Environmental Assessment

PROPOSED YASS VALLEY WIND FARM:

COPPABELLA HILLS AND MARILBA HILLS PRECINCTS

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Environmental Assessment has been prepared by **ngh**environmental on behalf of Epuron Pty Ltd (the Proponent) to assess the potential environmental impacts associated with development of the Coppabella Hills and Marilba Hills Precincts for the proposed Yass Valley Wind Farm.

The proposal is to be assessed as a Part 3A Major Project under the NSW *Environmental Planning and Assessment Act 1979*. Under this Act, the proposed development meets the criteria for Critical Infrastructure as it is a power generator with capacity to generate in excess of 250 MW.

This assessment report:

- Describes the Coppabella Hills and Marilba Hills Precincts of the proposed Yass Valley Wind Farm project
- Identifies the statutory assessment and approval requirements
- Identifies and assesses the environmental impacts, focussing on the key issues identified by stakeholders (including the Department of Planning, local and state government agencies and the local community)
- Identifies measures to manage risks and avoid or mitigate potential impacts

1.2 THE PROPONENT

Epuron Pty Ltd is the Australian subsidiary of Epuron GmBH, an international group of companies which develop and operate major renewable energy projects. Epuron is also currently working on number of wind farm projects at different stages of development as outlined in Table 1.1. Epuron was formerly known as Taurus Energy. Taurus Energy obtained approval for three wind farms in NSW, one of which is now in operation.

Table 1-1: Wind Farm Projects developed by Epuron

Project	Turbines / Size	Development Status	Region
Cullerin Range	15 WTG - 30 MW	Operating	Southern Tablelands
Conroy's Gap	15 WTG - 30 MW	Development Approval	Southern Tablelands
Snowy Plains	15 WTG - 30 MW	Development Approval	Monaro
Gullen Range	73 WTG ~ 240 MW	Project Approval	Southern Tablelands
Silverton	598 WTG ~ 1480 MW	Project Approval -stage one Concept Approval - stage two	Far Western NSW

Epuron is the most experienced wind farm company in NSW and currently operates and maintains one of the most extensive networks of monitoring masts in NSW.

1.3 THE PROPOSAL

Epuron Pty Ltd is proposing to build a wind farm with up to 182 turbines near Yass in southern New South Wales. The Yass Valley Wind Farm development would be comprised of three 'Precincts'; Coppabella Hills (up to 86 turbines), Marilba Hills (up to 66 turbines) and Carroll's Ridge (up to 30 turbines). Each precinct would be independently viable. This Environmental Assessment Report has been prepared in regards to the development of the Coppabella Hills and Marilba Hills Precincts. Henceforth, the 'proposed development' refers only to these two precincts. A separate application will be lodged for the proposed Carrolls Ridge Precinct along with further detailed biodiversity assessments. For the purpose of continuity and transparency, where appropriate, the impact of the three precincts have been assessed together, for example photomontages include all proposed turbines.

The proposed development would be sited on private farmland and involve around 23 properties. Wind turbines in these precincts would be located along the ridgelines and peaks of the South West Slopes, as shown on the indicative layout plans (Figures 3-10-3-12).

The wind turbine towers would stand at 78-100 metres high and the rotor diameter (total span of the blades) would be 80-112 metres. The maximum tip height for the turbine tower plus rotor would be 150 metres above ground level.

It is likely that construction of a substation, onsite control room and maintenance facility would be required in both precincts to connect the wind farm to the existing electricity network. Underground cabling would connect the turbines together into clusters, and overhead powerlines would connect the turbine clusters to the substation. Temporary construction facilities and upgrades to local roads would also be required.

The Coppabella Hills and Marilba Hills Precincts of the proposed wind farm would have a capacity of around 380 MW[1] and would generate approx. 1,200,000 MWh of electricity per year. The proposal would reduce our reliance on fossil fuels and avoid carbon dioxide emissions by 1, 160,000 tonnes per annum in a typical year. This is equivalent to taking 265,000 typical cars permanently off the road every year.

[1] Calculated using a typical 2.5 megawatt turbine, considered to be a representative size turbine for this project.

Table1-2: Summary of the proposed Coppabella Hills and Marilba Hills Precincts

ASPECT OF THE PROPOSAL	DESCRIPTION		
General features			
Project Summary	Construction and operation of a wind farm approx 30 kilometres west of Yass, NSW. The Coppabella Hills and Marilba Hills Precincts would have the ability to produce around 1,200,000 MWh of renewable energy every year.		
Infrastructure & Facilities	Both precincts are likely to require a 33kV to 132kV substation, onsite control room and maintenance facilities. Private access tracks would also connect all of the turbines internally.		
Electrical Connectivity	Underground and overhead cabling would connect the turbines internally. Through the onsite substations the wind farm would be connected to the existing transmission network.		
Employment	Development of the precincts would create approx 167 full time jobs during the construction phase and around 34 ongoing operation and maintenance jobs.		
Project Life	The wind turbines have a design lifetime of around 25 years, at which point they can either be replaced or decommissioned.		
Capital Cost	The project would have a capital cost of approx $670 million		
Environmental Benefits	CO_2 emissions reductions of 1,140,000 tonnes per year		
	Coppabella Hills	**Marilba Hills**	**Total**
Energy Potential (Based on a 2.5MW turbine)	86 turbines with a capacity of approx 215 MW	66 turbines – approx 165 MW	152 turbines – approx 380 MW
Development Envelope (ha)	2829.10	4140.00	6969.10
Woodland and forest to be removed (ha)	11.45	12.07	23.52

1.4 THE PROPOSAL SITE

The two precincts are located approximately 20 and 35 kilometres west of the township of Yass respectively, as shown in Figure 3-1. The Hume Highway runs predominantly along the southern boundary of the precincts between the towns of Bowning and Jugiong. The site is located in the Yass Valley and Harden Local Government Areas on land zoned for rural uses. Agriculture is a dominant industry in the region, particularly sheep and cattle grazing. This is reflected in the landscape which is characterised by open pasture on undulating to hilly terrain. The district is heavily cleared, with scattered paddock trees and small forest and woodland patches on watercourses and steeper slopes.

A strong transmission network passes through both precincts and connects into the Yass substation, one of the strongest nodes in the transmission network outside of Sydney.

1.5 PROJECT BENEFITS

The Proponent is committed to developing all precincts of the Yass Valley Wind Farm in a way which minimises adverse local impacts and maximizes the benefits of the project to the local and broader community.

Overall the project would reduce the current dependency on the consumption of fossil fuels for electricity and therefore reduce the impacts of climate change resulting from greenhouse gas emissions. Currently within the electricity sector in NSW, approximately 90% of electricity is generated by fossil fuel power stations, primarily coal fired power stations.

Based on the 152 indicative turbine layout proposed, the project offers the following benefits:

- Production of approximately 1,200,000 MWh of renewable energy per year, sufficient for the average consumption of around 140,000 homes in a typical year.
- Reduction in greenhouse gas emissions by around 1,140,000 tonnes per year, equivalent to taking around 265,000 cars of our roads permanently every year.
- Provision of local jobs and injection of up to $334 million into the Australian economy and approximately $75 into the local economy.
- Creation of up to 167 local jobs during the construction phase and up to 34 ongoing operations and maintenance jobs.
- Upgrades to local infrastructure such as roads and transmission lines.
- Improved security of electricity supply through diversification.

1.6 ENVIRONMENTAL IMPACT ASSESSMENT

Epuron commissioned a full environmental assessment of the Coppabella Hills and Marilba Hills Precincts of the wind farm to identify any potential impacts from the development and develop appropriate mitigation measures.

Epuron engaged **ngh**environmental to prepare the Environmental Assessment on their behalf. The main impacts of the proposal have been addressed with specialist studies which include detailed reports that can be found appended to this Environmental Assessment. Specialist assessments include:

- Landscape and Visual assessment conducted by Environmental Resource Management Australia (ERM)
- Noise impact assessments have been carried out by specialist acoustic consultants Heggies Australia and Marshall Day,
- Biodiversity Assessment conducted by **ngh**environmental
- Heritage and Archaeology impact assessment conducted by NSW Archaeology
- Traffic and Transport assessment conducted by Bega Duo designs

Other issues considered in the EA include:

- Communications and Aviation impact assessments
- Electromagnetic Interference assessment
- Hydrological impacts
- Fire and bushfire impacts
- Health and Safety impacts
- Economic impacts

The key potential impacts are summarised below.

1.6.1 Visual impacts

Epuron has assessed the potential visual impacts in the vicinity of the wind farm. The main concern with visual impact is the change to the existing environment that is likely for local residents, as well as road and recreational users.

The Visual Impact Assessment considered two elements; the potential impact to public view points, including road users and the potential impact to residences within 3km of a proposed turbine location.

The visual landscape in the study area has already been substantially modified by agriculture practices and contains many built elements, including several powerlines and farming structures. The assessment concluded that there were no areas where the wind farm would create unacceptable visual impacts. Visual impacts on the surrounding townships are expected to be low, and while there would be visibility from the main highways in the area, the overall impact has been found to be acceptable.

1.6.2 Noise impacts

The proponent commissioned an assessment on the potential for noise emissions from the construction and operation of the Coppabella Hills and Marilba Hills Precincts to have an impact on the local community. The primary concern of Epuron is to protect the amenity of the surrounding community from any adverse noise impacts.

To assess the impacts at local residences a consultant was engaged to model the predicted noise emissions at houses within 5 kilometres of all proposed turbine locations. In accordance with the relevant guidelines, background noise monitoring was conducted over two week periods to firstly determine existing noise conditions.

In total 100 houses were assessed for potential operational noise impacts. There are 21 houses located within 2 kilometres of proposed turbines, 16 of which are involved with the proposal. Results from this assessment showed that all residential locations were compliant with development guidelines under the worst case scenario. The results have been displayed graphically in Section 7.3.

Based on the proposed layouts for the Coppabella Hills and Marilba Hills Precincts, operational noise emissions would meet all relevant noise control criteria and World Health Organisation guidelines. If required after construction, a range of options remain available to mitigate noise at residences. These include, operating turbines with noise controls during specific weather conditions or fitting the turbine with acoustic insulation or the residence with mechanical ventilation or improved glazing.

1.6.3 Flora and fauna impacts

Epuron commissioned an assessment on the potential impacts to the local ecology from the proposed development with a particular focus on native flora and fauna including threatened species.

The primary concerns of the proponent in relation to fauna and flora impacts include the clearing of vegetation and habitat during the construction phase and potential blade strike impacts to birds and bats during the operational phase.

Field surveys were conducted by **ngh**environmental during spring and summer across both precincts within the development envelope – the area where wind farm infrastructure including turbines, transmission lines and road access, would be located.

Several plant and animal species which are listed as threatened were identified. These include one threatened plant (the Yass Daisy), four threatened birds (the Superb Parrot, Speckled Warbler, Diamond Firetail) and one threatened bat (Eastern Bent-wing Bat).

Microbats may be affected by bladestrike or changes in air pressure close to the rotating blades. High-flying and migrating bats are at most risk. Based on the survey results and available habitat, the turbines at the Coppabella Hills and Marilba Hills Precincts are not considered likely to significantly affect microbats.

As a result of the ecological assessment, Epuron modified the infrastructure layout to avoid areas that had high conservation significance and minimise the area of natural vegetation that would be impacted by the development, where possible. This has included removing and relocating turbines in sensitive areas as well as rerouting transmission easements and access roads.

Based on these modifications, the impacts of the proposal have been reduced to require around 23.33 hectares of box gum woodland to be permanently removed; the majority in poor condition. Habitat modification, for easement maintenance, and temporary impacts such as the construction of site compounds, have also been considered. Most of the affected woodland is in relatively poor condition. Better condition woodland and threatened plant habitats have generally been avoided by siting the infrastructure in cleared or disturbed areas. The proposal is not expected to significantly affect native flora at the proposal site.

The construction of the wind farm would result in the loss of a small area of marginal habitat for threatened woodland bird and reptile species. The habitat affected is generally degraded and woodland habitat in similar condition is relatively abundant in the study area.

Threatened woodland birds at the site are not likely to be affected by the turbines located on high ridgelines. High-flying raptors such as the Wedge-tailed Eagle and Little Eagle are present and may be vulnerable to bladestrike or loss of food resources. However, experience at other wind farms suggests that these impacts would not be significant or unacceptable.

1.6.4 Other impacts

Best practice erosion and sedimentation controls are sufficient to protect soils and watercourses at the proposal site. Several local and overseas studies suggest that the proposal would not have a significant impact on local land values and development potential. There would be no significant aviation impacts. Any interference to telecommunications should be readily able to be mitigated. The wind farm would not affect agricultural capacity at the site.

1.7 MITIGATION OF IMPACTS

A wide range of impact mitigation measures are identified in the Environmental Assessment, addressing the key impact areas of the proposal: visual, operational noise, biodiversity, communications, traffic and transport impacts as well as a range of issues relating to the benefits and impacts to local community, including wellbeing, lifestyle values and tourism. These would form part of the Proponent’s Statement of Commitments; actions that would be undertaken by the Proponent, if the project is approved. These would be implemented as part of a Project Environmental Management Plan (including Construction and Operation Environmental Management Plans). The Proponent is committed to ensuring the measures developed in these plans are best practice and is committed to working to ensure the best possible result is achieved for the proposed Yass Valley Wind Farm.

1.8 ASSESSING THE PROPOSAL

The proposal would be assessed under Part 3A of the NSW *Environmental Planning and Assessment Act 1979,* under the 'Critical Infrastructure' provisions. The Minister for Planning is the consent authority responsible for determining whether or not the proposal would be approved.

Consultation with government agencies, neighbours and local residents has identified key issues and concerns associated with the proposal. The consultation process is important in the development of this project and has is described in more detail in Section 6 of this EA.

Consultation began with a planning focus meeting which was conducted on site and involved members from local and state government agencies. Following on from this meeting a list of Director General's Requirements was compiled and has subsequently been addressed in this EA.

An open house event was held in Binalong to present preliminary findings of the specialist studies to the local community, and seek feedback on the proposal. Results from a questionnaire indicate the top three issues in order of priority to be noise levels, impact to birds and potential impact to property value.

Studies in the region have shown that adult residents are concerned about global warming and are aware of the alternatives available. Respondents surveyed are generally supportive of wind farms in their immediate locality, and a majority would still approve of a wind farm within one kilometre of their home.

2 INTRODUCTION

2.1 ABOUT THIS REPORT

This Environmental Assessment has been prepared by **ngh**environmental on behalf of the Proponent to assess the potential environmental impacts associated with the development of the Coppabella Hills and Marilba Hills Precincts of the Yass Valley Wind Farm, located west of Yass, on the Southern Tablelands of New South Wales. The Proposal is to be assessed as a Part 3A Major Project, under the NSW *Environmental Planning and Assessment Act 1979*.

This Environmental Assessment (EA):

- Describes the Coppabella Hills and Marilba Hills Precincts
- Identifies statutory assessment and approval requirements in relation to the Proposal
- Identifies and assesses the environmental impacts of the Proposal, with a focus on key issues identified by stakeholders (including the Department of Planning, local and state government agencies and the community)
- Identifies measures to manage risks, and avoid or mitigate potential impacts

This EA meets the assessment requirements of the Part 3A provisions of the *Environmental Planning and Assessment Act 1979* and the Major Projects State Environmental Planning Policy 2005.

This EA draws together a number of specialist studies investigating potential impacts in detail. The findings of these studies have been incorporated into the EA and are included as stand alone documents appended to this report. This EA concludes with a *Statement of Commitments* to which the Proponent would commit, pending approval of the Proposal, in order to manage identified impacts.

A Project Application was submitted to the Department of Planning for this project on 1 December 2008. Director General's Requirements were received from the Minister on 15 January 2009. Refinements to the project design and staging have occurred as a result of the specialist environmental and engineering studies undertaken since the Project Application was submitted. The current EA assesses the Coppabella Hills and Marilba Hills Precincts using the same site boundaries and essentially the same turbine layouts as presented in the Project Application. A separate EA will be submitted for the Carrolls Ridge Precinct.

2.2 OVERVIEW OF THE PLANNING PROCESS

The *Environmental Planning and Assessment Act 1979* (*EP&A Act*) is the main statute for environmental planning and development control in NSW. The Act establishes three principal types of statutory planning instruments; State Environmental Planning Policies (SEPP), Regional Environmental Plans (REP) and Local Environmental Plans (LEP).

Part 3A of the *Environmental Planning and Assessment Act 1979* came into force on 1 August 2005. Part 3A integrates the assessment and approval regime for all Major Projects that need the approval of the Minister for Planning, previously dealt with by Parts 4 and 5 of the Act. The associated State Environmental Planning Policy (Major Projects) 2005 defines developments for the purpose of electricity generation including wind power, with a capital cost of in excess of $30 million dollars as Major Projects. The proposed Yass Valley Wind Farm would have a capital cost in excess of $30 million and is therefore considered a Major Project under Part 3A. A letter from the NSW Department of Planning dated

17/10/2008 confirmed it was the Ministers opinion that the proposed development was a Major Project under Part 3A.

A declaration by the Minster for Planning on 27 February 2008 stated that any project with the capacity to generate in excess of 250 megawatts would be considered *Critical Infrastructure* under the *Environmental Planning and Assessment Act 1979.* Consequently the Yass Valley Wind Farm would be considered Critical Infrastructure as it meets these requirements.

The assessment process for this Proposal is as follows:

- The Proponent of a major project first submits a Project Application for the approval of the Minister for Planning.
- For more complex projects, the Department of Planning (DoP) convenes a Planning Focus Meeting of state agency and local government representatives to consider the scope and level of assessment of key issues.
- The Director-General of DoP then issues the Proponent with requirements for the Environmental Assessment, indicating the issues to be addressed, the level of assessment required and consultation requirements.
- The Director-General's requirements may also require the Proponent to include in an Environmental Assessment a statement of the commitments the Proponent is prepared to make for environmental management and mitigation measures on the site.
- After an Environmental Assessment has been prepared and accepted by the Director-General, the report is placed on public exhibition for a minimum of 30 days during which time submissions from the community, local government and state agencies are accepted.
- Following the consultation period, the Director-General may require the Proponent to respond to the comments, revise the Proposal or revise the *Statement of Commitments*.

Consistent with the Part 3A reforms, this assessment was preceded by an issues scoping exercise to identify and prioritise issues related to the project. A Planning Focus Meeting was held at the proposed Coppabella and Marilba sites on 14th and 15th October 2008, involving representatives from the Yass Valley and Harden Shire Councils, Department of Planning (DoP), Department of Environment and Climate Change (DECC), Murrumbidgee Catchment Management Authority (CMA), Department of Primary Industries (Minerals), Country Energy, Department of Lands, the NSW Roads and Traffic Authority (RTA) as well as the staff from the Proponents and **ngh**environmental. A Project Application identifying and prioritising issues relating to the project was submitted to DoP on 1 December 2008. DoP responded on 14 January with the Director–General's Requirements for the Environmental Assessment (refer to Section 5.1.3).

2.3 THE PROPONENT

The Proponent for this Proposal is Epuron Pty. Ltd.

Epuron Pty. Ltd. is the Australian subsidiary of Conergy AG, a significant international group of companies which develop, finance, build and operate major projects in the field of renewable energy. Epuron and Conergy AG have many years of experience in the development of solar photovoltaic, wind power, bioenergy and solar thermal energy projects. In addition to the proposed Yass Valley Wind Farm, Epuron is concurrently working on additional wind farm projects, Gullen Range Wind Farm, near Goulburn and

Silverton Wind Farm, north-west of Broken Hill, which both just received planning approval. Epuron also have a significant pipeline of potential wind farm sites in NSW.

Prior to January 2007, Epuron was formally known as Taurus Energy, a NSW-based renewable energy company established in 2002 to explore wind energy projects primarily in NSW. Taurus Energy previously gained approval for three wind farm projects in NSW; one from the Snowy River Shire Council and two from the Department of Planning as Part 3A assessments, Cullerin Wind Farm and Conroy's Gap Wind Farm, in the Southern Tablelands of NSW. The Cullerin Wind Farm is now in operation.

2.4 REGIONAL CONTEXT OF THE PROPOSAL

2.4.1 Socio-economic context

The study area is located in the Yass Valley and Harden Local Government Areas (LGAs). The entire development envelope of the Marilba Hills is located within the Yass Valley LGA and the majority of the Coppabella Hills Precinct is located within the Harden Shire LGA. At this stage, 14 of 86 turbines proposed for the Coppabella Hills Precinct are located within the Yass Valley LGA and the remaining 72 turbines are within the Harden Shire LGA.

The Yass Valley LGA covers approximately 3,970 square kilometres, has a population of 13,135 and includes the town of Yass and villages of Binalong, Bookham, Bowning, Gundaroo, Murrumbateman, Sutton and Wee Jasper. Within its boundaries, there is one National Park, five Nature Reserves and one State Conservation Area (Yass Valley Council 2005). Refer to Figure 2-1 for LGA boundaries and the proximity of the precincts to major centres.

The region has a long history of agriculture, particularly wool production, with diversification now occurring into horticultural industries. Residential numbers in Yass Valley Shire have consistently risen over the 20 years between the 1981 and 2001 censuses (ACT Government 2004). There were 3,816 separate houses in Yass Valley Shire at the time of the 2001 census. Population is increasing by around 2.5% per year, along with an increase in the average age of the population (ABS 2002). Population density is around 0.03 persons per hectare (or one person for every 29.43 hectares). The average population density across all 17 NSW Local Government areas in the Australian Capital Region is one person for every 41.58 hectares (ACT Government 2004). Most people work in the agriculture/forestry/fisheries, retail trade, and property and business services sectors (ABS 2002).

The Harden Shire Council is known for it's rich agricultural base including cereal cropping, horticulture and grazing, Harden (2008). The Harden Shire LGA is approximately 1861 square kilometres, has a population of 3,582 with the major centre being Harden Murrumburrah. The shire also has four villages, Jugiong, Wombat, Kingsvale and Galong.

Harden Shire LGA has the highest dryland wheat production within NSW. The predominate industry within the Shire is agriculture, the second largest industry is transport. The Harden shire is strategically located at the junction of the major transport routes; the Hume and Olympic Highways as well as the Burley Griffin Way (Harden 2008).

Along with a strong agricultural base, the region benefits economically from the proximity to Canberra, the Hume Highway transport corridor, which bypasses all of the towns, and rail connections to Melbourne and Sydney.

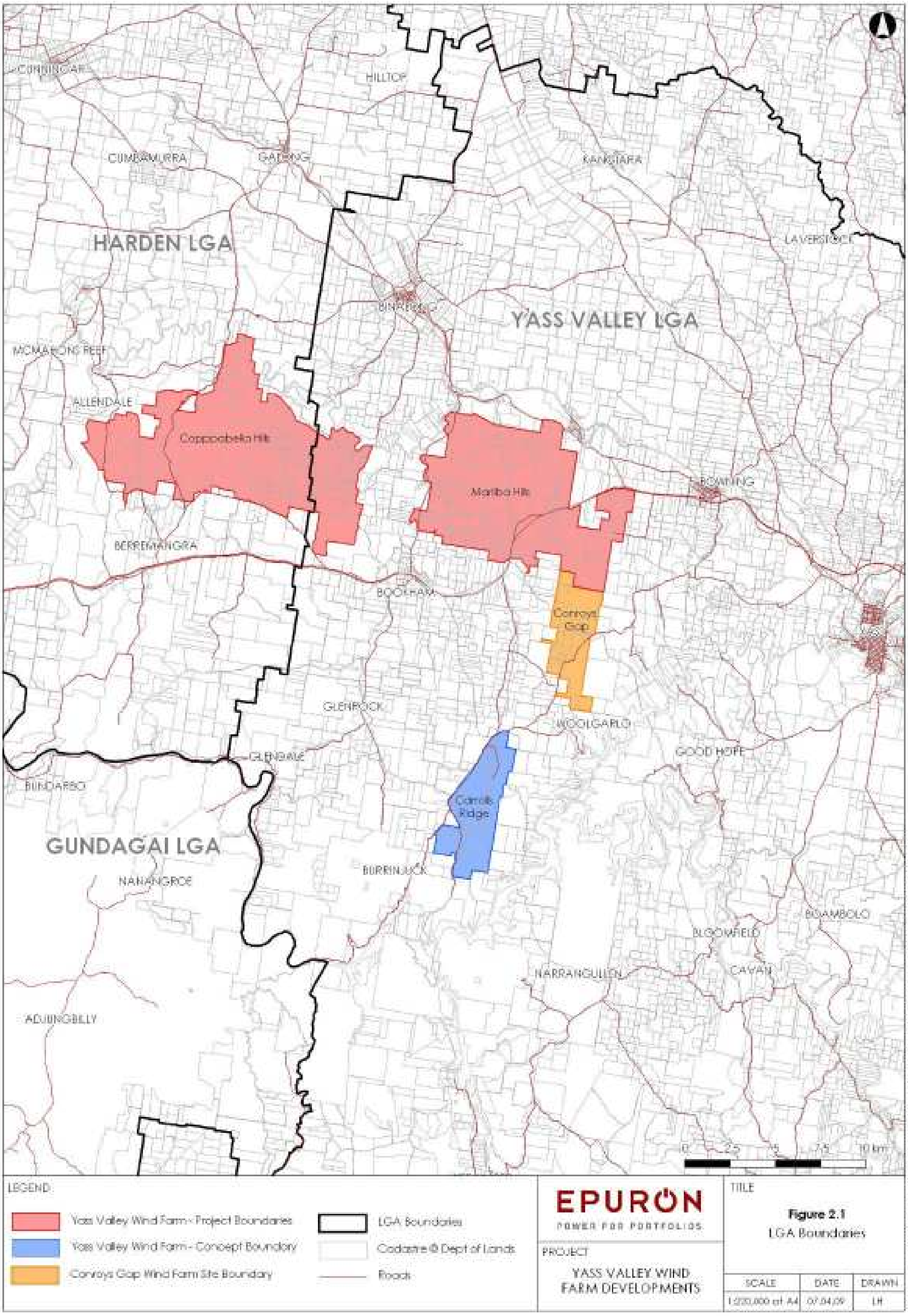


Figure 2-1: Location of proposed Yass Valley Wind Farm

The Coppabella Hills (top left) and Marilba Hills (top right) precincts are assessed in this EA. The Carrolls Ridge (bottom right) Precinct would be the subject of a separate EA. The approved Conroy's Gap wind farm is shown below the Marilba Hills Precinct.

3 DESCRIPTION OF THE PROPOSAL

3.1 GENERAL DESCRIPTION

The proposed development would involve the construction and operation of a wind farm spanning the Coppabella Hills and Marilba Hills Precinct areas along the boundary of the Southern Tablelands and Southwest Slopes in the Yass region of NSW.

The proposal includes:

- Up to 152 turbines across the two precincts;
- A substation and transmission connection at both precincts providing the electrical connectivity with the existing 132kV transmission network;
- Medium voltage electrical connections between the turbines and the substations, using multiple step-up transformers and a combination of overhead and underground power lines;
- Onsite control rooms and maintenance facilities;
- Internal site access tracks and minor upgrades to existing public roads to allow transport of equipment to the proposal; and
- Temporary construction facilities including batching plants and construction compounds during construction or refurbishment and decommissioning phases.

A range of turbines are being considered with a capacity between 1.5 and 3.6 megawatts. For ease of presentation the EA will refer to an indicative capacity of 380 MW based on a typical 2.5 MW turbine.

A number of turbines are under consideration for the proposal, each with varying physical dimensions, and a list of turbines is presented in Table 3-2. Section 3.3.2 discusses the range of physical dimensions of the turbines, including the largest (tip height, hub height and blade diameter) and the most likely or representative turbine. The turbines under consideration have a maximum hub height of 100m and a maximum of 112m blade diameter. The tallest tip height combination under consideration is 150m, while the likely tip height is expected to be between 125m – 135m.

Given the significance of turbine dimensions to the environmental assessment, further discussion on turbine sizes, their implications and the basis for the Environmental Assessment is provided in Section 3.3.2.

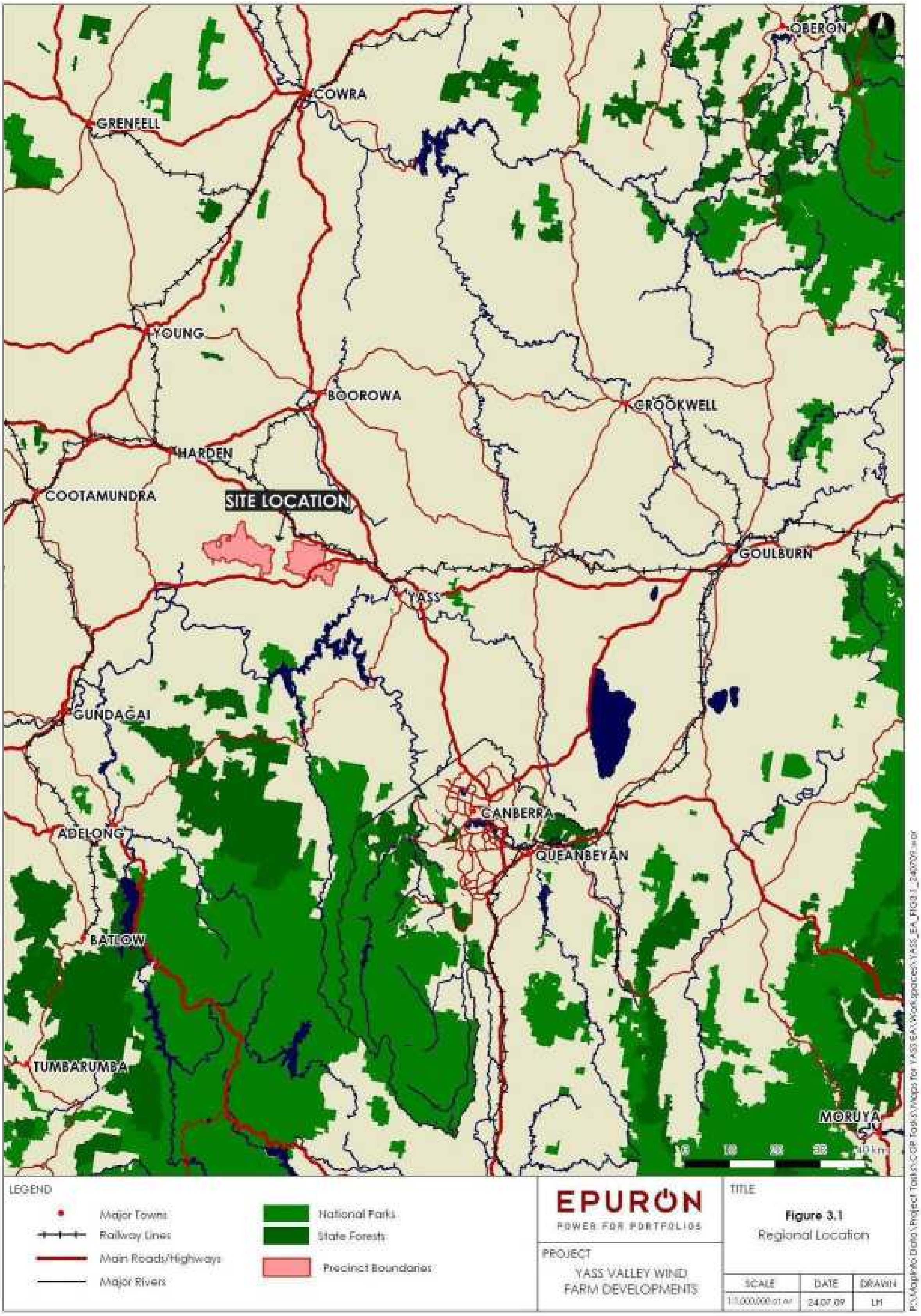


Figure 3-1 Regional locality of the Proposal

3.2 DESCRIPTION OF THE PRECINCTS

The Proposal is for construction and operation of a wind farm across two distinct geographical precincts within close proximity. Both precincts would be independently viable, that is, its development would not rely on the development of the other precinct. The precincts are described below and a list of the involved land parcels for each Precinct is presented in Attachment 1.

3.2.1 Coppabella Hills

The area known as the Coppabella Hills is located approximately 35 kilometres west of Yass and consists of one main ridge line with surrounding hillocks.

- This is the largest precinct of the Proposal and would contain up to 86 turbines with an approximate capacity of 215MW (based on a 2.5MW turbine)
- The Precinct is located approximately 10 kilometres southwest of the village of Binalong.
- A total of 15 landowners would be involved in the project for this Precinct.
- The Precinct could contain up to 86 wind turbines, each with three blades mounted on a tubular steel tower.
- Connection to TransGrids transmission network would be from the northern section of the Precinct where the existing Yass-Wagga Wagga 132kV transmission line passes through the site.
- The main access is proposed to be via the Hume Highway and Whitefields Road.

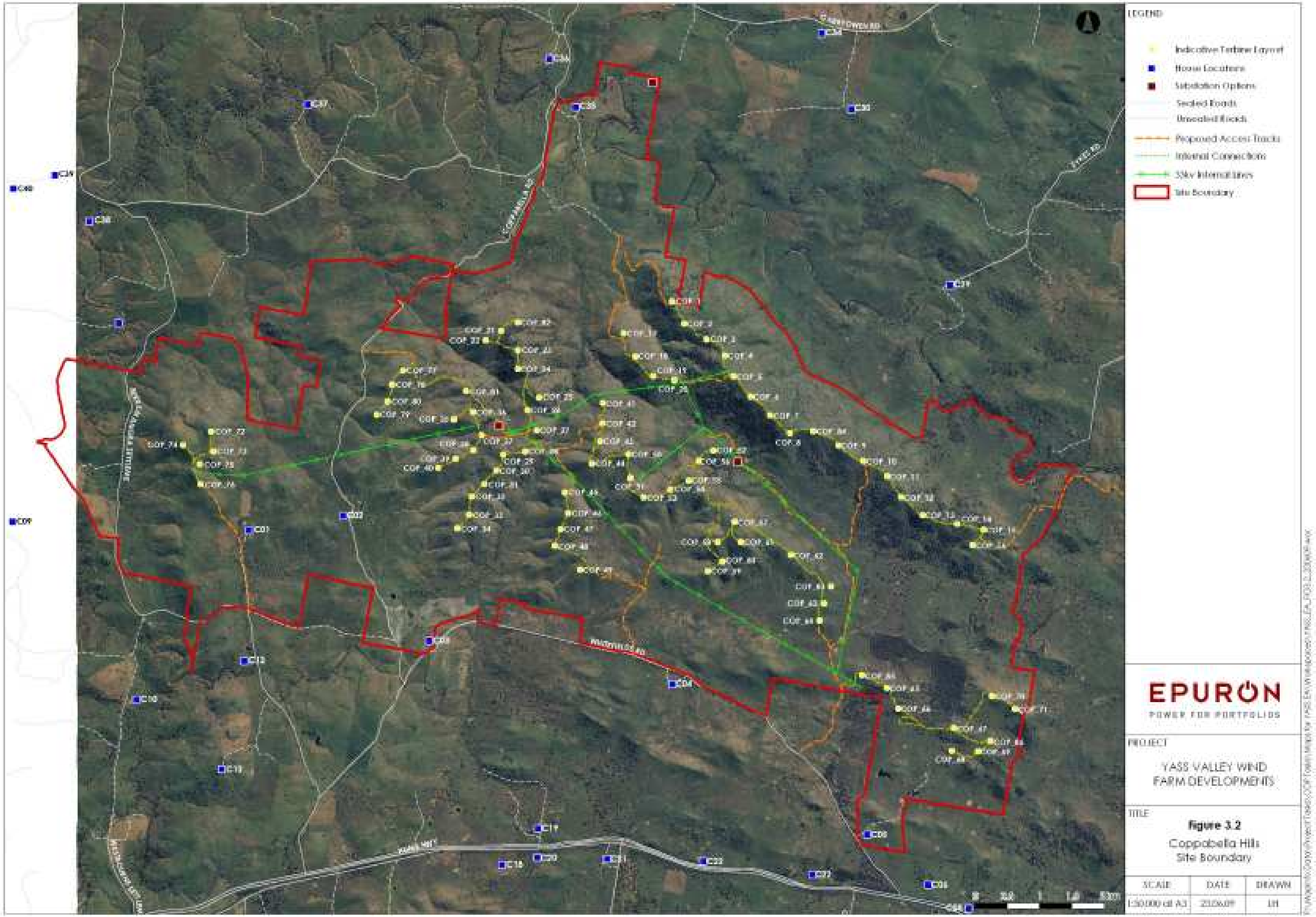


Figure 3-2: Site boundary – Coppabella Hills Precinct

Coppabella Hills consists of 86 turbines, is located 35 kilometres west of Yass and 10 kilometres southwest of Binalong.

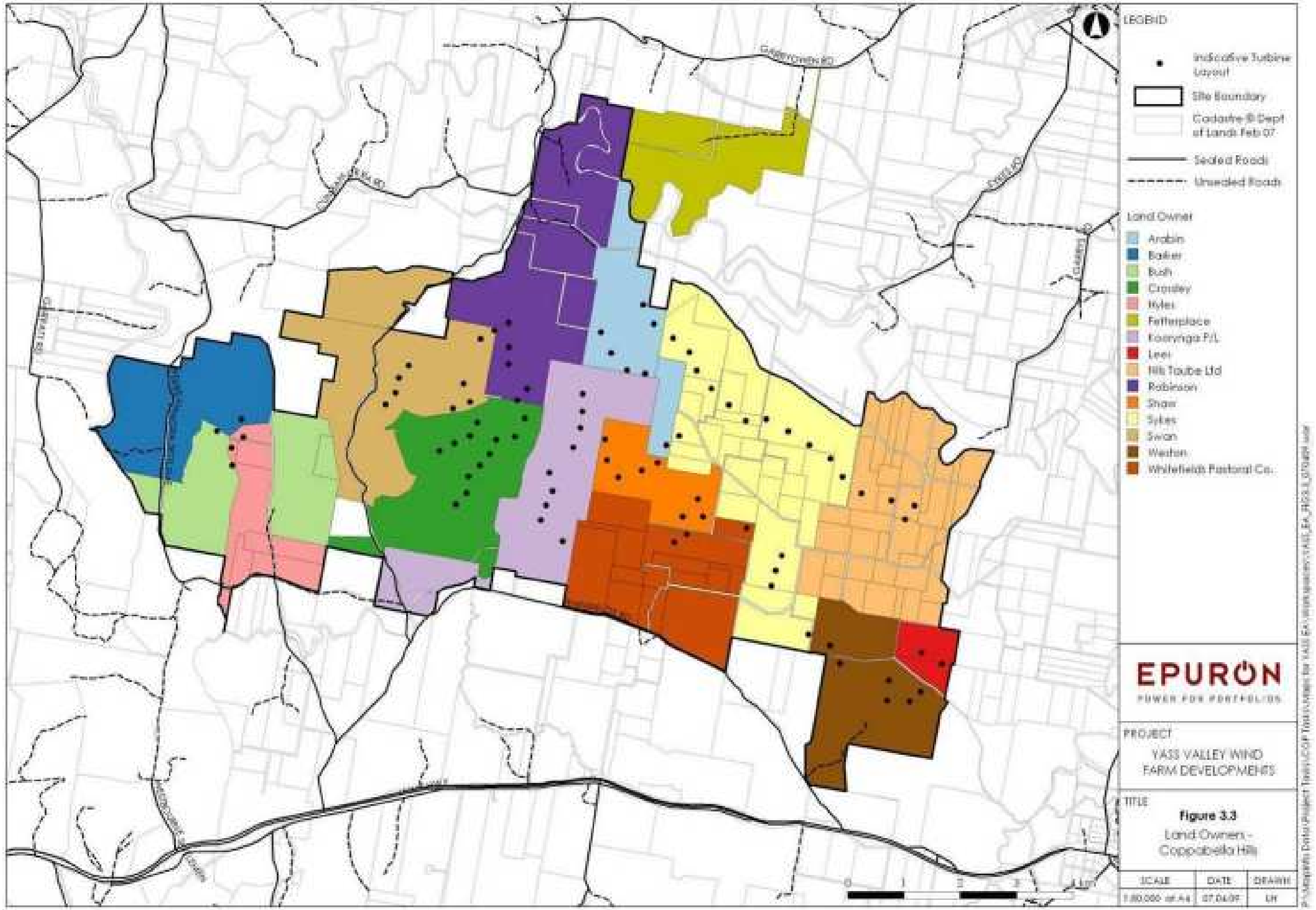


Figure 3-3: Landholdings – Coppabella Hills Precinct

Up to 13 landholders would potentially be involved in hosting turbines

3.2.2 Marilba Hills

The Marilba Hills Precinct would be located on ridges in the northern part of the Black Range and to the north of the previously approved Conroy's Gap Wind Farm Project. This precinct also includes a number of ridgelines to the west.

- There are up to 66 turbines proposed for the Marilba Hills Precinct with an approximate capacity of 165MW (based on a 2.5MW turbine)
- The Precinct is approximately 6 kilometres southeast of the village of Binalong.
- A total of 10 landowners would be involved with the project for this Precinct.
- The Precinct could contain up to 66 wind turbines, located on both sides of the Hume Highway.
- Connection to the existing transmission network would be via the northern section where the Yass – Wagga transmission line passes through the site or via a shared connection with the Conroy's Gap wind farm to the south.
- The main access for this Precinct is proposed to be via the truck rest stops on either side of the Hume Highway.

Figure 3-4: Site boundary – Marilba Hills Precinct

Marilba Hills consists of 66 turbines, and is located 20 kilometres west of Yass.

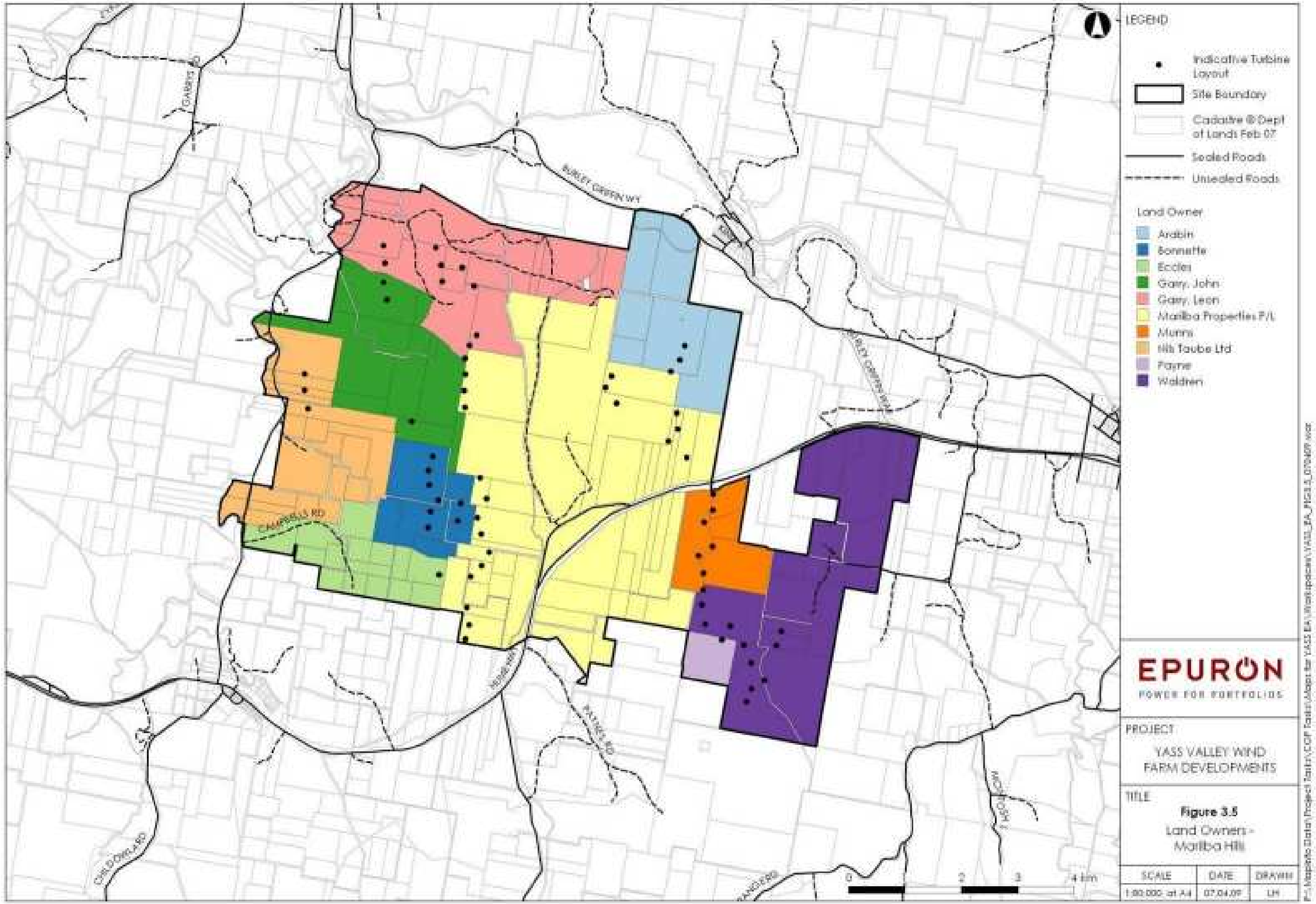


Figure 3-5: Landholdings Marilba Hills Precinct

Up to 10 landowners would potentially be involved in hosting turbines.

3.2.3 Nearby residences

The proposed site has a relatively small number of residences in close proximity to the wind turbine precincts. Table 3-1 presents a summary of the proximity of nearby residences in each precinct, measured from the nearest turbine.

Table 3-1 Residences within 5 kilometres from turbine locations

	Residences within 2km		Residences within 5km	
Precinct	**Involved[2]**	**Non-involved**	**Involved**	**Non-involved**
Coppabella Hills	5	0	10	31
Marilba Hills	11	4	0	59

[2] Involved landowners are those landowners hosting wind turbines on their property or who have agreements in place with the Proponent.

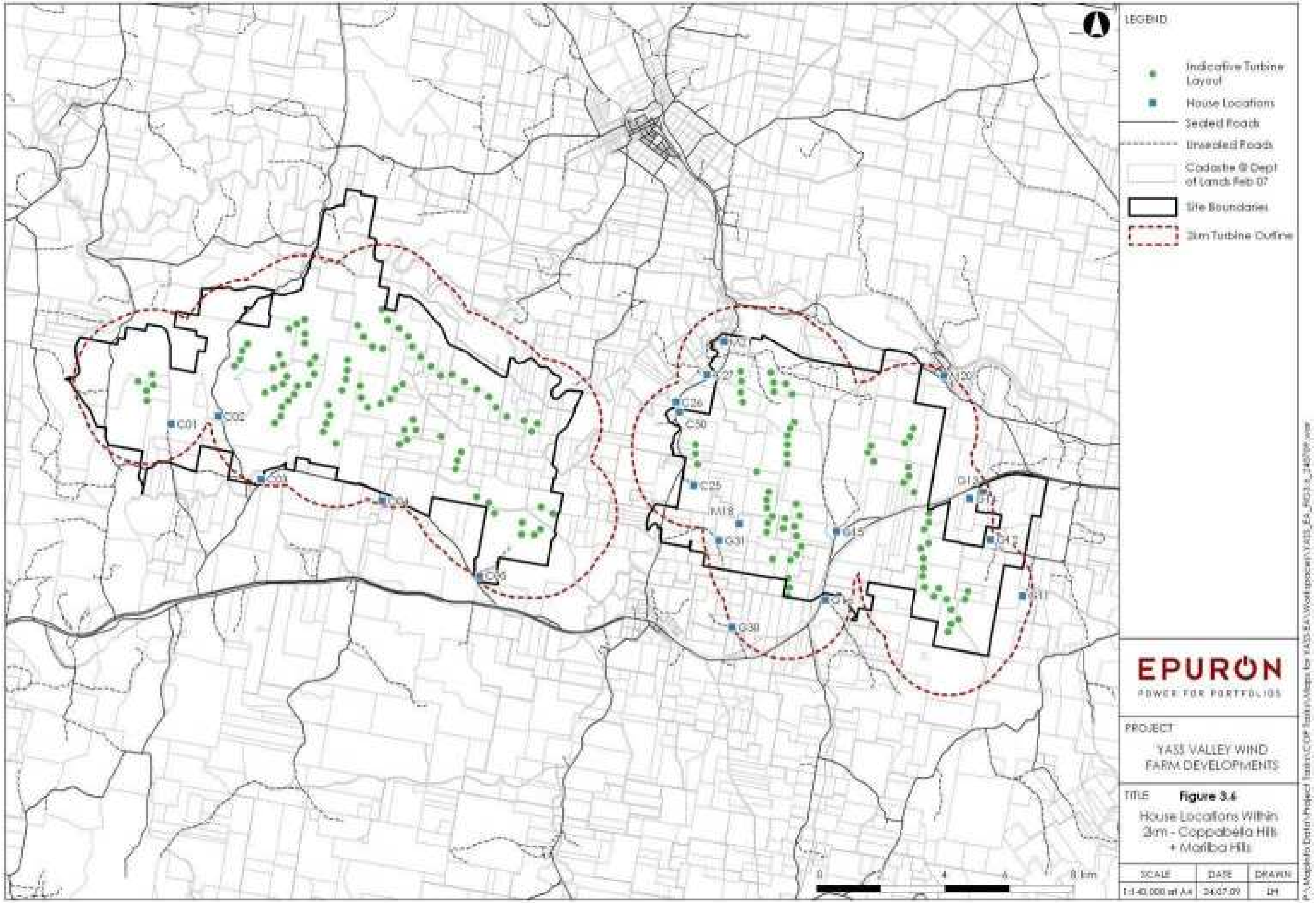


Figure 3-6: House locations (houses within 2km)

There are 17 houses located within 2 kilometres of proposed turbines on Coppabella Hills and Marilba Hills Precincts, 13 of which are landowners involved with the project.

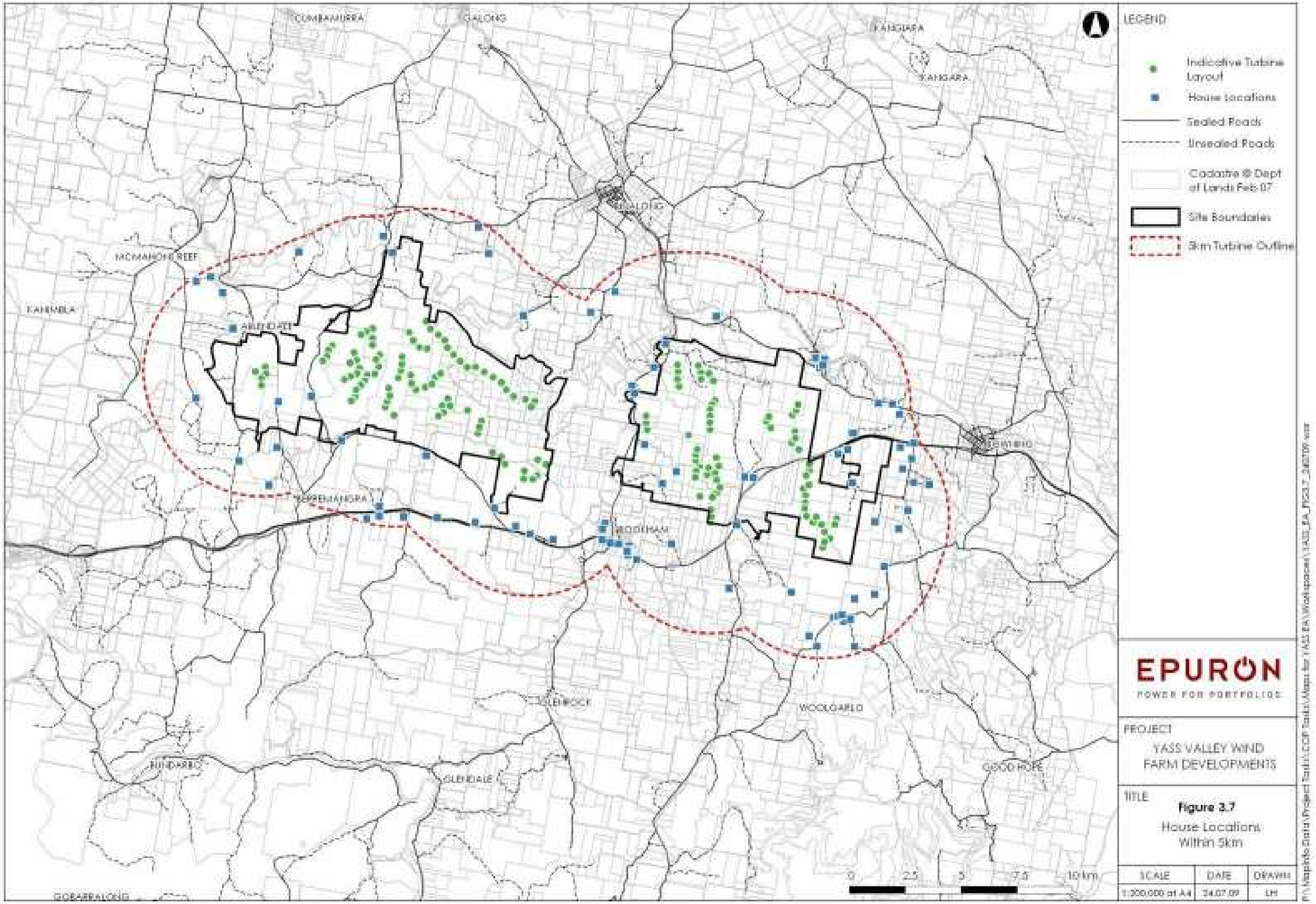


Figure 3-7: House locations (houses within 5km) – Both Precincts

Houses more distant from the site are generally located within the communities of Bookham and Goondah, and along the Hume Highway and Black Range Road.

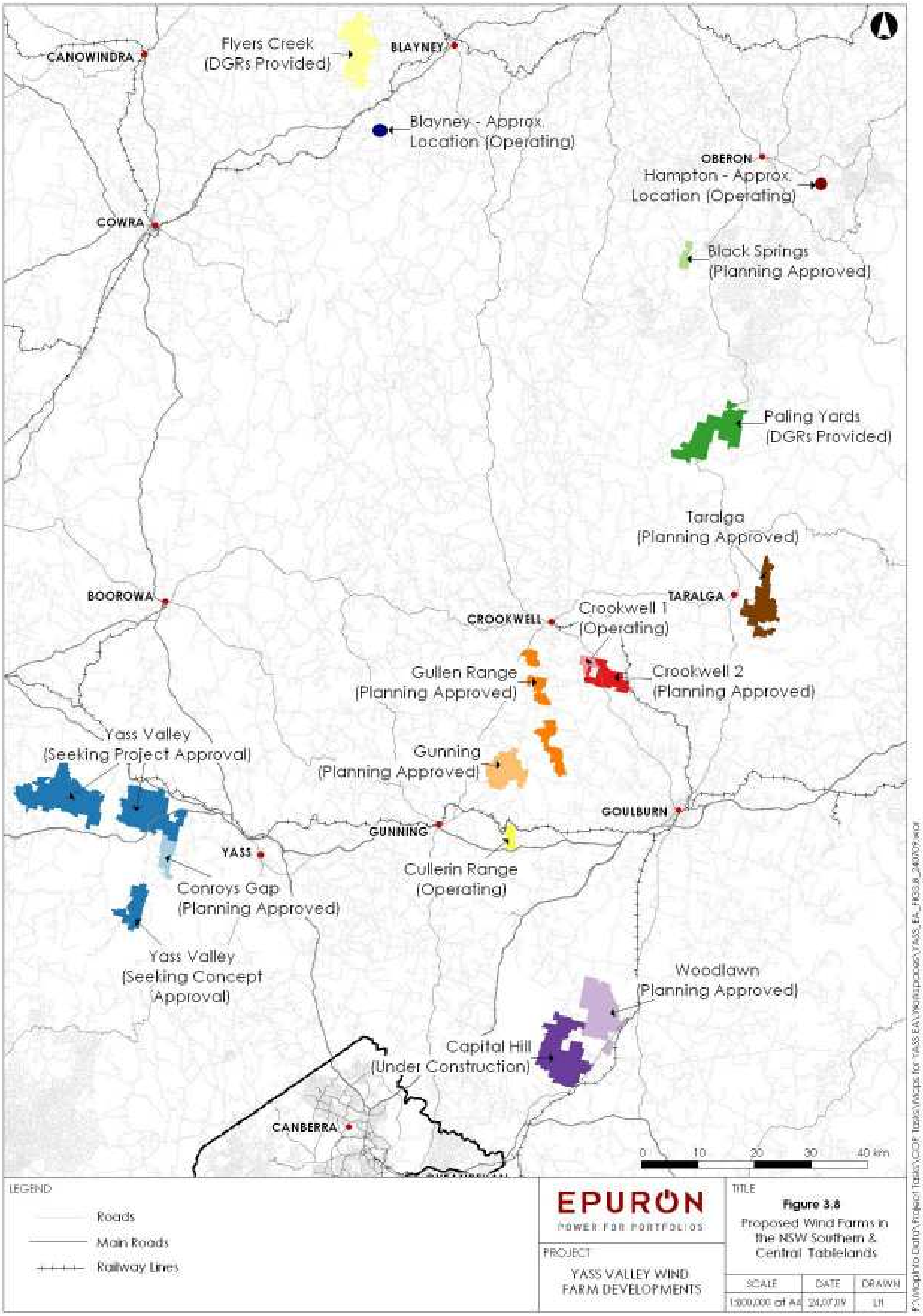


Figure 3-8: Proposed wind farms in NSW southern tablelands

One constructed and several approved wind farms occur in the region.

3.3 WIND FARM INFRASTRUCTURE

3.3.1 Wind turbines – general description

Wind Turbines

The wind turbines being considered for this Proposal have a rotor diameter of 80 to 112 metres and a hub height in the range of 78 to 100 metres. Examples of turbines currently under consideration are outlined in Table 3-2. This list is correct at the time of finalisation of this report, however wind turbine technology and design continues to evolve and new turbines are continually coming onto the market. Therefore, it is possible that minor variations to these typical dimensions could occur prior to final turbine selection.

The maximum tip height proposed for the site is 150 metres above ground level. Any turbine selected would meet this overall tip height limit.

Wind turbines can be fixed speed or variable speed machines, that is, the turbine blades would either rotate at a constant speed (when operating) or a variable speed depending on wind speeds. Variable speed machines have better performance over a wider range of wind speeds, provide higher quality power to the electricity grid, and help reduce wind turbine noise levels at low speeds. However, they are more expensive to install.

Each wind turbine would be a three bladed type of the “up-wind” design, i.e., facing up into the wind and in front of the tower. This design reduces noise levels generated during operation.

Wind turbine blades are typically made of glass fibre reinforced with epoxy or plastic (fibreglass) attached to a steel hub, and include lightning rods for the entire length of the blade. Blades are manufactured in one piece and are therefore the longest element transported to and around site.

Each wind turbine would have a rated power capacity of between 1.5 and 3.6 MW, subject to final turbine selection.

Nacelle

The nacelle is the housing at the top of the tower enclosing the generator, gearbox, and control gear including motors, pumps, brakes and electrical components. This control gear ensures that the wind turbine always faces into the wind, and adjusts blade angles to maximise power output and minimise blade noise. The nacelle also houses a winch or winches to assist in lifting maintenance equipment or smaller replacement parts to the nacelle.

The nacelle design takes into account acoustic considerations to minimise noise emissions from mechanical components.

Tower

The tower is a tubular steel or tubular steel and concrete tower up to 100 metres high, tapering from around 5 metres at the base to around 3 metres at the top. Exact dimensions would depend on the wind turbine design selected. The tower is constructed in up to five sections, each section bolted together via an internal flange. Within the tower are the power and control cables, and access ladder to the nacelle (with safety climb system).

Lattice towers would not be used as turbine towers in the project.

Figure 3-9: Typical wind turbine installed on an 80m tower

(Photo courtesy REPower Systems AG)

Access Tracks, Hardstands and Footings

The tower would be seated in a reinforced concrete footing and would require removal of rock and subsoil at the base of each turbine. Various designs of footing are under consideration, based around a gravity footing (where subsoil geology is less stable) and a rock-bolted footing (where subsoil geology provides good bedrock). A combination of these footing designs may be used on the site depending on the geology at each turbine location.

Each wind turbine would require track access and cabling access to allow construction and connection to each substation. Access tracks would typically be 6 metres wide (wider at bends) and be all weather graded tracks. Hardstand areas required beneath each turbine would be approximately 22m x 40m (900m^2) however are subject to final turbine selection and crane requirements.

Hardstands would be left in situ after construction to provide for ongoing maintenance and repairs if necessary. Access tracks would also be left in situ, however their width would be reduced to approximately 3 metres after construction is completed by covering with topsoil and revegetating.

Transformer

Each wind turbine generator would produce power at typically 690V, and up to 1,000V. This is then transformed at each wind turbine to either 22,000V or 33,000V for reticulation around the site. The transformer for each wind turbine would be located either within the base of the tower, in the nacelle, or adjacent to the tower as a small pad-mount transformer, depending on the specific wind turbine model selected. The transformer would be either a dry-type transformer, or would be suitably bunded.

Lightning protection

Each wind turbine would have a lightning protection system installed. This system includes lightning rods through each wind turbine blade, an earth mat built into the foundations of the wind turbine, and lightning protection around the various electronic components within the wind turbine.

Obstacle lighting

Civil Aviation Safety Authority (CASA) guidelines for aviation warning lighting for a group of wind turbines are currently being reviewed and Advisory Circular 1390-18(0) has been withdrawn by CASA. However, the issue of safety risks to aviation operations must be considered and therefore it is proposed that sufficient wind turbines should have red obstacle beacons to indicate the extent of a group of wind turbines. The (withdrawn) advisory circular defined that interval between turbines and obstacle beacons should not exceed 900m. Accordingly, if it is considered by CASA or an independent consultant that the project is likely to be a hazard to aircraft, it is expected that approximately 50 turbines in the proposed project may require aircraft warning lights. Requirements would be discussed with CASA once the final turbine layout is selected however it is assumed that aviation warning lighting would be required in accordance with CASA guidelines and the therefore the impacts are assessed in this EA.

Wind turbine controls and operation

Each wind turbine would have its own individual control system, and would be fully automated. Start-up and shutdown (including safety shutdowns) are fully automated, with manual interruption available via onsite control systems and remote computer.

Generally, wind turbines would commence operation at wind speeds around 3 – 5 metres per second (11 – 18 kilometres per hour) and gradually increase in production to their maximum capacity, usually at wind speeds around 12 – 15 metres per second (44 – 54 kilometres per hour). Once at this maximum capacity, the wind turbine would control its output by altering the pitch of the wind turbine blades. Under high wind conditions in excess of 25 metres per second (90 kilometres per hour) the wind turbine would automatically shut down to prevent damage. It would continue measuring the wind speeds during this state via an anemometer mounted on the nacelle, and would restart once wind speeds drop to a suitable level.

Various operating constraints can be programmed into the control system to prevent operation under certain conditions. For example, if operational issues are identified such as excess noise or shadow flicker under certain conditions, these conditions can be pre-programmed into the control system and individual wind turbines automatically controlled or shut down whenever these conditions are present.

It should be noted that shadow flicker is not expected to be an issue for this Proposal As shown in the detailed reports the indicative layout proposed complies with all existing guidelines. Furthermore, the Proposal can address these issues within the control system, allowing the adjustment of wind turbine operation modes for unforeseen outcomes.

3.3.2 Wind turbine selection

Background to turbine selection

Wind farms are highly capital-intensive, with around 90% of the long term costs of a wind farm being related to the up-front capital construction and financing costs. Likewise, revenues are directly linked to energy production, which is fixed by the turbine selection and siting carried out in the design phase. For this reason, to keep generation costs down and to ensure the project's financial viability, it is essential that the appropriate wind turbine is selected for a site, and that a competitive tender approach is used to select the final turbine model, thereby minimising the capital costs of the project.

At this stage, the specific wind turbine model and manufacturer has not been selected for this Proposal. Various international wind turbine manufacturers have products suitable for the Australian market and for this Proposal. These include Clipper Wind (US), Vestas (Denmark), RE Power (Germany), Mitsubishi (Japan), Nordex (Germany), Suzlon Energy (India), GE Wind (US), and Siemens (Germany). Improved turbines are progressively coming onto the market; superior models may be available by the time the project receives Project Approval.

While all of the turbines under consideration meet the general description in Section 3.3.1, each wind turbine model is different in its design parameters, and each manufacturer also offers a number of similar wind turbine models which are optimised for different wind speed conditions. Even small changes in wind speeds or minor modifications to turbine locations can impact a turbine's suitability for a site and energy production at a site. Accordingly, the final turbine selection is preferentially carried out under a competitive tendering process, once the conditions of approval are known.

Wind turbines under consideration

Every turbine has slightly different characteristics in terms of site suitability, physical size, energy production, and noise emissions. Further, some manufacturers provide different blade diameters for what is essentially the same machine. For example, REPower provides a nearly identical wind turbine with either 82m or 92m blades (MM82 or MM92 respectively). It is therefore possible to locate a combination of similar machines on the same site to provide the best overall outcome, such as Cullerin Range Wind Farm where both MM82 and MM92 machines are installed.

Table 3-2 shows the wind turbines currently under consideration for the Proposal, together with key parameters of these turbines. In general, different characteristics of turbine models require different turbine layouts, however to simplify the environmental assessment of the Proposal, an indicative layout has been developed that reflects the characteristics of a large range of turbine models.

Final wind turbine selection would be carried out based on commercial considerations within the consent conditions stipulated by the Department of Planning. In particular, a final assessment of potential noise impacts would be undertaken prior to construction based on the final turbine selection and layout. The Proponent would ensure that noise predictions for the final turbine selection and layout meets the SA EPA Guidelines for non-involved houses or the WHO Guidelines for involved houses, as appropriate (refer to Section 7.3).

Table 3-2 Wind turbines under consideration for the Yass Valley Wind Farm Proposal

Turbine supplier	Turbine model	Turbine capacity	Blade diameter	Hub heights	Maximum tip heights[3]
Clipper Wind	C89	2.5 MW	89m	80m	125m
Clipper Wind	C93	2.5 MW	93m	80m	127m
Clipper Wind	C96	2.5 MW	96m	80m	128m
Clipper Wind	C99	2.5 MW	99m	80m	130m
GE Wind	2.5xl	2.5 MW	100m	75m, 85m, 100m	125m – 150m
GE Wind	1.5sl/sle	1.5 MW	77m	80m, 85m, 100m	119m – 139m
GE Wind	1.5xle	1.5 MW	82.5m	80m, 100m	121m – 141m
Mitsubishi	MWT92	2.4 MW	92m	70m	116m
Mitsubishi	MWT95	2.4 MW	95m	80m	126m
Nordex	N90	2.5 MW	90m	80m, 100m	125m – 145m
Nordex	N100	2.5MW	100m	100m	150m
RE Power	MM82	2.0 MW	82m	80m	122m
RE Power	MM92	2.0 MW	92m	80m	127m
RE Power	MM104	3.3 MW	104m	80m	132m
Siemens	SWT83	2.3 MW	82.4m	80m	121m
Siemens	SWT93	2.3 MW	93m	80m	127m
Siemens	SWT101	2.3MW	101m	80m, 100m	130.5m, 150.5m[4]
Siemens	SWT107	3.6MW	107m	80m, 100m	133.5m, 153.5m
Suzlon	S88	2.1 MW	88m	80m	124m
Vestas	V80	2.0 MW	80m	78m	118m

[3] *Because of varying hub diameters for some turbines, the sum of the blade length plus tower height does not exactly equal maximum tip height.*

[4] *The SWT101 and SWT107 if built on a 100m tower would exceed the maximum tip height proposed (150m). Therefore should this turbine be selected it would be configured to achieve the maximum tip height of 150m.*

Turbine supplier	Turbine model	Turbine capacity	Blade diameter	Hub heights	Maximum tip heights[3]
Vestas	V82	1.65 MW	82m	78m	119m
Vestas	V90	1.8 MW	90m	80m	125m
Vestas	V90	3.0 MW	90m	80m	119m – 129m
Vestas	V112	3.0 MW	112m	84m, 94m	140m - 150m

Selection of 'representative' versus 'worst case impact' wind turbines

The majority of issues identified with respect to this proposed development are not impacted by specific turbine selection. For example, the assessment of biodiversity and archaeology constraints is based on a development envelope, that is, the entire geographic area where infrastructure may be located. This approach allows ecological and archaeological constraints to be defined within the development envelope and as a consequence allows for design responsiveness including minor relocation of infrastructure within the development envelope, without further assessment. However, the final turbine selection could have a material impact on some issues, and in these cases the decision as to whether to present a representative or worst case turbine must be considered.

The wind turbine layout design is based on a REPower MM92 turbine.

The REPower MM92 is a mid range turbine, known to be suitable for the site. If a larger physical turbine is selected, fewer turbines are likely to be installed in each precinct, a consequence of the requirement for larger separation distances between turbines. In this scenario, some associated impacts may be reduced (such as visual impacts). Conversely, a layout using the smallest turbine option would represent the worst-case scenario in terms of the number of turbines able to be developed but may overstate other impacts. Use of the REPower MM92 is therefore considered a likely and representative turbine for the purposes of assessment.

The energy production and greenhouse calculations are based on an indicative 2.5MW turbine,

A turbine with a name plate rating of 2.5MW sits in the middle of the range of turbines under consideration and is a likely turbine size to be ultimately selected. It is therefore considered representative of the energy production and greenhouse abatement benefits from the Proposal.

Impact area calculations, visual and noise propagation modelling

This Environmental Assessment and the related specialist studies consider impacts based on turbines that provide the worst case impacts and in some cases representative impacts as well.

The approach taken is to present the worst case impact assessment for specialist studies where physical dimensions and technical characteristics of turbines are related to the extent of the potential impact.

Examples of this are visual impacts and noise propagation. However, the most likely turbines to be ultimately selected for the project are not the largest and sit in the middle of the turbine size range (physical size and generation capacity). Therefore in this context, the Environmental Assessment also considers and presents the indicative or likely impacts.

Turbines providing the worst case impacts have been used for preparation of Photomontages, Zone of Visual Influence, and Shadow Flicker analysis for the Visual Impact analysis.

The photomontages, Zone of Visual Influence, and Shadow Flicker analysis are prepared using the GE 2.5xl, which is a turbine with a 100m blade diameter on a 100m hub height. This is the largest physical turbine with the highest hub height and maximum tip height proposed.

In some cases, the worst case presents an unrealistic portrayal of impacts when compared to the most likely turbines to be selected for the project. Therefore, in some areas, the Environmental Assessment also considers and presents the indicative or likely impacts for comparison. Noting that the layout would require review and likely removal of a number of turbines to accommodate the physically largest turbine, this assessment would overstate the visual impacts. One photomontage was prepared using the likely and indicative turbine sizing of an 85m hub height with a 100m blade diameter (tip height of 135m) to present the likely and representative scenario.

The noise assessment was conducted using the Vestas V90 3.0MW (the worst case scenario) and the REpower MM92 evolution (the representative scenario). The assessment considers an 80m hub height and a 100m hub height to reflect the worst case physical dimensions of turbines under consideration

The noise assessment presents the modelling of the REPower MM92 turbine as a likely and representative impact from the proposal, and the Vestas V90 as the worst case impact for the proposal. The MM92 presents the representative impacts as it has noise characteristics typical of modern wind turbines and therefore offers a good approximation of the likely noise impacts of the proposal. The physical and noise characteristics of these turbines are considered to be indicative of the wind turbines available. The V90 presents worst case impacts as it has noise characteristics higher than any other turbine considered for this proposal. The analysis demonstrates that it is possible to achieve the noise limits set by the SA EPA guidelines and WHO guidelines using the MM92 as the likely and representative turbine.

The indicative layout, as presented in this EA, has been formulated to allow design responsiveness to achieve the noise criteria in relation to the final selected turbines specific noise characteristics. Accordingly by contemplating that turbines can be relocated within a reasonable distance of their proposed location or removed to achieve the SA EPA Guidelines, a single flexible indicative layout can be presented and assessed. Additional analysis of the sensitivity of the physical dimensions (hub height and maximum tip height) on noise propagation and a worst case scenario, requiring mitigation, is presented in the noise assessment.

The approach undertaken simplifies the noise assessment process by avoiding a different layout for each proposed turbine. The Statement of Commitments affirms that modelling of the final turbine on the final layout would be undertaken and measures would be taken to ensure compliance with the SA guidelines.

3.3.3 Wind turbine layouts

Preparation of wind turbine layouts

The Proponent has prepared an indicative wind farm layout for both of the precincts, Coppabella Hills, and Marilba Hills, which identify 86 and 66 indicative wind turbine locations respectively (refer to grid co-ordinates, Attachment 2). These layouts reflect the typical spacing required for wind turbines under consideration.

To prepare this layout, key parameters and constraints were considered for each precinct, including:

- A Precinct boundary.
- Aerial photography of the precinct (for production of vegetation and roughness maps).
- High resolution topography of the precinct (5m contours).
- Wind speed data collected at each precinct (2 separate monitoring masts).
- Location of residences in the vicinity.
- Results of background noise assessment including proposed noise limits at residences.
- Information on general constraints within each precinct (including biodiversity and heritage constraints, boundary and residence proximity constraints).
- Information on communications constraints caused by the location of the communication tower in the Marilba Hills Precinct and related microwave/UHF links
- Operating parameters of selected representative wind turbines

An optimised wind turbine layout was then prepared that could accommodate the turbines under consideration using a variety of specialised software packages including WaSP and Windfarmer™, as follows:

- Preparation of wind speed correlation at the 2 monitoring mast locations (comparison of measure period with long term Bureau of Meteorology wind monitoring sites) to determine likely long-term wind speed characteristics at the monitoring locations
- Preparation of a wind speed profile across the precincts based on this long term wind speed and the site physical parameters (topography, vegetation)
- Optimisation of wind turbine location based on this wind speed profile to maximise wind energy production while meeting all constraints (including biodiversity, heritage, noise limits on neighbouring residences, EMF interference, and proximity constraints)
- Calculation of likely long term average wind energy production at each turbine

Turbine layout optimisation was carried out using the REPower MM92 turbine which is representative of turbines under consideration as discussed in Section 3.3.2. Adjustments to the optimised layout were then carried out to take into consideration site constraints, access and related issues.

The indicative turbine layout has undergone a preliminary review to determine if the layout is reasonably suitable for construction and would comply with expected consent conditions. However, minor relocation of specific turbines may be required prior to construction to take into account a number of factors including:

- Final turbine selection.

- Final wind speed and energy yield analysis.
- Additional site constraints identified through ongoing investigations.
- Constraints identified in relation to constructability or construction cost minimisation.
- Constraints identified in relation to turbine suitability assessment of the site.
- Constraints identified after the results of final geotechnical investigations at each turbine location are completed.

Depending on final turbine selection, it is possible that not all turbines proposed would be installed to ensure that the project continues to meet all consent conditions (e.g. noise constraints).

To that end, a final layout would be prepared after final turbine selection has taken place and prior to construction. This final layout would be adjusted to ensure all criteria (including noise criteria) are achieved.

Figure 3-10 Indicative turbine layout Coppabella Hills Precinct, western section

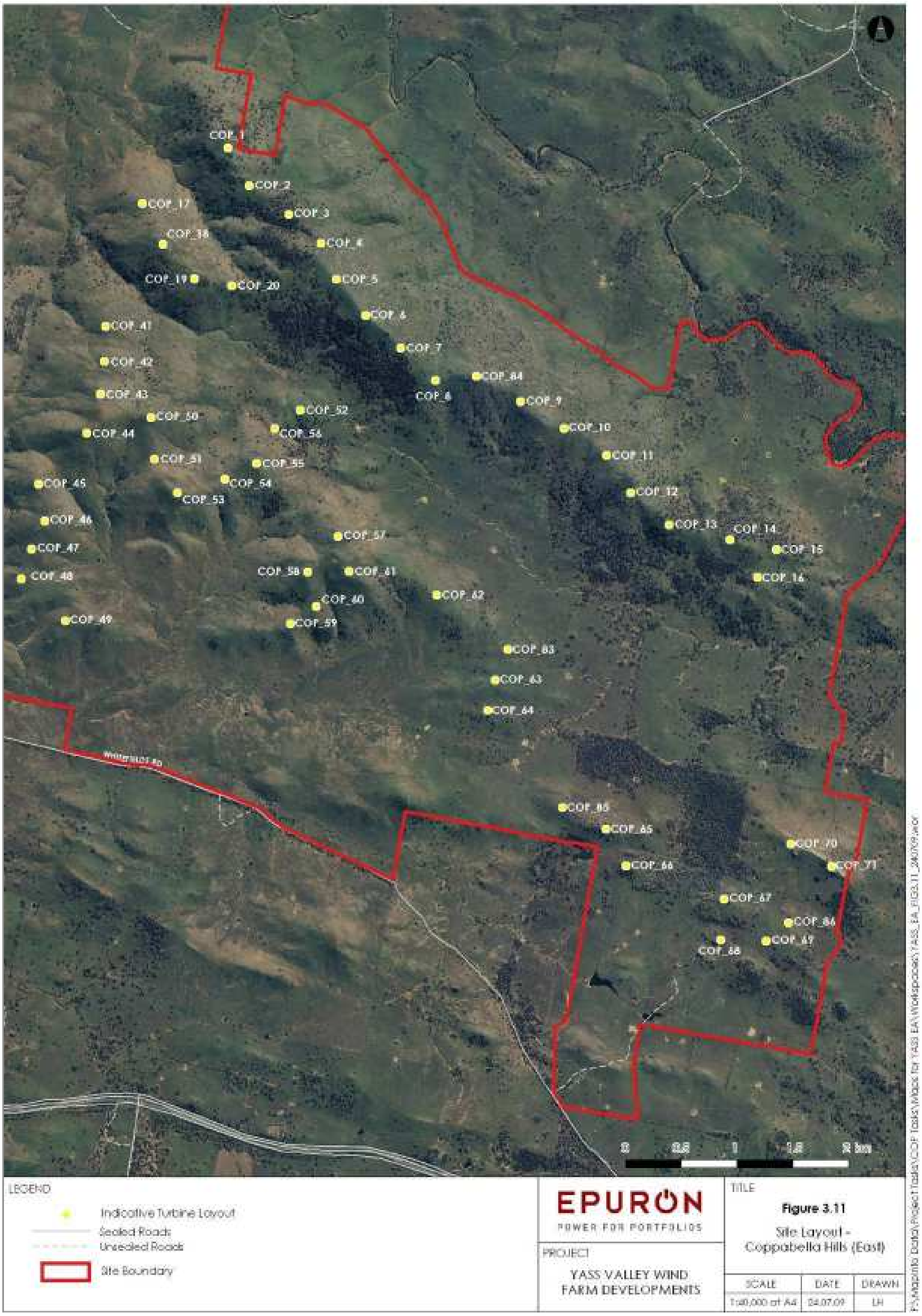


Figure 3-10: Indicative turbine layout Coppabella Hills Precinct, eastern section

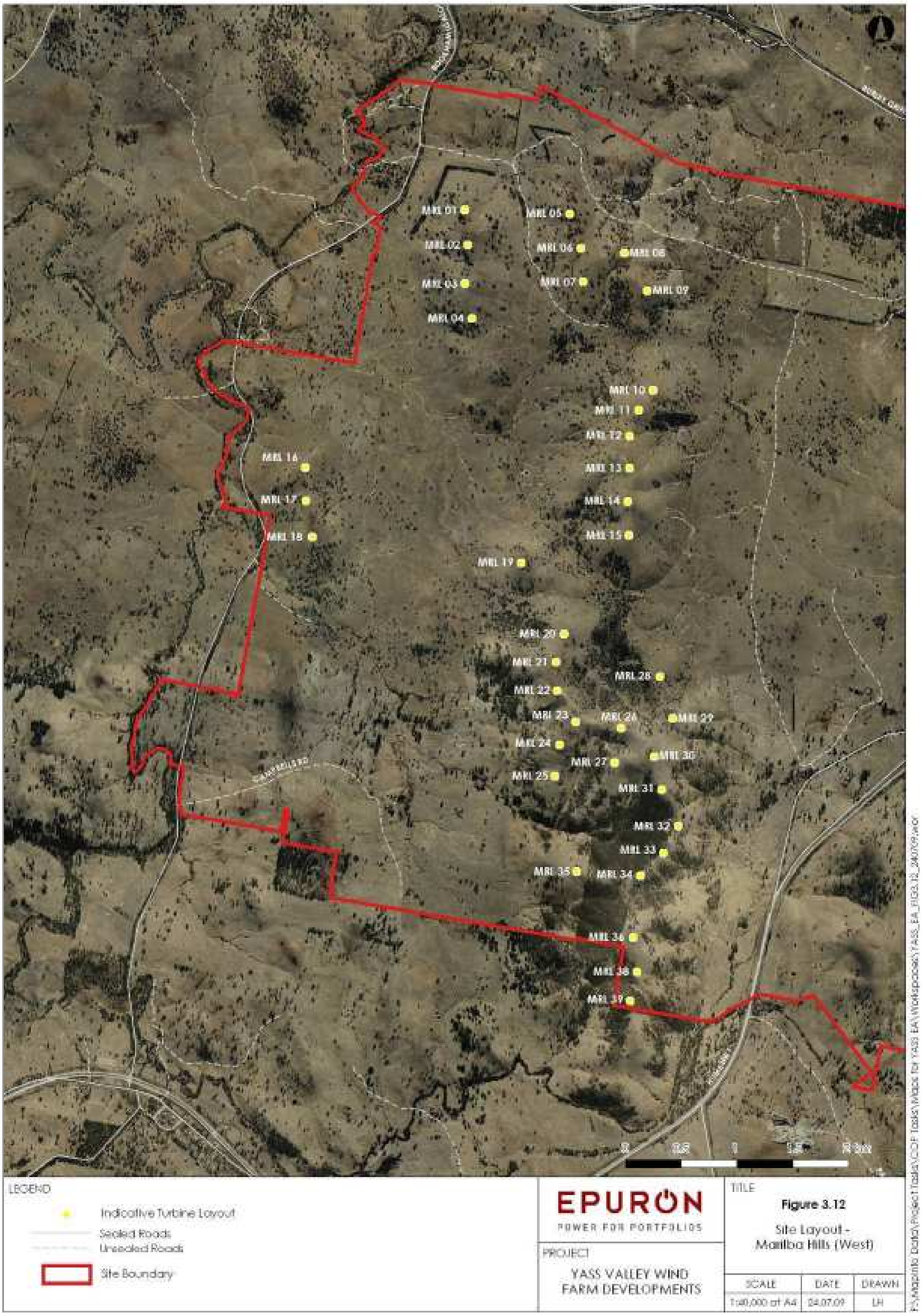


Figure 3-11: Indicative turbine layout Marilba Hills Precinct, western section

Figure 3-12: Indicative turbine layout Marilba Hills Precinct, western section

3.3.4 Electrical connections and substation

Introduction

To export power from the wind farm, it is necessary to electrically connect each wind turbine to the NSW electricity grid. Both precincts would require individual connection to the transmission network, and as a result the two precincts would be individually viable projects if necessary. The onsite electrical works at each precinct would include:

- A substation to step the voltage up from reticulation voltage to transmission voltage of 132kV, suitable for connection to the existing TransGrid's 132kV transmission network connecting Wagga and Yass. This network consists of two separate transmission lines, which pass through different sections of the two precincts.
- Onsite power reticulation cabling (underground and overhead) at either 22,000V (22kV) or 33,000V (33kV) to connect wind turbines to the control room and site substation
- Onsite control and communications cabling
- An onsite control building housing control and communications equipment

Onsite electrical reticulation

Within each wind turbine, or in the adjacent pad-mount transformer, the power voltage is stepped up from generation voltage to either 22kV or 33kV for reticulation around the precincts.

Each wind turbine must be connected together at reticulation voltage, and then connected to the precinct substation. These connections are to be made using a combination of underground and overhead cabling.

In general, overhead cabling offers benefits as it minimises ground disturbance and is lower cost, however, there are practical limitations installing overhead cabling on ridges where turbines are present. Therefore it is typical to use underground cabling to connect turbines on ridgelines, and use overhead cabling to transport power from clusters of turbines back to the substation.

Cable trenches would, where reasonable, be dug within or adjacent to the onsite roads to minimise any related ground disturbance. Short spur connections would come off a main cable run which would approximately follow the main road access route at each precinct. Underground cables would require a trench of approximately 1 – 1.5 metres deep and 0.5 – 1 metre wide.

All of the potential options for power reticulation have been assessed. Statements of Commitment accompany this proposal to ensure that micro-siting to minimise environmental impacts (particularly biodiversity impacts) would be undertaken with the assistance of an ecologist, where routes are located near sensitive environmental features.

Site substation and transmission connection

A number of substations are required at each precinct to convert power from on-site reticulation voltage of 22kV or 33kV to a transmission voltage of 132kV suitable to connect into TransGrid's transmission network. The exact number and configuration would depend on the results of detailed electrical connection studies and network connection agreements. It would also include all necessary ancillary equipment such as control room and amenities, control cubicles, voltage and current transformers, and circuit breakers for control and protection of the substation.

It is likely that each of the three precincts would require separate substations and control room buildings.

At each precinct, the substation area would be surrounded by a security fence as a safety precaution to prevent trespassers and stock ingress. The ground would be covered partly by crushed rock and partly by concrete pads for equipment, walkways and cable covers, and would have an earth grid extending outside of the boundary of the security fence. The substation would be built to a specification suitable to TransGrid.

