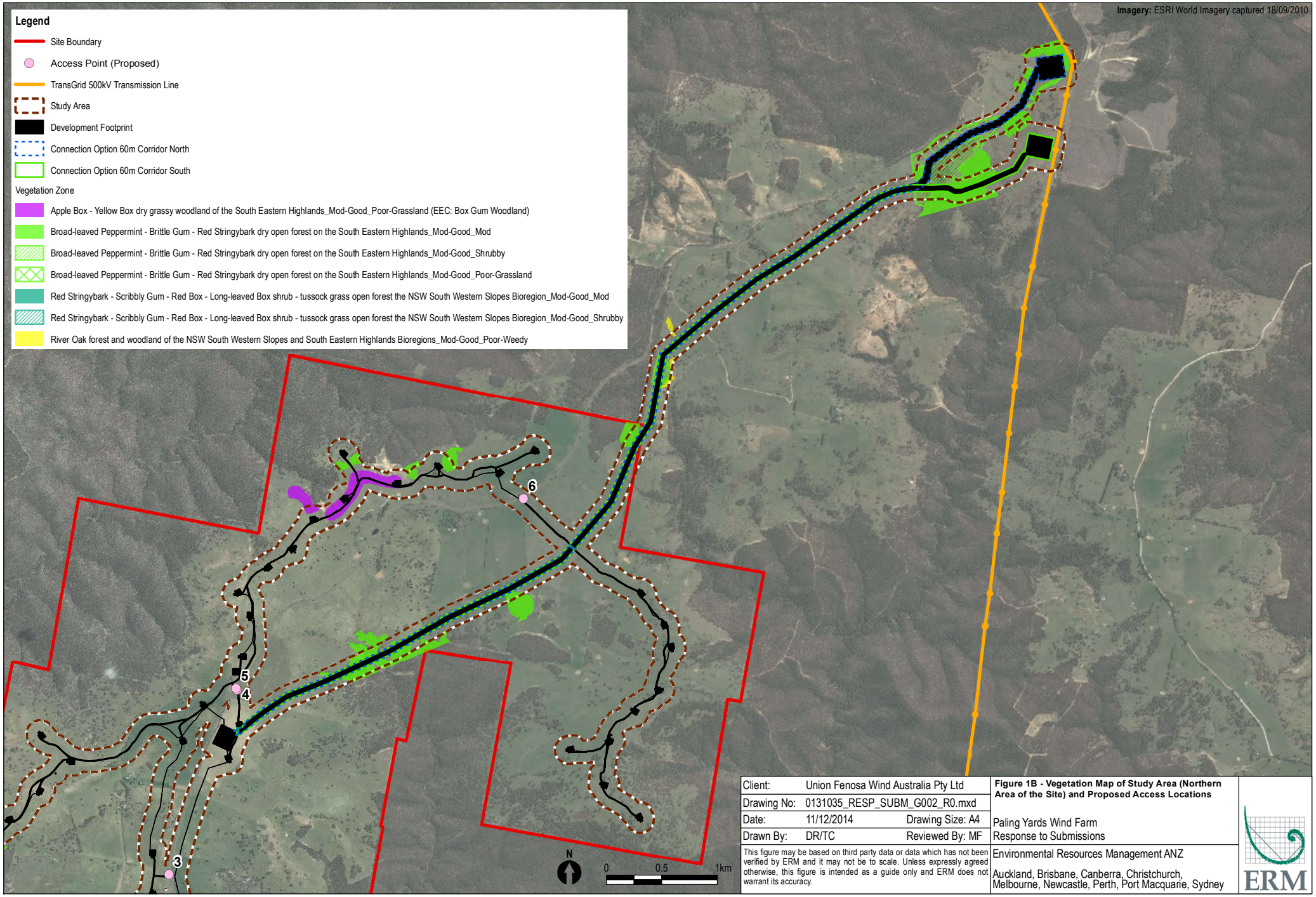

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Figure 1B - Vegetation Map of Study Area (Northern Area of the Site) and Proposed Access Locations

Paling Yards Wind Farm
Response to Submissions

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM

Annex B

BioBanking Credit Report

BioBanking Credit Calculator

Ecosystem credits

Proposal ID :	0089/2013/0733D
Proposal name :	Paling Yards Wind Farm
Assessor name :	Evelyn Craigie
Assessor accreditation number :	0089
Tool version :	1.1
Report created :	03/06/2013 16:11