Figure 3-13: Cullerin Range Wind Farm 132/33kV substation

The proposed locations for the substations would be within each precinct and generally adjacent to the existing TransGrid transmission line. Typically a 132kV substation would take up an area of up to 100m x 100m surrounded by a security fence.

Substations could be located in the areas indicated in Figure 3-14. These locations have been selected based on the indicative wind turbine layout. Final locations would be selected to minimise environmental disturbance, reduce cabling lengths and therefore reduce costs and environmental impacts, reduce visual impacts and ground disturbance of the Proposal. In general, substations are located in flatter areas.

The potential to establish a bushfire Asset Protection Zone (APZ) that complies with the RFS *Planning for Bushfire Protection* guidelines has been evaluated based on the vegetation type and slope. The site parameters (predominantly flat land with limited continuous canopy cover) indicate that a compliant inner protection area (which can be maintained under continued grazing practices) and outer protection area would be achievable.

Each substation would include up to two large power transformers. The transformers are likely to be of the oil-cooled variety, and therefore may contain considerable quantities of oil. Provision would be made in the design of each substation for containment of any oil which may leak or spill. Other equipment in the substation includes circuit breakers and a 132kV busbar.

It is likely that alterations would be required to the existing transmission line to allow connection of the new cabling. This may include the construction of new power poles at the connection point to direct the conductors to the proposed substation. A separate lower voltage supply would also be required to provide backup power to the substation.

3.3.5 Control and maintenance facilities

A control building would be built next to each substation to house instrumentation, control equipment and communications equipment. This building would also house routine maintenance stores, equipment, a small work area, and amenities for staff.

The control building is expected to be of concrete slab on ground construction with steel frame, metal or brick walls, a non-reflective sheet steel (colourbond) roof, and would include rainwater collection and storage for domestic use. A composting or septic toilet system would be installed for staff use. It is likely that the control building would be air-conditioned. The internal layout of the control building would be finalised after the Grid Connection Agreement has been completed with TransGrid. Parking would be provided adjacent to the building. Figure 3-25 presents an indicative control building.

Communications to the control building would be required to allow remote monitoring and control of the wind farm. This connection could consist of multiple buried telephone lines, broadband cable, microwave or a satellite connection. It is possible that a microwave link may be required by TransGrid for substation control, in this event this would be subject to a license application to the Australian Communications and Media Authority.

Standard 240 Volt / 415 Volt power would be installed at the control building.

The control building would be located adjacent to the substation, and is expected to be a joint facility for control of the substation as well as the wind farm (refer to Figure 3-14 to Figure 3-15) and would also encompass storage of maintenance components.

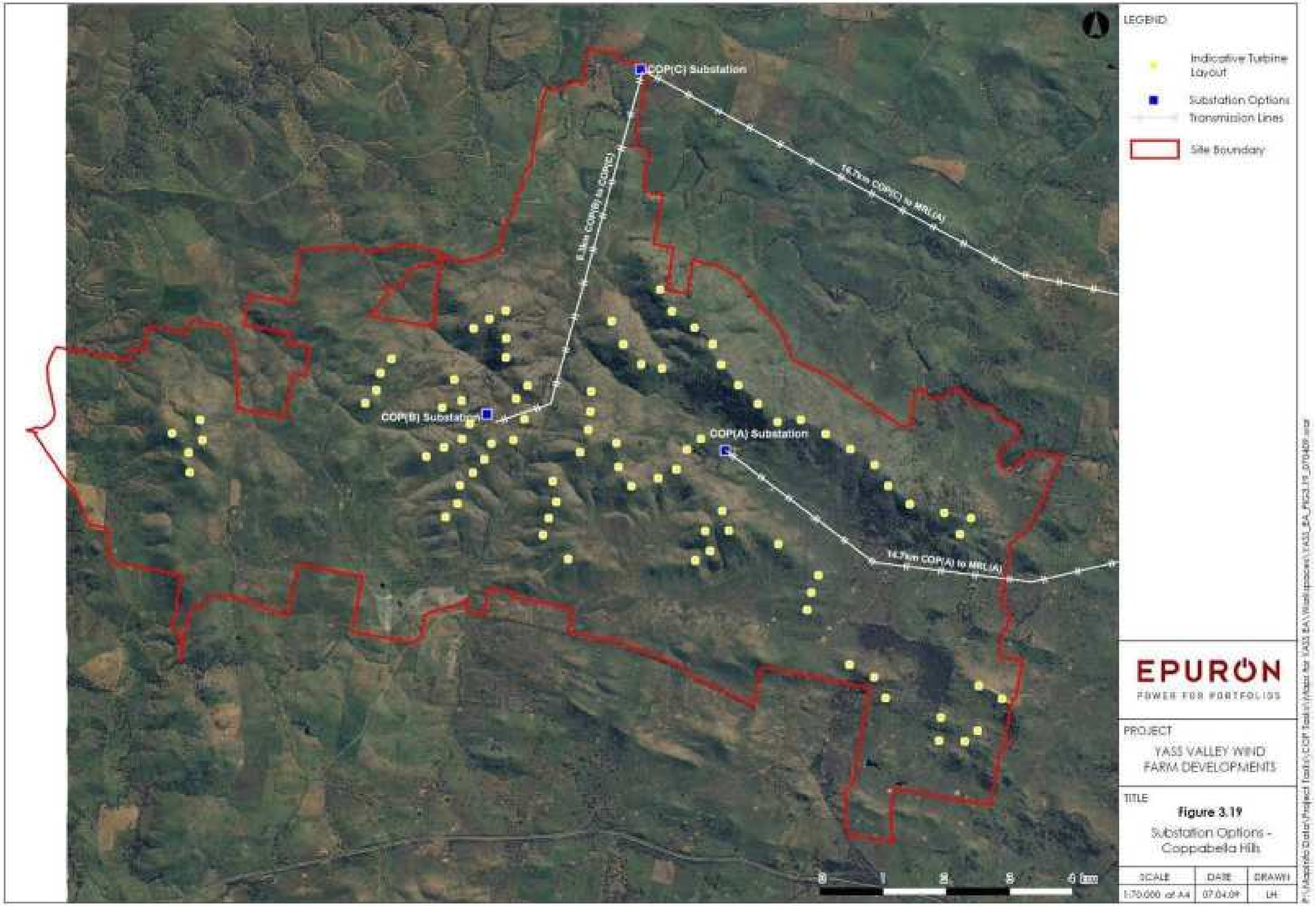


Figure 3-14: Substation and control building locations - Coppabella Hills Precinct

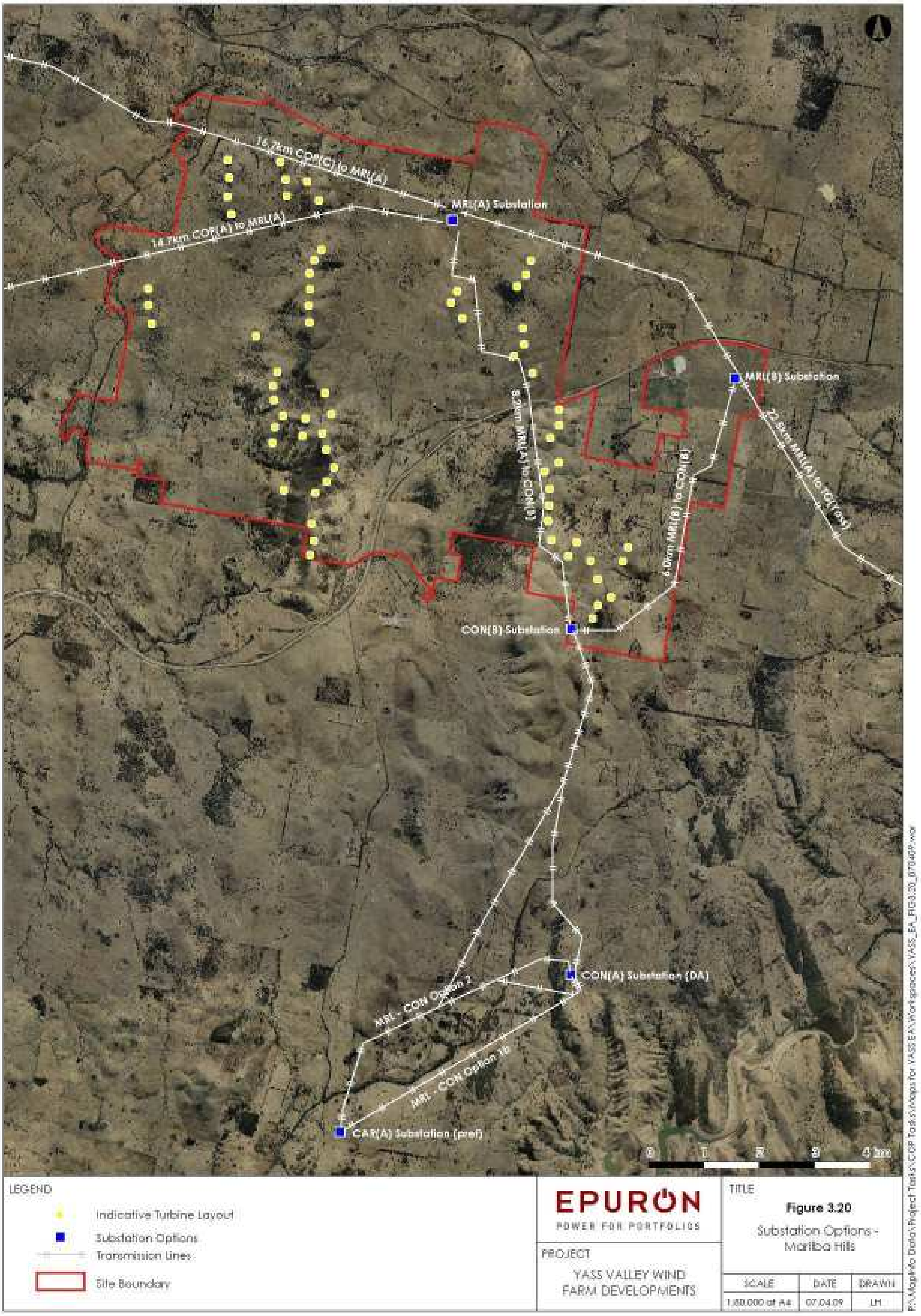


Figure 3-15: Substation and control building locations - Marilba Hills Precinct

Control cabling

In addition to the power reticulation cabling, control and communications cabling is required from the control building to each wind turbine, and to the substation. This control cabling would be installed using the same method and route as the power cabling described above, that is, strung from the same poles as overhead lines, or dug in the same cable trench as underground cables.

Control cables would consist of twisted pair cables, multi-core cables or optical fibres and would be used for central and remote control of individual wind turbines, substation controls, monitoring of weather data and equipment, and communications to offsite control centres where required.

Interaction with TransGrid

The Proponent has submitted a Grid Connection Application, and seeks to finalise a Grid Connection Agreement with TransGrid on the basis of the proposed connection arrangements and in accordance with the National Electricity Code. This Grid Connection Agreement would include all technical requirements for safe connection of the wind farm to the NSW electricity grid.

Relevant stakeholders including TransGrid and NEMMCO would be consulted in preparation of the related Grid Connection Application.

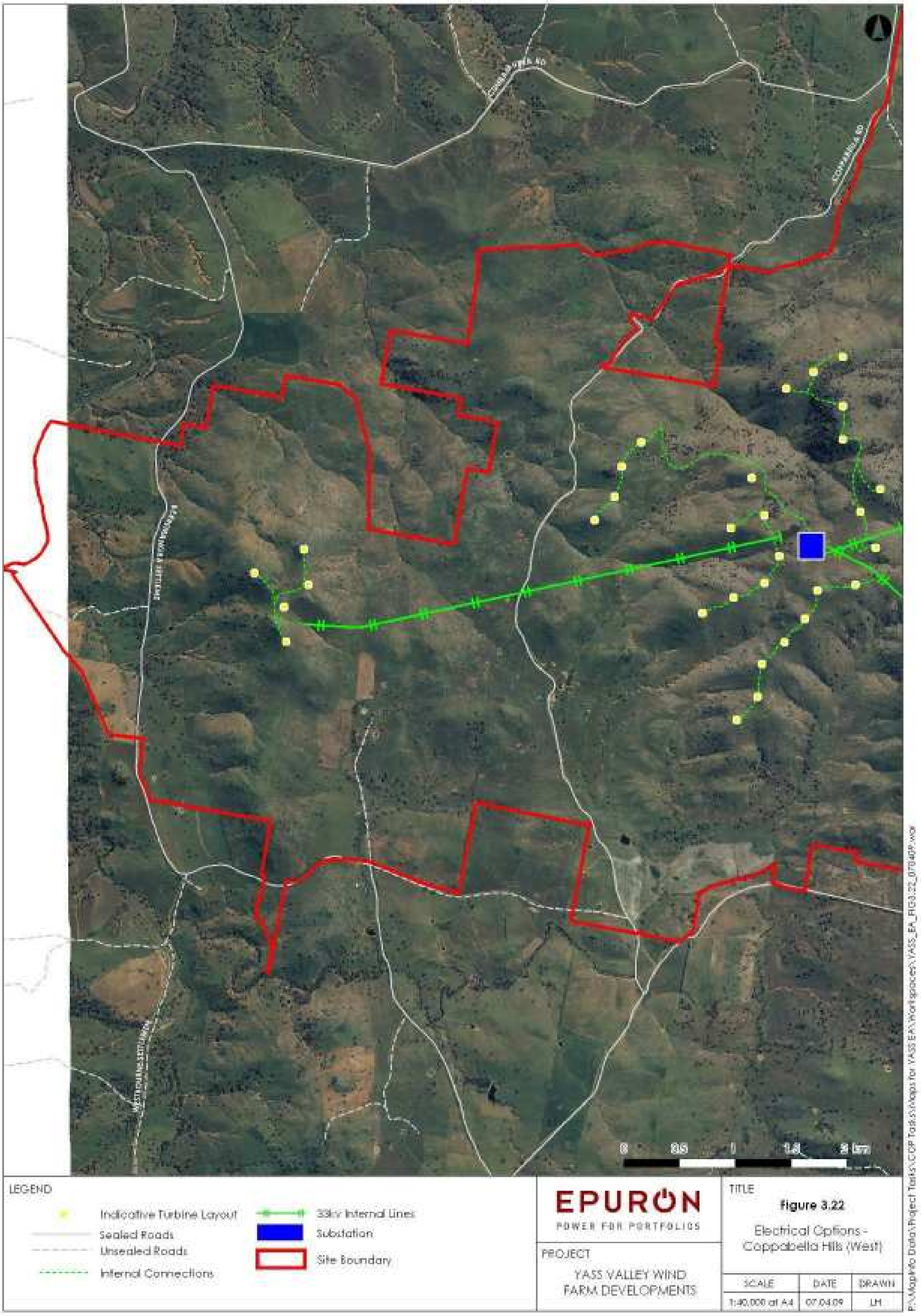


Figure 3-16: Indicative Electrical reticulation layout – Coppabella Hills Precinct western section

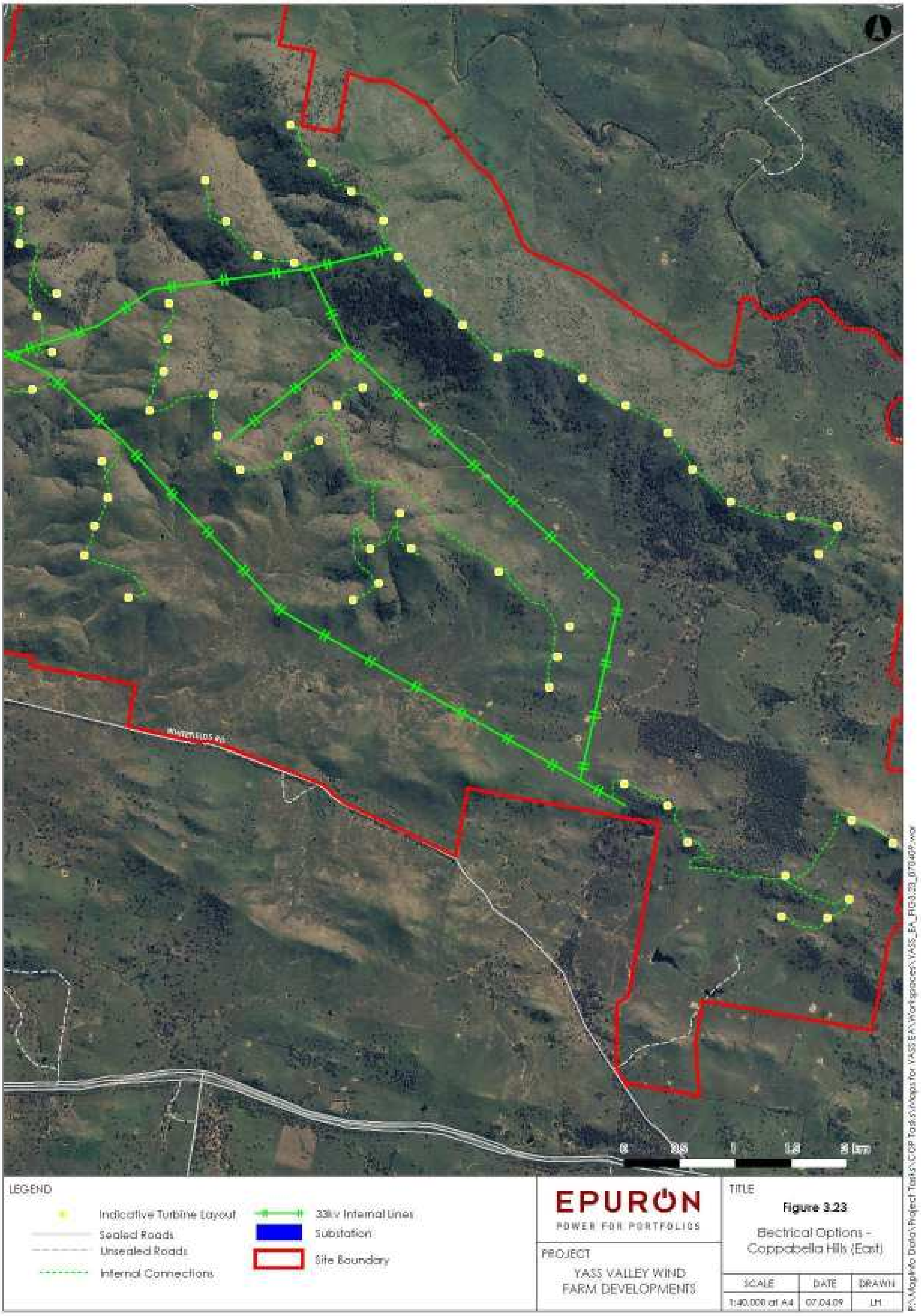


Figure 3-17: Indicative electrical reticulation layout – Coppabella Hills Precinct eastern section

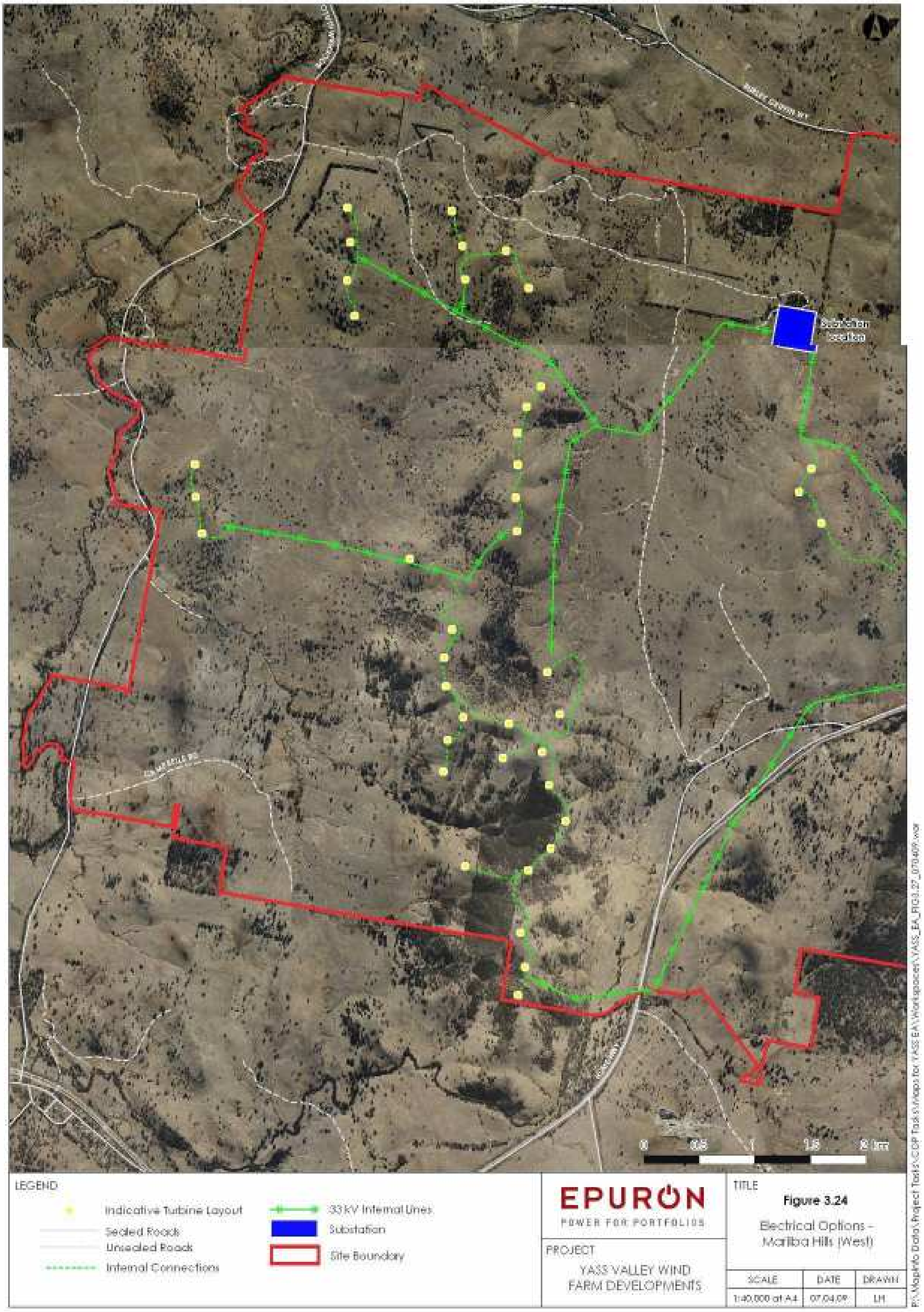


Figure 3-18: Indicative electrical reticulation layout – Marilba Hills Precinct western section

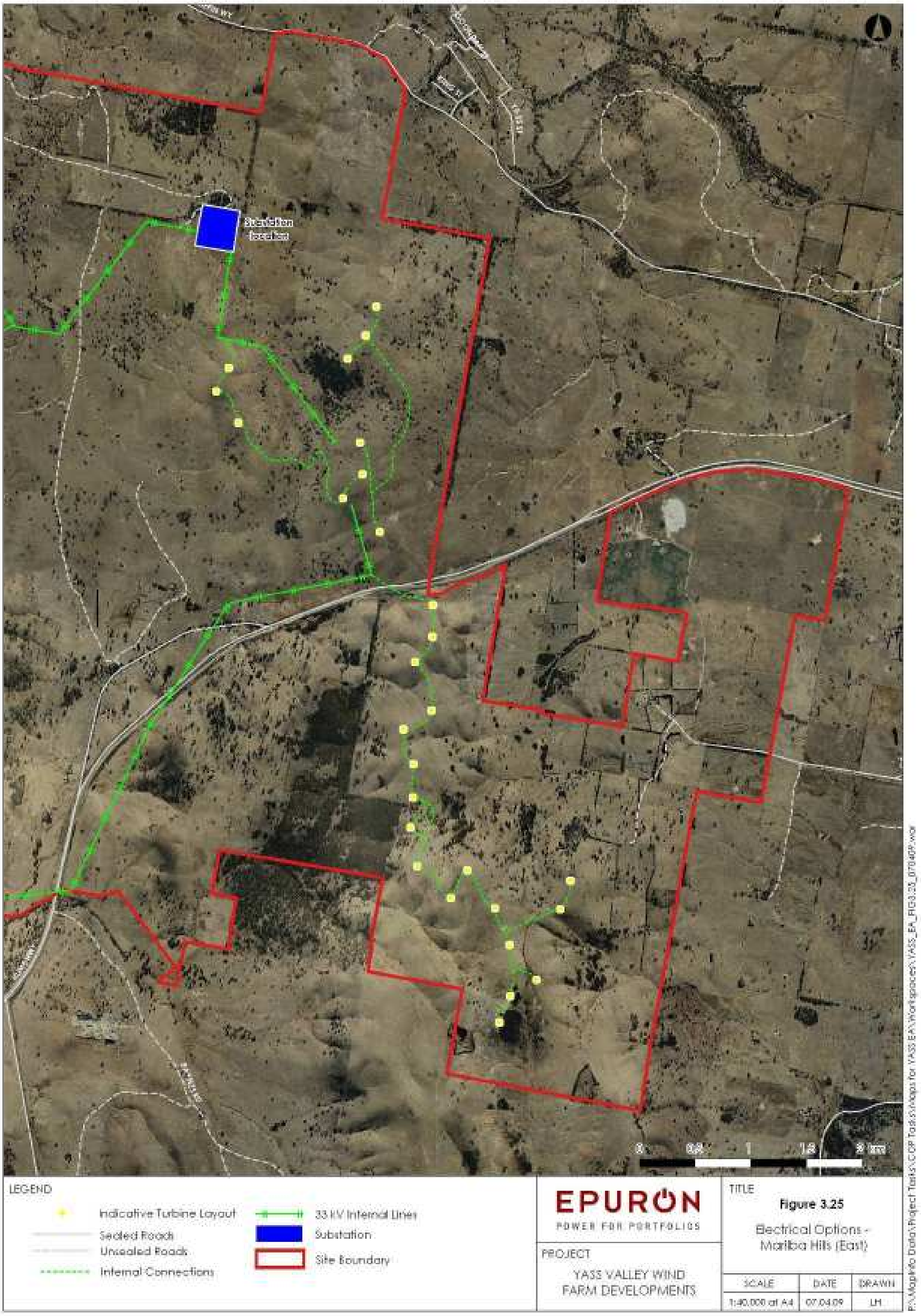


Figure 3-19: Indicative electrical reticulation layout – Marilba Hills Precinct eastern section

3.3.6 Site civil works, roads, and access

Access route

Access to both of the precincts would generally be via the Hume Highway, a high speed four lane dual carriageway road with a high standard of access at all of the major junctions. The Hume Highway provides access to within 10 kilometres of each precinct. Regional and locally maintained roads would be used to connect the Hume Highway to the sites.

The main access points being considered for the Coppabella Hills Precinct are from Whitefields Road to the south and Berramangra Road to the west. Both of these roads are under local control. These roads carry very small traffic numbers as they serve as access for residents.

Access points under consideration for the eastern section of Marilba Hills are from the Hume Highway, via the truck rest areas on either side of Conroy's Gap. Access to the western section would mainly be from the Marilba Station property access road, along with access from the northern section of Illalong Road off Burley Griffin Way.

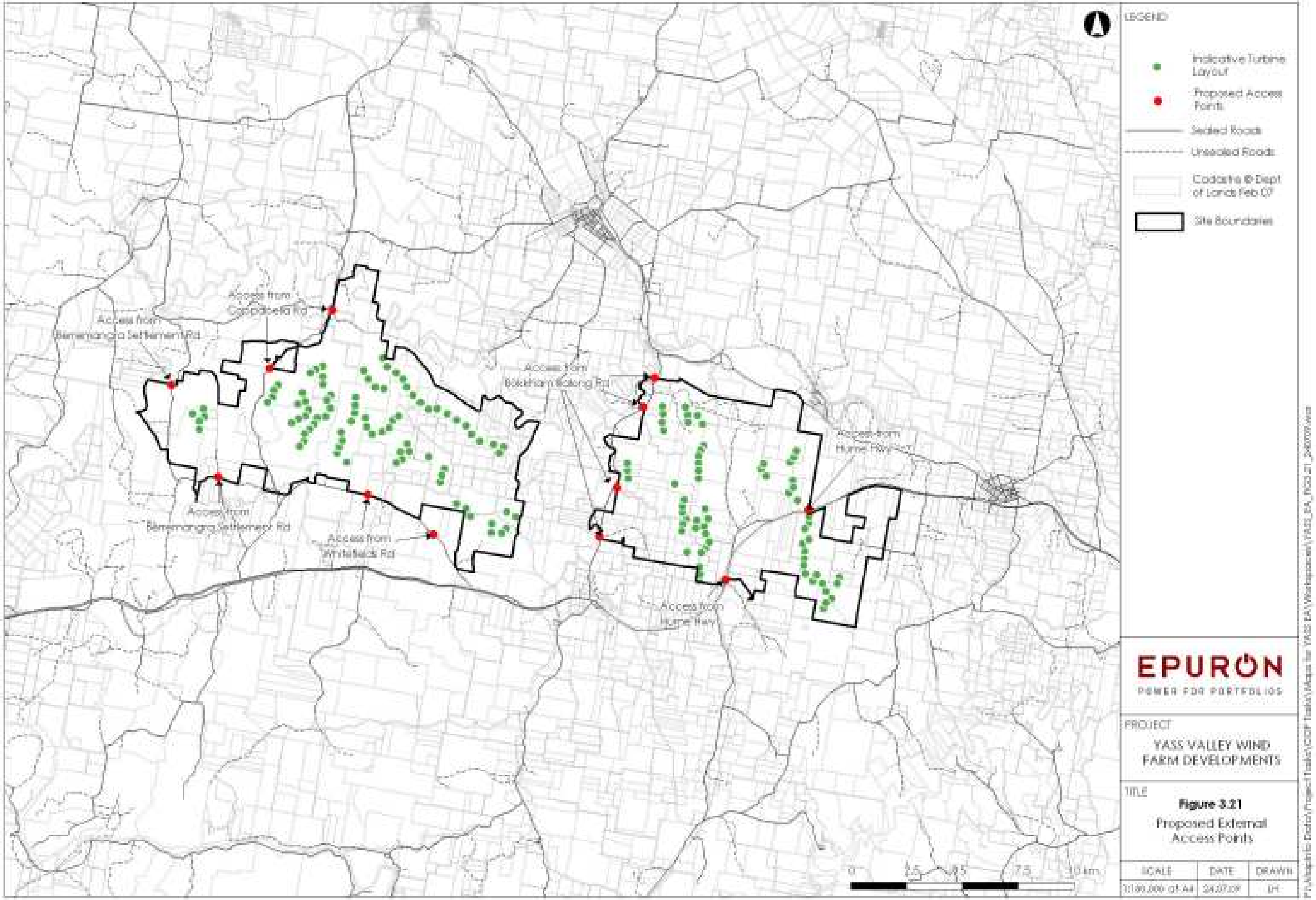


Figure 3-20: Proposed external access

Proposed external access points shown in red

Vehicle management

Every effort would be made to ensure vehicles:

- Are minimised in size, length, and number.
- Travel with appropriate regard to other road users.
- Travel at times which minimise traffic noise impacts to surrounding residents.

During construction, light vehicles would generally operate within 1 hour of the normal construction hours. However, the delivery of turbines via oversize vehicles may occur at night, outside normal construction hours, in order to ensure safe passage during low traffic conditions.

Traffic management is discussed in more detail in Section 7.10. A Traffic Management Plan (TMP) would be prepared to properly manage traffic impacts in accordance with Section 7.10. It would be developed in consultation with the roads authorities to ensure that the measures are adequate to address potential safety and asset degradation impacts.

Access tracks

On site access tracks required for construction and operation would be unsealed formations up to 8m in width or up to 12m in width where passing lanes are required. Tracks are required to the base of each wind turbine location and the location of each site substation and control building.

At each wind turbine base, a firm hardstand area would be required to provide a level and stable base for cranes necessary for construction (approximately 22m x 40m; 900m^2 in area). New gates and possibly new or realigned fences may also be required to protect stock during the construction phase.

Once the construction phase has finished, any tracks not used for normal farming practice or turbine maintenance would be rehabilitated to a width of 3 metres, suitable for use by standard 4WD vehicles. Both hardstand and access tracks would be maintained to allow maintenance and repairs to the wind turbines.

In locating access tracks on site, every effort would be made to:

- Minimise the number and length of necessary access tracks
- Locate access tracks along the route of existing farm tracks
- Locate access tracks to minimise clearing of native vegetation
- Locate access tracks to minimise impact on sensitive biodiversity or heritage areas
- Construct access tracks with due regard to erosion, sediment control and drainage

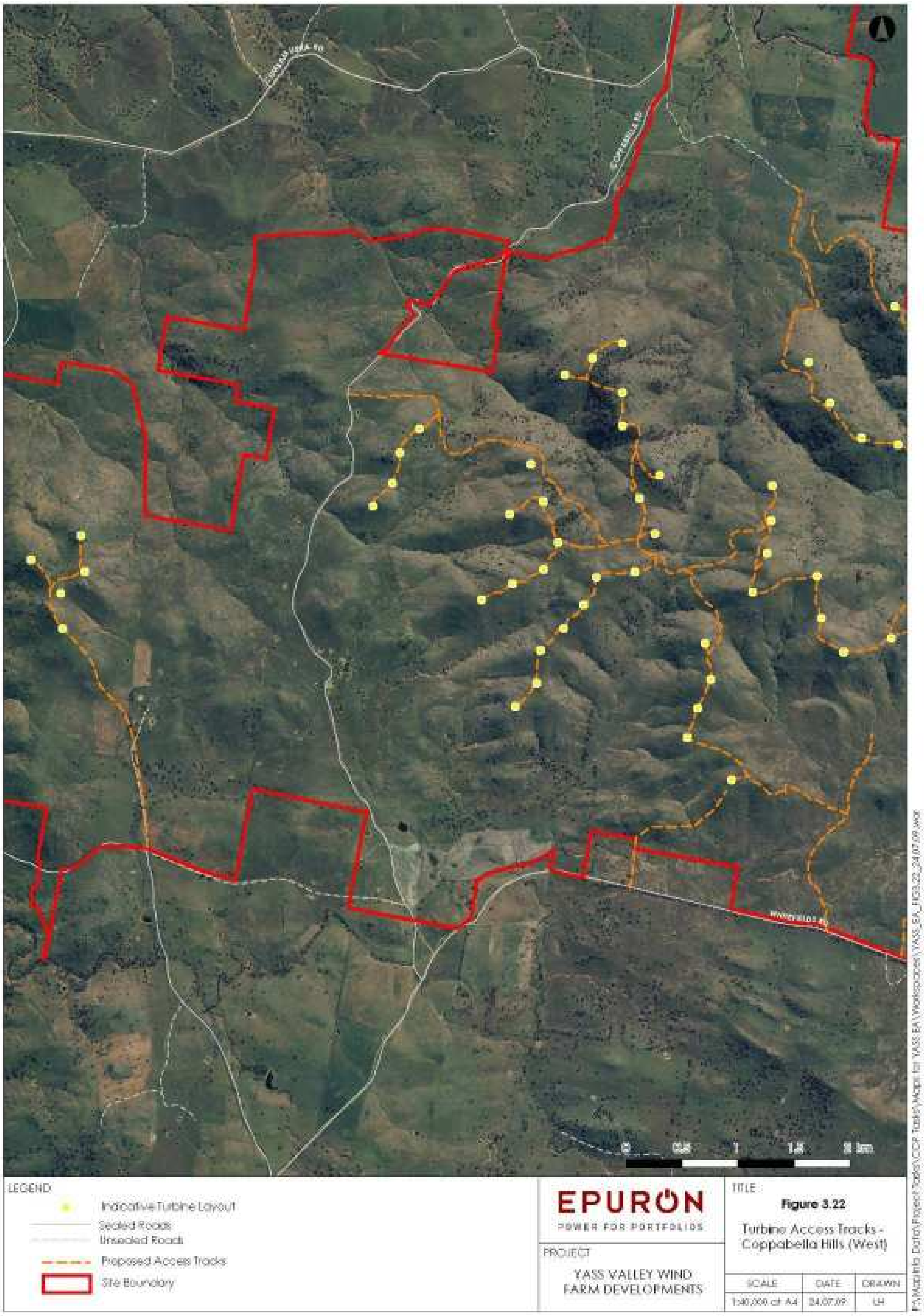


Figure 3-21: Shows an indicative track layout based on the current turbine layout and preliminary design principles.

This figure shows proposed existing tracks (some requiring upgrade) in white and proposed access tracks in orange.

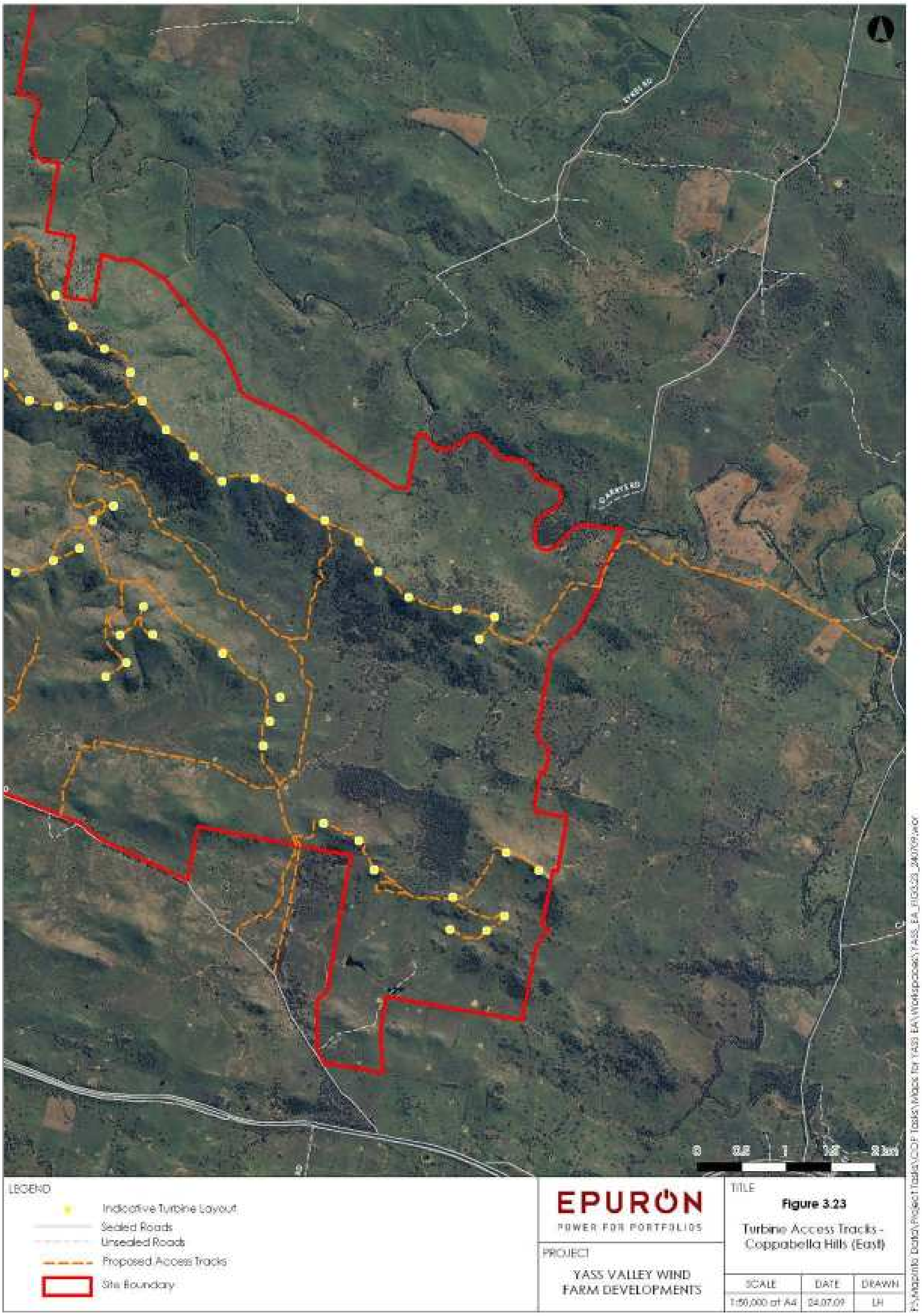


Figure 3-22: Indicative site access tracks, Coppabella Hills Precinct eastern section

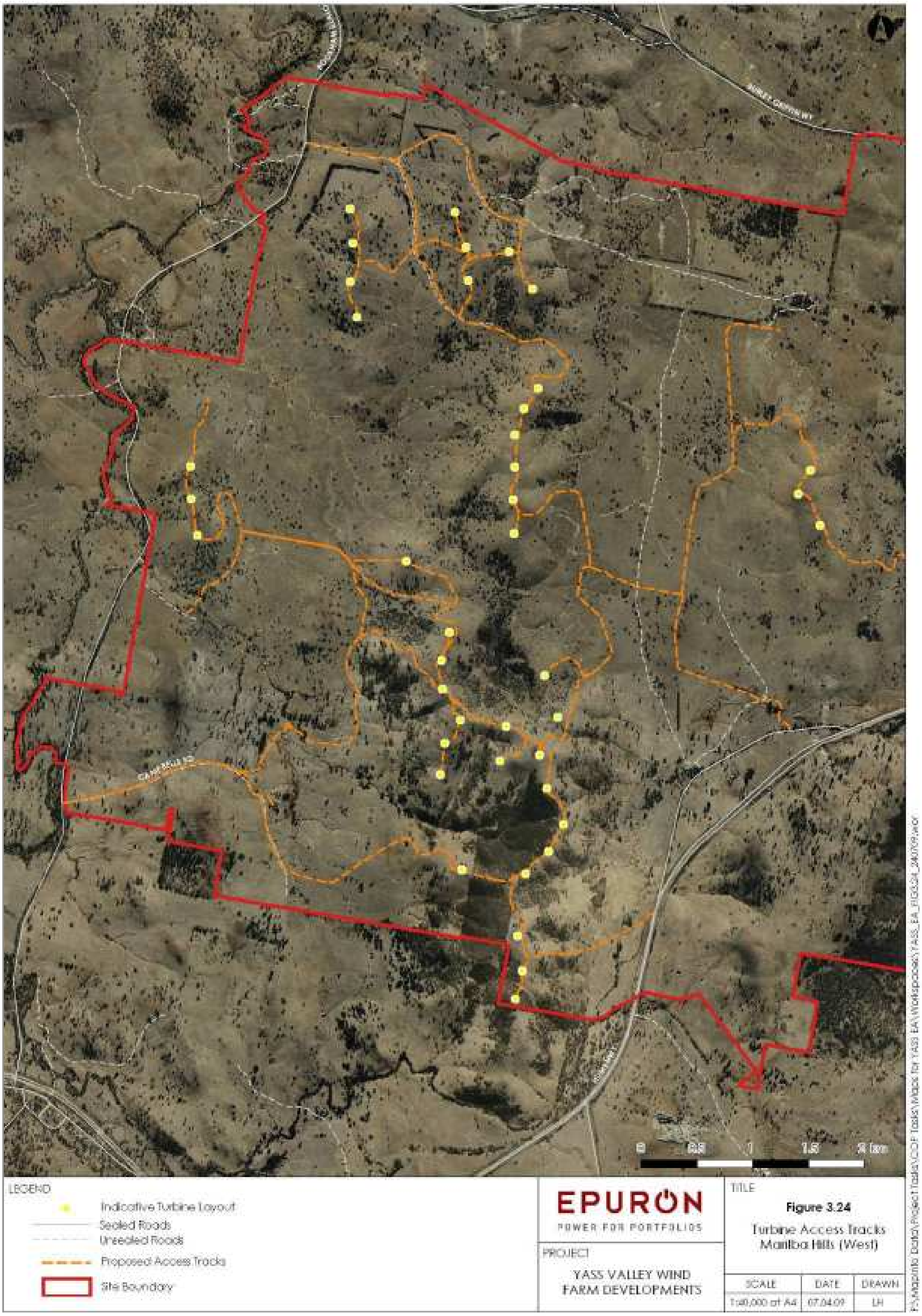


Figure 3-23: Indicative site access tracks, Marilba Hills Precinct western section

Figure 3-24: Indicative site access tracks, Marilba Hills Precinct eastern section

3.3.7 Wind monitoring equipment

The Proponent is currently maintaining a number of wind monitoring masts across each precinct to assess wind speeds at proposed turbine locations. Following construction, permanent wind monitoring masts would be required to assist the control and operation of the wind farm. These would be static guyed towers with remotely operated wind monitoring equipment installed at multiple heights on each mast.

Pending final wind turbine placements, it may be necessary to maintain the existing wind monitoring masts, move the existing wind monitoring masts to different locations within each precinct, replace the wind monitoring mast with a shorter or taller wind monitoring masts, or install additional wind monitoring masts to assist with control and operation of the proposed development.

These masts would be located within the development envelope assessed in the various studies reported in this document. Approvals for the construction of these masts are not required. The proponent would inform CASA and the Department of Defence of the location of any monitoring masts constructed.

Figure 3-25: Indicative control building

3.3.8 Other site services

Temporary power (11kV) would be required for the construction phase. In addition, a permanent power supply (11kV) would be required for each substation to allow backup supplies to each substation in the event of an outage on the main 132kV transmission line. The 11kV lines are typically the same sized distribution lines that provide domestic power supply to houses in the area of the site.

Operating staff would be responsible for removal of all other wastes generated from the wind farm; no waste management services would be required.

Site Office

During the construction phase up to 100 staff would be working on site at any time. A suitable location for the site office would be selected at each of the precincts, avoiding areas that are regarded as having environmental constraints. The site office may include several demountable buildings, and an amenities block located on site for the duration of construction. Sufficient parking would be provided for the expected usage.

3.4 MODIFICATIONS TO INFRASTRUCTURE LAYOUT

The infrastructure layout presented in this Proposal has undergone assessment to determine that the layout is reasonably suitable for construction and would comply with likely environmental constraints and consent conditions. Minor relocation of equipment may be required prior to construction however, as a result of a number of factors including:

- Final turbine selection.
- Final wind speed and energy yield analysis.

- Additional environmental constraints identified through any ongoing investigations.
- Constraints identified in relation to constructability or cost minimisation.
- Constraints identified in relation to turbine suitability assessment.
- Constraints identified after the results of final engineering and geotechnical investigations are completed.

It is recognized that in accordance with Section 75W the *Environmental Planning and Assessment Act 1979* equipment relocation is permissible if such relocation is broadly consistent with the Proposal as outlined and approved, otherwise an application for modification of the Development Consent would be required.

In a recent NSW Land and Environment Court ruling (Taralga Landscape Guardians v. Minister for Planning NSWLEC 2007) the Court found in relation to relocation of wind turbines in that circumstance:

> "… that a 250 m relocation of any of the elements is not unreasonable."

While this finding could be perceived to be site specific, it accepts the principle in relation to equipment relocation and provides some guidance as to acceptable relocation distances.

The Proponent considers that in relation to this Proposal, acceptable minor equipment relocation of wind turbines and other equipment of up to 250m would have negligible effect on visual impacts of the Proposal and is broadly consistent with the Proposal. In relation to noise impacts, relocation of wind turbines and other equipment is broadly consistent with the Proposal where the principle acceptability limit criteria outlined in the South Australia EPA Noise Guidelines for Wind Farms (February 2003) is achieved at neighbouring (non-involved) residences as outlined in Section 7.3.

Relocation of any equipment in a way which does not notably increase impacts to native vegetation, biodiversity, indigenous heritage or non-indigenous heritage (considered as a whole) is broadly consistent with the Proposal and this would be managed in accordance with the Statements of Commitment.

Any relocation required during the construction phase would be only undertaken within the defined development envelope and in consideration of any constraints identified within each of the specialist studies.

3.5 STAGING OF WORKS

The works establishment of the wind farm can be considered as occurring in four phases. These include construction, operation, refurbishment and decommissioning of the wind farm. A description of activities under these headings follows.

3.5.1 Phase 1: Wind farm construction

Before project approval has been received, it is not possible to define the timeline for the construction of the project. It would be expected that from the time project approval is received, it would take a further year to finalise the additional agreements required before construction could commence. This includes finalising the grid connection agreement and ordering long lead-time items such as transformers and turbines.

The construction phase of the wind farm would then occur over a 24-36 month period and would include such activities as:

- Transportation of people, materials and equipment to each precinct.

- Civil works for access track construction, footings and trenching for cables.
- Establishment, operation and removal of up to two concrete batching plants (as discussed below).
- Potential use of rock crushing equipment if required.
- Potential use of blasting in foundation excavation, if required.
- Installation of wind turbines using large mobile cranes.
- Construction of substation and onsite power reticulation lines and cables.
- Construction of temporary offices and facilities.
- Temporary storage.
- Restoration and revegetation of disturbed onsite areas on completion of construction works.

This Proposal may be constructed in phased or staged approach, with separate precincts or groups of infrastructure considered discrete work packages and commenced at different times.

In general for each precinct, construction would commence with the upgrading of roads and all other site civil works, including preparation of hardstand areas, and laying of cables. This would be followed by preparation of concrete footings, which must be cured for many weeks prior to construction of wind turbines.

Wind turbine construction can be relatively fast once the footings are prepared, with wind turbines installed at a rate of approximately 2 per week. The towers are erected in sections, the nacelles lifted to the top of the towers, and finally blades lifted and bolted to the hub.

The necessary substation construction and grid connection works would be carried out in parallel.

The commissioning phase would include pre-commissioning checks on all high-voltage equipment prior to connection to the TransGrid transmission system. Once the wind farm electrical connections have been commissioned and energised, each wind turbine is then separately commissioned, connected and put into service.

On completion of construction, disturbed areas would be revegetated and all waste materials removed and disposed of appropriately.

Wind turbine construction and installation

Installation of the wind turbine blades would require establishment of a level (<1% gradient) and stable hardstand area at the base of each wind turbine. This hardstand area would support cranes used for the major component lifts. It is also necessary to have a delivery area for the various components adjacent to the hardstand area.

Installation of the wind turbine blades would also require largely cleared areas at the base of each wind turbine to manoeuvre the wind turbine blades. Generally, the three blades are connected to the hub on-ground, and the hub and blades lifted as one piece by a crane located on a hard stand platform. There is some scope to avoid damage to or removal of native vegetation during this stage by careful positioning of the blades to avoid trees and shrub;, this would be carried out wherever possible[5].

[5] The calculation of estimated impact area assumes the entire ‘crane operation area’ would be entirely disturbed, in order to calculate a ‘worst case’ scenario.

The wind turbines would be anchored using large concrete gravity footings or smaller concrete footings bolted to rock, as determined by geological parameters. Some blasting of rock may be required to excavate footings, dependent on the geological properties of the rock and design of the footing. Should controlled blasting be required, it would be carried out in accordance with all relevant statutory requirements.

Rock crusher

Materials excavated during the construction of wind turbine footings may be able to be reused as road base for the road surface upgrades. For this purpose, it is possible that a mobile rock crusher would be used during construction.

Concrete batch plants

There are several quarries or batch plants within the vicinity of the project that are likely to have the ability to supply pre-mix concrete to both precincts from either Bookham, Jugiong or Yass. However, four locations have been identified as suitable for portable concrete batch plants should they be required to supply concrete during the construction phase and therefore are included in this Proposal. Batching plant equipment may be relocated within each precinct as the works progress to different areas of each precinct.

The Bogo Quarry on Paynes Road is currently preparing an Environmental Assessment for the expansion of the Quarry which would include a mobile concrete batch plant and a mobile asphalt plant (Department of Planning 2008). Access to this batch plant for the supply of concrete to all precincts has been considered as a desirable planning option.

In the event that pre-mix concrete is unable to be supplied to all precincts, up to four portable concrete batching plant locations would be required. The concrete batch plants would involve a level area of approximately 100 metres by 75 metres to locate the loading bays, hoppers, cement and admixture silos, concrete truck loading hardstand, water tank and stockpiles for aggregate and sands. The batching plant would include an in-ground water recycling / first flush pit to prevent dirty water escaping onto the surrounding area, and would be fully remediated after the construction phase.

Figure 3-26 indicates likely batching plant locations. These are proposed to be located either adjacent to substations or in cleared open paddocks. Final batching plant locations would be confirmed prior to construction. A concrete batching plant would produce up to 340m^3 of concrete per day when a turbine foundation is being poured. The maximum operational period would be 12 months and each plant would produce a maximum of 850 tonnes per day. This is equivalent to 114,750 tonnes during the construction phase assuming that 75% of the concrete is produced from onsite batching plants. The batch plant operations would therefore require a license to be issued by DECC (under the Protection of the Environment Operations Act 1997), given the amount exceeds the license threshold of 150 tonnes per day. License conditions specified by DECC are likely to include operational protocols and monitoring.

Sands and aggregate would be sourced from excavation of footings, where possible, or from existing sand and gravel pits within the local area. Every effort would be made to source clean sands and aggregates to prevent transport of weeds to site. Where possible, sands and aggregates used would be similar in colour to materials already found on site.

Water required for onsite concrete batching would be sourced from one or more of several options outlined in Section 8.1. These options include acquiring water from either Lake Burrinjuck, new or existing ground bores, the pipeline connecting Harden and Jugiong or trucking water from local town centres. In all of these scenarios an allocation of water would need to be purchased by the Proponent as an embargo exists in the area preventing the acquisition of new water allocation. Where possible and where there is available water, water from on-site dams may be utilised.

There are several quarries or batch plants within the vicinity of the project that are likely to have the ability to supply pre-mix concrete to all precincts from either Bookham, Jugiong or Yass. However, up to two portable concrete batch plants may be required to supply concrete onsite and therefore two concrete batch plant locations are included in this Proposal.

The Bogo Quarry on Paynes Road is currently preparing an environmental assessment for the expansion of the Quarry which would include a mobile concrete batch plant and a mobile asphalt plant (Department of Planning 2008). Access to this batch plant for the supply of concrete to all precincts has been considered as a desirable planning option.

In the event that pre-mix concrete is unable to supplied to all precincts, up to four portable concrete batching plants would be required on site. The concrete batch plants would involve a level area of approximately 100 metres by 75 metres to locate the loading bays, hoppers, cement and admixture silos, concrete truck loading hardstand, water tank and stockpiles for aggregate and sands. The batching plant would include an in-ground water recycling / first flush pit to prevent dirty water escaping onto the surrounding area, and would be fully remediated after the construction phase.

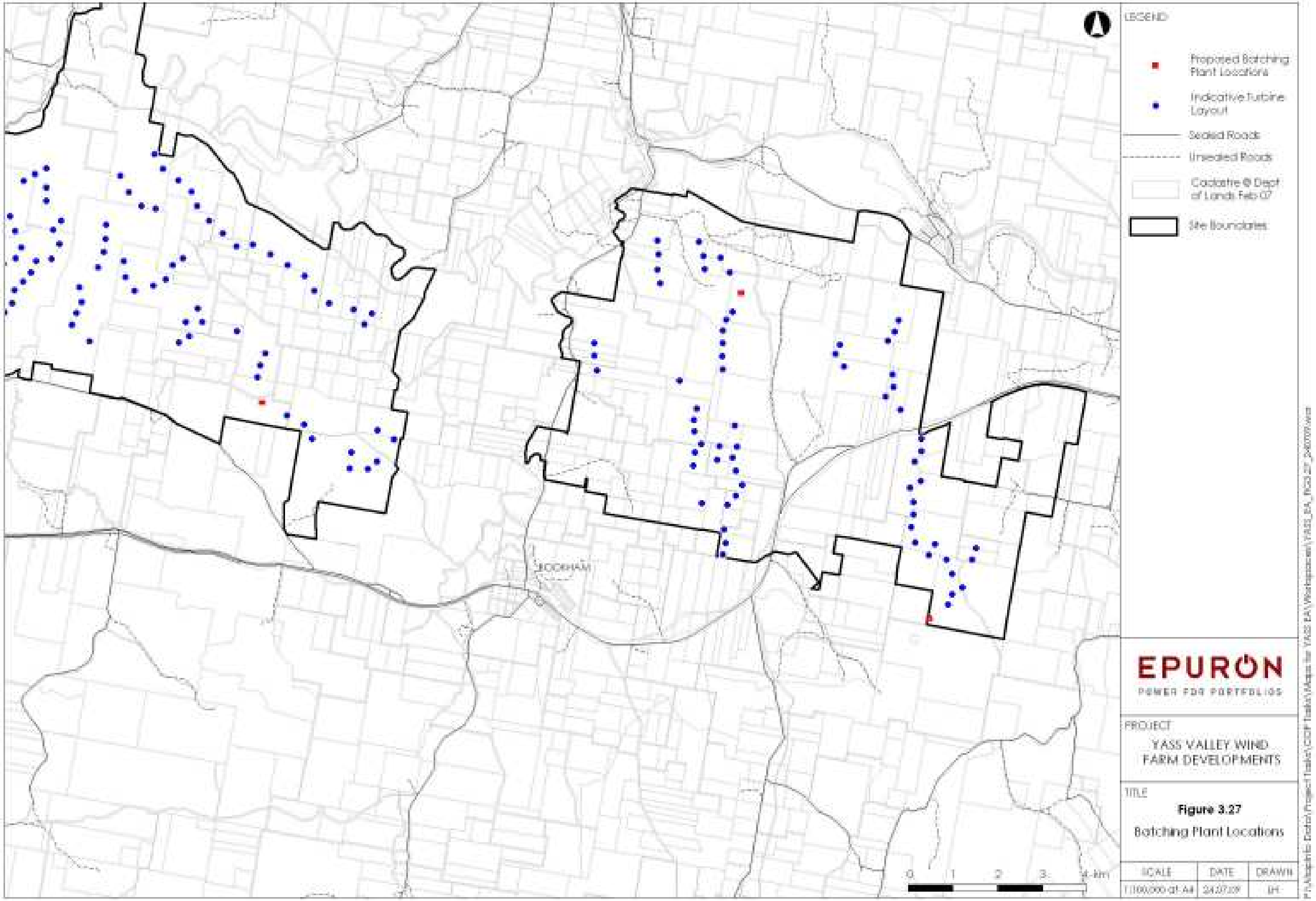


Figure 3-26: Proposed concrete batch plant locations

3.5.2 Phase 2: Wind farm operation

While the wind farm operates largely unattended, the wind turbines and other equipment would require regular maintenance. It is possible that some equipment may require major repair or replacement. In addition, during the initial operating years, operator attendance may be more regular while wind farm operation is being fine-tuned and optimised.

Once installed, the turbines would operate for an economic life of twenty to thirty years. After this time the turbines may be refurbished to improve their performance or decommissioned and removed from the site (refer to Sections 3.5.3 and 3.5.4).

Routine maintenance

To ensure the wind farm operates in a safe and reliable manner, it would require regular inspection and operation on an 'as needs' basis. This would generally be carried out using standard light vehicles.

In addition, regular maintenance is required, generally at 3, 6 and 12 monthly intervals. As a guide, each turbine requires approximately 7 days of maintenance per year. This does not require the use of major equipment, and could be carried out in a normal utility or small truck and would not require any additional works or infrastructure.

Major repairs

It is possible that major unexpected equipment failures could take place during the life of the wind farm. While wind turbines and electricity connections are designed for a 20 - 30 year life, failures can occur due to a number of factors including lightning strike (either directly to the wind turbines or offsite on the transmission line) and damage to key components (such as transformers or gearboxes). Failure can also occur on other equipment including that located in substations.

Most repairs can be carried out in a similar manner to routine maintenance, with some exceptions:

- Replacement of wind turbine blades, if necessary, would require bringing new blades to the affected turbine and installation of these blades using large cranes. The requirements are similar to the construction phase, and the access tracks established for construction may need to be brought into operation again.
- Replacement of wind turbine generators or gearboxes may require a crane and low loader truck to access the wind farm.
- Replacement of substation transformers would require a low loader truck to access the site.

Site monitoring program

A post-construction monitoring program would be established to determine any additional impacts resulting from the operation of the wind farm. The Operational Environmental Management Plan would contain specific monitoring programs required and would assess key issues such as biodiversity, noise compliance and visitation numbers.

Further details of the monitoring and adaptive management mechanisms are included in Section 10.

3.5.3 Phase 3: Wind turbine refurbishment

The life of a modern wind turbine is typically 20 - 30 years, at which point individual wind turbines would be refurbished, replaced, overhauled or removed. Individual turbines may also fail at shorter lives for various reasons as discussed above.

Replacement, refurbishment and recommissioning would involve similar road access arrangements to construction, and would require access for large cranes and transport vehicles to dismantle and remove the existing turbines and to install replacement turbines.

Existing substations and cabling would be largely reused. It is also possible that the existing footings and towers could also be reused, subject to the designs of turbine available at the time of replacement / recommissioning. This would allow a significant cost saving for the wind farm.

Any refurbishment or turbine replacement would comply with the requirements of the project approval under this application.

3.5.4 Phase 4: Wind turbine decommissioning

Should a turbine fail and it is not commercially viable to replace the turbine, the turbine would be decommissioned in accordance with the Statement of Commitments; any turbine remaining non-operational for a continuous 12 month period would be decommissioned and removed from the site.

Decommissioning would involve similar road access arrangements to construction, and would require access for large cranes and transport vehicles to dismantle and remove the turbines. All underground footings and cable trenches would remain in situ; all above ground infrastructure would be removed. The decommissioning period is likely to be significantly shorter and with significantly less truck movements than the construction phase.

It should be noted that the scrap value of turbines and other equipment is expected to be sufficient to cover the majority of the costs of their dismantling and site restoration.

3.5.5 Construction hours

Construction activities associated with the project that would generate audible noise at any residence would be undertaken during the hours of:

Monday – Friday	7am – 6pm
Saturday	7am – 1pm
Sunday and public holidays	Not proposed

These working hours have been proposed to allow reasonable efficiencies of effort to achieve maximum productivity to minimise the overall construction duration. However, some work (e.g. delivery or erection of turbines) may occur overnight due to logistic reasons. Turbine lifts, for example, can only be carried out during periods of lower wind speeds because of operational limitations with the tall cranes and it is possible that night-time work would be required in this instance. This scenario has occurred at other wind farms (for example Cape Bridgewater, Victoria) where night crane operations have been required because of strong winds during the day.

3.6 SITE DISTURBANCE AND IMPACT AREA

The proposed wind farm requires the construction of a number of elements including turbines, turbine foundations, underground and overhead powerlines, a substation, control building and access roads on the site.

During the construction phase, additional areas of the site would be impacted to provide construction compounds, concrete batching plants and storage areas. These areas can be rehabilitated and restored following the completion of the construction program.

The table below estimates the uppermost areas that would be impacted within the development envelope. The development envelope is the entire area that was assessed and in which infrastructure may be located. The table then breaks down these areas into those that would require permanent habitat loss (footings that would remain in place after decommissioning), habitat modification (transmission easements that will require slashing) and areas that could be rehabilitated post construction (the crane operation area, construction compounds etc).

Table 3-3 Impact area estimations

The development footprint is expected to create the following areas of disturbance. Some of these areas would be able to be rehabilitated after the construction phase.

Coppabella Hills Precinct				
Infrastructure	**Quantity**	**Width (m)**	**Length (m)**	**Area (ha)**
Turbine footing [a]	86.00	25.00	25.00	**5.38**
Crane hardstand [c]	86.00	22.00	40.00	**7.57**
Crane operation area (includes footing and hardstand) [c]	86.00	50.00	50.00	**21.50**
Tracks [a]	1.00	8.00	67063.65	**53.65**
Underground powerlines onsite [c]	1.00	2.00	21905.29	**4.38**
Overhead powerline cabling / easement [b]	1.00	20.00	14517.82	**29.04**
Overhead power pole footings [a]	145.18	1.00	1.00	**0.01**
Substation and control bldg [a]	3.00	2.00	18330.43	**11.00**
Concrete batch plant [c]	1.00	75.00	100.00	**0.75**
Construction compound, staging and storage [c]	1.00	300.00	100.00	**3.00**
Development envelope (DE)				**2829.10**
Percentage of DE permanently removed				**2.48**
Breakdown by impact type:				
a Permanent total habitat loss (includes all footings and tracks)				**70.04**
b Habitat modification (transmission easement maintenance)				**29.04**
c Temporary habitat loss (areas that can be rehabilitated post construction)				**24.26**

Marilba Hills Precinct				
Infrastructure	**Quantity**	**Width (m)**	**Length (m)**	**Area (ha)**
Turbine footing [a]	66.00	25.00	25.00	**4.13**
Crane hardstand [c]	66.00	22.00	40.00	**5.81**
Crane operation area (includes footing and hardstand) [c]	66.00	50.00	50.00	**16.50**
Tracks [a]	1.00	8.00	63834.46	**51.15**
Underground powerlines onsite [c]	1.00	2.00	18330.43	**3.67**
Overhead powerline cabling / easement [b]	1.00	20.00	40031.00	**80.06**
Overhead power pole footings [a]	400.31	1.00	1.00	**0.04**
Substation and control bldg [a]	5.00	150.00	85.00	**6.38**
Concrete batch plant [c]	1.00	75.00	100.00	**0.75**
Construction compound, staging and storage [c]	1.00	300.00	100.00	**3.00**
Development envelope (DE)				**4140.00**
Percentage of DE permanently removed				1.49
Breakdown by impact type:				
a Permanent total habitat loss (includes all footings and tracks)				**61.70**
b Habitat modification (transmission easement maintenance)				**80.06**
c Temporary habitat loss (areas that can be rehabilitated post construction)				**19.79**

4 THE ENERGY CONTEXT OF THE PROPOSAL

This section provides a strategic overview of the need for the project in regards to the requirement for additional electricity supply in NSW and the need for more renewable energy projects. It also outlines Government policy objectives and targets for renewable energy and greenhouse gas reductions.

The Yass Valley Wind Farm would:

- Help secure reliable energy in a market where demand will soon exceed supply
- Assist in the reduction of Green House Gas (GHG) emissions contributing to climate change
- Help meet Federal and State policy objectives

4.1 THE NATIONAL ELECTRICITY MARKET

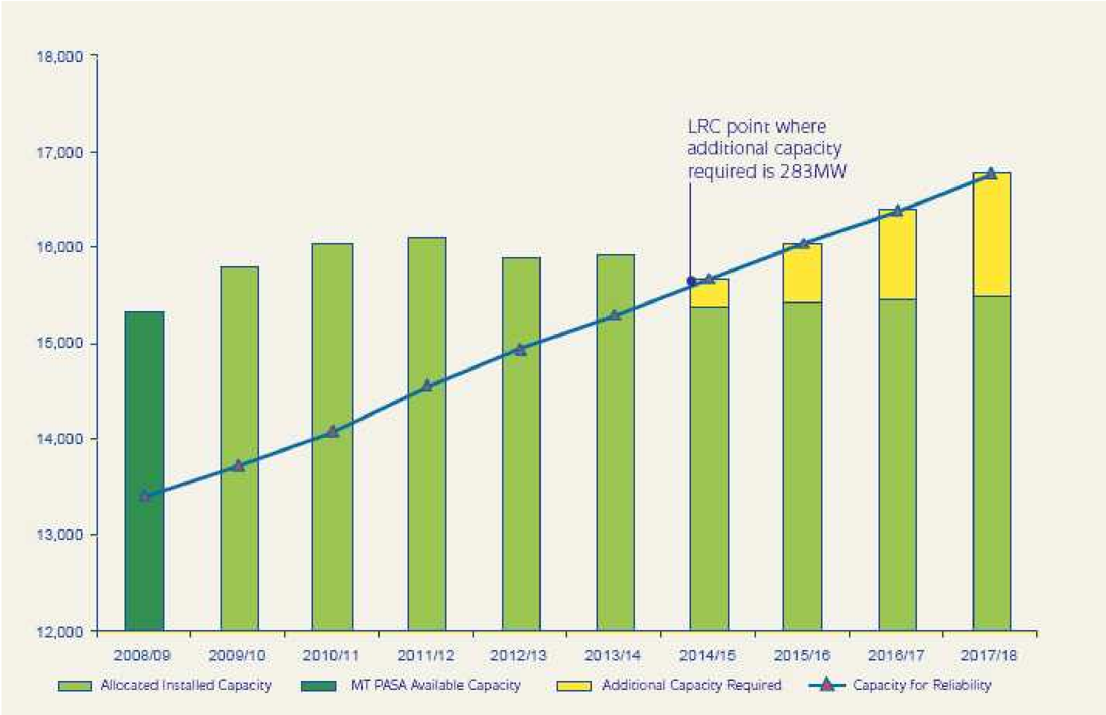
The National Electricity Market (NEM) is an all-inclusive market which facilitates the supply of electricity to retailers and consumers in Queensland, New South Wales, the Australian Capital Territory, Victoria, South Australia and Tasmania (NEMCO 2008). The NEM is a public-private partnership (PPP) where energy generated by various enterprises is aggregated into a pool made available to consumers. The NEM currently supplies to eight million end-use consumers which commands up to $10.2 billion of electricity to be traded annually (NEMCO 2008).

4.2 ELECTRICITY DEMAND IN NSW

TransGrid's Annual Planning Report (2008) confirms that growth in electricity demand will soon exceed supply during peak times. Scheduled demand projections indicate that additional generation will be required to manage peak periods by summer 2014/15. New South Wales currently has the capacity to supply 15,500 MW of reliable electricity (TransGrid 2008), however forecasts show demand will surpass this amount in the next 5 years. Consequently, the State will need to build additional electricity generators to meet this demand, as well as to evade power outages and blackouts.

This is reproduced in the NEMCO Statement of Opportunities 2008 report which analyses the supply and demand of electricity for each region of the market. The NSW average annual growth rate of scheduled energy is 0.8% and the summer supply-demand outlook graph (Figure 4-1) shows that additional capacity will be required to meet this forecast demand.

As depicted in the graph there is currently enough installed or planned energy infrastructure to meet the reliable capacity up until the summer of 2014/15, from which a minimum additional capacity of 283 MW will be required.



Source: NEMCO, 2008

Figure 4-1: NEMCO NSW Summer Outlook

4.3 THE ROLE OF RENEWABLE ENERGY

4.3.1 Climate change

There is scientific evidence that the Earth's climate is changing. Observations have shown global increases in air and ocean temperatures, the widespread melting of snow and ice and rising sea levels (IPCC, 2008). It has further been observed that many of the world's natural systems are already being affected by the change of regional climates, in particular temperature increases (IPCC, 2008). Other indicators include altered rainfall patterns and more frequent or intense weather patterns such as heatwaves, drought, and storms (DCC, 2009). In Australia, this change in the climate is anticipated to have an impact on water supply and quality, ecosystems and conservation, agriculture and forestry, fisheries, settlements and industry and human health. Australian trade and commodity prices may also be impacted on by the global impacts of climate change (DCC, 2009).

The drivers for climate change have been identified as being from both natural and anthropogenic forces, however a main contributor is the release of Green House Gases into the atmosphere (IPCC 2008).

4.3.2 Green House Gas (GHG) emissions

The International Panel for climate change (IPCC) has acknowledged that it is very likely that human GHG emissions have directly influenced global temperatures to increase, as well as lead to other climate impacts. As GHG emissions stay in the atmosphere for decades, a predicted warming of around 0.2°C per decade is already expected regardless of future emission levels (IPCC 2008). However, if GHG emissions continue to be emitted at their current rate then further and more extreme changes to the global climate system will be experienced (IPCC 2008). Therefore, a reduction in GHG emissions is able to reduce the rate and magnitude of climate change. The IPPC recognises that GHG mitigation efforts over the next 20-30 years will be crucial to stabilising the amount of change (IPCC 2008).

The GHG contributing the most to climate change is Carbon dioxide (CO2). Between 1970 and 2004 the amount of CO2 being emitted from human-based activities increased by 80% and the current level of CO2 in the atmosphere is now higher than ever measured (IPCC, 2008). This large increase is predominantly due to the burning of fossil fuels, such as coal, for energy generation. Therefore the IPPC (2008) recommends a vital step to reducing CO2 emissions is by employing renewable energy technologies.

4.3.3 GHG emissions in Australia and NSW

Department of Climate Change reports (2008c) show that emissions from the stationary energy sector, which include those from electricity generation and the manufacturing, construction and commercial sectors, is the largest and fastest growing area in terms of greenhouse gas emissions in Australia. The stationary energy sector accounted for 50 per cent of total emissions in 2006 (DCC, 2008c) and within this sector, emissions from electricity generation contributed nearly 70 per cent. Between 1990 and 2005 emissions from electricity increased by 65 Mt CO2-e, an average of 3.3% per year (DCC, 2008c). Currently in Australia, 198.1 (Gg) CO2-e, or 54.1% of total greenhouse gas emissions, are produced during the generation of electricity (DCC, 2008a).

In 2006, 35% of the total GHG emissions in NSW were from the generation of electricity. Between 1990 and 2006 emissions from electricity generation grew by 35% to a total amount of 59.3 MtCO2-e (DCC, 2008b). This made up 10% of the total GHG emissions in Australia.

4.3.4 The need for renewable energy technology

The NSW Department of Environment and Climate Change (DECC) has forecast that emissions from the Stationary Energy sector[6] will reach a total of 79 MtCO2-e by 2020 (DECC 2006) under a ‘business as usual’ approach.

An indicator used to determine the amount of greenhouse gases emitted per MWh of electricity supplied to the NSW grid in a particular year is the NSW Annual Pool Value (GGAS 2008). Table 4-1 shows that the Annual Pool Value is calculated by dividing the total energy supplied to the NSW grid by the total NSW emissions in that year.

To account for one-off highs or lows that may be experienced in a particular year the Pool Coefficient is determined. This value is calculated by averaging the five Annual Pool Values from previous years, with a lag of two years (GGAS, 2008). So the NSW Pool Coefficient for 2009 is the average of the Annual Pool Values from 2003 to 2007.

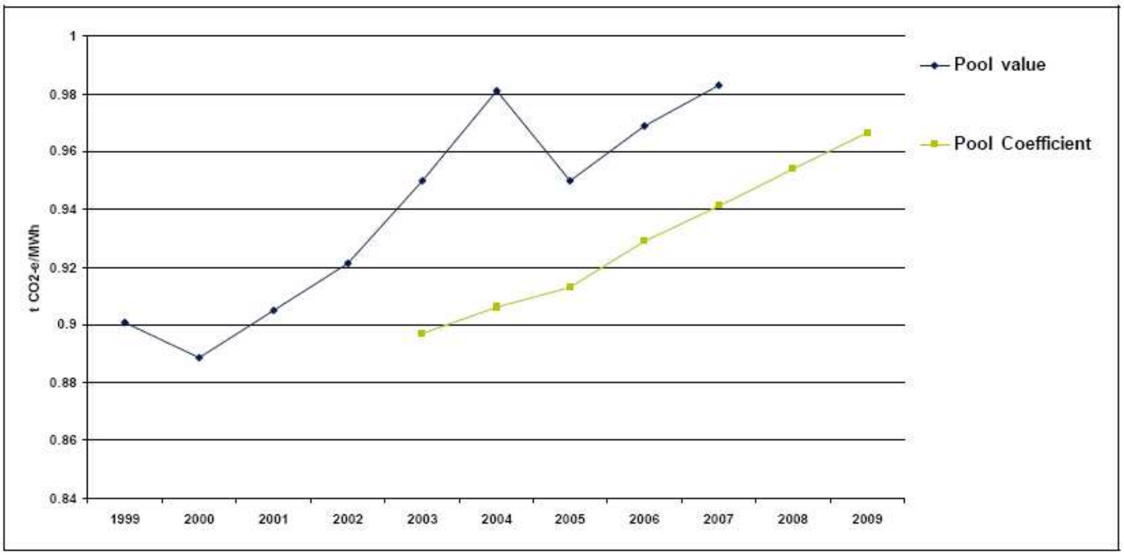
Table 4-1: NSW Annual Pool Values and Pool Coefficients (2003-2009)

Year	Total NSW emissions (tco2-e)	Total NSW sent out generation (MWH)	Annual pool value tco2- e/MWH	Pool coefficient tco2- e/MWH
2003	63,431,793	66,800,866	0.950	0.897
2004	65,979,036	67,276,401	0.981	0.906

6 The stationary energy sector includes all sources of energy production and consumption excluding transportation. Electricity generation makes up a large proportion of this sector.

Year	Total NSW emissions (tco2-e)	Total NSW sent out generation (MWH)	Annual pool value tco2- e/MWH	Pool coefficient tco2- e/MWH
2005	65,896,606	69,341,455	0.950	0.913
2006	70,010,515	72,222,646	0.969	0.929
2007	69,810,669	71,015,242	0.983	0.941
2008	TBA	TBA	TBA	0.954
2009	TBA	TBA	TBA	0.967

Source: GGAS, 2008



Source: GGAS, 2008

Figure 4-2: Historical NSW Pool Value and Pool Coefficient (1999-2009)

The 2009 Pool Coefficient value indicates that presently for every megawatt-hour of electricity supplied to the NSW electricity pool, 967 kg of green house gases are emitted. At this point in time, approximately 90% of electricity in NSW is generated by fossil fuel power stations, primarily coal fired. Therefore it can be assumed that for every megawatt-hour of electricity generated at a coal power station 967kg of green house gases are emitted.

The Annual Pool Value is calculated using the total sent out electricity from all technologies, including that from renewable energy. It is expected that the more electricity supplied to the pool from renewable sources, reducing the amount required from coal power stations, the lower the Annual Pool Value and the lower the Pool Coefficient.

4.4 RENEWABLE ENERGY TARGETS

The Australian Government's Mandatory Renewable Energy Target (MRET) scheme was established in 2001 to expand the renewable energy market and increase the amount being utilised in Australia's electricity supply. The MRET advocates that an additional 2 percent, or 9,500 GWh, of renewable energy by sourced by 2010 (DCC, 2009a).

In 2007, the NSW State Government introduced new legislation called the Renewable Energy (NSW) Bill as part of their Greenhouse Policy to encourage additional generation of renewable energy. The NSW Renewable Target (NRET) requires 10% of electricity to be sourced from renewable energy by 2010 and 15% by 2020 (DEUS, 2006). The NRET will be incorporated in the new Federal RET.

The Renewable Energy Target (RET) is an expansion of the MRET and requires an additional 20 percent of Australia's total electricity supply to be sourced from renewable projects by 2020 (DCC, 2009a). This means a total of 45,000 GWh of electricity will need to be sourced from renewables, requiring an additional 8,000 - 10,000 MW of new renewable energy generators to be built across Australia in the next decade. The RET also assures that national greenhouse gas emissions are reduced to meet Federal Government targets. Currently the legislation is in draft form and has been introduced to parliament but has yet to be finalised.

4.5 ENERGY RELIABILITY

In the State Plan, the Government has identified energy reliability as "critical to our quality of life and State's business competitiveness' (NSW Government 2006). The Plan also identifies low cost energy as crucial to attracting business investments and socio-economic equality. To ensure this, along with the issue of controlling GHG emissions, the Government aims to increase the State's energy efficiency while at the same time reducing the environmental impacts of energy generation (NSW Government 2006). Additional stable and reliable renewable energy projects in NSW are required to help meet this aim.

5 PLANNING CONTEXT

5.1 STATE GOVERNMENT LEGISLATION AND POLICY

5.1.1 Critical infrastructure

This Proposal is to be assessed as a Part 3A Major Project, under the NSW *Environmental Planning and Assessment Act 1979.* On 26 February 2008, then NSW Premier Morris Iemma announced that proposals to build new power stations with a capacity to generate at least 250 MW would be declared Critical Infrastructure under the *Environmental Planning and Assessment Act 1979*. The declaration is intended to secure the energy future of the state and to allow for sustainable economic development. Therefore this proposal is considered critical Infrastructure under the EP&A Act as it is a power generator with capacity to generate in excess of 250 megawatts and is the subject of an application lodged under Section 75E of the EP&A Act.

On 27 February 2009, it was announced by the NSW Premier that the criteria for wind farm projects considered as Critical Infrastructure under the Environmental Planning and Assessment Act 1979 is being amended. Wind farm projects that fall within the specified renewable energy precincts that generate 30 MW or more of electricity would be considered critical, replacing the existing criteria of 250 MW.

The renewable energy precincts were listed as;

- The NSW/ACT Cross Border Region;
- The Central Tableland;
- The New England Tableland;
- The Upper Hunter; and
- The South Coast.

The Government considers this to be a strategic move to advance renewable energy projects by giving them planning priority. The proposed wind farm is nearby to the NSW/ACT border and is designed to generate approximately 455 MW of electricity across the three precincts. Therefore the project is recognised by the State as being Critical Infrastructure.

5.1.2 Part 3A approval process

The Proposal is a Major Project which will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (*EP&A Act*). The project has a capital investment of more than $30 million and was confirmed to be a project to which Part 3A of the EP&A Act applies by the Director-General of the Department of Planning on 17 October 2008, refer to Attachment 3.

Part 3A integrates the assessment and approval regime for all Major Projects that require the approval of the Minister for Planning, previously dealt with by Parts 4 and 5 of the Act. Projects approved under Part 3A of the *EP&A Act* do not require authorisations under the:

- *Fisheries Management Act 1994* (sections 201, 205 or 219, stop work orders)
- *Heritage Act 1977* (Part 4 or Section 139)

- *National Parks and Wildlife Act 1974* (section 87, consent under Section 90, interim protection and stop work orders)
- *Native Vegetation Act 2003* (section 12)
- *Rivers and Foreshores Improvement Act 1948* (Part 3A)
- *Rural Fires Act 1997 (*section 100B)
- *Water Management Act 2000* (sections 89, 91)
- *Threatened Species Conservation Act 1995* (interim protection and stop work orders)
- *Protection of the Environment Operations Act 1997* (environment protection notices)
- *Local Government Act 1993* (orders under Section 124)

5.1.3 Director General's Requirements

Under the EP&A Act, Determining Authorities are to *consider 'to the fullest extent possible all matters affecting or likely to affect the environment* by reason of that activity'. The Director General's Requirements that outline the form and content of the Environmental Assessment are attached to this document (Attachment 4). The following table summarises the requirements and where they are addressed in this report.

Table 5-1 Director General's Requirements

This table outlines the DGRs, issued by the DoP on 12 January 2009 and where each item is addressed in this EA. The full DGRs are provided in Attachment 4.

Director-General Requirement's	Addressed in:
General requirements	
• Executive summary	Section 1
• Detailed description of Proposal including construction, operation and decommissioning details, grid coordinates of turbines and details of all infrastructure	Section 3
• Timeline indicating staging (including decommissioning)Proposal	Section 3.5
• Consideration of relevant statutory provisions (including consistency of the project with the objects of the *Environmental Planning and Assessment Act 1979*)	Section 5
• Assessment of key issues (outlined below) during construction, operation and decommissioning	Section 7
• Draft *Statement of Commitments*	Section 10.2
• Conclusion justifying the project taking into consideration environmental, Social and economic impacts of the project; suitability of the site and the public interest	Section 11
• Certification by the authors of the EA	Section 13

Director-General Requirement's	Addressed in:
Key issues	
• Strategic justification	Section 9
• Visual amenity impacts	Section 7.2
• Noise impacts	Section 7.3
• Flora and fauna (biodiversity)	Sections 7.4 and 7.5
• Indigenous heritage (archaeological and cultural)	Section 7.6
• Hazards and Risks (aviation / communications / EMFs / bushfires)	Sections 7.7, 7.8, 7.9, and 7.11
• Traffic and transport	Section 7.10
• General environmental risk analysis	Section 8
Consultation requirements	
• Appropriate and justified level of consultation with agencies and community	Section 6

Resources considered in this EA include:
• DoP Draft NSW Wind Energy Environmental Impact Assessment Guidelines 2002
• Auswinds's Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia 2006
• Auswea and National Heritage Trust Wind Farms and Landscape Values March 2005
• South Australian EPA Wind Farms – Environmental Noise Guidelines 2003
• EPA – Environmental Noise Control Manual 2004
• Section 5A *Environmental Planning and Assessment Act 1979*: Impact on critical habitats, threatened species, populations and ecological communities
• DEC and DPI Draft Guidelines for Threatened Species Assessment 2005
• DEH Cumulative Risk for Threatened and Migratory Species, 2006
• Auswind's Wind Farms and Birds: Interim Standards for Risk Assessment 2005
• Auswea's Assessing the Impacts on Birds – Protocols and Data Set Standards

Resources considered in this EA include:
• DEC's Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation 2005
• CASA Advisory Circular AC 139-18(0) Obstacle marking and Lighting of Wind Farms 2005 (withdrawn)[7]
• ARPANSA Guidelines on Radiation Protection Standard for Exposure Limits to EMFs
• RFS Planning for Bushfire Protection

5.1.4 Protection of the Environment Operations Act 1997

This Act is administered by the Department of Environment and Climate Change (DECC), Environmental Protection Authority (EPA). Projects approved under Part 3A of the *EP&A Act* do not generally require authorisations under this Act. Matters relevant to this Act have been taken into consideration in the preparation of this EA.

Until recently, general electricity works with the capacity to generate more than 30 megawatts of power required a licence under this Act. Recent amendments to this Act describe "general electricity works" as:

> *the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.*

Therefore, the proposed development of the Coppabella Hills and Marilba Hills Precincts does not require a licence under this act.

Concrete batch plants exceeding production of 150 tonnes per day or 30,000 tonnes per year require a license under this Act. In the event that concrete cannot be sourced from local batching plants or quarries, temporary batching plants would need to be installed on site. It is anticipated that up to two temporary concrete batch plants would exceed this amount and in this case, would require a license to be issued by DECC.