Assessment circle name	Landscape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
AC1	12.00	LA103_Moderate/Good_Poor	Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands	Moderate/Good_Poor	Yes	Hardstand	1.90	11.46	0.00	11.46	11	36	Spotted-tailed Quoll	22.22	0.35	36
AC1	12.00	LA124_Moderate/Good_Medium	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	Moderate/Good_Medium	No	Hardstand	0.10	42.71	0.00	42.71	1	0		0.00	0.00	1
AC1	12.00	LA124_Moderate/Good_Medium	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	Moderate/Good_Medium	No	Powerline	6.80	42.71	10.94	31.77	74	155	Spotted-tailed Quoll	27.77	0.35	155
AC1	12.00	LA124_Moderate/Good	Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	Moderate/Good	No	Powerline	2.30	38.19	15.80	22.39	20	25	Spotted-tailed Quoll	11.11	0.35	25
AC1	12.00	LA182_Moderate/Good_Medium	Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion (Benson 290)	Moderate/Good_Medium	No	Hardstand	1.20	51.04	0.00	51.04	19	66	Spotted-tailed Quoll	72.22	0.35	66
AC1	12.00	LA186_Moderate/Good_Poor	River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions (Benson 85)	Moderate/Good_Poor	Yes	Powerline	0.30	49.48	18.75	30.73	3	6	Squirrel Glider	33.33	0.45	6

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : 1.1

Report created : 03/06/2013 16:11

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / number of loss	Negligible loss	Red flag status	Number of credits
			No					

BioBanking Credit Calculator

BioBanking credit report

This report identifies the number and type of credits required at a DEVELOPMENT SITE.

Date of report: 3/06/2013 Time: 4:13:01PM Tool version: 2.0

Development details

Proposal ID:	0089/2013/0733D
Proposal name:	Paling Yards Wind Farm
Proposal address:	Abercrombie Rd Paling Yards NSW 2580
Proponent name:	Union Fenosa Wind Australia Pty Ltd
Proponent address:	Suite 403, 68 York St Sydney NSW 2000
Proponent phone:	02 82978700
Assessor name:	Evelyn Craigie
Assessor address:	Buidling C, 33 Saunders Street PYRMONT NSW 2009
Assessor phone:	8586 8719
Assessor accreditation:	0089

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions (Benson 85)	Vegetation type being > 70% cleared; or it contains an endangered ecological community;

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
- ☐ Change negligible loss
- ☐ Expert report
- ☐ Predicted threatened species not on site
- ☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	0.10	1	No
Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	6.80	155	No
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands	1.90	36	Yes
Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands	2.30	25	No
Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion (Benson 290)	1.20	66	No
River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions (Benson 85)	0.30	6	Yes
Total	12.60	289	

Credit profiles

1. Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands, (LA103)

Number of ecosystem credits required	36
CMA sub-region	Crookwell - Lachlan
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands, (LA103) Apple Box - Yellow Box dry grassy woodland of the South Eastern Highlands, (CW102) Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 277), (CW112)	Crookwell - Lachlan Upper Slopes - Central West

2. Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion (Benson 290), (LA182)

Number of ecosystem credits required	66
CMA sub-region	Crookwell - Lachlan
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions

Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion (Benson 290), (LA182) Broad-leaved Stringybark - Mountain Ribbon Gum - Messmate open forest of escarpment ranges of the North Coast and New England Tablelands, (HU518) Red Stringybark - Red Box - Long-leaved Box - Scribbly Gum shrub - tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion (Benson 290), (MU573)	Crookwell - Lachlan Wollemi (Part A) Wollemi - Central West Capertee Bathurst - Central West Hill End Orange - Lachlan Yengo - Hunter/Central Rivers Cumberland - Sydney Metro Wyong Walcha Plateau - Northern Rivers Armidale Plateau Rocky River Gorge Northeast Forest Lands - Northern Rivers Tenterfield Plateau Kerrabee - Central West Hunter Liverpool Range - Central West Liverpool Range - Namoi Peel - Namoi Upper Slopes - Lachlan Upper Slopes - Central West Stanthorpe Plateau

3. Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands, (LA124)