5.1.5 DoP draft NSW Wind Energy Environmental Impact Assessment Guidelines 2002

This guideline identifies some important factors to be considered when undertaking environmental assessment of wind farm projects. Key recommendations relate to consultation, site selection, project justification as well as specific impact areas such as noise, visual amenity and aerial fauna.

The DoP guideline has been considered in the preparation of this EA.

5.1.6 Auswinds's Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia 2006

The guidelines were developed to establish the process for identifying, developing and implementing wind energy projects, recognising that each project would require assessment on its individual merits. They are focused primarily on technical and planning issues.

These guidelines have been considered in the preparation of this EA, particularly with respect to the chronological flow of the project phases.

[7] CASA have recently withdrawn their advisory circular and are currently reviewing their guidelines for obstacle lighting on turbines. As it has not yet been replaced, the criterion in the withdrawn advisory circular has been considered in this Environmental Assessment.

5.1.7 DEH Supplementary Significant Impact Guidelines 2.1.1: Wind Farm Industry Sector 2005

The purpose of these guidelines is to assist operators in the wind farm industry to decide whether or not actions which they propose to take require assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*).

These guidelines have been considered in the preparation of this EA, particularly with reference to Section 7.4, biodiversity impacts.

5.1.8 Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands

The Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands (Fallding 2002) provides regional principles and planning settings to be considered in planning and development control decision-making. The Framework identifies key planning issues and conservation values relevant for 18 landscape units within the Southern Tablelands region. The Framework also provides recommended actions and impact assessment guidelines for threatened species and communities occurring in the region. The Framework has no statutory force, but is to be considered by decision-makers in development planning and approval processes.

The Coppabella Hills and Marilba Hills Precincts are located within the Yass and Wee Jasper landscape units. Key features of these two units, adapted from Fallding (2002), are presented in Table 5-2. These features, most pertaining to biodiversity attributes, have been considered in Section 7.4 of this EA.

Table 5-2: Key Features of Landscape Units after Fallding (2002)

	Yass landscape unit	Wee jasper landscape unit
General description	Undulating country fringed to the east by the low Mundoonan Range and in the south-west by the Murrumbidgee valley, including the Burrinjuck Reservoir. Largely occupied by extensive Box-Gum Woodlands, areas of Grassland-Woodland Mosaic and areas of Grasslands, the unit is fringed to the east and southwest by Dry Forest on the low ranges. Riparian Forests of River Red Gum and River Oak occur along the Murrumbidgee River.	A rugged unit whose major feature is the Murrumbidgee River below Burrinjuck Dam. The vegetation is largely Dry Forest with minor areas of Grassland and Box-Gum Woodland.
Vegetation Status	Dry forests on the fringing hills remain relatively intact in the east, though are largely cleared and fragmented in the southwest. The Box-Gum Woodlands have been severely cleared or modified throughout.	Large areas of dry forest still dominate much of the hilly country and some areas of Box-Gum Woodlands also remain. Grasslands are highly modified or cleared.
Land uses	Cropping, grazing, a town and several small villages, rural subdivisions, two major transport links, lake-based recreation, one medium-sized and one very small nature reserve.	Grazing, two small villages, recreation (caves and bushwalking), several areas of National Park and Nature Reserve.
Endemic features	• The region's core nesting habitat for Superb Parrot • The region's only population of Grey-crowned Babbler • Records of vagrant Major Mitchell's Cockatoos • Records of Striped Legless Lizard and Pink-tailed • Worm-lizard • The centre of the Yass Daisy distribution • A minor karst landscape within Hatton's Corner NR.	The region's most extensive karst landscapes. The cave system has yielded many records of the Eastern Bent-wing Bat and Large-footed Myotis The only populations anywhere of the Wee Jasper Grevillea and the only known record of Caladenia sp.'Burrinjuck' (a spider orchid) The only known regional records of Woolly Ragwort

5.1.9 Ecologically Sustainable Development (ESD)

Ecologically sustainable development (ESD) involves the effective integration of social, economic and environmental considerations in decision-making processes. In 1992, the Commonwealth and all state and territory governments endorsed the *National Strategy for Ecologically Sustainable Development*. In NSW, the concept has been incorporated in legislation such as the *EP&A Act* and Regulation.

For the purposes of the *EP&A Act* and other NSW legislation, the Intergovernmental Agreement on the Environment (1992) and the *Protection of the Environment Administration Act 1991* outline the following principles which can be used to achieve ESD.

(a) The precautionary principle: that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

(i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment

(ii) An assessment of the risk-weighted consequences of various options

(b) Inter-generational equity: that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations

(c) Conservation of biological diversity and ecological integrity: that conservation of biological diversity and ecological integrity should be a fundamental consideration

(d) Improved valuation, pricing and incentive mechanisms: that environmental factors should be included in the valuation of assets and services, such as:

(i) Polluter pays: that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement

(ii) The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste

(iii) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems

The precautionary principle has been adopted in the assessment of impact; all potential impacts have been considered and mitigated where a risk is present. Where uncertainty exists, measures have been suggested to address the uncertainty.

The majority of potential impacts of the Proposal are likely to be localized and would not diminish the options regarding land and resource uses and nature conservation available to future generations. Parameters such as the site's soil, hydrology and native vegetation have been valued in terms of their broader contribution to the catchment and catchment processes. The reversibility of the Proposal has been specifically addressed in Section 9.5 and is considered to be an advantage of this type of development.

The impacts of the Proposal on biodiversity, including EPBC listed species, have been assessed in detail in the attached Biodiversity Assessments (summarised in Section 7.4).

The aims, structure and content of this EA have incorporated these ESD principles. The Draft *Statement of Commitments* in Section 10.2 provides an auditable environmental management commitment to these parameters. Based on the Social and environmental benefits accruing from the Proposal at a local and broader level, and the assessed impacts on the environment and their ability to be managed, it is considered that the development would be ecologically sustainable within the context of the above ESD definitions.

5.2 COMMONWEALTH LEGISLATION

5.2.1 *Environment Protection and Biodiversity Conservation Act 1999*

This Act provides for a Commonwealth assessment and approvals system for:

i) Actions that have a significant impact on 'matters of national environmental significance'

ii) Actions that (indirectly or directly) have a significant environmental impact on Commonwealth land

iii) Actions carried out by the Commonwealth Government

A Proposal requires the approval of the Environment Minister if an action is likely to have a significant impact on a matter of national environmental significance or listed as a matter of national significance which includes:

i) World Heritage Properties

ii) Wetlands of International Importance (Ramsar wetlands)

iii) Commonwealth Listed Threatened Species and Ecological Communities

iv) Commonwealth Listed Migratory Species

v) Nuclear action

vi) Commonwealth marine areas

vii) Commonwealth land

The Act aims to ensure the conservation and recovery of flora and fauna species and communities at a state and national level. The requirements of EPBC Act under Part 13 - Species and communities, are that the Minister must establish a list of threatened species, threatened communities and key threatening processes. The list must contain threatened species and communities as contained in Schedules 1 and 2 of the *Endangered Species Protection Act 1992*. Listed species are divided into the following categories: Extinct, extinct in the wild, critically endangered, vulnerable and conservation dependent. Threatened communities are divided into the following categories: Critically endangered and endangered. Key threatening processes are contained in Schedule 3 of the *Endangered Species Protection Act 1992*.

A search for Matters of National Environmental Significance based on the study area and a 50 kilometre buffer was undertaken using the Commonwealth Government's Protected Matters Search Tool. This tool covers World Heritage properties, National Heritage places, significant wetlands, migratory species, nationally listed threatened species and communities and other matters protected by the EPBC Act. The report generated by the Matters of National Environmental Significance Commonwealth Government's Protected Matters Search Tool is provided in full and discussed within the Biodiversity Assessment, provided in Appendix 3. A summary of the results of the Protected Matters Search Tool is provided in Table 5-3 below.

Table 5-3: Summary of the results of the Protected Matters Search tool

	Coppabella Hills Precinct	Marilba Hills Precinct
Threatened Species	20	20
Migratory Species	12	12
Invasive Species	14	14
Threatened Ecological Communities	2	2
World Heritage Properties	None	None
Australian Heritage Sites	49	49
Ramsar Wetlands	1	1
Nationally Important Wetlands	None	None
NPI Reporting Facilities	None	None
NPI Airsheds	None	None
NPI Catchments	None	None
Protected Areas	6	6

On the basis of the biodiversity investigations, the proposal is not considered likely to have an impact on EPBC listed species. To obtain certainty however, an EPBC referral would be lodged to determine whether, on the basis of Matters of National Significance, the Proposal would be considered a ‘controlled action’.

5.2.2 Bilateral agreements

In accordance with subsection 45(4) of the *EPBC Act* and Division 16.1 of the EPBC Regulations 2000, the Commonwealth of Australia entered into a bilateral agreement with New South Wales. One of the aims of the agreement is to minimise duplication of environmental impact assessment processes, ensuring a co-ordinated approach for actions requiring approval from both the Commonwealth and the state. Should the Proposal be considered a ‘controlled action’ under the *EPBC Act* the referral would be assessed by the NSW DoP, funded by the federal agency.

While it is not considered that the Proposal represents a ‘controlled action’, as defined by the *EPBC Act 1999*, an EPBC referral was completed for the Proposal as a precautionary measure as detailed in Section 5.2.1, above. No other matters pertaining to this Proposal are relevant to the bilateral agreement.

5.3 LOCAL GOVERNMENT INSTRUMENTS AND POLICIES

The proposed Yass Valley Wind Farm is located across two local government areas, Yass Valley and Harden Local Government Area. Marilba Hills is located within the boundaries of the Yass Valley LGA, with Coppabella Hills located across the two LGA's.

5.3.1 Yass Valley Local Environmental Plans (LEPs)

The Yass Valley Local Government Area was created as part of a council amalgamation in February 2004. Yass Valley Council therefore has a number of Local Environmental Plans (LEP's) and Development Control Plans (DCP's) that apply to the Yass Valley Local Government Area. The LEP's and DCP's which applied to the former Yass, Yarrowlumla and Gunning LGA's continue to apply to those areas until such time that they are replaced by the new LEP and DCP (www.yass.nsw.gov.au 2008).

The Proposal site is located in No 1(a) Rural Agriculture Zone. Under the LEP, the objective of this zone is to set aside certain land for agricultural purposes and purposes incidental thereto. Agriculture (with some exceptions), dams and forestry developments are permitted without consent. Industries (other than extractive industries, home industries or rural industries) are prohibited. Development for other purposes requires development consent.

'Industries' in the LEP is defined in the Environmental Planning and Assessment Model Provisions 1980 and the Factories, Shops and Industries Act 1962, and does not include wind farms (Paul De Szell, Yass Valley Council pers. comm.). The Model Provisions contain a specific definition of 'generating works', which would encompass the Proposal; 'a building or place used for the purpose of making or generating gas, electricity or other forms of energy'. The wind farm Proposal is therefore not prohibited under the LEP, but would require development consent.

Permissibility under the LEP is important because, although Major Projects are approved by the Minister and planning instruments (other than State Environmental Planning Policies) do not apply, the Minister cannot approve projects which are not critical infrastructure projects, and which would (but for Part 3A) be prohibited under a planning instrument.

In addition, the Minister is to take into consideration the provisions of any environmental planning instrument that would have (but for Part 3A) substantially governed the carrying out of the project. The Minister would therefore have regard to the provisions of the Yass Valley LEP in assessing the Coppabella Hills wind farm Proposal. The Yass Valley Council is currently revising the LEP.

Yass Valley Council is also developing guidelines for a Development Control Plan (DCP) for the development of wind farms in the Shire. The DCP will incorporate elements of the Upper Lachlan and Goulburn Mulwaree Councils' DCPs relating to wind farms (Yass Tribune 2006). The Council is also preparing a new DCP covering rural and urban lands and commencing a community-based strategic planning process to manage change in the LGA (Yass Valley Council 2005).

5.3.2 Interim Development Order No. 1 – Shire of Harden

Although the majority of the Proposal area is located within the Yass Valley LGA, the western portion of the Coppabella Hills Precinct is located within Harden Shire LGA. The Harden Shire Council do not have a current LEP in place, though the council are in the process of developing a draft LEP. At present development controls are dictated by the Interim Development Order (IDO) No. 1 – Shire of Harden. Works proposed for the wind farm fall within lands zoned 1. (a) Non-urban "A." Developments that may be carried out without consent from the council on this land include Agriculture, some housing developments (pursuant to certain clauses) and forestry. Industries other than extractive home industries, offensive or hazardous industries, rural industries and complying development may only be carried out with the consent of the Council and the concurrence of the Commission.

Under this IDO, the Proposal would require consent of the Council and the concurrence of the Commission. The “Council” means the Council of the Shire of Harden and the “Commission” means the New South Wales Planning and Environment Commission constituted under the New South Wales Planning and Environment Commission Act, 1974. This Act has been repealed and Harden Council are currently preparing an LEP consistent with the *Environmental Planning and Assessment Act* 1979.

6 CONSULTATION

6.1 GOVERNMENT CONSULTATION

6.1.1 Initial meetings

The Proponent met with the consent authority, the NSW Department of Planning, formally on 16 September, 2008, introducing the Proposal and seeking advice on the assessment process. The Proponent sought a determination from the Director General that the Proposal would be assessed as a Major Project under *Part 3A of the Environmental Planning and Assessment Act.* On 22 October 2008, the Proponent was issued with a letter from the Department of Planning confirming that the proposal would be assessed as Major Project under Part 3A of the EP&A Act.

6.1.2 Planning Focus Meeting (PFM)

The Planning Focus Meeting is a requirement for complex Major Projects. It is an opportunity to introduce the Proposal to government stakeholders who would have input into the environmental assessment process.

Participants met in Binalong on the 14th of October 2008 where a presentation on the Proposal was given by Epuron Project Director, Simon Davey (representative of the Proponent), and **ngh**environmental Project Manager, Brooke Marshall (representative of the environmental assessment team). Participants asked questions and presented issues of relevance to their agencies onsite. Marilba Hills was visited in the afternoon of the 14th. The following day, 15th October, the participants visited the main ridge of the Coppabella Hills Precinct. Epuron Project Manager, Julian Kasby, gave an overview of likely infrastructure placement and views to other ridges within the development envelope.

Participants included:

- Neville Osborne and Marek Cholinski, Department of Planning
- John Daunt, Department of Lands
- Dr Sandie Jones and Lyndel Walters, Department of Environment and Climate Change
- Cressida Gilmore, Department of Primary Industries
- John Franklin, Murrumbidgee Catchment Management Authority
- Sharon Langman, Harden Shire Council
- Suzanne Jurcevic, Yass Valley Shire Council
- Ben Bates and Mahesh Nagarajan, Country Energy
- Maurice Morgan, Roads and Traffic Authority
- Michael McManus, Transgrid
- Rodger Ubrihien, Bega Duo Designs (Traffic Impact Study representative)
- Simon Davey and Julian Kasby, Epuron (Proponent representative)
- Brooke Marshall and Tim Browne, **ngh**environmental (environmental assessment representatives)

Additionally, agencies unable to attend the PFM but expressing interest in the Proposal and further consultation included:

- Civil Aviation Safety Authority
- Department of Defence
- Department of Water and Energy

The minutes of the PFM are included in Attachment 5.

6.2 COMMUNITY CONSULTATION

Wind farm developments and approvals in Australia have elicited polarised responses from the community, highlighting the need to appropriately identify and consult with community stakeholders early in the development process. The Proponent has informed and consulted with the local community during the planning and development of the Yass Valley Wind Farm Proposal, as discussed below.

6.2.1 Community Consultation Plan (CCP)[8]

A Community Consultation Plan was prepared by Epuron for the Proposal (Attachment 6). It began by developing the objectives of consultation, which were:

- To ensure that the community is fully informed about the Proposal
- To provide opportunities for the community to receive information and provide feedback about the Proposal
- To incorporate the feedback into the design of the wind farm where possible
- To provide multiple opportunities for ongoing dialogue with the community
- To engage with all neighbouring landowners and understand any potential impacts from the Proposal

The format of this Plan included:

- Community profile of the Yass-Harden area
- Consultation objectives
- Issue management
- Project-based activities
- Documentation of activities undertaken (to be completed post-construction)

The plan was used to guide consultation during the development of the Proposal. The intention of the plan was that it be adapted as community feedback was received so that consultation activities were a pragmatic response to the issues raised by the community.

Key consultation activities included an open house session attended by a range of specialists working on the Proposal, follow-up phone calls and correspondence, face-to-face meetings with neighbouring and

[8] During the consultation process, the Yass Valley Wind Farm constituted proposed infrastructure at three precincts: Coppabella Hills, Marilba Hills and Carrolls Ridge. This Environmental Assessment (EA) deals only with Coppabella Hills and Marilba Hills. Carrolls Ridge Precinct is covered by a separate EA.

concerned landowners, attendance at the local Landcare meeting in Binalong, release of media statements, newspaper advertisements and community newsletters. The Proponent has also proposed to attend a local council meeting at both Yass and Harden to discuss the proposed wind farm.

6.2.2 Implementation of the Community Consultation Plan

While the majority of the consultation process focussed on *informing* the community about issues relating to the Proposal, activities to engage the community in *two-way dialogue* were also undertaken for the purpose of incorporating community concerns, local knowledge and thereby maximising the suitability of the Proposal to the site and the community's acceptance of the Proposal. Examples of this included the open house event, follow-up correspondence and face-to-face meetings with community stakeholders.

Open house

The open house forum allowed the opportunity for members of the community to speak individually or in small groups to the Proponent representatives and to persons undertaking parts of the environmental assessment. The open house format is helpful in avoiding potential conflict in a public meeting for contentious issues, allowing a flow of stakeholder dialogue throughout the event rather than a more constrained discussion that can be hijacked by the most vocal individuals. It allows for a larger proportion of stakeholders to voice their individual concerns with the relevant representatives in a less confrontational situation. It also allows the presentation of issues and information to be tailored to individual queries.

The open house session was held on 10 December 2008 at the Royal Tara Motel, Binalong. A community newsletter preceded the event which was also advertised in the local media (newspaper and radio). The event ran from 2:00-7:00pm. Representatives from the Proponent (five representatives), nghenvironmental (two representatives), Bega Duo Designs (one representative) Heggies (one representative) and ERM (one representative) were present to discuss the Proposal specifics (including general questions about wind farms and wind farm development), the environmental planning process, biodiversity, noise and visual impacts. A summary of the work completed to date was distributed as well as feed back forms. Photomontages and noise modelling of the latest turbine layout were posted on the walls of the hall.

Thirty-six people registered their attendance on the day. It is estimated that in total, approximately 55 people attended. Notable observations made on the day included:

- The majority of people who registered their attendance at the open house reside in the surrounding villages of Binalong and Bookham
- Some attendees were interested in the flora and fauna work and also the construction management plan in relation to weed and erosion control
- Several people wanted to know what the status of the Conroy's Gap Project Application, and what the intentions for construction were
- Some people were concerned with the potential visual impacts and the effect they may have on property value
- Some people were concerned about the potential noise impacts that may result from operation of the wind farm
- A number of people expressed their support for renewable energy and wind farms, as verified in the feedback form summary

- Two attendees requested that a residential visual assessment was conducted from their property

In conversations with the community throughout the day, it became apparent that the amount of local knowledge about existing wind farm developments and wind farm impacts was greater than previously encountered in the Yass/Goulburn area in similar open house forums conducted by **ngh**environmental on behalf of Epuron over the last three years. Also apparent was a larger degree of misinformation about various environmental impacts, gained from word of mouth and anecdotal information obtained from the internet. Both factors assisted the effectiveness of the consultation by facilitating discussion.

Feedback forms & open house follow-up

Seven community feedback forms (dealing with the three precincts as one proposal) were received on the day and five were received via post. An example of the feedback form is presented in Attachment 7. Blank feedback forms were left at the post office in Binalong to allow any community members who were unable to attend the open house to comment on the Proposal. The community feedback forms allowed the community an opportunity to comment on the proposed wind farm through answering a number of questions. The issues of most concern were that of visual, noise and community impacts. The results are tallied below.

Table 6-1: Results of feedback forms and Open House follow up

What do you value most about the local area?		**Tally**
	Views	8
	Community / family ties	8
	Historic values	7
	Other	2
	Work opportunities	1
	Recreation opportunities	1
What is you interest in the local area?		
	Live nearby	9
	Industry	4
	Recreation	1
	Work nearby	2
	Other	1
Which statements best describe you?		
	See from house	6
	Resident in the area	7
	See from property or work	4
	See from place of recreation	2
	Involved landowner	0
What do you like about wind farms		
	See them as an alternative energy option for Australia	9
	Nothing	3
What do you dislike about wind farms		
	Visual impact	1
	Noise pollution	2
	Impact to the Environment	1
	Nothing	8
If you have concerns about this proposal, please state them under any headings that are relevant below:		

a) Environmental concerns		
	Bird kill	2
	Impacts to other animals	2
	Uncertain environmental value	1
b) Visual concerns		
	Reduction in value of land	1
	Too large	1
c) Aboriginal / heritage concerns		
	none	
d) Noise issues		
	Sound levels	2
e) Recreational issues		
	none	
f) Health issues		
	unsure	1
g) Community concerns		
	Divides community	1
h) Other		
	Owner's participation in local community	1

Face-to-face consultation

To better understand the potential issues associated with the Proposal, Epuron attempted to arrange a face-to-face meeting with landowners directly neighbouring the project area. This was conducted by Dr Richard Finlay-Jones, a landowner management a community consultation consultant. Where requested, Epuron provided the most up-to-date information possible on various different aspects of the project and provided supplementary material to answer general wind farming questions.

Binalong Landcare meeting

Representatives from the Binalong Landcare group were present at the Open House in Binalong and expressed interest in issues such as soil erosion and environmental management during construction. Epuron was invited to give a presentation at the next Landcare meeting on the 16th February 2009. Two representatives from Epuron attended the meeting and provided an overview of the project, the current status and proposed timeline for the project, and answered questions relating to general and specific wind farm inquiries.

Notable observations on the night included:

- A general interest in the potential environmental impacts of wind farms including, noise impacts, visual impacts, land values and the possibility of bush fires. (A report conducted by The Australia Institute titled *The Facts and Fallacies about Wind Farms* was subsequently sent out to the Landcare coordinator for distribution, see https://www.tai.org.au/file.php?file=DP91.pdf).
- An interest in the specifications of the roads constructed on site for turbine delivery.
- Questions relating to the Environmental Management Plan and how it would be audited.
- A general interest in land management relating to both grazing stock and regeneration of disturbed areas.

- Interest in the opportunity for local jobs to be created and for materials to be sourced from within the region.

In conversations with members of the group after the meeting, it became apparent that there was a general support for the project and the potential benefits to the community, however, there were concerns over the constructability and land management as the terrain is quite steep.

Newsletters

The first newsletter introduced the Proposal in August 2008; outlining an indicative time frame for submission to the consent authority and advising of opportunities for receipt of community input. It was distributed to all residents within 5km of the site; 110 landowners in Yass Valley and Harden Shire.

The second newsletter in November 2008 provided updated Proposal information (regarding the number of turbines) and invited the community to attend the open house session to be held locally. It was distributed to all residents within 5km of the site; 110 landowners in Yass Valley and Harden Shire.

A third newsletter would accompany the submission of the EA, to advise where the reports can be viewed by the public and to thank the community for their participation to date.

Copies of all community consultation material (Community Consultation Plan, local community questionnaire, broader perceptions survey, community newsletters, media releases and letters received from key stakeholders are included as attachments (Attachment 8).

Media articles

During the Proposal development period, a number of articles were published in the local media. The majority of these articles expressed viewpoints by individuals, community groups or other stakeholders. These articles maintained the awareness of issues surrounding the wind farm, and the Proponent responded where appropriate via media interviews.

7 ASSESSMENT OF KEY ISSUES

7.1 SCOPING AND PRIORITISATION OF ISSUES

Reforms to the *Environmental Planning and Assessment Act 1979* and associated planning instruments (Part 3A) provide for improvements to efficiency in the assessment and approval process, by allowing assessments to focus on key issues.

Key issues are those with the potential to produce significant environmental or human impacts. They have been identified with respect to this Proposal in the Director General's Requirements (refer to Section 5.1.3). The impact assessment process that this EA report documents is focussed on these key issues. Table 7.1 summarises the key issues and the investigation strategies employed to investigate them. Section 7 summarises the methodologies, results and mitigation measures recommended by these investigations, for each key issue individually.

Additional issues were identified using the risk analysis methodology, Section 8, Table 8-1. These additional issues are discussed separately in Section 8.

Table 7-1 Categorisation of key impact areas related to the Proposal

Issue	Investigation strategy
Visual	Specialist report including photomontages of turbine layouts
Noise	Specialist report including modelling and mapping
Biodiversity	Specialist report including flora, fauna Separate desktop investigation of Mitchell landscapes
Aboriginal archaeology	Specialist report, including consultation
Aviation	Desktop review and consultation
Communications	Desktop review and consultation
Electromagnetic Fields (EMF)	Desktop review and consultation
Traffic and transport	Specialist report
Fire and bushfire	Desktop review and consultation

7.2 VISUAL IMPACT

A Landscape and Visual Assessment (LVA) of the proposed Yass Valley Wind Farm was undertaken by Environmental Resources Management (ERM). The LVA is presented in full in Appendix 1. The LVA assesses all three precincts of the proposed Yass Valley Wind Farm. This Environmental Assessment is for the Coppabella Hills and Marilba Hills Precincts only, however as the Carrolls Ridge Precinct may form part of the Yass Valley Wind Farm it is included to ensure that the landscape and visual assessment for the entire wind farm was prepared on a conservative basis.

7.2.1 Methodology

The methodology used within the visual assessment was based on the *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (May 2003)* as well as past projects undertaken by ERM in the visual assessment of wind farms in New South Wales, Victoria, South Australia and New Zealand. This methodology is supported by the *Wind Farms and Landscape Values, National Assessment Framework.*

The methodology used within the visual assessment of the proposed Yass Valley Wind Farm included the following steps.

- Describing the visual components of the proposed Yass Valley Wind Farm.
- Describing peoples' perception of wind farms in the landscape based upon past research in Australia and overseas.
- Defining the viewshed of the proposed Yass Valley Wind Farm based upon the parameters of human vision.
- Defining the Landscape Units which are based on physical characteristics of the area within the viewshed.
- Undertaking a Seen Area Analysis of the proposed turbine visibility area using the Geographical Information Systems software (GIS).
- Assessing the visual impact of the proposed wind farm from publicly accessible viewpoints within the viewshed of the proposed wind farm, including information partly based on photomontages and distances of the viewer.
- Assessing the visual impact from residential properties within the wind farm locality.
- Discussion of mitigation measures and how they may reduce the visual impact to residences.
- Examining the cumulative visual impact of the Yass Valley Wind Farm against other approved or existing wind farms in the area.[9]
- Describing the potential impact of the developments' night lighting.
- Preparation of photomontages (by Garrad Hassan) to illustrate the visual impact of the proposed development. Photomontages have been prepared in accordance with ERM methodology.

[9] The approved Conroy's Gap Wind Farm has been included in all photo montages to assess the cumulative impacts.

- Conducting a sequential viewpoint analysis along the Hume Highway and Burley Griffin Way.

7.2.2 Existing environment

The areas surrounding the proposed Yass Valley Wind Farm are predominately cleared hilly farm land, with existing infrastructure including roads, rail, transmission lines, towers, power lines, and communication towers as well as the typical infrastructure and buildings associated with farming activities.

The proposed Yass Valley Wind Farm is located on low hills and ridgelines on the north and south side of the Hume Highway. The topography within the viewshed can be described as rolling hills, often creating enclosed visual corridors. Typically the hills and valleys have been cleared for farming activities, however much of the existing farmland also contains scattered remnant trees.

The Yass Valley Wind Farm is located on hilly areas where the elevation change across the site may vary from 500-820 m.

7.2.3 Results

Visual components of the wind farm

These include, but are not limited to, wind turbines, power lines, substations and access roads.

The wind turbines are the most visually apparent element of a wind farm proposal. The proposed wind turbines would be up to 150 m tall to the tip of blade. The nacelle will be up to 100 m from ground level and the blades have a total diameter of up to 100 m. The following table summarises the proposed components of the wind farm

Item	Maximum values
Hub Height (Approx)	100 metres (Approx)
Rotor Diameter (Approx)	100 metres (Approx)
Overall Height (Approx)	150 metres (Approx)
Proposed number of turbines	152 turbines (Approx)

People's perception of wind farms

Studies undertaken in the Southern Tablelands region, within Australia and overseas indicate an increasing level of public support for wind farm developments. Perception studies continually show that in many Australian and overseas examples, between 60-70% of people find wind turbines an attractive element in the landscape, with up to 15% of respondents undecided and 20% dislike wind farms. Public opinion research on wind farms in New South Wales has been limited. Although community consultation is undertaken as part of the planning process for wind farms, this consultation is mostly qualitative in nature, in that it seeks the views on a number of aspects of the wind farm development from specific stakeholders, including the local community, and those further away, as well as the views of special interest groups, government agencies and local government involved or impacted by the development.

Some social research has been undertaken by government agencies as well as by wind farm Proponents, to ascertain people's perception and response to wind farms in the New South Wales and Victorian landscapes and the outcomes of this research is consistent.

A study was commissioned by Epuron and conducted by ERM, to ascertain the regions view towards wind farms. The study was conducted from the 27th of July and concluded on the 2nd of August 2007. This study was previously quoted in the Planning Application Report for the Gullen Range Wind Farm. The study area however, included the Goulburn – Crookwell – Yass regions (Southern Tablelands), thus it has geographical relevance for this project.

Results have shown a discernable rise in the level of public acceptance, with almost 9 out of 10 (89%) of respondents supporting development of wind farms in the Southern Tablelands. Furthermore 71% of respondents would support a wind farm development within 1 km of their residence, and 67% found wind farms to be visually appealing.

Viewshed and zones of visual influence

The area that may potentially be visually affected by the wind turbines is called the viewshed. The viewshed for the proposed Yass Valley Wind Farm is based on the parameters of human vision. Given that the overall height of the wind turbines would be up to 150 m, the viewshed can be considered to extend to a distance at which the 150 m wind turbines would take up less than 5% of the full vertical field of view. Typically the field of view of a person is 10°; therefore, 0.5° is less than 5% of the typical vertical field of view. Therefore a wind turbine 150 m high viewed from a distance of 17.0 km would take up 5% of the vertical field of view, which has been considered as the viewshed for the Yass Valley Wind Farm.

Table 7-2 Zone of Visual Impact (ZVI)

Distance from an observer to the nearest wind turbine	Visual impact
> 17 km	*Visually insignificant* A very small element in the viewshed that is difficult to discern and would be invisible in some lighting or weather circumstances.
8.5 km – 17 km	*Potentially noticeable, but would not dominate the landscape.* The degree of visual intrusion would depend on the landscape sensitivity and the sensitivity of the viewer. However, the wind turbines do not dominate the landscape.
3.0 km -8.5 km.	*Potentially noticeable and can dominate the landscape.* The degree of visual intrusion would depend on the landscape sensitivity and the sensitivity of the viewer
1.5-3.0 km	*Highly visible and would usually dominate the landscape* The degree of visual intrusion would depend on the wind turbines' placement within the landscape and factors such as foreground screening.
< 1.5 km	*Would be visually dominant in the landscape from most viewing locations.* Dominates the landscape in which they are sited.

Larger townships within the viewshed of the proposed Yass Valley Wind Farm include:

- Binalong – approximately 8km north of the Marilba Hills Precinct
- Bowning – approximately 8.5km east of the Marilba Hills Precinct
- Galong – approximately 14km north of the Coppabella Hills Precinct
- Jugiong – approximately 15km west of the Coppabella Hills Precinct
- Yass – approximately 17km east of the Marilba Hills Precinct

There are also several named 'localities' that consist of a few dwellings and/or buildings and with no shopping or convenience services.

Landscape Units and Sensitivity

Landscape units are based on areas with similar visual characteristics in terms of topography, geological features, soil, vegetation, and land use. The following sections describe the underlying patterns of these elements to derive the landscape units within the viewshed.

The units are broken up into 5 categories:

- Landscape Unit 1 – "Gently Undulating and Flat Cleared Farmland";
- Landscape Unit 2 – "Steeply Undulating Cleared Farmland";
- Landscape Unit 3 – "Forested Hills";
- Landscape Unit 4 – "Rural Townships"; and
- Landscape Unit 5– "Recreation Resorts".

The visual sensitivities of the area are affected by the level of anthropogenic modification in the landscape. These are discussed in detail in the Landscape and Visual Assessment (LVA), Appendix 1. The landscape sensitivities are summarised below.

Table 7-3: Landscape Sensibility table

Landscape unit	Sensitivity
Unit 1 Gently Undulating and Flat Cleared Farmland	Low This unit is highly modified, contains visible infrastructure, is not topographically dramatic and does not contain large areas of water.
Unit 2 Steeply Undulating Cleared Farmland	Medium This landscape is largely cleared of vegetation however the steeply folded hills create an appealing landscape.
Unit 3 Forested Hills	Medium to High This landscape is attractive
Unit 4 Rural Townships	Medium The concentration of houses increases the visual sensitivity of this landscape unit.
Unit 5 Recreation Resorts	High Used for recreation and to enjoy views of the landscape.

Seen area analysis

A Seen Area Analysis shows those areas within the viewshed from which wind turbines, or sections of wind turbines, may be visible. The extent to which a wind farm is visible depends upon the nature of the intervening topography. A maximum tip height of 150m, with a tower height of 100m, was used for the analysis and as such represents a worst case scenario.

The Seen Area Analysis for the Yass Valley Wind Farm was based on 10m contour data, solely on topography. That is vegetation that could potential screen the visibility of the wind farm along roadsides and around dwellings was not considered in this analysis.

The table below shows the range of visibility options that have been mapped in this GIS based analysis.

It is important to note these zones are not exclusive. For example a location that has the potential to view a wind turbine in its entirety falls into Zone A. A viewer at this location would also be able to see "any part of the wind turbine blades" and therefore would also fall into Zone D.

Zone	Extent to which the wind turbines are visible
Zone A	One or more wind turbines in their entirety
Zone B	The entire swept path of the blades of one or more wind turbines
Zone C	At least half of the swept path of one or more wind turbines
Zone D	Any part of the wind turbine blades of one or more wind turbines

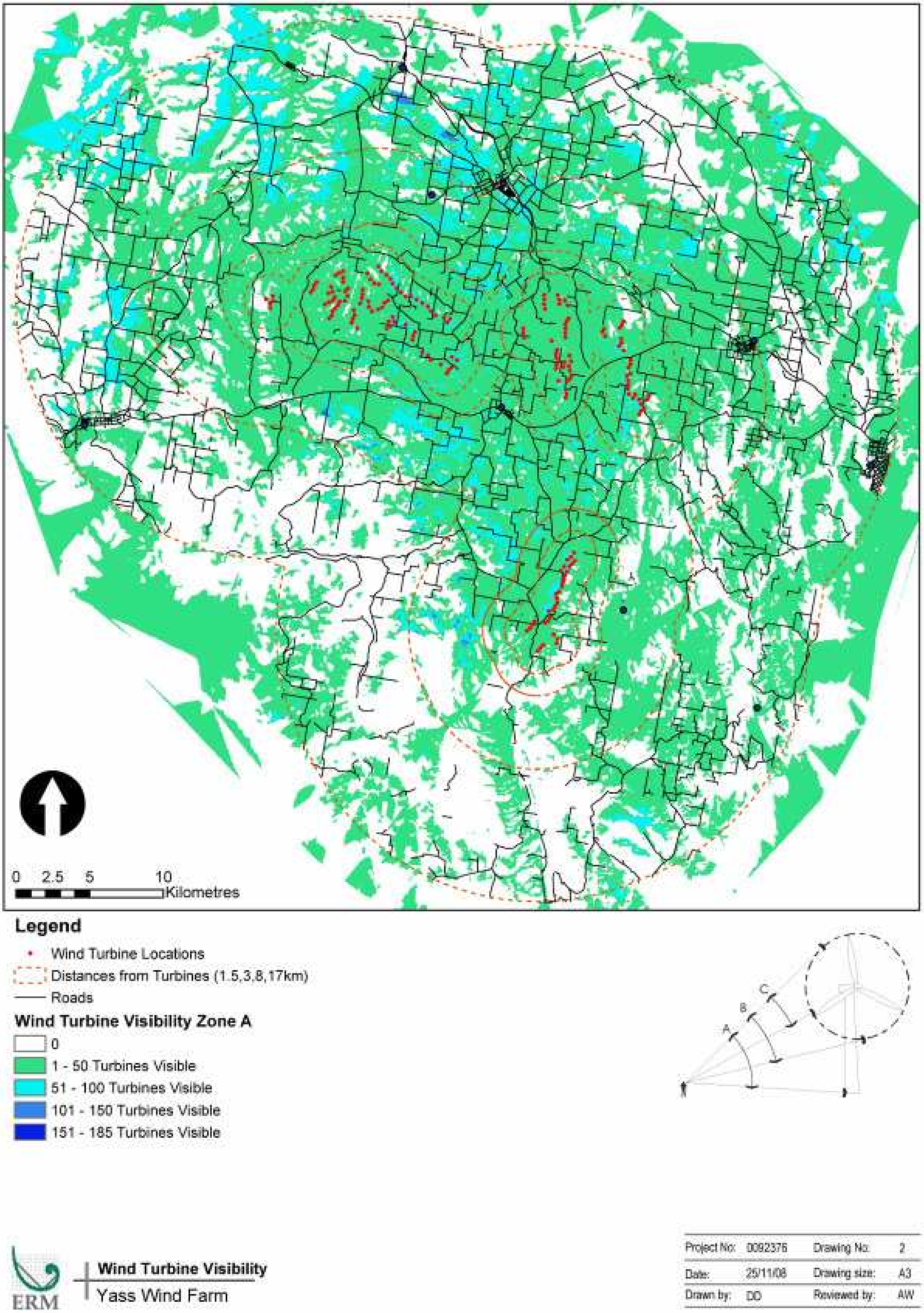


Figure 7-1: Turbine visibility Zone A

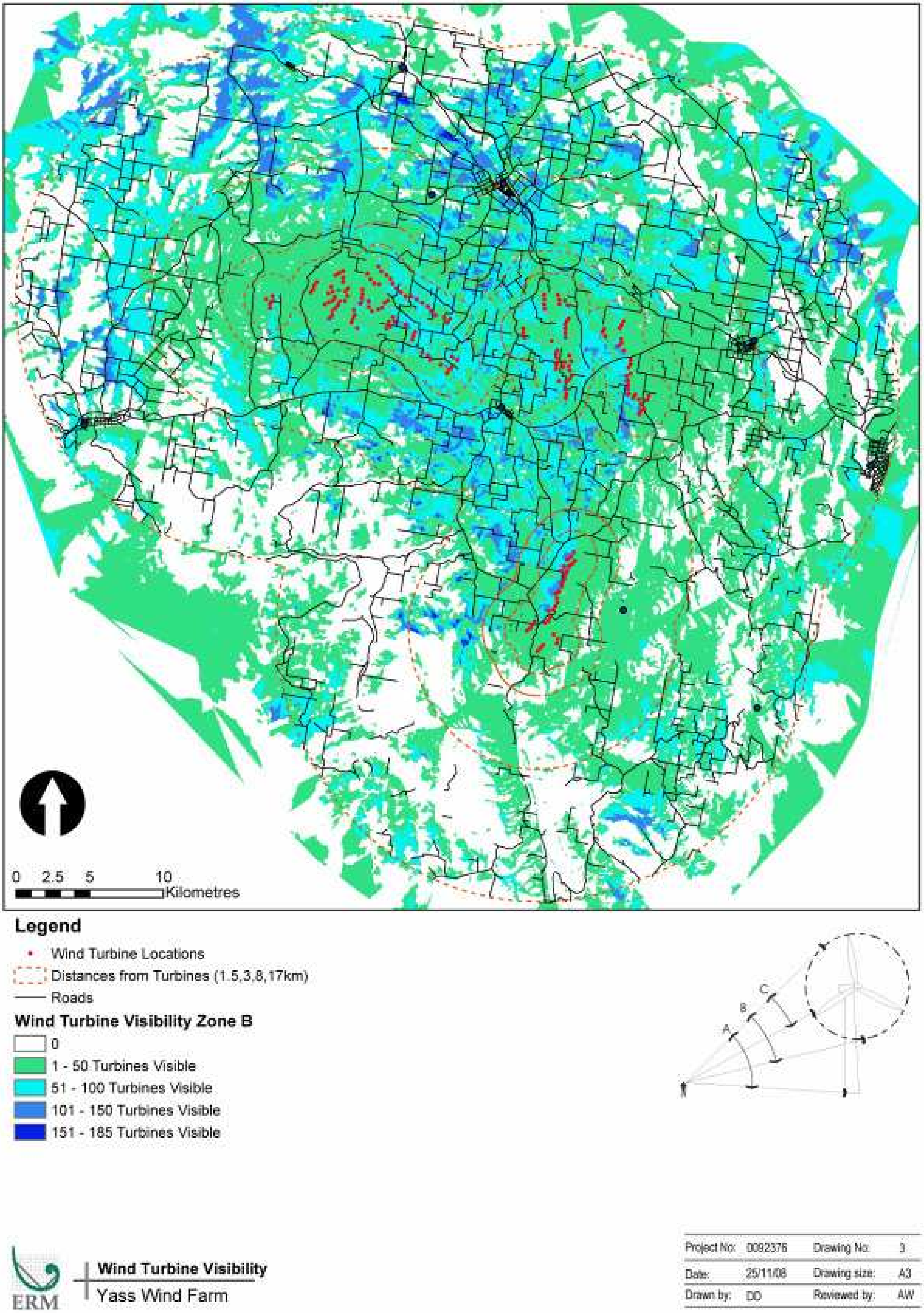


Figure 7-2: Turbine visibility Zone B

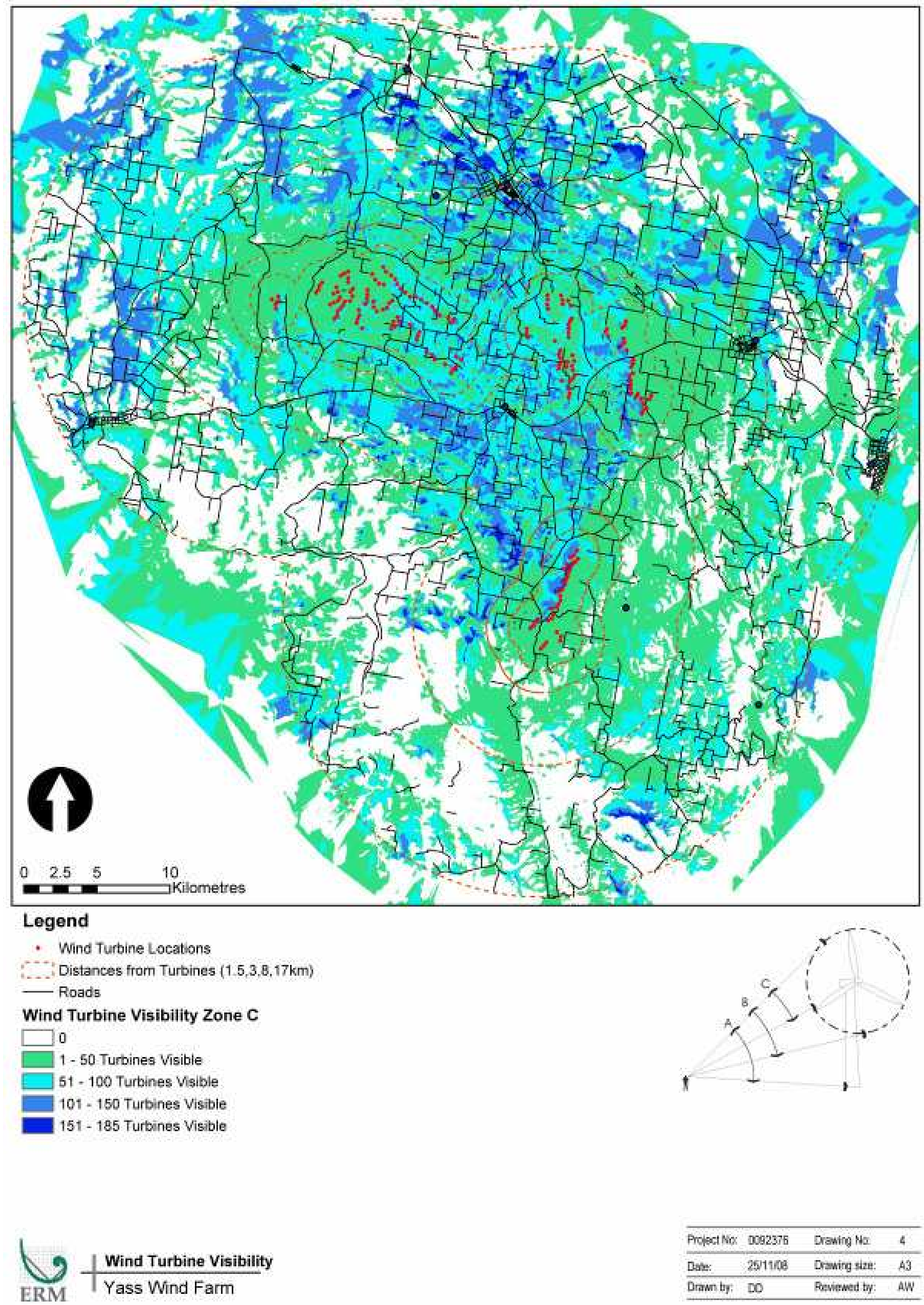
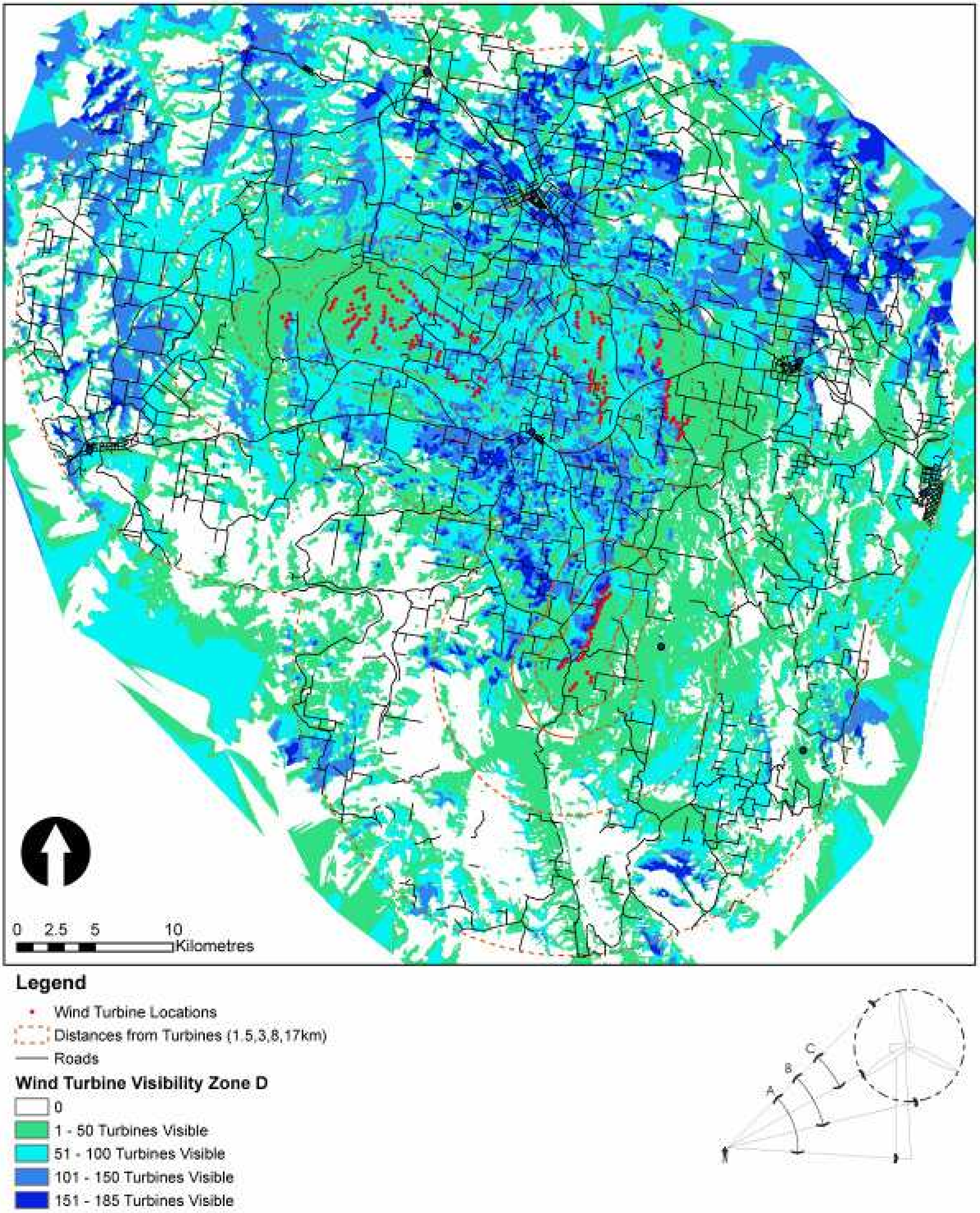


Figure 7-3: Turbine visibility Zone C



ERM

Wind Turbine Visibility
Yass Wind Farm

Project No:	0092376	Drawing No:	5
Date:	25/11/08	Drawing size:	A3
Drawn by:	DD	Reviewed by:	AW

Figure 7-4: Turbine visibility Zone D

Publicly visible viewpoints

The selection of viewpoints in the LVA seeks to provide for a representative range of views from publicly accessible areas within the viewshed. These have been selected around the wind farm primarily in areas that were identified in the Zone of Visual Influence (ZVI) analysis from which viewers would be able to potentially see wind turbines while generally within 8.5 km of a wind turbine. Further details are provided in Section 7 of the LVA.

33 publically visible viewpoints have been selected in the areas of:

- Yass Township
- Hume Highway
- Coppabella Road
- Barramangra Road
- Talmo
- Illalong Road
- Burrley Griffin Way
- Yass Road
- Black Range Road
- Whitfields Road
- Binalong
- Garryowen Road

In addition to this, 11 sequential viewpoints were selected to assess the visual impact from the Hume Highway and Burley Griffin Way, refer to Section 8 of LVA for further details.

Within each assessment of the public viewpoints the following information was recorded and researched:

- Viewpoint location and description (including GPS co-ordinates and map)
- Distance from the viewpoint to the nearest wind turbine, turbine number and nearest visible wind turbine with turbine number
- Landscape unit description
- Image of the viewpoint location
- Landscape sensitivity and viewer numbers
- Photomontage if required

A summary of the publicly visible viewpoints and the overall conclusion as to the potential impact the wind farm on publicly accessible viewpoints identified that most of the potential visual impacts are of a minor or medium level. There are no locations within the public domain where the potential visual impact is assessed as high. In part this is because the majority of the surrounding landscape has been assessed as having a medium level of sensitivity and therefore the highest visual impact in these areas would be medium.

The main areas with higher levels of potential impact are along the Hume Highway and to a lesser extent along Burley Griffin Way. However the assessment of community perception within this Yass region, for many viewers using the highways the presence of the wind farm may be a positive element within the roadside vistas.

Photomontages have been prepared for 10 locations surrounding the site. Due to the resolution required to portray these montages, they are provided separately in Appendix C of the LVA. A selection has been extracted from the Visual Impact Assessment as an example.

Existing

Photomontage

Legend

Photomontage Viewpoint

Proposed Turbine

Turbine Buffer

Site Perimeter

Details

Viewpoint: SVP1

Coppabella Hils - Hume Highway

Looking From 350° to 121.9° - Centre 56.1°

Cordinates: 631614m East 6146395m North (MGA55)

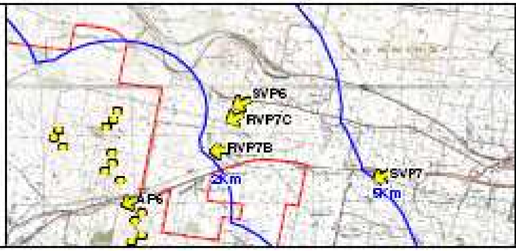
Time/ Date of Photo: 12:25pm on 22st of November 2008

Distance to nearest wind turbine: - 7.7km - COP76

Figure 7-5: Photomontage from viewpoint SVP1

Existing

Photomontage



Legend

Photomontage Viewpoint

Proposed Turbine

Turbine Buffer

Site Perimeter

Details

Viewpoint: SVP7 (100m Hub Height)

Mariba Hills Precinct - Hume Highway

Looking From 181.5° to 299.5° - Centre 240.5° - FoV 120°

Cordinates: 663621m East 6150982m North (MGA55)

Time/Date of Photo: 8:30am on 21st of November 2008

Distance to nearest wind turbine: - 5.2km - MRL65

Figure 7-6: Photomontage from viewpoint SVP7

Residential Viewpoints

The LVA methodology used in this report is supported by past Victorian Planning Panel decisions and recent NSW Land and Environment Court decisions. The major impact of wind turbines on residential properties occurs where wind turbines are within 1.5 km; however, wind turbines can be dominant to 3km, with the greatest potential impact being to neighbouring non-participatory resident properties.

In total there are four non-participatory residences within 1.5km of all turbines. A residential impact assessment was conducted at eight residences, and a total of five montages were prepared for a selection of these residences. Further detail is provided in section 9 of the the LVA in Appendix 1.

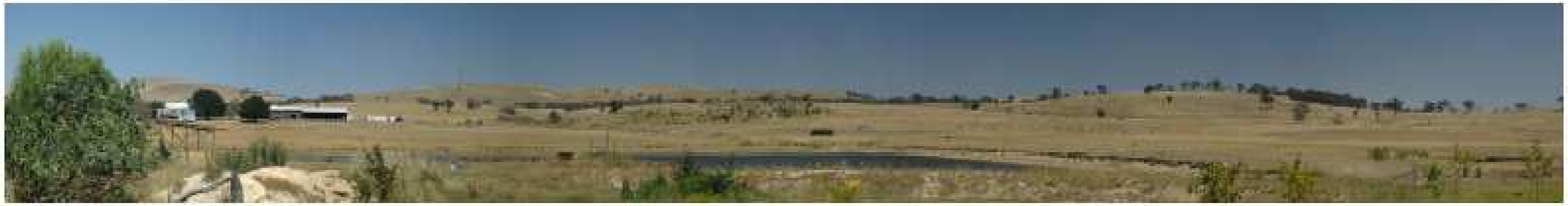
The eight residential viewpoints are as follows

- "Tullyvale Hall" (House #G14)
- "The Pines"Goondah Road, Goondah (House #M02)
- 918 Burley Griffin Way" (House #M22
- "Gwandoban" (House #C53)
- "Naranghi" (House #C54)
- The Crisp Galleries, Hume Highway (House #C34)
- "Deepwater", Hume Highway, Bookham (House #C41)
- 55 Illalaong Road (House #C42)

Within each assessment of the residential viewpoints the following information was recorded and researched:

- Viewpoint location description (including GPS co-ordinates, map and aerial of the existing conditions of the residence)
- Distance from the viewpoint to the nearest wind turbine, turbine number and nearest visible wind turbine with turbine number
- Sensitivity of the house (eg. orientation, screening)

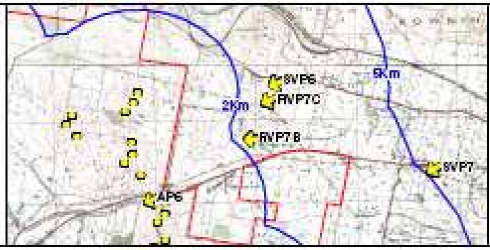
In these assessments of residential viewpoints the overall visual impact was typically assessed as being moderate to low when the wind turbines were visible and there was no existing screening. In part, this is because of existing vegetation or anthropogenically modified structures surrounding the residence, the residence orientation, the distance towards the wind turbines and the perception of the owners of the residence towards wind farms. Landscape mitigation possibilities for the residences with a higher visual impact also help reduce the impact of the wind farm on individual residences.



Existing

Photomontage

EPURON
POWER FOR PORTFOLIOS



Legend

Photomontage Viewpoint

Proposed Turbine

Turbine Buffer

Site Perimeter

Details

Viewpoint: RVP7B

The Crisp Galleries - Future Bamboo Garden'

Looking 211.9° To 318.4 - Centre 265.2° - FoV 107°

Cordinates: 660018m East 6151762m North (MGA55)

Time/ Date of Photo: 12:10pm on 28th of January 2009

Distance to nearest wind turbine: - 2.3km - MRL43

Figure 7-7: Photomontage from viewpoint RVP7B

Cumulative Impact

The presence of multiple wind farms in an area can create a cumulative visual impact. This can occur when either sequential and/or simultaneous views to wind turbines from publicly accessible viewpoints or from private viewing locations lead to change in a communities, resident's or visitor's perception of a region.

There are no locations within the township of Yass where one can perceive the Yass Valley Wind Farm. Therefore as there are no views to multiple wind farms from Yass there would be no direct cumulative impact on the township of Yass. The proposed Yass Valley Wind Farm would be visible from the townships of Bookham and Bowning, with limited views from Binalong. Therefore, there would be some cumulative impact on these townships cause by the construction of the Yass Wind Farm.

Wind turbines at the Gunning Wind Farm and the Yass Wind Farm may also be visible from the Hume Highway behind the Cullerin Range Wind Farm. However, as has been demonstrated previously, views from the Hume Highway to the Yass Wind Farm are very limited to the road between Bowning and some distance west of Bookham.

For these reasons, whilst it may be possible for more than one wind farm to be viewed while travelling through the Yass Valley, the cumulative impact would be minimal. The main impact on Highway users would remain the nearby Cullerin Range Wind Farm.

There may be a cumulative visual impact for users of roads near the Yass Valley Wind Farm and continuing past other wind farms. However these are typically small gravel roads, serving local farms and the cumulative impact would be negligible.

This assessment of the cumulative visual impact of the Yass Wind Farm has concluded that there would be minimal cumulative visual impact and that the changes to peoples' perception of the surrounding area would not be significantly changed by the presence of multiple wind farms in the locality.

Obstacle lighting

The assessment of the viewshed of the Yass Valley Wind Farm has identified the low density of occupants within the surrounding area as well as the relatively low usage of the local road network. In essence this has highlighted the fact that the wind farm is located in an area with little night time lighting – albeit with few night time viewers.

The Assessment of night lighting impact has been made with recourse to a limited number of trials have been undertaken in Victoria and experience from existing lighting at Mt Millar in South Australia. These trials have identified that the type of lights do make a difference to the visual impact; there are forms of lighting that can be used to reduce visual impact. Hazard identification lights are still an obvious element in the landscape, particularly where there are few light sources and these will be an obvious addition to the night panorama. There are few light sources in the proposed location of the Yass Valley Wind Farm. Wind turbines will therefore be an obvious addition to the night panorama. However, few light sources are also an indication of few viewers. If lights are required by CASA, it is considered that the solution constructed at Mt Millar provides an acceptable level of visual impact while providing the required level of night time hazard identification.

A cumulative impact can potentially be envisaged for travellers on the Hume Highway, passing multiple Wind Farms where hazard identification lighting may be visible. However, whilst the lighting may be visible, it will only be one further element in a traveller's experience which obviously includes the frequent presence of rear tail lights, headlights and lights from nearby houses and farms. As such the cumulative visual impact for these road users will be minimal. There would also be some residents located in the area around the Yass Valley Wind Farm which may also be able to see the hazard identification lighting from other wind farms.

However, although residents may be able to see hazard identification lighting of multiple wind farms such impact would effect few houses, and be a relatively small visual impact because when people are at home at night and when inside lights are on, windows become mirrors, reflecting the interior of the house and not allowing views to the low level lights in the distance.

Obviously when curtains or blinds are closed, there is also no visibility to the proposed lights in the surrounding area. Therefore at night in most situations, a viewer needs to be outside to even see the proposed hazard identification lights.

For these reasons there would be negligible cumulative impact from the proposed hazard identification lighting if they were installed both at the Yass Valley Wind Farm and other wind farms in the vicinity.

7.2.4 Impact assessment - construction and decommissioning

Wind turbines are considered the most visually apparent element of the wind farm proposal. The proposal seeks wind turbines up to 150m tall to the blade tip, with the nacelle up to 100m from the ground level and blades with a total diameter of up to 100m.

The proposed wind farm would include a number of 33kV/132kV transformers. Each wind turbine would have its own transformer. Each turbine would then be connected by cabling to the substation. In general, the interconnecting cables would be underground.

Each precinct would require the following components:

- A substation
- A control building
- Office building
- A small car park to service the buildings
- Access tracks
- Aviation obstacle lighting (applicable if the wind turbines exceed 110 m above ground level)

Topsoil would be removed to a suitable founding layer.

The period from pre-construction through to completed tests following commissioning of the wind turbine generators is likely to be 24-36 months.

7.2.5 Impact assessment – operation

The landscape and visual assessment demonstrates that the proposed Yass Valley Wind Farm would generally have a low visual impact within the Yass locality and the surrounds of the Southern Tablelands in New South Wales. This area is known for high wind speeds and therefore has potential for wind energy projects.

The low visual impact conclusion is supported by the following issues that are discussed further in the LVIA included as Appendix 1):

- Perception studies, as detailed in the LVIA, demonstrating an increasing support of wind farms in the Yass locality and within Australia. The majority of viewers do not object to the construction of wind turbines on any but the most sensitive and localised landscapes.

- The proposed Yass Valley Wind farm is located in a modified landscape. This includes agricultural activity, associated structures and other forms of human intervention
- There is low visual impact on the surrounding townships. There are limited locations from which long distance views are available from the townships of Yass to the east and the villages of Bowning and Binalong to the east and north-east towards the wind farm.
- The main visibility is from the main roads. Although there would be views from the Hume Highway and the Burley Griffin Way, the overall impact is expected to be medium due to the predominately medium landscape sensitivity.
- There would be a visual impact on viewers using the minor roads within the Yass locality especially where these run along the wind farm precincts. Some lesser used (including unsealed) roads run along and through the proposed wind farm. However these roads have far fewer users than the major roads and highways. While there would be a visual impact from these roads, it is considered to be minor from the locations as the viewer numbers are low.
- The level of cumulative visual impact for users of Burley Griffin Way would be less as there are few opportunities for sequential wind farm views. It is therefore assessed as being a low adverse visual impact.
- Users of the Hume Highway would have views of the existing Cullerin Range Wind Farm and possibly the Gunning Wind Farm in addition to the proposed Yass Valley Wind Farm. However, it has been shown that views from the Hume Highway to the Yass Valley Wind Farm are very limited due to screening on the Highway between Bowning and some distance west of Bookham.
- The assessment of the cumulative visual impact of the Yass Valley Wind Farm has concluded that there would be minimal cumulative visual impact and that the changes to peoples' perception of the surrounding area would not be significantly changed by the presence of multiple wind farms in the locality.
- If obstacle identification lighting is required by CASA the visual impact would be low. The area already contains multiple night light sources.

7.2.6 Mitigation measures

This assessment concludes that there would be no need for management options to include planting along public roads as a visual mitigation measure; however a commitment is made to protect the visual amenity of residential properties.

SoC[10]	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
1	Deterioration of visual amenity at surrounding residences	Mitigate impacts	The proponent would offer vegetative screening of any residence within 3 km of a wind turbine. The proponent would write to the owner of each residence outlining the offer and process. A site visit would determine the extent and type of planting required Species selection would be determined in consultation with landholders using specialist advice. This offer would remain in place for a period of 1 year after project construction, to allow people time to either adjust or to decide that landscape filtering or screening is warranted. Planting would be completed within 2 years of completion of project construction.	Post Construction	OEMP	X	X
2	Deterioration of visual amenity at surrounding residences	Mitigate impacts	The Proponent would make reasonable efforts to locate powerlines, substations and control buildings in areas which minimise the visual impact where practical. Vegetative screening would be provided around substations and control buildings where they were visible from neighbouring residences.	Planning	DoP	X	X

[10] SoC: Statement of Commitment

7.3 OPERATIONAL AND CONSTRUCTION NOISE IMPACTS

7.3.1 Approach

A noise impact assessment was completed by an independent acoustic consultant for the Coppabella Hills and Marilba Hills Precincts of the proposed Yass Valley Wind Farm. The precincts were assessed by Marshall Day Acoustics Pty Ltd, and the entire report is presented in Appendix 2.1.

The noise impact assessment was undertaken in accordance with the South Australia Environmental Protection Authority, *Environmental Noise Guidelines: Wind Farms (2003)*, as requested in the Director-General's Requirements. The acceptability criteria is that the wind farm noise should not exceed the greater of, an amenity limit of 35dBA or existing background noise plus 5dBA.

New South Wales adopts the methodology and criteria from the SA EPA guidelines, and as such, this document has been used as the sole basis for assessing operational noise from the proposed Yass Valley Wind Farm. The approach of the assessments were as follows:

- Preliminary predictions of wind farm noise levels were modelled for each receiver using computer noise modelling software SoundPLAN. The results were used together with site photographs and topographical data to identify receiver locations that would be relevant for assessing the effects of wind farm noise from the development. Marshall Day selected eleven (11) receivers at Coppabella Hills and seven (7) receivers at Marilba Hills Precincts for background noise monitoring.
- All models generated as part of the noise assessment used the algorithm described in *IS9613-2: 1996 – Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*. This standard facilitates the prediction of noise levels through spherical spreading effects and directivity and allows for variables including screening, atmospheric absorption and ground attenuation.
- Background noise monitoring was conducted at each relevant receiver for a 2-week period equivalent to approximately 2000 data points. Simultaneous monitoring of local weather conditions was undertaken in order to determine periods of rainfall. Where it was determined that rainfall had occurred, the representative background noise data were excluded from the dataset. Extraneous noise was also excluded from the dataset.
- A regression analysis was performed on measured background noise data, with a third order polynomial giving a best-fit line representing the site-specific background noise level across the wind speed range of interest.
- The noise criteria for new wind farm developments, as stipulated by the South Australian EPA, were then applied to the derived background noise levels in the wind speed range of interest in order to determine noise limits at each receiver location.
- Finally, a comparison was made between the predicted wind farm noise levels and the noise limits determined in accordance with the SA Guideline for each receiver in order to establish compliance.

Assessment of construction noise has been conducted in accordance with the NSW DECC document *Environmental Noise Control Manual*. The noise criteria adopted for this development is that the L_{10} level measured over a period of not less than 15-minutes when the construction site is in operation should not exceed the background noise level (L_{90}) by more than 10dB.

A blasting noise and vibration assessment was conducted in accordance with ANZEC guidelines. Time of day, air-blast overpressure level and ground vibration peak particle velocity are all considered.

An outline assessment of construction vibration was conducted in accordance with the NSW DECC document *Assessing Vibration: a technical guide* (DEC2006/43), February 2006. In addition, for evaluation of vibration in buildings due to construction we have referred to British standard BS 7385 Part 2: 1993 *Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground-borne vibration*.

Noise from construction traffic on local roads was assessed in accordance with the NSW DECC's *Environmental Criteria for Road Traffic Noise (ECRTN)*.

7.3.2 Existing environment

In general there are very few residences that surround the Coppabella Hills Precinct with only five (5) dwellings located within 2 kilometres of the nearest turbine, all of which are involved with the project.

The Marilba Hills Precinct is located on two adjacent ridgelines which have been designated Marilba-1 and Marilba-2 within the noise assessment report (Appendix 2.1). There are very few residences in the surrounding areas with 15 dwellings located within 2km of the nearest turbine, eight (8) of which are involved with the project.

7.3.3 Impact assessment - construction and decommissioning

An impact assessment of the potential construction noise levels likely to occur during the construction phase of the project was undertaken. Construction tasks associated with the project include the following:

- Access road construction
- Turbine tower foundation construction
- Trench digging to accommodate underground cabling
- Assembly of turbine tower, nacelle and rotor blades.

The SA Guidelines require measurements to be conducted in 10 minute intervals, while the NSW *Industrial Noise Policy* 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.

Results from the construction noise assessment indicated that the predicted noise levels associated with the use of a variety of different machinery during the construction of the wind farm would comply with the limits described in the Environmental Noise Control Manual (NSW EPA, 2004).

The predicted construction blasting noise and vibration levels have been found to comply with ANZEC guidelines. A maximum instantaneous charge (MIC) of approximately 30kg is recommended.

The predicted construction vibration levels have been found to comply with DECC guidelines at all receiver locations.

7.3.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
3	Construction noise	Minimisation	The Proponent will employ appropriate noise reduction strategies to ensure the recommendations of the NSW Environmental Noise Control Manual are met. Strategies may include the re-orientation of machinery, rescheduling of noisy activities, installation of temporary noise barriers, improved vehicle noise control and the use of 'quiet work practices' (such as reducing or relocating idling machinery).	Detailed design	CEMP	x	x
4	Construction noise	Minimisation	The Proponent would only undertake construction activities associated with the project that would generate audible noise at any residence during the hours: • 7:00 am to 6:00 pm, Monday to Friday, • 8:00 am to 1:00 pm Saturday; and • At no time on Sundays or public holidays	Detailed design	CEMP	x	x
5	Construction noise	Minimisation	Meet ANZECC guidelines for control of blasting impact at residences.	Detailed design	CEMP	x	x

7.3.5 Impact assessment – operation

Two turbine types have been considered and modelled for the purpose of this assessment. A representative turbine (REpower MM92) has been modelled to demonstrate that SA EPA guidelines are achievable with the proposed indicative layout, and a worse case turbine (Vestas V90 3MW) has been modelled to show the maximum potential noise impact.

In total 50 dwellings were considered for the Coppabella Hills Precinct, with 11 receivers being selected for background noise monitoring. Over 70 dwellings were assessed for the Marilba Hills Precinct, with 7 receivers being selected for background noise monitoring. The methodology and justification for the selection of these receivers is detained in Section 5 of the Noise Impact Assessment (NIA) (Appendix 2.1).

The assessment of all receivers located within 5km of the proposed wind farm was found to be fully compliant in accordance with SA EPA and World Health Organisation guideline criteria when using the REpower MM92. The results from the worst case scenario, modelling the V90 3MW, showed that there is marginal exceedence (within the 3dB error margin of the model) would be experienced at several receiver locations. Noise mitigation measures would need to be implemented which could include operating the turbine in a noise reduced mode or switching the turbine off under certain conditions. Table 11 of the NIA (Appendix 2.1) summarises the results of the assessment for relevant receivers.

Tests for tonality have been independently conducted on behalf of the turbine manufacturers in accordance with *IEC-61400-11*. For the wind speed range analysed (6–10 m/s) tonality was not deemed to be audible (ΔL_{ta} <-3) and hence no penalty was applied. Infrasound is not tested as an obligatory part of IEC 61400-11. It should be noted that in general modern WTGs do not exhibit significant infrasound emissions.

A total of three substation options on the Coppabella Hills Precinct and two options on the Marilba Hills Precinct have been modelled for the assessment of transformer noise. The assessment assumed dual 100MW transformers at all locations.

MDA has estimated the sound power level of each transformer as 102dBA. This level has been estimated from Australian Standard AS2374.6-1994 *–Power transformers – Determination of transformer and reactor sound levels.*

Predicted noise levels from the transformer installations are expected to be below existing ambient background.

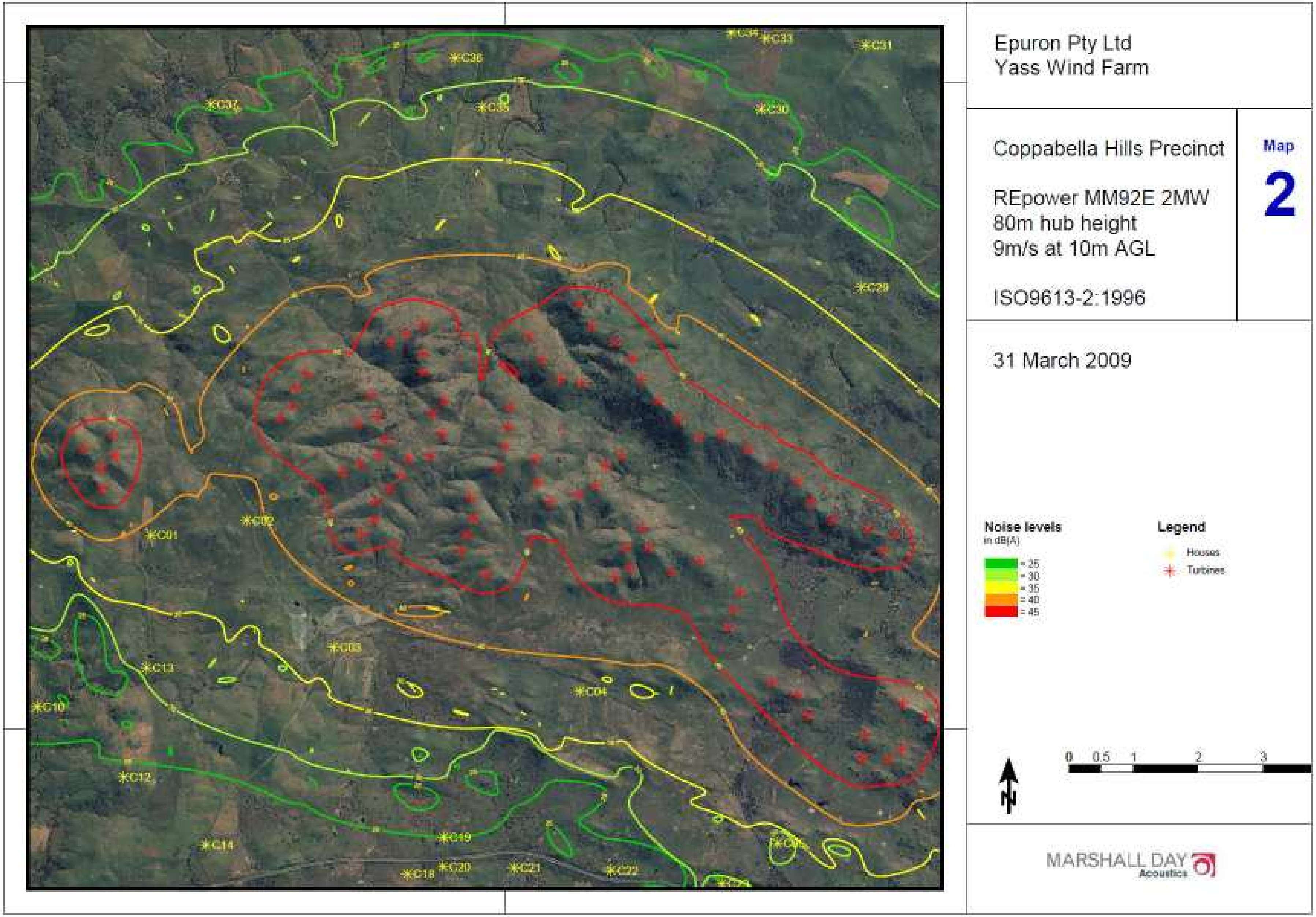


Figure 7-8: Predicted noise plot for turbine type MM92 – Coppabella Hills Precinct

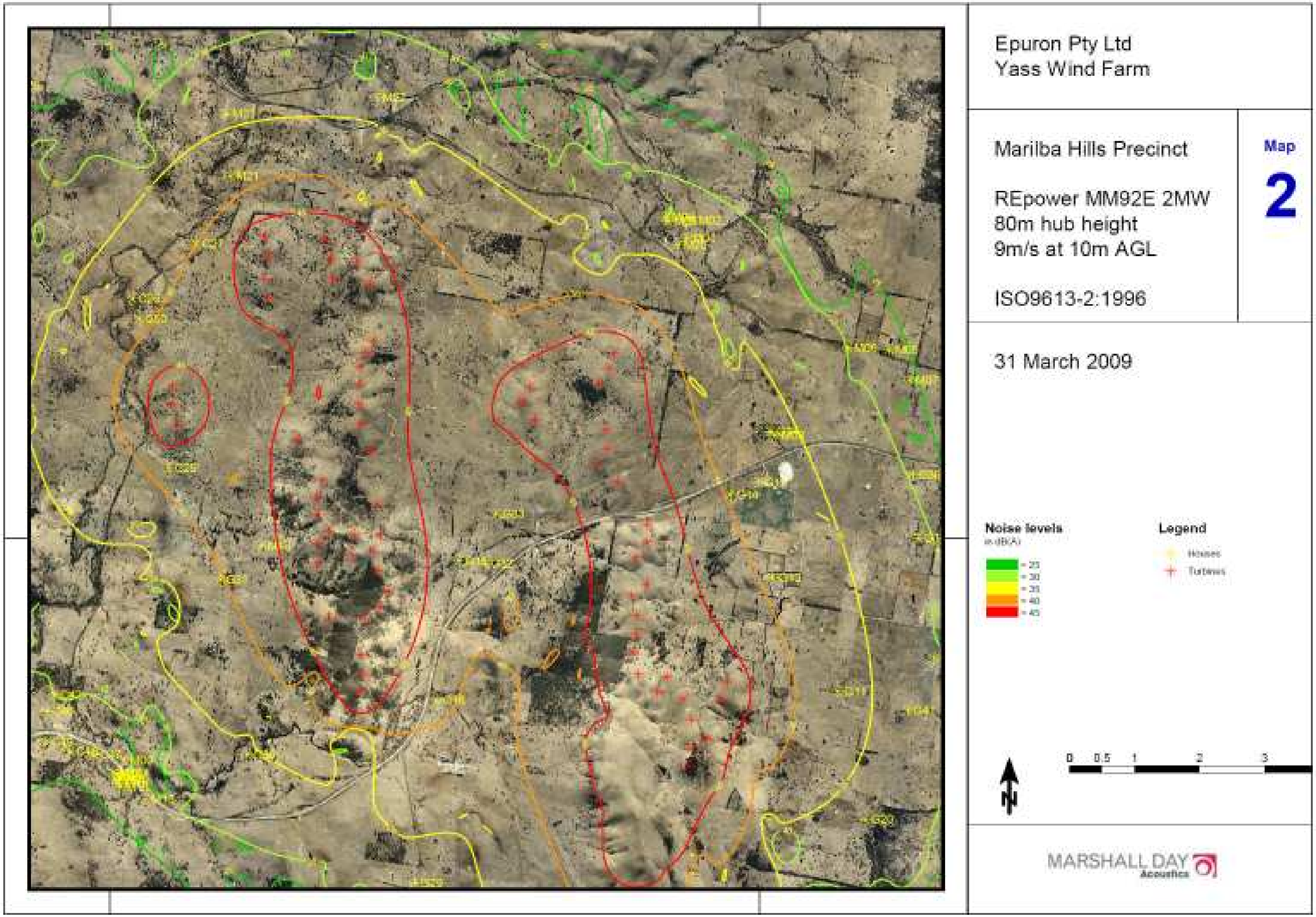


Figure 7-9: Predicted noise plot for turbine type MM92 – Marilba Hills Precinct

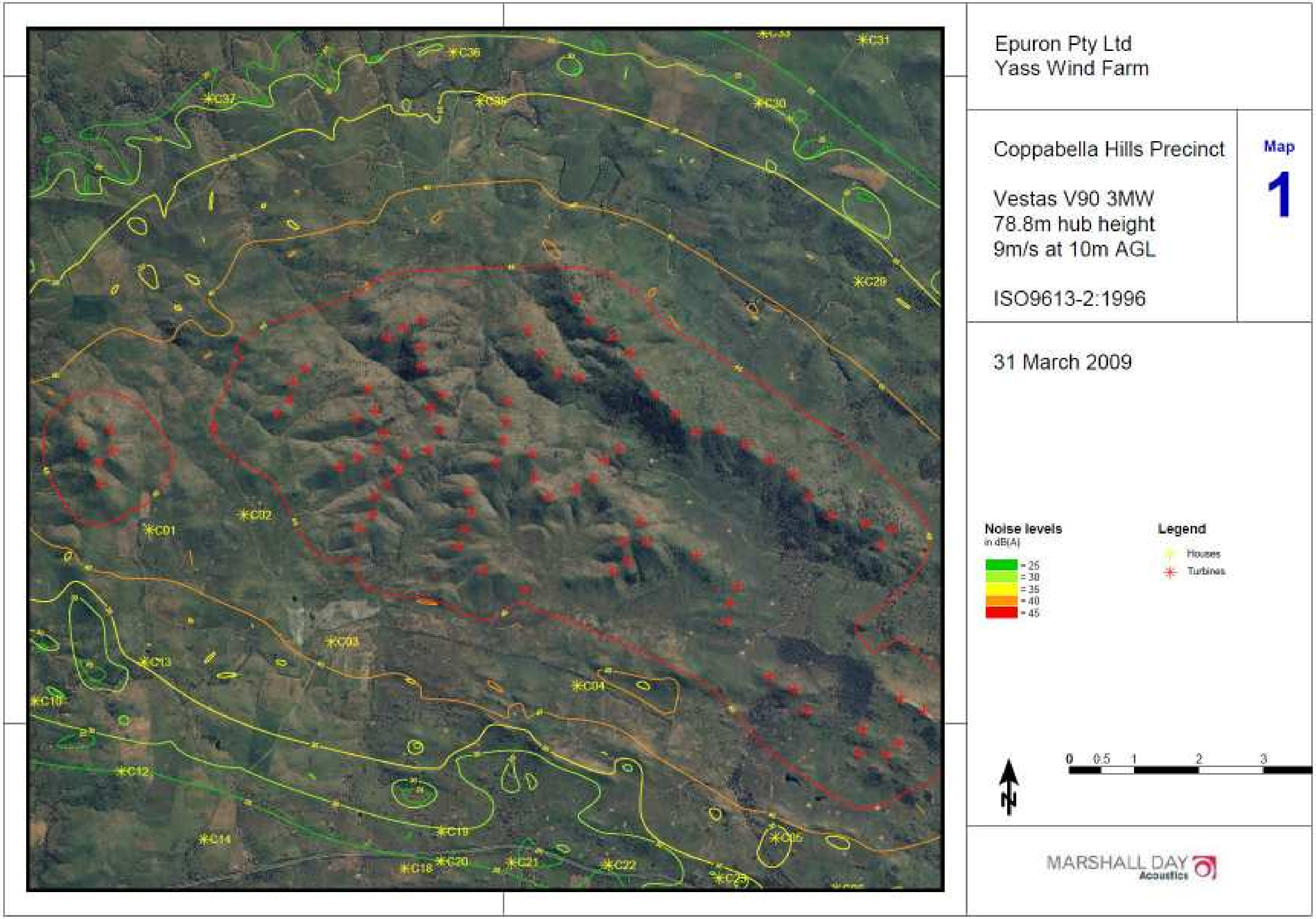


Figure 7-10: Predicted noise plot for turbine type V90 – Coppabella Hills Precinct

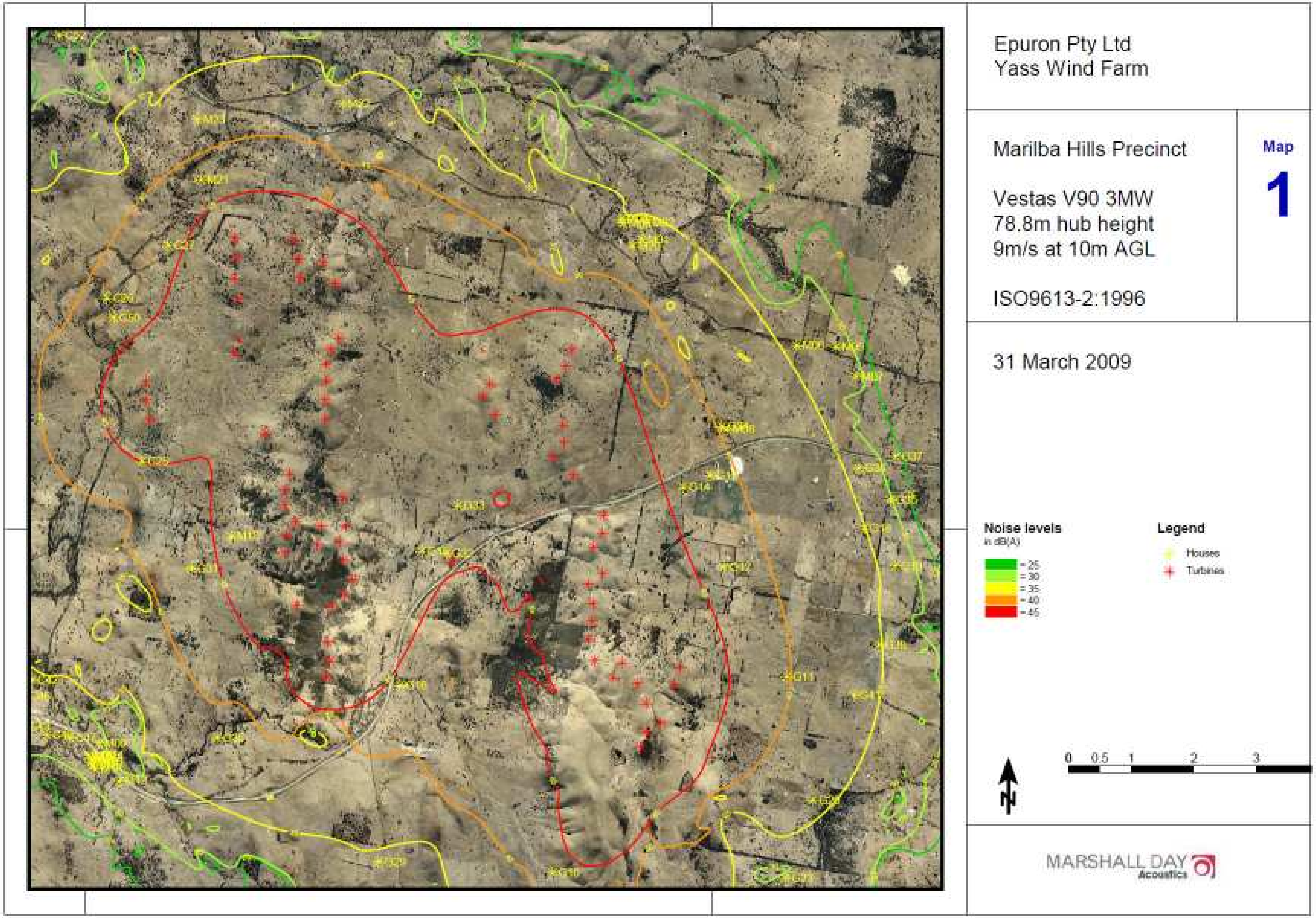


Figure 7-11: Predicted noise plot for turbine type V90 – Marilba Hills Precinct

7.3.6 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
6	Operational noise	compliance	The Proponent will ensure final turbine selection and layout complies with the SA EPA Noise Guidelines of 35 dB(A) or background plus 5 dB(A) (whichever is higher) for all non-involved residential receivers. (other than those which have entered into a noise agreement with the Proponent in accordance with the SA EPA Noise Guidelines)	Detailed design	OEMP	x	x
7	Operational noise	Compliance	The Proponent will ensure final turbine selection and layout complies with the World Health Organisation Guidelines for Community Noise requiring 45 dB(A) or background plus 5 dB(A) (whichever is higher) for all involved residential receivers and all non-involved residential receivers which have entered into noise agreement with the Proponent in accordance with the SA EPA Noise Guidelines	Detailed design	OEMP	x	x
8	Operational noise	Compliance	Prior to construction, the Proponent will prepare and submit to the Department of Planning a noise report providing final noise predictions based on any updated background data measured, the final turbine model and turbine layout selected, to demonstrate compliance with the relevant guidelines for all residences	Detailed design	OEMP	x	x
9	Operational noise	Mitigate	If operational monitoring identifies exceedances, the Proponent would give consideration to providing mechanical ventilation (to remove the requirement for open windows), building acoustic treatments (improving glazing) or using turbine control features to manage excessive noise under particular conditions.	Detailed design	OEMP	x	x
10	Operational noise	compliance	Develop and implement an operational noise compliance testing program.	Detailed design	OEMP	x	x

7.4 FLORA AND FAUNA

7.4.1 Approach

A separate biodiversity assessment was undertaken to document the existing environment and evaluate potential biodiversity impacts at each precinct: Coppabella Hills and Marilba Hills. Each assessment is appended in full in Appendix 3.1 and 3.2, respectively. The assessments were undertaken in the following stages, following the Guidelines for Threatened Species Assessment (DEC and DPI 2005) for development applications assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*:

Steps in the assessment process

Preliminary assessments: Desktop analysis and a short site visit were undertaken to identify dominant vegetation types and habitat features, species and communities of conservation significance which may be present in the study area and obtain site information necessary to plan and design the field survey. The regional context of the proposal is also documented, as specific characteristics of wind farm development, such as the height of infrastructure and extensive length of transmission and access corridors, suggest the potential for impacts to extend well beyond the proposed site. District scale habitat features, such as movement corridors, are identified in this process.

Field survey: All parts of the site which have potential to carry infrastructure, termed the 'development envelope' (DE) were subject to field assessment, rather than a focus on one final infrastructure layout. The development envelope approach allows fine-scale development planning and site decisions to be informed by the findings of the assessment. For example, high biodiversity values areas can be identified and avoided early in the project design process. It also provides resilience to layout alterations, which are commonplace in wind farm development.

Comprehensive field surveys[11] were undertaken using dedicated botanical and zoological teams[12]. Surveys were stratified based on vegetation type, condition and landscape position[13] and aimed to determine the likelihood for threatened species, populations and communities to occur and be affected by the proposal. Table 7-4 Table 7-4: Survey timing and effort summary by precinct

summarises the survey methods and effort employed at each precinct.

Constraints mapping and impact assessment: The results of the field survey were documented, and potential for impacts evaluated in three separate reports; one per precinct. Recommendations were made to avoid high constraint areas where possible and to minimise and offset impacts where avoidance was not possible.

[11] Detailed survey methodologies are described in each biodiversity assessment, Sections 5.1 Flora methods and 6.1 Fauna methods (located in Appendix 3.1: Coppabella Hills Precinct and Appendix 3.2: Marilba Hills Precinct).

[12] The roles, qualifications and experience of team members are provided in Section 11 of the Coppabella Hills Precinct Biodiversity Assessment and Section 10 of the Marilba Hills Precinct Biodiversity Assessment.

[13] Survey effort is overlaid on the development envelope in each biodiversity assessment; Figure 5.1 of the Coppabella Hills Precinct Biodiversity Assessment and Map Set 1 of the Marilba Hills Precinct Biodiversity Assessment.

Where potential for significant impact was identified, Assessments of Significance (pursuant to the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, as appropriate) were undertaken to characterise the significance of the impact.

Iterative assessment and offsetting:

nghenvironmental provided biodiversity advice on several layout revisions, as the infrastructure placement was varied to reflect overlaying constraints, including biodiversity constraints. Follow-up visits and separate investigations were undertaken where further investigation was required. Where high impact areas could not be avoided, specific mitigation measures have been formulated as Statements of Commitment, including the requirement for further assessment in some cases. The preparation of an Offset Plan, pending finalisation of the infrastructure layout, forms one such Statement of Commitment. The aim of the Offset Plan is to ensure a net environmental improvement is obtained for the proposal.

Survey effort, timing and optimality

The main survey was undertaken in September 2008, following good rains about a month previously. A follow-up November survey was undertaken to better target grass species, difficult to identify in spring. Some species which flower in response to irregular disturbance events such as fire will have gone unrecorded. Cool evenings in September did not prove optimal for some species of fauna (particularly reptiles and microchiropteran bats). Follow-up January 2009 surveys were undertaken to address this limitation.

Additional research

Additional research was undertaken to inform the conclusions of threatened species impact evaluations. This included the preparation of a literature review, specific to wind farm risk to birds and bats. Furthermore, a recommendation of both biodiversity assessments was the need to understand more about the use of the sites by microbats. To address this recommendation, a further microbat survey was undertaken. Both of these additional reports are appended to this EA: Appendix 3.3 *Wind Farm Risks to Birds and Bats*, and Appendix 3.4 *Microbat Study: Proposed Yass Valley Wind Farm*. The latter was also subject to a peer review by Greg Richards (Australian bat specialist), May 2009. This additional research has informed the assessment of impact and development of mitigation measures.

Precautionary principle

The survey effort across both precincts was considered by the authors of these reports to have been appropriate to the identification of biodiversity constraints and the assessment of the significance of potential impacts. Uncertainty is addressed by applying the precautionary principle. That is, lack of detection was not grounds to rule out any species. If suitable habitat and local records were present, the species was assumed to be present and a precautionary course of action was recommended.

Table 7-4: Survey timing and effort summary by precinct

Precinct:	Coppabella Hills, Development Envelope = 2829.10 Hectares	Marilba Hills, Development Envelope = 4140.00 Hectares
Preliminary site visit	<u>1-3 September 2008</u> One botanist, two project officers	<u>1-3 September 2008</u> One botanist, two project officers
Main survey	<u>16-22 September 2008</u> Two botanist and one technical assistant (60 person hours in total). In each vegetation type, plot-based quadrats, random meanders (after Cropper 1993), spot inspection and condition assessments were undertaken. Vegetation types were assigned after Thomas et al. (2000) and Gellie (2005). Fauna team consisted of two Biodiversity Project Officers (responsible for fauna survey; 4 days each onsite) and one technical assistant (responsible for habitat assessment; 2 days onsite). Mammal trapping 210 trap nights Bird census 17.5 person hours Reptile searches 11.5 person hours Frog census 6 person hours Call play-back 3.25 person hours Spotlighting 5 person hours Anabat 5 overnight surveys Habitat evaluation 37 surveys	<u>26-28 March 2007 (Cluster 7 only)</u> Mammal trapping 24 trap nights Bird census 4 person hours Reptile searches 1.5 person hours Nocturnal surveys 40 person hours Anabat 3 overnight surveys <u>16-22 September 2008 (remainder of site)</u> Two botanists and one technical assistant (58 person hours in total). In each vegetation type, plot-based quadrats, random meanders (after Cropper 1993), spot inspection and condition assessments were undertaken. Vegetation types were assigned after Thomas et al. (2000) and Gellie (2005). Fauna team consisted of two Biodiversity Project Officers (responsible for fauna survey; 4 days each onsite) and one technical assistant (responsible for habitat assessment; 2 days onsite). Mammal trapping 216 trap nights Bird census 3 person hours Reptile searches 7.75 person hours Nocturnal surveys 3.23 person hours Anabat 3 overnight surveys Habitat evaluation 17 surveys
Follow up surveys	<u>6-7 November 2008</u> Additional vegetation surveys, habitat assessments and reptile surveys <u>19-23 January 2009</u> Additional microbat surveys[14] (2 overnight surveys) <u>9-11 March 2009</u> Additional flora and habitat evaluation (6) for new transmission option	<u>8-9 November 2008</u> Additional vegetation surveys and habitat assessment <u>19-23 January 2009</u> Additional microbat surveys (2 overnight surveys) and nocturnal surveys <u>9-11 March 2009</u> Additional flora and habitat evaluation (6) for new transmission option

[14] The additional microbat surveys were documented as a stand-alone report, Appendix 3.5 *Microbat Study: Proposed Yass Valley Wind Farm.*

7.4.2 Existing environment

Regional context

Much of the sub-catchment has been cleared of woodland vegetation, particularly evident in the north of the sub-catchment, with remaining remnants small and disconnected. Within this landscape, roadside corridors, travelling stock routes and riparian vegetation are likely to provide important connectivity.

Several reserves are located within close proximity of the site. These include Burrinjuck Nature Reserve and Burrinjuck Waters State Park, Hattons Corner Nature Reserve, Wee Jasper Nature Reserve and Brindabella National Park and State Conservation Area.

A major east-west riparian corridor crosses approximately 15km south of the precincts, following the Murrumbidgee River west, the Lake Burrinjuck system centrally, fed by the Yass River and Goodradigbee River to the east.

Four maternity caves for the vulnerable Eastern Bent-wing Bat (TSC Act) are known in NSW. One is the Church Cave at Wee Jasper, approximately 35km 'as the bat flies' south of the precincts.

Coppabella Hills Precinct

Vegetation and disturbance within the precinct

Three broad groupings of Box-Gum woodland and derived native pasture occur in this precinct: box-gum woodland, long-leaved box-red stringybark dry shrub/grass forest and riparian river red gum forest.

Forests and woodlands in the precinct have been progressively ring-barked and felled over the past two centuries to provide pasture. Clearing and agriculture has produced a range of direct and indirect impacts to flora habitats, including altered microclimate, loss of pollinator and dispersal fauna, erosion of soils, particularly wind erosion from exposed ridge tops, elevated soil nutrients and rising saline groundwater. Agricultural activities have also resulted in the colonisation of a range of introduced plant species.

Flora and fauna recorded within the precinct

A total of 165 vascular plant species were recorded during the flora survey, including 51 exotic species. A full list of species recorded in the eleven survey zones (Clusters 1-10 and the potential offset area), and their typical cover/abundance. One threatened species: Yass Daisy *Ammobium craspedioides* was identified at the subject site.

Ninety-four vertebrate species were recorded during the surveys. This included 65 birds, 17 mammals, 8 reptiles and 4 frog species. The highest fauna species richness was recorded from woodland habitats (45 species), followed by wetland habitats (40 species), disturbed woodland (39 species) and ridges (19 species). Threatened fauna included the Superb Parrot *Polytelis swainsonii* and Diamond Firetail *Stagonopleura guttata*.

Marilba Hills Precinct

Vegetation and disturbance within the precinct

Remnant native vegetation derived from two Southern Region dry shrub/grass forest types and several box gum woodland types is present in the precinct. The vegetation types which most closely correspond to remnants in the precinct include box-gum woodland and derived grassland, long-leaved box dry grass forest and broad-leaved peppermint/ brittle gum dry grass forest.

The subject site has been impacted by agricultural activities including clearing, grazing and, in lowland areas, ploughing and pasture improvement. In heavily grazed and sheep camp areas on some ridge rests, asteraceous weeds such as Capeweed and thistles, Paterson's Curse and European Nettle dominate. In less disturbed areas with a tree canopy the most common exotic species at the time of the spring survey were annuals, particularly Chickweed and Quaking Grass.

Flora and fauna recorded within the precinct

A total of 232 vascular plant species were recorded during the flora survey, including 73 exotic species. One threatened species, the Yass Daisy (*Ammobium craspedioides*), was identified at the subject site.

In total, 107 vertebrate fauna species were recorded during the surveys. This comprises 62 birds, 11 terrestrial and arboreal mammals, 12 microbats, 17 reptiles and 5 frog species. The highest fauna species richness was recorded from woodland habitats. Threatened fauna included the Superb Parrot *Polytelis swainsonii,* Speckled Warbler *Pyrrholaemus saggitatus,* Diamond Firetail *Stagonopleura guttata* and Eastern Bentwing Bat *Miniopterus schreibersii.*

Table 7-5: Key biodiversity features by precinct

Precinct	Coppabella Hills Precinct	Marilba Hills Precinct
Vegetation		
Vegetation types	Box-gum woodland, long-leaved box-red stringybark dry shrub/grass forest and riparian river red gum forest.	Box-gum woodland and derived grassland, long-leaved box dry grass forest and broad-leaved peppermint/brittle gum dry grass forest.
Vegetation of conservation significance	**Box gum woodland** Falls into the TSC Act definition of EEC. Three areas would also fall into the EPBC Act definition of CEEC. **Dry grass** Falls in to the TSC Act definition of EEC. One small area would also fall into the EPBC Act definition of CEEC. **Pasture** Where native species are dominant, these areas would fall into the TSC Act definition of EEC (derived from Box Gum Woodland)[15].	**Box gum woodland** The majority of the site belongs to the box-gum woodland EEC listed under the TSC Act, including Yellow Box, Blakely's Red Gum or White Box stands and treeless areas (native pasture) dominated by native grasses. Given their landscape context and floristics, long-leaved box stands have also been included within the EEC. Several areas also qualify under the EPBC Act definition of CEEC on the basis of groundcover diversity or patch size/tree density.
Noxious weeds	Devil's Claw, Paterson's Curse Scotch Thistle, Sweet Briar Blackberry, Serrated Tussock	Paterson's Curse, Horehound Scotch Thistle, St John's Wort Serrated Tussock, Sweet Briar Blackberry, Yellow-flowered Devil's Claw
Threatened or significant species		
Flora	Yass Daisy	Yass Daisy
Fauna	Superb Parrot, Diamond Firetail, Rainbow Bee-eater	Superb Parrot, Speckled Warbler, Diamond Firetail, Rainbow Bee-eater, Satin Flycatcher, Eastern Bent-wing Bat[16]

15 The broad definition of the Act would see much of the Coppabella and Marilba development envelopes designated as low or moderate EEC. No areas without tree cover would be considered high quality at either precinct.

16 Recorded outside of the occupation period of the Wee Jasper maternity cave.

Maps sets

Maps sets included within each Biodiversity Assessment contain the following information:

Flora and fauna survey sites

Ecological communities, vegetation condition and significant flora features

Fauna habitat and significant fauna features

Biodiversity constraints mapping

The size of the precincts necessitates multiple maps per precinct (Coppabella – 9 maps, Marilba – 5 maps) and for this reason they have not been provided in the EA. Please refer to the Appendix 3.1 Coppabella Hills Precinct Biodiversity Assessment (Figures 5.1, 5.6, 6.1, 7.1), the Appendix 3.2 Marilba Hills Precinct Biodiversity Assessment (Map sets 1-4).

7.4.3 Threatened species assessments

Where potential for construction or operation related impact was present, Assessments of Significance, pursuant to NSW and Commonwealth legislation, were undertaken to characterise the significance of the impacts. These included assessments for the following species:

Table 7-6: Listed species with potential for impact

Scientific Name	Common Name	Listing[17]	Coppabella Hills	Marilba Hills
FLORA				
Ammobium craspedioides	Yass Daisy	V, v	x	x
Thesium australe	Austral Toadflax	E, e		x
Caladenia sp *Burrinjuck*	Burrinjuck Spider Orchid	E, e	x	x
Cullen parvum	Small Scurf-pea	E		x
Swainsona sericea	Silky Purple Pea	V		x
ECOLOGICAL COMMUNITIES				
White Box Yellow Box Blakely's Red Gum Woodland (TSC Act) / Yellow Box – White Box- Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (EPBC Act)		EEC, ceec	x	x
FAUNA				
Oxyura australis	Blue-billed Duck	V	x	x
Ardea ibis	Cattle Egret	m	x	
Haliaeetus leucogaster	White-bellied Sea-Eagle	m	x	
Pyrrholaemus saggitatus	Speckled Warbler	V	x	x
Lophoictinia isura	Square-tailed Kite	V	x	x
Stagonopleura guttata	Diamond Firetail	V	x	x
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	x	x
Grantiella picta	Painted Honeyeater	V	x	x
Xanthomyza phrygia	Regent Honeyeater	E, e, m	x	x
Melithreptus gularis gulari	Black-chinned Honeyeater (eastern subspecies)	V		x
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	x	x
Callocephalon fimbriatum	Gang-gang Cockatoo	V	x	x
Lathamus discolor	Swift Parrot	E, e, m	x	x

[17] V: Vulnerable *TSC Act*, E: Endangered *TSC Act*, EEC: Endangered Ecological Community *TSC Act*, v: Vulnerable *EPBC Act*, e: Endangered *EPBC Act*, ceec: Critically Endangered Ecological Community *EPBC Act*

Scientific Name	Common Name	Listing[17]	Coppabella Hills	Marilba Hills
Neophema pulchella	Turquoise Parrot	V	x	x
Polytelis swainsonii	Superb Parrot	E, e	x	x
Ninox connivens	Barking Owl	V	x	x
Hirundapus caudacutus	White-throated Needletail	m	x	
Merops ornatus	Rainbow Bee-eater	m	x	
Petaurus norfolcensis	Squirrel Glider	V	x	x
Phascolarctos cinereus	Koala	V	x	x
Chalinolobus picatus	Little Pied Bat	V	x	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	x	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	x	x
Myotis adversus	Large-footed Myotis	V	x	x
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	x	x
Suta flagellum	Little Whip Snake	V	x	
Aprasia parapulchella	Pink-tailed Worm-lizard	V, v	x	x
Delma impar	Striped Legless Lizard	V, v	x	x

7.4.4 Impact assessment - construction and decommissioning

Habitat removal

Construction and decommissioning impacts at all precincts include direct flora and fauna habitat loss and habitat modification, for the installation of infrastructure. The greatest impact would occur during construction as, during decommissioning, all below ground footings would remain in place.

The proposal would result in the removal of specific areas of vegetation within the development envelope, to install the turbine towers and surrounding hardstand areas, control building, substation, new and widened access tracks, power-line footings for overhead lines and trenches for underground cables. Some of this vegetation would be removed permanently (footings), some would be maintained for easements and some areas would be able to be rehabilitated, post construction.

Indirect impacts

Additional areas would be susceptible to trampling and compaction, increased sedimentation and nutrient input, weed ingress and contamination, due to the operation of large machinery and the disturbance of soils. Fragmentation of habitat, temporary noise, dust and vibration impacts, were also considered as indirect impacts within the biodiversity assessments.

Impact area estimations

Impact area estimations were undertaken to calculate the footprint of the development, within the development envelope, and attribute areas of direct impact to the vegetation types they would occur in. As the development envelope assessment aims to ensure flexibility, the calculation of impact areas must be undertaken on a 'worst case scenario' basis, in order to ensure that impacts are not underestimated.

This has been derived by including the following assumptions:

Native pasture

Pasture derived from box gum woodland within all precincts can fit the definition of an Endangered Ecological Community. The EEC definition under the TSC Act is broad in terms of vegetation structure and condition. It encompasses treeless formations dominated by native grasses, including examples in poor-moderate condition with low forb diversity. The EEC therefore covers a wide range of relative conservation significance. EEC status does not necessarily equate to high conservation value. For example, grazed native pastures derived from box gum woodland dominated by native grasses but with very low native forbs diversity would form part of the EEC. However this vegetation is locally very abundant, is likely to have low natural recovery potential and is considered to have relatively low conservation value.

Crane operation area

The crane operation area takes in the turbine footing, crane hard stand area and additional area required for manoeuvring the turbine blades during assembly. The total area required for crane operation has been assumed to constitute a temporary loss of habitat.

Tracks

The total area of tracks has been assumed to constitute a permanent loss of habitat. It is likely that a considerable amount of this area will overlap existing tracks or will be able to be rehabilitated after the construction phase. However, as existing tracks will require upgrade and the final location may be altered, the total track area has been used in impact area calculations.

Transmission lines

While there is potential to locate underground trenches within roads, this has not been assumed for the purpose of these impact area calculations. As vegetation within overhead power line easements will require maintenance, the entire easement width has been used in impact area calculations. For areas without tree cover however, the impact areas will be very small (limited to posts hole disturbance).

Specific to each precinct and vegetation type, the following impact area estimations have been derived.

Table 7-7 Coppabella Hills maximum impact areas by vegetation type

Coppabella Hills Precinct									
Infrastructure	**Quantity**	**Width (m)**	**Length (m)**	**Area (ha)**	**P**	**BGW**	**DSGF**	**RRGF**	**RO**
Turbine footing [a]	86.00	25.00	25.00	**5.38**	3.63	0.50	0.06	0.00	1.19
Crane hardstand [c]	86.00	22.00	40.00	**7.57**	5.11	0.70	0.09	0.00	1.67
Crane operation area (includes footing and hardstand) [c]	86.00	50.00	50.00	**21.50**	14.50	2.00	0.25	0.00	4.75
Tracks [a]	1.00	8.00	67063.65	**53.65**	42.67	6.95	0.07	0.00	3.96
Underground powerlines onsite [c]	1.00	2.00	21905.29	**4.38**	3.45	0.77	0.03	0.00	0.13
Overhead powerline cabling / easement [b]	1.00	20.00	14517.82	**29.04**	13.27	15.27	0.36	0.14	0.00
Overhead power pole footings [a]	145.18	1.00	1.00	**0.01**	0.01	0.01	0.00	0.00	0.00
Substation and control bldg [a]	3.00	2.00	18330.43	**11.00**	7.14	3.86	0.00	0.00	0.00
Concrete batch plant [c]	1.00	75.00	100.00	**0.75**	0.75	0.00	0.00	0.00	0.00
Construction compound, staging and storage [c]	1.00	300.00	100.00	**3.00**	3.00	0.00	0.00	0.00	0.00
Development envelope (DE)				**2829.10**					
Percentage of DE permanently removed				**2.48**					
Breakdown by impact type:									
a Permanent habitat loss (includes all footings and tracks)				**70.04**	53.44	11.32	0.13	0.00	5.15
b Habitat modification (transmission easement maintenance)				**29.04**	13.27	15.27	0.36	0.14	0.00
c Temporary habitat loss (areas that can be rehabilitated post construction)				**24.26**	18.08	2.27	0.22	0.00	3.69

P: Pasture, BGW: Box Gum Woodland, DSGF: Dry Shrub/Grass Forest, RRGF: Riparian River Red Gum Forest, RO: Rocky Outcrops

Table 7-8 Maximum impact areas on each woodland vegetation condition class and on high and moderate constraint Box Gum Woodland EEC[18].

Calculations are based on the indicative infrastructure layout provided by the Proponent.

Coppabella Hills Precinct							
Woodland vegetation types	**Permanent habitat loss [a] within each condition class**						**Total of each vegetation type within DE**
	Good	**Moderate / good**	**Moderate**	**Poor / moderate**	**Poor**	**Total**	
Box Gum Woodland	0.17	0.17	0.21	2.95	7.84	**11.34**	892.11
Long-leaved Box Dry Grass Forest	0.00	0.04	0.00	0.04	0.06	**0.13**	91.01
Riparian River Red Gum	0.00	0.00	0.00	0.00	0.00	**0.00**	11.27

Coppabella Hills Precinct		
Woodland vegetation types	**Permanent habitat [a] loss within each class**	
	High constraint EEC	**Moderate constraint EEC**
Box Gum Woodland	0.59	2.99
Total area within the DE	**265.24**	**717.88**

[18] Endangered Ecological Community (EEC) Box-Gum Woodland includes both box-gum woodland and long-leaved box dry grass forest treed remnants. EEC of high conservation value are woodland remnants in good, moderate to good, and moderate condition. EEC of moderate conservation value are woodland remnants in poor to moderate and poor condition.

Table 7-9 Marilba Hills maximum impact areas by vegetation type

Marilba Hills Precinct										
Infrastructure	**Quantity**	**Width (m)**	**Length (m)**	**Area (ha)**	**P**	**BGW**	**BGBPF**	**DSTF**	**LBDGF**	**BGWke**
Turbine footing [a]	66.00	25.00	25.00	**4.13**	3.25	0.82	0.06	0.00	0.00	0.00
Crane hardstand [c]	66.00	22.00	40.00	**5.81**	4.58	1.14	0.09	0.00	0.00	0.00
Crane operation area (includes footing and hardstand) [c]	66.00	50.00	50.00	**16.50**	13.00	3.25	0.25	0.00	0.00	0.00
Tracks [a]	1.00	8.00	63834.46	**51.15**	43.80	7.35	0.00	0.00	0.00	0.00
Underground powerlines onsite [c]	1.00	2.00	18330.43	**3.67**	2.92	0.75	0.00	0.00	0.00	0.00
Overhead powerline cabling / easement [b]	1.00	20.00	40031.00	**80.06**	40.52	37.89	0.21	1.44	0.00	0.00
Overhead power pole footings [a]	400.31	1.00	1.00	**0.04**	0.02	0.02	0.00	0.00	0.00	0.00
Substation and control bldg [a]	5.00	150.00	85.00	**6.38**	2.55	3.83	0.00	0.00	0.00	0.00
Concrete batch plant [c]	1.00	75.00	100.00	**0.75**	0.75	0.00	0.00	0.00	0.00	0.00
Construction compound, staging and storage [c]	1.00	300.00	100.00	**3.00**	3.00	0.00	0.00	0.00	0.00	0.00
Development envelope (DE)				**4140.00**						
Percentage of DE permanently removed				**1.49**						
Breakdown by impact type:										
a Permanent habitat loss (includes all footings and tracks)				**61.70**	49.62	12.01	0.06	0.00	0.00	0.00
b Habitat modification (transmission easement maintenance)				**80.06**	40.52	37.89	0.21	1.44	0.00	0.00
c Temporary habitat loss (areas that can be rehabilitated post construction)				**19.79**	16.42	3.18	0.19	0.00	0.00	0.00

P: Pasture, BGW: Box Gum Woodland, BGBPF: Brittle Gum – Broad-leaved Peppermint Forest, DSTF: Dry Shrub – Tussock Grass Forest, LBDGF: Long-leaved Box Dry Grass Forest, BGWke: Box-Gum Woodland – *Kunzea ericoides*

Table 7-10 Marilba Hills maximum impact areas on Box Gum Woodland EEC[19] vegetation based on condition class and constraint level.

Calculations are based on the indicative infrastructure layout provided by the Proponent.

Marilba Hills Precinct						
EEC	**Permanent habitat loss a within each condition class**					
	Good	**Moderate / good**	**Moderate**	**Poor / moderate**	**Poor**	**Total**
Box Gum Woodland	0.29	0.00	1.18	7.84	2.69	12.00

Marilba Hills Precinct			
	Permanent habitat loss [a] within each class		
	High constraint EEC	**Moderate constraint EEC**	**Low constraint EEC**
Box Gum Woodland EEC	1.47	7.84	
Total area within the DE	527.00	1275.00	2182.00

19 Box-Gum Woodland EEC includes both box-gum woodland and long-leaved box dry grass forest remnants. In general terms, poor and poor-moderate condition class EEC without tree cover (native pasture) represent low constraint, poor and poor-moderate classes with tree cover represent moderate constraint, moderate and good condition classes represent high constraint (refer Section 7). Condition classes are defined in section 5.1.2 of the Marilba Hills Precinct Biodiversity Assessment, Appendix 3.2.

For flora and ecological communities, the results of these assessments indicated that impacts to generally poor and poor-moderate condition stands of the EEC White Box - Yellow Box –Blakely's Red Gum Grassy Woodland will occur as a result of the development, but will not be significant in the local context, since degraded remnants of the community are still relatively common in the local area. Stands in moderate-good and good condition would generally be excluded from the development envelope and protected from direct and indirect impacts during the works. Similarly, the core populations of the Yass Daisy and potential habitat for other threatened woodland flora species would be excluded from the development envelope, and the proposal would not produce impacts to these species such that local populations would be placed at risk of extinction.

For fauna at Coppabella Hills and Marilba Hills, the construction of the wind farm would result in the loss of a small area of marginal habitat for threatened woodland bird and reptile species. The habitat affected is generally degraded and woodland habitat in similar condition is relatively abundant in the precinct. Accordingly, it is not considered that there will be significant faunal impacts at either of these two precincts.

The development envelopes have been mapped in terms of constraints within each biodiversity assessment to ensure that construction impacts avoid, then minimise and offset according to the biodiversity values of the precincts. In this way, construction impacts are considered highly manageable.

7.4.5 Impact assessment - operation

Turbine operation impacts

Turbine operation impacts are relevant to fauna, particularly those that are able to forage or disperse within the 'rotor sweep area', within 40-150m above ground. There are two types of risk posed by the operational turbines to fauna.

- Blade-strike and barotrauma: The significance of blade-strike mortalities or injuries such as barotrauma[20] is species-specific. If the species is at low density in the landscape or susceptible to multiple collision events (such as for flocking species), blade-strike may threaten a local population. If the species is a top order predator or key stone species, there may also be ecological ramifications for other species.
- 'Avoidance' behaviour caused by the presence of the turbines and associated infrastructure: Depending on where the turbines are located, this may affect foraging patterns, nesting, roosting or movements around the site. It equates to a loss or modification of habitat and therefore can have resultant impacts on the carrying capacity of the site.

Literature review, risk assessment and assessments of significance were undertaken to characterise the impacts to threatened and significant species. For microbat species, an additional survey and assessment were completed to address this specific issue. High risk was considered to coincide with species that flock in large numbers or are top order predators. Risks are considered manageable for all species, with the implementation of specific mitigation measures set out in Section 8 of each of the biodiversity assessments (Appendix 3.1, 3.2) and Section 5 of the Microbat Study (Appendix 3.4).

[20] Rapid or excessive air-pressure change near moving turbine blades has been linked to bat fatalities as a result of haemorrhaging of the lungs (Baerwald et al. 2008).

Maintenance impacts

Maintenance and monitoring visits would be required, although existing farm and construction tracks would be used and impact on vegetation is expected to be minimal. Access tracks would be maintained to minimise ongoing erosion and sedimentation impacts. The impacts of major repairs would be similar in nature to construction impacts, but more limited in extent. The proposal would produce an ongoing pollution risk from the oil-cooled substation, requiring design measures to ensure that any spill could be contained and treated expeditiously. These impacts are highly manageable.

Cumulative impacts

The biodiversity impacts associated with each precinct have been assessed separately in standalone Biodiversity Assessments for each precinct. Cumulative impacts are considered within each of these assessments. For both precincts, the loss or modification of habitat during construction has been reduced using a constraints mapping methodology, to concentrate infrastructure in areas of least environmental constraint. This acts to reduce the cumulative impact of the proposal.

The key impact of wind farms, with respect to cumulative impacts, is the potential to generate continuing losses of some species with low reproductive rates (such as Wedge-tailed Eagles and Eastern Bentwing Bats), and thereby create a ‘mortality sink’ with potential to affect populations at a regional level (Jonzen et al. 2005). Mitigation strategies are included in this proposal to address this risk.

The impacts of the wind farm on biodiversity values would combine with existing impacts resulting from land clearing, agricultural activities, weeds and hazards. It is important to recognise that the district has experienced extensive losses to ecosystem integrity and stability. Woodland and grassland communities in particular, which coincide with prime agricultural land, and riparian and wetland communities have been heavily impacted. It is likely that many woodland flora and fauna species have become locally extinct, and many are in continuing decline. There is a time lag, or ‘extinction debt’, operating which will mean that decline and extinction will continue for many species for decades to come, regardless of management responses. Further impacts on lowland environments are expected from soil and water salinisation, soil erosion and sedimentation, weed invasion and spread, disruption to river hydrology due to farm dam construction and water extractions and habitat fragmentation and clearing resulting from residential sub-division and building.

To address cumulative biodiversity impacts, this EA includes mitigation measures to reduce impacts on areas of higher conservation significance and to offset the area to be disturbed by the proposal. Offsets are considered to be required, where impacts cannot be avoided, in order to achieve a ‘maintain or improve’ environmental outcome. The approach taken by this assessment is to offset the quantum of habitat loss associated with the proposal, based on the finalised infrastructure layout. The broader environmental benefits of establishing renewable energy sources have not been considered in the assessment or offset plan. Therefore, coupled with measures to offset habitat loss, the contribution of the proposal to reducing the adverse environmental impacts of fossil fuel based electricity generation is anticipated to constitute an overall ‘improve’ outcome.

Offset principles

Offsets are considered to be required, where impacts cannot be avoided, in order to achieve a ‘maintain or improve’ environmental outcome. The approach taken by this assessment is to offset the quantum of habitat loss associated with the proposal, based on the finalised infrastructure layout. The broader environmental benefits of establishing renewable energy sources have not been considered in the assessment or offset plan. Therefore, coupled with measures to offset habitat loss, the contribution of the proposal to reducing the adverse environmental impacts of fossil fuel based electricity generation is anticipated to constitute an overall 'improve' outcome.

Thirteen biodiversity offset principles are outlined in the *Guidelines for Threatened Species Assessment* (DEC and DPI 2005), to ensure that the offsets achieve long-term conservation outcomes. These principles would be addressed in the offset plan, committed to in a Statement of Commitment of the proposal.

There is land available of suitable vegetation type and quality within the site boundaries of the proposal able to be utilised as offsets. The Proponent has identified several sites with a total area in excess of 500Ha, sufficient to offset the worst case scenario for disturbance area (refer to Figure 7-12 and Figure 7-13). The identified area is owned by landowners already involved in the proposal and initial consultation has indicated that an offset program in these areas would be achievable.

No biometric surveying has been done in these areas to calculate offsets. Vegetation type and condition for most of these areas was determined as part of the biodiversity assessments and demonstrates these areas include the vegetation types that would need to be offset.

Specifically, for Coppabella Hills, offset areas are available in Areas 4, 6 and 7 (refer to Figure 3-1 of the Coppabella Hills Biodiversity Assessment). These areas comprise Long-leaved Red Stringybark Dry Grass Forest (good condition) and Box Gum Woodland (areas of poor – moderate, moderate to good condition, good condition). Foraging resources for fauna include hollow-bearing trees in woodland and disturbed woodland and modified wetlands. Impact areas proposed at Coppabella Hills are detailed in Table 7-7 and include Pasture (majority of impact area), Box Gum Woodland, Dry Shrub/Grass Forest and Rocky Outcrops.

Specifically, for Marilba Hills, offset areas are available in Areas 2 and 4 (refer to Figure 3-2 of the Marilba Hills Biodiversity Assessment). These areas comprise Long-leaved Box Dry Grass Forest (moderate condition) and Box Gum Woodland (areas of moderate, moderate to good condition). With reference to fauna, both areas are relatively large woodland areas. Area 2 contains woodland birds including the Superb Parrot, Rainbow Bee-eater and Speckled Warbler. Impact areas proposed at Marilba Hills are detailed in Table 7-9 and include Pasture (majority of impact area), Box Gum Woodland, and a minor amount of Brittle Gum – Broad-leaved Peppermint Forest.

For both precincts, and particularly at Coppabella Hills, the offset areas include poor and good condition Box Gum Woodland EEC. This is considered a good outcome as this offsetting strategy would protect the best areas but also would allow improvement of poor condition areas.

Key thresholds statement

Risk assessments, impact evaluations and assessments of significance were carried out to characterise the significance of potential impacts for the threatened species identified within the Biodiversity Assessments[21]. The following key thresholds statements, provided in accordance with Step 5 of the Threatened Species Guidelines (DEC and DPI 2005), are based on the information in these assessments.

1. Will the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, maintain or improve biodiversity values.
This threshold is most relevant to the construction phase. The infrastructure layouts have been modified to minimise impacts, using a constraints mapping process. Statements of Commitment include measures to

[21] Full risk assessments, evaluations of impact and assessments of significance are included at the end of each biodiversity assessment: Coppabella Hills Precinct Appendices D, E and F of Appendix 3.1 and Marilba Hills Precinct Appendices C, D, E and F of Appendix 3.2.

mitigate specific residual impacts and offset all areas that would be impacted by the proposal. The aim of the offset plan will be to ensure a long-term improvement in biodiversity values, through securing and managing for biodiversity outcomes suitable quantum of native vegetation. This will ensure improved biodiversity values at the local scale. Coupled with the contribution of the proposal to the long-term reduction in greenhouse gas emitting electricity sources, the proposal will result in a net gain in biodiversity values.

2. Is the proposal likely to reduce the long-term viability of a local population of the species, population or ecological community

This threshold is most relevant to the operational phase, where collisions may pose a population level risk to some species. Assessments of significance have been used to characterise the impacts to threatened species at risk of adverse impact. Where uncertainty exists, mitigation measures have been committed to which would address the risk to long-term viability of a local population of the species, population or ecological community. For collision risks, an adaptive management monitoring program would be developed to ensure that turbine operation does not pose undue risks and that exceedences are responded to. In some instances, mitigation takes the form of further research or survey prior to turbine construction.

3. Whether or not the proposal is likely to accelerate the extinction of a species, population or ecological community or place it at risk of extinction.

In addressing point 2 above, through the effective implementation of the Statements of Commitment, the proposal would ensure that no species, population or ecological community is placed at accelerated risk of extinction.

4. Whether or not the proposal will adversely affect critical habitat.

No areas of critical habitat have been declared within the district.

Further work

The requirement for further surveying work to be undertaken at both Coppabella and Marilba Hills precincts have been identified, targeting areas where hollow-bearing trees may be removed and where threatened species may occur. It is planned that additional survey work would be conducted during spring 2009. This additional work would include a determination of the importance of habitat provided by hollow bearing trees to threatened species. It would also include, targeted searches for Burrinjuck Spider Orchid and threatened grassy woodland species would be undertaken in areas of potential habitat where impacts could not be avoided. The aim of this work is to provide more rigour to the assumptions of the biodiversity assessment. The results would be incorporated into the Submissions Report.

Conclusion

Measures to address identified construction and operational impacts of the proposal have been incorporated into the Statements of Commitment to ensure the project would be managed to avoid a significant impact to any species, population or endangered community. Specifically, the proposal is well able to be managed to have a low impact on flora and fauna values at Coppabella Hills and Marilba Hills Precincts.

With the measures discussed below, the proposal now reflects the biodiversity values of the precincts and is considered able to meet the requirement to maintain or improve biodiversity values.

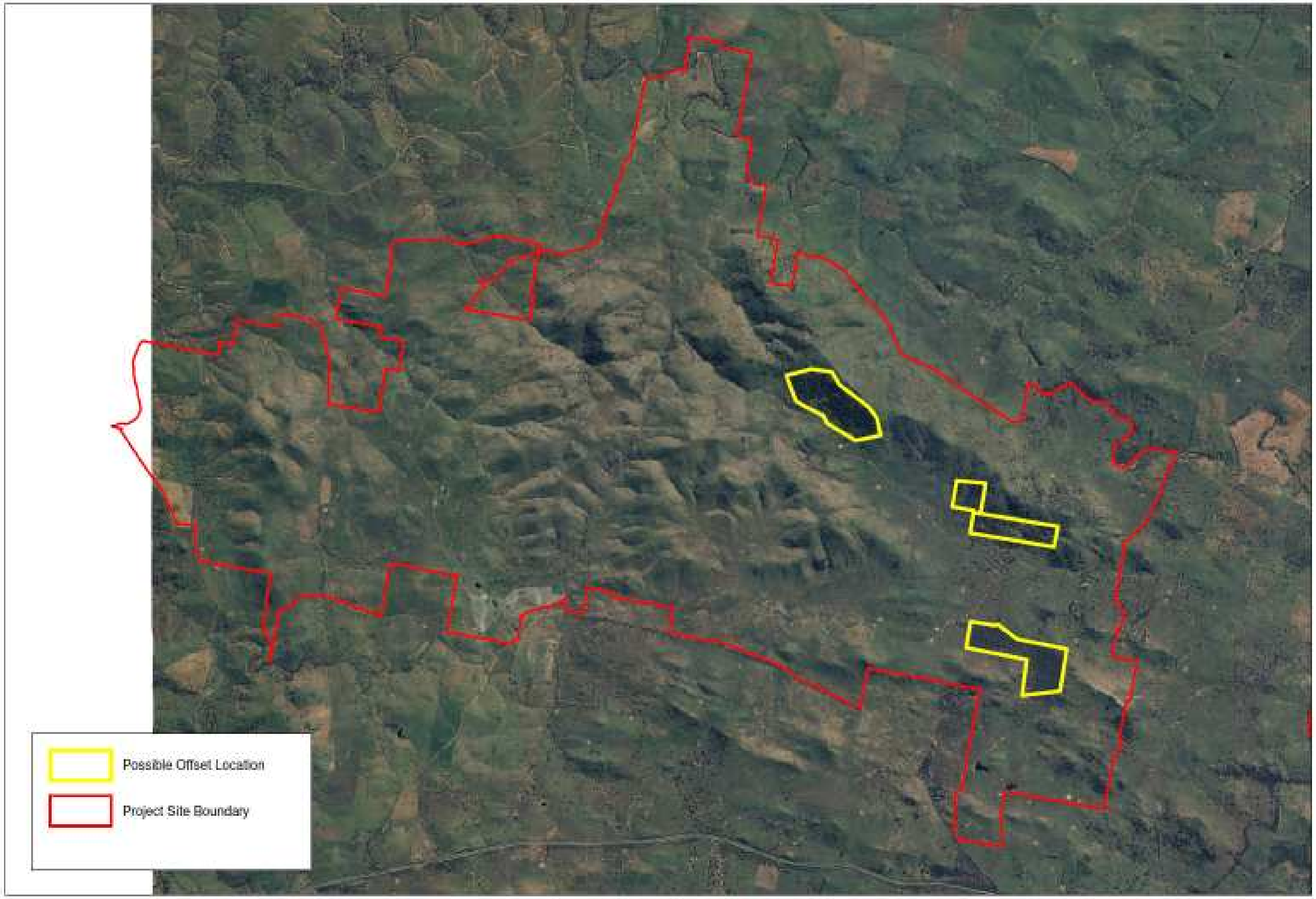


Figure 7-12 Options for offsetting: Coppabella Hills Precinct

Areas within the site boundaries identified as suitable and feasible to provide offsets for areas of habitat that would be removed by the proposal.

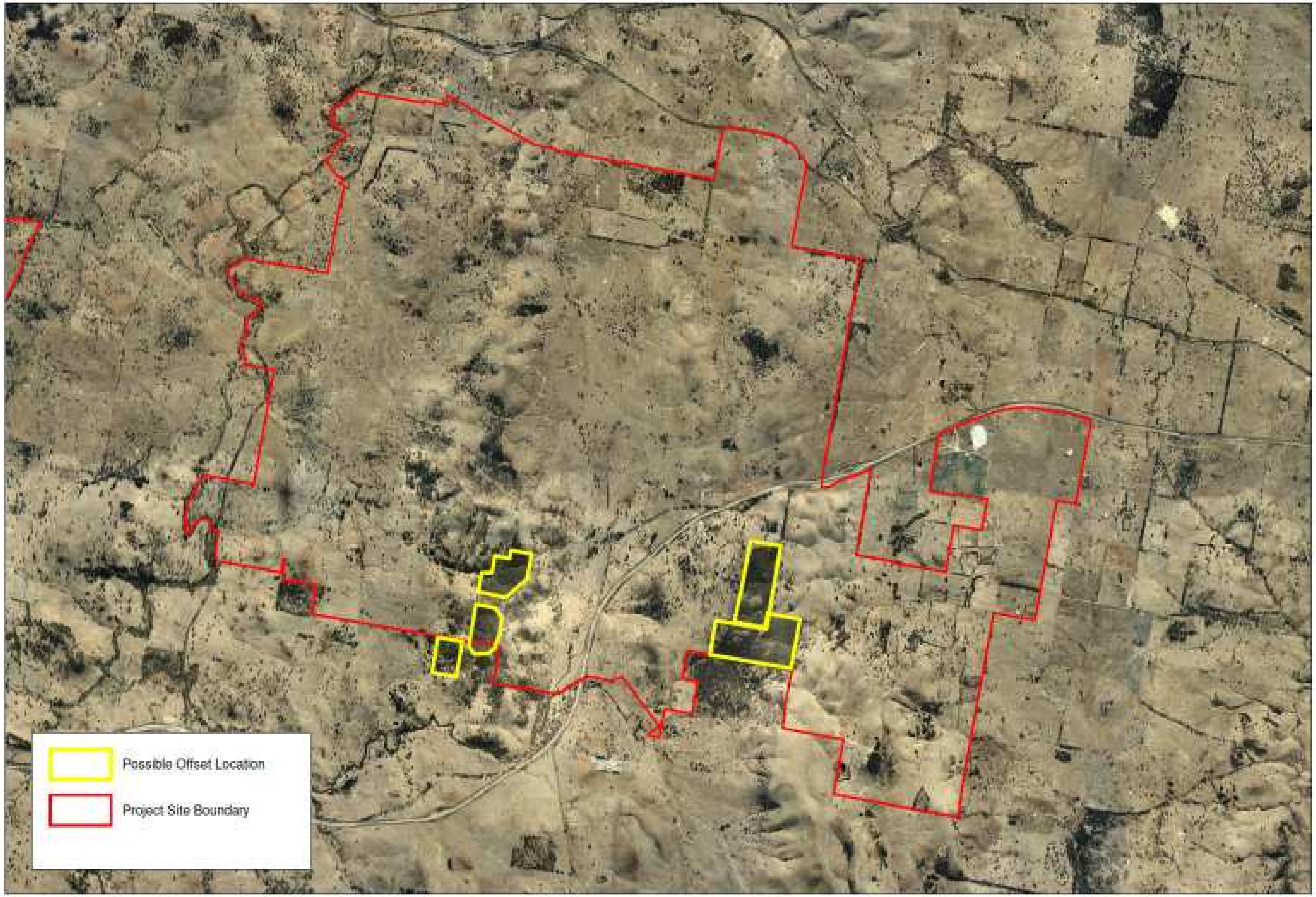


Figure 7-13 Options for offsetting: Marilba Hills Precinct

Areas within the site boundaries identified as suitable and feasible to provide offsets for areas of habitat that would be removed by the proposal.

7.4.6 Mitigation Measures

Recommendations within the biodiversity assessments centre on management specific to constraints zones (high, moderate and low) as well as habitat and species-specific measures. As three different Biodiversity Assessments were undertaken, in come areas the Statements of Commitment refer to these documents for additional detail.

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[22]	Coppabella Hills	Marilba Hills
11	Loss or modification of habitat	Avoid, minimise, offset	All infrastructure would be sited entirely within the development envelope assessed in the Biodiversity Assessments. Where this is not possible, additional assessment would be undertaken and the appropriate approval would be sought (ie. variation to Conditions of Approval).	Detailed design of infrastructure layout	CEMP	x	x
12	Loss or modification of habitat	Avoid, minimise, offset	All infrastructure would be sited to avoid high constraint areas (including high constraint habitat features) and minimise impacts in moderate constraint areas. These areas are identified within Appendix 3.1 of the Coppabella Hills Precinct Biodiversity Assessment (Figure 7.1), and Appendix 3.2 of the Marilba Hills Precinct Biodiversity Assessment (Map set 4).	Detailed design of infrastructure layout	CEMP	x	x
13	Loss or modification of habitat	Avoid, minimise, offset	Where high constraint areas cannot be avoided, micrositing of infrastructure would be undertaken with input from an ecologist, to minimise impacts (includes road widening and transmission easement).	Detailed design of infrastructure layout	CEMP	x	x

[22] The Construction and Operation Environmental Management Plans (CEMP and OEMP) are documents submitted to Dept. Planning prior to construction and operation. Incorporation of these commitments within these management plans allows each commitment to be auditable.

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[22]	Coppabella Hills	Marilba Hills
14	Loss or modification of habitat	Avoid, minimise, offset	Where hollow-bearing trees cannot be avoided, nest boxes would be installed to replace this resource. This measure is considered supplementary to offsets that would also take into account the removal of hollows.	Detailed design of infrastructure layout	CEMP	x	x
15	Loss or modification of habitat	Avoid, minimise, offset	Works should be sited outside known Yass Daisy population areas and Commonwealth-listed CEEC areas identified in Appendix 3.1 Coppabella Hills Precinct Biodiversity Assessment (Figure 5.6), and Appendix 3.2 Marilba Hills Precinct Biodiversity Assessment (Map set 2).	Detailed design of infrastructure layout	CEMP	x	x
16	Loss or modification of habitat	Avoid, minimise, offset	Where rocks and boulders cannot be avoided, they would be placed directly adjacent to the works area to preserve the availability of refuge.	Construction	CEMP	x	x
17	Loss or modification of habitat	Avoid, minimise, offset	Should dams be required to be removed during site development, alternative watering points would be established to compensate for their loss, where practical and with the agreement of the landowner.	Construction	CEMP	x	x
18	Loss or modification of habitat	Avoid, minimise, offset	Additional targeted surveys would be undertaken, if the identified areas would be impacted by the proposal. These areas include: **Coppabella Hills** • Hollow-bearing trees targeted for removal. **Marilba Hills** • Burrinjuck Spider Orchid, undertaken in mid-October, where the dry forest remnant in the far south of Cluster 7 would be impacted by the proposed works. • Threatened grassy woodland species, undertaken in Spring, if the secondary grassland on the south-western side of Cluster 7 would be substantially impacted.	Detailed design of infrastructure layout	CEMP	x	x

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[22]	Coppabella Hills	Mariba Hills
19	Loss or modification of habitat	Avoid, minimise, offset	Contractors and staff would be made aware of the significance and sensitivity of the constraints identified in the Biodiversity Assessment constraint map set for each precinct during the site induction process.	Construction	CEMP	x	x
20	Loss or modification of habitat	Avoid, minimise, offset	A buffer twice the distance of the tree drip-line would be established in sensitive areas identified in the Biodiversity Assessment constraint map set for each precinct to ensure indirect impacts (such as compaction, noise and dust) are minimised where practical..	Construction	CEMP	x	x
21	Loss or modification of habitat	Avoid, minimise, offset	The Proponent would commit to preparing and implementing an Offset Plan, to offset the quantum and condition of native vegetation to be removed, in order to achieve a positive net environmental outcome for the proposal. Offset areas would reflect the actual footprint of the final layout (ie footing areas and new tracks) not the maximum impact areas included in Table 7-7 and Table 7-9 (which include easements and existing tracks). The Offset Plan would be prepared in consultation with DECC, prior to construction.	Prior to construction	CEMP	x	x
22	Loss or modification of habitat	Avoid, minimise, offset	An adaptive Bird and Bat Monitoring Program would be developed prior to construction and would include the collection of baseline (pre-operation) as well as operational monitoring data.	Prior to construction	CEMP, OEMP	x	x
23	Loss or modification of habitat	Avoid, minimise, offset	A Biodiversity Management Plan would be prepared within the CEMP to document the implementation of biodiversity measures, sourcing the Biodiversity Assessments prepared for each precinct for area-specific measures. This would include construction and operational activities.	Prior to construction	CEMP	x	x
24	Loss or modification of habitat	Avoid, minimise, offset	An EPBC referral would be submitted to determine whether the proposal constitutes a 'controlled action' under the meaning of the *Environment Protection and Biodiversity Conservation Act 1999.*	Detailed design of infrastructure layout	CEMP	x	x

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[22]	Coppabella Hills	Marilba Hills
25	Loss or modification of habitat	Avoid, minimise, offset	A flora and fauna assessment would be undertaken prior to decommissioning to identify biodiversity constraints and develop specific impact mitigation measures.	Decommissioning	OEMP	x	x

7.5 MITCHELL LANDSCAPES

7.5.1 Existing environment

Mitchell Landscapes are an ecosystem classification system which provides an overview of geology, geomorphology, topography, soils and geodiversity for bioregions within NSW. Data exists on the level of modification (such as clearing) that has occurred within the Mitchell Landscape mapping units and in this way the significance of further impact can be evaluated. For example, a Mitchell Landscape which has been over 70% cleared since European settlement would be considered significant; further clearing within this landscape may have ecological implications for the bioregion. This data is used by Catchment Management Authorities within NSW.

Five Mitchell landscapes occur within the development envelopes of the two precincts, Table 7-11. As the precincts occur within the Murrumbidgee Catchment Management Authority (CMA), it is the percentage cleared since European settlement within this CMA that is significant. As can be seen, all five landscapes are considered significant, having been extensively modified (84-91% cleared) since European settlement.

Table 7-11 Mitchell Landscapes within the development envelopes of Coppabella Hills and Marilba Hills

Mitchell Landscape	% cleared since European settlement within the Murrumbidgee CMA [23]	Coppabella Hills Precinct (Ha)	Marilba Hills Precinct (Ha)
Boorowa Volcanics	90	2101.09	687.19
Young Hills and Slopes	91	2.13	-
Murrumbidgee - Tarcutta Channels and Floodplains	95	39.44	-
Marilba Range	84	-	1888.74
Burrinjuck Ridges	89	-	344.51

Although not statutorily required for Part 3A Major Projects, the *Native Vegetation Act 2003* states that vegetation in moderate to good condition (as determined by the Environmental Outcomes Assessment Methodology - EOAM) within overcleared Mitchell landscapes is not permitted to be cleared. Although this Act does not apply to Part 3A developments, an appropriate goal of the Proposal should be to avoid or minimise impacts within these overcleared vegetation types.

[23] Source: 'revised percent cleared' as stated in the DECC BioMetric: Terrestrial Biodiversity Tool for the NSW Property Vegetation Planning System Website, http://www.environment.nsw.gov.au/projects/BiometricTool.htm

7.5.2 Impact assessment - construction and decommissioning impacts

Impact types, extent and vegetation condition have been discussed in Section 7.4. Loss of native vegetation and degradation of native vegetation are the key potential impacts of the construction phase.

A discrete development footprint is proposed, relative to the site boundaries and development envelopes. Approximately 2.48% of the Coppabella Hills Precinct development envelope and 1.49% of the Marilba Hills Precinct development envelope would be directly and permanently affected by the Proposal.

Constraints mapping has been undertaken as part of the Biodiversity Assessments (presented in Appendix 3.1 Coppabella Hills Precinct Biodiversity Assessment (Figure 7.1), and Appendix 3.2 Marilba Hills Precinct Biodiversity Assessment (Map set 4) to ensure that infrastructure placement is sensitive to the type and condition of existing native vegetation. In general, low constraint zones have been cleared and modified by long histories of grazing, resulting in native vegetation of relatively low conservation value. Vegetation of better quality or conservation significance has been mapped as a moderate constraint and mitigation measures developed to minimise impacts. High constraint areas represent moderate to good condition Endangered Ecological Communities (EECs) or areas with potential for quality threatened species habitat and these areas would be avoided (discussed in detail in Section 7.4 Flora and Fauna).

The potential for degradation of native vegetation through indirect or secondary impacts of construction is readily managed. Erosion, sediment and weed controls are set out in Sections 7.4 Flora and Fauna, 8.1 Hydrology and 8.2 Soils and Landforms. No additional mitigation measures are considered to be required, specific to Mitchell Landscapes.

Decommissioning of the wind turbines would involve similar impact types to the construction phase. A reduced level of impact is anticipated however, as all below-ground structures (footings, concrete slabs, underground cabling) would remain *insitu* reducing the amount of excavation required and associated environmental impacts to native vegetation, water and soils and landforms. No additional mitigation measures are considered to be required, specific to Mitchell Landscapes.

7.5.3 Impact assessment - operation

No additional mitigation impacts or mitigation measures are considered to be required, specific to Mitchell Landscapes, for the operational phase of the development.

7.6 ABORIGINAL ARCHAEOLOGY

7.6.1 Approach

New South Wales Archaeology Pty Ltd has undertaken an Indigenous archaeological and heritage assessment of the proposed Yass Valley Wind Farm, Appendix 4. This assessment has been conducted in accordance with the consultation process as outlined in the Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants (NSW DEC 2004). The field survey and assessment has been undertaken with representatives from Buru Ngunawal Aboriginal Corporation, Young Local Aboriginal Land Council, and Onerwal Local Aboriginal Land Council.

The study has sought to identify and record Aboriginal objects, to assess the archaeological potential of the landform elements and to formulate management recommendations based on the results of background research, a field survey and significance assessment.

The investigation has included a literature review, field survey and analysis of results. Field work was undertaken over an 18 day period[24] in December 2008 and February 2009. A landscape based approach has been implemented during this study; the proposal area has been divided into a number of Survey Units each of which has been defined on the basis of a landform morphological type. Survey Units are utilised as a framework of recording, analysis and the formulation of management and mitigation strategies.

The New South Wales DECC (formerly National Parks and Wildlife Service) has prepared a draft document which provides a series of guidelines regarding the assessment and management of Aboriginal cultural heritage in New South Wales. This report has been prepared in accordance with these draft guidelines (NSW NPWS 1997).

Additionally the study has been conducted in accordance with the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW DEC July 2005). The Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation have been prepared specifically for development applications assessed under Part 3A of the Environmental Planning and Assessment Act 1979.

The archaeological and heritage report documents the following:

- The Aboriginal consultation process undertaken for the project and the involvement in the project of the Aboriginal community
- A description of the proposal and whether or not it has the potential to result in impacts to Aboriginal cultural heritage
- A description of the impact history of the proposal area
- The methodology implemented during the study
- The landscape and natural resources of the study area in order to establish background parameters
- A review of archaeological and relevant literature and heritage listings on the NSW DECC Aboriginal Heritage Information Management System
- A synthesis of local and regional archaeology
- A predictive model of Aboriginal object type and location relevant to the proposal area
- The cultural and archaeological sensitivity of the landforms subject to proposed impacts
- A review of Non-Indigenous history of the proposal area and the results of relevant heritage database searches
- The field survey results
- The significance of Aboriginal objects
- An assessment of the impact of the proposal on Aboriginal objects and places
- A description and justification of the proposed outcomes and alternatives and

[24] Field work included the assessment of the Carrolls Ridge Precinct, not discussed further within this Environmental Assessment.

- A series of recommendations relating to management and mitigation based on the results of the investigation
- A description and justification of the proposed outcomes and alternatives
- A series of recommendations relating to management and mitigation based on the results of the investigation.

7.6.2 Existing Environment

A review of previous investigations in the area has been undertaken in order to define the existing information relating to Indigenous archaeology and heritage and to provide an analytical context to the assessment. This information is reviewed in Section 7 of the archaeology and heritage report (presented in Appendix 4 of this EA).

Searches of the New South Wales Department of Environment and Climate Change (the NSW DECC) Aboriginal Heritage Information Management System (AHIMS) have indicated that there are no previously recorded sites located within the proposed impact areas (AHIMS #23853; #23852; #23851: 1st October 2008).

> **Coppabella Hills:** The search area measured 221 km² and encompassed eastings: 631000 – 648000, and northings: 6149000 – 6162000. No previously recorded sites are listed on AHIMS for this area.
>
> **Marilba Hills:** The search area measured 156 km² and encompassed eastings: 650000 – 663000, and northings: 6144000 – 6156000. 17 previously recorded Aboriginal objects are listed on AHIMS for this area, none of which are located within the proposal area.

While there are no previously recorded Aboriginal objects in the proposal area, the AHIMS register only includes sites which have been reported to NSW DECC. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal sites situated within the local area. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. It can be expected that sites will be present within the proposal area but that to date they have not been recorded and/or reported to NSW DECC.

There have been no previous archaeological studies conducted within the proposal area itself and few have been undertaken within the immediate local area. The construction of a relevant predictive model of Aboriginal site type and location is therefore based on a review of research conducted across the broader region. This review suggests that the most common Aboriginal object recordings in the region are distributions of stone artefacts. In the region a general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. Higher artefact density sites are located near to permanent water sources and low density artefact distributions are found elsewhere. Rare site types include rock shelters, scarred trees, quarry and procurement sites, burials, stone arrangements, carved trees, contact sites and traditional story or other ceremonial places. A detailed predictive model of Aboriginal object type and location is set out in Section 7 of the archaeological and heritage report.

The proposal area can be characterised as a woodland resource zone. The hills would have possessed limited biodiversity and a general lack of water; accordingly they are likely to have been utilised by Aboriginal people for a limited range of activities which may have included hunting and gathering, travel through country and possibly ceremonial. Such activities are likely to have resulted in low levels of artefact discard. Given the often steeply undulating nature of the hill crests, artefacts are likely to be located in spatially discrete areas such as knolls or saddles, rather than being continuous in distribution.

The nature of stone artefacts discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity.

By comparison the valleys between the hills are likely to have possessed greater levels of biodiversity given the likely presence of chains of ponds and possibly also swamp features along drainage lines; in addition a more reliable source of water is likely to have been present in valleys for much of the year. Such areas are likely to have been utilised more frequently and possibly by greater numbers of individuals at any one time; certainly the valleys are likely to have been the favoured camp locations while people utilised the broader local area. Accordingly the levels of artefact discard in valleys can be predicted to be correspondingly higher; artefact diversity and complexity is also likely to be greater.

The results of the archaeological assessment conducted in each of the three precincts is summarised below.

Coppabella Hills

The Coppabella Hills development area has been divided into 24 Survey Units. The Coppabella Hills development envelope surveyed during this assessment measured approximately 458 hectares in area. It is estimated that approximately 207 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have measured 46 hectares in area. Of that ground exposure area archaeological visibility is estimated to have been 31 hectares. Effective Survey Coverage is therefore relatively high and calculated to have been 6.9% of the surveyed area.

A total of 70 Aboriginal object locales were recorded. Artefacts were recorded in all Survey Units except SU4, SU8, SU10, SU12, SU13, SU14 and SU22, all of which are assessed to be of low archaeological potential on environmental grounds. Artefacts were recorded along the majority of crests in which turbines are proposed; the majority of locales contain either single or otherwise very few artefacts. Given the relatively large areas of exposure, and the very few artefacts recorded, it is concluded that artefact density, is very low generally in the Coppabella Hills proposal area.

Several Survey Units and locales within some Survey Units have been predicted to contain subsurface artefacts in low/moderate density including several ridge saddles, a large upland basin and the valleys.

Marilba Hills

The Marilba Hills development area has been divided into 33 Survey Units. The Marilba Hills development envelope surveyed during this assessment measured approximately 488 hectares in area. It is estimated that approximately 301 hectares of that area was subject to survey inspection. Ground exposures inspected are estimated to have been 16 hectares in area. Of that ground exposure area archaeological visibility is estimated to have been 13 hectares. Effective Survey Coverage is therefore calculated to have been 2.7% of the surveyed area. The presence of thick grass cover at Marilba accounts for the lower effective survey coverage in Marilba Hills compared to the other precincts.

A total of 31 Aboriginal object locales were recorded in 15 of the Marilba Survey Units. It is recognised that Effective Survey Coverage was very low across the Marilba study area. Nevertheless the majority of Survey Units in which artefacts were not recorded are assessed to be of low archaeological potential on environmental grounds. Artefacts were recorded along many of the crests in which turbines are proposed. The majority of locales contain either single or otherwise very few artefacts. Given the very few artefacts recorded, it is concluded that artefact density, generally is very low in the Marilba Hills proposal area. Several exceptions to this trend have however been identified. Several Survey Units and locales within some Survey Units have been predicted to contain subsurface artefacts in low/moderate density including several ridge saddles, and the valleys.

7.6.3 Impact assessment – construction and decommissioning

As noted above the majority of the Aboriginal object locales recorded in the proposal area are low or very low density stone artefact distributions; these are assessed to be of low archaeological significance. In addition however a number of Aboriginal object locales have been identified which are assessed to be of low/moderate or moderate archaeological significance.

The construction of the Yass Valley Wind Farm will result in substantial physical impacts to any Aboriginal objects which may be located within direct impact areas - irrespective of their archaeological significance. That is, any Aboriginal object situated within an area of direct impact will be comprehensively disturbed, and/or destroyed during construction.

As with any development the chances of impacting Aboriginal objects, particularly stone artefacts, is high given that they are present in a continuum across the landscape and located on or within ground surfaces. Yass Valley Wind Farm is no exception in this regard and it would be impossible to have a development of this nature without causing direct physical impact.

However in regard to the majority of Aboriginal object locales such as artefact scatters assessed to be of low significance, the impacts can be viewed as being of correspondingly low significance. On the other hand, impacts to any object locales which are assessed to be of higher archaeological significance can be viewed as being of correspondingly higher significance. This assessment forms the basis for the formulation of management strategies which aim to mitigate impacts.

The Survey Units and Aboriginal object locales recorded in the proposal area do not surpass scientific significance thresholds which would act to preclude the construction of the proposed wind farm. Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, and the results of the study, it is concluded that the proposed impact areas do not warrant further investigation such as subsurface test excavation. The environmental contexts in which the turbines (and associated impacts) are proposed contain eroded and disturbed soils as a result of high levels of environmental degradation; generally these soils have low potential to contain intact and/or stratified archaeological deposit. Furthermore, the majority of the proposed impact areas are not predicted to contain artefact density sufficient to warrant test excavation. It is considered that subsurface testing is unlikely to produce results, different to predictions made in respect of the archaeological potential of the landforms in question.

Given the nature and density of the majority of artefact locales recorded in the proposal area and the generally low scientific significance rating they have been accorded, unmitigated impact is considered appropriate; a strategy of impact avoidance is not warranted in regard to these locales.

However several Aboriginal object locales are assessed to be of low/moderate or moderate archaeological significance. Accordingly it is generally recommended that limiting the extent of impacts to these locales, if at all feasible, should be given consideration.

As a form of mitigation of overall construction impact to the archaeological resource within the proposal area it is proposed that a reasonably detailed and broad scale research program of archaeological excavation and analysis be undertaken within a sample of the proposed impact areas prior to construction. This is justified for some Survey Units on ridge tops which are assessed to be of low archaeological significance, as excavation opportunities in these areas rare and therefore of increased significance. It is justified in Survey Units assessed to be of low /moderate or moderate archaeological significance in areas where the proposal is unable to limit the extent of impacts (limiting the extent of impacts has been recommended as a first course of action, where this is feasible).

The rationale for including individual survey units within the broad scale research program is given in Section 12.1 and Section 12.2 of the Archaeology Assessment, in Tables 19, 20 and 21 (Appendix 4 of this EA). The rationale considers both predicted artefact density and the elevated significance of these Survey Units (greater than low significance). In committing to this program, the Proponent addresses the large area of impact of the proposal (and the concomitant extent of impacts to the archaeological resource), the large degree of impact that excavation has on the archaeological resource directly within the development footprint, and the paucity of detailed archaeological information currently available in the region.

Detailed management and mitigation strategies are outlined and justified in Section 12 of the archaeology and heritage report Appendix 4; they are outlined below in summary form:

- No Survey Units have been identified in the proposal area to warrant further archaeological investigation such as subsurface test excavation; the Effective Survey Coverage achieved during the field survey was relatively high and can be considered to have been generally adequate for the purposes of determining the archaeological status of the proposed impact areas.
- None of the Survey Units in the proposal area have been assessed to surpass archaeological significance thresholds which would act to entirely preclude proposed impacts.
- The majority of the Aboriginal object locales recorded are very low or low density distributions of stone artefacts. The archaeological significance of these locales is assessed to be low. Accordingly a management strategy of unmitigated impact is considered to be appropriate.
- Many of the Aboriginal object locales and/or discrete areas within Survey Units are assessed to be of low/moderate or moderate archaeological significance. Accordingly, in regard to these areas it is generally recommended that limiting the extent of impacts to these locales, if at all feasible, should be given consideration.
- In regard to these locales it is recommended that a research program of sub-surface excavation be undertaken as a form of Impact Mitigation. This would be incorporated within a broader research program proposed.
- As a form of mitigation of overall construction impact to the archaeological resource within the proposal area it is proposed that a program of archaeological salvage excavation and analysis be undertaken in a sample of impact areas prior to construction as defined in Tables 19, 20 and 21 in section 12 of the archaeology report.
- The development of an appropriate research project should be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Conservation and Climate Change.
- It is recommended that additional archaeological assessment is conducted in any areas which are proposed for impacts that have not been surveyed during the current assessment. It is predicted that significant Aboriginal objects can occur anywhere in the landscape and accordingly if present they need to be identified and impact mitigation strategies implemented prior to impacts.
- The Proponent should, in consultation with an archaeologist, develop a Cultural Heritage Management Protocol, which documents the procedures to be followed for impact avoidance or mitigation. The development of an appropriate Cultural Heritage Management Protocol should be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Conservation and Climate Change.

- Personnel involved in the construction and management phases of the project should be trained in procedures to implement recommendation relating to cultural heritage where necessary.

7.6.4 Impact assessment - operation

It is considered unlikely that there would be any impact to Indigenous sites during the operation of the wind farm.

7.6.5 Mitigation Measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
26	Unavoidable disturbance to Aboriginal objects (stone artefacts) located in generally continuous albeit low density distribution across the proposal area.	Mitigate disturbance	A salvage program of archaeological excavation and analysis would be undertaken in a sample of impact areas prior to construction. The development of an appropriate research project would be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Conservation and Climate Change.	Construction and decommissioning	CEMP	x	x
27	Disturbance to an Aboriginal object of low/moderate or moderate significance	Minimise disturbance	The Proponent would minimise the extent of impacts to areas assessed to be of low/moderate or moderate archaeological significance, where possible. A program of salvage subsurface excavation would be undertaken in impact areas at these locales prior to construction as a form of Impact Mitigation. The scope of this program is provided in Tables 19, 20 and 21 of Section 12 of the Archaeological Assessment, which identify the survey units that would be targeted in the program.	Construction and decommissioning	CEMP	x	x
28	Disturbance to an unidentified Aboriginal object	Minimise risk	The Proponent would conduct additional archaeological assessment in any areas which are proposed for impacts that have not been surveyed during the current assessment.	Construction and decommissioning	CEMP	x	x
29	Inadvertent impacts to Aboriginal objects	Minimise risk	The Proponent would develop a Cultural Heritage Management Protocol which documents the procedures to be followed for minimising risk and implementing mitigation strategies. This would be	Construction and decommissioning	CEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Conservation and Climate Change.				

7.7 AIRCRAFT HAZARD IMPACTS

7.7.1 Approach

The development of the Coppabella Hills and Marilba Hills Precincts of the Yass Valley Wind Farm would involve the construction of up to 152 wind turbines, each with a height of up to 150 meters to the blade tip. Due to the height of the wind turbines, potential impacts to aviation safety have been assessed for the construction, decommissioning and operational phases of the wind farm. The air safety issues that have been considered for the proposed wind farm include:

- Proximity of the proposed wind farm to landing fields
- Potential intrusion into air traffic zones and regulatory requirements
- Potential effects on activities such as use of private landing strips.

7.7.2 Existing Environment

Landing fields are classified according to whether instrument landings are available. The nearest airfield to the wind farm site providing instrument landings is the Canberra International Airport. Canberra Airport is approximately 60 km southeast of the proposed wind farm site and as a result Civil Aviation Safety Authority (CASA) has advised that there are no regulated aerodromes within the vicinity of the proposed wind farm. CASA advised that the Obstacle Limitation Surfaces reach a distance of 15 km from the field. The Obstacle Limitation Surfaces (OLS) are conceptual surfaces associated with a runway, which identify the lower limits of the aerodrome airspace above which objects become obstacles to aircraft operations and must be reported to CASA.

Due to the current land use of the proposed wind farm site, potential impacts to aerial spraying of agricultural areas are considered negligible.

Airservices Australia was notified on 17 July, 2008 in relation to the Proposal. A preliminary high level assessment of the Proposal was carried out and at the time, the Proponent was advised that there were radar links in the vicinity of the wind farm and that there was the potential to impact the navigational aid systems. Airservices were unable to provide specific details regarding the number of turbines in question. The Proponent will continue to work with Airservices to resolve any issues associated with the navigational aid systems and intends to engage a consultant to conduct a detailed investigation. Full details are provided in the Communication Impact Assessment (Appendix 5).

The Department of Defence was notified in writing on 17 July, 2008 in relation to the Proposal. A response from Mr John Kerwan of the Department of Defence dated 5 August 2008 was sent to the Proponent.

The letter stated that the Department of Defence had conducted a preliminary assessment with regard to the possible impact of the Coppabella Hills, Marilba Hills & Carrolls Ridge Precincts (the Yass Valley Wind Farm) on military aircraft operations, radio communications and the operation of navigational aids and radars. The Department of Defence advised that the proposed development will be outside any areas affected by the Defence (Areas Control) Regulations (DACR). The DACR control the height of objects (both manmade structures and vegetation) and the purpose for which they may be used within approximately 15 km radius of Defence airfields. In addition, the Proposal has been assessed as unlikely to affect existing Defence communications within the region.

7.7.3 Impact Assessment - construction and decommissioning phases

The physical placement of turbines on the site is the cause of the potential for air hazard impacts. As turbines are installed in the construction phase, mitigation of this impact must be undertaken prior to the construction of the wind turbines.

CASA guidelines for aviation warning lighting for a group of wind turbines are currently being reviewed and Advisory Circular 1390-18(0) has been withdrawn by CASA. At the time of writing this Environmental Assessment there are currently no requirements for aviation obstacle lighting, however, it is understood that the new CASA guidelines may require the project to install such lighting.

The (withdrawn) advisory circular defined that interval between turbines and obstacle beacons should not exceed 900m. Accordingly, if it is considered by CASA or and independent consultant that the project is likely to be a hazard to aircraft, it is expected that up to 40 turbines in the proposed project may require aircraft warning lights. Requirements would be discussed with CASA once the final turbine layout is selected however it is assumed that aviation warning lighting will be required in accordance with CASA guidelines and therefore the impacts have been assessed in the Visual Impact Assessment of this EA. Accordingly, if CASA considers that the project is likely to be a hazard to aircraft, the Proponent would liaise with CASA to determine the appropriate number, location and type of aircraft warning beacons to be fitted on wind turbines prior to the commencement of construction.

The Royal Australian Air Force (RAAF AIS) has requested that the Proponent supply location and height details once the final position of the wind turbines have been determined and before construction commences. After construction is complete, the Department of Defence requests that the Proponent provide RAAF AIS with ‘as constructed’ details for the wind turbines, wind monitoring masts and electricity transmission lines if applicable.

Subject to the conditions stated in the letter (consultation with CASA in relation to Obstacle Marking and provision of location and height details to RAAF AIS) the Department of Defence has no objection to the proposed wind farm.

The minor, private airstrips in the local area rely on visual rather than instrument-based landings and, as the turbines are clearly visible structures, it is considered unlikely that the development would pose any additional hazard to the users of these airstrips. The location of these airstrips in relation to the Proposal is presented in Figure 7-14. There are no certified or registered airstrips in the vicinity of the proposal.

7.7.4 Impact Assessment - operation

No additional impacts other than those discussed and addressed above are specifically related to the operational phase of the project.

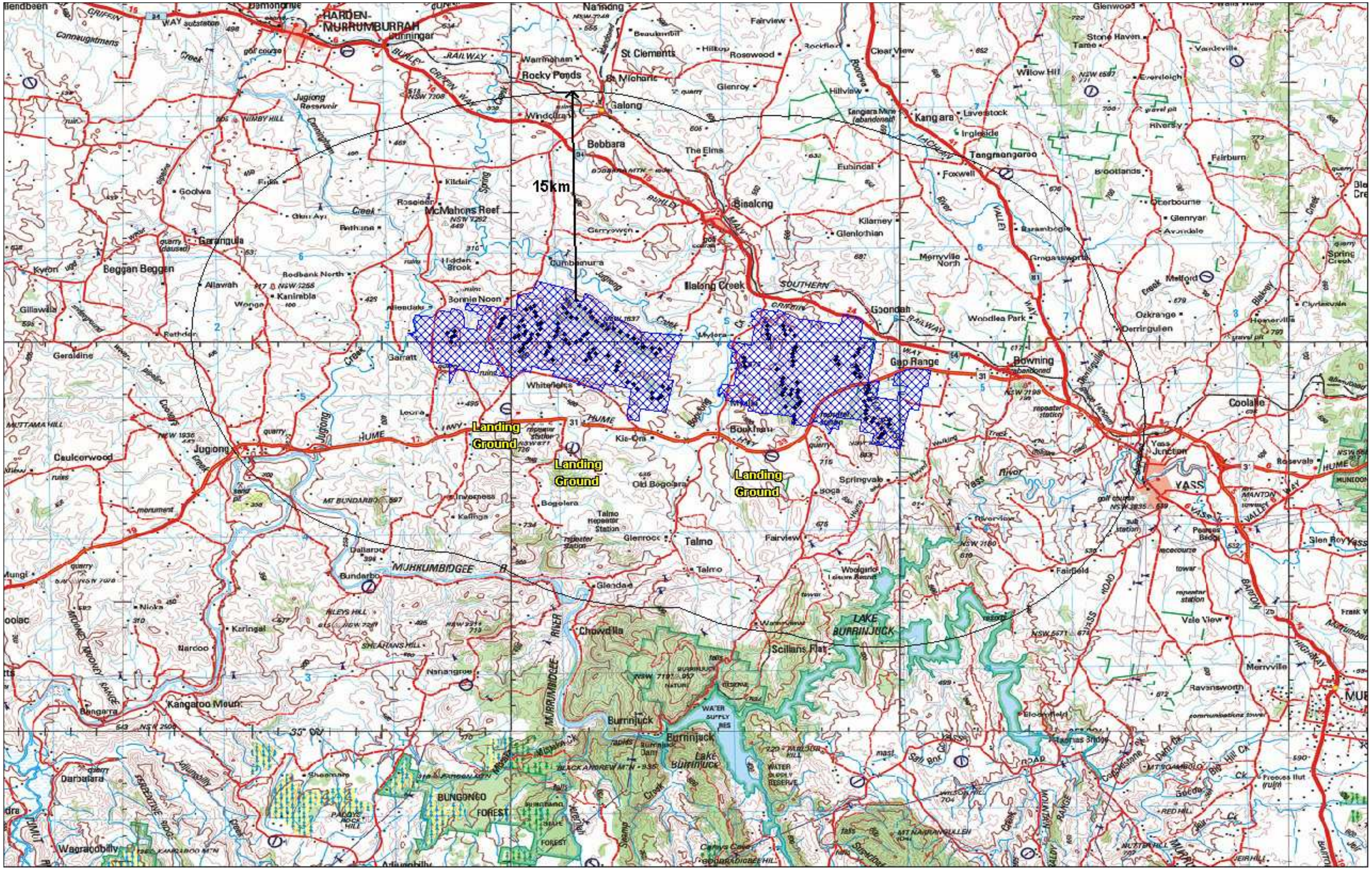


Figure 7-14: Location of airstrips in relation to the Proposal

7.7.5 Mitigation Measures

SoC	Impact	Objective	Mitigation Tasks	Project Phase	Auditing	Coppabella Hills	Marilba Hills
30	Creation of Hazard	Minimise risk	Liaise with CASA and determine the appropriate number, location and type of aircraft warning beacons to be fitted on wind turbines prior to the commencement of construction.	Pre-construction	DoP	X	X
31	Creation of Hazard	Minimise risk	The Proponent would liaise with all relevant authorities (CASA, Airservices, and Department of Defence) and supply location and height details once the final locations of the wind turbines have been determined and before construction commences.	Pre-construction	DoP	X	X

7.8 COMMUNICATION IMPACTS

A communication impact assessment report was prepared by Epuron Pty Ltd. The objectives of this investigation were to identify the potential for impacts from the proposed Yass Valley Wind Farm on existing telecommunications services in the vicinity of the proposal, and to identify appropriate mitigation strategies for potential impacts. The full investigation including a glossary of acronyms used in the investigation, maps, footnotes and references is presented in Appendix 5.

7.8.1 Approach

The following approach was adopted to identify the potential impact of the Yass Valley Wind Farm proposal on telecommunications:

- Identify license holders within a 25km radius of the proposed wind farm, and point-to-point links in the vicinity of the three precincts, using information provided on the Australian Communications and Media Authority (ACMA) RADCOM database.
- Provide written notification of the proposal and seek comments from each license holder identified via the ACMA RADCOM database search.
- Record and review all responses received to identify any issues raised by license holders.
- Discuss issues raised with relevant license holders with the aim to resolve or identify mitigation options.
- Carry out an assessment of the “Fresnel zone” associated with each fixed point-to-point communications link in the vicinity of each precinct. (A Fresnel zone is one of number of concentric ellipsoids of revolution which define volumes in the radiation pattern of an aperture).
- Determine appropriate ‘exclusion zones’ for the proposed indicative turbine layout based on Fresnel zone calculations and advice from license holders.
- Confirm that all turbines (including blades) are located outside the ‘exclusion zone’.
- Determine appropriate additional mitigation measures which may be required.

7.8.2 Existing Environment

The potential impacts of the proposed Yass Valley Wind Farm on the four most commonly used telecommunications services have been investigated separately and are summarised below.

These services include:

- Television and radio broadcast services
- Mobile phone services
- Radio communication services

Aircraft navigation services.

Mitigation measures are stated at the end of the section, under these service headings.

Television and radio broadcast services

Summary of existing services and facilities

The ACMA RADCOM database lists the following broadcasters for television and radio active in the areas of Yass (2582) and Binalong (2584).

Table 7-12 Existing services: television and radio

EXISTING SERVICES AND FACILITIES					
	Television	**Radio**			
	Southern NSW TV1:	Canberra RA1:	Canberra RA2:	Goulburn RA1:	Yass RA1:
Yass	ABC, CBN, CTC, SBS and WIN	1ART, 1CBR, 1CMS, 1WAY, 1XXR, 2ABCFM, 2CA, 2CC, 2CN, 2JJJ, 2PB, 2RN, 2ROC, 2SBSFM	1RPH	2ABCFM, 2ABCRN, 2ABCRR, 2GN, 2JJJ, 2RN, 2SNO.	2YAS
Binalong	ABC, CBN, CTC, SBS and WIN	-	-	-	-

Television

The Black Mountain Tower situated atop Black Mountain, ACT, is the nearest TV transmission source for the locality of the proposed Yass Valley Wind Farm. Black Mountain is approximately 55km South East of the Carrolls Ridge Precinct (the most southern section of the proposed Yass Valley wind farm).

Television Interference (TVI) is dependent on a range of factors including; environmental factors (topography, direct signal strength, transmitter type, and receiver type) and wind farm design factors (turbine elevation, rotor size and orientation, speed of rotation, blade material and pitch). Due to the variability of local conditions and the characteristics of antennae used in particular installations, there is a degree of uncertainty regarding predicted levels of interference.

The zone of potential interference for a wind farm is the resultant total of the effects from the individual turbines. There are approximately 60 houses within a 5km radius of the proposed Coppabella Hills precinct (refer to Appendix 5).

Very High Frequency (VHF) TV reception at dwellings within approximately 1 km of the wind farm turbines and with antennas having turbines located with +/- 25 degrees angle of their reception direction would have some probability of noticeable “ghosting” at times.

For Ultra High Frequency (UHF) TV, time variant ghosting may be evident out to approximately 2 km for turbines located +/- 20 degrees from the reception direction. Digital TV is not susceptible to visible “ghosting” degradation. For any confirmed wind farm interference problems where TV antenna system improvements are unsuccessful, the use of the digital TV services in the area may be the best solution, requiring the provision of a digital set top converter.

It is difficult to assess the likely impact on specific house locations. During the operational phase of the proposal it is possible that television reception could be affected at some of these locations unless some form of mitigation is introduced. The International Telecommunications Union Recommendation ITU-R BT.805 states that impacts beyond 5 kilometres are unlikely.

Radio

The level of radio broadcast interference experienced can be influenced by a variety of variables including; abnormal weather conditions, multi-path distortion (reception of a signal directly from a transmitter and also a reflected signal from hills, structures etc.), overloading (when an FM receiver receives too strong a signal) and electrical interference.

Low power national FM stations on 107.7 & 106.9MHz are listed on the Wades Hill TV site at Crookwell. National, community and commercial services on 101.5, 102.3, 105.5, 104.7, 98.3, 99.1, 92.7, 91.9, 91.1, 106.3 and 103.9MHz are located on Black Mountain. Potential wind farm impacts on MF radio are highly unlikely and therefore the stations serving the area have not been listed.