Number of ecosystem credits required	181
CMA sub-region	Crookwell - Lachlan
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	**Offset options - CMA sub-regions**
Broad-leaved Peppermint - Brittle Gum - Red Stringybark dry open forest on the South Eastern Highlands, (LA124)	Crookwell - Lachlan Wollemi (Part A) Wollemi - Central West Capertee

	Bathurst - Central West Hill End Orange - Lachlan Yengo - Hunter/Central Rivers Cumberland - Sydney Metro Wyong Walcha Plateau - Namoi Walcha Plateau - Northern Rivers Armidale Plateau Rocky River Gorge Oberon - Central West Eastern Nandewars Murrumbateman - Murrumbidgee Bondo Bondo (Part A) Bondo (Part B) Wongwibinda Plateau Nightcap Northeast Forest Lands - Northern Rivers Tenterfield Plateau Kerrabee - Central West Hunter Liverpool Range - Central West Liverpool Range - Namoi Peel - Namoi Upper Slopes - Lachlan Upper Slopes - Central West Stanthorpe Plateau

4. River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions (Benson 85), (LA186)

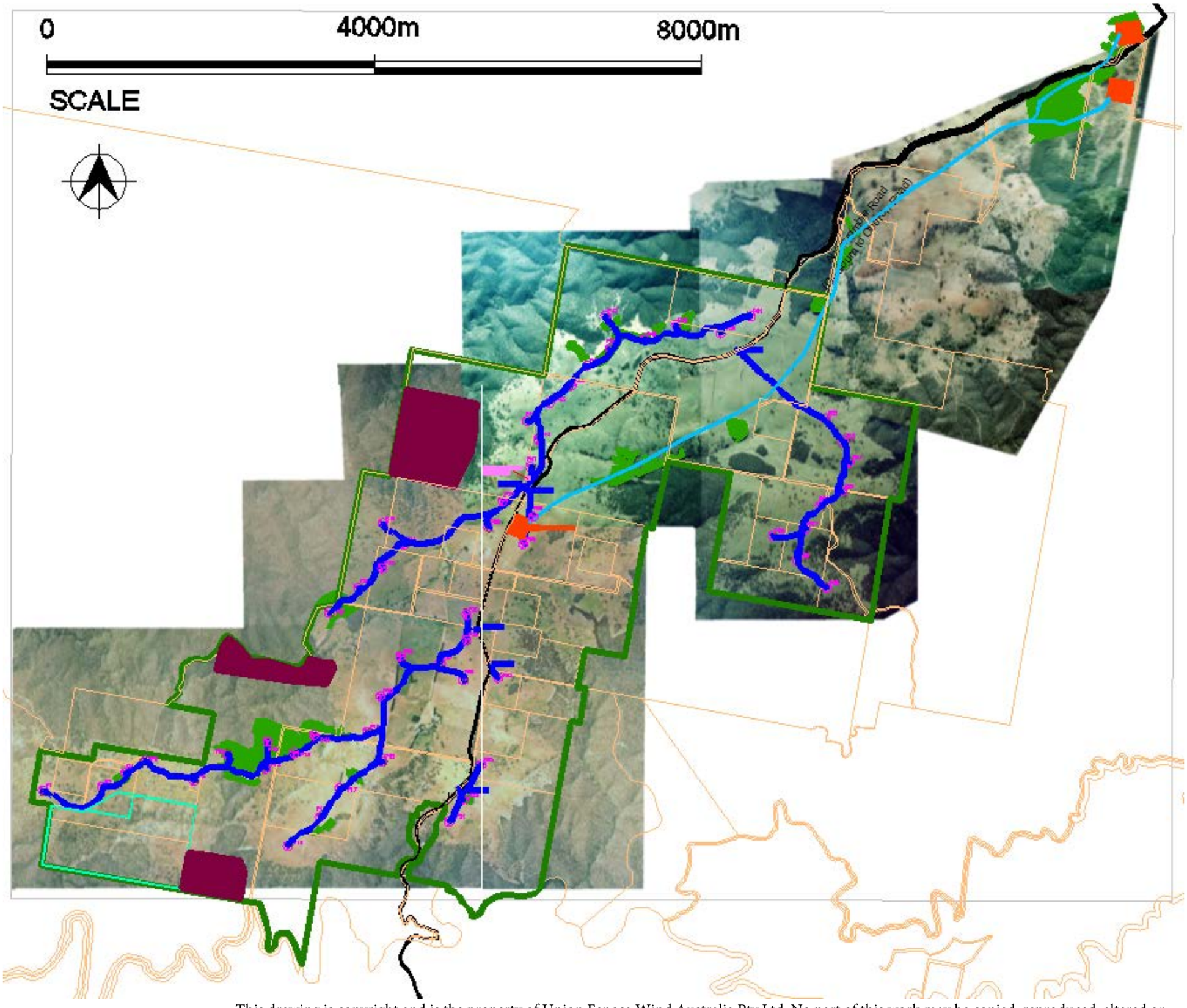
Number of ecosystem credits required	6
CMA sub-region	Crookwell - Lachlan
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