Mobile phone services

This section covers GSM and 3G mobile phone services (high frequency communications links used for mobile transmission networks are discussed in the next section - Radio communication services). Figures showing the existing local mobile phone coverage from the three main providers are presented in Appendix 5.

A mobile phone network consists of a system of adjoining zones called 'cells', which vary in size with a radius of 2-10 km. Each cell has its own base station that sends and receives radio signals throughout its specified zone. Mobile phone antennas need to be mounted clear of surrounding obstructions such as buildings to reduce 'dead spots' and allow the base station to effectively cover its intended cells. No GSM/CDMA mobile services are registered at sites in the close vicinity of the proposed wind farm. The Telstra mobile service from Wades Hill, Crookwell is considered too distant to be affected by the wind turbines[25].

Radio communication services

Organisations identified as operating radio communication licences (including fixed link communications) within 25km of the proposed wind farm were consulted. Each was asked to provide independent comments / advice on the possibility of the Yass Valley Wind Farm development interfering with their communications links (license holders within 25km listed in full in Appendix 5).

A fixed link radio transmission is a point-to-point transmission path typically between two elevated topographical features. The transmission path may become compromised if a turbine is located within the direct line of sight ("Fresnel zone") around the line-of-sight between the sending and receiving antennae. Communication is only likely to be affected if a turbine is in the line-of-sight between the two sending and receiving antennae or within a zone of the line-of-sight of these antennae.

The point-to-point communication links were identified and mapped in the vicinity of the proposed wind farm site to establish the line-of-sight paths. In order to ensure that no obstruction to transmission paths occurs, calculations of the 2nd Fresnel zone of the point-to point communications links in proximity to the proposed wind farm were undertaken. It is suggested that beyond the 2nd Fresnel zone, the power of a scattered signal from a structure such as a wind turbine would be small enough such that it would not result in significant interference at the receiver.

[25] Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

Coppabella Hills Precinct

Five point-to-point communications links were identified as crossing the Coppabella Hills precinct. In order to determine whether a radio link could be affected by the wind turbines, an 'exclusion zone' was defined, beyond which the level of interference is unlikely to disrupt the radio link, based on the concept of the Fresnel zone, as previously described.

As a result of the exclusion zones established in planning the wind farm, there is the possibility that impacts could occur to existing point-to-point links, in particular link 27571 operated by Harden Shire Council. The Proponent has engaged with council to discuss these potential impacts and possible mitigation strategies. Both council and the Proponent are confident that any potential impacts would be able to be mitigated using the following techniques:

- Modifications to or relocation of the existing antennae;
- Installation of a directional antennae to reroute the existing signal;
- Installation of an amplifier to boost the signal; and/or
- Utilisation of onsite optical cable to reroute the original signal.

Marilba Hills Precinct

Seven point-to-point communications links were identified as crossing the Marilba Hills precinct. When considering the exclusion zones established in planning the wind farm, there are two links identified that could potentially be impacted. The Rural Fire Service and the Department of Environment and Climate Change have been consulted regarding the potential impacts and both parties are confident that a mitigation solution will be possible using the following methods:

- Relocation of the existing antennae;
- Installation of a directional antennae to reroute the existing signal;
- Utilisation of onsite optical cable to reroute the original signal.

Aircraft navigation systems

The closest airports to the Yass Valley Wind Farm are Canberra and Goulburn. There is one radar installation in the vicinity of Canberra airport, namely Mt Majura. A secondary radar installation is located at Mt Bobbara to the North of the Coppabella Hills and Marilba Hills Precincts.

EPURON has consulted with the Civil Aviation Safety Authority (CASA), Airservices Australia and the Department of Defence in relation to the proposal.

Due to the height of the proposed turbines (>110m), the Civil Aviation Safety Authority previously recommended that obstacle lighting be provided as per Section 5.5 of Advisory Circular 139-18(0) - *Obstacle Marking and Lighting of Wind Farms.* However, the Advisory Circular was withdrawn in September 2008 and at the time of writing a recommendation was not available from CASA in relation to Obstacle Marking and Lighting of Wind Farms not in the vicinity of an aerodrome.

EPURON wrote to Airservices Australia (AA) in relation to the wind farm proposal on 15-7-08. In their response dated 16-12-08, AA suggested that there may be "navigational aid issues" associated with the proposal. Specific details regarding particular installations affected were not provided.

EPURON met with Airservices Australia on 1 April, 2009 to discuss the scope of work required for a detailed analysis. Airservices Australia indicated at the meeting that they would not be able to conduct an internal assessment of the impacts to their navigational aids due to resourcing constraints. Accordingly, it was proposed that EPURON agree on a scope of work acceptable to Airservices Australia so that EPURON could engage a suitable consultant to investigate and prepare a report to assist Airservices Australia in their assessment of the proposal.

EPURON will continue to work closely with AA to mitigate issues discovered with the Mt Bobbara (SSR) and Mt Majura (PSR / SSR) that can be reasonably attributable to the proposed wind farm.

A review of the proposal was undertaken by the Department of Defence. No objection to the proposal was made.

Following a review of the communication services near the proposed wind farm, potential interference and consultation with the service providers, it is considered that the wind farm would have minimal effect on telecommunications services. Mitigation strategies are proposed to ensure any impacts can be managed and mitigated. These are stated below.

7.8.3 Impact Assessment - construction and decommissioning phases

No telecommunications impacts are anticipated during the construction and decommissioning phases of the wind farm development. However, some measures are best instituted during this stage. These include:

Television and radio broadcast services

- Use of primarily non-metallic turbine blades
- Use, wherever practical, of equipment complying with the Electromagnetic Emission Standard, AS/NZS 4251.2:1999

7.8.4 Impact assessment – operation

It is considered that potential impacts would be confined to the *operational phase* of the wind farm, as discussed previously in this section.

Television and radio broadcast services

At the commencement of operation, the Proponent would offer to undertake a monitoring program of houses within 5km of the wind farm to determine any loss in television signal strength, if requested by the owners.

In the event that television interference (TVI) is experienced by existing receivers in the vicinity of the wind farm, the source and nature of the interference would be investigated by the Proponent.

Should investigations determine that the cause of the interference can be reasonably attributable to the wind farm; the Proponent would put in place mitigation measures at each of the affected receivers in consultation and agreement with the landowners.

Specific mitigation measures available include:

- Modification to or replacement of receiving antenna
- Provision of a land line between the effected receiver and an antenna located in an area of favourable reception
- Improvement of the existing antenna system
- Installation of a digital set top box

- In the event that interference cannot be overcome by other means, negotiating an arrangement for the installation and maintenance of a satellite receiving antenna at the Proponents cost

Mobile phone services

Recommendations from telecommunications companies have been incorporated into the planning of the project.

- Mobile phone services in the area are not expected to be impacted by the wind farm or its operation

Radio communications services

Mobile radio and other radio communication services in the area are not expected to be impacted by the wind farm or its operation. Conflicts between point-to-point radio systems and the wind turbines are expected to be avoided using a range of mitigation strategies which include:

- Modifications to or relocation of the existing antennae
- Installation of a directional antennae and/or
- Installation of an amplifier to boost the signal

Aircraft Navigation Systems

The closest airports to the proposed wind farm site are Canberra and Goulburn. There is one radar installation in the vicinity of Canberra airport, namely Mt Majura. A secondary radar installation is located at Mt Bobbara.

EPURON will continue to work with Airservices Australia to mitigate any issues with navigational aids. EPURON will consider any relevant recommendations made by CASA in relation to obstacle lighting should these become available.

7.8.5 Mitigation Measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
32	Deterioration of signal strength	No deterioration of signal strength	The Proponent would locate wind turbines to avoid existing microwave link paths that cross each precinct, or liaise with the owners of such links to relocate services to avoid potential impacts from turbines.	Pre construction		x	x
33	Deterioration of signal strength	No deterioration of signal strength	The Proponent would undertake a detailed investigation to develop appropriate mitigation measures associated with potential impacts to navigational aids from the Coppabella Hills and Marilba Hills Precincts. The Proponent would liaise with Airservices Australia to ensure all mitigation measures are acceptable.	Pre-construction and operation		x	x
34	Deterioration of signal strength	No deterioration of signal strength	Ensure adequate television reception is maintained for neighbouring residences as follows: • Undertake a monitoring program of houses within 5km of the wind farm site to determine any loss in television signal strength if requested by the owners. • In the event that after construction television interference (TVI) is experienced by existing receivers within 5km of the site, investigate the source and nature of the interference. • Where investigations determine that the interference is cause by the wind farm, establish appropriate mitigation measures at each of the affected receivers in consultation and agreement with the landowners. Specific mitigation measures may include: • Modification to, or replacement of receiving antenna	Operation		x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			• Provision of a land line between the effected receiver and an antenna located in an area of favourable reception • Improvement of the existing antenna system • Installation of a digital set top box or • In the event that interference cannot be overcome by other means, negotiating an arrangement for the installation and maintenance of a satellite receiving antenna at the Proponents cost				

7.9 ELECTROMAGNETIC FIELDS (EMFS)

7.9.1 Assessment

Background

Electromagnetic fields (EMF) (having both electric and magnetic components) are generated by operational electrical equipment, including transmission lines, substations and wind turbines. Transmission lines and electrical devices, including substations and wind turbines, generate 50 Hz electric and magnetic fields within their vicinity.

Electromagnetic fields can have acute and chronic health impacts. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) have produced fact sheets which state that studies to date have consistently shown that there is no evidence that prolonged exposure to weak *electric* fields (such as those found in the home or in most workplaces), results in adverse human health effects. Whether chronic exposure to weak *magnetic* fields is equally harmless remains an open question. While there is no evidence that these fields cause immediate, permanent harm, laboratory studies on animals and cell cultures have shown that weak magnetic fields can have effects on several biological processes (hormone and enzyme levels, the rate of movement of some chemicals through living tissue). The fact sheets state that while most studies have produced inconclusive results or no increased cancer incidence in laboratory animals following exposure to EMFs, a few studies have indicated an increased incidence (ARPANSA web page updated 2007).

The Australian Radiation Protection and Nuclear Safety Agency (APANSA) was formed in 1998 as a Federal Government agency charged with the responsibility of protecting the health and safety of people and the environment, from the harmful effects of ionising and non-ionising radiation. ARPANSA is currently developing guidelines on exposure limits to EMFs but in the meantime they still refer to the National Health and Medical Research Council Interim Guidelines. The National Health and Medical Research Council Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields recommended limit for 24 hour exposure is 1000mG for magnetic fields and 5kV/m for continuous public exposure to electrical fields. They note that research suggests that health effects are associated with prolonged exposure; measurements at one point in time do not accurately reflect prolonged exposure levels.

Electric fields can be reduced both by shielding and with distance from operating electrical equipment. Magnetic fields are reduced more effectively with distance.

7.9.2 Impact assessment – construction and decommissioning phases

Potential for EMF impacts occurs only during the operational phase of the wind farm when electrical infrastructure is capable of generating electromagnetic fields. The electromagnetic fields produced by the wind farm infrastructure would vary at different locations onsite, as discussed below. No impact mitigation is considered to be required for the construction and decommissioning phases.

7.9.3 Impact assessment – operation

Transmission lines

Underground and overhead transmission lines connecting turbines to the substations at each precinct would be 33 kV. At the substation within each precinct, the voltage would be stepped up to 132 kV and fed into the existing TransGrid transmission network.

The magnetic fields associated with a transmission line at any moment in time depend on a range of factors, including the amount of power flowing in the line and the distance of the measurement point from the conductors. Typical levels of magnetic field under a 132 kV high-voltage transmission line range from 5 - 50 mG at a distance of 30 metres from the centre of the easement. The strength of the field falls away rapidly with increased distance. High-voltage lines can produce magnetic fields of up to 80 mG. These figures are far less than the 1,000 mG limit recommended for 24-hour exposure (National Health and Medical Research Council Interim Guidelines on Limits of Exposure to 50/60 Hz electric and magnetic fields).

Electric fields from power lines diminish rapidly with distance from the source. Their levels are extremely low, with levels of 0.07V/m and 0.01V/m recorded at 30m and 60m from a 115kV power line (Hafemeister, 1996), and are significantly less than the 5kV/m (5000V/m) NHMRC interim guideline for continuous exposure. At the voltage (33kV) proposed in this project, the effects are negligible.

In a 33 kV transmission line, the load may be 'unbalanced' (greater at one end than the other) and located closer to the ground than in a 132 kV line and, as such, receivers may be exposed to larger EMFs than the higher voltage lines (pers. comm. Mr Colin Hackney, Country Energy 2006). Where practical, 33 kV lines would be underground, maximising the shielding effect to minimise EMF exposure.

Where practical, 33kV lines would be underground, maximising the shielding effect to minimise EMF exposure. Cables used in the 33kV onsite reticulation cabling will contain three core conductors in trefoil (three lobed) arrangements to cancel out the effects of magnetic fields from adjacent conductors.

Any off-site electricity lines will be located and designed in accordance with the Principals of Prudent Avoidance which essentially means taking appropriate precautions at modest cost without undue inconvenience to avert possible risk. Therefore electricity cables will be located away from residences, where practical, to minimise magnetic fields from any off-site transmission lines.

Substation

The United Kingdom National Grid Company has conducted a survey of suburban substations to determine the level of EMFs produced. Measurements were taken at 0.5 m above ground level within 1m of enclosures. The results revealed mean magnetic flux densities of approximately 19 mG, halving at an average distance of 1.3 m and becoming indistinguishable from the background due to other domestic sources within 5 m (HPA 2004).

Fencing around the substation and the location of the substation and control buildings would ensure that the EMF exposure to receivers including the public, property owners and workers are well below the 1,000 mG levels determined for public health.

Wind Turbines

A report investigated the expected magnetic field for 1,650 kW proposed wind turbines for Windrush Energy in 2004 (Iravani *et al.* 2004). The study was based on research and measurements of an existing wind turbine. The measured flux density at the door of the existing turbine was 0.4 mG and the typical value around the wind turbine was 0.04 mG. The acceptable frequency is 833 mG. The results determined that no measurable magnetic field would be expected at a distance of eight metres from the 1,650 kW wind turbine.

The report concluded:

> *It is our strong belief that the magnetic fields produced by the generation and export of electricity from the Windrush wind turbine does not pose a threat to public health.*

The areas proposed for the installation of wind farm infrastructure would have limited public access. Access to these areas by the general public would be restricted, with periodic access by appropriately trained and qualified maintenance staff only. Property owners accessing the sites would have no reason to spend extended periods near the infrastructure, which is not located near frequent use areas such as sheds, yards and residences. Should property owners require access to control buildings or other wind farm infrastructure, they would be accompanied by an appropriately trained and qualified maintenance staff member.

Wind farms present an opportunity for tourist and educational use. Although it does not form part of this Proposal, there is a potential for the Yass Valley Wind Farm to be used in the future as a renewable energy educational facility. Again, extended exposure is not anticipated from tours, however, appropriate safeguards could be put into place prior to the operation of any tours to ensure the opportunity for human exposure to EMFs is minimised and within recommended guidelines.

7.9.4 Mitigation Measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
35	Radiation exposure from EMFs	Minimise exposure	Adhere to standard industry approaches and policies with respect to EMF through maintenance of adequate easements around transmission lines.	Operation	OEMP	x	x
36	Radiation exposure from EMFs	Minimise exposure	The turbines, control building, substation and transmission lines would be located as far as practical from residences, farm sheds, and yards in order to reduce the potential for both chronic and acute exposure.	Operation	OEMP	x	x

7.10 TRAFFIC AND TRANSPORT

7.10.1 Approach

The Traffic Impact Study was prepared by Bega Duo Designs (December 2008) assessing potential traffic implications that may result from the Proposal. This study was completed in accordance with the *Guide to Traffic Generating Developments* as recommended by the RTA. The study assessed potential impacts of the proposed development and provided recommendations for minimising potential traffic impacts associated with the Proposal. The traffic impact study is primarily focused on the construction phase of the Proposal as it is considered that the construction phase would generate the greatest volume of traffic. A full copy of the Traffic Impact Study is presented in Appendix 6.

The methodology adopted by Bega Duo Designs included:

- General project information was obtained from the Proponent and **ngh**environmental
- Further information and feedback was received from key stakeholders at the Yass Valley Wind Farm Planning Focus Meeting, held on site on the 14th & 15th of October, 2008
- Existing mapping was used to identify features during inspections of each precinct
- Planning documentation for other wind farm Proposals was reviewed
- Roads were inspected, inventories prepared and photographs taken. Road junction and intersections were inspected and photographed
- Approximate traffic count information was obtained from observations at all precincts during November 2008. Roads & Traffic Authority data was used to establish the existing traffic volumes (vehicles per day) on the main roads.
- Consultation with representatives from **ngh**environmental, Epuron, Roads & Traffic Authority, Harden and Yass Valley Councils was undertaken
- Information on road conditions was obtained from property owners and interested residents at the Open House Community Consultation Day on 10th of December 2008
- Methods of wind turbine construction and programming of the works were investigated to estimate the proposed vehicle trips[26]

7.10.2 Results

Access

The roads in the vicinity of the Proposal area are generally classified as follows:

- National Highways - Hume Highway which is owned and maintained by the Roads & Traffic Authority

[26] In accordance with the Guide to Traffic Generating Developments, a 'trip' is defined as a one-way vehicle movement from one point to another, excluding the return journey. The general method of measuring traffic volume is 'vehicles per day'. This is the total of all trips made in either direction per day.

- State Roads – Burley Griffin Way which is maintained by Yass Valley Council under contract to the Roads & Traffic Authority
- Regional Roads – Burrinjuck Road which is part funded by a grant agreement administered by the Roads & Traffic Authority
- Local Roads – All other roads which are owned by the Council (either Harden or Yass Valley).

Each precinct is located between 20 and 50 kilometres west of Yass, a major country town and service centre. The Hume Highway provides a safe road connection with up to 110km/h travel speed. The village of Binalong provides some services and is within 10 kilometres of the northern extremity of the Marilba Hills and Coppabella Hills precincts.

Access requirements for the proposed wind farm can be separated into the following categories:

- Standard road vehicles from 2 wheel drive cars to B-Double trucks. These vehicles are required to access each precinct usually as far as the depot or storage compound. They represent the largest proportion of vehicles. It is anticipated that light vehicles would be the primary source of transport within the construction area of each precinct.
- 4 wheel drive vehicles which may be required for most transport to the turbine locations and would provide ongoing maintenance.
- Specialist vehicles may include off-road construction vehicles, for example vehicles with nonstandard axle combinations. These may include tracked vehicles and reconfigured trailers used to tow components into position. This type of vehicle would not generally be able to be used on sealed local roads.
- Over-dimensional vehicles transporting turbine components and oversize construction machinery. These vehicles would generally be wider and longer but weights of loads would not be excessive (generally up to 70 tonnes carried over 7 axles) and they would be able to cross most drainage structures without damage.
- Over-mass and over-dimensional vehicles transporting electrical transformers of up to 200 tonnes. These vehicles would possibly require the strengthening of bridges and drainage structures because of the close spacing of axles. Only a small number of these vehicles are anticipated during construction.

Coppabella Precinct

The major access points being considered for the Coppabella Hills Precinct are from Whitefields Road to the south of the precinct. Whitefields Road connects with the Hume Highway, 38 kilometres from Yass. The western end of Whitefields Road connects with the Hume Highway via Coppabella and Berramangra Roads. Additional access points may be available from Coppabella Road for low volumes of 4 wheel drive or specialist vehicles. The five turbines at the western end of the precinct would likely be accessed from Berramangra Road which junctions with the Hume Highway, 47.3 kilometres from Yass.

Marilba Precinct

Access points under consideration for the eastern section of the Marilba precinct are from the Hume Highway, via the truck rest areas on each side of Conroys Gap, 20.9 kilometres from Yass. Access to the majority of turbines would be from the Marilba Station access road, 23.0 and 25.2 kilometres from Yass. An access to the northern section from Illalong Road at 1.6 kilometres from Burley Griffin Way is being considered. An access off Burley Griffin Way at 3.5 kilometres from the Hume Highway could provide access to the eastern section of the precinct and the proposed connection to the 132kV transmission line.

Existing Traffic Volumes

Volumes obtained from RTA counts are average, annual, daily traffic counts and have been adjusted to represent numbers of vehicles. The volumes were based on counts collected in 2006. The figures include vehicle numbers in both directions and can be adjusted if required, assuming that the peak hour represents 10% of the annual average daily traffic volumes (AADT). Precise volumes are not considered to be critical in the examination of traffic impacts and therefore the 2006 volumes have been adopted.

Observations on most of the minor roads, undertaken as part of the field assessment, revealed hourly counts approaching zero. The traffic on these roads is generated primarily by the occupied properties. The numbers adopted below have been adjusted based on the number of properties multiplied by traffic generation rates for dwellings given in the RTA Guide to Traffic Generating Developments.

The traffic volumes on Paynes Road at Bogo Quarry are dependant on the production rate of a particular day and can reach up to 20 vehicles per hour. For the purposes of this report, this maximum rate is assumed over a 7 hour day.

The accuracy of the adopted traffic counts on the minor roads is not significant in the assessment of traffic impacts while the volumes remain low. Impacts on these roads are considered based on observed defects in each road.

Table 7-13: Traffic Volumes (AADTs)[27] for Roads in the Study Area.

Road	AADT (vehicles per day)	Information source
Hume Highway at Bowning	7223	Obtained from RTA records
Burley Griffin Way Stn 94.085	1661	Obtained from RTA records
Illalong Road	70	Adjusted from counts taken
Berramangra Road	Less than 50	Adjusted from counts taken
Garry Owen Road	Less than 50	Adjusted from counts taken
Paynes Road to Bogo Quarry	Less than 200	Adjusted from quarry production rates
Cumbamurra, Coppabella, Coppa Ck, Waterview & Whitefields Road	Less than 30	Adjusted from counts taken and discussions with landholders

7.10.3 Impact Assessment - construction and decommissioning phases

Over-mass and over-dimensional vehicles

The larger vehicles would occupy most of the width of the roadway at many locations thereby requiring traffic control procedures to ensure safe passage for local road users. For nearby property owners, there is likely to be an increase in traffic noise and dust nuisance in addition to the need to control stock from

[27] AADTs represent the total traffic volume in both directions (they also equate to the number of trips)

straying on the roads which are not fenced. Dust generated on unsealed roads could impact visibility and result in the loss of pavement materials. Gravel road surfaces would deteriorate and potholes would form under the increased traffic loads, particularly during wet weather when water ponds or drains across a road. Structural damage may occur to some of the culverts, concrete causeway crossings, stock grids and traffic islands. The location of trees and other roadside objects have the potential to obstruct the passage of long wide loads and high loads. Lack of roadside delineation in some locations may impact traffic safety during periods of poor visibility. Some intersections have inadequate pavement width to safely accommodate the turning manoeuvres of the over-size vehicles.

It is considered that these impacts would be temporary, as the equipment haulage is not a continuous program. Most of the heavy haulage would be in the form of convoys and would be managed through a number of specific mitigation measures developed and implemented in conjunction with both RTA and Yass Valley and Harden Councils. These measures usually include escort vehicles.

Decisions on the final routes for these vehicles would be the subject of negotiations between the haulage contractor and the road authorities.

Traffic impacts at specific locations

Hume Highway

Additional traffic would be turning to and from the Hume Highway at seven locations between Burley Griffin Way and Westbourne Road (18.3 to 50.2 kilometres west of Yass).

The junctions at Burley Griffin Way, Paynes Road, Burrinjuck Road, Illalong Road and Berramangra Road are of a high standard and the relatively small increase in traffic volumes is unlikely to have any significant impacts on safety for turning traffic.

The junctions with Burley Griffin Way and Burrinjuck Road have advance signposting allowing traffic departing from the Highway to select the appropriate lane and decelerate smoothly in preparation for the turn. This facility is not available on the other junctions and drivers who are unfamiliar with the locality are often required to make sudden manoeuvres at high speed when they approach their departure point at a minor junction.

Hume Highway rest areas at Conroys Gap

The existing access track from the rest area on the northern side departs from the deceleration lane at a point where travel speeds have not sufficiently reduced to permit safe access. The existing access on the southern side does not have sufficient setback from the rest area formation and turning radii are insufficient for large vehicles. The rest areas do not permit safe turning for return travel.

Illalong Road

Increased vehicle movements particularly by heavy vehicles would increase the potential of vehicle conflicts.

Yass Valley Council has imposed a weight restriction of ten tonnes on the full length of Illalong road as the pavement is considered to be of insufficient strength to withstand large volumes of heavy traffic.

A timber bridge at 3.3 kilometres from Burley Griffin Way is currently under repair. The width between kerbs is 4.8 metres. This bridge and the concrete bridges at 6.09 and 10.27 kilometres may be of insufficient strength and width for use by heavy vehicles.

Marilba access roads

The increased volumes of traffic at these junctions may result in vehicle conflicts in the 'throat' of the junction, between vehicles departing and entering at peak periods.

Whitefields Road

The increased volumes of traffic at the junction with Hume Highway may result in vehicle conflicts in the 'throat' of the junction between vehicles departing and entering at peak periods.

Whitefields Road has insufficient width for most of its length to operate as a two lane access road carrying construction traffic. Trees overhang the road at many locations which would restrict high loads. The proximity of many trees to the roadside could restrict the passage of long wide loads.

The road reserve is not fenced for stock control and properties are separated by gates at six locations along the 10 kilometre length.

Coppabella Road (Southern section from Whitefields Road to Berramangra Road).

The 2.6 kilometre section of Coppabella Road from Whitefields Road to Berramangra Road is of insufficient width for part of a major access route and is not fenced.

Berramangra Road

Berramangra Road has inadequate delineation of the alignment and insufficient warning of the poorly aligned sections and roadside hazards. The available width of bitumen is reduced at some locations by roadside vegetation.

The junction with Coppabella Road has insufficient sight distance to the north along Berramangra Road.

An old concrete bridge at 3.6 kilometres has an available width of 5.5 meters between kerbs.

The junction with Hillview Road has inadequate turning radius to the north. The Westbourne Road Junction requires larger turning radii for safe turning by larger vehicles.

Berramangra Road beyond 9.3 kilometres from Hume Highway has a low standard of alignment which reduces safe travel speed on some sections to 40 to 50 kilometres per hour.

Impacts on Minor Roads

There is the potential to impact Westbourne Road, Coppa Creek Road, Cumbarmurra Road, Garry Owen Road and Coppabella Road (Northern Section). Although it is not anticipated that these minor roads would become primary access routes, it is probable that some of these routes would experience a small increase in traffic volumes. A relatively small increase in traffic volumes would require improvements to ensure the safety of road users particularly in relation to conflicts between vehicles and stock.

The road reserves are fenced on Westbourne Road and Garry Owen Road and therefore can support small increases in traffic without the level of improvement required on the other minor roads.

Isolated curves and crests on looser gravel surfaces could result in drivers losing control. Several drainage structures may need upgrading to ensure continued access in wet weather.

Several mitigation measures have been developed to manage traffic impacts during the construction phase; key areas are highlighted in Table 7-14 and full measures are detailed in Section 7.10.5 .These centre around the development of a Traffic Management Plan (TMP) in consultation with roads authorities and affected members of the community, to finalise the routes and ensure that safety and protection of assets is managed effectively.

7.10.4 Impact assessment – operation

Once operational, the wind farm would be managed and operated by several crews of technicians, likely to be based at Yass. The precincts would be accessed regularly for operational and maintenance activities. It is estimated that the operational phase would generate up to 8 trips per day into the Coppabella Precinct from Whitefields Road. It is assumed that there would be at least four permanent access points into the Marilba Precinct, generating approximately 4 trips per day from the access points at Conroys Gap and Marilba Station.

It is considered that the operational wind farm may generate tourist traffic on the roads surrounding each precinct. The proposed wind farm may generate interest as a visual feature in the locality however, it is considered that this would not significantly increase the number of tourists visiting Yass and therefore the increase in traffic volumes and subsequent impacts are likely to be low. Each precinct is in relative close proximity to the Hume Highway. This highway is a dual carriage way main road that would be able to facilitate the potential increase in traffic.

No specific mitigation measures are considered warranted to manage operational traffic impacts.

Table 7-14: Summary of the type and extent of key safeguards required to reduce traffic impacts

Key safeguards	Hume Highway	Burley Griffin Way	Illalong Road	Marilba Access Road	Paynes Road	Whitefield's Road	Coppabella Road	Berramangra Road	Westbourne Road	Coppa Creek Road	Cumbamurra Road	Garry Owen Road
Reconstruction and/or realignment to provide 6m wide pavement	-	-	-	-	-	Up to 9.8 km of reconstruction (to the junction of site)	2.6 km of reconstruction on the southern section only	-	-	-	-	-
Improve turning radii and advance signposting on junctions [28]	5 junctions	1 junction	2 junctions	(see Hume Highway)	-	(see Hume Highway)	-	2 junctions	(see Berramangra Road)	-	-	-
Check bridges and pavement condition on sealed roads in consultation with road authorities	-	-	3 bridges & 11 km of pavement	-	-	-	-	1 bridge & 8.5 km of pavement	-	-	-	1 bridge
Maintain road shoulders on sealed roads	-	-	-	-	-	-	-	13.8 km of sealed pavement	-	-	-	0.81km of sealed pavement
Provide warning signs and guideposts	-	-	-	-	-	9.8 km length	3.12 km length in the northern section	13.8 km length	5.0 km length	-	-	9.7km length
Liaise with roads authority and land holders on improvements required	2 junctions at Conroys Gap Rest Areas	-	11 km length	2.2 km length	1.34 km length		10.33 km length	13.8 km length	5.0 km length	2.3 km length	7.5 km length	9.7km length

[28] The road indicated is the more major road of the junction

7.10.5 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
37	Safety and asset protection	Minimise Risk	The Proponent would develop and implement a Traffic Management Plan (TMP) in consultation with roads authorities to facilitate appropriate management of potential traffic impacts. The TMP would include provisions for: • Scheduling of deliveries and managing timing of transport • Limiting the number of trips per day • Undertaking community consultation before and during all haulage activities • Designing and implementing temporary modifications to intersections, roadside furniture, stock grids and gates • Managing the haulage process, including the erection of warning and/or advisory speed signage prior to isolated curves, crests, narrow bridges and change of road conditions • Designation of a speed limit would be placed on all of the roads that would be used primarily by construction traffic • Preparation of a Transport Code of Conduct to be made available to all contractors and staff • Identification of a procedure to monitor the traffic impacts during construction and work methods modified (where required) to reduce the impacts • Provide a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures • Reinstatement of pre-existing conditions after temporary	Construction	CEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			modifications to the roads and pavement along the route.				
38	Safety and Asset protection	Minimise Risk	The Proponent would use a licensed haulage contractor with experience in transporting similar loads, responsible for obtaining all required approvals and permits from the RTA and Councils and for complying with conditions specified in those approvals.	Construction	CEMP	x	x
39	Safety and Asset protection	Minimise Risk	The Proponent would prepare road dilapidation reports covering pavement and drainage structures in consultation with roads authorities for the route prior to the commencement of construction and after construction is complete. The Proponent would repair any damage resulting from the construction traffic (except that resulting from normal wear and tear) as required during and after completion of construction at the Proponent's cost or, alternately, negotiate an alternative for road damage with the relevant roads authority.	Construction	CEMP	x	x
40	Safety and Asset protection	Minimise Risk	Route specific mitigation measures, as detailed Section 5.2 of the Traffic Impact Study, would be adopted where significant increases in use are anticipated as a consequence of the proposal.	Construction	CEMP	x	x

7.11 FIRE AND BUSHFIRE IMPACTS

7.11.1 Existing environment

The development envelope of both Coppabella Hills and Marilba Hills Precincts is predominately pasture. Remnant patches of Box Gum Woodlands (both precincts), Box Gum Woodland Derived Grassland (Marilba Hills), Broad-leaved Peppermint Dry Grass Forest (Marilba Hills), Long leaved-box Dry Grass Forest (Marilba Hills) and Long-leaved Box / Red Stringybark Dry Grass Forest (Coppabella Hills) also occur.

Factors mitigating fire risks within the precincts include the sparse and fragmented nature of woodland and forest remnants flanking the development envelope at Coppabella Hills and Marilba Hills and the continued grazing regimes, which acts to reduce fuel loads. However grass fires can spread rapidly and threaten life and property.

The bushfire danger period for both the Yass Valley and Harden Shire Local Government Area (LGA) is generally between 1st October and 31st March, but can vary subject to local conditions. Summer conditions in these LGAs can be dry and hot with high wind speeds. Existing ignition sources include farm machinery and vehicles, hay storage, vehicles stopping in long grass on road verges, cigarette butts thrown from car windows (both precincts border the Hume Highway) and lightening strikes. The elevated position of the sites may increase the frequency of lightning strike. The steep topography and absence of built areas or natural fire breaks such as large water bodies may assist the rate of spread of wildfires. Furthermore, steep topography currently impedes access to all areas of the precincts.

The NSW Fire Brigade defines hazardous materials as 'anything that, when produced, stored, moved, used or otherwise dealt with without adequate safeguards to prevent it from escaping, may cause injury or death or damage to life, property or the environment'. The fuels and lubricants required to construct and operate the wind farm constitute hazardous materials under this definition.

The NSW Fire Brigade has the authority to attend, combat and render safe any land-based or inland waterway spillage of hazardous materials within the State. All fire stations are equipped with trained personnel and resources for dealing with hazmat incidents. The Hazardous Materials Response Unit has a 24 hour phone contact (Tel: 02 9742 7155). Intermediate hazardous materials response is delivered by 20 strategically located units; each unit is equipped with detection equipment and has the capability to access chemical databases with information on chemical, biological, radiological and toxic industrial chemical substances. The closest NSW Intermediate Hazardous Materials Response Unit is located at Goulburn Fire Station 157 – 161 Burke St. Goulburn. The travel time to the site would be 1.5 hours (approximately 100km).

7.11.2 Impact assessment - construction and decommissioning phases

Issues relevant to the Proposal and bushfire impacts include:

- Activities such as hot welding in fire danger periods;
- Potential for infrastructure to start or influence a fire; and
- Access to the site and fire fighting strategies onsite.

These issues are discussed below.

Flammable materials and ignition sources brought onto the site, such as fuels, would increase the risk of fire during the construction period. Correct handling and storage procedures would mitigate against the risk of ignition. Appropriate fire fighting equipment would be held at each precinct when the fire danger is very high to extreme, and a minimum of one person on site would be trained in its use.

The Rural Fire Service would be consulted in regard to the adequacy of bushfire prevention procedures to be implemented on site during construction, operation and decommissioning. These procedures would in particular cover hot-work procedures and response measures to control any incident.

Planning for Bushfire Protection (2006) guidelines present methods for determining building standards according to the assessed category of bush fire attack (considering APZ distances, topography and vegetation). The Proponent would assess the likely categories of bush fire attack according to PBP methodology and, where appropriate, aim to ensure building standards comply with A*S 3959-1999 Construction of buildings in bushfire-prone areas* standards for the appropriate level of bushfire attack. The Proponent would also consider other aspects of building design to protect buildings from radiation and ember attack and ensure that buildings comply with the fire provisions of the Building Code of Australia.

7.11.3 Impact assessment - operation

Ignition sources

Ignition sources are similar for each precinct, being dependant on the infrastructure to be installed.

Being electrical equipment and containing petrochemicals, there is potential for the wind turbines, substations, control buildings and transmission lines to start or influence the spread of fire. For the wind turbines themselves, the risk of fire can be associated with malfunctioning turbine bearings, inadequate crankcase lubrication, cable damage during rotation, electrical shorting or arcing occurring in transmission and distribution facilities (AusWEA 2001).

Zilkha Renewable Energy (2002) reports that records from a leading insurer show that fires due to equipment failure are very rare in modern wind turbine designs. In 15 years and with over 12,000 insured turbines, the insurer has had only one case of third party damage from fire caused by a turbine. Turbines automatically shut down if ambient temperatures exceed the safe operating range, or if components overheat.

There remains however, a possibility that electrical failure could produce a fire within a turbine tower. In the event of a turbine igniting within any precinct, the generally low fuel levels in surrounding pasture and fragmented woodland at the Coppabella Hills and Marilba Hills precincts would reduce the chance and intensity of wildfire.

The ready visibility of the turbines and local presence of RFS equipment and personnel would and assist detection, response time and control. In addition, shut down mechanisms are installed in the wind turbines, and remote alarming and maintenance procedures would also be used to minimise risks.

Lightning conductors are installed in turbines to ground lightning strikes in order to minimise risk of damage to the turbines and risk of ignition of a wildfire. Relatively minor damage to turbines may occur from lightning strike. At the existing Crookwell I site, a direct strike resulted in damage to one of the turbine blades, which was repaired onsite. No wildfire resulted. The risk of turbine ignition is considered to be low, based on the low likelihood of electrical failure or over-heating and a range of factors mitigating the fire hazard.

Electrical transmission lines would be installed to connect the wind farm to the electricity grid system. The lines are underground across most of the precincts and overhead to connect the precincts to the substations. The overhead lines have been routed to avoid trees and forest fragments where possible, reducing the need for clearing and eliminating ongoing fire risks from tree growth and in the event of a line breakage. Cable routes would be periodically inspected to monitor any regrowth.

The transformers located in the substation facilities would contain transformer oil for the purpose of cooling and insulation. These facilities would be bunded with a capacity exceeding the volume of the transformer oil to contain the oil in the event of a major leak or fire and would be regularly inspected and maintained to ensure leaks do not present a fire hazard, and to ensure the bunded area is clear (including removing any rainwater). Transformer oil would be changed regularly at appropriate intervals by qualified staff to minimise the potential for fire caused by contaminated oil. The oil would be removed from the site and disposed of appropriately.

The substations would be surrounded by a gravel and concrete area free of vegetation to prevent the spread of fire from the substation and reduce the impact of bushfire on the structure. The substation areas would also be surrounded by a security fence as a safety precaution to prevent trespassers and stock ingress. An asset protection zone would be maintained around the control room and substation buildings, compliant with the RFS *Planning for Bushfire Protection* guidelines. Workplace health and safety protocols would be developed to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities.

Impacts on fire-fighting operations

Wind farms have been found to influence temperature and wind speed around turbines and have the potential to influence bushfire behaviour. A distance of up to 1.25km (SEDA 2002) around each wind turbine is likely to experience warmer night temperatures and faster wind speeds on average, although this attenuates rapidly with distance from the turbine. While the amount of increase is small (approximately 0.7^{o}C increase and approximately 0.6 metres/second increase at ground level; Baidya, *et al.* 2004) these factors may enhance bushfire conditions, slightly increasing the intensity or rate of spread of a bushfire at the site. This minor increase in fire intensity is not considered likely to noticeably affect the rate of spread or controllability of wildfires. In the event of a fire, the turbines would be shut down.

The turbines have the potential to present a hazard to fire fighting helicopters and planes.

The access tracks installed to build and maintain the wind farm would increase the accessibility onsite and would therefore have a positive impact on the response time and ability to fight fires onsite or on neighbouring properties.

The RFS have participated in the environmental assessment process of several wind farms in the region, including in person at Planning Focus Meetings. Representatives of the RFS have stated at these meetings that, due to the hazardous materials stored onsite (hydrocarbons within turbines and the substation), the local RFS would only ever act in a support capacity to the NSW Fire Brigade, in the event of an infrastructure related fire onsite. The RFS and NSW Fire Brigade would be consulted regarding safety, communication, site access and response protocols in the event of a fire originating in the wind farm infrastructure, and also in the event of an external wildfire threatening the wind farm. They have also stated that wind farm infrastructure is not different with regard to bush fire risk than similar large scale infrastructure developments.

7.11.4 Mitigation measures

The discussion above illustrates that bushfire risks are manageable with respect to the Proposal.

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
41	Bushfire risk	Minimise risks	The Proponent would prepare a Bushfire Management Plan as part of the Construction Environmental Management Plan. The Rural Fire Service and NSW Fire Brigade would be consulted in regard to its adequacy to manage bushfire risks during construction, operation and decommissioning. The plan would as a minimum include: • Hot-work procedures, asset protection zones, safety, communication, site access and response protocols in the event of a fire originating in the wind farm infrastructure, or in the event of an external wildfire threatening the wind farm or nearby persons or property • Flammable materials and ignition sources brought onto the site, such as hydrocarbons, would be handled and stored as per manufacturer's instructions. • During the construction phase, appropriate fire fighting equipment would be held onsite when the fire danger is very high to extreme, and a minimum of one person on site would be trained in its use. The equipment and level of training would be determined in consultation with the local RFS • Substations would be bunded with a capacity exceeding the volume of the transformer oil to contain the oil in the event of a major leak or fire. The facilities would be regularly inspected and maintained to ensure leaks do not present a fire hazard, and to ensure the bunded area is clear (including removing any rainwater) • Substations would be surrounded by a gravel and concrete area free of vegetation to prevent the spread of fire from the substation and reduce the impact of bushfire on the structure. The substation area would also be surrounded by a security fence as a safety precaution to	Construction Operation Decommissioning	CEMP and OEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			prevent trespassers and stock ingress • Asset protection zones (APZs), based on the RFS Planning for Bushfire Protection, would be maintained around the control room, sub-station and in electricity transmission easements. Workplace health and safety protocols would be developed to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities • Fire extinguishers would be stored onsite in the control building and within the substation building • Shut down of turbines would commence if components reach critical temperatures or if directed by the RFS in the case of a nearby wildfire being declared (an all hours contact point would be available to the RFS during the bushfire period). Remote alarming and maintenance procedures would also be used to minimise risks • Overhead transmission easements would be periodically inspected to monitor regrowth of encroaching vegetation				

8 ASSESSMENT OF ADDITIONAL ISSUES

Beyond the key issues identified by the Department of Planning in the Director General's Requirements, additional areas of impact were identified using a risk analysis model. This model considers the nature of the potential impact (i.e., is it temporary, reversible, likelihood of secondary impacts), the receiving environment and the likelihood of the impact occurring.

Table 8-1 Risk analysis of remaining issues

The risk rating ranges from 1 to 5: 1 = low anticipated impact / sensitivity / likelihood of occurrence

5 = high anticipated impact / sensitivity / likelihood of occurrence

DISCUSSED IN THIS SECTION:	IMPACT AREA	NATURE OF IMPACT	SENSITIVITY OF RECEIVING ENVIRONMENT	LIKELIHOOD OF OCCURRENCE	RISK RATING
8.1	Hydrology	4	4	3	48
8.2	Soils and Landforms	4	3	3	36
8.3	Mineral Exploration	2	2	2	8
8.4	Land Values	4	3	2	24
8.5	Economic[29]	3	3	5	45
8.6	Community Wellbeing	3	3	2	18
8.7	Lifestyle	2	4	2	16
8.8	Tourism	2	3	3	18
8.9	Agricultural	1	1	4	4
8.10	Health and Safety	5	2	2	20
8.11	Historic heritage	2	1	1	2
8.12	Climate and Air Quality	2	2	2	8
8.13	Resource	2	2	5	20
8.14	Cumulative	3	3	4	36

[29] Economic Impacts as a result of the proposal are considered a positive impact.

8.1 HYDROLOGY (WATER, WATER QUALITY AND WATER-TABLE IMPACTS)

8.1.1 Existing environment

Surface water

Coppabella Hills and Marilba Hills Precincts are located within close proximity of one another, in terms of catchment hydrology, and are combined in this discussion. They both occur within the mid Murrumbidgee Catchment north of the Murrumbidgee River, which is the largest river in the vicinity of the two Precincts. The Murrumbidgee River catchment is a major component of the Murray-Darling Basin, joining the Murray River at Balranald, with an area of 84,000 square kilometres. The Murrumbidgee catchment has a diverse range of landscapes, and significant agricultural, social and conservation values. As discussed in Wasson *et al.* (1998), erosion and sedimentation in the catchment are primarily generated from channels and stream bank erosion rather than erosion from unchannelled hillslopes. The study concluded that post 1830, only about 5% of the total sediment in the study area had been derived by unchannelled slopes; the remainder had come from channel incision and bank erosion. Further, the results indicated that to control the downstream effects of erosion, conservation efforts should be focussed on gullies and channel banks, Wasson *et al.* (1998). It should be noted that although the study site was not located in the vicinity of the three Precincts it was located on the Southern Tablelands and Wasson *et al.* (1998) state the results of the study are applicable to the wider area.

Coppabella Hills and Marilba Hills Precincts are located within the Jugiong Creek and Illalong Creek sub catchments of the mid Murrumbidgee catchment. The major creek within these catchments is Jugiong Creek. There are a number of small creeks that flow into Jugiong Creek which is the primary exit point for water in these sub-catchments to flow into the Murrumbidgee River. The Murrumbidgee flows in a general east to west direction.

Jugiong Creek, a tributary of the Murrumbidgee River is located approximately 1.8 kilometres to the north of the closet portion of the Coppabella Hills Precinct. Coppabella Hills Creek is located to the south of the Coppabella Hills Precinct adjacent to Whitefields Road. Stony Creek, a small tributary of Jugiong Creek, runs in a general north – south direction within the Coppabella Hills Precinct.

Illalong Creek is located approximately 690 metres to the north of the closet portion of the Marilba Hills Precinct. Conroys Creek is located within the Marilba Hills Precinct which flows into the Bogolong Creek.

There are a number of creeks located within the Coppabella and Marilba precincts. Only higher order creeks would be permanent however, for the purposes of this assessment, it has been assumed that water would flow in all creeks and unnamed drainage lines during certain hydrologic conditions. These creeks that were identified using topographic maps are presented in Table 8-2: below.

Table 8-2: Creeks located within the Coppabella and Marilba Hills precincts with the potential to be impacted

Creek name	Precinct	Potential impact
Coppabella Creek	Coppabella Hills	Access tracks
Jugiong Creek	Coppabella and Marilba Hills	Transmission easement
Balgalal Creek	Coppabella Hills	Transmission easement
Stony Creek	Coppabella and Marilba Hills	Access tracks and transmission easement
Bushrangers Creek	Coppabella Hills	Access tracks and transmission easement
Bald Hill Creek	Coppabella Hills	Access tracks
Deep Stony Watercourse	Coppabella Hills	Access tracks
Two Mile Creek	Coppabella Hills	Transmission easement
Blind Creek	Marilba Hills	Access tracks and transmission easement
Conroys Creek	Marilba Hills	Transmission easement
Garry Creek	Marilba Hills	Access tracks
McCullums Creek	Marilba Hills	Access tracks and transmission easement
Woolgarlo Creek	Marilba Hills	Transmission easement
Burnt Hut Creek	Marilba Hills	Transmission easement
Dunderaligo Creek	Marilba Hills	Transmission easement
Back Creek	Marilba Hills	Transmission easement

There are also a number of unnamed drainage lines that traverse the landscape of the Coppabella and Marilba Hills precincts with the potential to be impacted by the proposal.

An existing causeway across Jugiong Creek may need to be traversed by large and oversized vehicles, if this route is included in the preferred haulage route. Increased traffic during construction would occur, even if this is not selected in the haulage route, as contractors access and leave the site during construction and operation.

The local drainage system within these precincts is defined as “waters’ in accordance with Section 120 of the POEO Act.

Water supply

Yass (2007) identified that the Yass Dam has a capacity of 850ML and services Yass, Bowning and Binalong. Yass (2007) indicates pressures on water supplies within the LGA due to a combination of population growth and drought. As detailed in Section 8.12.1, rainfall for the general area has been below average for six of the last seven years, confirming drought conditions.

Liaison with Yass Valley Council indicated that generally, water supplied from the Yass Dam was directed to Yass and surrounding villages, however, an upgrade to this dam is expected to be completed prior to construction of this project and remains an option for consideration. At the time of writing the Yass LGA was under level one, permanent water restrictions. Residents living outside of the villages rely on their own supplies; supply is likely to include rainwater tanks, onsite dams and groundwater extraction bores. It is considered that residents living outside of the villages have critical water supply issues in this current drought.

Water in the Harden LGA is primarily sourced from the Murrumbidgee River and is managed by the Golden Fields County Council. A pipeline runs from the village of Jugiong to Harden. Initial consultation with representatives from the Golden Fields County Council indicated that the pipeline could offer a potential source of water for the proposal. The potential for Golden Fields County Council to supply water to the proposal would depend on a range of factors including recent climatic conditions prior to the request for water the total amount of water required for the proposal and the duration of water supply required. Should the Proponent wish to investigate the potential for using this water as a source of water for the proposal consultation and negotiations with Golden fields County Council would be required.

Liaison with Harden Shire Council indicated that residents had in the past been able to connect to this water supply pipe. It is understood that residents who live on properties outside of the near vicinity of the pipe are likely to be on their own supply similar to residents outside Yass and surrounding villages.

There are no statements of joint intent issued by the healthy rivers commission in the Murrumbidgee catchment area.

Groundwater

A number of registered groundwater bores are located within the general area of each precinct.

As discussed above, it is likely that residents within the local vicinity of the development area are likely to have their own supply of water for both domestic and agricultural use. It is likely that a number of properties extract water from groundwater bores.

Yass (2007) describes that most groundwater within the Yass LGA is suitable for domestic, agricultural and limited industrial uses. Further, increased development in rural areas may impact the quantity and quality of groundwater to existing users and the environment, Yass (2007). In 2004, an embargo was placed on new groundwater extraction licenses due to concerns that groundwater in the Yass catchment was unsustainable.

The Department of Water and Energy indicated that the vast majority of groundwater registered bores located in the area, both within the Yass Valley and Harden LGAs would be extraction bores for irrigation purposes (pers. comm. M. Mitchell, DWE 17 Dec 2008).

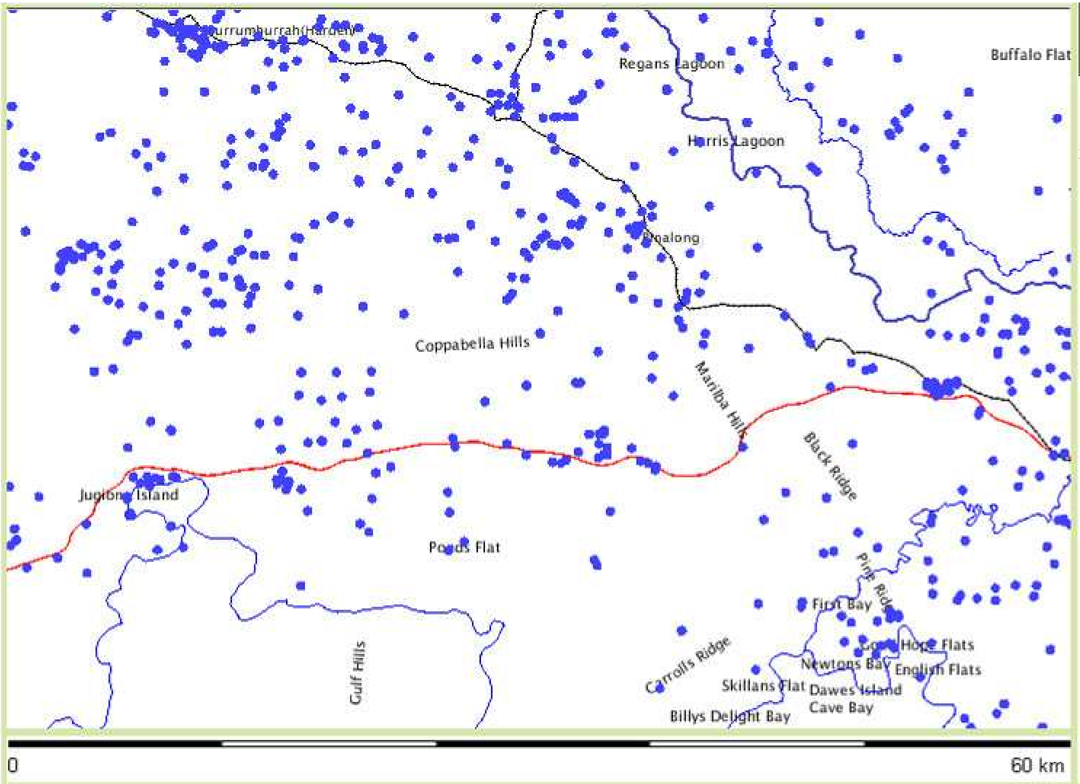


Figure 8-1: Groundwater bores located within the general vicinity of the precincts (DECC 2008)

8.1.2 Impact assessment - construction and decommissioning

It is considered that the volume of water required for Proposal would be similar across all three precincts. The following estimates of the volume of water required are based on daily usage rates expected during the construction period of the proposed wind farm. Please note these estimates have been based on the construction of all 182 proposed turbines over a construction period of 24 months.

Table 8-3: Estimated water usage required for the Proposal

Activity	Estimated volume (litres)	Expected duration	Expected total for construction (mega litres)
Site facilities	10,000 (per week)	Entire construction phase	1.04
Turbine footings	50,000 (per footing)	182 turbines	9.1
Water Cart (dust suppression)	60,000	One water cart running each day of construction, two water carts per turbine footing.	9.3

Surface water

Water bodies located within close proximity of the precincts are likely to be sensitive to input from pollutants, including sediment, hydrocarbons and nutrients. Excavation, soil stockpiling and haulage form the primary risks with regard to protecting the water quality in the catchment from sediment input. The transport of chemicals, the requirement to batch concrete and use hydrocarbons onsite (in vehicle refuelling as well as in machinery such as the substation and nacelles), represents a spill risk, as detailed below.

Excavation activities, including road construction and track upgrades and the excavation of footings for turbines, crane pads, control buildings and substation, as well as soil stockpiling would be located away from natural drainage features where possible. However a number of Creek and drainage line crossings would be required to be constructed. Table 8-2 identifies Creeks within the development envelope that have the potential to be impacted by the construction of access tracks and transmission easements. There is also the potential for impact indirectly by sediment or pollutant laden run-off during large rainfall events to affect local drainage lines. As detailed in Section 8.2, there will large amount of earthworks including stockpiling associated with the Proposal. It is considered that stockpiles and other areas undergoing earthworks have the potential to generate sediment laden run off during periods of rain fall. Dust and soil sediments may be transported off site as run-off as a result of heavy vehicles using access tracks during construction.

There is potential for construction materials, such as alkaline concrete wash and hydrocarbons to be discharged from construction sites and during transport. Chemicals are found in concrete products, soil additives used for stabilisation and other purposes, concrete-curing compounds, fuels and building material wastes. When used or stored improperly, these chemicals can become mixed with stormwater and carried by sediment and runoff from construction sites. Staff amenities would also be required onsite, producing biological waste[30].

The input of any of these substances can cause eutrophication of surrounding waters, affecting water quality required for stock and domestic use, and lead to the degradation of aquatic habitats and the environmental services associated with them, such as water filtration, aeration) could also occur from the use of fertiliser (during site remediation), and nutrient release from sediments as a result of erosion and release of turbid waters during construction.

Water courses that have potential to be impacted at Coppabella Hills and Marilba Hills are lower order streams. The construction and maintenance of proposed creek crossings has the potential to impact on water quality and hydrologic regimes.

While works adjacent to and within creeks pose a serious risk to local water ways without controls, impacts are manageable, through the design, implementation and monitoring of specific controls during the construction phase and associated site remediation. The development footprint of the Proposal (the sum of all areas to be directly affected by tracks, footings or stockpile and compound sites) has been calculated as:

Coppabella Hills:	1.47 % of the site	((116.22 ha / 7907 ha) x 100)
Marilba Hills:	3.60 % of the site	((149.17 ha / 4140.0 ha) x 100)

The small percentage of direct impact, the buffer distances able to be achieved around drainage lines and the high degree of manageability, suggest that impacts to water quality would be able to be managed effectively. Potential impacts would be managed through the preparation and adoption of a Sediment Erosion and Control Plan. This plan would identify details and design specifications of sediment and

30 At this stage it is difficult to identify the exact quantity of chemicals that would be required during the construction phase. This information would become evident prior to the construction phase. The Proponent commits to identifying all chemicals (including quantities and physio-chemical properties) required for construction activities and preparing an appropriate management plan to manage these chemicals. The appropriate vehicle for this is considered to be the Construction Environmental Management Plan.

erosion controls and would be prepared in general accordance with *Managing Urban Stormwater – 'Soils and Construction'* guidance document.

Groundwater

The Proposal area is currently under a groundwater embargo that would restrict the extraction of groundwater for construction purposes. Thus, should the Proponent propose to extract groundwater for use during construction or decommissioning, they would have to purchase this water off an already licensed user. Additionally, should an agreement be reached with a licensed user the Proponent would likely compensate the user such that this impact would unlikely be significant.

There is also the potential for groundwater dependant ecosystems (GDEs) to be impacted during the construction phase of the Proposal. Draft information obtained from the Department of Water and Energy identified three main types of GDEs within the Murrumbidgee catchment, Karst, Wetlands and Springs. Results of the draft study identified the presence of two GDEs, Karsts, at Talmo and Taemas. Both these locations are outside of the development envelope but within the vicinity of the Proposal. `These are presented in Figure 8-2 below.

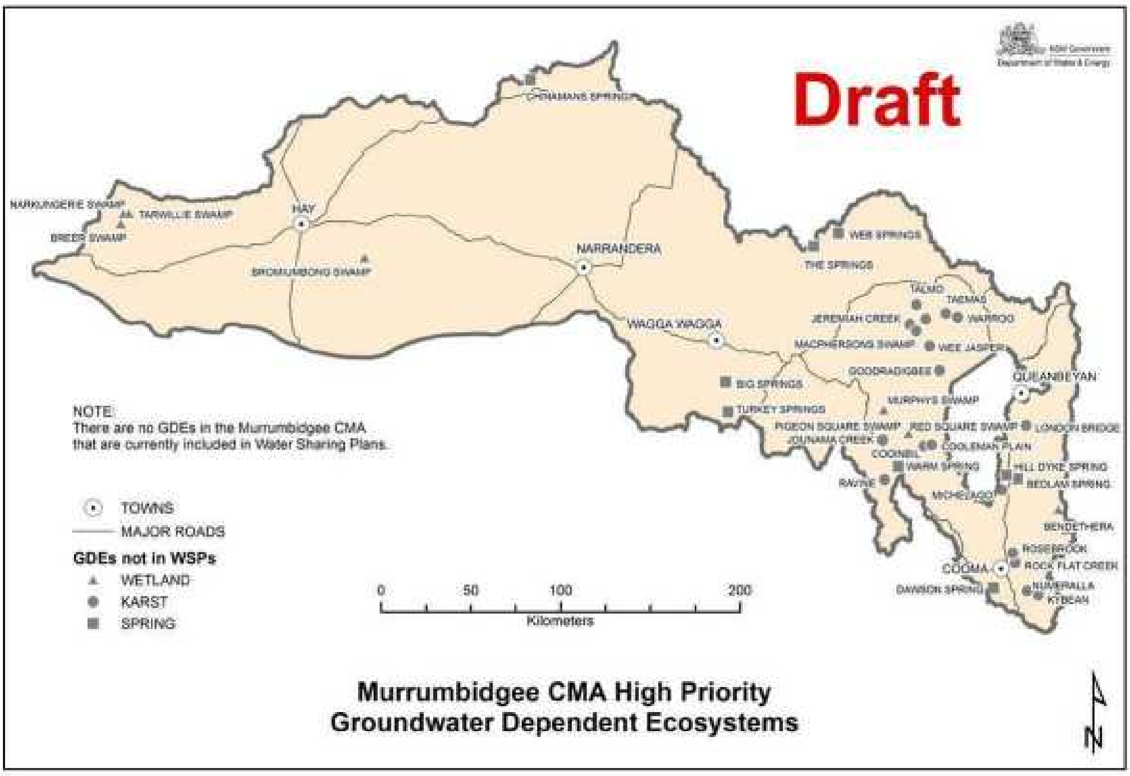


Figure 8-2: GDE's within the Murrumbidgee CMA, (data sourced from DWE)

Should groundwater extraction be required, appropriate approvals would be sought from the Department of Water and Energy prior to the extraction of groundwater. Additionally, studies would be undertaken by an appropriately qualified geotechnical engineer to ensure that unacceptable impacts to groundwater are avoided.

Blasting may be required, to anchor turbines (this will be determined by detailed geotechnical investigations, prior to construction). Should controlled blasting be required, it would be carried out in accordance with all relevant statutory requirements. The Proponent would investigate the potential to affect groundwater prior to blasting works being undertaken.

Water supply

The total amount of water required to develop the Coppabella Hills and Marilba Hills Precincts is estimated to be around 16.23 Mega litres. The majority of this water is required in concrete batching to provide footings for turbines, control buildings and substations. Water will also be required onsite for dust suppression and in case of fire.

There are a number of options being considered for sourcing water for the construction phase of the project. Surface water could be supplied from either Jugiong creek or Lake Burrinjuck, however, test results may be required to determine the suitability of the water for construction purposes. In both cases a temporary allocation would need to be purchased from an existing license holder. Direct access to the water supply would also need to be arranged, which would involve necessary occupancy agreements through state water or a landowner and work approvals through the Department of Water and Energy.

Groundwater is another option available through the use of ground bores. As the site area currently has an embargo on ground water an allocation would need to be purchased. As the project is considered a Major Project under Part 3A of the NSW Environmental Planning and Assessment Act 1979, a ground bore could be drilled should a suitable location be found.

The Goldenfields Water County Council (GWCC) maintains a pipeline that supplies water from Jugiong to Harden. Initial contact with GWCC revealed that while this is not the general practice it has not been ruled out as an option. The pipeline runs approximately 10 kilometres west of the Coppabella Hills Precinct. A purchase and allocation agreement would be negotiated between the Proponent and GWCC.

The Yass Dam is expected have an upgrade completed by the anticipated time of construction. The Proponent will liaise with council closer to the construction phase to determine if this is still an option for sourcing water.

Water would be reused where possible to reduce the total amount required. No waste-water would be discharged into creeks or drainage lines. No sewerage or septic would be installed for the construction phase; portaloos would be available to construction staff during this phase. Water used for dust suppression, would be controlled such that the smallest volume possible is administered to minimise water requirements and the potential for run off.

8.1.3 Impact assessment - operation

Water tanks may be installed to collect rain water from the control building, in order to supply water for maintenance staff facilities. No additional water connections are anticipated. A septic system may be installed in the control building. These would meet Council (Yass or Harden, as appropriate) standards.

The operation of the wind farm would require minimal traffic on roads/tracks, which would have been upgraded to accommodate heavy loads during the construction phase. The increase in compacted areas as a result of the track upgrades may potentially increase the amount and turbidity of runoff around these tracks. All access tracks would be maintained in accordance with the OEMP, including appropriate permanent sediment and erosion controls.

Infrastructure including the substation and turbines would be designed to prevent any leakage of fuels or lubricants, even in high rain fall events (eg Stormceptor type system).

The NSW DECC provides NSW water quality objectives (WQO) and river flow objectives (RVO) for surface waters within NSW. The NSW water quality objectives *are the agreed environmental values and long-term goals for the NSW's surface waters* (DECC 2009). These goals identify:

- The community's values and uses for our rivers, creeks, estuaries and lakes (i.e. healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water); and
- A range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses (DECC 2009)

The River Flow Objectives:

> *are the agreed high-level goals for surface water flow management. They identify the key elements of the flow regime that protect river health and water quality for ecosystems and human uses* (DECC 2009).

The Proposal area for both precincts is located within the Murrumbidgee River and Lake George catchment. The Proposal has the potential to impact the Murrumbidgee River, classed as a major regulated river, Burrinjuck Dam, classed as a major storage and a number of uncontrolled streams, including Jugiong and Illalong creeks.

River quality and objectives for the Murrumbidgee and Lake Catchment are presented in Table 8-4 below. Water quality objectives are presented in Table 8-5Table 8-4.

Table 8-4: River quality objectives for Murrumbidgee and Lake George Catchments

Environmental value	River quality objectives	Water body	Classification
Protect pools in dry times	Protect natural water levels in pools of creeks and rivers and wetlands during periods of no flows	Jugiong and Illalong creeks	Uncontrolled stream
Protect natural low flows	Protect natural low flows	Jugiong and Illalong creeks	Uncontrolled stream
Minimise the effect of weirs and other structures	Minimise the impact of instream structures	Jugiong and Illalong creeks	Uncontrolled stream
Protect important rises in water levels	Protect or restore a proportion of moderate flows ('freshes') and high flows	Jugiong and Illalong creeks	Uncontrolled stream
Maintain wetland and floodplain inundation	Maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems	Burrinjuck Dam	Major water storage
Mimic natural drying in temporary waterways	Mimic the natural frequency, duration and seasonal nature of drying periods in naturally temporary waterways	Burrinjuck Dam	Major water storage

Environmental value	River quality objectives	Water body	Classification
Manage groundwater for ecosystems	Maintain groundwater within natural levels and variability, critical to surface flows and ecosystems	Burrinjuck Dam	Major water storage
Maintain natural flow variability	Maintain or mimic natural flow variability in all streams	Jugiong and Illalong creeks	Uncontrolled stream

Table 8-5: Water quality objectives for Murrumbidgee and Lake George Catchments

Environmental value	Water quality objectives	Water body	Classification
Aquatic Ecosystems	Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Visual amenity	Aesthetic qualities of waters	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Secondary contact regulation	Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Primary contact regulation	Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Livestock water quality	Protecting water quality to maximise the production of healthy livestock	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Irrigation water supply	Protecting the quality of waters applied to crops and pasture	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Homestead water supply	Protecting water quality for domestic use in homesteads, including drinking, cooking and bathing	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream
Drinking water-groundwater	Refers to the quality of drinking water drawn from	Murrumbidgee River	Major regulated river

Environmental value	Water quality objectives	Water body	Classification
	the raw surface and groundwater sources before any treatment	Jugiong and Illalong creeks	Uncontrolled stream
Aquatic foods	Refers to protecting water quality so that it is suitable for the production of aquatic foods for human consumption and aquaculture activities.	Murrumbidgee River Jugiong and Illalong creeks	Major regulated river Uncontrolled stream

Water quality objectives detailed above are *not intended to be applied directly as regulatory criteria* (DEC 2006). However it is considered prudent that the Proposal consider these objectives when defining measures for the mitigation of potential impacts associated with the Proposal.

The guiding principle of the development with regards to water quality is to have a neutral or beneficial impact. The objectives presented in the tables above describe protection, maintaining or improving water quality within the catchment. The mitigation measures outlined in Section 8.1.4 have been prepared so as to achieve the “neutral or beneficial impact’. It is considered that these mitigation measures are consistent with the WQOs and RVOs.

8.1.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
42	Deterioration of water quality (Surface Water)	Minimise risk	Infrastructure placement, including turbines, tracks, substations, control buildings, stockpiles, and site compounds and turnaround areas, would not be sited within 40 metres of a major drainage line or water course	Detailed design	CEMP	x	x
43	Deterioration of water quality (Surface Water)	Achieve neutral or beneficial water quality impact	The Proponent would prepare a Sediment / Erosion Control Plan (SECP) as a sub plan of the Construction Environmental Management Plan. This plan would include the following provisions: • Sediment traps would be installed wherever there is potential for sediment to collect and enter waterways • Stockpiles generated as a result of construction activities would be bunded with silt fencing, (mulch bunds or similar) to reduce the potential for runoff from these areas • On the steeper slopes check banks would be installed across the trenchline, as appropriate, following closure of the trench. These would discharge runoff to areas of stable vegetation • Stabilisation and site remediation would be undertaken as soon as practicable throughout and post construction. • Soil and water management practices would be developed as set out in Soils and Construction Vol. 1 (Landcom 2004)	Construction	CEMP	x	x
44	Deterioration of water quality (Surface Water)	Minimise risk	Design water crossings to minimise impact on existing banks, water flow and animal passage.	Construction	CEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
45	Water supply	Minimise risk	Undertake liaison with representatives of Golden Fields County Council regarding the potential supply of construction water	Construction	CEMP	X	X
46	Deterioration of water quality (Surface Water)	Minimise risk	All vehicles onsite would follow established trails and minimise onsite movements	Construction Operation	CEMP OEMP	X	X
47	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Machinery would be operated and maintained in a manner that minimises risk of hydrocarbon spills	Construction Operation	CEMP OEMP	X	X
48	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Maintenance or re-fuelling of machinery would be carried out on hard-stand in accordance with industry standards for fuel transfer	Construction	CEMP	X	X
49	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Design of concrete batch plants would ensure concrete wash would not be subjected to uncontrolled release. Areas of the batching would be bunded to contain peak rainfall events and remediated after the completion of the construction phase. Waste sludge would be recovered from the settling pond and used in the production of road base manufactured onsite. The waste material would be taken from the batching plant to be blended in the road base elsewhere onsite.	Construction	CEMP	X	X
50	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Carry out dust suppression as required through either watering or chemical means (environmentally friendly polymer based additives to water).	Construction Decommissioning	CEMP	X	X
51	Deterioration of water quality	Achieve neutral or	A Site Restoration Plan (SRP) would be prepared as part of the Construction Environmental Management Plan. This would set out	Construction	CEMP	X	X

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
	(Surface Water)	beneficial water quality impact	protocols for restoration works including: • Site preparation • Stabilisation • Revegetation • Monitoring	Decommissioning			
52	Deterioration of water quality (Surface and Ground Water)	Minimise risk	A Spill Response Plan would be prepared as part of the CEMP and OEMP including: • Identify persons responsible for implementing the plan if a spill of a dangerous or hazardous chemical/waste would occur • Identify all chemicals required for the Proposal, including physio-chemical properties, risks posed to water quality objectives and appropriate methods of storage of these chemicals. • Locate Material Safety Data Sheets (MSDS) for all chemical inventories at on site and readily available • Comply with manufacturers recommendations in relation to application and disposal where chemicals are used • Report any spill that occurs to the Construction Manager regardless of the size of the spill • Establish clearly defined works and refuelling areas • Spill protocols in this plan would dictate when the EPA would be notified • Chemical / fuel storage areas would be identified, and be bunded to prevent loss of any pollutants • Hydrocarbon spill kits would be stored at the site. A	Construction Operation Decommissioning	CEMP OEMP	X	X

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			number of site staff are to be trained in the use of the spill kits				
53	Deterioration of water quality (Surface and Ground Water)	Minimise Risk	The Proponent would notify the NSW DECC EPA in the event of any spill that had the potential to pollute waters.	Construction Operation	CEMP OEMP	X	X
54	Protection of ground water	Minimise risk	Undertake investigations, as part of the geotechnical investigation, to ensure that the project would have no material adverse effect on groundwater/aquifers as a result of blasting activities.	Pre-construction	CEMP	X	X
55	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Monitor bunded infrastructure to ensure that volume of oil could be fully contained in the event of leak	Operation	OEMP	X	X
56	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Maintain septic systems, if installed, to meet appropriate Australian standards	Construction Operation Decommissioning	CEMP OEMP	X	X

8.2 SOILS AND LANDFORMS

8.2.1 Existing environment

The State of Environment Report for the Yass Valley Shire (2006-2007), has identified that soil erosion is a serious environmental issue throughout the LGA. The SoE identifies that erosion has occurred across the Yass Valley as a result of clearing for agriculture, poor land management practices, overstocking and flooding events.

The Harden SoE (2004) identified that surveys indicated about 420 kilometres of gully erosion and about 50 kilometres of streambank erosion were present in the shire, as well as extensive areas of severe to minor sheet erosion.

Soils landscapes vary across each Precinct of the Proposal. Soil landscapes of the Coppabella Hills and Marilba Hills Precincts have been described in Hird (1991) which identified that soils within the three Precincts have erosion potentials including high to extreme. A brief description of the landscape at each Precinct is presented below.

A search of the contaminated land record, managed by the NSW DECC (DECC 2009a) identified one site within the Yass Valley LGA and one site within the Harden LGA of known contamination. The first site is a service station located within the township of Yass and the second site is a railway site within the township of Harden. There are no records on the public register of known contamination within or nearby any of the three precincts. It is understood that land use history within the precincts is a mixture of farming (grazing). Farming operations have the potential to contaminate land through activities such as sheep and cattle dips and diesel refuelling. Due to the historical land use of the precincts (farming) and the close involvement of the landowners in the development of the sites, the potential for contamination to be present and disturbed by construction activities is considered to be low.

Coppabella Hills Precinct

The landscape within the Coppabella Hills Precinct is generally steep with granite rock outcrops. As described in Table 8-6, Oak Creek, Cockatoo, Binalong and Canowindra soil landscapes occur within the development envelope. With the exception of Canowindra, soils across the Coppabella Hills Precinct have erosion potentials ranging from high to extreme. Gullying on the slopes and foothills of the Precinct is clearly evident, Figure 8-3.

Erosion gully in the foothills of the Coppabella Hills Precinct

Erosion on side slope within Coppabella Hills Precinct

Figure 8-3: Examples of erosion within Coppabella Hills Precinct

Marilba Hills Precinct

The landscape within this Precinct is moderately steep with less rock outcropping than the Coppabella Hills Precinct. As described in Table 8-6, Oak Creek, Cockatoo, Barrenjack, Conroys Creek, Binalong and Canowindra soil landscapes occur within the development envelope. With the exception of Canowindra, soils across the Coppabella Hills Precinct have erosion potentials ranging from high to extreme.

Gullying is less evident, although slumping is occurring in some areas; a consequence of tree clearing causing excessive water to permeate between the soil horizons. This is being addressed on some properties by planting timber belts to intercept ground water.

Sparsely vegetated landscape of Marilba Hills

Marilba Hills

Figure 8-4: Examples of erosion within Marilba Hills Precinct

A brief description of the applicable soil landscapes is presented in Table 8-6 below.

Table 8-6: Soil landscapes of the Proposal area. All information obtained from (Hird 1991).

Soil landscape	Description	Erosion potential	Soil salinity	Precinct
Murringo (mu)	Murringo occurs in association with Young granite. On crests and side slopes moderately deep gradationally textured and duplex red soils. Yellow earths and yellow podzolic soils occur on foot slopes with yellow soldic soils in some drainage lines. Occurs in undulating to rolling low hills with slope gradients generally between 5% and 25%.	Non-clacic brown soils and red earths of side slopes have a moderate erosion potential.	No salting evident	Coppabella Hills
Oak Creek (oc)	Oak Creek is described as shallow soils formed on steep hills. Shallow siliceous sands and shallow sandy Red Earths occur on crests and side slopes with minor red and yellow sandy podzolic soils on lower slopes. Oak Creek soils are located on steep hills of elevations varying from 600-750 metres with slope gradients of 30-50%. Siliceous sands that occur on the crests and side slopes are described as having an extreme erosion hazard with the sandy earths of the remainder of the unit having a high erosion hazard.	Siliceous sands that occur on the crests and side slopes are described as having an extreme erosion hazard with the sandy earths of the remainder of the unit having a high erosion hazard.	No salting evident	Coppabella Hills Marilba Hills
Cockatoo (ct)	Cockatoo soil landscapes are found on small rocky hills. The soils are shallow to moderately deep, brightly coloured red and yellow gradationally textured soils with weak to occasionally moderate structure. Cockatoo soils are located on rolling low hills and hills with local relief between 60-150 m and gradients varying between 10-30%.	Soils of the Cockatoo landscape are described as having a high erosion potential.	Not Present	Coppabella Hills Marilba Hills
Barrenjack (bj)	Barrenjack soils are formed on steep hills. The soils are shallow stony, sandy to loamy soils on crests and side slopes. Stony red and yellow Podzolic soils on colluvial footslopes with alluvial soils. These soils are located on steep hills and mountains, local relief varies between 200-400 metres with slope gradient between 30-50%.	Shallow loams of the Barrenjack landscape have an extreme erosion potential with the remainder of the unit having a very high erosion hazard.	No salting evident	Marilba Hills
Conroys Creek (cy)	Occurs as a valley in the vicinity of Burrinjuck dam. Acid yellow duplex soils with deep massively structured and bleached A2 horizons on mid and lower slopes. Lithosols and Red and Yellow earths are found on upper slopes with yellow Solodic soils on footslopes and in drainage lines. This landscape exists as valleys between hill formations.	Soils of the Conroys Creek landscape unit have been described as having a moderate to high erosion potential.	Patchy	Marilba Hills

Soil landscape	Description	Erosion potential	Soil salinity	Precinct
Binalong (bi)	Moderately deep, bright yellowish brown gradationally or occasionally duplex textured, weakly to moderately structured occur on crests and side slopes. Yellow podzolic soils occur on the lower slopes. Local relief within the unit varies between 30-90 metres with slope gradients between 3-10%.	Lithosols and Stoney earths of the crests and side slopes have extreme and very high erosion potential, respectively. Podzolic soils of the foot slopes have high erosion potential.	No salting evident	Coppabella Hills Marilba Hills
Canowindra (cd)	The primary soils are non-calcic Brown soils. Yellow and brown Solodic soils occur in some drainage lines, with shallow red podzolic soils sometimes found on crests and upper slopes. Red earths also occur on higher crests. Local relief varies from 20-60 metres with gradients between 2-8%.	All soils in this soil landscape group are described as having a moderate erosion potential.	Moderate	Coppabella Hills

8.2.2 Impact assessment - construction and decommissioning impacts

Construction of turbine footings and crane pads would be located on the crests within each Precinct. Access roads would be constructed over all areas of the landscape; crests, side slopes and foothills. The majority of civil construction works would be located on soils documented as having high to extreme erosion potential, and therefore managing potential erosion, associated landform stability and sediment mobilisation impacts are serious issues during the construction and decommissioning phases.

It is anticipated that access tracks would be constructed at a nominal width of approximately 6 metres; however some sections would be required to be 12 metres wide to allow turn around bays and over taking areas. In addition to access tracks, the construction of turbine footings and crane pads need to be level, which in undulating and steep terrain, would likely require a large amount of earthworks. Due the engineering specifications, construction of access roads, turbine footings and crane pads would likely require considerable 'cut and fill' resulting in a substantial amount of material to be stockpiled. Generally these stockpiles are located in the vicinity of the earth works, along the edge of the tracks or near the footings and pads. These stockpiles create a larger impact area than the specific works which they are associated with. Thus stockpiling material would impact the areas in the immediate vicinity of infrastructure locations that are not subject to direct earth works. Off site migration of sediment laden run off could potentially originate from stockpiles and areas of extensive earthworks during rainfall events. Although this has the potential to impact receptors off site, impacts are considered manageable, as discussed in Section 8.1.

Soil compaction would occur, as hardstands and tracks are created and as work progresses across each Precinct. This would reduce the permeability of the soil, increasing run off.

A range of chemicals would be required during the construction phase; in paints, acids for cleaning surfaces, cleaning solvents, concrete products, soil additives used for stabilisation and other purposes, concrete-curing compounds, fuels as well as other sources. When used or stored improperly, these chemicals can become mixed with stormwater and carried by sediment and runoff from construction sites. They can also cause soil contamination, affecting plant growth. The Proponent would prepare a spill response plan that would identify procedures to respond to chemical spills that have the potential to impact the surrounding environment. The DECC would be notified if a spill was considered to present a significant risk of harm to humans or the environment.

During the construction works, there is the potential for existing contamination to be disturbed. The three precincts are located on private property that has a land use history of farming (grazing). Farming operations are a potential source of contamination, likely resulting from activities including sheep and cattle dipping, diesel refuelling and historical use of pesticides. Live stock dips and refuelling areas (if any) are likely to be located on flatter terrain at the base of ridges. It is considered unlikely that these operations would occur on the side slopes and tops of the ridges, where most of the proposed development would occur. Further, the side slopes and ridges which dominate the landscape of the development envelope are likely to be used for grazing, thus reducing the likelihood of potentially contaminating activities. The use of pesticides has been predominately in cropping areas. Again the likelihood of pesticide use is small on the side slopes and ridges.

The Proponent would prepare a protocol to be actioned in the event of disturbance of any areas considered to be contaminated. This protocol would be included in the CEMP and outline the process to be followed if contamination was identified as result of civil construction works.

Acid Sulfate Soils (ASS) are not mapped as occurring within the three precincts. Acid sulfate soils occur in about 40,000 square kilometres of Australia's coastal zone, including parts of every state and the

Northern Territory (Sammut 2000). Further, Sammut (2000) point out that in general, iron sulfide layers are expected to be located in areas where the surface elevation is less than five metres above mean sea level.

The Candowindra soil group was identified as having moderate salting evident. The Canowindra soil group is located on the crests and upper slopes within the Coppabella precinct and there is the potential of works disturbing these soils. The remainder of the soil groups anticipated to be present within each precinct had low potential for salts.

Blasting may be required, to anchor turbines (this will be determined by detailed geotechnical investigations, prior to construction). Should controlled blasting be required, it would be carried out in accordance with all relevant statutory requirements.

Construction impacts are expected to be temporary within each Precinct. As construction would occur within a specific time and area, the potential for impact, would be limited to discrete locations. Additionally, the application of mitigation measures would reduce the potential for cascading impacts (such as transport of sediment in drainage lines and resultant impacts offsite).

Decommissioning impacts are considered to be minor relative to construction. It is considered that mitigation measures detailed below would allow for the appropriate management of soils during the decommissioning phase.

8.2.3 Impact assessment - operation

The operation of the wind farm is likely to require minimal traffic, as discussed in Section 7.10. By this time, the roads/tracks that would have been upgraded to accommodate heavy loads during the construction phase. No soil or landform impacts are anticipated to be generated during the operational phase.

8.2.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
57	Landform stability	Minimise risk	The Proponent would undertake geotechnical investigations in the area of the proposed turbines to determine ground stability.	Pre - construction	DoP	X	X
58	Contamination	Minimise risks	Consult with involved property owners in relation to areas of land potentially contaminated by past land use and manage impacts in these areas to avoid affecting the any areas of contamination.	Pre - construction	CEMP	X	X
59	Soil quality	Minimise risks	Subsoil would be separated from topsoil for rehabilitation purposes. Topsoil from the excavation sites would be stockpiled and replaced. On steep slopes, topsoil would be stabilised. Any excess subsoil would be removed from the site and disposed of at an appropriate fill storage site.	Construction	CEMP	X	X
60	Soil quality	Minimise impact	Avoid compaction of soil resulting from vehicle access and laying of materials particularly during saturated soil conditions, and remediate as necessary	Construction	CEMP	X	X
61	Soil quality	Minimise impact	The Proponent would prepare a protocol in the instance that suspected contamination is unexpectedly found. Should contamination or potential contamination be disturbed during excavation works, the area would be assessed by appropriately qualified consultants. The DECC would be notified if warranted.	Construction	CEMP	X	X
62	Soil loss or stability of landform loss	Minimise risks	Concrete wash would be deposited in an excavated area, below the level of the topsoil, or in an approved landfill site. Where possible, waste water and solids would be reused onsite.	Construction	CEMP	X	X
63	Soil loss or stability of landform loss	Minimise risks	Access routes and tracks would be confined to already disturbed areas, where possible. All contractors would be advised to keep to established tracks.	Construction	CEMP	X	X

8.3 MINERAL EXPLORATION IMPACTS

8.3.1 Existing environment

Geologically, the area proposed for the Yass Valley Wind Farm lies in the eastern Lachlan Fold Belt, an area consisting of Palaeozoic age sequences (Ordovician to Permian) overlain in part by Cainozoic age basalts and sediments. Over 580 metallic mineral occurrences are known within the area defined in the Goulburn 1:250 000 map sheet area. Historically, the area has produced significant amounts of gold and base metals, as well as tungsten. The area also hosts important industrial mineral resources; including coarse aggregate, sand, iron oxide and limestone.

The Department of Primary Industries has indicated during the consultation process that the impact of the Proposal on mineral exploration and mining is a key concern. There is one current exploration license within the wind farm that has the potential to be impacted. Exploration License 3559 (EL 3559) is located across the north east portion of the Coppabella Hills Precinct and north western portion of the Marilba Hills Precinct. The NSW DPI suggest that while the construction of the wind farm may not physically prevent exploration from being undertaken within the area, it could be a disincentive to explorations if it restricts or precludes the mining of any resources that may be discovered.

EL 7248 is currently held by Taronga Mines Limited. Exploration leases entitle the holders to carry out exploration and prospecting for minerals within the specified areas. Lease boundaries are indicated on Figure 8-5 and overlap a portion of both Coppabella Hills and Marilba Hills Precincts. The exploration lease is for Group 1 minerals which include a number of metallic minerals.

The Proponent has undergone consultation with representatives of Taronga Mines. During a phone conference on 20 February 2009, the Taronga mines representative acknowledged that they were aware of the Proposal and that part of the proposed development envelope was within the boundary of the Taronga Mines Exploration license area. Further, the representative of Taronga mines indicated that in the current economic climate, the company had no immediate plans to act on the exploration license in the following six months.

Taronga mines indicated that they did not require any further information with regards to the Proposal and indicated that they would like the Proponent to consult with them in six months time.

There are no operating mines within the development envelope. Bogo quarry is located to the south east of the Marilba precinct. It is understood that Bogo Quarry extracts coarse aggregate, and subject to approvals may operate a concrete batching plant in the future. Should the proposed Bogo quarry batching plant gain approval and begin operation, this would establish an alternate source of concrete that could potentially be used during construction.

Representatives from Glenella Quarry Pty Ltd (owner/operators of Bogo Quarry) met with the Proponent on 27 February 2009 to discuss both proposals. Of particular interest to the Proponent is the capacity of the proposed batching plant and the likely timeframe of its development and operation. Both issues were consistent with the requirements of this proposal. The proximity of the quarry to the proposed development envelope provides that there is an opportunity for the quarry to supply base materials for road construction and rehabilitation as well as concrete for turbine foundations if the batching plant be approved.

8.3.2 Impact assessment - construction and decommissioning impacts

Potential sterilisation of the mineral resource and inhibition of an active or future exploration program would be the key mineral resource concern posed by the Proposal. The Proposal has the potential to impact on one current exploration area. The Coppabella and Marilba precincts are located within a portion of Exploration Licence (EL) 7248. Final turbine and infrastructure layouts would be provided to the license holder and DPI.

There is a potential for any planned exploration works to be impacted. This may occur during the construction phase, when infrastructure is developed and would depend on the size and location of the infrastructure, including the substation, turbines footings, control building and access roads, as well as the unknown quality, quantity and location of the mineral resource. Although there is a potential for the construction of the wind turbines to impact the potential for exploration, the construction phase is of relatively short duration. It is considered that future exploration project schedules could be managed in relation to the planned timeframe for construction.

8.3.3 Impact assessment - operation

In principle, there is no reason why the exploration of minerals could not occur around the operational wind turbines as the direct footprint of the wind farm infrastructure is less than 0.5 per cent EPL site area. The Proposal would not prevent access to the Coppabella precinct or ground based exploration of minerals except in the vicinity of infrastructure where there may be safety, structural, operational or engineering limitations. In this context, it is possible that the operational wind farm may impede the exploration of minerals within the exploration lease area, in close proximity to infrastructure such as turbines and substations. This may be due to restrictions on the manoeuvrability of exploration machinery, localised sensitivity of magnetic and gravity remote sensing methods and occupational health and safety considerations. However, the access roads constructed for the proposed wind farm would likely facilitate future exploration works via the creation of easier access as well as making a greater portion of the exploration lease area more accessible. Impacts to manoeuvrability and occupational health and safety considerations would be reversed at the end of the project's life, allowing exploration of all areas except for those discussed above; including substation, turbines and control building footings. This combined area is small in relation to the lease area and as stated in relation to construction and decommissioning impacts, the impact is considered to be justified.

It is understood that mineral exploration can also be achieved aerially by low flying planes and ground penetrating radar. The operation of the wind farm would limit the opportunity for this exploration method to be achieved.

While only one Exploration Lease occurs within the development envelope at this time, if a mineral deposit is discovered then an application for a Mining Lease can be made. There is no certainty that a discovery would be made or a Mining Lease would be granted and accordingly the amount of potential lost mining revenue cannot be known in advance. In comparison to the exploration lease area, the relatively small land area that would be sterilised and the level of reversibility of the Proposal suggest that this impact is justifiable; the temporary loss of these areas for mining would be offset by the utilisation of a renewable resource during the project's life. The benefits of the wind farm Proposal would extend to involved property owners (via lease agreements), Yass Valley Wind Farm and its shareholders as well as the end users of the renewably generated electricity.

This combined area is small in relation to the lease area and as stated in relation to construction and decommissioning impacts, the impact is considered to be justified.

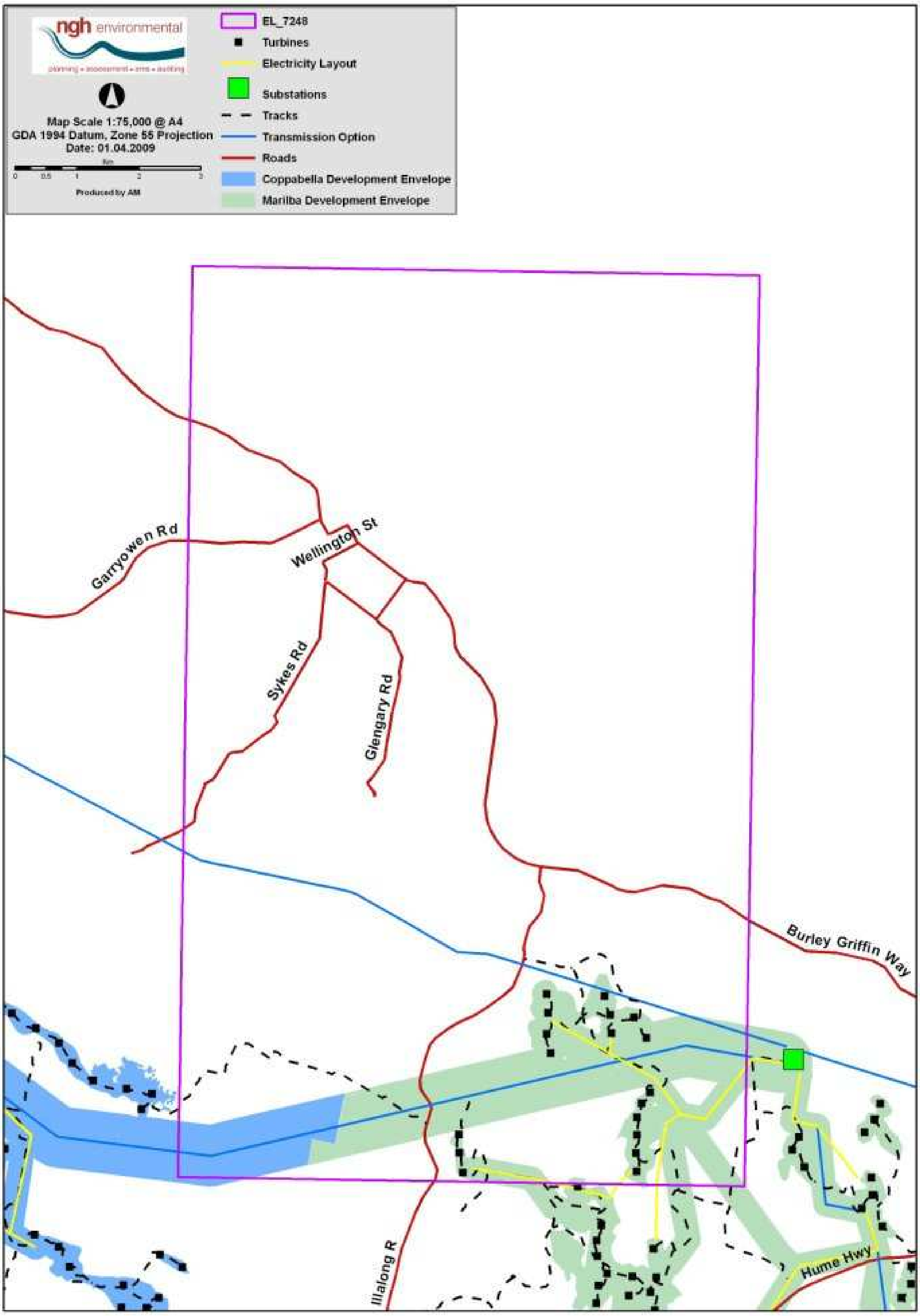


Figure 8-5: Mining leases in the vicinity of the Yass Valley Wind Farm Proposal (supplied by NSW Department of Primary Industries)

8.3.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
64	Conflict with mineral exploration	Minimise conflict	The Proponent would liaise with the current mineral lease holder providing a final turbine and infrastructure layout, prior to the construction phase	Pre-construction	CEMP	X	X
65	Conflict with mineral exploration	Minimise conflict	The Proponent would liaise with continue to liaise with Taronga Mines. This consultation would be ongoing between the Proponent and Taronga Mines.	Pre-construction / Construction	CEMP	X	X
66	Conflict with mineral exploration	Minimise conflict	The Proponent would provide a point of contact to the current mineral lease holder	Pre-construction	CEMP	X	X
67	Conflict with mineral exploration	Minimise conflict	The Proponent would liaise with the involved land owners and current mineral lease holders prior to rehabilitation, to ensure that any project access roads that they may wish to retain are retained. Several of these access roads are likely to be of benefit both to routine agricultural activities as well as to exploration activities onsite	Construction	CEMP	X	X

8.4 LAND VALUE IMPACTS

8.4.1 Existing environment

Local determinants of land value

Land values are influenced by prevailing and permitted land uses, economic conditions, access and proximity to markets and workplaces, demand for lifestyle and a range of other dynamic factors. While public perception of wind farms can be highly variable and subjective (SRSC 2005), there is the potential for a section of the market to be negatively affected by perceived or actual visual or noise impacts, or by changes to compatible land uses as a consequence of wind farm development.

Permitted land uses: agriculture and residential subdivision

The proposed Yass Valley Wind Farm is located in an area where agricultural capacity has traditionally been the largest determinant of land prices. The land surrounding the precincts within the Yass Valley LGA is zoned No. 1(a) Rural Agricultural Zone, used for extensive sheep and cattle grazing. The land surrounding the western portion of the Coppabella Hills Precinct (located within the Harden Shire LGA) is zoned 1(a) Non-urban “A” under the Interim Development Order (IDO) No. 1 – Shire of Harden. There are major shifts occurring in agriculture in the region, driven by declining international agricultural markets, extended droughts and the introduction of new farming methods. Linked to these changes, rural subdivision applications are being made in the Yass Valley and Harden Shire Councils as agriculturalists capitalise on increasing property values. There is also increasing demand for rural subdivision lots, increasingly valued for their rural character and lifestyle values, rather than agricultural productivity.

Information provided by Yass Valley Council identified that there are three approved subdivisions within the vicinity of the proposal. The approved subdivisions are located west and south west of Bowning and near Bookham Figure 8-6.

Yass Valley Council have provided the following information on these approved subdivisions:

- DA 5.2003.379.1, 8 lots (8 – 160 hectares), consent granted in 2004 (non involved)
- DA 5.2005.251.1, 8 lots (8 – 159 hectares), consent granted in 2006 (involved)
- DA 5.2003.380.1, 3 lots (48 – 134.1 hectares), consent granted in 2004 (non involved)
- DA 4.1997.113.1, 2 concessional lots (3.5 and 9.2 plus the residual lot), consent granted in 2006 (non involved)

The size of the smaller lots indicates that agricultural productivity would not be the prime land use. One subdivision is being marketed as an eco-village.

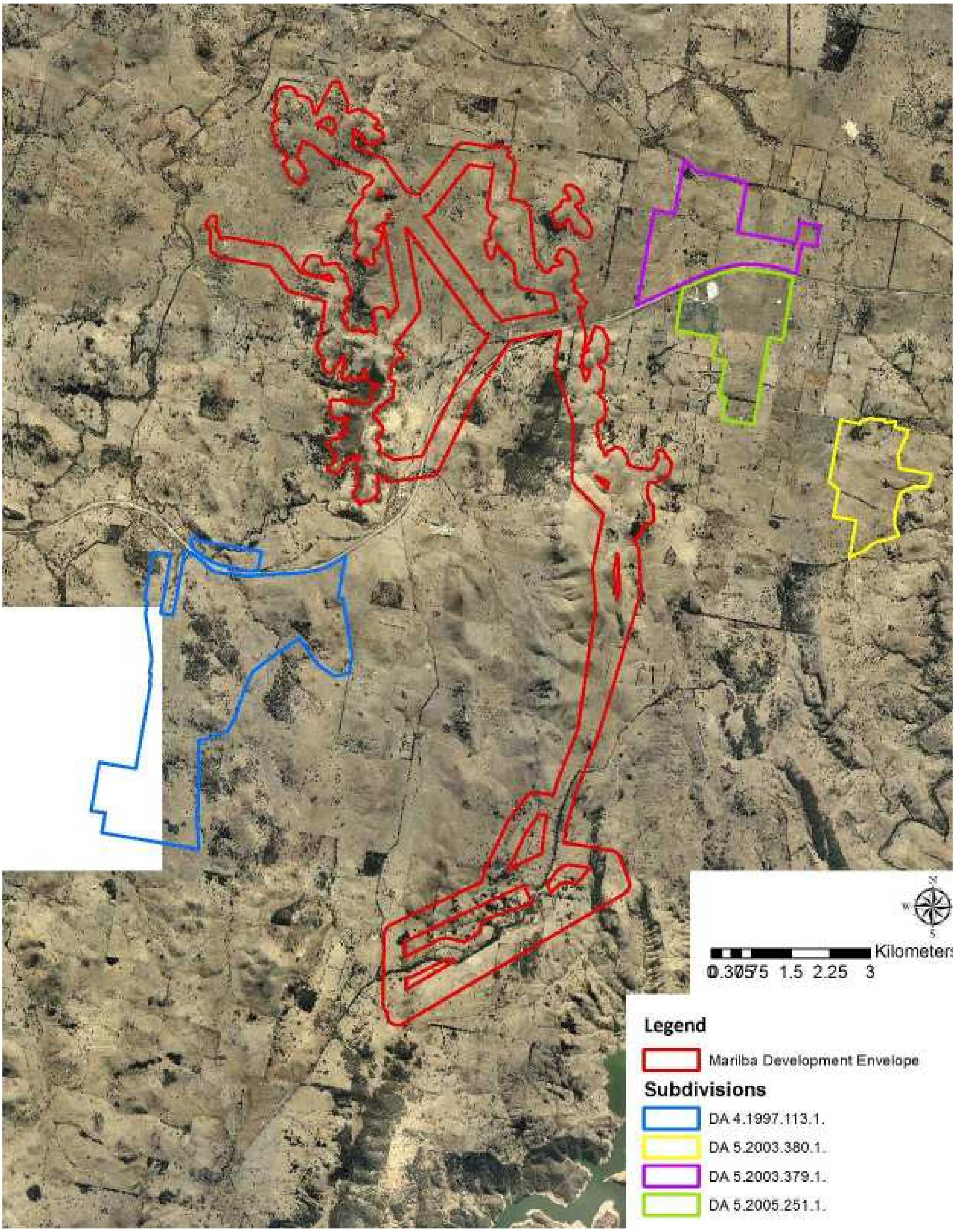


Figure 8-6 Relevant subdivisions in Yass LGA and their proximity to the Marilba Hills Precinct

Information provided by Harden Shire Council identified that there are two approved subdivisions in the vicinity of the Coppabella Hills precinct. One is a four Lot subdivision located on Burley Griffin Way. It is estimated that the closet point of this subdivision to a proposed turbine is 8.5 kilometres to its north-north-east. The other approved subdivision is a three lot rural subdivision located north of the Coppabella Hills precinct along Garry Owen Road. It is estimated that the closet portion of the approved subdivision to the nearest proposed turbine is 4.5 kilometres.

There is also potential for further concessional lot applications in the surrounding district. In addition to traditional farmers, 'hobby farm' or 'lifestyle' residents are present in the local area particularly along Black Range Road, near to the Marilba Hills Precinct.

Commutable proximity to the larger population centres of Canberra and Sydney is likely to be an important factor in the trend smaller subdivisions; increasing numbers are settling in the Yass district and commuting to work in Canberra. The potential for subdivision in the area increases the importance of land value impacts. While agriculture and wind farms are demonstrably highly compatible, recreational and aesthetic land uses have a higher subjective component. There is speculation within the local community that the Proposal would reduce land values (B.Marshall pers. obs. Yass Valley Wind Farm Open House, 10 Dec 2008).

Land value studies and wind farms

The impact of wind farms on land values has been raised as a key concern by several individuals during the community consultation process. However, it is a difficult question to definitively address. There are examples of successful residential estates being developed near wind farms in Australia; an informal study of the Salmon Beach estate near the Esperance wind farm in Western Australia showed a strong trend of increasing house prices (AusWEA 2004). However, the interplay of multiple land value determining factors undermines any direct comparisons.

Henderson and Horning Property Consultants (2006) undertook a study into local property values around the Crookwell 1 wind farm, the closest operational wind farm to the proposed Yass Valley Wind Farm (although significantly smaller in turbine number and size). The study was undertaken in relation to the potential impact of the Cullerin wind farm (located between Gunning and Goulburn on the Hume Highway) but has land use factors comparable to the proposed Yass Wind Farm. Henderson and Horning's study explored the effects of a wind farm on local land values, with recourse to the impacts resulting from other wind farm developments, in Australia and overseas. Henderson and Horning's Land Value Assessment is sourced below, with additional studies, to provide a background to the effects of wind farms on land value.

United States Sterzinger et al. 2003

The United States report (Sterzinger *et al.* 2003) was an empirical review where data from 10 wind farm sites was collected and subjected to a statistical regression analysis to determine price changes in three ways:

- How property values changed over the entire period of the study for the view shed and comparable region;
- How prices changed in the view shed before and after the projects came on-line; and
- How property values changed for both the view shed and comparable community but only for the period after the project came on-line.

This study concluded that:

> "*there is no support for the claim that wind development will harm property values*"

and was qualified with a statement that more data would need to be analysed as it becomes available.

United Kingdom ref RICS 2004

The United Kingdom perceptual study gauged professional property opinions about the impact wind farm development had on both residential and agricultural land values. It received 405 responses of which 81 indicated they had dealt with residential transactions affected by wind farm development. The report concluded the main negative impact on property values are visual impact, fear of blight and the proximity of a property to a wind farm. Seventy-two percent of the sample believed wind farm development had no impact or a positive impact on agricultural land values. Sixty percent believed wind farms decreased the value of residential properties where the wind farm was in view. The perceived negative impact was recorded to continue but becomes less severe two years post completion.

United Kingdom Dent and Sims 2007

A recent study (Dent and Sims 2007) looked at 919 residential property transactions at three locations in Cornwall, within 5 miles of wind farms. The results were analysed and local estate agents were interviewed to understand the underlying reasons for any variation in property prices.

The results were generally inclusive, with terrace and semi-detached houses within a mile of a turbine significantly lower in price than similar houses located further away. Detached houses and all property greater than a mile from a turbine showed no clear linear relationship between physical distance and transaction price. Upon investigation with local real estate agents it became clear that the lower prices of terraced and semi-detached houses within 1 mile of a turbine were ex-defence housing properties and were less desirable, confounding any conclusion about wind farm effects.

The study concluded that the relationship between property price and distance from turbines was inconclusive however, it suggested that factors other than wind farms had a more significant effect on property prices. It also concluded that the 'threat' of a wind farm may have a more significant impact than the actual presence of one. This finding agrees with perception studies undertaken by Warren *et al.* (2005) which found exaggerated perceptions of wind farms are often dispelled by actually living near a wind farm (Elliott 1994; Redlinger *et al.* 2002; SEDD 2002; Braunholtz 2003; SEI 2003a, cited in Warren *et al.* 2005).

Victoria Australia Smith et al 2004

In Victoria Australia, the Bald Hills Wind Farm Panel Inquiry examined the issues of property devaluation for neighbouring properties in a similar manner; property valuers and real estate agents provided submissions and appeared before the Panel Inquiry as expert witnesses. The Panel Inquiry report concluded that:

> "*All that appears to emerge from the range of submissions and evidence on valuation issues is the view that the effect of wind energy facilities on surrounding property values is inconclusive, beyond the position that the agricultural land component of value would remain unchanged. On this there appeared to be general agreement.*"

Crookwell, Australia Henderson and Horning 2006

The Crookwell wind farm was developed in 1998. Sales transactions over a 15 year period were searched (1990 to 2006). Properties that surround the development and have some direct impact from a valuation perspective were investigated (principally aesthetic influences including, visual, noise and shadow effects).

The context of the study was a general trend of larger properties being sold and broken up into smaller lots commencing in the late 1990's, with very few sales occurring in the period prior to the development of the wind farm. This trend is an example of the changing nature of land use in the area, from commercially operating grazing land to a more passive rural residential use. Market forces appear to value the rural residential amenity above that of the agricultural productive capacity of the land.

It is clear that the underlying agricultural productive capacity of the land and the surrounding property subject to the wind farm is not in any measured way affected by the development of the Crookwell wind farm, meaning there has been no reduction in values. Indeed the property subject to the development enjoys additional revenue (leasing agreements) and additional benefits including improved access, erosion control and passive wind protection for stock from the sub stations and turbine tower structures. Henderson and Horning concluded, the revenue stream from the wind farm plus the underlying agricultural production from the land may well outbid the subdivision potential for the site. This is premised on the rental income from the turbines being at market value.

The Land Value Assessment report concluded that further research would be required to determine what value the market would place on the wind farm revenue streams however, it is suggested that the capitalisation rates would be similar to other infrastructure improvements like mobile communication towers and signage investments. Therefore the wind farm development has the potential to slow down the process of productive agricultural land changing to rural residential uses in the short to medium term with the shift caused by the additional income generated from the wind farm revenue making the agricultural use of (involved properties) more viable.

Additional to agricultural land values, there is also the potential of wind farm development to impact land values determined by recreational land uses. No literature on recreational land values and wind farm impacts was able to be identified, to assist with this aspect of the impact assessment. Impacts to lifestyle and tourism have however, been investigated separately in Section 8.7 and 8.8.

8.4.2 Impact assessment - construction and decommissioning impacts

During the construction and decommissioning phases of the wind farm, a temporary increase in traffic loads, as well as increased noise and visual impacts would occur. These impacts would be temporary and would not be anticipated to be reflected in the land value of the site or land values in the area.

When the site is decommissioned, it could continue to be used for extensive agricultural activities or could be subdivided or used for more intensive uses, as dictated by prevailing markets and the interests of the land owners. Disturbed soil, excluding access tracks which the landowners may wish to retain, would be stabilised and rehabilitated. Underground structures including the concrete footings used to anchor turbines and buildings would remain onsite, but occupy a small proportion of the development envelope (refer to Section 3.6). These features may have a minor impact on land use however, the lease agreements during the life of the project are intended to compensate the landowner for this. This impact would not be anticipated to be reflected in the land value of the site or land values in the area.

8.4.3 Impact assessment - operation

The operational impacts of the development are considered to have the greatest bearing on land value. While the lease agreements are intended to compensate the involved landowners for impacts during the life of the project, the development may potentially affect the land values of the surrounding properties that are in some way affected by the development; those with a view of the site or near enough to experience operational noise. For the Coppabella Hills and Marilba Hills Precincts, future land uses may include agriculture and residential subdivision. The population density is currently sparse and provided that visual and noise impacts are adequately mitigated in the design and construction of the Proposal (as per Sections 7.2 and 7.3) no significant impacts are anticipated, based on the available literature discussed above.

Operational traffic impacts would be negligible during the operational phase and, if anything, access improvements may positively affect local land values.

The conclusions of the studies considered in this section, applied to the Coppabella Hills and Marilba Hills Precincts, suggest that:

- The agricultural productive capacity of land affected by wind farm Proposals (including the development envelope itself as well as surrounding properties) is not anticipated to be affected by the development of the wind farm.
- The revenue stream from the wind farm and associated benefits (such as improved access) plus the underlying agricultural production capacity of the sites directly affected may well outbid the subdivision potential of the sites, slowing down the process of productive agricultural land changing to rural residential uses in the short to medium term.
- The evidence suggests that having a view of the wind turbines would not adversely affect the land values of surrounding properties. Any negative perceptions that this is the case are likely to decrease two years post construction.
- The wind farm may dampen a sensitive section of the property buying market however, this effect is balanced by other influences such as demand for land and housing within a commutable distance from larger centres, Canberra, Melbourne and Sydney and the creation of a development-oriented or green energy aesthetic.
- As the site would be returned to its current appearance at the end of the project’s life, the potential impacts to land values are reversible in the long-term.

The are four subdivision in the Yass Valley LGA and two in the Harden LGA that have the potential to impacted during operation of the wind farm. Due to the location of these sub-divisions, refer to

Figure 8-6, potential noise and visual impacts to residents and future residents of these sub-divisions is considered the main potential impact of the development. Potential visual and noise impacts are assessed in detail in Section 7.2 and Section 7.3. Additionally, potential impacts to land values has been discussed above.

While the wind farm cannot be developed without the risk of some land value impact on surrounding properties during the construction and operational phases, it is considered by this assessment that on balance the benefits of the Proposal are sufficient to outweigh this risk. The risk is not dissimilar to that posed by other large scale infrastructure developments undertaken to meet increasing energy demands.

No mitigation is considered to be required for the potential impacts to land values. As a large component of this issue is related to visual, noise, community, lifestyle and tourism impacts, measures outlined in Section 8.6 for mitigation of impacts to the community are considered sufficient to address this issue.

8.5 ECONOMIC IMPACTS

8.5.1 Existing environment

The proposed Yass Valley Wind Farm would be located primarily within the Yass Valley Local Government Area (LGA). The exception is the Coppabella Hills Precinct, a portion of which is located within the Harden Shire LGA.

Key statistics pertaining to the two LGAs are provided in Table 8-7.

Table 8-7 Key statistics for the LGA

	Yass (2006)	Harden (2006)
Size of shire: Area of sq km.	3970	1861
Population		
Number	13,135 (2006)	3,582 (2006)
% Growth since 2001	34%	-4%
Medium age 2006 (yrs)	39	44
Median Family Income ($AUSD)	1377	903
Top Industries (number of people employed)		
Sheep, beef, cattle and grain farming	534	354

Central government administration	445	N/A
School education	271	85
Road and freight	N/A	60
Cafes and restaurants	249	N/A
Public order and safety services	158	N/A
Fruit and tree nut growing	N/A	50
Meat manufacturing	N/A	41

Source: Australian Bureau of statistics

The Yass Valley Shire is largely agricultural. Extensive grazing of sheep and cattle are the predominant land uses. In recent years many new agricultural industries are emerging including cool climate wines, alpaca studs, miniature cattle studs, olives and berries, Yass (2006). The major industry sectors within the Yass Valley Shire are agriculture, retail trade and tourism, which reflect the predominately rural nature of the area, Yass (2006). Bowning and Binalong are the closest villages to the three Precincts and provide limited services (groceries, accommodation). Yass, the major centre of the Yass Valley LGA is located approximately 20-30 kilometres east of the three Precincts and has a population of approximately 6000 residents (Tourism NSW 2008). The Yass Valley LGA features historic buildings, wineries, rural villages, antiques and art galleries along with Burrinjuck Water State Park (Yass 2008), valued by locals and visitors alike.

The Harden Shire Council is known for its rich agricultural base including cereal cropping, horticulture and grazing, Harden (2008). Land within the Harden Shire LGA has the highest dryland wheat production within NSW. The predominate industry within the Shire is agriculture, the second largest industry is transport. The Harden shire is strategically located at the junction of the major transport routes, the Hume and Olympic highways as well as the Burley Griffin Way, Harden (2008).

Relevant to both LGAs, the drought has put increasing pressure on agricultural enterprises. Increasing growth in the Yass Valley also places water resources and other services under greater demand.

8.5.2 Impact assessment- construction and decommissioning

The Yass Valley Wind Farm would provide temporary employment opportunities during construction and decommissioning. Increased demand for services in the local area, most likely during the construction phase, would also accompany the development, as contractors seek accommodation and utilise other services in the local area. It is estimated that between $150 and $250 million could be spent within the region as a result of the wind farm over its life.

There is an opportunity for local contracting and manufacturing services to be contracted during site development. These may include concreting, earthworks, steel works and electrical cabling. As well, other service-related employment would follow, with the provision of food, fuel, accommodation and other services to contractors. Based on a construction phase spanning 24-36 months, employment would likely increase by 505 FTE jobs across the local area. It is considered that construction, property and business services, retail trade and wholesale trade would make up most of the employment growth. Precise economic benefits would vary depending on final site design, turbine suppliers, timing of works and other details. Currently there are no facilities capable to manufacture turbine components (nacelles and blades) in Australia. There may be the potential to manufacture towers in Australia.

There are a number constraints related to the potential socioeconomic impacts described. These include supply-side constraints; primarily the supply of labour and the capacity of local business to service new contracts together with the quality of local housing and other physical and social infrastructure and amenities needed to attract and retain workers.

As the construction and decommissioning phases of the projects would take place over a considerable time period (estimated to be 24-36 months for construction and approximately 12 months for decommissioning), there is potential to adversely impact current grazing activities on the sites that would be developed and for the additional heavy vehicle traffic on public roads to interfere with other economic activities, for example, scenic drives, field days and other tourist related activities. It is anticipated that grazing impacts would be confined to involved land holders. Involved land holders would be compensated by the Proponent for allowing the infrastructure to be constructed on individual properties. It is considered that this compensation would off-set impacts on grazing. These impacts are discussed specifically in *Sections 8.8 Tourism Impacts*, and *8.9 Agricultural Impacts.*

8.5.3 Impact assessment - operation

Wind farms are an economically viable means to generate electricity (refer to *Section 9 Strategic Justification*). The Proposal would be privately funded. There would be no ongoing financial expenses to the community or any government agency. Economic inputs would involve employment opportunities for the local, regional and national work force.

The operational phase of the project is anticipated to create 40[31] full time equivalent jobs over a 30-year period. At this time the project may be decommissioned or recommissioned.

[31] This figure is based on a paper written by MacGill (2007) that states O&M jobs created are 0.09 * MW capacity

8.5.4 Mitigation Measures

Mitigation measures relating to the economic aspect of the Proposal centre on the maximisation of economic benefits to the wider community.

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
68	Affect on local community	Maximise positive impact of Proposal	Liaise with local industry representatives to maximise the use of local contractors and manufacturing facilities in the construction and decommissioning phases of the project.	Construction	CEMP	X	X
69	Affect on local community	Maximise positive impact of Proposal	Liaise with the local visitor information centres to ensure that construction and decommissioning timing and haulage routes are known well in advance of works and to the extent practical coordinated with local events	Construction	CEMP	X	X
70	Affect on local community	Maximise positive impact of Proposal	Liaise with Yass Valley and Harden Shire Councils and the Department of State and Regional Development to provide information to assist in attracting people to the local area to facilitate meeting the expected demand for human resources for both construction and operation of the Proposal	Construction Operation	CEMP	X	X
71	Affect on local community	Maximise positive impact of Proposal	Make available employment opportunities and training for the ongoing operation of the wind farm to local residents where reasonable	Operation	OEMP	X	X

8.6 COMMUNITY WELLBEING

8.6.1 Existing environment

Wind farms have been seen as divisive developments in terms of local communities. To investigate the potential for adverse impact to the community, this section considers the current makeup of the local community, indicators of community well being, documented responses by communities to wind farm developments, and specific responses of the local community to the Yass Valley Wind Farm Proposal.

The make-up of the local community can be seen as being comprised of families that have been in the area for several generations and newer residents attracted by work opportunities or by the rural lifestyle. By virtue of the increased transient population alone, the tree-change (or sea change) demographic shift can result in a loss of sense of community (Gurran *et al.* 2005).

The greater Southern Tablelands region has, over the last several years, had several wind farms proposed and developed. Criticisms have been levelled at the general planning process relating to consultation and community funds. Further, it is understood that in general, Yass Valley Shire Council does not support wind farms within their local government area, (pers. comm. S.Jurcevic, Yass Valley Shire Council 2008). It is understood that frustration has been observed in other communities within the Southern Tablelands area related to the developers, type of development and the assessment and consent process for both state and council approved developments (Twyford Consulting 2007).

Indicators of wellbeing and issues of concern

Community wellbeing is related to the quality of the natural and urban surroundings, socio-economic position, the availability of services and perceptions of safety (Yass Valley Shire Council State of the Environment Report 2004). One measure of 'community' is the willingness of individuals to be involved in volunteer organisations such as the Bush Fire Brigade, Meals on Wheels, the Country Women's Association and farmers' associations. The additional element of people who have long associations with the area can strengthen the fabric of the local community. These features are present in the local community.

The Yass Valley Shire Council prepared the 2006-2011 Yass Valley Council Social Plan (Yass 2006).The aim of the plan is to *identify the key social and cultural needs of the community and respond to these needs in partnership with other government and non government service providers* (Yass 2006). Key indicators that enhanced the wellbeing of the Yass Valley community as detailed in Yass (2004) included:

- Drinking water quality was good overall
- There were no major noise problems
- The rate of annual growth in the ratio of employed persons to resident population went from – 0.9% in 1996 to +0.2% in 1998, and remained positive at the time of the 2001 Census
- An additional 207 places in the Shire were recognised for their heritage value in the Local Environment Plan

Issues for community wellbeing identified during the State of the Environment 2004 reporting period were:

- The Shire's population continued to grow in number and age (accommodation for the ageing population was noted as a concern)

- Limited tertiary courses are offered through a local campus of the Illawarra Institute of TAFE (no other tertiary courses are offered in the local government area)
- Local health services for residents was noted as a concern;
- Although infrastructure assets are considered to be in fair condition, the sewage treatment plant requires an upgrade
- Limited public transport is available to many residents in the Shire

The Social Plan identified ten action plans *corresponding to key strategic directions that represent the broader needs of the community*. The impacts of ongoing drought heighten the existing levels of stress within people of the predominately agricultural community and have clear links to stress and adverse health impacts. The key strategic directions formulated by the Social plan are reproduced below:

1. Enhancing Community Capacity
2. Enhancing Community Infrastructure
3. Improving Transport
4. Supporting our Children
5. Supporting our Youth
6. Preparing for an Ageing Population and Supporting Older People
7. Encouraging Greater Participation in Learning, Education and the Workforce
8. Enhancing Culture, Heritage, and the Environment
9. Improving the Community's Health and Wellbeing
10. Creating a Safe Environment

Similar to Yass Valley Shire Council, Harden Shire Council has prepared a Social Plan 2006-2010, (Harden 2006). The communities of Galong and Jugiong are located in close proximity to the west portion of the Coppabella Hills Precinct. Harden (2006) identified that the three main issues for local residents of the Galong community were, activities, village presentation and transport. A number of recommendations were presented including minor road upgrades, public area beautification projects and improvement to the community hall to recreate it as the centre of community life for families and children.

The Jugiong community identified community strengths including, but not limited to the following:

- Proximity to the Hume highway
- Community spirit
- Numerous community assets

Harden (2006) identified that the Jugiong community thought that an increase in tourist numbers would be positive for the community.

It is recommended that, to address the potential for the Yass Valley Wind Farm Proposal to be divisive and generate stress within the community, adversely affecting community wellbeing, that the Social Plan priority actions be used as a guide when considering community well-being mitigation measures.

Community responses to wind farms

Warren *et al.* (2005) observed that the move from centralised power generation to decentralised use of renewable sources raises novel and challenging issues for planning, land use and social engagement. Their study of wind farms in Scotland and Ireland investigated the nature of community views about wind farms.

The study found that aesthetic perceptions (whether positive or negative) are the strongest single influence on individuals' attitudes towards wind farms and that proximity to wind farms is not a reliable indicator of perception in the long-term. Surveys showed that people with anti-wind farm views perceived turbines as noisier and more intrusive than those in favour of wind turbines, regardless of the actual recorded levels (Krohn and Damborg 1999, cited in Warren *et al.* 2005). The study observed that opposition arises in part from exaggerated perceptions of wind farms that living near a wind farm dispels (Elliott 1994; Redlinger *et al.* 2002; SEDD 2002; Braunholtz 2003; SEI 2003a, cited in Warren *et al.* 2005). More positive feelings about wind farms were recorded closer to the wind farm site than further away (Warren *et al.* 2005).

Eltham *et al.* (2008) identified that a communities attitude for a wind farm change over time. The study found a small increase in the percentage of people supporting the wind farm subject to the study, after living with the development, who had initially been opposed. Additionally, Eltham *et al*. (2008) pointed out that changes in opinion were also identified between the recalled opinions for an increase in residents finding the wind turbines visually attractive and the increase in residents considering the secure form of energy that wind energy provides to be a valuable asset.

Warren *et al.* (2005), state that a consistent picture of public attitudes to wind power is emerging from surveys and case studies in Europe. Large majorities are strongly in favour of wind farms, their opinions formed by personal experience, in contrast to a minority in opposition whose opinions are formed not by experience but by misinformation and prejudice. This does not discount the real issues associated with community impacts, those being landscape aesthetics and the speed, scale and uncoordinated nature of the wind farm developments (Warren *et al.* 2005).

Public attitudes are critically influenced by the nature of the planning and development process; the more open and participatory, the greater the level of public support (Birnie et al. 1999; Khan 2003, cited in Warren et al. 2005). Additionally, Gross (2007) describes outcomes that are perceived to be unfair can result in protests, damaged relationships and divide communities particularly when decisions are made which benefit some sections of the community at the perceived expense of others. Thus, the notion of 'winners' and 'losers' within the community can also influence community perceptions towards wind farms, Gross (2007).

Community perceptions towards wind farms in the Southern Tablelands

A specialist report, *Report on Community Perceptions of Wind Farms in the Southern Tablelands, New South Wales* was prepared for the Proponent in October 2007 and incorporated the areas around the proposed Yass Valley Wind Farm of. The study was commissioned by the Proponent to facilitate the collection of a bench mark measure of attitudes of local residents towards the construction of a wind farm in their local community. The study area was a collection of rural localities situated in the Goulburn – Crookwell – Yass region within the southern highlands of NSW, and thus is considered to be directly geographically relevant. The survey was undertaken by ERM in conjunction with REARK Pty. Ltd., a consulting firm that specialises in public opinion and market research surveys. The methodology for the public opinion survey is detailed below.

- The study was conducted by telephone in a prescribed geographic area defined by post codes and locality names (including the areas surrounding the proposal)
- Sample source was derived from the electronic white pages listing of residential numbers within the defined area
- The sample size for the survey was defined at 300. The report indicated that 50% of the sample of 300 would have a sampling precision of 50±5.7%. Further details of the sample statistics are detailed in ERM (2007), presented in Attachment 9.
- The respondent for this survey was defined as a randomly selected adult resident within the residence called using the closest birthday technique
- The telephone study was undertaken with the assistance of a Computer Assisted Telephone Interviewing (CATI) system. Field work was undertaken by appropriately qualified personnel
- A questionnaire was developed for the purposes of this study. The questionnaire is presented in ERM (2007), Attachment 9. The field work was conducted during the evening and concluded in early August, 2007
- The data collected was analysed and presented in the form of tabulated results within ERM (2007)

Prior to the commencement of the survey, the level of knowledge held by the community with regards to wind farms and associated infrastructure was a relative unknown. The outcomes of the study undertaken as adapted from ERM (2007) are presented below.

- Eighty percent of respondents are concerned with the threat of global warming and its impact on the environment. Conversely, 16% of respondents indicated that were not concerned
- General awareness of wind turbines was very high. Almost all of respondents had claimed that they had seen a wind turbine and 9 in 10 claimed to have actually seen a turbine. Further, in excess of 8 in 10 respondents had seen the current wind farm located at Crookwell
- Approximately 90% of respondents were aware of announcements relating to wind farms
- Eighty-nine percent of respondents were in favour of wind farm projects to be developed in the southern tablelands with 5% opposed. Of the 89%, 83% stated *"I would be happy to see a wind far, built on farm land near where I live"*
- Eighty-seven percent of respondents supported the development of a wind farm within 25 kilometres of their house, with 71% supporting a wind farm within 1 kilometre of their house
- With respect to the construction of multiple wind farms, 75% accepted two 'typical' wind farms (15 to 80 turbines) in their local rural area, with 17% opposed

The study concluded that generally adult residents in the survey area are concerned about global warming and are aware of alternatives available. Additionally, the respondents were generally aware of wind turbines and how wind turbines appear within the landscape and are generally supportive. Survey results further indicated that respondents were generally not adverse to the development of wind farms in the immediate locality. The survey also indicated that 89% of the respondents indicated that they were in favour of the development of a wind farm within the southern highlands. In addition, over 9 in 10 respondents agreed that '*wind energy is a good alternative energy source*'. The survey also found that the community had no clear preference between a few clusters, close together, or spread out at reasonable intervals along the highway (ERM 2007).

Based on the results of the survey undertaken by ERM in 2007, it would appear that the community within the southern tablelands are generally supportive of wind farms. The survey also indicated that the community was aware of announcements relating to wind farm development in the region.

A poll conducted recently in the Upper Lachlan Shire Council LGA (LG Elections 2009) aimed to identify the community's perspectives with relation to wind farms. The question posed to the community was: Do you support the continuing development and construction of wind farm turbines in the Upper Lachlan Council area?. A total of 4,727 votes were counted during the poll with 70.04% (3,311) voting 'yes' to the question posed as detailed above with 29.96% (1,416) of respondents voting 'no'. The results of this poll support the supposition that general public perceptions of wind farms in the Upper Lachlan LGA are positive.

8.6.2 Impact assessment - construction

Impacts relevant to construction centre around transport and traffic issues, as well as this being a defining stage in the development of a large scale project which some people may have misgivings about. The construction of the wind farm would generate a level of community disruption, not necessarily related to actual construction impacts but rather to this phase marking the beginning of a Proposal that people have strong views about. As discussed above, adverse impacts arise for a number of reasons:

- The development represents a large outside force over which the individual feels little control
- The development process takes the power of consent out of the hands of local representatives, being decided at the state (and sometimes federal) level
- The development is of a nature that would be highly visible, relatively novel and may not be avoidable (in a visual context) during day to day activities
- The development is of a nature which focuses monetary benefits on a relatively small number of directly involved property owners, often creating resentment and inequity

The construction phase may be the trigger for feelings of resentment about the development. The long-term effects of stress can compound over time. As cited above, several studies have now documented that this trend appears to abate with time. That is, exaggerated perceptions are often dispelled post construction, by the direct experience of a wind farm.

The proposed road upgrades would contribute positively to community wellbeing, by enhancing local infrastructure. The provision of local jobs it would contribute to the socio-economic aspect of wellbeing directly.

8.6.3 Impact Assessment – operation and decommissioning

The Proposal would not act to exacerbate existing community issues in the affected LGAs, as summarised above. In terms of infrastructure, employment and tourism, the Proposal would have benefits, as discussed in more detail in *Sections 7.10 Traffic and Transport, 8.5 Economic Impacts, 8.8 Tourism Impacts.*

No additional mitigation measures are considered to be required for operational impacts.

8.6.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
72	Community wellbeing	Provide accurate information	Dissemination of accessible and independent information on wind farm impacts	Pre-construction	CEMP	X	X
73	Community wellbeing	Provide accurate information	Biodiversity monitoring information collected during the operation of the wind farm would be made publicly available	Operation	OEMP	X	X

8.7 LIFESTYLE IMPACT

8.7.1 Existing environment

For local residents and visitors alike, rural land use and large land holdings in the area create a landscape amenable to recreation (horse-riding, walking, fishing, boating) and one in which many people seek to retire or 'escape' from a more urban environment. Yass (2006) identifies that people from both Sydney and Canberra are moving into the Yass Valley LGA *to benefit from the rural lifestyle while having the advantages of access to employment opportunities and a major retail centre, Canberra.*

The western portion of the Coppabella Hills Precinct is located within the Harden Shire Council LGA. Harden was historically a railway centre which created significant employment until post-World War Two. The declining need for rail services impacted the area, Harden (2006). The Harden LGA is now predominately an agricultural area with a number of agricultural support industries. However, correspondence with Council representatives has indentified two approved Development Applications for small subdivisions within the proposed Coppabella Hills Precinct. Similar to the Yass LGA, it is expected that the lifestyle values of the Harden LGA are not purely related to agriculture and transport.

There are two approved subdivisions in the vicinity of the proposal area. These are discussed in Section 8.4.1.

8.7.2 Impact assessment - construction and decommissioning

Construction noise, the generation of dust from vehicles and the increased traffic flow during construction and decommissioning may impact on the lifestyle values of the locality in the short term. Impacts would be experienced by nearby properties as well as properties on the haulage route. For local residents, this may create an ongoing nuisance for the period of construction and then cease. For visitors to the area, this nuisance may dominate a short vacation or weekend away. The close proximity to the Hume Highway means that haulage on minor roads would be limited (refer to *Section 7.10 Traffic and Transport* for a more detailed discussion).

Impacts would attenuate rapidly with distance from the work sites and haulage routes. These impacts would be temporary, occurring over a 24 - 36 month period (not continuous in any one location), and would be regulated by occupational health and safety and noise and pollution restrictions. Due to the temporary duration of the impacts and relatively low population density, this is not expected to generate an unacceptable level of impact.

The two approved subdivisions located in the vicinity of the Coppabella Hills precinct within the Harden LGA are located approximately 4.5 km and 8.5 km away from the nearest proposed turbine. The lots sizes within these two subdivisions range from 40 ha up to 384 ha. There is the potential for residents and future residents of these subdivisions to have views of the proposed wind farm. It is unlikely that these subdivisions would be impacted by noise during either the construction or operational phase of the proposed wind farm.

8.7.3 Impact assessment - operation

A different set of impacts relate to the operational phase of the wind farm. While the operational wind farm would not preclude nearby residential or recreational land uses, the perceived visual, noise, health and land value impacts may adversely affect the experience of those seeking the quiet, rural character of the area. These impacts are expected to attenuate with distance from the site. Time can also lessen the perceived adverse impacts of a wind farm, as actual experience replaces initial exaggerated perceptions (cited in Warren *et al.* 2005).

Specialist reports have quantified and evaluated the visual, noise and land value impacts of the Proposal (refer to Appendix 1, 2.1, 2.2 and Section 8.4 respectively). Health impacts have been evaluated in Section 8.10. On the basis of these assessments, the impact on the life style values of the site is expected to be manageable by specifically managing visual impact, operational noise impact, community wellbeing impacts, tourism impacts and health and safety impacts, as detailed in Sections 7.2, 8.6 and 8.10 of this report.

No additional mitigation is proposed for lifestyle impacts.

8.8 TOURISM IMPACTS

8.8.1 Existing environment

The Yass Valley Wind Farm would be located between the local service centres of Yass, Binalong, Bookham and Bowning. These towns and their surrounds have historic appeal, retaining buildings and other historic features of interest to locals and tourists alike. Tourist accommodation is located within these villages. The rail network passes through Binalong. The three Precincts are not located near any formalised tourist drives however, the Hume Highway, a major thorough fare passes close to the Coppabella Hills and Marilba Hills Precincts. The local road network is used by local and tourist traffic alike.

Binalong, Bookham and Bowning have a rich cultural history (Yass 2008). One of Australia’s most famous poets, A.B. ‘Banjo’ Patterson was raised on a station outside of Binalong. The visitors guide points out a number of tourist attractions within the shire including historical buildings, wineries, limestone caves, quality antiques and arts and craft.

The Yass Valley Development Corporation was formed to assist in the promotion of the benefits of the Yass Valley including tourism. The development corporation is responsible for the promotion of visitor services, events ands and general tourism promotion within the Shire. Visitor numbers within the Yass LGA dropped in the period 2005/2006 due largely to the national petrol price increases, however numbers increased again in the period 2006/2007 (Yass 2007a).

There are a number of annual events that cater for tourists in the Yass Valley Shire LGA. A number of these events are located in the vicinity of the three Precincts and have the potential impacted as part of the Proposal. These events, adapted from Yass (2008) are presented in the table below. There are also a number of events in the township of Yass which have been omitted from this table.

Table 8-8 Annual tourism attractions

Event name	Location	Date
Bookham Sheep Show and Fair	Bookham	April
Binalong Memorial Swimming Pool Market Day	Binalong	October
Wee Jasper Naturally	Wee Jasper	February and August

8.8.2 Impact assessment - construction and decommissioning

Key construction impacts centre on construction traffic along haulage routes, and associated visual, noise and dust impacts. Safety and transport issues are discussed and mitigated within *Section 7.10 Traffic and Transport.* Visual, noise and climate and air quality impacts are discussed separately in Sections 7.2, 7.3 and 8.12.

Additional to mitigation measures discussed for these specific areas, there is potential to minimize the disruption of the construction phase, through liaison with tourist operators.

8.8.3 Impact assessment - operation

Operational impacts, from a tourism perspective, centre on the visual impacts of the development. The number and type of visitors to the area is not anticipated to be impacted by the operational wind farm. The development is not incongruous with the production-based economy of the general area.

The development may generate increased tourism if it is promoted as a tourist destination (pull over area with information or potentially tours of the site). The level of promotion that the development receives would be determined as a separate matter to this development application. It would not be instigated by the Proponent but would be supported by the Proponent if it appeared to be something that the involved landowners, local community and the Yass Valley and Harden Shire Councils desired. Promotion of the development is not part of this Proposal.

8.8.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
74	Affect on local activities	Minimise disruption	Co-ordinate construction activities with local tourist operators. The Proponent would liaise with the local visitor information centres to ensure that construction and decommissioning timing and haulage routes are known well in advance of works	Pre-construction	CEMP	x	x
75	Affect on local activities	Maximise benefits	The Proponent would work with the involved landowners, the community and both Yass Valley and Harden Shire Councils to allow for the development of the wind farm as a tourist attraction, if this option becomes desirable to these three parties.	Operation	OEMP	x	x

8.9 AGRICULTURAL

8.9.1 Existing environment

Agriculture is the main land use in the Yass Valley, occupying approximately 73% of the total land area (Yass 2007) or about 290,913 hectares. Agriculture in the region is dominated by wool production. Approximately five million kilograms of wool are produced annually from 331 properties (Capital Region Development Board 2005). A sideline industry has developed in fat lambs for the meat industry using Merino-Border-Leicester cross. Yass Valley LGA is diversifying its rural products; many new agricultural industries are emerging including wine, alpaca studs, olives and berries. The close proximity of Canberra to the Yass Valley LGA is assisting the establishment of these new enterprises (Yass Valley Council 2006a). The shift from grazing to cropping and mixed farming is a recent trend and may be related to the recent drought conditions; this trend has been recognised as having implications for land degradation as the land capability is not suited to long-term cultivation (Sheppard 2006).

In general, the precincts are comprised of cleared ridges, slopes and flats containing scattered trees and forest remnants. The pasture is a mixture of native and exotic species.

The context of climate change is relevant to a discussion on the future of agricultural land use. General warming in the region is likely to reduce the capacity of the land. Pittock (2003) observed that a significant proportion of Australian exports are agricultural products sensitive to changes in climate, water availability, carbon dioxide, fertilisation, and pests and diseases. As well as direct impacts, agricultural profits could be affected by a projected increase in agricultural production in mid to high latitude northern hemisphere countries (Pittock 2003). Development of land with uses that are compatible with agricultural activities, such as wind power, therefore have potential to provide increased economic security to rural industries. As well, they provide a substitute for carbon emission producing electricity production that is stable (not dependent on other countries) and renewable.

There is potential for wind power to become a new rural industry, providing a significant new income stream for rural communities at a time when traditional land uses are under pressure (Warren *et al*. 2005). Agriculture has been identified as having a significant role to play in carbon offsetting by a CSIRO report commissioned by the Agricultural Alliance on Climate Change, which includes farming and green organisations, ABC (2007). The report states that farmers could make an extra $3 billion a year by helping to produce clean energy and by offering carbon offsets to polluters. The Climate Institute states this is a key step needed to cut greenhouse gases. These points are particularly relevant to the Yass area where agricultural endeavours have been greatly impacted by recent drought and where anticipated climate change projections indicate a continuation of this trend.

The Proposal would provide a drought resistant supplementary income stream for involved land holders, compatible with current grazing practices.

8.9.2 Impact assessment - construction and decommissioning

Adverse impacts affecting the agricultural use of the three Precincts and surrounding properties would be greatest during the construction and decommissioning phases of the development. They would centre on restrictions to stock access and potential to affect grazing land (direct loss of land, due to footings and tracks, and potential degradation of land, through erosion and sedimentation, pollution and weed ingress).

During construction and decommissioning, stock may need to be excluded from the works area and, in some cases, restricted from access roads, to minimise the risk of collisions. There are likely to be temporary speed limits enforced to mitigate the risk. The impact of exclusion of stock would be high Coppabella Hills and Marilba Hills which involve very large land holdings and multiple affected agricultural enterprises.

During the construction phase, soil disturbance through the construction and upgrading of tracks, laying electrical cables, excavate footings and create hardstand areas would remove pasture currently available for grazing (refer to the impact area calculations in Section 3.6). In many cases, this impact would be temporary, as disturbed areas would be rehabilitated before the completion of the construction phase (crane hard stand areas, access tracks not required during the operational phase and underground cable trenches). During decommissioning, further areas would be restored to their pre-existing capacity (access and spur tracks not required by the landowner, electricity easements). During the restoration activities, stock access would be periodically restricted while vegetation is re-established. The total amount of land not able to be returned to pre-project agricultural capacity is a minor proportion of the total impact area (access tracks, the footings of turbines, control building and substation).

Potential for indirect impacts is present where soil compaction, erosion, turbid runoff, weed ingress, pollution from chemical spills is not managed adequately. Impacts such as erosion, turbid runoff and weed ingress have the potential to spread, affecting much greater areas of land. Unmitigated, these impacts would reduce the productivity of the affected areas. These impacts are highly manageable, however.

Noise and dust generated during the construction and decommissioning are manageable and considered to represent negligible impacts for agricultural activities, given the mitigation proposed (detailed in Sections 7.3 and 8.12).

Construction impacts are therefore considered to be largely temporary and manageable. Affected land owners would be compensated for the loss of the development footprint by way of the lease arrangements they enter into with the Proponent.

There is an opportunity to improve the native composition of the site and production capacity in some areas onsite. The ongoing expenses of resowing exotic species as well as the resultant loss of soil condition and ingress of weeds are good reasons to investigate the sustainability of using native species rather than replacing them with exotics during site restoration. The precincts retain varying degrees of native understorey, a result of soil type, stocking rate and improvement practices. The rehabilitation and encouragement of native grasses onsite could have production and conservation benefits and should be explored as a potential offset to clearing during the construction phase of project development. Revegetation of disturbed and weedy areas with productive native species, excluding stock from unstable areas as well as management of the timing and intensity of grazing, could be implemented during and following site development to benefit landform stability, native vegetation diversity and may create more drought tolerant pastures.

8.9.3 Impact assessment - operation

Grazing practices

The operational wind farm is not anticipated to affect the way that involved landowners or neighbouring landowners currently manage their agricultural activities. Nor is it anticipated to affect the production capacity of the land, apart from a minor loss of the available grazing area taken up directly by the foot print of the Proposal. The operational wind farm provides a benefit to involved landowners, a supplementary drought resistant income stream throughout the life of the project.

Wind energy organisations promote the capability to graze stock right to the base of wind turbines without ill effect (Union of Concerned Scientists 2005). Given the number of wind farms and duration of their operation on grazing land and the lack of data available to indicate adverse impact, it is assumed that the turbines would have minimal impact on livestock grazing onsite and nearby. A 'settling in period' is likely to occur during which livestock become accustomed to the turbines (I. Newton, Wind Farm Manager, Eraring pers. comm. Jan 2005; *AusWEA* undated (b); British Wind Energy Association undated). There is no evidence to suggest that this would be drawn out or adversely impact animal welfare or agricultural productivity.

Agricultural flying

The use of aeroplanes and helicopters for agricultural purposes such as crop dusting, spraying and fertilising occurs throughout the Southern Tablelands and in the region of the three Precincts. This is significant to the safety of aircraft operating in the vicinity of wind turbines and the potential limitation of aerial operations due to the presence of turbines.

Agricultural operations involving low level flying can only occur in good conditions (high visibility) in accordance with the aviation regulations. It is considered that these conditions would be conducive to wind turbines being readily observable. Pilots who are engaged in low level flying and agricultural operations are required to undertake a risk assessment for each flight. This would identify specific hazards such as trees and powerlines. Wind turbines would be treated no differently. Therefore the operation of agricultural aircraft in the vicinity of wind turbines does not represent an unacceptable risk and is considered safe provided that normal operational procedures are followed.

The location of wind turbines may provide a potential limitation on the aerial application of fertiliser or spraying in the immediate location of a turbine. CASA has no regulations for the minimum distance that agricultural pilots can fly from objects such as wind turbines. The pilot is responsible for assessing the risks with each job. As the turbines are located on ridges predominately used for grazing, spraying activities associated with crops is unlikely. Additionally the turbines are located on involved landowners properties who have consented to the project.

Any turbines located adjacent to property boundaries would have a restricted impact on the ability to conduct aerial operations on neighbouring lands. Therefore it is considered unlikely that the presence of turbines would significantly effect aerial spraying in the vicinity of the three Precincts.

8.9.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
76	Impact on current land use	Minimise disruption	Stock would be restricted from works areas where there is a risk stock injury or where disturbed areas are being stabilised.	Construction	CEMP	x	x
77	Impact on current land use	Minimise impact	Develop, implement and monitor the effects of a **Site Restoration Plan.** The plan would aim to stabilise disturbed areas as rapidly as possibly. The Plan would consider: • Appropriate stabilisation techniques across the precincts • Suitable species for re-seeding (native species would be given preference due to their superior persistence and for conservation purposes) • Monitoring for weed and erosion issues	Construction and Decommissioning	CEMP	x	x
78	Impact on current land use	Minimise disruption	Liaison would be undertaken with neighbouring landowners and landowners adjoining access roads, to provide information about the timing and routes to be used during construction and decommissioning. This could be in the form of advertising and provision of a contact point for further inquiries. The aim would be to reduce the risk of interference with agricultural activities on affected roads and road verges.	Construction	CEMP	x	x
79	Impact on current land use	Minimise impacts	Ensure that the switchyard and substation is appropriately fenced to eliminate stock ingress.	Operation	OEMP	x	x

8.10 HEALTH AND SAFETY

8.10.1 Existing environment

There are a number of hazards associated with the construction, operation and decommissioning of wind farms, including construction activities, construction noise, shadow flicker and the stability of turbines. These issues are assessed below. Note that operational noise impacts and electromagnetic fields are discussed separately in Sections 7.3 and 7.9, respectively.

8.10.2 Impact assessment- construction and decommissioning

Construction activities

Hazards inherent with wind farm construction activities relate to the size and movement of infrastructure (large rotating blades at a great height), high voltage electricity and high wind speeds. The risks are similar to working on other large infrastructure, such as tall buildings and transmission lines. According to Gipe (2008) two members of the public have been killed by wind turbines since 1975. One was a parachutist another was a crop duster that hit a guy wire of a wind monitoring tower. Additionally, Gipe (2008) identifies that 32 construction, operation and maintenance staff has been killed since 1975. Industry practice has improved over this time and many dangerous activities have been eliminated or reduced (SEDA 2004). Employee safety is managed through the application of standard work place practices, such as restraints, fall arrest systems, protective clothing and procedures that enable infrastructure to remain stationary during specific activities. Emergency response protocols and equipment and reminders of the requirement for workers to take responsibility for their safety are able to address a large component of potential risks.

Construction works would take place over a 24-36 month period for all three Precincts, utilising main and local roads. Considering traffic flow to and from the site, the maximum daily rate of traffic at any point in the project's road network is approximately 250 vehicles per day (refer to Appendix 6). As the Precincts are spread over several locations, there would be a number of individual turbines sites and sections of road works. As such, construction impacts at any one location are unlikely to be continuous.

The safety issues associated with construction traffic have been discussed in Section 7.10. Access routes have been selected which, with the implementation of recommended environmental safeguards, would minimise risks to workers, the public and stock during the construction phase.

Hazards and associated risks that construction staff would be exposed to as a result of the Proposal are considered manageable through the implementation of a Site Occupational Health and Safety Plan.

8.10.3 Impact assessment- operation

Shadow Flicker

Shadow flicker is the name given to describe the effect caused by the shadow created as the sun passes directly through the rotating blades of a turbine at a stationary viewpoint. Due to their height, wind turbines can cast shadows on the areas around them. Coupled with this, the moving blades create moving shadows. When viewed from a stationary position the moving shadows appear as a flicker giving rise to the phenomenon of 'shadow flicker'. For a particular position, shadow flicker will only occur during periods when the suns rays pass directly through the swept area of the turbine blades to the viewpoint. The extent of the shadow flicker is dependent on the time of day, geographical location, meteorological conditions of the site and local vegetation.

The effect of 'chopping the light' attenuates with distance and is not considered, by modellers of shadow flicker (Danish Wind Industry Association 2003) to be noticed beyond 500-1000m from a turbine. The operational wind turbines are not anticipated to produce a flicker frequency high enough to pose a health risk. Comparable turbines have been rated 0.45 to 0.95 Hz, significantly below critical levels of 8-30 Hz for public health.

A detailed analysis of the potential for shadow flicker and blade glint to affect dwellings has been carried out and the full report is presented in the Visual Assessment, Appendix 1. Modelling of the shadow flicker was conducted at each precinct using specialist industry software, assessing the largest turbine (maximum tip height) proposed for the project to represent the worst case impact scenario. The calculated number of annual hours at each of the nearby houses where shadow flicker may be experienced is presented below in Table 8-9. A reduction of the theoretical maximum number of hours was assumed based on the long term observation of cloudy days.

In NSW there are no guidelines on which to assess shadow flicker generated by wind turbines. To carry out the shadow flicker assessment, the Victorian Planning Guidelines [1] that limit the duration of shadow flicker to a maximum of 30 hours per year and 30 minutes in one day, have been sourced. The South Australian Planning Bulletin suggests that shadow flicker is insignificant once a separation of 500m between the turbine and house is exceeded. However, a conservative distance of 1 km has been used for this assessment.

Table 8-9 Calculated hours of shadow flicker predicted for nearby residences.

Residence no.[32]	Precinct	Theoretical maximum shadow flicker (hrs/year)	Actual (reduced) shadow flicker (hrs/year)	Maximum shadow flicker (mins/day)	Compliance with Victorian planning guidelines
M18	Marilba Hills	7	2.1	21	Yes
C25	Marilba Hills	0	N/A	0	Yes

The results show compliance with the Victorian Guidelines of 30hrs/year and 30 mins/day at all nearby residences.

Blade glint will be avoided by the use of non-reflective coatings on the turbine blades.

Flicker vertigo is an imbalance in brain cell activity caused by exposure to low frequency flickering or flashing of a light or sunlight seen through a rotating propeller (Rash 2004). It can result in nausea, dizziness, headache, panic, confusion and – in rare cases – loss of consciousness. Flicker vertigo is usually associated with a light flashing sequence, or flicker frequency, of between approximately 4 hertz (cycles per second) and 20 hertz (Rash 2004, NASA 2001).

Shadow flicker frequencies of between 8-30 hertz can trigger epileptic seizures for photosensitive epileptics. Less than 5% of cases involve photosensitive epilepsia, and only a portion of these photosensitive cases have experienced a seizure triggered by flickering light (Epilepsy Association of Australia).

Flicker frequency of rotating propellers, including wind farm rotors, is derived by multiplying the hub rotation frequency by the number of blades. Based on the rotation speed of the 3 bladed wind turbines

[32] Residence number codes supplied as Appendix 1.

proposed for the project, the maximum shadow flicker frequency would be 1 cycle per second (1 hertz), well outside the frequency range associated with flicker vertigo or photosensitive epilepsy.

The proposal is therefore unlikely to represent a health risk to local residents in relation to flicker vertigo or photosensitive epilepsy.

Stability of Turbines

The stability of turbines is an issue often raised by the local community. Fear that component parts may detach and fall from the turbines can create distress to nearby landowners. The wind turbines, at up to 150 metres in height, would represent a hazard if inadequate anchorage resulted in a turbine falling over or if a blade were to detach during operation and fall to the ground. Ice may also be propelled from the blades in extremely cold conditions. However, the likelihood of these events occurring further than 210m from a turbine has been calculated as 1:10,000,000 (Taylor and Rand 1991, cited in SEDA 2004).

Due to the size of component parts, objects are not likely to fall far from the turbine, in the rare event of malfunction. Three hundred metres has been suggested as the upper buffer distance required to ensure no buildings or populated areas are within range (SEDA 2004). SEDA (2004) also notes that this would always be less than the buffer required to meet visual and noise criteria.

Modern wind turbines are extremely safe and reliable, with a history of independent certification and compliance of over 25 years. Wind turbines supplied by the leading global manufacturers (including those identified in Table 3-2) are designed and built to high industry standards, such as the International Electrotechnical Commission (IEC). Type Certification of particular wind turbine models is provided by independent certification authorities that specialise in wind turbines such as Det Norske Veritas (DMV), Germanischer (GL) and TUV Rheinland (TUV). The Type Certification process establishes the safety and reliability of the design and the validity of its supporting calculations, including the assumptions and inputs on which the certificates are based.

The wind turbine foundations are designed to meet the requirements and loads for the particular wind turbine model, as well as the site specific geotechnical, seismic and climatic conditions. The design and construction of the wind turbine foundations would be in accordance with the Australian Standard for concrete structures (AS3600).

> *"Wind energy is one of the safest energy technologies. It is a matter of record that no member of the public has ever been injured during the normal operation of a wind turbine, with over 25 years operating experience and with more than 70,000 machines installed around the world"*
>
> (British Wind Energy Association 2007)

Complex noise effects on health

Wind turbines and the noise produced from these generators is a relatively new and complex concept. Large changes have been made to turbine design affecting noise propagation over recent years. The complex nature of the noise from wind turbines has motivated recent research on the possibility of adverse health effects from wind turbine noise. There are numerous conflicting papers dealing with this issue yet to date there is no clear evidence to suggest that wind turbine noise causes any physical health problems. Adopting a precautionary approach to this potential impact, a review of these studies is presented below.

A British General Practitioner conducted a study of 42 people suffering adverse affects and *living within 2km of wind turbines*. Despite the small sample size, anecdotal survey style (this paper has not been published or formally peer reviewed), Dr. Harry made several points of interest for wind farm development:

- The noise produced by wind turbines is complex (intermittent, involving low frequency sound, complicated by other factors) and therefore, the responses produced can also be complex
- The kind of symptoms experienced can act to reinforce each other; sleep disturbance, tiredness, anxiety, head aches and migraines, depression. Having one family member who experiences any or all of these symptoms is likely to affect the well being of other family members, who may not experience adverse noise effects directly
- People most susceptible are those with noise sensitivity; children, the elderly, those with existing stress or depression
- Attitudes to wind turbines and to the amenity value of the landscape and 'peace and quiet' values also appeared to affect the level of adverse impact
- The vibrational component and the visual reinforcement of the moving turbines can compound the effects
- There can be a disincentive for affected people to report symptoms due to the effect it may have on their ability to sell a house near a turbine, generating a 'catch 22' for sufferers

The Swedish Environmental Protection Agency commissioned a report on noise from wind turbines conducted by E. Pedersen from Halmstad University. The aim of the report was to review all present knowledge on perception and annoyance of noise from wind turbines in residential areas as well as recreational areas. The report was to form a base for further discussions on regulation and guidelines for noise from wind turbines in Sweden. The results of the review came to the following conclusions:

- Annoyance from wind turbines is to a degree correlated to noise exposure, but is also influenced by the turbines' visual impact on the landscape;
- Wind turbine noise does not directly cause any physical health problems; and
- Regulations regarding noise from wind turbines for different countries in Europe were inconsistent. The recommended levels, where stated absolutely, varied from 40 – 55 dBA during the day and 35 – 45 dBA during the night when recorded from outside a dwelling. Countries such as France and Scotland recommend that wind farm noise be limited to between 3 – 5 dBA above background noise.

The World Health Organisation (WHO Guidelines for Community Noise, 1999) has developed guideline values for community noise that present noise levels where the lowest adverse effects may occur as a result of noise including temporary or long term deterioration in physical, psychological or social functioning. The available knowledge of the adverse effects of noise on health is sufficient for the WHO to develop guidelines on the following:

- Annoyance
- Speech intelligibility and communication interference
- Disturbance of information extraction
- Sleep disturbance
- Hearing impediments

The most significant and relevant of these in relation to wind farms is the noise levels that could impact the ability of nearby residents to sleep. The WHO guidelines on noise levels that do not result in sleep disturbance is 45dBA measured outside the residence. This is above the criteria levels of the SA noise guidelines of 35dBA that the wind farm must comply with for non-involved landowners.

Early identification of the noise problems and mitigation of its effects may be the best approach to avoiding potential health problems. The Proponent commits to monitoring and mitigating noise exceedences in accordance with the SA EPA Guidelines. Visual impact is discussed in Section 7.2. Community level impacts are discussed in Sections 8.6 and 8.7.

The health hazards associated with the operational phase of the wind farm are assessed as being low. Standard vehicles would be used to during maintenance visits. The control building would be Council approved. Procedures would be put in place to ensure a safe working environment is maintained.

8.10.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
80	Safety of persons or stock	Minimise risks	A detailed **Health and Safety Plan (H&SP)** would be prepared, as a sub plan of **the Construction Environmental Management Plan**, identifying hazards associated with construction works, the risks of the identified hazards occurring and appropriate safeguards would be prepared prior to the commencement of construction works. The Plan would include, but not be limited to: • Inductions for all contractors requiring site access. • Ensure all staff are appropriately qualified and trained for the roles they are undertaking	Construction	CEMP	x	x
81	Safety of persons or stock	Minimise risks	Site fencing would be installed where there is a risk to the safety of the general public (i.e. when the trench is left open for extended periods)	Construction and Decommissioning	CEMP	x	x
82	Safety and Asset protection	Minimise Risk	Establish procedures to ensure that soil is not carried onto the Hume Highway on the wheels of construction traffic	Construction	CEMP	x	x
83	Safety / nuisance to persons or stock	Minimise risks	If shadow flicker is found to be a nuisance to residents, conditions would be pre-programmed into the control system and individual wind turbines automatically shut down whenever these conditions are present	Operation	OEMP	x	x
84	Safety of persons or stock	Minimise risks	Shadow flicker effects on motorists would be monitored following commissioning and any remedial measures to address concerns would be developed in consultation with the RTA and the Department of Planning	Operation	OEMP	x	x
85	Safety of persons	Minimise risk	Establish a turbine maintenance program in accordance with industry standards.	Operation	OEMP	x	x

8.11 HISTORIC HERITAGE

8.11.1 Approach

An assessment of the non-Indigenous heritage status of the proposed Yass Valley Wind Farm is included in the archaeology and heritage report prepared by New South Wales Archaeology Pty Ltd.

This Non-Indigenous component has referred to literature relating to the European occupation, a review of Parish maps and a field inspection aimed at locating historical items, features or potential archaeological sites.

The NSW Department of Urban Affairs and Planning and the NSW Heritage Office have produced guidelines for preparing archaeological and heritage assessments as set out in Heritage Assessments 1996. Where relevant this report has been prepared in accordance with these guidelines and those most recently defined as a result of the 1998 amendments to the *NSW Heritage Act 1977*.

8.11.2 Existing Environment

Searches have been conducted for previous heritage listings in and around the study area; these searches have included all of the relevant heritage registers for items of local through to world significance. Details of these searches are provided in the archaeology and heritage report. The results are summarised briefly below:

Australian Heritage Database

This database contains information about more than 20 000 natural, historic and Indigenous places.

The database includes places in, and places under consideration for any one of these lists:

- the World Heritage List
- the National Heritage List
- the Commonwealth Heritage list
- the Register of the National Estate

A search of the database (11th December 2008) revealed that there are 4 items listed on the Register of the National Estate in or near the Binalong/Burrinjuck area. None of these items are located within or directly adjacent the Yass Valley Wind Farm precincts.

State Heritage Inventory

The *NSW heritage databases* contain over 20,000 statutorily-listed heritage items in New South Wales. This includes items protected by heritage schedules to local environmental plans (LEPs), regional environmental plans (REPs) or by the State Heritage Register.

A search of this database (27th November 2008) revealed that there are 7 items that are listed as being present in the Binalong/Burrinjuck region. None of these items are located within or directly adjacent the Yass Valley Wind Farm precincts.

National Trust of Australia (NSW) Register

The National Trust of Australia (NSW) is a non-government Community Organisation which promotes the conservation of both the built and natural heritage (for example, buildings, bushland, cemeteries, scenic landscapes, rare and endangered flora and fauna, and steam engines may all have heritage value). The Trust has approximately 30,000 members in New South Wales.

Following its survey and assessment of the natural and cultural environment, the Trust maintains a Register of landscapes, townscapes, buildings, industrial sites, cemeteries and other items or places which the Trust determines to have heritage significance and are worthy of conservation. Currently there are some 11,000 items listed on the Trust's Register. They are considered to be 'Classified'.

A search of the National Trust of Australia (NSW) Register (11^{th} December 2008) revealed that there is one item in the vicinity of the Yass Valley Wind Farm proposal area that is currently listed with the National Trust. The item is outside the Wind Farm precincts.

The historical themes relevant to the proposal area have been listed in the archaeological and heritage report. An historical theme is a way of describing a major historical event or process that has contributed to the history of NSW. Historical themes provide the background context within which the heritage significance of an item can be understood. Themes have been developed at National and State levels, but corresponding regional and local themes can also be developed to reflect a more relevant historical context for particular areas or items.

There is an enormous array of themes and hence potential site types that might occur in and around the Yass Valley Wind Farm precincts. Nonetheless, many of these correspond to heritage items in urban contexts. Given that there are no known historical villages or towns within the proposal areas it is unlikely that most of these themes will be represented within the proposed turbine envelopes and other areas of direct impacts. There is however potential for sites associated with agriculture, such as fences, ploughlands, sheds and water tanks. More generally there is the potential for roads, tracks and paths.

Given that the majority of impacts associated with the proposed wind farm are located on exposed ridge tops, the potential for evidence of early settlement, such as homesteads and huts, is relatively low. The most likely site types to be encountered are sections of old fences and roads. There is also a limited potential for evidence of small mining ventures.

During the field survey three potential non-Indigenous heritage items were recorded in and adjacent areas of proposed impacts. These recordings include a section of wooden fence (Marilba SU4/H1); a small stone feature, possibly a hut platform (Marilba SU28/H1) and an area of ploughland (Coppabella SU24/H1). The potential heritage items recorded during this survey have been assessed against the State Heritage Register criteria and have been guided by the NSW Heritage Office update *Assessing Heritage Significance* (2001) and the Heritage Council of NSW update *Levels of Heritage Significance* (2008). A statement of significance for each item is provided in the archaeology and heritage report. The three potential heritage items are assessed to be of insufficient significance to warrant heritage listing. They cannot be linked to people or events of historical importance and they present limited research potential, aesthetic qualities or other values that might be associated with an item of heritage significance. It is however recommended that limiting the extent of impacts to these items should be undertaken if feasible.

8.11.3 Impact assessment - construction and decommissioning

The construction of the Yass Valley Wind Farm will result in physical impacts to any potential heritage items which may be located within direct impact areas. Given that the three items identified do not warrant heritage listing these impacts are assessed to be low.

8.11.4 Impact assessment - operation

It is considered unlikely that there would be any impact to non-Indigenous sites during the operation of the wind farm.

8.11.5 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
86	Disturbance to a non-Indigenous potential heritage item	Minimise disturbance	The Proponent would limit the extent of impacts to the three identified heritage items.	Construction and decommissioning	CEMP	x	x

8.12 CLIMATE AND AIR QUALITY

8.12.1 Existing environment

The physical impacts discussed below relate to climate and air quality. *Hydrology and Soils and Landforms* were investigated separately as higher priority issues, *Sections 8.1 and 8.2.*

Climate

The proposed Yass Valley Wind Farm development envelope would occupy a total area of approximately 1,400 hectares, with turbine infrastructure located predominantly on elevated ridges addition to access tracks on the side slopes and foothills.

Data obtained from the Bureau of Meteorology the nearest weather station at Lake Burrinjuck, accessed November 2008, indicate that the highest mean maximum temperature occurs in January (29.4°C) and the lowest mean minimum occurs in July (3°C). The mean annual precipitation in the Burrinjuck area is recorded as 919.1mm, between 1908 and 2008. However, precipitation in the Burrinjuck area has been lower than average for six of the last seven years. The annual precipitation totals for the last seven years are as follows: 765.4mm (2001), 653.7mm (2002), 992.2mm (2003), 772.9mm (2004), 892.9 (2005), 358.1 (2006) and 827.8 (2007). Highest monthly rainfall historically occurs from June to August with the lowest monthly rainfall historically occurring from January to March. Climatic data for the Yass area indicates that diurnal conditions in summer can be dry and hot with high wind speeds. This could be expected to produce dusty conditions, particularly in drought where heavily grazed paddocks are prone to wind erosion. Although the local topography of ranges and plateaus can result in localised climatic conditions, climatic conditions onsite are expected to be similar to that described.

The Southern Tablelands of inland New South Wales has been targeted for the development of wind farms in recent years, due to the reliably high wind speeds recorded on ridges in the area. Davy and Coppin (2003) analysed wind speeds at several sites in South East Australia, including Goulburn on the Southern Tablelands. Summer showed the largest potential for wind generation capacity, with lowest seasonal capacity in autumn.

Air quality

The two precincts are predominately used for agricultural operations. Agricultural activities can produce periodic adverse affects on air quality during activities such as sowing pasture, harvesting or slashing pasture. During drought conditions particularly, large areas of bare ground may occur after intensive grazing, fire or periods of low rainfall. This may increase wind erosion with resultant increases in dust levels.

The State of the Environment (SoE) report for the Yass Valley Council for 2006/2007 identified that 55 substances were emitted into the air in the Yass Valley LGA as reported to the National Pollutant Inventory in 200-2005. Further, air emission in the Yass Valley LGA is impacted by increased transport and use of domestic solid fuel heaters (Yass 2007). Yass (2007) states that air quality in the LGA is generally good but can reduce in winter due to solid fuel heater emissions.

There was no air quality monitoring undertaken in the reporting period or the Harden 2004 State of Environment Reporting period however, this LGA is expected to be more affected by poor air quality, due to greater level of broad acre farming.

Receptors which may be considered sensitive to air quality impacts during and following the development of the proposed wind farm include residences, places of work, and tourist destinations. These are sparsely distributed in the vicinity of the precincts.

8.12.2 Impact assessment - construction and decommissioning

Climate

No climatic impacts are anticipated to be generated during the construction or decommissioning phases. Dust and erosion mitigation are discussed below and in *Section 8.2 Soils and Landforms.*

Air Quality

Dust and emissions are likely to be generated during clearing, excavation, blasting (if required), concrete batching, rock crushing (if required), road works and during the transport of infrastructure and materials to each Precinct. It is considered that any impacts likely to occur would be greatest during the construction and decommissioning phases, both temporary phases, likely to last between 24 - 36 months. In addition, the works area would not be static for this period, it would move as infrastructure is progressively installed and therefore the impact would not be experienced continuously at any one place during these phases.

The precincts and location of nearby residential properties are identified in Figure 3-7: House locations (houses within 5km) – Both Precincts

. The distance between the proposed activities and the receptors as well as the potential for mitigation suggest that air quality impacts during construction and decommissioning would not be high. The impacts of the Proposal during the construction and decommissioning phases are considered manageable with regard to air quality. Mitigation strategies that would be employed during these phases to manage the potential for adverse air quality impacts are presented, below. It is considered that these mitigation measures would be effective in reducing the potential generation of dust resulting from activities associated with the Proposal.

8.12.3 Impact assessment - operation

Climate

Local climate impact

The local climate may be affected to a minor degree by the increase in turbulence caused by the operational wind turbines. Modelling and experimentation on real wind turbines has shown that the mixing effect of thermal layers has very little effect on temperature during the day (Baidya, *et al.* 2004). Recordings taken below wind turbines and averaged over a 24 hour period were observed to be greater than existing ground level wind speeds by approximately 0.6 metres/second and raise temperatures by approximately 0.7^{o}C (Baidya, *et al.* 2004).

Wind speed impacts have been suggested as being confined to a distance from each turbine equivalent to 10 times the vertical height of the turbine (SEDA 2002). For the turbines considered, (maximum of 150 metres from the ground to blade-tip), an effect up to 1.5km from each turbine may be noted (attenuating with distance from the turbines). As the local topography is undulating, the horizontal distance from each turbine may be less than this amount in actuality.

The turbines would turn slowly in low wind conditions and faster with increasing wind speeds; hence they would amplify rather than counter natural wind conditions. The anticipated change in wind speed and temperature at ground level is not considered large enough to impact vegetation or be in conflict with the continued agricultural use of the land. This impact would be ongoing but negligible.

Broad climate impact

The Proposal would make a positive contribution to the reduction in greenhouse gas emissions by providing an alternative to electricity sourced from fossil fuels. This constitutes the chief environmental benefit of the Proposal, as discussed in detail in Section 4 of this document.

For each megawatt-hour of electricity consumed in the NSW electricity pool, approximately 1,000 kilograms of greenhouse gases are emitted, primarily from coal fired power stations. The Yass Valley Wind Farm would represent a renewable method of electricity generation to meet increasing demand of non-greenhouse gas producing electricity generation. Therefore every megawatt-hour of electricity generated by the wind farm could prevent approximately one megawatt-hour of electricity being generated at a coal-fired power station.

Reduction in greenhouse gas emission directly contributes to combating the adverse impacts associated with climate change including:

- The increase in extreme weather events
- Increased demand for water and associated impacts on natural systems
- Economic impacts associated with changing land capability

Adverse impacts noted specifically for Australian agricultural communities include an increase in floods, droughts and forest fires. As a consequence of reduced local production capacity in conjunction with increased production in positively affected northern hemisphere countries, the economic impact of climate change is particularly relevant to agricultural economies (AGO 2003) such as the Yass region.

No adverse climate change impacts related to the operational phase of the wind farm would result.

Air Quality

The operation of the wind farm would require minimal traffic on roads/tracks that would have been upgraded to accommodate heavy loads during the construction phase. Additionally, none of the wind farm infrastructure would generate emissions that would impact air quality. Therefore, negligible air quality impacts are anticipated to be generated during the operational phase of the wind farm.

8.12.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
87	Air quality	Minimise risks	A cost benefit analysis would be completed on differing potential mitigation options for dust suppression, for inclusion in the CEMP.	Construction	CEMP	x	x
88	Air quality	Minimise risks	Dust levels at stockpile sites would be visually monitored. Dust suppression would be implemented if required. Stockpiles would be protected from prevailing weather conditions	Construction	CEMP	x	x
89	Air quality	Minimise risks	Undertake ongoing visual dust monitoring and suppression (if required) during the construction phase. Monitoring would regularly assess the effectiveness of dust suppression activities. Monitoring would regularly assess the effectiveness of dust suppression activities.	Construction	CEMP	x	x
90	Air Quality	Minimise risks	Should a complaint relating to dust by a resident be received, monitoring at the boundary of the construction site would be undertaken using dust gauges. The Proponent would assess the dust gauges and identify additional mitigation measures, where required.	Construction	CEMP	x	x
91	Air quality	Minimise risks	Should blasting be required, it would be carried out in accordance with all relevant statutory requirements and residences within 1km of blasting activities would be informed prior to blasting	Construction	CEMP	x	x
92	Air quality	Minimise risks	Dust filters would be installed on silos, where required	Construction	CEMP	x	x

8.13 RESOURCE IMPACTS

8.13.1 Existing environment

Life cycle analysis: wind turbine

Life cycle analysis (LCA) is based on careful accounting of energy and material flows associated with a system or process. It is a way to quantify and analyse the resource impacts of a process or project. This approach covers the whole project life cycle, from the extraction of raw materials to the disposal of materials at the completion of projects. LCA is particularly relevant for renewable technologies, where it is often argued that the energy used to produce the technology is not 'paid back' during the lifetime of the technology (Schleisner 2000). LCA estimates of energy and emissions based on the total life cycle of materials used for a project, i.e. the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner 2000).

In Schleisner's (2000) analysis of two wind farms in Denmark, the energy 'payback' time was modelled to be 0.26 years for a wind farm on land. That is, in approximately 3 months, the energy produced by the wind farm had 'paid back' the energy consumed in producing, installing and decommissioning that wind farm. It was found that 94% of the materials used for construction of a wind turbine could be recycled (Schleisner 2000). Additionally, the value of the materials able to be sold for reuse can be used to offset the cost of decommissioning the wind farm and rehabilitating disturbed areas to pre-existing or better condition.

Matinez *et al* (2009) completed a study of the Life Cycles of wind turbines based on an energy efficiency of 200 equivalent full load hours. The study points out that relative payback times for energy used in the production and disposal of materials comprising the wind turbine 0.40 year or 2% of a 20 year lifetime. Additionally, the pay back time for contamination caused by its manufacture, start up, operation and decommissioning is less than 3.1% of a 20 year lifetime.

In 2004 Vestas Wind Systems, a Danish wind turbine manufacturer, commissioned a lifecycle analysis (LCA) of the V80 2.0 MW turbine (Elsam Engineering A/S, 2004). The study investigated the manufacturing, construction, installation, operation and decommissioning impacts of the wind turbine. The study was site specific and investigated turbines in the Tjæreborg wind farm on the west coast of Denmark. The results of the V80 LCA found that a total of 3,635,850 kWh of energy was consumed in the lifetime of each turbine (Elsam Engineering A/S, 2004). Based on this figure it was found that the Tjæreborg wind farm had an energy payback period of 7.7 months (when disposing and recycling of the equipment is taken into account).

A life-cycle assessment has been conducted by Vestas for a Vestas V90-3.0MW wind turbine. Vestas divided the life-cycle into four phases: production, transportation, operation and disposal. This assessment looked only at the turbines and did not consider associated infrastructure such as transmission lines, substation and control building.

The study identified that the greatest consumption of energy and resources occurred during the production phase. Raw materials required include iron ore for the construction of steel components and their casings as well as crude oil to make the epoxy materials used in blade construction. These resources are limited and considered non-renewable. In contrast, energy consumption during the transportation, operation and disposal phases was relatively minor.

During the operational phase (based on a 20-30 year life-span and taking into account the maintenance required over this period) the costs of construction and decommissioning begin to be offset by the operational capacity of the turbines. Disposal encompasses the fuels required to dismantle and transport the turbines as well as the disposal of materials.

Using a functional unit of 1 kW hour as a basis for comparison, Vestas provide the following comparisons between phases of the 3MW wind turbine life-cycle and CO_2 emissions between other energy producing power stations (tables below).

Table 8-10 Break down of the energy consumed during phases of the life cycle of a Vestas V90-3MW.

A Vestas V90-3MW turbine is expected to generate 157,800MWh during a 20 year lifetime, repaying energy required to produce the turbine in approximately 6.6 months. Energy required to produce, transport, operate and dispose of the turbine has been converted to MWhs to facilitate comparison with total energy produced.

Phase	Onshore vestas v90-3mw
Production phase	7,795.00 MWh
Transport phase	74.00 MWh
Operation phase	14.00 MWh
Disposal phase	*-3,572.00 MWh
Total	4.311 MWh

** the negative figure indicates the value of the material for reuse or recycling.*

Table 8-11 Comparison of CO2 emissions produced per kilowatt hour

Using energy output (kWh) to compare emissions, the wind turbine produces a small fraction of the CO_2 emissions of coal or gas-fired power stations.