Offset options - vegetation types	Offset options - CMA sub-regions
River Oak forest and woodland of the NSW South Western Slopes and South Eastern Highlands Bioregions (Benson 85), (LA186)	Crookwell - Lachlan Orange - Lachlan Pilliga - Central West Pilliga (Part B) Upper Slopes - Lachlan Upper Slopes - Central West Liverpool Plains (Part A) Liverpool Plains (Part B)

Species credits

Annex C

Location Of Proposed Potential Offsets



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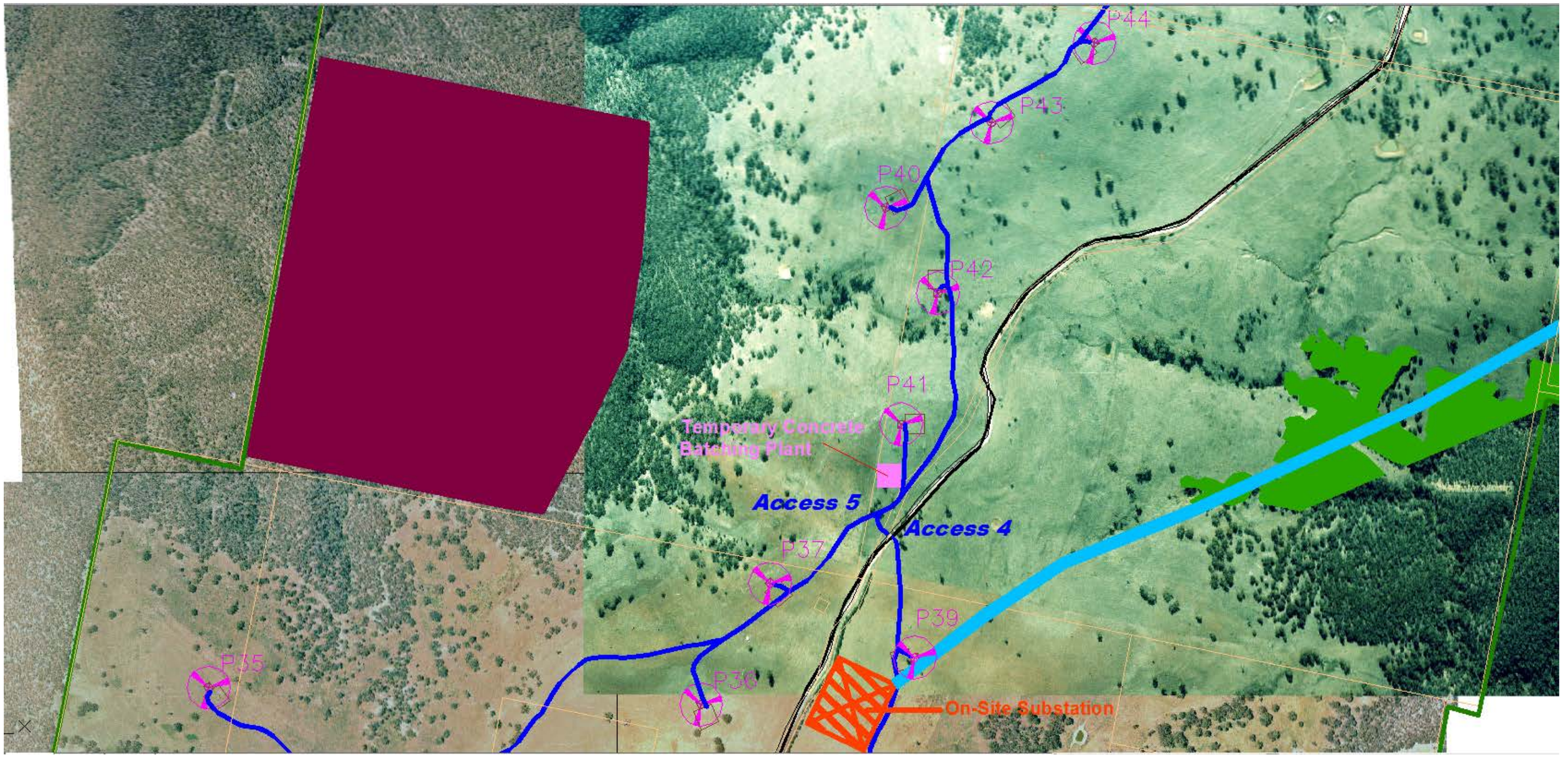