Generation method	CO_2 produced
Onshore Vestas V90-3MW turbine	8 grams per kWh
Gas-fired power station	467 grams per kWh
Coal-fired power station	826 grams per kWh

Hence, by comparison to major electricity generating methods employed in Australia, wind farms rate favourably based on:

- CO_2 emissions generated per kilowatt hour of energy produced
- Potential to reuse and recycle component parts
- Energy payback time in comparison to the life span of the project

8.13.2 Impact assessment - construction and decommissioning

It is considered that the majority of resource use and waste generation would occur during the construction and decommissioning phases.

Use of resources

The construction of the proposed wind farm, including associated infrastructure, would require the use of various resources, such as concrete and other masonry products (footing, slabs, hardstand areas, building elements), materials associated with the operation of machinery, and motor vehicles (fuels and lubricants) and other construction materials (metals, glass, plastics). These materials are not currently depleted or restricted in supply however; increasing scarcity and environmental impacts are becoming apparent from the use of fossil fuels, mineral resources and other non-renewable resources. As such, the Proposal is unlikely to place significant pressure on the availability of local or regional resources.

Additionally, research cited above indicates that embedded energy within wind turbines is 'paid back' within a relatively short time frame. Research reviewed indicated that payback times varied up to one year post commissioning of the wind farm.

Recycling of materials at the end of the life of the wind farm would create another opportunity for a positive impact resulting from the Proposal. The life cycle analysis of the Vestas 3 MW wind turbine identified that recycling of parts post decommissioning of turbines would have the net effect of -3572.0 MWh based on the value of material for reuse or recycling.

Generation of waste

Solid waste is one of the major pollutants caused by construction. Waste would be generated by a number of different activities occurring during the construction phase including:

- Vegetation clearing
- Material from packaging
- Building materials
- Scrap metals
- Excess soil material
- Plastic and masonry products

It is considered that waste generated as a result of the construction phase, detailed above would be classified as building and demolition waste within the class *general solid waste (non putrescibles)* in accordance with the POEO Act.

Sanitary wastes would also be generated within the ancillary facilities (site compound) during the construction period. This waste would be classified as *general solid waste (putrescibles)* in accordance with the POEO Act.

Table 8-12 identifies the potential waste streams and proposed management options for each stream.

Table 8-12: Likely waste streams and associated management options

Waste stream	Generation process	Example of waste type	POEO classification	Management strategy	Waste storage
Office Waste	General office activities	Paper, plastics, packaging, cartridges, polystyrene	General Solid (non-putrescible)	Provide separated recycling bins onsite for recyclable material. Provide general waste bins for non recyclable materials.	A mixed recycling bin would be provided and located within the site office compound
Office Waste	General office activities	Food	General solid (putrescible)	Provide separate waste bins on site for food waste. Regular collection of this waste will be undertaken with the collected waste disposed of at an appropriately licensed facility.	A food scraps bin would be provided and located in the site mess room
Packaging	General construction activities	Timber pallets, plastic, steel strapping, cardboard	General Solid (non-putrescible)	Provide separated recycling bins onsite for recyclable material. Provide general waste bins for non recyclable materials.	A recycling bin would be provided and located within the designated lay down area
Construction Activities	Excavation and earthworks	Excess spoil	General Solid (non-putrescible)	Reuse onsite, if unable to re use on site dispose of at appropriately licensed land fill.	Any excess material would be stockpiled on site
Construction Activities	Vegetation clearing	Excess cleared vegetation	General Solid (non-putrescible)	Non weedy material would be mulched and used during rehabilitation.	Any excess material would be disposed of at an appropriately licensed facility.
Construction Activities	Vegetation clearing	Excess cleared vegetation	General Solid (non-putrescible)	Weedy vegetation would be sprayed and bagged to avoid potential proliferation.	This material would be disposed of at an appropriately licensed facility.
Construction Activities	Construction materials	Formwork, reinforcing steel, PVC conduits, cables	General Solid (non-putrescible)	Ensure this waste is not mixed with any other waste. Provide separated recycling bins onsite for recyclable material. Provide general waste bins for non recyclable materials.	This material would be stockpiled on site and removed by an appropriately licensed waste contractor

Waste stream	Generation process	Example of waste type	POEO classification	Management strategy	Waste storage
Construction Activities	Construction materials	Cable reels	General Solid (non-putrescible)	All cable reels would be stored on site and returned to the manufacturer	Cable reels would stored on site within the lay down area
Construction Activities	Concrete Truck Wash out	Concrete laden water	Liquid waste	Washout waster would be contained within a concrete wash out bay. This water has a high pH and high turbidity. The water component of the waste water is left within settling ponds to evaporate. The resulting waste is concrete sludge.	A dedicated concrete wash facility would be located in the close vicinity of each turbine. Concrete sludge would be re-used for road base aggregate or disposed as inert waste to an appropriately licensed land fill
Construction Activities	Sewage	Sewage	Liquid waste	Sewage waste generated onsite would be stored within toilet tanks.	The sewage would be collected and transported by a transport company licensed to transport class C waste
Construction Activities	Use of chemicals	Empty drums and storage containers	Classification dependant on chemical stored	Drums and containers would be stored in an appropriately bunded hardstand area.	This material would be disposed of at an appropriately licensed facility.

POEO: *Protection of Environment Operations Act* 1997

A key strategy of construction and decommissioning works would be to avoid and minimise waste from the construction site, reuse and recycle waste where possible and dispose appropriately of waste which cannot be managed in any other way. This is the application of the Waste Hierarchy which states that:

1. Strategies which try to avoid products becoming waste are generally preferable to
2. Strategies which seek to find a use for waste, which are in turn generally preferable to
3. Strategies for disposal which should be used as a last resort

The Proponent would prepare a Waste Management Plan (WMP) as part of the CEMP. The WMP would identify all potential waste streams associated Proposal. The WMP would also outline methods of disposal of waste at appropriately licensed facilities.

8.13.3 Impact assessment - operation

Resources required during the operational phase include fuel for construction and maintenance vehicles, lubricants for oil changes in the turbines and replacement parts if required that may consist of metal and plastic based products. The discussion and safeguards above apply equally to this phase, although resource requirements and wastes are anticipated to be much lower. All wastes would be removed by contractors and maintenance staff. No local garbage service would be required.

8.13.4 Mitigation measures

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
93	Waste generation	Minimise waste and maximise recycling of materials	The Proponent would prepare a **Waste Management Plan** to be included within the **Construction Environmental Management Plan**. It would include but not be limited to the following: • The scope for reuse and recycling would be evaluated • Provision for recycling would be made onsite • Wastes would be disposed of at appropriate facilities • Toilet facilities would be provided for onsite workers and sullage from contractor's pump out toilet facilities would be disposed at the local sewage treatment plants or other suitable facility agreed to by Council • Excavated material would be used in road base construction and as aggregate for footings where possible. Surplus material would be disposed of in appropriate locations on site (on agreement with the landowner), finished with topsoil, and revegetated	Construction Operation	CEMP OEMP	x	x

8.14 CUMULATIVE IMPACTS

8.14.1 Existing environment

Cumulative impacts, for the purpose of this assessment, relate to the combined potential effects of different impact areas of the proposal (i.e. construction traffic combined with visual impact) as well as the potential interaction with other proposals in the local area (e.g. the combined effects of multiple adjacent wind farms or other large infrastructure projects, during construction, operation and decommissioning).

The Goulburn / Yass region has high wind speeds and good access to electricity and transport corridors. Therefore, there is potential for other wind farms or similarly large scaled infrastructure to be proposed and developed in the future. In the Goulburn / Yass region (16,175 km^2, one wind farm is operational (Crookwell I), two have commenced construction (Capital and Cullerin) and four additional projects have been granted Planning Approval (Woodlawn, Crookwell II, Taralga and Gunning). In the Yass area, one wind farm has been approved (Conroys Gap).

This proposal would involve the construction of up to 152 turbines over two precincts: Coppabella Hills (up to 86 turbines), Marilba Hills (up to 66 turbines). Carroll's Ridge Precinct would be the subject of a separate EA (up to 30 turbines). The approval of all three precincts of the proposed Yass Valley Wind Farm would represent a 69.5% increase in the total number of turbines developed or approved for development within the region.

Cumulative impacts can occur concurrently or sequentially. They are assessed in this section under the broad headings of visual impacts, noise impacts, biodiversity impacts, air hazard impacts, traffic impacts, economic and resource impacts, social impacts and climate and air quality impacts.

8.14.2 Impact assessment

Visual

It is considered that the potential visual impact associated with the construction of one precinct would be less than if two or three precincts were constructed. For the purposes of this assessment, consideration of potential cumulative impacts associated with the construction of all three precincts (up to 182 turbines) has been adopted.

There are a number of wind farms either approved, under construction or proposed in the southern tablelands of NSW. The construction of the proposed Yass Valley Wind Farm would result in a large increase in the total number of turbines approved or proposed in the southern tablelands. This large increase in the total number turbines has the potential to increase the cumulative visual impact of the Yass wind farm. Currently, the closest approved wind farm is Conroy's Gap which is flanked by the Marilba Hills precinct.

The proposed Yass Valley Wind Farm is located in close proximity to the Hume Highway. Currently the Cullerin Range wind farm (under construction) and the Conroy's Gap wind farm (planning approved), are the only other wind farms located in the direct vicinity of the Hume Highway, east of the Yass proposal. The Cullerin Range wind farm site (15 turbines) is visible from the Hume Highway and is located between 45 and 60 minutes east of the current proposal. The Conroy's Gap wind farm is located adjacent to the Marilba Hills precinct and is visible from the Hume Highway. The construction of the proposed Yass Valley Wind Farm would represent a cumulative visual impact to users if the Hume Highway. It is considered that the distance between Cullerin and the proposed Yass Valley Wind Farm in addition to individual mitigation measures applied on a precinct specific basis would reduce the severity of this potential cumulative impact.

Noise

Cumulative noise impacts were considered in the modelling completed for the noise impact assessment. All layouts displayed in the noise impact assessment have considered the cumulative impacts of nearby wind farm developments and have shown that compliance is achievable. Cumulative noise impacts are expected to be within guideline limits for operational noise from the wind farm.

Biodiversity

The key impact of wind farms, with respect to cumulative impacts, is the potential to generate continuing losses of some species with low reproductive rates (such as Wedge-tailed Eagles and Eastern Bentwing Bats), and thereby create a 'mortality sink' with potential to affect populations at a regional level (Jonzen et al. 2005). Mitigation strategies are included in this proposal to address this risk.

The impacts of the wind farm on biodiversity values would combine with existing impacts resulting from land clearing, agricultural activities, weeds and hazards. It is important to recognise that the district has experienced extensive losses to ecosystem integrity and stability. Woodland and grassland communities in particular, which coincide with prime agricultural land, and riparian and wetland communities have been heavily impacted. It is likely that many woodland flora and fauna species have become locally extinct, and many are in continuing decline. There is a time lag, or 'extinction debt', operating which will mean that decline and extinction will continue for many species for decades to come, regardless of management responses. Further impacts on lowland environments are expected from soil and water salinisation, soil erosion and sedimentation, weed invasion and spread, disruption to river hydrology due to farm dam construction and water extractions and habitat fragmentation and clearing resulting from residential sub-division and building.

To address cumulative biodiversity impacts, this EA includes mitigation measures to reduce impacts on areas of higher conservation significance and to offset the area to be disturbed by the proposal. Offsets are considered to be required, where impacts cannot be avoided, in order to achieve a 'maintain or improve' environmental outcome. The approach taken by this assessment is to offset the quantum of habitat loss associated with the proposal, based on the finalised infrastructure layout. The broader environmental benefits of establishing renewable energy sources have not been considered in the assessment or offset plan. Therefore, coupled with measures to offset habitat loss, the contribution of the proposal to reducing the adverse environmental impacts of fossil fuel based electricity generation is anticipated to constitute an overall 'improve' outcome.

Ongoing monitoring of operational biodiversity impacts, such as collisions, would be undertaken in collaboration with both precincts, as well as other regional wind farms. This commitment addresses the need to build local knowledge of actual impacts of wind farms in the region and address them in a co-ordinated manner. Specific Statements of Commitment are stated in Section 7.4 of this EA.

Traffic impacts

There is the potential for an increase in traffic, primarily associated with the construction phase to combine with existing road traffic on the Hume Highway and surrounding roads. It is planned that construction of the wind farm would occur sequentially, one precinct at a time, thus reducing the severity of the potential impact. Traffic impacts are considered to be primarily associated with the construction period and therefore would be temporary in nature.

The Hume Highway is a state highway that acts as the main inland transport corridor for people travelling between Sydney and Melbourne. It is considered that impacts to motorists using the Hume Highway would be manageable as the road is designed to cater for a large volume of traffic. Smaller roads that would be utilised for access would be subject to increased traffic volumes during the construction phase. With the adoption of the mitigation options identified these impacts are also considered manageable.

Economic and resource impacts

The potential for positive cumulative economic effects of the proposal is very real during the construction of the project. Particularly, if a number of wind farms are constructed within the region at the same time, there would be potential to increase the skills of the local work force and to establish industry relating to the manufacture of a proportion of project infrastructure. Liaison will continue with local economic development bodies to ensure this potential is maximised.

Social impacts

Public perception studies have shown that more realistic and positive perceptions accompany actual physical experience of wind farms; fear of the unknown can exaggerate perceptions of visual and noise impacts particularly (Warren et al. 2005).

While it is certain that not all members of the community will view the proposed development of wind farms favourably, in some communities, investment in clean energy production can become a point of pride to residents. During wind farm community consultation in Berridale, NSW for the Snowy Plains Wind Farm, many participants spoke with pride about the Snowy Hydro Scheme and the appropriateness of similar clean energy developments in their shire (B. Marshall pers. obs 2005). The southern tablelands region looks well placed to become a leader in the Australian wind industry. The results of the NSW Southern Tablelands Survey 2007 (REARK Pty Ltd 2007, refer to Section 4.2.2) indicate that support for renewables is high.

Adverse cumulative impacts post construction may result from the altered perception of the character of the area. For lifestyle, recreational and tourist land uses, this impact is keener. These impacts have been discussed in Sections 8.7 and 8.8.

Climate and air quality impacts

During construction, there is potential for cumulative exhaust and dust generation, if other wind farms or other large scale infrastructure projects occur concurrently. These impacts are highly manageable on a project by project basis. Measures in Section 8.12 would assist in ensuring that the impacts of this proposal would be managed appropriately.

The cumulative impact of additional wind farms in the region would have positive impacts for NSW in terms of the provision of non-fossil fuel sourced electricity to meet increasing demand. In terms of addressing increasing greenhouse gas emissions, this is a net benefit of the proposal.

9 STRATEGIC JUSTIFICATION

This section provides a strategic assessment of the justification for the project in the context of its local and regional setting. It also outlines the suitability of the project, and indicates where this is discussed in more detail throughout the report, as well as describing the considered alternatives.

The justification for the Coppabella Hills and Marilba Hills Precincts of the Yass Valley Wind Farm development is based on the following forecasts;

- In full operation, it would generate 1200 GWh of electricity per year -sufficient for the average consumption of 150,000 homes
- It would improve the security of electricity supply through diversification
- It would reduce greenhouse gas emissions by approximately 1,160,000 tonnes of carbon dioxide (equivalent) per annum
- It supports the strategic direction of the region, as outlined in the Sydney-Canberra Corridor Regional Strategy
- It would contribute to the NSW Government's target of providing 15% of consumed energy from renewable sources by 2020
- It would contribute to the NSW Government's target of reducing green house gas emissions by 60% by the year 2050
- It would create local employment opportunities and inject funds of up to $334 million into the Australian economy

Apart from these main objectives, ancillary benefits and opportunities would also accrue. These include local community, infrastructure, tourism and biodiversity benefits.

9.1 PRIMARY JUSTIFICATION

9.1.1 Electricity generation capacity

In order to determine the likely energy generated by the proposed wind farm, a thorough wind energy assessment was undertaken based on an indicative turbine layout. This analysis calculated the amount of energy produced by the project in a typical annual wind regime. Various on-site losses, such as in cabling and from substation operations, were then subtracted to produce an estimate of the sent-out electricity generation for a typical year.

Additional investigations were carried out by the Proponent on a wider range of turbines using the wind turbine analysis tool Windographer™. This analysis has produced a range of energy yield estimates based on the turbine layouts indicated in Figures 3-10 to 3-12.

On the basis of these studies energy production estimates (on a sent-out basis) for the proposed Yass Valley Wind Farm are in the range of 5.5 to 8.5 GWh per turbine per annum, depending on final turbine selection and turbine layout. This calculation is based on a predicted typical year, with variations in the order of 10-20% likely for any single year. Predictions used in this report are therefore based on an average figure of 7.0 gigawatt-hours (GWh) per turbine per year.

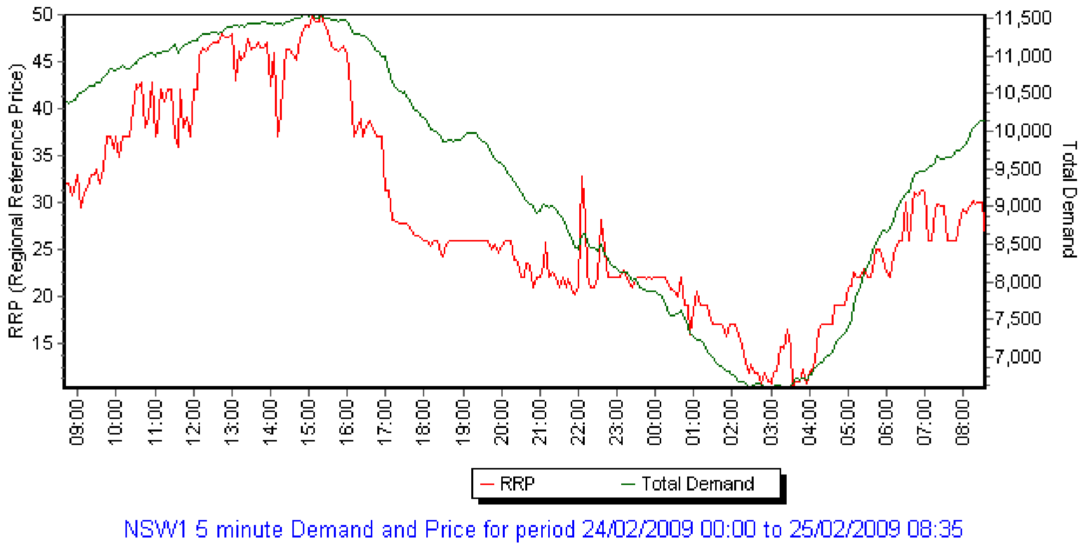
In 1999 the average domestic electricity consumed in NSW was 7,399 kWh, growing from the 1990 average of 6,983 kWh (DEUS 2000). A figure of 8,000 kWh on average is applied in this report based on

ABS figures. On this basis the wind farm is expected to produce electricity in the order of 1200 GWh per annum, equivalent to the average consumption of 150,000 homes. Further figures in this report are based on this production estimate.

9.1.2 Security through diversification

The reliability of electricity supply is a measurement of the total time customers are without electricity each year against the total time that electricity was demanded. The NSW electricity supply is currently rated as being 99.7% reliable. The Government's goal is to achieve 99.98% by 2016 (NSW Government, 2006). A reliance on coal-power stations to achieve this goal may be limited.

Figure 9-1 below shows electricity demand in NSW over a 24 hour period on February 25 2009. The graph shows a daily variation of approximately 5,000 MW.



Source: NEMCO Live Market Data, **www.nemmco.com.au**, accessed 25/02/09

Figure 9-1: Daily variations in NSW electricity demand (25th February 2009)

Coal fired power stations are limited in their ability to vary their output and match the daily fluctuations in energy demand. Efforts to flatten out the demand curve to match supply include reduced cost electricity being offered to consumers when demand is lower. In general, energy generated from renewable technologies, such as solar and wind, are more flexible with their output and can follow the short-term variations in demand (Needham, 2008).

Energy generated from the Coppabella Hills and Marilba Hills Precincts would fluctuate daily with variations in the wind speed on-site. These variations would not impact on the daily demands within the electricity system.

TransGrid and NEMMCO require modelling of the existing network (in accordance NEM rules) to demonstrate that the wind farm would not adversely affect the performance of the network under normal or fault conditions. The proposed wind farm is located in close proximity to the substation at Yass, one of the strongest nodes in TransGrid's network. Preliminary investigations have revealed that the network in this area is strong and stable under most fault conditions and would able to handle fluctuations in power output from the wind farm.

The development of these Precincts would offer diversification to the existing electricity supply infrastructure, which helps mitigate the risks of power station failures. A single coal fired power station in NSW can generate up to 2,640MW, or approximately 20% of the total NSW generation capacity. An outage or failure of such a power station would have a significant impact on the operations on the electricity system and thereby the economy as a whole

9.1.3 Need for renewable energy

Life Cycle Assessment and Embodied Energy

Life cycle analysis (LCA) is based on careful accounting of energy and material flows associated with a system or process. It is a way to quantify and analyse the resource impacts of a process or project. LCA is particularly relevant for renewable technologies, where it is often argued that the energy used to produce the technology is not 'paid back' during the lifetime of the technology. A detailed LCA is presented in Section 8.13.

A study commissioned by Vestas Wind Systems in 2004 revealed that the energy 'pay-back' for the Tjæreborg wind farm was 7.7 months (when scrapping of the equipment is taken into account). When considering the turbine itself it found that the Vestas V90 3.0MW machine produced 8 grams of carbon dioxide per kWh over its lifecycle. In comparison a Gas-fired power station produces 467 grams per kWh and a coal-fired power station produces 826 grams per kWh.

Contribution to reducing greenhouse gas emissions

During its operational phase, the Yass Valley Wind Farm would generate electricity without producing greenhouse gases. The Life Cycle Analysis discussed in Section 8.13 demonstrates that while there are some GHG emissions associated with the manufacturing, construction and decommissioning of wind turbines, this amount is negligible compared to the amount of clean renewable energy produced. At this stage it is not possible to determine the exact reduction in GHG emissions, however, some assumptions can be derived.

By providing additional energy to the grid, the project would reduce the need for this same amount of energy to be produced at a coal power station. This would in turn reduce the amount of GHGs emitted that are currently associated with this amount of electricity.

As derived in Section 4.3.4, 967 kilograms of GHGs are emitted for every megawatt-hour of electricity produced by power stations for the National Electricity Market. In theory for every megawatt-hour of electricity generated by the proposed wind farm, the emission of at least 967 kilograms of greenhouse gases is avoided.

If the amount of energy is 1430 GWh p.a, then the amount of GHGs avoided would be 1,368,000 tonnes per year. This value is estimated based on the current dominance of coal power stations in the NSW pool. It doesn't account for change to the NSW Pool Coefficient, or change to the future mix of electricity generators.

The employment of other renewable energy technologies would also result in similar GHG reductions. However, as demonstrated in Table 9-1 and Table 9-2, wind technology has a higher sent-out capacity and lower capital and operating costs than other technologies. Therefore the most feasible way to reduce GHG emissions from energy generation is presently via wind farms.

Table 9-1 Technology Costs and Performance Assumptions, 2007

Option	Life (years)	Sent-out capacity (MW)	Capital cost - 2010 ($/KW SO)	Efficiency improvement (% pa)	Variable non-fuel operating ($/MWH)	Fixed operating cost ($/KW)
Wind	25	99	2,134	0.2	2.0	35
Biomass - Steam	30	28	2,598	0.1	4	50
Biomass - Gasification	25	27	2,784	0.1	5	50
Concentrated Solar Thermal Plant	20	99	4,176			50
Geothermal - Hot Dry Rocks	25	45	4,400	0.1	3	70
Concentrating PV	30	97	4,640	0.1		
Hydro	35	30	2,320	0.1	3	35

Source: McLennan Magasanik Associates, 2009

In 2008, the projects listed in Table 9-2 were approved as Critical Infrastructure projects under Part 3A of the *Environmental Planning and Assessment Act 1979*. The total additional electricity generated from the projects once they are in full operation would be 560 MW per year. Development of the Coppabella Hills and Marilba Hills Precincts of the proposed Yass Valley Wind Farm is predicted to generate roughly 380 MW per year. As shown in Table 9-2, the combined total of GHG emissions from these projects is in the order of 1,558,769 tCO2e per year. In comparison this development would have a very low amount of GHG emissions associated with the construction, operation and decommissioning phases. The size of the proposed wind farm project would reduce the need for multiple smaller scale power plants.

Table 9-2:Energy Generation Projects Granted Development Approval in 2008

Project name	Project description	Projected (additional) annual energy production	Predicted (additional) annual greenhouse gas emissions
Narrabri Coal Seam Gas Utilisation Project	Expansion of the Wilga Park Power Station from 11MW to 40MW	40 MW	204,193 tCO2e
Bamarang Gas-Fired Power Station	Construction and operation of a gas fired power station (Stage 2)	400MW	1,245,576 tCO2e
North-West Parkes Gas-Fired Power Station	Construction and operation of a gas-fired power station	120 MW	109,000 tCO2e

Sources: Project EA's as found on the Department of Planning's website.

Impact on climate change

Reduction in greenhouse gas emission directly contributes to combating the adverse impacts associated with climate change including:

- The increase in extreme weather events
- Increased demand for water and associated impacts on natural systems, and
- Economic impacts associated with changing land capability.

Adverse impacts noted specifically for Australian agricultural communities include an increase in floods, droughts and forest fires. As a consequence of reduced local production capacity in conjunction with increased production in positively affected northern hemisphere countries, the economic impact of climate change is particularly relevant to agricultural economies (AGO 2003) such as the Yass region.

Major changes in vegetation composition will come through shifts in rainfall patterns and increased runoff distribution and will favour the establishment of woody vegetation and encroachment of unpalatable woody shrubs in many areas (Australian Greenhouse Office 2003). In modified landscapes, the ability of organisms to survive climate change through dispersal may be limited (Brasher & Pittock 1998, Australian Greenhouse Office 1998, cited in DECC 2007). Species at particular risk from the effects of climate change include those species with long generations, poor mobility, narrow ranges, specific host relationships, isolated and specialised species and those with large home ranges (Hughes & Westoby 1994, cited in DECC 2007). Pest species may also be advantaged by climate change.

As it represents a positive contribution to reducing the emission of GHGs, the proposal therefore is a positive contribution toward addressing the negative environmental consequences of climate change.

9.1.4 Supporting state and regional initiatives

Federal renewable targets

As mentioned in the previous Chapter, the Australian Government has committed to sourcing 20 per cent of Australia's total electricity supply from renewable energy by 2020. This Renewable Energy Target (RET) requires a total of 45,000 GWh of electricity to be generated from renewable projects. Similarly, to meet the NSW State government NRET targets an additional 1,317 GWh is needed by 2010 and 7,250 GWh by 2020.

The Coppabella and Marilba Precincts would help meet both Federal and State government renewable energy targets by providing 1200 GWh per year. This would contribute to just over 2.5% of the renewable energy needed to the Federal RET and 16.5% towards the 2020 NRET.

The RET is technology neutral, however because it is market based it feeds the electricity source with the lowest cost generation into the NEM. As shown in Table 9-3 out of all the commercially viable renewable energy technologies, wind energy currently has lower costs associated with generation.

Table 9-3: Comparison of energy technologies

	Technical Maturity	CO_2 Intensity (Kg/MWH)	Water Use (L/MWH)	Cost ($/MWH)
Coal	Mature	969	1,300,000	31 – 40
Natural Gas	Mature	500	~ 260,000 - 520,000	37 - 44
Hydro	Mature	4 - 10	Significant enviro issues	27 - 282
Wind	Mature	7	Nil	75 - 90
Solid Biomass	Mature	Possibly negative under some circumstances	~ 2000 (wet) ~ 700 (dry)	47 - 120
Solar Thermal	Demo	~ 3	~ 2000 (wet) ~ 150 (dry)	120 - 150
Solar PV	Mature	~ 3	Nil	400 - 800
Geothermal	Research	~ 3	high	Large range
Nuclear	Mature	~ 3	1,100 – 1,850	50 - 80
Ultra Clean Coal	Demo	770 - 825	Unknown	Unknown

Source: *Macquarie Generation 2007.*

Reports from three consultants, CRA International, ROAM Consulting and ACIL Tasman, have all concluded that wholesale electricity prices would be lower after the commencement of the Federal Government RET in 2010. It is forecast by CRA that by increasing low cost renewable energy to the national electricity pool, prices could fall by as much as 5% (Galacho, 2009). DECC modelling results released at the same time contradicts this by stating wholesale electricity prices would rise by an average of 0.5% from 2010 to 2020 (Galacho, 2009). Modelling undertaken by McLennan Magasanik Associates for the Federal Government found that that wholesale electricity prices will rise by less than 1% after the commencement of the RET scheme, however retail prices will rise by around 3.5% (Breusch, 2009).

The proposed Precincts would provide renewable energy eligible for Renewable Energy Certificates under the Federal Government's RET. The full costs of these schemes have already been taken into account by electricity retail companies in power prices set by them.

NSW renewable targets

The State Plan (NSW Government, 2006) is a Government planning document that provides a comprehensive overview of the strategic direction for the State. The plan outlines rigid framework which sets priorities and targets for action over the next 10 years.

In the Plan electricity has been identified as a key area of State concern, with currently only 6% of NSW’s total energy consumption being provided from renewable energy sources. Priority E2 of the Plan sets a target to increase this to 10% by 2010, and to 15% by 2020. One of the initiatives established to help achieve this is the NSW Renewable Energy Target (NRET), as previously discussed.

Green house gas emissions are also identified as an area of concern and Priority E3, which directs air quality and greenhouse gas emissions across the State, sets the target of achieving a 60% cut in greenhouse emissions by 2050 and returning to the year 2000 GHG emission levels by 2025. To achieve this the NSW Government has made a commitment to support low energy emission supply projects.

The proposed Precincts of the Yass Valley Wind Farm support the strategic direction of State by providing an on-going renewable energy source with no GHG emissions. The project would assist the Government towards achieving the targets set in both Priority E2 and Priority E3 of the State Plan.

Sydney-Canberra Corridor Regional Strategy

The majority of the proposed Precincts fall within the NSW Department of Planning's Sydney-Canberra Corridor Regional Strategy (Department of Planning 2008) and would feed energy into transmission lines that service the identified Corridor area. The Strategy predicts a population increase of 46,350 people in the Region by 2031, demanding an extra 25,200 new dwellings. This expected population increase would also create the need for additional local employment opportunities. The Strategy also calculates that an additional 295 ha of land in the region would need to be rezoned for employment (Department of Planning, 2008); meaning the region would experience a growth in industrial ventures. This development would supply electricity to the regional grid, having the potential to power 150,000 homes each year or support growth in business and industry. Furthermore, the operational and maintenance phases of the wind farm would assist the Strategy by providing up to 33 on-going local jobs.

The Sydney-Canberra Corridor Strategy (2008) identifies wind farms as a "critical investment in the Region and the State's energy network" and recognises the geographical attributes of the Region as having huge potential to house wind farms. As an outcome, the Strategy advocates that planning authorities undertake actions that support renewable energy projects and provide opportunities for the development of wind powered electricity generation.

9.1.5 Economic stimulus

According to MacGill & Watt (2002) the Coppabella Hills and Marilba Hills developments have the potential to inject nearly $418 million into the Australian economy over its life time. This is based on the figure of the injection of $1.1 million per MW for wind farm installations in 2010. This economic injection would also contribute to the local economy through:

- Use of local contractors (where possible) in construction of the wind farm
- Use of local services (food and accommodation, fuel, general stores etc) during the construction period
- Ongoing use of these local services during the operation of the wind farm
- Lease payments to local landholders
- Provision of ongoing local jobs in operating and maintaining the wind farm

MacGill & Watt (2002) forecast that wind farm installations in the year 2010 would create 4.5 job-years per MW for manufacturing and installation and 0.06 on-going jobs per MW for operation and maintenance. By applying these figures, the Yass Valley Wind Farm would create 1,710 job years Australia wide and 22 on-going local jobs.

9.2 SECONDARY PROJECT BENEFITS AND OPPORTUNITIES

In addition to the increase in renewable energy supply, the proposed Precincts of the Yass Valley Wind Farm would provide a variety of benefits and opportunities.

9.2.1 Infrastructure

Infrastructure required for development of the wind farm would also benefit the local community. The proponent would fund the upgrading of some local roads as outlined in the Traffic Study. The works that would mainly benefit the region include the reconstruction of segments along Whitefield's and Coppabella Roads and the paving and maintenance of sections along Berramangra and Garry Owen Roads. Other infrastructure works would include the provision of traffic signs and guide posts.

9.2.2 Tourism

Although, the operation of a tourist facility is not part of this proposal, the Yass Valley Wind Farm would provide an opportunity to increase the regional tourism industry, which currently is a main contributor to the economy. In 2001, tourism in the Sydney-Canberra Corridor Region generated $600 million (Department of Planning, 2008). The Region's heritage and its proximity to Canberra and the NSW snowfields already provide a stable base for tourism. While initial interest is likely to be higher than on-going interest, the wind farm could be utilised as an additional attraction to secure visitors to the local townships. This would lead to further contributions to the local service industry.

9.2.3 Biodiversity

During the assessment of this proposal, areas and features of high conservation significance were identified. The additional research and field work undertaken during the assessment now provides a greater understanding of the local environment. As well, specific measures accompany this proposal to ensure the key features are protected from unacceptable impacts.

In particular:

- The Coppabella Hills and Marilba Hills Precincts contain large areas of Box-gum woodland. Some of these areas are of sufficient quality to qualify as the NSW listed 'Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community' and Commonwealth listed 'Yellow Box – White Box- Blakely's Red Gum Grassy Woodland and Derived Native Grasslands Critically Endangered Ecological Community''.
- A host of threatened flora and fauna were identified at the precincts and nearby. These include the Yass Daisy, Superb Parrot, Diamond Firetail, Speckled Warbler, Eastern Bent-wing Bat.

This information will be used in preparing a Biodiversity Management Plan and an Offset Plan to ensure the maintenance of these biodiversity attributes in the long-term.

9.3 SUITABILITY OF THE PROJECT

A comprehensive assessment of the proposed project has recognised that the development is suitable on a local level in terms of existing and future land use impacts. The following sections outline where this Environmental Assessment discusses the suitability of the project and the reasons behind the justification.

9.3.1 Strategic land use

The proposed sites and the adjacent land parcels are zoned as land use 1(a) Rural Agriculture under the Yass Valley Council LEP 1987 and the Harden Shire Interim Development Order No.1. This land has been set aside by the local councils for agricultural purposes, and the land is currently used for commercial agriculture (sheep and cattle grazing) and rural residences.

While in operation the proposed wind farm would not impact on the day-to-day farming activities currently being carried out by the existing landowners. The turbine footprint and access tracks would only occupy approximately 1.12% of the landowner's property and through strategic planning and consultation, infrastructure would not occupy productive land. Normal farming operations may be affected during the construction phase, primarily due to increased traffic. The magnitude of these impacts are not expected to cause economic loss to the landowners.

When considering the existing and future land uses, the proposed site is suitable for a wind farm. Both local councils have strategically identified the site and its surrounds as being important agricultural land and there is no future intention to modify this zoning. The wind farm would coexist with the existing farming operations without any major disturbances to productivity. Potential impacts to land use is discussed in more detail in Section 8.4.

9.3.2 Property values

Henderson and Horning Property Consultants (2006) assessed the likely impact on local land values from the proposed Crookwell wind farm near Goulburn NSW. The context of the study was a general trend of larger properties being sold and broken up into smaller lots. Market forces appear to value the rural residential amenity above that of the agricultural productive capacity of the land. Discussions with local Crookwell agents generally indicated that although topical, the existing wind farm had little or no effect on land values in Crookwell. However, the perception of the proposed wind farm (Crookwell II) planned close to the existing farm could have an effect. The analysis of sales evidence indicated that no detectable discount exists for properties deemed directly affected by the existing wind farm. That is, the market evidence suggested that having a view of the wind turbines did not affect land value.

While there is some potential for properties in the vicinity of the proposed wind farm to be negatively affected by perceived visual or noise impacts. However, agricultural productivity would be a primary determinant in land value for the properties surrounding the wind farm. Development of the wind farm has the potential to slow down the process of rezoning agricultural land changing to rural residential uses in the short to medium term, with the shift caused by the additional income generated from the wind farm revenue making the agricultural use of (involved properties) more viable. Section 8.4 discusses the potential impacts to property values in more detail.

9.3.3 Land of significant scenic or visual value

The proposed Precinct sites are located in a man-modified environment predominantly cleared for agricultural and rural residential purposes. It is recognised that some people value the appearance of such landscapes and the undulating topography can also add to aesthetic value. The Visual Assessment report, discussed in Section 7.2, identifies three (3) of the thirty four (34) selected viewpoints as having high landscape sensitivity. Of these, the two locations that will be impacted by the wind farm are located at Burrinjuck Waters State Park and along Burrinjuck Road. These locations are associated with the Carrolls Ridge Precinct and hence do not form part of this application. The application for Carrolls Ridge Precinct will fully discuss these visual impacts and it is believed that all impacts would be able to be mitigated/remedied. Most of the visual impacts from the wind farm are classified as being minor or medium. It was also concluded that the cumulative impacts of the surrounding wind farms will not be greater than the visual impact of the Yass Valley Wind Farm on its own.

9.3.4 Land of high agricultural value, mineral reserves and conservation areas

As discussed in Section 8.9 the site and surrounding land parcels have been strategically zoned for agricultural purposes - an industry that the local economy depends on. A small percentage of agricultural land will be impacted by the wind farm infrastructure, however, this land is not considered to be of high agricultural value or expected to cause economic losses for the landowner.

There is one mining license that encompasses some of the area on the Coppabella Hills Precinct, however, consultation with the license holder has revealed that they are currently not active in this area. Refer to Section 8.3.

9.4 CONSIDERATION OF ALTERNATIVES

9.4.1 Site selection

Suitable sites for wind farms are very rare in New South Wales. Appropriate locations are found where:

- Wind speeds are not only high but consistent
- High voltage transmission lines are available on or near site
- Reasonable road access is available to site
- Relevant landowners are interested in allowing wind turbines on their land
- Native vegetation cover is sparse or would be minimally impacted
- Housing in the immediate vicinity is relatively sparse

The Proponent currently has 36 active wind monitoring masts across NSW as well as wind data from 5 decommissioned masts. By modelling information from these masts, plus over twenty third party monitoring masts, the proponent holds one of the most extensive wind data sets available in NSW. On the proposed sites the Proponent has six monitoring masts and two off-site monitoring masts within the immediate vicinity. The proponent has investigated various regions around NSW for their wind farm potential, and as such has identified the Yass area as having:

- High and consistent wind speeds
- Sparse native vegetation cover in areas that would be affected
- Low population density - one person per 29 hectares in the Yass Valley area (ABS, 2006)
- Existing electricity transmission line on site (330kV Yass - Sydney West)

After identifying this as a prospective wind farm site the area was further investigated in terms of its development potential. A major contributor in the determination of the site land parcels was the engagement of interested property owners. The final development envelope was chosen over alternatives because of its commercial viability, landowner agreements and opportunity to minimise environmental impacts.

9.4.2 Alternative turbine/infrastructure layouts

The indicative turbine layout was determined through an iterative process that aimed to minimise impacts on the existing environment (including biodiversity, noise and visual considerations), have a low infrastructure envelope, have minimal impact on land use and productivity, and produce the highest yield of wind energy. This was achieved through consultation with land owners and consultants as well as the Proponents own expert knowledge. Individual turbine locations were shifted around during the planning process to achieve a socially, environmentally and economically acceptable layout.

9.5 REVERSIBILITY OF THE PROPOSAL

During the decommissioning phase, all above ground infrastructure would be removed from the site. The concrete footings and access trails would remain, reducing the amount of further disturbance. All soil disturbance would be rehabilitated and revegetated, as appropriate. The landforms, land use and visual character of the site would then be returned to its pre-existing state.

This Environmental Assessment outlines measures that would be implemented to facilitate protection of the existing environment and minimise both environmental and social impacts of the proposal. Nearly all of these impacts relate to the construction and operation of the project. It should be noted that with regard to environmental impacts, the proposal is entirely reversible in many areas, once decommissioned.

Visual and noise impacts relate primarily to the operational phase of the wind farm and are entirely reversible, post-decommissioning of the project.

Measures to mange biodiversity impacts are equally relevant to the construction and operational phases of the proposal. Specific measures are committed to as a part of this proposal to manage identified impacts. Adaptive management, through ongoing monitoring and analysis, is used to address uncertainty. Post-decommissioning, the Offset Plan remains to ensure that over time, the biodiversity outcomes of the site are improved, rather than reduced.

Traffic impacts are largely focussed on the construction phase. Post construction, these improvements to tracks and pavements are a medium to long-term benefit of the project.

10 ENVIRONMENTAL MANAGEMENT

The environmental impacts related to the proposal would be managed by the Proponent's commitment to the Draft *Statement of Commitments* (Section 10.2). These commitments include all mitigation measures recommended in previous sections of this EA as well as several additional measures. The framework for the implementation of these measures is discussed below (Section 10.1).

10.1 IMPLEMENTATION OF ENVIRONMENTAL MITIGATION MEASURES

The implementation of all mitigation measures would be by way of a **Project Environmental Management Plan** (PEMP), comprising a **Construction Environmental Management Plan** (CEMP) and an **Operation Environmental Management Plan** (OEMP). This process is illustrated in Figure 10-1. The PEMP would include performance indicators, timeframes, implementation and reporting responsibilities, communications protocols, a monitoring program, auditing and review arrangements, emergency responses, induction and training and complaint/dispute resolution procedures. The monitoring program would clearly identify any residual impacts after mitigation. Adaptive management would ensure that improvements were consolidated in the updated EMPs.

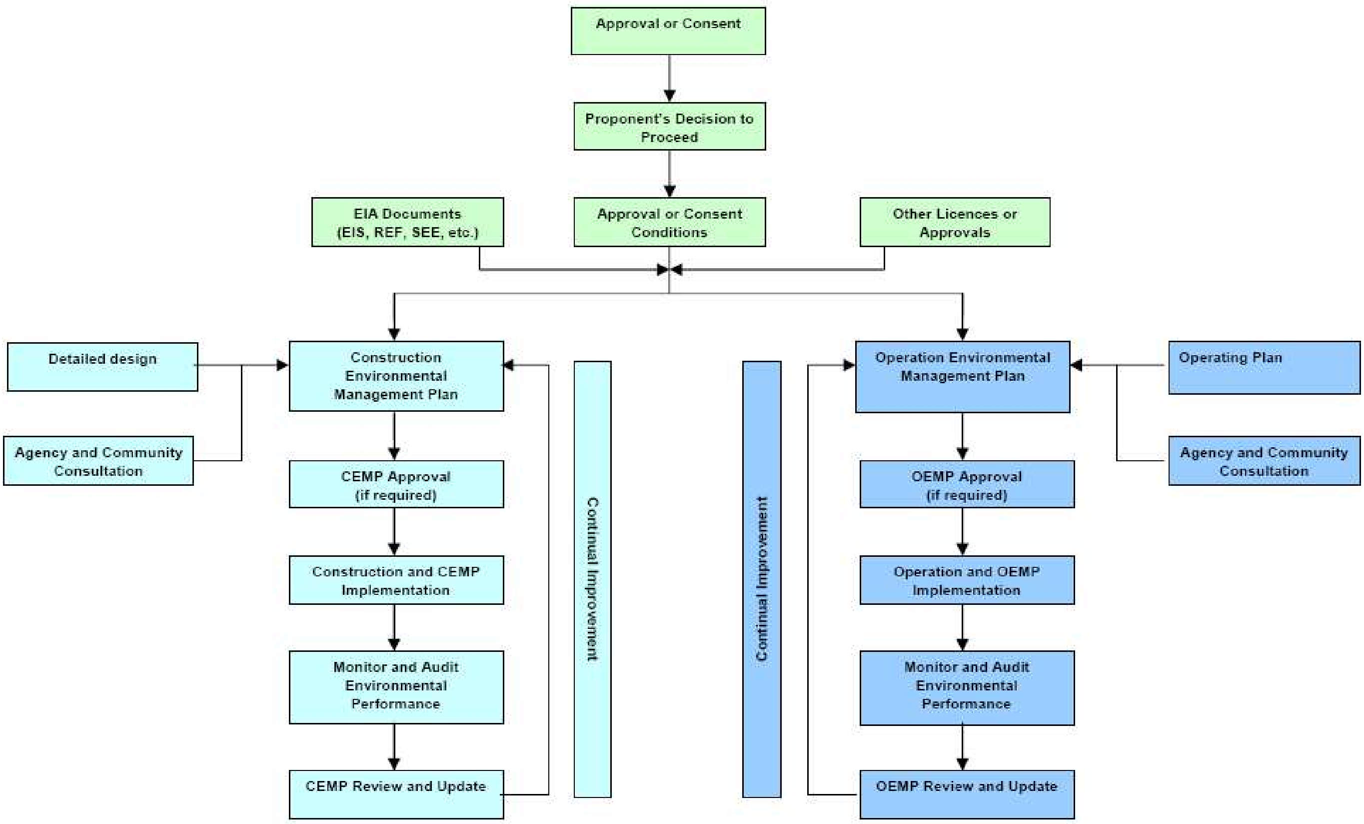


Figure 10-1: Post approval Project Environmental Management Plan (PEMP) process

10.2 DRAFT STATEMENT OF COMMITMENTS

Under the Part 3A reforms, Proponents are required to provide a *Statement of Commitments* on how they propose to manage the project to minimise, and where possible avoid, impacts. Avoidance and mitigation measures have been developed for the design, construction, operation and decommissioning phases of the project within this EA.

The commitments in this section have been developed into a comprehensive set of environmental impact avoidance and mitigation measures which incorporate:

- Specific recommendations contained in the specialist reports;
- Additional measures identified during the preparation of this Environmental Assessment (in consultation with the community and government agencies).

To avoid duplication in this section, mitigation measures are located under the most appropriate heading only and are not repeated in subsequent tables.

10.2.1 Visual

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
1	Deterioration of visual amenity at surrounding residences	Mitigate impacts	The proponent would offer vegetative screening of any residence within 3 km of a wind turbine. The proponent would write to the owner of each residence outlining the offer and process. A site visit would determine the extent and type of planting required Species selection would be determined in consultation with landholders using specialist advice. This offer would remain in place for a period of 1 year after project construction, to allow people time to either adjust or to decide that landscape filtering or screening is warranted. Planting would be completed within 2 years of completion of project construction.	Post Construction	OEMP	X	X
2	Deterioration of visual amenity at surrounding residences	Mitigate impacts	The Proponent would make reasonable efforts to locate powerlines, substations and control buildings in areas which minimise the visual impact where practical. Vegetative screening would be provided around substations and control buildings where they were visible from neighbouring residences.	Planning	DoP	X	X

10.2.2 Noise

Construction

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
3	Construction noise	Minimisation	The Proponent will employ appropriate noise reduction strategies to ensure the recommendations of the NSW Environmental Noise Control Manual are met. Strategies may include the re-orientation of machinery, rescheduling of noisy activities, installation of temporary noise barriers, improved vehicle noise control and the use of 'quiet work practices' (such as reducing or relocating idling machinery).	Detailed design	CEMP	x	x
4	Construction noise	Minimisation	The Proponent would only undertake construction activities associated with the project that would generate audible noise at any residence during the hours: • 7:00 am to 6:00 pm, Monday to Friday, • 8:00 am to 1:00 pm Saturday; and • At no time on Sundays or public holidays	Detailed design	CEMP	x	x
5	Construction noise	Minimisation	Meet ANZECC guidelines for control of blasting impact at residences.	Detailed design	CEMP	x	x

Operation

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
6	Operational noise	compliance	The Proponent will ensure final turbine selection and layout complies with the SA EPA Noise Guidelines of 35 dB(A) or background plus 5 dB(A) (whichever is higher) for all non-involved residential receivers. (other than those which have entered into a noise agreement with the	Detailed design	OEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			Proponent in accordance with the SA EPA Noise Guidelines)				
7	Operational noise	Compliance	The Proponent will ensure final turbine selection and layout complies with the World Health Organisation Guidelines for Community Noise requiring 45 dB(A) or background plus 5 dB(A) (whichever is higher) for all involved residential receivers and all non-involved residential receivers which have entered into noise agreement with the Proponent in accordance with the SA EPA Noise Guidelines	Detailed design	OEMP	x	x
8	Operational noise	Compliance	Prior to construction, the Proponent will prepare and submit to the Department of Planning a noise report providing final noise predictions based on any updated background data measured, the final turbine model and turbine layout selected, to demonstrate compliance with the relevant guidelines for all residences	Detailed design	OEMP	x	x
9	Operational noise	Mitigate	If operational monitoring identifies exceedances, the Proponent would give consideration to providing mechanical ventilation (to remove the requirement for open windows), building acoustic treatments (improving glazing) or using turbine control features to manage excessive noise under particular conditions.	Detailed design	OEMP	x	x
10	Operational noise	compliance	Develop and implement an operational noise compliance testing program.	Detailed design	OEMP	x	x

10.2.3 Flora and Fauna

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[33]	Coppabella Hills	Marilba Hills
11	Loss or modification of habitat	Avoid, minimise, offset	All infrastructure would be sited entirely within the development envelope assessed in the Biodiversity Assessments. Where this is not possible, additional assessment would be undertaken and the appropriate approval would be sought (ie. variation to Conditions of Approval).	Detailed design of infrastructure layout	CEMP	x	x
12	Loss or modification of habitat	Avoid, minimise, offset	All infrastructure would be sited to avoid high constraint areas (including high constraint habitat features) and minimise impacts in moderate constraint areas. These areas are identified within Appendix 3.1 of the Coppabella Hills Precinct Biodiversity Assessment (Figure 7.1), and Appendix 3.2 of the Marilba Hills Precinct Biodiversity Assessment (Map set 4).	Detailed design of infrastructure layout	CEMP	x	x
13	Loss or modification of habitat	Avoid, minimise, offset	Where high constraint areas cannot be avoided, micrositing of infrastructure would be undertaken with input from an ecologist, to minimise impacts (includes road widening and transmission easement).	Detailed design of infrastructure layout	CEMP	x	x
14	Loss or modification of habitat	Avoid, minimise, offset	Where hollow-bearing trees cannot be avoided, nest boxes would be installed to replace this resource. This measure is considered supplementary to offsets that would also take into account the removal of hollows.	Detailed design of infrastructure layout	CEMP	x	x

[33] The Construction and Operation Environmental Management Plans (CEMP and OEMP) are documents submitted to Dept. Planning prior to construction and operation. Incorporation of these commitments within these management plans allows each commitment to be auditable.

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[33]	Coppabella Hills	Marilba Hills
15	Loss or modification of habitat	Avoid, minimise, offset	Works should be sited outside known Yass Daisy population areas and Commonwealth-listed CEEC areas identified in Appendix 3.1 Coppabella Hills Precinct Biodiversity Assessment (Figure 5.6), and Appendix 3.2 Marilba Hills Precinct Biodiversity Assessment (Map set 2).	Detailed design of infrastructure layout	CEMP	x	x
16	Loss or modification of habitat	Avoid, minimise, offset	Where rocks and boulders cannot be avoided, they would be placed directly adjacent to the works area to preserve the availability of refuge.	Construction	CEMP	x	x
17	Loss or modification of habitat	Avoid, minimise, offset	Should dams be required to be removed during site development, alternative watering points would be established to compensate for their loss, where practical and with the agreement of the landowner.	Construction	CEMP	x	x
18	Loss or modification of habitat	Avoid, minimise, offset	Additional targeted surveys would be undertaken, if the identified areas would be impacted by the proposal. These areas include: **Coppabella Hills** • Hollow-bearing trees targeted for removal. **Marilba Hills** • Hollow-bearing trees targeted for removal. • Burrinjuck Spider Orchid, undertaken in mid-October, where the dry forest remnant in the far south of Cluster 7 would be impacted by the proposed works. • Threatened grassy woodland species, undertaken in Spring, if the secondary grassland on the south-western side of Cluster 7 would be substantially impacted.	Detailed design of infrastructure layout	CEMP	x	x

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[33]	Coppabella Hills	Marilba Hills
19	Loss or modification of habitat	Avoid, minimise, offset	Contractors and staff would be made aware of the significance and sensitivity of the constraints identified in the Biodiversity Assessment constraint map set for each precinct during the site induction process.	Construction	CEMP	x	x
20	Loss or modification of habitat	Avoid, minimise, offset	A buffer twice the distance of the tree drip-line would be established in sensitive areas identified in the Biodiversity Assessment constraint map set for each precinct to ensure indirect impacts (such as compaction, noise and dust) are minimised where practical..	Construction	CEMP	x	x
21	Loss or modification of habitat	Avoid, minimise, offset	The Proponent would commit to preparing and implementing an Offset Plan, to offset the quantum and condition of native vegetation to be removed, in order to achieve a positive net environmental outcome for the proposal. Offset areas would reflect the actual footprint of the development (ie footing areas and new tracks) not the maximum impact areas included in Table 7-7 and Table 7-9 (which include easements and existing tracks). The Offset Plan would be prepared in consultation with DECC, prior to construction.	Prior to construction	CEMP	x	x
22	Loss or modification of habitat	Avoid, minimise, offset	An adaptive Bird and Bat Monitoring Program would be developed prior to construction and would include the collection of baseline (pre-operation) as well as operational monitoring data.	Prior to construction	CEMP, OEMP	x	x
23	Loss or modification of habitat	Avoid, minimise, offset	A Biodiversity Management Plan would be prepared within the CEMP to document the implementation of biodiversity measures, sourcing the Biodiversity Assessments prepared for each precinct for area specific measures. This would include construction and operational activities.	Prior to construction	CEMP	x	x
24	Loss or modification of habitat	Avoid, minimise, offset	An EPBC referral would be submitted to determine whether the proposal constitutes a 'controlled action' under the meaning of the *Environment Protection and Biodiversity Conservation Act 1999.*	Detailed design of infrastructure layout	CEMP	x	x

SoC	IMPACT	OBJECTIVE	MITIGATION TASKS	PROJECT PHASE	AUDITING[33]	Coppabella Hills	Marilba Hills
25	Loss or modification of habitat	Avoid, minimise, offset	A flora and fauna assessment would be undertaken prior to decommissioning to identify biodiversity constraints and develop specific impact mitigation measures.	Decommissioning	OEMP	x	x

10.2.4 Aboriginal Archaeology

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
26	Unavoidable disturbance to Aboriginal objects (stone artefacts) located in generally continuous albeit low density distribution across the proposal area.	Mitigate disturbance	A salvage program of archaeological excavation and analysis would be undertaken in a sample of impact areas prior to construction. The development of an appropriate research project would be undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Conservation and Climate Change.	Construction and decommissioning	CEMP	x	x
27	Disturbance to an Aboriginal object of low/moderate or moderate significance	Minimise disturbance	The Proponent would minimise the extent of impacts to areas assessed to be of low/moderate or moderate archaeological significance, where possible. A program of salvage subsurface excavation would be undertaken in impact areas at these locales prior to construction as a form of Impact Mitigation. The scope of this program is provided in Tables 19, 20 and 21 of Section 12 of the Archaeological Assessment, which identify the survey units that would be targeted in the program.	Construction and decommissioning	CEMP	x	x
28	Disturbance to an unidentified Aboriginal object	Minimise risk	The Proponent would conduct additional archaeological assessment in any areas which are proposed for impacts that have not been surveyed during the current assessment.	Construction and decommissioning	CEMP	x	x
29	Inadvertent impacts to Aboriginal objects	Minimise risk	The Proponent would develop a Cultural Heritage Management Protocol which documents the procedures to be followed for minimising risk and implementing mitigation strategies. This would be	Construction and decommissioning	CEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			undertaken in consultation with an archaeologist, the relevant Aboriginal communities and the NSW Department of Conservation and Climate Change.				

10.2.5 Aircraft Hazards

SoC	Impact	Objective	Mitigation Tasks	Project Phase	Auditing	Coppabella Hills	Marilba Hills
30	Creation of Hazard	Minimise risk	Liaise with CASA and determine the appropriate number, location and type of aircraft warning beacons to be fitted on wind turbines prior to the commencement of construction.	Pre-construction	DoP	X	X
31	Creation of Hazard	Minimise risk	The Proponent would liaise with all relevant authorities (CASA, Airservices, and Department of Defence) and supply location and height details once the final locations of the wind turbines have been determined and before construction commences.	Pre-construction	DoP	X	X

10.2.6 Communication

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
32	Deterioration of signal strength	No deterioration of signal strength	The Proponent would locate wind turbines to avoid existing microwave link paths that cross each precinct, or liaise with the owners of such links to relocate services to avoid potential impacts from turbines.	Pre construction		x	x
33	Deterioration of signal strength	No deterioration of signal strength	The Proponent would undertake a detailed investigation to develop appropriate mitigation measures associated with potential impacts to navigational aids from the Coppabella Hills and Marilba Hills Precincts. The Proponent would liaise with Airservices Australia to ensure all mitigation measures are acceptable.	Pre-construction and operation		x	x
34	Deterioration of signal strength	No deterioration of signal strength	Ensure adequate television reception is maintained for neighbouring residences as follows: • Undertake a monitoring program of houses within 5km of the wind farm site to determine any loss in television signal strength if requested by the owners. • In the event that after construction television interference (TVI) is experienced by existing receivers within 5km of the site, investigate the source and nature of the interference. • Where investigations determine that the interference is cause by the wind farm, establish appropriate mitigation measures at each of the affected receivers in consultation and agreement with the landowners. Specific mitigation measures may include: • Modification to, or replacement of receiving antenna	Operation		x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			• Provision of a land line between the effected receiver and an antenna located in an area of favourable reception • Improvement of the existing antenna system • Installation of a digital set top box or • In the event that interference cannot be overcome by other means, negotiating an arrangement for the installation and maintenance of a satellite receiving antenna at the Proponents cost				

10.2.7 Electromagnetic Fields

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
35	Radiation exposure from EMFs	Minimise exposure	Adhere to standard industry approaches and policies with respect to EMF through maintenance of adequate easements around transmission lines.	Operation	OEMP	x	x
36	Radiation exposure from EMFs	Minimise exposure	The turbines, control building, substation and transmission lines would be located as far as practical from residences, farm sheds, and yards in order to reduce the potential for both chronic and acute exposure.	Operation	OEMP	x	x

10.2.8 Traffic and Transport

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
37	Safety and asset protection	Minimise Risk	The Proponent would develop and implement a Traffic Management Plan (TMP) in consultation with roads authorities to facilitate appropriate management of potential traffic impacts. The TMP would include provisions for: • Scheduling of deliveries and managing timing of transport • Limiting the number of trips per day • Undertaking community consultation before and during all haulage activities • Designing and implementing temporary modifications to intersections, roadside furniture, stock grids and gates • Managing the haulage process, including the erection of warning and/or advisory speed signage prior to isolated curves, crests, narrow bridges and change of road conditions • Designation of a speed limit would be placed on all of the roads that would be used primarily by construction traffic • Preparation of a Transport Code of Conduct to be made available to all contractors and staff • Identification of a procedure to monitor the traffic impacts during construction and work methods modified (where required) to reduce the impacts • Provide a contact phone number to enable any issues or concerns to be rapidly identified and addressed through appropriate procedures • Reinstatement of pre-existing conditions after temporary modifications to the roads and pavement along the route.	Construction	CEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
38	Safety and Asset protection	Minimise Risk	The Proponent would use a licensed haulage contractor with experience in transporting similar loads, responsible for obtaining all required approvals and permits from the RTA and Councils and for complying with conditions specified in those approvals.	Construction	CEMP	x	x
39	Safety and Asset protection	Minimise Risk	The Proponent would prepare road dilapidation reports covering pavement and drainage structures in consultation with roads authorities for the route prior to the commencement of construction and after construction is complete. The Proponent would repair any damage resulting from the construction traffic (except that resulting from normal wear and tear) as required during and after completion of construction at the Proponent's cost or, alternately, negotiate an alternative for road damage with the relevant roads authority.	Construction	CEMP	x	x
40	Safety and Asset protection	Minimise Risk	Route specific mitigation measures, as detailed Section 5.2 of the Traffic Impact Study, would be adopted where significant increases in use are anticipated as a consequence of the proposal.	Construction	CEMP	x	x

10.2.9 Fire and Bushfire

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
41	Bushfire risk	Minimise risks	The Proponent would prepare a Bushfire Management Plan as part of the Construction Environmental Management Plan. The Rural Fire Service and NSW Fire Brigade would be consulted in regard to its adequacy to manage bushfire risks during construction, operation and decommissioning. The plan would as a minimum include: • Hot-work procedures, asset protection zones, safety, communication, site access and response protocols in the event of a fire originating in the wind farm infrastructure, or in the event of an external wildfire threatening the wind farm or nearby persons or property • Flammable materials and ignition sources brought onto the site, such as hydrocarbons, would be handled and stored as per manufacturer's instructions. • During the construction phase, appropriate fire fighting equipment would be held onsite when the fire danger is very high to extreme, and a minimum of one person on site would be trained in its use. The equipment and level of training would be determined in consultation with the local RFS • Substations would be bunded with a capacity exceeding the volume of the transformer oil to contain the oil in the event of a major leak or fire. The facilities would be regularly inspected and maintained to ensure leaks do not present a fire hazard, and to ensure the bunded area is clear (including removing any rainwater) • Substations would be surrounded by a gravel and concrete area free of vegetation to prevent the spread of fire from the substation and reduce the impact of bushfire on the structure. The substation area would also be surrounded by a security fence as a safety precaution to prevent trespassers and stock ingress • Asset protection zones (APZs), based on the RFS Planning for Bushfire	Construction Operation Decommissioning	CEMP and OEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			Protection, would be maintained around the control room, sub-station and in electricity transmission easements. Workplace health and safety protocols would be developed to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities • Fire extinguishers would be stored onsite in the control building and within the substation building • Shut down of turbines would commence if components reach critical temperatures or if directed by the RFS in the case of a nearby wildfire being declared (an all hours contact point would be available to the RFS during the bushfire period). Remote alarming and maintenance procedures would also be used to minimise risks • Overhead transmission easements would be periodically inspected to monitor regrowth of encroaching vegetation				

10.2.10 Hydrology

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
42	Deterioration of water quality (Surface Water)	Minimise risk	Infrastructure placement, including turbines, tracks, substations, control buildings, stockpiles, and site compounds and turnaround areas, would not be sited within 40 metres of a major drainage line or water course	Detailed design	CEMP	x	x
43	Deterioration of water quality (Surface Water)	Achieve neutral or beneficial water quality impact	The Proponent would prepare a Sediment / Erosion Control Plan (SECP) as a sub plan of the Construction Environmental Management Plan. This plan would include the following provisions: • Sediment traps would be installed wherever there is potential for sediment to collect and enter waterways • Stockpiles generated as a result of construction activities would be bunded with silt fencing, (mulch bunds or similar) to reduce the potential for runoff from these areas • On the steeper slopes check banks would be installed across the trenchline, as appropriate, following closure of the trench. These would discharge runoff to areas of stable vegetation • Stabilisation and site remediation would be undertaken as soon as practicable throughout and post construction. • Soil and water management practices would be developed as set out in Soils and Construction Vol. 1 (Landcom 2004)	Construction	CEMP	x	x
44	Deterioration of water quality (Surface Water)	Minimise risk	Design water crossings to minimise impact on existing banks, water flow and animal passage.	Construction	CEMP	x	x

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
45	Water supply	Minimise risk	Undertake liaison with representatives of Golden Fields County Council regarding the potential supply of construction water	Construction	CEMP	X	X
46	Deterioration of water quality (Surface Water)	Minimise risk	All vehicles onsite would follow established trails and minimise onsite movements	Construction Operation	CEMP OEMP	X	X
47	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Machinery would be operated and maintained in a manner that minimises risk of hydrocarbon spills	Construction Operation	CEMP OEMP	X	X
48	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Maintenance or re-fuelling of machinery would be carried out on hard-stand in accordance with industry standards for fuel transfer	Construction	CEMP	X	X
49	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Design of concrete batch plants would ensure concrete wash would not be subjected to uncontrolled release. Areas of the batching would be bunded to contain peak rainfall events and remediated after the completion of the construction phase. Waste sludge would be recovered from the settling pond and used in the production of road base manufactured onsite. The waste material would be taken from the batching plant to be blended in the road base elsewhere onsite.	Construction	CEMP	X	X
50	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Carry out dust suppression as required through either watering or chemical means (environmentally friendly polymer based additives to water).	Construction Decommissioning	CEMP	X	X
51	Deterioration of water quality	Achieve neutral or	A Site Restoration Plan (SRP) would be prepared as part of the Construction Environmental Management Plan. This would set out	Construction	CEMP	X	X

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
	(Surface Water)	beneficial water quality impact	protocols for restoration works including: • Site preparation • Stabilisation • Revegetation • Monitoring	Decommissioning			
52	Deterioration of water quality (Surface and Ground Water)	Minimise risk	A Spill Response Plan would be prepared as part of the CEMP and OEMP including: • Identify persons responsible for implementing the plan if a spill of a dangerous or hazardous chemical/waste would occur • Identify all chemicals required for the Proposal, including physio-chemical properties, risks posed to water quality objectives and appropriate methods of storage of these chemicals. • Locate Material Safety Data Sheets (MSDS) for all chemical inventories at on site and readily available • Comply with manufacturers recommendations in relation to application and disposal where chemicals are used • Report any spill that occurs to the Construction Manager regardless of the size of the spill • Establish clearly defined works and refuelling areas • Spill protocols in this plan would dictate when the EPA would be notified • Chemical / fuel storage areas would be identified, and be bunded to prevent loss of any pollutants • Hydrocarbon spill kits would be stored at the site. A	Construction Operation Decommissioning	CEMP OEMP	X	X

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
			number of site staff are to be trained in the use of the spill kits				
53	Deterioration of water quality (Surface and Ground Water)	Minimise Risk	The Proponent would notify the NSW DECC EPA in the event of any spill that had the potential to pollute waters.	Construction Operation	CEMP OEMP	X	X
54	Protection of ground water	Minimise risk	Undertake investigations, as part of the geotechnical investigation, to ensure that the project would have no material adverse effect on groundwater/aquifers as a result of blasting activities.	Pre-construction	CEMP	X	X
55	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Monitor bunded infrastructure to ensure that volume of oil could be fully contained in the event of leak	Operation	OEMP	X	X
56	Deterioration of water quality (Surface and Ground Water)	Minimise risk	Maintain septic systems, if installed, to meet appropriate Australian standards	Construction Operation Decommissioning	CEMP OEMP	X	X

10.2.11 Soils and Landforms

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
57	Landform stability	Minimise risk	The Proponent would undertake geotechnical investigations in the area of the proposed turbines to determine ground stability.	Pre - construction	DoP	X	X
58	Contamination	Minimise risks	Consult with involved property owners in relation to areas of land potentially contaminated by past land use and manage impacts in these areas to avoid affecting the any areas of contamination.	Pre - construction	CEMP	X	X
59	Soil quality	Minimise risks	Subsoil would be separated from topsoil for rehabilitation purposes. Topsoil from the excavation sites would be stockpiled and replaced. On steep slopes, topsoil would be stabilised. Any excess subsoil would be removed from the site and disposed of at an appropriate fill storage site.	Construction	CEMP	X	X
60	Soil quality	Minimise impact	Avoid compaction of soil resulting from vehicle access and laying of materials particularly during saturated soil conditions, and remediate as necessary	Construction	CEMP	X	X
61	Soil quality	Minimise impact	The Proponent would prepare a protocol in the instance that suspected contamination is unexpectedly found. Should contamination or potential contamination be disturbed during excavation works, the area would be assessed by appropriately qualified consultants. The DECC would be notified if warranted.	Construction	CEMP	X	X
62	Soil loss or stability of landform loss	Minimise risks	Concrete wash would be deposited in an excavated area, below the level of the topsoil, or in an approved landfill site. Where possible, waste water and solids would be reused onsite.	Construction	CEMP	X	X
63	Soil loss or stability of landform loss	Minimise risks	Access routes and tracks would be confined to already disturbed areas, where possible. All contractors would be advised to keep to established tracks.	Construction	CEMP	X	X

10.2.12 Mineral Exploration

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
64	Conflict with mineral exploration	Minimise conflict	The Proponent would liaise with the current mineral lease holder providing a final turbine and infrastructure layout, prior to the construction phase	Pre-construction	CEMP	X	X
65	Conflict with mineral exploration	Minimise conflict	The Proponent would liaise with continue to liaise with Taronga Mines. This consultation would be ongoing between the Proponent and Taronga Mines.	Pre-construction / Construction	CEMP	X	X
66	Conflict with mineral exploration	Minimise conflict	The Proponent would provide a point of contact to the current mineral lease holder	Pre-construction	CEMP	X	X
67	Conflict with mineral exploration	Minimise conflict	The Proponent would liaise with the involved land owners and current mineral lease holders prior to rehabilitation, to ensure that any project access roads that they may wish to retain are retained. Several of these access roads are likely to be of benefit both to routine agricultural activities as well as to exploration activities onsite	Construction	CEMP	X	X

10.2.13 Economic

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
68	Affect on local community	Maximise positive impact of Proposal	Liaise with local industry representatives to maximise the use of local contractors and manufacturing facilities in the construction and decommissioning phases of the project.	Construction	CEMP	X	X
69	Affect on local community	Maximise positive impact of Proposal	Liaise with the local visitor information centres to ensure that construction and decommissioning timing and haulage routes are known well in advance of works and to the extent practical coordinated with local events	Construction	CEMP	X	X
70	Affect on local community	Maximise positive impact of Proposal	Liaise with Yass Valley and Harden Shire Councils and the Department of State and Regional Development to provide information to assist in attracting people to the local area to facilitate meeting the expected demand for human resources for both construction and operation of the Proposal	Construction Operation	CEMP	X	X
71	Affect on local community	Maximise positive impact of Proposal	Make available employment opportunities and training for the ongoing operation of the wind farm to local residents where reasonable	Operation	OEMP	X	X

10.2.14 Community Wellbeing

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
72	Community wellbeing	Provide accurate information	Dissemination of accessible and independent information on wind farm impacts	Pre-construction	CEMP	X	X
73	Community wellbeing	Provide accurate information	Biodiversity monitoring information collected during the operation of the wind farm would be made publicly available	Operation	OEMP	X	X

10.2.15 Tourism

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
74	Affect on local activities	Minimise disruption	Co-ordinate construction activities with local tourist operators. The Proponent would liaise with the local visitor information centres to ensure that construction and decommissioning timing and haulage routes are known well in advance of works	Pre-construction	CEMP	x	x
75	Affect on local activities	Maximise benefits	The Proponent would work with the involved landowners, the community and both Yass Valley and Harden Shire Councils to allow for the development of the wind farm as a tourist attraction, if this option becomes desirable to these three parties.	Operation	OEMP	x	x

10.2.16 Agricultural

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
76	Impact on current land use	Minimise disruption	Stock would be restricted from works areas where there is a risk stock injury or where disturbed areas are being stabilised.	Construction	CEMP	x	x
77	Impact on current land use	Minimise impact	Develop, implement and monitor the effects of a **Site Restoration Plan.** The plan would aim to stabilise disturbed areas as rapidly as possibly. The Plan would consider: • Appropriate stabilisation techniques across the precincts • Suitable species for re-seeding (native species would be given preference due to their superior persistence and for conservation purposes) • Monitoring for weed and erosion issues	Construction and Decommissioning	CEMP	x	x
78	Impact on current land use	Minimise disruption	Liaison would be undertaken with neighbouring landowners and landowners adjoining access roads, to provide information about the timing and routes to be used during construction and decommissioning. This could be in the form of advertising and provision of a contact point for further inquiries. The aim would be to reduce the risk of interference with agricultural activities on affected roads and road verges.	Construction	CEMP	x	x
79	Impact on current land use	Minimise impacts	Ensure that the switchyard and substation is appropriately fenced to eliminate stock ingress.	Operation	OEMP	x	x

10.2.17 Health and Safety

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
80	Safety of persons or stock	Minimise risks	A detailed **Health and Safety Plan (H&SP)** would be prepared, as a sub plan of **the Construction Environmental Management Plan**, identifying hazards associated with construction works, the risks of the identified hazards occurring and appropriate safeguards would be prepared prior to the commencement of construction works. The Plan would include, but not be limited to: • Inductions for all contractors requiring site access. • Ensure all staff are appropriately qualified and trained for the roles they are undertaking	Construction	CEMP	x	x
81	Safety of persons or stock	Minimise risks	Site fencing would be installed where there is a risk to the safety of the general public (i.e. when the trench is left open for extended periods)	Construction and Decommissioning	CEMP	x	x
82	Safety and Asset protection	Minimise Risk	Establish procedures to ensure that soil is not carried onto the Hume Highway on the wheels of construction traffic	Construction	CEMP	x	x
83	Safety / nuisance to persons or stock	Minimise risks	If shadow flicker is found to be a nuisance to residents, conditions would be pre-programmed into the control system and individual wind turbines automatically shut down whenever these conditions are present	Operation	OEMP	x	x
84	Safety of persons or stock	Minimise risks	Shadow flicker effects on motorists would be monitored following commissioning and any remedial measures to address concerns would be developed in consultation with the RTA and the Department of Planning	Operation	OEMP	x	x
85	Safety of persons	Minimise risk	Establish a turbine maintenance program in accordance with industry standards.	Operation	OEMP	x	x

10.2.18 Historic Heritage

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
86	Disturbance to a non-Indigenous potential heritage item	Minimise disturbance	The Proponent would limit the extent of impacts to the three identified heritage items.	Construction and decommissioning	CEMP	x	x

10.2.19 Climate and air quality

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
87	Air quality	Minimise risks	A cost benefit analysis would be completed on differing potential mitigation options for dust suppression, for inclusion in the CEMP.	Construction	CEMP	x	x
88	Air quality	Minimise risks	Dust levels at stockpile sites would be visually monitored. Dust suppression would be implemented if required. Stockpiles would be protected from prevailing weather conditions	Construction	CEMP	x	x
89	Air quality	Minimise risks	Undertake ongoing visual dust monitoring and suppression (if required) during the construction phase. Monitoring would regularly assess the effectiveness of dust suppression activities. Monitoring would regularly assess the effectiveness of dust suppression activities.	Construction	CEMP	x	x
90	Air Quality	Minimise risks	Should a complaint relating to dust by a resident be received, monitoring at the boundary of the construction site would be undertaken using dust gauges. The Proponent would assess the dust gauges and identify additional mitigation measures, where required.	Construction	CEMP	x	x
91	Air quality	Minimise risks	Should blasting be required, it would be carried out in accordance with all relevant statutory requirements and residences within 1km of blasting activities would be informed prior to blasting	Construction	CEMP	x	x
92	Air quality	Minimise risks	Dust filters would be installed on silos, where required	Construction	CEMP	x	x

10.2.20 Resource impacts

SoC	Impact	Objective	Mitigation tasks	Project phase	Auditing	Coppabella Hills	Marilba Hills
93	Waste generation	Minimise waste and maximise recycling of materials	The Proponent would prepare a **Waste Management Plan** to be included within the **Construction Environmental Management Plan**. It would include but not be limited to the following: • The scope for reuse and recycling would be evaluated • Provision for recycling would be made onsite • Wastes would be disposed of at appropriate facilities • Toilet facilities would be provided for onsite workers and sullage from contractor's pump out toilet facilities would be disposed at the local sewage treatment plants or other suitable facility agreed to by Council • Excavated material would be used in road base construction and as aggregate for footings where possible. Surplus material would be disposed of in appropriate locations on site (on agreement with the landowner), finished with topsoil, and revegetated	Construction Operation	CEMP OEMP	x	x

11 CONCLUSION

This Environmental Assessment (EA) has assessed the likely environmental impacts that may result from the proposed Yass wind farm; a proposal that would be capable of generating up to 380 [34] MW of greenhouse gas emission free electricity.

The proposal has incorporated the environmental constraints identified in an iterative manner throughout the project design to arrive at the most appropriate site layout. It has also incorporated measures to proactively address identified environmental risks throughout the construction, operation and decommissioning of the project. All measures to which the Proponent would commit are detailed in the draft Statement of commitments, Section 10.2.

This EA considers the key issues of the proposal relating to visual, operational noise, biodiversity, communications, traffic and transport impacts and a range of issues relating to the benefits and impacts to local community, including wellbeing, lifestyle values and tourism. These impacts must be considered in balance with the public benefits of the proposal.

Benefits of the proposal have been identified at the global, regional and local scale. These include:

- In full operation, it would generate 1200 GWh of electricity per year -sufficient for the average consumption of 150,000 homes
- It would improve the security of electricity supply through diversification
- It would reduce greenhouse gas emissions by approximately 1,160,000 tonnes of carbon dioxide (equivalent) per annum
- It supports the strategic direction of the region, as outlined in the Sydney-Canberra Corridor Regional Strategy
- It would contribute to the NSW Government's target of providing 15% of consumed energy from renewable sources by 2020
- It would contribute to the NSW Government's target of reducing green house gas emissions by 60% by the year 2050
- It would create local employment opportunities and inject funds of up to $334 million into the Australian economy

The success of the proposal in mitigating environmental impacts hinges on the development and implementation of the Project Environmental Management Plan and its associated Construction and Operation Environmental Management Plans. The Proponent is committed to ensuring the measures developed in these plans are best practice and is committed to working to ensure the best possible result is achieved for the proposed Yass Valley Wind Farm. This not only has immediate benefits for the site and locality which would house the project, it would also set a high standard for the development of wind energy resources in the region.

[34] Based on the development of the Coppabella Hills and Marilba Hills Precincts, a maximum of 152 turbines.

12 GLOSSARY AND ACRONYMS

ABARE	Australia Bureau of Resource Economics
AHD	Australian Heritage Database
AHIMS	Aboriginal Heritage Information Management System
AIS	Aeronautical Information Service
APANSA	Australian Radiation Protection and Nuclear Safety Agency
APZ	Asset Protection Zone (for bushfire compliance)
ARL	Acoustic Research Laboratories
AusWEA	Australian Wind Energy Association
CANRI	Community Access to Natural Resource Information
CASA	Civil Aviation Safety Authority
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
DCP	Development Control Plan
DEC	NSW Department of Environment and Conservation, now the Department of Environment and Climate Change
DECC	NSW Department of Environment and Climate Change, formerly the Department of Environment and Conservation
DEH	Commonwealth Department of Environment and Heritage, now the Department for Environment and Water Resources
DEWR	Commonwealth Department for Environment and Water Resources, formerly the Department of Environment and Heritage
DGRs	NSW Department of Planning's Director Generals Requirements. The Environmental Assessment report must address issues as directed in the DGRs
DoP	NSW Department of Planning
DPI	Department of Primary Industries
EA	Environmental Assessment report, format dictated by the NSW Department of Planning's Director Generals Requirements
EEC	Endangered Ecological Community
EMF	Electromagnetic fields
EPA	Environmental Protection Agency
ER	Environmental Representative, appointed during the environmental management of the construction and operational phases, appointment must be approved by the Department of Planning
ERM	Environment Resources Management (visual impact consultants for this project)
ESC	Effective Survey Coverage (referred to in Aboriginal Archaeology survey

	methods and results)
ESD	Ecologically Sustainable Development
GWh	gigawatt-hour
HN	Hawkesbury Nepean
IBRA bioregions	Interim Biogeographic Regionalisation for Australia
kV	kilovolt
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
mG	milligaus
MW	megawatt
MWh	megawatt-hour
Mitchell landscape	Landscapes classified for IBRA bioregions
MOS	Manual of Standards
NES	National Environmental Significance
NPI	National Pollutant Inventory
OEMP	Operational Environmental Management Plan
PEMP	Project Environmental Management Plan
PFM	Planning Focus Meeting
Proponent	Epuron Pty. Ltd.
REP	Regional Environmental Plan
RFS	Rural Fire Service
RNE	Register of the National Estate
SC	Shire Council
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
TMP	Traffic Management Plan
TVI	Television Interference
V	volt
W	watt

13 ASSESSMENT PERSONNEL

This report was prepared by **ngh**environmental. Specific sections were drawn from consultants' reports or from the Proponent, as detailed in Table 13-1.

Table 13-1: Preparation of the Environmental Assessment

Section		Author
1	Executive summary	**ngh**environmental
2	Introduction	**ngh**environmental
3	Description of the Proposal	Epuron
4	The Energy Context of the Proposal	Epuron
5	Planning context	**ngh**environmental
6	Consultation	Epuron and **ngh**environmental
7	Assessment of key issues	
7.1	Scoping and prioritisation of issues	**ngh**environmental
7.2	Visual impact	Environmental Resources Management
7.3	Operational and construction noise	Heggies Pty Ltd and Marshall Day Pty Ltd
7.4	Flora and Fauna	**ngh**environmental
7.5	Mitchell Landscapes	**ngh**environmental
7.6	Aboriginal Archaeology	NSW Archaeology
7.7	Aircraft hazard impacts	Epuron
7.8	Communication impacts	Epuron
7.9	Electromagnetic fields (EMFs)	Epuron
7.10	Traffic and transport	Bega Duo Designs
7.11	Fire and bushfire impacts	**ngh**environmental
8	Assessment of additional issues	
8.1	Hydrology (Water, Water Quality and Water Table impacts)	**ngh**environmental
8.2	Soils and landforms	**ngh**environmental
8.3	Mineral Exploration Impacts	**ngh**environmental
8.4	Land Value Impacts	**ngh**environmental
8.5	Economic impacts	**ngh**environmental

8.6	Community wellbeing	**ngh**environmental
8.7	Lifestyle impacts	**ngh**environmental
8.8	Tourism impacts	**ngh**environmental
8.9	Agricultural impacts	**ngh**environmental
8.10	Health and safety	**ngh**environmental
8.11	Historic Heritage	NSW Archaeology and **ngh**environmental
8.12	Climate and Air Quality	**ngh**environmental
8.13	Resource Impacts	**ngh**environmental
8.14	Cumulative impacts	**ngh**environmental
9	Strategic Justification	Epuron
10	Environmental management	**ngh**environmental
11	Conclusion	**ngh**environmental

Nick Graham-Higgs, Tim Browne and Brooke Marshall of **ngh**environmental constitute the document's primary authors. The information contained in this document is neither false nor misleading. All information is considered by the authors to be correct at the time of writing.

Nicholas Graham-Higgs

nghenvironmental (Director)

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Tim Browne

nghenvironmental (Project Officer)

………………………………………………………………………………………

Brooke Marshall

nghenvironmental (Senior Project Officer)

………………………………………………………………………………………………………

Authors	Experience
Nicholas Graham-Higgs *Bachelor of Applied Science*	Nick has worked as an environmental planning consultant since 1992, specialising in environmental impact assessment and natural resource management. His work demands an in-depth knowledge of current planning and environmental legislation coupled with a comprehensive understanding of development-related impacts, especially those relating to the development of sustainable power generation facilities, including hydro and wind generated electricity. Nicholas has acquired his knowledge in this field over the last 17 years, during which he has worked with a number of land management organisations within and outside Australia. Much of the work undertaken has been within sensitive areas, including major works for infrastructure development: the augmentation of water supplies at Perisher Range and Adaminaby, the development of mini-hydro plants at Jounama, Khancoban and Geehi and environmental assessment for a wind farm on the Snowy Plains, near Kosciuszko National Park.
Tim Browne *Bachelor of Science* *Masters Environmental Management*	Tim completed a Bachelor of Science (in earth and environmental studies) at the University of Technology, Sydney and a Masters of Environmental Management at the University of NEW England. Tim has consulting experience in environmental impact assessment, contaminated land investigation and remediation, as well as experience within the mining industry of Western Australia. Tim was one of the primary authors of another Part 3A assessment for the proposed Silverton Wind Farm. Tim has recently prepared and assisted in the preparation of environmental impact assessments and biodiversity and management documents for clients such as Country Energy, RTA and Epuron Pty Ltd. These projects have given Tim a detailed understanding of the local and regional environments of south-eastern NSW, complimenting his knowledge of greater metropolitan Sydney and northern NSW. Tim has had field experience in environmental impact assessments, biodiversity assessments including terrestrial fauna and flora and fauna surveys and contaminated site investigations. Tim is also an active member of the Environment Institute of Australia and New Zealand and The Geological Society of Australia.
Brooke Marshall *Bachelor of Natural Resources (Hons)*	Since joining nghenvironmental in 2004, Brooke has prepared impact assessment reports relating to residential developments, road construction, water supply infrastructure, telecommunications infrastructure, river modification, wind farms and prescribed burning activities. These reports have included threatened flora and fauna species assessments requiring research, fieldwork and GIS components. Brooke has prepared DAs under Parts 3A, 4 and 5 of the EP&A Act, as well as Environmental Management Plans, Rehabilitation Plans and Community Consultation Plans associated with these proposals. Brooke has prepared strategic reports considering natural values for local government (Snowy River Shire and Bega Valley Shire) and has worked on Species Impact Statements and EPBC Referrals. Brooke's work has been focussed on the South Coast, Southern Tablelands and Snowy Mountains regions of NSW, including sensitive sub-alpine areas. Brooke is currently focusing on environmental impact assessment, biodiversity assessments and wildlife management issues.