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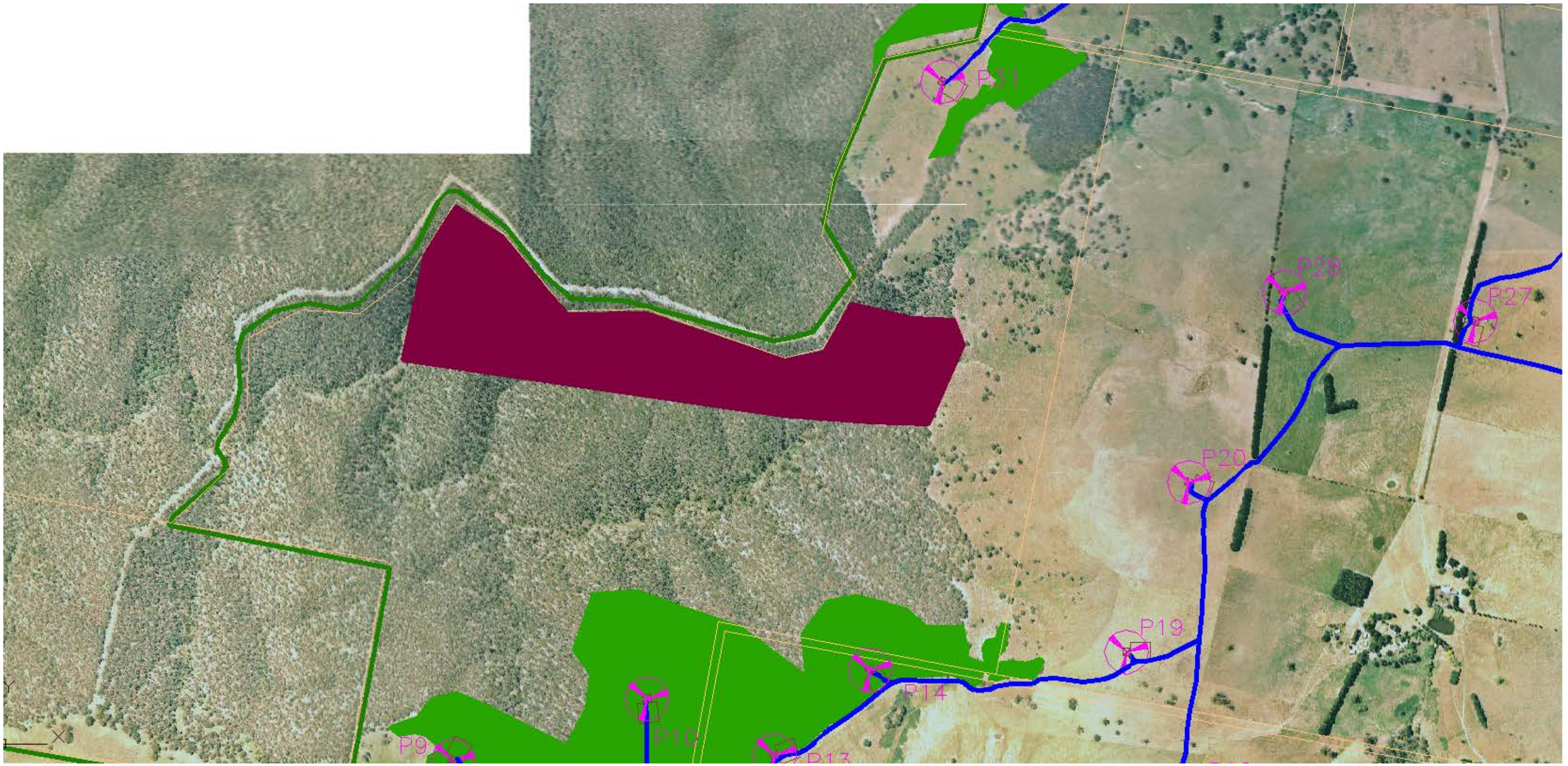

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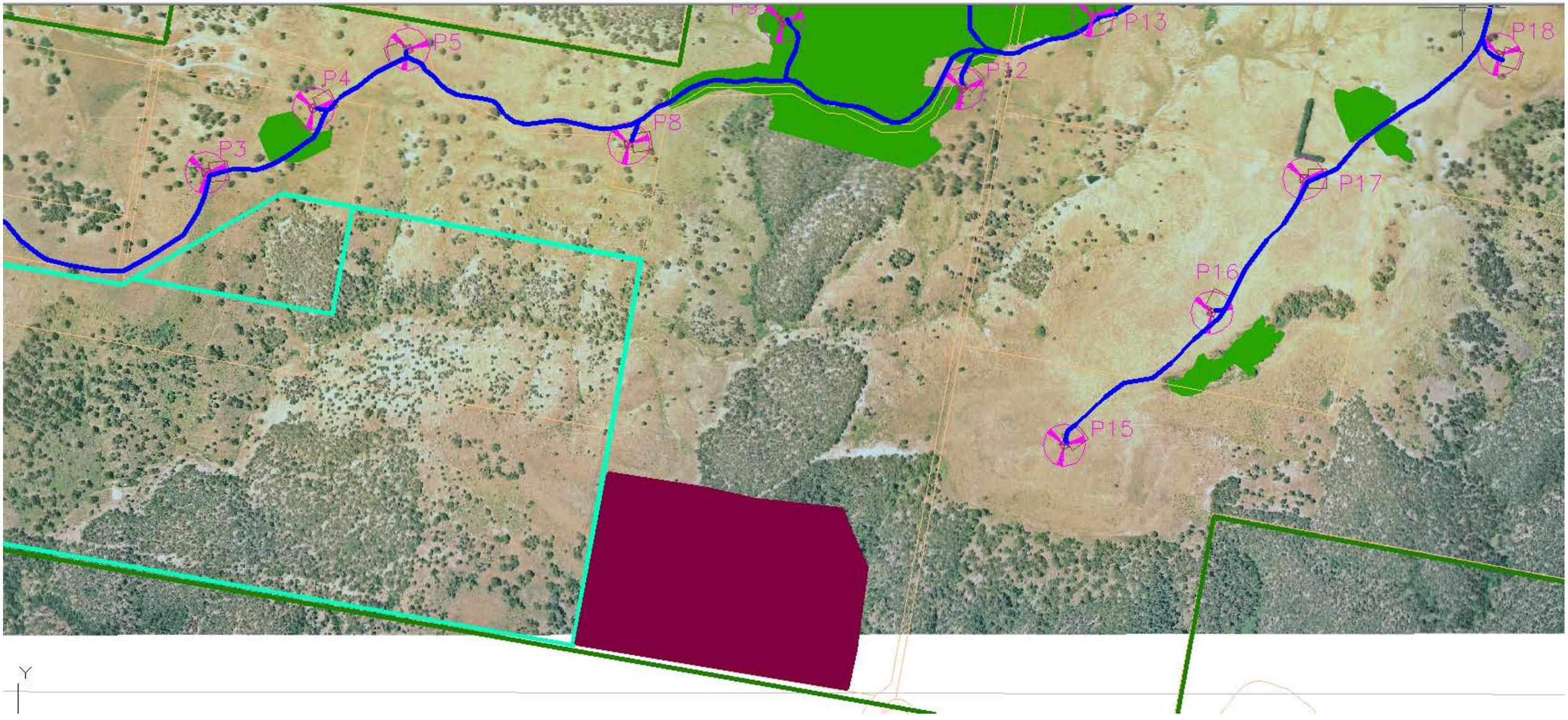

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