14 REFERENCES

ABC (2007) http://www.abc.net.au/news/stories/2007/10/16/2060466.htm accessed December 2008

Australian Greenhouse Office (2003). *Climate change: An Australian Guide to the Science and Potential Impacts*. Australian Greenhouse Office, edited by B Pittock, 2003.

Australian Radiation Protection and Nuclear Safety Agency (2007). *Electricity and Health*. Retrieved Oct 2007 from: http://www.arpansa.gov.au/radiationprotection/Factsheets/is_electricity.cfm.

Australian Wind Energy Association (2001). *Wind farm safety in Australia*. Retrieved Feb 2008 from http://www.wind-power.com.au/Downloads/BP11_Safety.pdf

Australian Wind Energy Association (2004). *Wind Farms and Landscape Values Report*. Retrieved from http://www.auswea.com.au/auswea/

Auswind (2006). *Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia*.

Baidya, R.S., Pacala, S.W. & Walko, R. L., 2004, 'Can large wind farms affect local meteorology?' *Journal of Geophysical Research*, vol. 109, D19101.

Breusch, J., 2009 'Renewable energy not overly costly' *Australian Financial Review*, 12 February, p.5

British Wind Energy Association 2007. Reference Wind energy frequently asked questions.' Retrieved May 2008 from http://www.bwea.com/ref/faq.html#safe

Danish Wind Industry Association website. http://www.windpower.org/en/tour.htm

Davey, R. and Coppin, P. (2003) South East Australia Wind Power Study *Wind Energy Research Unit CSIRO Atmospheric Research*

Dent, P. and Sims, S. (2007). *What is the impact of wind farms on house prices?*. Oxford Brooks University, March 2007.

Department of Climate Change (DCC), 2009a *Australia's Renewable Energy Target*, February 2009, www.climatechange.gov.au/renewabletarget/index.html

Department of Climate Change (DCC), 2009b *Climate Change Impacts*, February 2009, www.climatechange.gov.au/impacts/overview.html

Department of Climate Change (DCC), 2008a *National Greenhouse Gas Inventory 2006: Accounting for the Kyoto Target*

Department of Climate Change (DCC), 2008b *State and Territory Greenhouse Gas Inventories 2006*

Department of Climate Change (DCC), 2008c *Stationary Energy Sector Greenhouse Gas Emissions Projections 2007*

Department of Environment and Climate Change (2009) accessed 2009: http://www.environment.nsw.gov.au/ieo/Murrumbidgee/index.htm

Department of Environment and Climate Change (2009a) Accessed 2009: http://www.environment.nsw.gov.au/clmapp/searchregister.aspx

Department of Environment and Climate Change (DECC), 2006 *NSW Greenhouse Office data 2006 www.environment.nsw.gov.au/soe/soe2006/download/chapter3/fig_3-4.xls*

Department of Environment and Conservation (2006) *Using the ANZECC Guidelines and Water Quality Objectives in NSW*

Department of Energy, Utilities and Sustainability (DEUS), 2006 *NSW Renewable Energy Target: Explanatory Paper*, November 2006 www.deus.nsw.gov.au/Publications/NRET%20Explanatory%20Paper%20FINAL.pdf

Department of Energy, Utilities and Sustainability (2000). *Energy at a Glance 2000*, Department of Energy, Utilities and Sustainability. Retrieved from: http://www.deus.nsw.gov.au/publications/esp/enswc/index.htm

Department of Lands (2008) *Hume and Hovell Walking Track, Spirit of Discovery* accessed December 2008, available from *www.lands.nsw.gov.au/_media/lands/pdf/recreation/**Hume**__and__**hovell**_DL.pdf -*

Department of Planning (2002), *Draft NSW Wind Energy Environmental Impact Assessment Guidelines.*

Department of Planning, 2008 *Sydney–Canberra Corridor Regional Strategy 2006-2031*

Diesendorf, M., 2003 *Why Australia needs wind power,* Dissent, no. 13, pp.43-48

Elsam Engineering A/S, 2004 *Life Cycle Assessment of offshore and onshore sited wind farms*, March 2004 from Elsam Engineering A/S and Vestas Wind Systems A/S, 2004 *Life cycle assessment (LCA) of turbines – Analysis of possibilities of product directed environmental optimisation*

Eltham, D.C. Harrison, G.P. and Allen, S.J (2008) Change in public attitudes towards a Cornish wind farm: Implications for planning, *Energy Policy,* 36 pp 23-33

Fallding, M. (2002). *Planning Framework for Natural Ecosystems of the ACT and NSW Southern Tablelands,* prepared by the Land and Environment Planning, NSW National Parks and Wildlife Service, Hurstville.

Galacho, O, 2009 'Power prices tipped to fall' *Herald Sun,* 13 February, p.86

Gipe, P. 2008 Deaths in Wind Energy Database available from: http://www.wind-works.org/articles/BreathLife.html

Greenhouse Gas Reduction Scheme (GGAS), 2008 *FS-Comp-PoolCoeff*, November 2008 www.greenhousegas.nsw.gov.au/documents/FS-Comp-PoolCoeff-Nov08.pdf

Gross, C. 2007 Community perspectives of wind energy in Australia: The application of a justice and community fairness framework to increase Social acceptance *Energy Policy* Vol 35 pp 2727-2736

Gurran, N., Squires, C. and Blakely, E. (2005). *Meeting the Sea Change Challenge: Sea change communities in coastal Australia*, prepared by the University of Sydney, Faculty of Architecture, Planning Research Centre. Report for the National Sea Change Taskforce, 31 March 2005.

Harden Shire Council (2004) *State of the Environment Report*

Harden Shire Council (2006) *Harden Shire Council Social Plan* available at: http://www.harden.nsw.gov.au

Harden Shire Council (2008) *Harden Shire Council Management Plan 2008-2011* available at: http://www.harden.nsw.gov.au

Hird, C. (1991) *Soil Landscapes of the Goulburn 1:250 000 Sheet.* Soil Conservation Service of NSW, Sydney

Health Protection Agency United Kingdom (2004). *Substations and Electromagnetic Fields*, Retrieved Oct 2007 from: http://www.hpa.org.uk/radiation/understand/information_sheets/substations_and_emfs.htm

Henderson and Horning Pty Ltd, 2006 *Land Value Impact of Wind Farm Development, Crookwell New South Wales* February 2006

Interim Biogeographic Regionalisation of Australia 5.1 Available from http://www.environment.gov.au/parks/nrs/science/bioregion-framework/ibra/index.html

Intergovernmental Panel on Climate Change (IPCC), 2008 *Climate Change 2007: Synthesis Report*

Iravani, R., Graovac, M. and Dewan, S. (2004). *The Health Effects of Magnetic Fields Generated by Wind Turbine*, summary of report, Ontario Canada October 2004

Landcom 2004. Soils and Construction Vol. 1. Prepared by Landcom March 2004.

Local Government Elections (LG Elections) http://www.lg.elections.nsw.gov.au/LGE2008/result.Upper_Lachlan.poll.html accessed 2009

MacGill, I.F. and Watt, M. E. (2002). *Jobs and Investment Potential of Renewable Energy: Australian wind industry scenarios.* Retrieved from: http://www.acre.ee.unsw.edu.au/anzses2002/ANZSES_WindScenario_UNSW.pdf

Macquarie Generation Annual Report (2007). Retrieved Feb 2008 from: http://www.macgen.com.au/News/MG990web.pdf

Martinez, E., Sanz, F., Pellegrini, S. and Blanco, J. (2009) Life cycle assessment of a multi-megawatt wind turbine *Renewable Energy* 34 pp. 667-673

National Parks and Wildlife Service (NPWS) 2006 Black Andrew Nature Reserve Plan of Management available at: *www.environment.nsw.gov.au/resources/parks/blackAndrewMgmtplan.pdf*

National Parks and Wildlife Service (NPWS) 2008 *Burrinjuck Nature Reserve Draft Plan of Management* available at: http://www.environment.nsw.gov.au/parkmanagement/BurrinjuckDraftPOM.htm

Needham, S., 2008 *The potential for renewable energy to provide baseload power in Australia*, Research Paper no. 9 2008–09, 23 September 2008 www.aph.gov.au/library/pubs/rp/2008-09/09rp09.htm, accessed 11 March 2009

National Electricity Market Management Company Limited (NEMMCO), 2008 *An Introduction to Australia's National Electricity Market*, June 2008

New South Wales Department of Environment and Conservation (2006) *Using the ANZECC Guidelines and Water Quality Objectives in NSW*

New South Wales Department of Environment and Conservation (2004). *Interim Guidelines for Aboriginal Community Consultation: Requirements for Applicants*.

New South Wales Department of Environment and Climate Change (2009) *NSW Water Quality and River Flow Objectives* available at: http://www.environment.nsw.gov.au/ieo/

New South Wales Department of Environment and Climate Change (2009a) *Contaminated land record* http://www.environment.nsw.gov.au/clmapp/searchregister.aspx

New South Wales Environment Protection Authority (2000). NSW Industrial Noise Policy, EPA, Sydney.

New South Wales Greenhouse Office (2005). GGAS Fact Sheet: 'The NSW Pool Coefficient', NSW Greenhouse Office, November 2005. Retrieved Feb 2006 from: http://www.greenhousegas.nsw.gov.au/documents/FS-Comp-PoolCoeff-05.pdf

NSW Government, 2006 *State Plan: A Direction for NSW*, November 2006

Pedersen, E. (2003). *Noise annoyance from wind turbines: A review*. Retrieved Feb 2008 from http://www.nowap.co.uk/docs/620-5308-6.pdf

Pittock, B. (ed.) (2003). *Climate Change: An Australian Guide to the Science and Potential Impacts.* Australian Green House Office. Retrieved from: http://www.greenhouse.gov.au/science/guide/pubs/science-guide.pdf

NSW Rural Fire Service (2006) ***Planning for Bushfire Protection.*** RFS publication.

REARK Pty Ltd 2007. 'Wind farm impact study – Southern Tablelands'. Report prepared for Epuron, August 2007.

Road Traffic Authority 2002, Guide to Traffic Generating Developments.

Impact of wind farms on the value of residential property and agricultural land, An RICS survey, 2004.

Sammut, J. (2000) An introduction to acid sulphate soils Environment Australia and Agriculture, Fisheries and Forestry - Australia

Schleisner L. 2000, 'Life cycle assessment of a wind farm and related externalities', *Renewable Energy*, vol. 20, pp. 279-288.

Sheppard, H (2006) Environmental Planning Officer, Yass Valley Council, personal communication.

Smith, R., Banon, C. and Finn, P (2004) Bald Hills Wind Farm Project EES, EES supplement and called-in planning permits

Snowy River Shire Council (SRSC) 2005, 'Snowy River Shire Wind Farm Development: Issues paper'. Snowy River Shire Council 4 August 2005.

South Australia Environmental Protection Agency (2003). *Wind Farm Environmental Noise Guidelines*.

State Water (2008) State Water website *http://statewater.com.au* accessed 2008

Sterzinger, G. Beck, F. and Kostiuk, D. (2003). *The Effect of Wind Development on Local Property Values*. Renewable Energy Policy Project, Washington, D.C., May 2003.

Sustainable Energy Development Authority 2004, 'Wind farm safety in Australia'. available at: http://www.auswea.com.au/WIDP/assets/BP11_Safety.pdf

Sustainable Energy Development Authority (2002). *Wind Energy Handbook*. SEDA, Sydney.

Tourism NSW (2008) http://www.visitnsw.com/town/Yass.aspx accessed December 2008

TransGrid, 2008 *NSW Annual Planning Report 2008*

Twyford Consulting 2007, 'Interview with Local Stakeholders', a Research Report for Epuron Pty. Ltd, May 4 2007.

Union of Concerned Scientists 2005, 'Farming the Wind: Wind Power and Agriculture fact sheet' available at: http://www.ucsusa.org/assets/documents/clean_energy/agfs_wind_2003.pdf

Vestas Wind Systems A/S, 2006 *Life cycle assessment of offshore and onshore sited wind power plants based on Vestas V90-3.0 MW turbines* www.vestas.com/Admin/Public/Download.aspx?file=Files/Filer/EN/Sustainability/LCA/LCAV90_juni_2006.pdf

Warren, C.R., Lumsden, C., O'Dowd, S. and Birnie, R.V. 2005, 'Green on Green: Public Perceptions of Wind Power in Scotland and Ireland', *Journal of Environmental Planning and Management*, vol 48, No. 6, 873-875.

Wasson, R.J., Mazari, R.K., Starr, B and Clifton, G. (1998) The recent history of erosion and sediment on the Southern tablelands of southeastern Australia: sediment flux dominated by channel incision *Geomorphology,* vol.24, 291-308

World Health Organisation Guidelines for Community Noise (1999) Accessed from http://www.who.int/docstore/peh/noise/guidelines2.html

Yass Tribune (2006) http://yass.yourguide.com.au/news/local/news/general/council-responding-to-wind-farm-presure/240702.aspx

Yass Valley Shire Council (2004) *State of the Environment Report* accessed 2008 available from http://www.environmentcommissioner.act.gov.au/soe/soe2004/YassValley/index.htm

Yass Valley Council (2006) *2006-2011 Yass Valley Council Social Plan* accessed 2008 available from: http://www.yassvalley.nsw.gov.au

Yass Valley Council (2006a) *Historic Yass Valley* accessed 2008. available from http://www.yass.nsw.gov.au

Yass Valley Council (2007) *2006-2007 Supplementary State of the Environment Report*: available from: http://www.yassvalley.nsw.gov.au

Yass Valley Council (2007a) *2006-2007 Annual Report* available from: http://www.yassvalley.nsw.gov.au

Yass Valley Council (2008) *Yass Valley Visitors Guide,* accessed December 2008 available from: http://www.yassvalley.nsw.gov.au

Zilkha Renewable Energy 2002. Web site, retrieved from: www.zilkha.com/whatweredoing.asp?id=

Attachment 1. INVOLVED LAND PARCELS

INVOLVED LAND PARCELS

The cadastral information for the Coppabella Hills, Marilba Hills and Carrolls Ridge sites are detailed in the tables below.

Table 1 - Detailed Property Information for Coppabella Hills

Lot/DP	Owner
2//717646	Robinson
344//753595	Weston
291//753602	Shaw
Y//382611	Swan
293//721898	Swan
274//753602	Bush
275//753602	Bush
278//753602	Bush
281//753608	Barker
285//753602	Koorynga P/L & Rawont Holdings P/L
260//753602	Arabin
268//753602	Arabin
1//593527	Sykes
2//593527	Sykes
61//753595	Sykes
31//753602	Sykes
41//753602	Sykes
42//753602	Sykes
43//753602	Sykes
86//753602	Sykes
87//753602	Sykes
88//753602	Sykes
89//753602	Sykes
90//753602	Sykes
91//753602	Sykes
92//753602	Sykes
135//753602	Sykes
137//753602	Sykes
138//753602	Sykes
197//753602	Sykes
200//753602	Sykes

Lot/DP	Owner
211//753602	Sykes
212//753602	Sykes
213//753602	Sykes
230//753602	Sykes
234//753602	Sykes
235//753602	Sykes
194//753626	Sykes
201//753626	Sykes
307//753595	Sykes
314//753595	Sykes
284//753602	Crossley
57//753595	Nils Taube Ltd
58//753595	Nils Taube Ltd
59//753595	Nils Taube Ltd
60//753595	Nils Taube Ltd
123//753595	Nils Taube Ltd
124//753595	Nils Taube Ltd
125//753595	Nils Taube Ltd
126//753595	Nils Taube Ltd
184//753595	Nils Taube Ltd
185//753595	Nils Taube Ltd
212//753595	Nils Taube Ltd
51//753626	Nils Taube Ltd
76//753626	Nils Taube Ltd
77//753626	Nils Taube Ltd
78//753626	Nils Taube Ltd
91//753626	Nils Taube Ltd
106//753626	Nils Taube Ltd
119//753626	Nils Taube Ltd
136//753626	Nils Taube Ltd
137//753626	Nils Taube Ltd
138//753626	Nils Taube Ltd
146//753626	Nils Taube Ltd
147//753626	Nils Taube Ltd
148//753626	Nils Taube Ltd
155//753626	Nils Taube Ltd
180//753626	Nils Taube Ltd
181//753626	Nils Taube Ltd
182//753626	Nils Taube Ltd

Lot/DP	Owner
183//753626	Nils Taube Ltd
184//753626	Nils Taube Ltd
186//753626	Nils Taube Ltd
222//753626	Nils Taube Ltd
1//1102090	Nils Taube Ltd
2//1102090	Nils Taube Ltd
1//364690	Hyles
2//364690	Hyles
120//753602	Hyles
122//753602	Hyles
132//753602	Hyles
134//753602	Hyles
154//753602	Hyles
159//753602	Hyles
24//753602	Whitefields Pastoral Co. P/L
25//753602	Whitefields Pastoral Co. P/L
26//753602	Whitefields Pastoral Co. P/L
46//753602	Whitefields Pastoral Co. P/L
71//753602	Whitefields Pastoral Co. P/L
84//753602	Whitefields Pastoral Co. P/L
85//753602	Whitefields Pastoral Co. P/L
136//753602	Whitefields Pastoral Co. P/L
140//753602	Whitefields Pastoral Co. P/L
188//753602	Whitefields Pastoral Co. P/L
193//753602	Whitefields Pastoral Co. P/L
210//753602	Whitefields Pastoral Co. P/L
264//753602	Whitefields Pastoral Co. P/L
266//753602	Whitefields Pastoral Co. P/L

Table 2 - Detailed Property Information for Marilba Hills

Lot/DP	Owner
108//753595	Bonnette
109//753595	Bonnette
209//753595	Bonnette
325//753595	Bonnette
341//753595	Bonnette
203//753626	Bonnette

Lot/DP	Owner
209//753626	Bonnette
20//251362	Gemwane P/L
21//251362	Gemwane P/L
22//251362	Gemwane P/L
23//251362	Gemwane P/L
24//251362	Gemwane P/L
25//251362	Gemwane P/L
173//753596	Gemwane P/L
177//753596	Gemwane P/L
186//753596	Gemwane P/L
193//753596	Gemwane P/L
199//753596	Gemwane P/L
200//753596	Gemwane P/L
201//753596	Gemwane P/L
205//753596	Gemwane P/L
206//753596	Gemwane P/L
230//753596	Gemwane P/L
273//753596	Gemwane P/L
278//753596	Gemwane P/L
299//753596	Gemwane P/L
207//753596	Payne
C//408402	Garry
D//408402	Garry
3//457026	Garry
4//457026	Garry
5//457026	Garry
6//457026	Garry
7//457026	Garry
8//457026	Garry
129//753626	Garry
175//753626	Garry
196//753626	Garry
204//753626	Garry
224//753626	Garry
291//753596	Munns
292//753596	Munns
210//878465	Munns
212//878465	Munns
B//415303	Arabin

Lot/DP	Owner
176//753626	Arabin
177//753626	Arabin
178//753626	Arabin
2//849324	Arabin
1//1108872	Garry
2//1108872	Garry
3//1108872	Garry
4//1108872	Garry
2//131969	Marilba Properties P/L
112//665719	Marilba Properties P/L
96//753595	Marilba Properties P/L
99//753595	Marilba Properties P/L
110//753595	Marilba Properties P/L
111//753595	Marilba Properties P/L
112//753595	Marilba Properties P/L
113//753595	Marilba Properties P/L
114//753595	Marilba Properties P/L
136//753595	Marilba Properties P/L
137//753595	Marilba Properties P/L
139//753595	Marilba Properties P/L
140//753595	Marilba Properties P/L
210//753595	Marilba Properties P/L
238//753595	Marilba Properties P/L
312//753595	Marilba Properties P/L
111//753626	Marilba Properties P/L
122//753626	Marilba Properties P/L
165//753626	Marilba Properties P/L
193//753626	Marilba Properties P/L
207//753626	Marilba Properties P/L
208//753626	Marilba Properties P/L
210//753626	Marilba Properties P/L
17//753633	Marilba Properties P/L
105//753633	Marilba Properties P/L
2//851327	Marilba Properties P/L
200//878465	Marilba Properties P/L
202//878465	Marilba Properties P/L
204//878465	Marilba Properties P/L
207//878465	Marilba Properties P/L
209//878465	Marilba Properties P/L

Lot/DP	Owner
214//878465	Marilba Properties P/L
60//1038444	Marilba Properties P/L
30//1048395	Marilba Properties P/L
31//1048395	Marilba Properties P/L
32//1048395	Marilba Properties P/L
33//1048395	Marilba Properties P/L
34//1048395	Marilba Properties P/L
171//1133448	Marilba Properties P/L
172//1133448	Marilba Properties P/L
159//1133708	Marilba Properties P/L
1//116565	Nils Taube Ltd
2//116565	Nils Taube Ltd
1//455031	Nils Taube Ltd
2//455031	Nils Taube Ltd
3//455031	Nils Taube Ltd
54//753595	Nils Taube Ltd
55//753595	Nils Taube Ltd
56//753626	Nils Taube Ltd
57//753626	Nils Taube Ltd
58//753626	Nils Taube Ltd
59//753626	Nils Taube Ltd
84//753626	Nils Taube Ltd
85//753626	Nils Taube Ltd
101//753626	Nils Taube Ltd
133//753626	Nils Taube Ltd
134//753626	Nils Taube Ltd
160//753626	Nils Taube Ltd
197//753626	Nils Taube Ltd
198//753626	Nils Taube Ltd
202//753626	Nils Taube Ltd
17//753595	Eccles
18//753595	Eccles
28//753595	Eccles
71//753595	Eccles
72//753595	Eccles
146//753595	Eccles
147//753595	Eccles
191//753595	Eccles
192//753595	Eccles

Lot/DP	Owner
202//753595	Eccles
237//753595	Eccles
239//753595	Eccles
300//753595	Eccles
308//753595	Eccles
326//753595	Eccles

Attachment 2. GRID COORDINATES OF WIND TURBINES

TURBINE COORDINATES

The turbine coordinates for the Coppabella Hills, Marilba Hills and Carrolls Ridge sites are detailed in the tables below. The coordinate system used in MGA Zone 55.

Table 1 – Turbine Coordinates for Coppabella Hills

ID	Easting	Northing
COP 01	641141.84	6156569.77
COP 02	641328.80	6156230.56
COP 03	641680.85	6155979.76
COP 04	641967.31	6155722.98
COP 05	642099.72	6155401.79
COP 06	642361.55	6155082.24
COP 07	642670.90	6154792.69
COP 08	642980.24	6154509.78
COP 09	643736.42	6154321.18
COP 10	644120.75	6154082.09
COP 11	644496.90	6153842.12
COP 12	644712.42	6153513.92
COP 13	645051.25	6153228.09
COP 14	645590.39	6153096.38
COP 15	646003.79	6153010.05
COP 16	645833.87	6152763.14
COP 17	640381.72	6156076.65
COP 18	640567.82	6155715.39
COP 19	640848.12	6155409.05
COP 20	641174.72	6155345.02
COP 21	638470.99	6156113.57
COP 22	638226.99	6155966.60
COP 23	638733.49	6155811.44
COP 24	638730.79	6155516.30
COP 25	639063.96	6155074.42
COP 26	638886.10	6154872.44
COP 27	639022.16	6154555.90
COP 28	638845.28	6154224.79
COP 29	638504.44	6154174.13
COP 30	638392.83	6153925.33
COP 31	638212.64	6153718.37
COP 32	638011.95	6153523.93
COP 33	637973.18	6153233.88
COP 34	637788.04	6153025.88
COP 35	637734.71	6154728.57
COP 36	638034.40	6154843.44
COP 37	638166.21	6154479.94
COP 38	638037.58	6154243.37

ID	Easting	Northing
COP 39	637761.77	6154114.28
COP 40	637485.25	6153973.88
COP 41	640060.51	6154985.99
COP 42	640049.35	6154673.89
COP 43	640014.63	6154384.33
COP 44	639888.78	6154038.25
COP 45	639464.04	6153587.56
COP 46	639516.45	6153264.17
COP 47	639400.40	6153013.34
COP 48	639307.90	6152751.07
COP 49	639700.29	6152377.48
COP 50	640458.28	6154179.56
COP 51	640492.14	6153813.19
COP 52	641783.30	6154241.99
COP 53	640693.44	6153510.48
COP 54	641113.93	6153632.62
COP 55	641397.68	6153769.25
COP 56	641555.84	6154081.20
COP 57	642115.30	6153126.21
COP 58	641848.55	6152808.95
COP 59	641695.34	6152353.95
COP 60	641924.31	6152502.84
COP 61	642214.01	6152812.85
COP 62	642992.32	6152607.21
COP 63	643511.38	6151853.65
COP 64	643442.43	6151582.49
COP 65	644492.82	6150530.25
COP 66	644669.92	6150208.74
COP 67	645540.03	6149909.53
COP 68	645506.95	6149548.71
COP 69	645912.85	6149537.68
COP 70	646130.59	6150400.73
COP 71	646492.43	6150200.28
COP 72	633941.45	6154540.30
COP 73	633979.79	6154224.49
COP 74	633501.18	6154330.61
COP 75	633765.44	6154029.05
COP 76	633779.71	6153719.79
COP 77	636938.39	6155490.12
COP 78	636766.22	6155273.81
COP 79	636525.48	6154799.73
COP 80	636701.69	6155005.33
COP 81	637922.76	6155172.35
COP 82	638731.17	6156246.21
COP 83	643622.85	6152121.02
COP 84	643344.47	6154542.50
COP 85	644107.15	6150725.34

ID	Easting	Northing
COP 86	646109.89	6149703.50

Table 2 - Turbine Coordinates for Marilba Hills

ID	Easting	Northing
MRL 01	652381.78	6154634.51
MRL 02	652404.99	6154326.81
MRL 03	652378.54	6153986.63
MRL 04	652442.52	6153673.17
MRL 05	653312.01	6154603.00
MRL 06	653407.27	6154293.96
MRL 07	653429.10	6153998.70
MRL 08	653791.84	6154252.73
MRL 09	653997.40	6153918.53
MRL 10	654050.08	6153040.78
MRL 11	653921.23	6152861.39
MRL 12	653839.48	6152630.23
MRL 13	653842.25	6152346.29
MRL 14	653825.38	6152054.65
MRL 15	653835.30	6151755.33
MRL 16	650966.17	6152350.64
MRL 17	650970.11	6152059.61
MRL 18	651030.24	6151737.25
MRL 19	652880.13	6151508.10
MRL 20	653261.38	6150880.25
MRL 21	653187.33	6150629.27
MRL 22	653200.89	6150374.85
MRL 23	653359.78	6150100.67
MRL 24	653219.67	6149898.44
MRL 25	653181.28	6149616.75
MRL 26	653765.73	6150043.94
MRL 27	653709.28	6149738.24
MRL 28	654107.10	6150500.38
MRL 29	654155.44	6150036.83
MRL 30	654059.10	6149791.15
MRL 31	654126.04	6149498.74
MRL 32	654271.19	6149175.54
MRL 33	654138.17	6148935.26
MRL 34	653937.75	6148738.39
MRL 35	653373.97	6148774.73
MRL 36	653868.02	6148186.85
MRL 38	653908.60	6147881.00
MRL 39	653845.21	6147628.62
MRL 43	657771.94	6152855.21
MRL 44	657680.29	6152600.67
MRL 45	657519.38	6152393.07
MRL 46	656461.90	6152312.66

ID	Easting	Northing
MRL 47	656351.05	6152105.86
MRL 48	656547.56	6151827.06
MRL 49	657627.98	6151651.65
MRL 50	657646.60	6151369.20
MRL 51	657475.23	6151155.09
MRL 52	657803.87	6150858.98
MRL 53	658275.36	6150211.05
MRL 54	658270.48	6149927.68
MRL 55	658117.54	6149706.26
MRL 56	658264.65	6149274.48
MRL 57	658027.08	6149116.28
MRL 58	658102.69	6148797.42
MRL 59	658094.64	6148516.30
MRL 60	658049.18	6148241.96
MRL 61	658136.73	6147894.82
MRL 62	658581.71	6147857.47
MRL 63	658435.50	6147612.63
MRL 64	658828.01	6147520.79
MRL 65	659500.74	6147765.32
MRL 66	659406.68	6147513.15
MRL 67	658957.94	6147197.29
MRL 68	659195.20	6146888.44
MRL 69	658963.57	6146741.61
MRL 70	658870.38	6146506.04

Table 3 - Turbine Coordinates for Carrolls Ridge

ID	Easting	Northing
CAR 01	654199.01	6136795.23
CAR 02	653942.58	6136627.63
CAR 04	654261.10	6136320.30
CAR 05	654077.39	6136132.97
CAR 06	653959.04	6135798.06
CAR 07	653726.29	6136101.06
CAR 08	653529.80	6135850.03
CAR 09	653821.03	6135567.97
CAR 10	653740.18	6135307.59
CAR 11	653635.41	6135065.62
CAR 12	653592.61	6134793.83
CAR 13	653391.61	6134451.74
CAR 14	653191.19	6134298.07
CAR 15	653258.14	6133997.90
CAR 16	653147.85	6133456.33
CAR 17	653276.25	6133699.14
CAR 18	653014.92	6133211.34
CAR 19	652744.45	6133095.32

ID	Easting	Northing
CAR 20	651542.79	6132163.05
CAR 21	651409.80	6131929.35
CAR 22	651179.28	6131761.44
CAR 23	651735.05	6132361.52
CAR 24	652307.43	6130817.84
CAR 25	652125.48	6130606.87
CAR 26	654409.21	6137096.91
CAR 28	652745.60	6131187.11
CAR 30	651937.01	6130394.33
CAR 31	653318.15	6131209.92
CAR 32	653286.44	6130929.26

Attachment 3. LETTER CONFIRMING PART 3A POSITION

NSW GOVERNMENT
Department of Planning

22 October 2008

Contact: Marek Cholinski
Phone: 02 92286284
Fax: 02 9228 6366
Email:
marek.cholinski@planning.nsw.gov.au

Our ref: S08/01553

Simon Davey
Project Manager
Epuron Pty Ltd
Level 11
75 Miller Street
North Sydney NSW 2060

Dear Mr Davey

Yass Wind Farm Proposal-Application of Part 3A of the Environmental Planning and Assessment (EP&A) Act

I refer to your letter dated 9 October 2008, which sought advice on the application of Part 3A of the EP&A Act to the Yass Wind Farm proposal.

The Director-General of the Department of Planning, as delegate of the Minister for Planning, has formed an Opinion that the Yass Wind Farm proposal (as described in your letter) will be subject to Part 3A. A copy of the Opinion is enclosed for your information.

If you have any queries regarding the above, please contact Marek Cholinski on (02) 9228 6284 or via email marek.cholinski@planning.nsw.gov.au

Yours sincerely

Marek Cholinski
Environmental Planning Officer
Major Infrastructure and Assessments

NSW GOVERNMENT
Department of Planning

Record of Minister's opinion for the purposes of Clause 6(1) of the State Environmental Planning Policy (Major Projects) 2005

I, the Director-General of the Department of Planning, as delegate of the Minister for Planning under delegation executed on 26th February , 2007, have formed the opinion that the development described in the Schedule below, is development of a kind that is described in Schedule 1, Group 8, clause 24 of *State Environmental Planning Policy (Major Projects) 2005* namely development for the purpose of a wind electricity generation facility that has a capital investment value of more than $30 million. It is therefore declared to be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies for the purpose of section 75B of that Act.

Schedule

A proposal by Epuron Pty Ltd for the Yass Wind Farm, a wind electricity generating facility and associated infrastructure located within the Harden and the Yass Valley local government areas, with an installed generating capacity of approximately 450 megawatts comprising approximately 200 turbines, as generally described in the letter by NGH environmental on behalf Epuron Pty Ltd to the Department of Planning dated 9 October 2008.

SHaddad

Sam Haddad
Director-General
Department of Planning

Date: 17/10/2008.

Attachment 4. DIRECTOR GENERAL REQUIREMENTS

NSW GOVERNMENT
Department of Planning

Contact: Marek Cholinski
Phone: (02) 9228 6284
Fax: (02) 9228 6366
Email: marek.cholinski@planning.nsw.gov.au

Our ref: S08/01553

Mr Andrew Durran
Executive Director
Epuron Pty Ltd
Level 11, 75 Miller Street
North Sydney NSW 2060

Dear Mr Durran

Proposed Yass Wind Farm, Yass Valley and Harden Shire Local Government Areas (Application Reference: 08_0246)

The Department has received your major project application for the proposed Yass wind farm project.

I have attached a copy of the Director-General's requirements (DGRs) for the preparation of an Environmental Assessment for the project. These requirements have been prepared following the Planning Focus Meeting held on 14 and 15 October 2008 and in consultation with the relevant government agencies. I have also enclosed a list of relevant guidelines that you may wish to refer to during the preparation of the Environmental Assessment.

It should be noted that the Director-General's requirements have been prepared based on the information provided to date. Under section 75F(3) of the Act, the Director-General may alter or supplement these requirements if necessary and in light of any additional information that may be provided prior to the Proponent seeking approval for the project.

I would appreciate it if you could contact the Department at least two weeks before you propose to submit the Environmental Assessment for the project to determine:

- the fees applicable to the application;
- relevant land owner notification requirements;
- consultation and public exhibition arrangements that will apply;
- options available in publishing the Environmental Assessment via the Internet; and
- number and format (hard-copy or CD-ROM) of the Environmental Assessment that will be required.

Prior to exhibiting the Environmental Assessment, the Department will review the document to determine if it adequately addresses the DGRs. The Department may consult with other relevant government agencies in making this decision. If the Director-General considers that the Environmental Assessment does not adequately address the DGRs, the Director-General may require the Proponent to revise the Environmental Assessment to address the matters notified to the Proponent. Following this review period the Environmental Assessment will be made publicly available for a minimum period of 30 days.

If your project includes any actions that could have a significant impact on matters of National Environmental Significance, it will require an additional approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Department of the Environment, Heritage, Water and the Arts to determine if an approval under the EPBC Act is required for your project (6274 1111 or http://www.environment.gov.au). Please note that the Commonwealth Government has accredited the NSW environmental assessment process for assessing impacts on matters of National Environmental Significance. As a result, if it is determined that an approval is required under the EPBC Act, please contact the Department immediately as supplementary Director-General's requirements will need to be issued.

If you have any enquiries about these requirements, please contact Mr Marek Cholinski, Environmental Planning Officer, Major Infrastructure Assessments on 02 9228 6284 or via email (marek.cholinski@planning.nsw.gov.au).

Yours sincerely

12.1.09

Chris Wilson
Executive Director
Major Project Assessments
as delegate of the Director-General

Director-General's Requirements

Section 75F of the *Environmental Planning and Assessment Act 1979*

Project	Construction and operation of an approximately 500 megawatt wind farm including up to 195 wind turbines and associated infrastructure.
Site	Approximately 20-35 kilometres west-southwest of Yass at 3 sites, Coppabella Hills, Marilba Hills and Carrolls Ridge. In the Harden Shire and Yass Valley local government areas.
Proponent	Epuron Pty Ltd
Date of Issue	12.01.09
Date of Expiration	12.01.11
General Requirements	The Environmental Assessment (EA) must include: • an **executive summary**; • a **detailed description** of the project including: → construction, operation and decommissioning details; → the location and dimensions of all project components including the wind turbines (including map coordinates and AHD heights), any above ground transmission connection to the existing 132kV transmission network, electrical sub stations, underground cabling between turbines, on site control room and equipment storage, temporary concrete batching plant(s), construction compounds and access roads; → resourcing requirements (including water use and source impacts); and → a timeline identifying the proposed construction and operation of the project components, their envisaged lifespan and arrangements for decommissioning and staging. • consideration of any **relevant statutory provisions** including the consistency of the project with the objects of the *Environmental Planning and Assessment Act 1979;* • an **assessment of the key issues** outlined below, during construction, operation and decommissioning (as relevant); • a **draft Statement of Commitments** detailing measures for environmental mitigation, management and monitoring for the project; • a **conclusion justifying the project** taking into consideration the environmental, social and economic impacts of the project; the suitability of the site; and the public interest; and • **certification by the author** of the EA that the information contained in the Assessment is neither false nor misleading.
Key Assessment Requirements	The EA must include assessment of the following key issues: • **Strategic Justification** - the EA must: → include a strategic assessment of the need, scale, scope and location for the project in relation to predicted electricity demand, predicted transmission constraints and the strategic direction of the region and the State in relation to electricity supply, demand and electricity generation technologies; → include a clear demonstration of quantified and substantiated greenhouse gas benefits, taking into consideration sources of electricity that could realistically be replaced and the extent of their replacement; and → include an analysis of the suitability of the project with respect to potential land use conflicts with existing and future surrounding land uses (including existing and approved rural residential development, property values, land of significant scenic or visual value, land of high agricultural value, mineral reserves and conservation areas), taking into account local and strategic landuse objectives; and → describe alternatives considered (location and/ or design) and provide justification for the preferred project demonstrating its benefits including community benefits on a local and strategic scale and how it achieves stated objectives.

	• **Visual Impacts** - the EA must: → provide a comprehensive assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the project. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the project based on surveys and consultation. Cumulative visual impacts of existing and approved wind farms must also be assessed in the EA; → assess the impact of shadow "flicker", blade "glint" and night lighting from the wind farm; → identify the zone of visual influence (no less than 10 kilometres) and assess the visual impact of all project components on this landscape; → include photomontages of the project taken from potentially affected neighbouring residences (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures; → provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented. • **Noise Impacts** - the EA must: → include a comprehensive noise assessment of all phases and components of the project including turbine operation, construction and traffic noise. The assessment must identify noise sensitive locations (including approved but not yet developed dwellings or subdivisions with residential rights), baseline conditions based on monitoring results, the levels and character of noise (e.g. tonality, impulsiveness etc) generated by noise sources, noise criteria, modelling assumptions and worst case noise impacts. → in relation to wind turbine operation, the EA must determine worst case noise impacts under operating meteorological conditions (i.e. wind speeds from cut in to rated power), which may include impacts under meteorological conditions that exacerbate impacts. The probability of such occurrences must be quantified; → 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 proposed measures and any residual impacts after these measures have been incorporated; → 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; and → include an assessment of vibration impacts associated with the project. The assessment must be undertaken consistent with the following guidelines (or as otherwise agreed with the DECC): → Wind Turbines - the South Australian Environment Protection Authority's *Wind Farms - Environmental Noise Guidelines*, 2003 Site Establishment and Construction - *Environmental Noise Control Manual* (NSW EPA, 2004); → Traffic Noise – *Environmental Criteria for Road Traffic Noise* (NSW EPA, 1999); → Site Establishment and Construction - *Environmental Noise Control Manual* (EPA, 2004); and → Vibration – *Assessing Vibration: A Technical Guideline* (DECC, 2006). • **Flora and Fauna** - the EA must: → include an assessment of all project components on flora and fauna and their

	habitat consistent with the *Draft Guidelines for Threatened Species Assessment* (DEC, 2005), including details on the existing site conditions and quality and likelihood of disturbance; → The EA must specifically consider worst case impacts to all species, especially threatened species and communities listed under both State and Commonwealth legislation that have been recorded on the site and surrounding land, impacts to riparian and/ or instream habitat in the case of disturbance of waterways, impacts to endangered ecological communities and to biodiversity corridors. In addition, impact of the project on birds and bats from blade strikes, effects of low air pressure zones at the blade tips, and alteration to movement patterns resulting from the turbines and transmission lines must be assessed, including demonstration of how the project has been sited to avoid and/ or minimise such impacts; → details of how flora and fauna impacts would be managed during construction and operation including adaptive management and maintenance protocols. This includes impacts from associated infrastructure separate to actual turbine impacts; and → measures to avoid, mitigate or offset impacts consistent with "improve or maintain" principles. Sufficient details must be provided to demonstrate the availability of viable and achievable options to offset the impacts of the project. • **Indigenous Heritage** - the EA must include an assessment of the potential impact of the project components on indigenous heritage values (archaeological and cultural).The EA must demonstrate effective consultation with indigenous stakeholders during the assessment and in developing mitigation options (including the final recommended measures) consistent with *Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation* (DEC, July 2005). • **Hazard/Risks**– the EA must include an assessment of the potential impacts on aviation safety considering nearby aerodromes and aircraft landing areas, defined air traffic routes and radar interference such as the installation at Mt Bobbara, communication systems in particular the communication tower near the Coppabella site, electric and magnetic fields and bushfires. • **Traffic and Transport** – the EA must assess the construction and operational traffic impacts of the project including: → details of the nature of traffic generated, transport routes, traffic volumes and potential impacts on local, regional and Crown roads such as the Hume Highway and Burley Griffin Way, bridges and intersections, including any proposed road upgrades and repairs; and → details of site access roads including how these would connect to the existing road network and any operational maintenance or handover requirements. • **General Environmental Risk Analysis** –notwithstanding the above key assessment requirements, the EA must include an environmental risk analysis to identify potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of the additional key environmental impact(s) must be included in the EA.
Consultation Requirements	The Proponent must undertake an appropriate and justified level of consultation with the following parties during the preparation of the EA: • Yass Valley Council; • Harden Shire Council; • Department of Environment and Climate Change; • Department of Water and Energy; • Department of Primary Industries; • Department of Lands

	• NSW Roads and Traffic Authority; • Transgrid • Country Energy; • NSW Rural Fire Service; • Murrumbidgee Catchment Management Authority; • Commonwealth Department of Defence; • Civil Aviation Safety Authority; • Airservices Australia; and • the local community and landowners. The EA must clearly describe the consultation process and indicate the issues raised by stakeholders during consultation and how these matters have been addressed.
Deemed refusal period	120 days

Relevant Guidelines - For Reference

General
Wind Energy Facilities draft Environmental Impact Assessment Guidelines (Planning NSW, June 2002) Best Practice Guidelines for Implementation of Wind Energy Projects in Australia (Auswind, 2006)
Visual
Wind Farms and Landscape Values: National Assessment Framework (Australian Wind Energy Association and Australian Council of National Trust, June 2007).
Biodiversity
Cumulative Risk for Threatened and Migratory Species (Commonwealth Department of Environment and Heritage, March 2006) Wind Farms and Birds: Interim Standards for Risk Assessment, (Auswind, July 2005) Assessing the Impacts on Birds – Protocols and Data Set Standards (Australian Wind Energy Association)
Aviation Hazard
Advisory Circular 139-18(0) Obstacle Marking and Lighting of Wind Farms (Civil Aviation Safety Authority, July 2007) Note: this advisory is currently withdrawn however a replacement has to date not been issued.
Water Quality
The NSW State Groundwater Quality Protection Policy The NSW State groundwater Ecosystem Policy

Attachment 5. PLANNING FOCUS MEETING MINUTES

ngh environmental

planning • assessment • ems • auditing

23rd October 2008

Dear Sir / Madam

RE: Planning Focus Meeting, Yass Wind Farm, 14th and15th October 2008

Thank you for attending the Planning Focus Meeting for the proposed Yass Wind Farm.

The attached final minutes have been sent to all participating agencies and amended as appropriate to ensure that the comments noted are accurate and in context; changes were made to the Department of Lands, Department of Planning, Harden Shire, Department of Primary Industry and the Rural Fire Service comments only.

As discussed, these minutes are intended to 'kick-off' agency consultation. You will have further opportunity to provide comments to the Department of Planning after the Project Application for this proposal has been lodged.

If you would like to pass further comments on to the Department of Planning directly, please contact Neville Osborne neville.osborne@planning.nsw.gov.au or Marek Cholinski, Marek.Cholinski@planning.nsw.gov.au.

Thank you again for your participation which will assist us in carrying out a thorough assessment of the proposal.

Yours sincerely

Tim Browne

*Project Officer, **ngh**environmental*

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email ngh@nghenvironmental.com.au
a division of nicholas graham-higgs pty ltd

Participants included:

- Neville Osborne and Marek Cholinski, Department of Planning
- John Daunt, Department of Lands
- Dr Sandie Jones and Lyndel Walters, Department of Environment and Climate Change
- Cressida Gilmore, Department of Primary Industries
- John Franklin, Murrumbidgee Catchment Management Authority
- Sharon Langman, Harden Shire Council
- Suzanne Jurcevic, Yass Valley Shire Council
- Ben Bates and Mahesh Nagarajan, Country Energy
- Maurice Morgan, Roads and Traffic Authority
- Michael McManus, Transgrid
- Rodger Ubrihien, Bega Duo Designs
- Simon Davey and Julian Kasby, Epuron
- Brooke Marshall and Tim Browne, **ngh**environmental

Meeting format

Participants met in Binalong on the 14th of October 2008 where a presentation on the proposal was given by Epuron Project Manager, Simon Davey and **ngh**environmental's Brooke Marshall. Two of the three precincts were visited on day one, Carrolls Ridge and Marilba Hills. Participants initially proceeded to the Carrolls Ridge precinct near where a monitoring mast is due for erection.

Participants asked questions and presented issues of relevance to their agencies. The group then relocated to the Marilba Hills site on the northern side of the Hume Highway, near a telecommunications tower. This area was chosen as it afforded a good view of the Marilba Hills proposal area. Similar to Carrolls Ridge, discussions within the group focussed on identifying issues of concern from a number of agencies.

On Wednesday October 15th, the participants were taken to the main ridge at the Coppabella Hills precinct. Due to the size of the precinct, it was considered impracticable to attempt to see a large portion of each precinct in detail. As such, the site inspection sites were chosen to facilitate extended views of each precinct. At each stop, Julian Kasby gave an overview of likely infrastructure placement and views to other ridges within the development envelope. The number of turbines and their placement would not be decided until after the results of specialist studies.

Key issues discussed at the meeting are indicated below.

Comments from participants:

Agency	**Issues raised**
Department of Planning	The Department of Planning representatives, Neville Osborne and Marek Cholinski, raised the following issues: • Potential socio-economic impacts and the ability of members of the community to shape the final infrastructure layout • Was Epuron considering a different approach to the community fund that had been offered in past project applications lodged by Epuron? Simon Davey indicated that benefits for the local community was important but Epuron was not yet committing to a voluntary community fund, based on feedback in relation to other projects, and will consider the issue further during the project development phase. • Sought clarification that the archaeology assessment going to include appropriate consultation. Brooke Marshall indicated that the advertisement had been issued and consultation would be as per the DECC guidelines. • The potential impact to local airfields • Need to consider the proposal in the light of the 'maintain or improve' principle • The general access routes for all precincts • Potential cumulative impact of the proposal • Potential soil and erosion issues particularly at the Coppabella Hills precinct • Are there potential locations for other winds farms in the vicinity of the three precincts? Simon Davey indicated that although Epuron was not actively developing other potential sites in the area, given the wind resource and electrical grid it is probable that there may be future wind energy development in the area. • Indicated that they would like the outer envelope for development to be clearly defined in the Environmental Assessment ie: the 'worst case' impacts • Wanted to ensure that maps of the proposal were presented clearly at appropriate resolutions • The DoP inquired about the potential impact of low air pressures around blade tips to bats. • Consideration of water issues regarding the construction phase and water sourcing, need for batch plants as well as affects on local catchments from the project. • DoP stressed the importantance for good community consultation during the proposal • The proximity of non associated dwellings the to consequent visual and noise impacts • The amount vegetation clearing at Carroll's Ridge
Department of Environment and Climate Change	DECC representatives, Dr Sandie Jones and Lyndal Walters, raised the following issues: • DECC indicated that under the Protection of Environment Operations Act 1997 wind farms were no longer licensed and during construction and operation any issues (breaches) relating to noise would default to local Councils rather than the EPA branch of the DECC. • DECC also enquired as to whether concrete batch plants would be required onsite during the proposal. Further, the DECC indicated that should concrete batch plants be required during the proposal this may trigger the requirement for the proponent to obtain a license under the POEO Act specifically relating to concrete batching. • The DECC indicated that grid connections outside of the development envelope should also be considered as part of the environmental assessment • The DECC indicated that any assessment would need to include amount of proposed clearing of native vegetation and proposed offsetting associated with potential clearing. DECC also indicated that if exact amount of clearing within each vegetation community could not be finalised using the 'development envelope' approach then offset calculations would be based on the entire development envelope

Agency	Issues raised
	• DECC representatives noted that there was evidence of habitat for arboreal mammals and abundant woodland (Carrolls Ridge) which is likely habitat for birds and bats and a likely corridor. The DECC were also interested in the potential impact of low air pressures around blade tips to bats.
Murrumbidgee CMA	Murrumbidgee CMA representative, John Franklin raised the following issues • The CMA were concerned with the amount of vegetation clearing and the quality of any vegetation that would require clearing • Potential impacts to land holders regarding any offsetting requirements
Department of Lands	The Department of Lands representative, John Daunt, raised the following issues: • There is potential for native title implications at the trig station at Carrolls Ridge. Further, it is unlikely that native title has been extinguished in this area. • There appears to be no Crown land affected by the proposal other than perhaps a couple of Trig reserves • For most wind farm projects it is mostly Crown roads that are affected. Crown roads, particularly those that are not constructed, are generally not suitable to be used for wind farm access tracks and such use is not favoured by the Department. It is suggested that proponents locate such tracks and the associated underground and/or overhead cables within easements on private land. • Lands are aware that access tracks and cables may unavoidably have to cross over Crown roads. • Department of Lands is a Roads Authority and for this and other Part 3A developments and is required (per Section 75 V of the EP&A Act 1979) to grant consent under Section 138 of the Roads Act 1993 for works on Crown public roads. his consent is usually provided by the granting of a licence which authorises the works on the Crown roads and sets the conditions and rental applying to this consent. uch a licence can also be extended to apply to any similar works located on Crown land such as Trig reserves provided that native title issues are satisfied. The consent of the Surveyor General will also be required for any works to be located on Trig reserves.
Department of Primary Industries	• Cressida Gilmore, of DPI, raised the following issues: • There is two current exploration license that has the potential to be affected by the proposal, specifically at the Marilba Hills precinct. Further, the DPI indicated that potential exploration work is likely to target the Mt Mylora prospect located in the northern portion of the Marilba Hills precinct. Part of ELA 3559 does cover the Coppabella Precinct as well so whilst it appears at this stage the main issue is impacts on exploration in the Marilba Hills precinct, the Coppabella area will also need to be assessed for impacts. • From a fisheries and agriculture point of view, potential indirect impacts such as sediment laden runoff should be assessed as well as ccess roads over waterways (if there are any) needing approval from DPI Fisheries Division and the need to comply with Fisheries policies and guidelines. • Mitigation measures for managing weeds will be required to be detailed particularly as they will most likely be introduced from trucks and any imported soils. Weeds will also take hold on disturbed soil areas, particularly on access roads and disturbed sites for cabling and other associated development. Those areas will need particular attention. • Adequate mitigation measures for the control of soil erosion and dust, generated particularly from the internal access roads will need to be implemented. • Impacts on the existing farming operations will need to be minimised. In particular, you will need to ensure that livestock are not able to escape from the property as a result of opening gates for trucks. • Containment of any substances from any proposed substation is required to ensure that the contamination of pasture and dams does not occur. • It will be important also to consult with landholders in the vicinity of the wind farm to assess community issues and concerns.
Roads and Traffic	The Roads and Traffic Authority representative, Maurice Morgan, made the following comments.

Agency	Issues raised
Authority	• Careful consideration would have to be undertaken when identifying the route for infrastructure to be transported to site. • The RTA were concerned with ensuring the safe movement of vehicles • Safe viewing areas off the Highway should be considered • Access points from the Hume Highway should be carefully considered. The RTA indicated that the Hume Highway may have restricted access points and access points should be indentified in consultation the with RTA
Yass Valley Shire Council	Suzanne Jurcevic, raised the following issues: • As a result of the Conroys Gap wind farm, the Yass Valley Shire Council have determined not to support wind farms within the LGA • Council would expect some form of community funding to be part of any proposal
Harden Shire Council	Sharon Langman raised the following issues: • Council would consider some form of community funding to be an appropriate part of any proposal. Administration of the fund considering the close proximity to Yass LGA would be of interest (previously, community boards have been problematic in Harden) • Council would also like the visual impact of the proposal from both the Hume Highway and Burley Griffin Way assessed • Potential impact to farmers in the immediate vicinity to realise the 40 hectare minimum for dwellings in the area. • Soil erodibility issues in the Coppabella precinct • The presence of an emergency communications tower used by the RFS, police and Council in the vicinity of the Coppabella precinct • This is the first wind farm proposal for the Harden Shire

Comments from agencies unable to attend the PFM:

Agency	Comments
Defence	Flight Safety – will the site of the wind farm have any affect on the safety of military flying operations? Communications – are there any Defence line-of-sight communications such as microwave link paths passing through the wind farm site? Defence radars – is the proposed wind farm site in proximity to Defence radar? Please keep Defence informed of the proposal. When do you expect that Defence would be requested to formally provide comment?
Airservices Australia	Indicated that the following information would be required • heights in AHD and coordinates in WGS84 of turbines • An assessment could then be made on receipt of the required information
Rural Fire Service	The Rural Fire Service is concerned that the development may provide a source of ignition for a bush fire either by lightning strike or electrical/mechanical failure. The RFS are however confident that these can be overcome by appropriate design consideration.
Department of Water and Energy	The Department of Water and Energy were unable to comment at this early stage of planning process. Ongoing consultation with the DWE will continue throughout the planning phase of the proposal.

Attachment 6. COMMUNITY CONSULTATION PLAN

Yass Valley Wind Farm, Community Consultation Plan

This plan includes key community consultation issues associated with the proposal and strategies to address these.

The format of this plan is:

1. Consultation objectives
2. Issue management
3. Project based activities
4. Documentation of activities undertaken

1. Consultation Objectives

The objectives of the consultation are:

- To ensure the community is fully informed about the proposal
- To provide multiple opportunities for the community to receive information and provide feedback about the proposal
- To incorporate the feedback into the design of the wind farm where possible
- To open channels for on-going dialogue with the community
- To build positive, trust-based relationships with members of the local community

Wind farm site selection and development is challenging and focused with a requirement for elevated land and good wind speeds usually in rural and remote areas. Once a site containing all these requirements has been found there is reasonably limited scope for surrounding communities to be involved in making key decisions about proposals.

Accordingly, the community engagement process will focus on informing the surrounding community about the wind farm development, and highlighting areas where the community can contribute to the project.

The consultation approach should be summarised as

> "Use multiple methods to seek out community members to inform them of the proposal and to understand their concerns and aspirations in relation to it. Where possible incorporate their feedback into the design of the wind farm and inform them of where and how this has been done. "

From Epuron's point of view the decision statement is:

How best to design and site the wind farm to meet technical, legislative, financial, social and environmental constraints.

From the community's point of view, the decision statement is:

While some will object to the proposal, it is hoped that the community will form the view that their collective interests are best served by assisting the proponent with the identification and mitigation of potential impacts of importance to the community. Consultation should also look at how best to maximise the local and regional benefit of the development.

This requires the identification of impacts and opportunities, and suggestions for mitigation of impacts and enhancement of opportunities. It also relies on the community understanding the process of wind farm development and specific issues of interest to the community. The focus of the consultation plan will be on providing this understanding and engagement.

2. Issue management

Several issues have been identified below. These issues pose potential risks to the effective identification and mitigation of impacts important to the community. Mitigation strategies have been developed below, specific to the identified issues.

Issue	**Risks**	**Mitigation strategies**
a) Distrust in wind farms A lot of misinformation is available about the pros and cons of wind farms. The reasons behind wind farm development are complex and not easily reduced to simple facts. Complex issues can be difficult to communicate to a wide audience.	Oversimplification of issues. Confusion of issues (i.e. cases at other wind farms may or may not apply to this project). Appear to not be giving sufficient weight to issues important to the community.	Dissemination of issue-specific information; i.e. not lumped with other issues; i.e. a FAQ format
b) Distrust in approvals process The complex approvals process can be difficult to communicate to a wide audience. Previous efforts by individuals trying to have input may have gone unrewarded so a feeling of futility can exist.	Perception that the process is too difficult to become involved in. Suspicion that input will not be valued.	Clearly illustrate approvals process. Clearly define opportunities for community input including what is required and when it is required. Communicate back, identifying where input has been used.
c) Distrust in wind farm developers Epuron seen as an overseas company. Epuron seen as a city based and focused on solving city problems at the expense of rural areas. Perception that the development	Anger and resentment. Distrust of impact identification and mitigation.	Establish credentials of the developers. Outline motives and previous projects. Focus on community benefits. Listen to community and demonstrate having taken on board concerns.

is an external influence of change over which they have no control.		Focus on maximising use of regional resources. Mitigate as per **a)** and **b)**.
d) Distrust in environmental assessors Consultants not seen as independent and credible.	Distrust of impact identification and mitigation.	Establish credentials. Outline previous projects. Listen to community and demonstrate having taken on board concerns.
e) Fear of unknown impacts Large volume of technical material to digest. Complex issues difficult to explain to people when they are distressed.	Exaggerated fears.	Layman explanations of issues delivered in concise, digestible amounts. Dissemination of issue-specific information.
f) Staging of the project / involvement potential By the time the sites are chosen there is little role for the community	Apathetic or against proposal due to lack of involvement.	Acknowledge the scope for input is limited and thereby reduce the potential to raise expectations unrealistically. Clearly outline areas for community involvement. Actively invite input within this scope.
g) The 'articulate irate' As those most against the proposal will be dominating responses, the consultation may reflect one-sided view point.	Vocal opponents are generally not interested in contributing to the proposal, they oppose the principles of wind farm development. Heated meetings will further deter engagement of the broader community. Interested sections of the community may be "overpowered" and may be marginalised.	Ensure community is engaged in a forum that minimises risk of vocal opponents dominating face to face public consultation. This can be achieved via the 'drop in' or open house sessions, face to face liaison and by using focussed meetings with specific groups invited ie. local landcare group, neighbours. Meet with vocal opponents and demonstrate listening to their concerns.
h) Unified message Many points of contact exist for the community, including Epuron, consultants, Dept. of Planning.	Differing messages may create confusion and distrust.	Stay 'on message': • we are investigating the impacts thoroughly, • we will develop mitigation measures to make them as acceptable as possible, • we will seek the community's input into identification and mitigation measures • we will communicate back,

		identifying where input has been used.
i) Unequal distribution of benefits Residents close to the development are likely to feel more strongly. These people should have a greater say in the development.	These individuals will be more concerned and require more contact with the company.	Consultation should target these people preferentially. Consultation should separate local and broader engagement activities.
j) First impressions Once an individual has formed an opinion, it may be difficult to relay opposing information.	That individuals will discount any benefits of wind farms if their first exposure is one being proposed nearby.	Present a positive image of wind power as early as possible.
k) Exposure Need to get information out to a wide range of people, not just neighbours and vocal groups.	Inadequate consultation if information is not getting out to broader audience.	Use established social (and media) channels in dissemination of materials, ie. sport clubs.

Project-based activities

The following table outlines the different project stages and associated community consultation objectives and activities. For each stage, the level of consultation sought is also indicated:

- Inform: one way transfer of information, promote awareness and educate, or
- Consult: two way transfer of information, seek input and feed-back.

From the initial announcement of the project, which will alert the wider community to the development, the Proponent should follow up with:

- Newsletters,
- Media opportunities
- Community Open House in the local area
- Attendance at local group meetings eg. landcare
- Letters to identified residents within 5kms of the proposal site
- Follow up individual meetings to concerned landowners

Specifically, the community open house forum will seek to inform the community about the wind farm as well as seeking individual and community views on issues that the community perceives as being important. Follow up phone calls, emails, letters can progress individual issues raised. This strategy is designed to be responsive to concerns raised by the community and individuals and will allow complex issues to be dealt with more thoroughly on their own rather than amalgamated with other topics.

It may be appropriate to have a post open house, follow up meetings with individual landowners that express concerns about the project. This follow up meeting would create an opportunity for the Proponent to further address the potential concerns of the individuals in the community and to provide information on how their feedback has helped plan the most appropriate design for the proposed wind farm.

Finally, closer contact with the nearby properties owners is recommended. Addressing concerns proactively allows the best chance of greater acceptance of the proposal by the broader community. Broader and local activities are separated in some of the project-based activities that follow.

Project stages	Community engagement objectives	Level on the Spectrum	Suggested community engagement activities
Identify sites for turbines and easements **and** **Secure landowners**	Transparency.6 Build trust. Public to understand justification for wind farms. Public to understand criteria and rationale for site selection. Public understands development process.	Inform Consult Inform Inform	*1) Local:* Contact made with local residents. Phone number provided for one-on-one contact (ngh to field calls related to impacts). Key issues to discuss: • Rationale for wind farms, • Staging of project, • Present all three precincts, • Why has this site been selected? • What might be involved? • Will the project definitely go ahead? • How we propose to mitigate concerns? • Evidence we have done it in the past? • What are the landowner's main concerns? (document) Resources on hand: • Flow chart showing assessment process, where community input is required • Auswea fact sheets on key issues, *2) Broader:* Editorial on need for sustainable energy sources and specifics of wind power (local papers). Editorial on the assessment process and stage of the project.
	Public understands factors	Inform	Newsletter to explain site variables, assessment process, what the public

Design site layout (concept design)	influencing the development. Understands assessment process and likely mitigation strategies. Public contributes local information. Public understands what they can influence. Receives feedback about what information was used.	Consult Inform	can influence. Indicate Open House will be coming soon. Distribute through varied channels, i.e. sports, schools, clubs, Landcare groups. Open House to provide information, identify and talk through issues and establish contacts for further information (advertise in newspaper, through local groups, call nearby landowners). Open House resources: issue specific hand-outs provided. Web pages made available to establish credentials of the Proponent and subcontractors. Face to face briefings as required (Council, neighbours, interest groups). Editorial to broader community indicating some of the issues identified and strategies being employed to overcome them.
Pre-DA submission	Public has an opportunity to validate the draft assessment summary (any glaring omissions?) Public provides input on draft assessment. Public provides formal input (submissions) on final assessment docs.	Inform Consult	It is recommended that the Proponent present photomontages of the draft layout of the turbines, and associated document at a drop in session that engages the local community. This would provide the Proponent with an opportunity to show the local community how their feedback has helped plan the most appropriate design for the locality. *1) Local:* Contact made by phone or letter with local area, providing summary information, asking for concerns. Follow-up with focused 'drop in' session(s) that informs the local community of the proposal and allows the Proponent to deal with specific issues in detail (if required). 2) *Broader:* Newsletter summarises findings in lay terms, indicates timeline for assessment and exhibition time lines. Feedback sought on summary, further concerns.
DA submission	Public understands the process (how decisions are made).	Inform	Newsletter / fact sheet.
Public exhibition period	Public is aware of the decision.	Inform	Newsletter and/or editorial.

Attachment 7. EXAMPLE OF COMMUNITY FEEDBACK FORM

EPURON

Community feed back form.

You can help us understand the impact of the proposed Yass wind farm on the local area by taking a few minutes to fill out this form. The results will be collated and used in the environmental assessment of the proposed wind farm.

Your feedback is particularly useful to us in three ways:

1. **To make sure we have thoroughly identified community concerns,**
2. **To make sure we haven't missed any important local information,**
3. **To feed this information back into the project and thereby allow for the best possible wind farm proposal to be submitted.**

Please be as specific as possible with your feedback; attach another sheet if you need more space.

---

1. What do you value the most about the local area:

- ☐ Views
- ☐ Community / family ties
- ☐ Historic values
- ☐ Recreation opportunities
- ☐ Work opportunities
- ☐ Other ……………………………………………………………………………………….

2. What is your interest in the local area (please provide details)

- ☐ Industry (Agriculture or Mining)……………………………………………………………...
- ☐ Recreation / tourism: ……………………………………………………………………..
- ☐ Live nearby:……………………………………………… ……………………..……..
- ☐ Work nearby……………………………………………………………………………..
- ☐ Other……………………………………………………………………………………..

3. Which statements describe you (tick all those that apply)

- ☐ I may see the wind farm from my house
- ☐ I may see the wind farm from my property or from my place of work
- ☐ I am a resident of the area in which the wind farm may be located
- ☐ I am a landowner involved with the proposal
- ☐ I may see the wind farm from a place of recreation. Where from?....................……………

4. If you have concerns about this wind farm, what aspect would have the <u>biggest impact</u> on you?
....
....
....

4. What do you <u>like</u> about wind farms, in general?
....
…………………………………………………………………………………………………
....
…………………………………………………………………………………………………

5. What do you <u>dislike</u> about wind farms, in general?
....
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

EPURON
Level 1, 75 Miller Street, North Sydney, NSW
Phone: (02) 8456 7400

EPURON

Community feed back form.

6. If you have concerns about this proposal, please state them under the appropriate headings.

a. Environmental issues (plants, animals, soils, water, air):

....
....
....

b. Visual issues:

....
....
....

c. Aboriginal or non-indigenous heritage issues:

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....
....

d. Noise issues:

....
....
....

e. Recreation issues:

....
....
....

f. Health issues:

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....
....

g. Community issues:

....
....
....

h. Other issues:

....
....
....

About you: this section is optional, however, adding your name and the **general area where you live** would add credibility to the survey and improve effectiveness.

Name ....
Address...
Phone ....

☐ I would like to be contacted by the proponents of the wind farm with further information about its assessment and development.

Please attach further comments on a separate sheet or send further correspondence to:
Julian Kasby, Epuron, Level 11, 75 Miller Street North Sydney, NSW

Attachment 8. COMMUNITY CONSULTATION MATERIAL

YASS WIND FARMS

Community Update No. 1 – November 2008

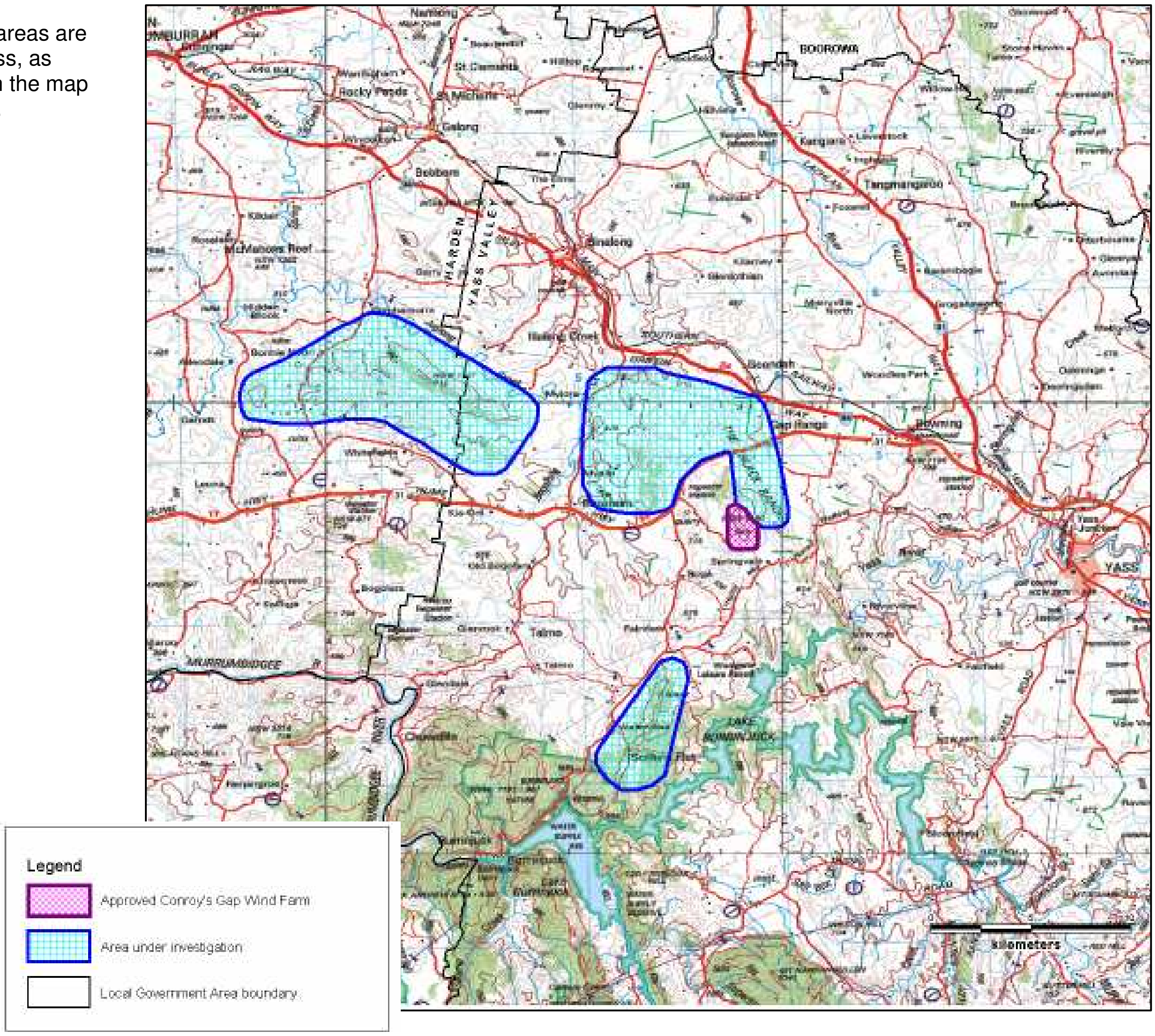
INTRODUCTION

EPURON has commenced investigations into the potential for three wind farms to the west of Yass. This newsletter presents the areas under study and outlines the opportunities for community participation in relation to the work.

EPURON invites local residents and other interested parties to an Open House / Information Day (details are over the page). This provides an opportunity to discuss the project in more detail and for the community to provide feedback.

YASS WIND FARMS PROPOSAL

The study areas are west of Yass, as indicated in the map to the right.



WHAT IS BEING PROPOSED

EPURON has recently started work to determine the potential for 3 wind farms to be located in the region west of Yass region, as indicated in the map. The wind farms are proposed in 3 distinct precincts, generally consisting of exposed hilltops and ridges to the north and south of the Hume Highway. The wind farms generate electricity that will feed into the NSW grid via the existing 132,000 volt powerlines in the area.

Our activities will include engagement with the local community to exchange information and to understand specific issues in relation to the project area.

Specialist investigations will be made in biodiversity, noise and visual impacts to enable us to understand and mitigate potential impacts of the projects.

EPURON will use this information as well as detailed computer modelling of predicted wind resources in the area to determine the potential number and location of wind turbines in the areas marked on the map above. The wind farm will use the latest technology wind turbines and at this stage a possible total of up to 195 wind turbines is envisaged across the 3 precincts.

POTENTIAL BENEFITS

Generation of new, clean, renewable power is required to meet increased customer demand and to reduce greenhouse gas emissions from carbon based fuels. The Yass area has excellent wind speeds and is well positioned to benefit from wind energy production.

The project will have a number of benefits:

- Clean, renewable energy, with no water used in generation. The project will provide enough renewable electricity for the average consumption of around 200,000 homes over a typical year;
- Reduced pollution and greenhouse gas emissions, leading to a better environment for future generations. The project will reduce greenhouse gas emissions by 1 million tonnes of CO_2 (equiv) over a typical year; and
- Income, employment and investment opportunities for the Yass and Harden regions.

APPROVAL PROCESS

The project will be assessed as a Major Project under Part 3A of the NSW Environmental Planning and Assessment Act. The NSW Minister for Planning is the approval authority. The application for approval will include an Environmental Assessment, which assesses the project against key issues that have been identified by the Director-General of the Department of Planning.

Environmental Assessment

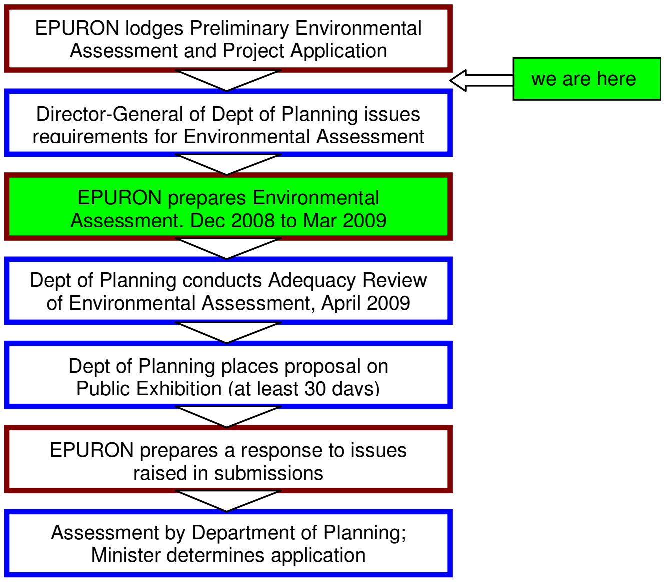
The Environmental Assessment identifies the potential environmental impacts of a proposal and how to mitigate them. Studies will include:

- background noise measurements;
- visual impact assessments;
- flora and fauna assessments including bird and bat studies;
- television and radio interference assessments;
- Aboriginal and other historic heritage; and
- traffic and transport impact assessments.

This will feed into the design process to ensure impacts are considered and the project modified accordingly. These studies are being carried out by independent contractors with input sought from the community.

Indicative timeframe

This chart shows the steps in the process we are following:



HAVING YOUR SAY

Input from the Community

Our aim is to ensure that we identify and, where possible, avoid or mitigate the potential impacts of the wind farm. Before finalising the proposal for submission to the Department of Planning, we wish to ensure that:

- all relevant issues are considered by EPURON in the assessment of the project; and,
- the community is fully informed and your feedback and concerns are considered in the proposal.

An independent phone survey and a recent poll by the Upper Lachlan Shire Council have confirmed strong support for wind farms, but we recognise that opinions in relation to wind farms vary between individuals. The objective of consultation is to determine how to develop the best wind farm possible on this site.

Community Information "Open House"

EPURON is holding an Open House to present the proposal, answer any questions and record community feedback. EPURON staff and consultants will be available to discuss the project and will have photo montages to show what the project is likely to look like.

Date:	Wednesday 10th December 2008
When	2pm – 7pm, drop in any time
Where	Royal Tara Motel 1 Stephen St, Binalong

CONTACT US

Write to us:	EPURON Pty Ltd Level 11, 75 Miller St NORTH SYDNEY NSW 2060
Contact:	Julian Kasby Project Manager Phone: 02 8456 7400 Fax: 02 9922 6645 Email: Yass-projects@epuron.com.au

EPURON

WIND FARM INFORMATION DAY

EPURON is proposing a wind farm on ridges in the Coppabella Range, Marilba Hills and Carrolls Ridge, approximately 20-35km west and south-west of Yass.

We're holding an open house in Binalong for the local community. It will allow you to learn more about the proposal, provide input and ask any questions.

Date: **Wednesday 10th December, 2008**
Time: **2pm-7pm (drop in any time)**
Place: **Motel Royal Tara**
Stephens St, Binalong

For further details, please contact:
Tim Browne, Ph: 6492 8333

EPURON PTY LTD
Level 11, 75 Miller St,
NORTH SYDNEY, NSW 2060
Fax 02 9922 6645

EPURON begins investigations of further potential for wind power in the Yass Region

Sydney, October 7, 2008: EPURON has commenced investigation into the feasibility of a wind farm to the west and south west of Yass in the NSW Southern Tablelands.

The area under investigation encompasses ridgeline areas along parts of Black Range, the Coppabella Hill's and Carroll's Ridge. Epuron expects there will be strong and consistent local wind speeds on the elevated areas that would be suitable for wind energy generation. The current investigation activities will enable EPURON to determine the wind farm configuration including turbine numbers and locations prior to presenting its concept plan to the community

"With careful consideration and planning, EPURON believes the wind farm can be developed with positive benefits to the environment and community." Project Director Simon Davey said.

EPURON values the input of the local community, the Council and other stakeholders in the planning of this project. Community consultation, at each stage of the process, will be incorporated into the project and this will include newsletters, open houses and media releases. The wind farm will be assessed under Part 3A of the Environmental Protection and Assessment Act, therefore the consent authority is the NSW Minister for Planning.

Investigations will include measurement of wind speeds at several locations and then assessment of noise propagation, flora and fauna (including bird and bat) investigations, assessment of aboriginal and European heritage values, visual impact studies (including photomontages to show what the wind farm might look like) and traffic and communications studies.

There is a necessity to reduce greenhouse gas emissions and wind farms provide efficient and reliable generation of clean renewable electricity into the electricity network. As costs associated with coal powered generation increase (and the price of carbon is factored in) renewable energy will play a significant role in meeting NSW's future energy needs.

Wind farms are good news for the environment, reducing greenhouse gas emissions and taking pressure off power stations that are suffering under drought and water shortages. They also bring jobs and investment to rural and regional NSW.

"By bringing forward this new project, not only do we ensure that this investment occurs within NSW, we also provide the capacity for a region like the Yass Valley to establish ongoing, long term, sustainable jobs through related service, construction and manufacturing industries. " Executive Director Andrew Durran said.

Further community updates will be regularly made as project proceeds. A community consultation day will be arranged later in the year to present details of the project.

Background

EPURON has received planning approvals for three projects in NSW to date: Snowy Plains (30 Megawatts, near Berridale), Cullerin Range (30 Megawatts, near Goulburn) and Conroy's Gap (30 Megawatts, near Yass). These three projects were sold to Origin Energy in January 2008. The Cullerin Range wind farm is now under construction. EPURON is currently developing the Gullen Range Wind Farm near Goulburn and, in partnership with Macquarie Capital, the Silverton Wind Farm in.

About EPURON

EPURON Pty Ltd is based in North Sydney and has been exploring wind resources in NSW since 2002. It is a subsidiary of EPURON GmbH, one of the world's leading project development and structured financing companies in the renewable energy sector. The company develops, finances, implements and operates solar and wind farms, solar thermal power stations as well as biogas and bio-ethanol plants.

Since its foundation in 1998, EPURON has financed and implemented over 60 large scale projects with a total capital cost of over 550 million euros. Its clients include institutional and private investors from many countries.

EPURON has subsidiaries or offices in Australia, Germany, Spain, France, Italy, Greece, Turkey, South Korea, India, Singapore and the USA. EPURON is a part of the listed company Conergy AG, a world leading company in wind, solar and other renewable power systems.

For further information about EPURON, please visit www.epuron.com.au or contact:

Martin Poole, Executive Director, phone 0411 159 114
Andrew Durran, Executive Director, phone 0407 206 199
Simon Davey, Project Director, phone 0405 735 260

EPURON PTY LTD
Level 11, 75 Miller St,
NORTH SYDNEY, NSW 2060
Fax 02 9922 6645

EPURON to host community information day for local wind energy projects

Sydney, December 3, 2008: EPURON is pleased to invite the local community to an information day on Wednesday 10th December to learn more about their proposal to build a wind farm on ridges in the Coppabella range, Marilba Hills and Carrolls Ridge to the west and south-west of Yass.

The purpose of the information day is to provide an opportunity for the community to see preliminary concepts of the proposal and preliminary results of the environmental studies as well as having the EPURON project team and specialists on hand to answer any questions.

"We are seeking input and comments from the community- which we see as essential to refining our proposal and developing the best possible wind farm on the site," Simon Davey, EPURON Project Director said.

"We hope that anyone who has questions, comments, concerns or just wants to learn more about this exciting project will come along and meet with our team of experts," Mr Davey said.

Date: **Wednesday 10th December, 2008**

Time: **2pm-7pm (drop in any time)**

Place: **Motel Royal Tara, Stephens St, Binalong**

EPURON has now submitted a Project Application to the Department of Planning seeking its requirements for the Environmental Assessment of the project. The Project Application is the first stage of the project approval process. It outlines the project under consideration sufficiently to allow the Department of Planning to specify its requirements in relation to EPURON's Environmental Assessment.

The Project Application was lodged following a Planning Focus Meeting (PFM) which was held on-site on the 14th and 15th of October. The PFM is a forum that enables relevant government agencies to provide input to the Department of Planning in formulating the environmental assessment requirements for the proposal.

Preliminary environmental investigations at the site have commenced and include background noise measurements, flora and fauna (including bird and bat) investigations, assessment of aboriginal and European heritage values, visual impact studies and traffic and communications studies. The results of these studies, along with community feedback, will enable EPURON to finalise the proposal (including the number and location of turbines, electricity connections and access roads) for submission to the Department of Planning in the coming months.

Media Contact: Andrew Bradley, Wilkinson Media (02) 8001 8888; 0403 777 137

For further information about EPURON, please visit **www.epuron.com.au** or
contact Simon Davey, Project Director Ph: 0405 735 260

Attachment 9. COMMUNITY PERCEPTION STUDY

Wind Farm Impact Study - Southern Tablelands

a research report prepared for

EPURON
POWER FOR PORTFOLIOS

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Ref: EPURON 160707 AR
August, 2007

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EXECUTIVE SUMMARY

The research study presented in this document was conducted in late July and early August in 2007. It was conducted in an election year and in an environment where media exposure has accelerated public interest and concern with the global warming issue, heightened awareness of alternative energy sources and subsequently has assisted related environmental issues capture more of the daily news agenda.

The respondents in this study were located in urban and rural locations in the Southern Tablelands of New South Wales. An area which included the existing Crookwell wind farm to the North of Goulburn together with adjoining areas in which wind farm developments had been announced and others planned. The research question was: What is the impact of the existing and proposed wind farm developments in the Southern Tablelands?

Prior to the conduct of this study we didn't know just how much adults living in the survey area knew of Crookwell or the other planned projects, or indeed what they knew, if anything, of wind farms or what the wind turbines that populated and powered them look like, let alone know what they actually did or how their attitudes might be influenced by the issue of global warming.

The outcomes of this study show, viz:

- 80% of respondents are concerned, right now, with the threat of global warming and its impact on the environment. A very high proportion, but down somewhat on the nine in ten respondents reflecting similar concerns in the national AC Neilsen survey conducted in October 2006 at the height of the drought. 16% said they were unconcerned.

- 50% of respondents felt *"Global warming is a serious and pressing problem [and] we should be taking steps now even if this involves significant costs".* We have called this group the 'act now' advocates and 97% of this group are 'concerned', right now, with the threat of global warming. This group is the most committed to accepting and adopting steps to address global warming and approaches the issue with a sense of urgency. It is biased toward females, those under 55 years of age and those with a university qualification. In the Lowy Institute national poll conducted 12 months ago, just on seven in ten respondents classified themselves in this category. The smaller proportion reflected in this study is perhaps reflective of a growing public conservatism with the issue of global warming due to the high level of media exposure the subject has received.

- 33% of respondents *felt "The problem of global warming should be addressed, but its effects will be gradual, so we can deal with the problem gradually"*. We have termed those in this group the 'gradual response' advocates and whilst two in three are concerned with the threat of global warming, one in three are not. In profile this group is biased toward males, those over 55 years of age and with a trade or tertiary education. They emerge as a conservative group.

- 17% of respondents make up the third of our global warming analysis groups and they felt *"Until we are sure global warming is really a problem, we should not take any steps that would have economic costs".* We have termed those in this group the 'Do not incur costs' advocates: six in ten are concerned with the threat of global warming, four in ten are not. In profile this group has a similar profile to the 'gradual response' group but are less urban with a bias towards those living out of town.

- 65% of respondents considered the existing Crookwell wind farm was located in their local rural area; 35% did not. An analysis of the demographic profiles of the two groups shows there is no significant difference in their profiles, other than where they conduct their major weekly grocery shopping. Nonetheless there is a difference between these two groups in terms of their supportiveness of wind farm development in the Southern Tablelands. Those who do not consider the existing Crookwell wind farm to be in their local rural area tend to be much more conservative in their attitude to wind farm development in the Southern Tablelands. Experience counts.

- When respondents think of clean energy, they think of solar power (91%) and wind power (86%), well ahead of water or hydro-electric power (72%) and wave or tidal power (57%). But when you ask them to nominate acceptable power sources for a new power station to be built 10 kilometres from home, solar (82%) and wind power (81%) dominate. Given the choice of only one source of power for such a power station, 48% select solar and 41% select wind. In the absence of solar power, 80% select wind power as the preferred source of power for a new power station located 10 kilometres from home.

- 90% of respondents were aware of announcements of wind farms to be built in the Southern Tablelands, albeit only 32% could nominate Crookwell and 21% Taralga as prospective sites on an unaided basis. Despite the vagueness with respect to the name and location of prospective wind farm developments in the Southern Tablelands the consciousness of such activity was high.

- When it came to assessing respondents' understanding and knowledge of wind turbines and wind farms, we found:

  - 97% knew what a wind turbine was;
  - 93% had seen a picture of a wind turbine;
  - 89% had seen an actual wind turbine;
  - 83% were aware a wind farm was a collection of large wind driven wind turbines;
  - 90% had seen a wind farm;
  - 85% of those who had seen a wind farm, mentioned they had seen the Crookwell wind farm (unaided)
  - 67% of those who had seen a wind farm, found them to be visually appealing, only 15% did not.

- When it came to assessing the benefits and advantages of wind farms, the principal advantages mentioned, were, viz:

  - 56% Safe / low impact (on environment);
  - 49% Source of energy / power / electricity;
  - 21% Environment / friendly affect on the environment;
  - 15% Cost effective / low maintenance;
  - 4% No advantages.

- Whilst 40% of respondents perceived no disadvantages, the principal disadvantages mentioned, were, viz:

  - 29% Effect on the environment;
  - 18% Appearance;
  - 10% As a power source;
  - 6% Takes up a lot of space;
  - 5% The cost;
  - 3% Devaluates property
  - 2% Safety
  - 40% No disadvantages.

- Whilst respondents are prepared to be critical of wind farms, when it comes to a trade-off between clean energy and the landscape, 91% agreed: *"We need to use wind power as a source of clean energy even if it mean changing the appearance of some landscapes".*

- 89% of respondents were in favour of wind farm projects being developed in the Southern Tablelands. 5% were opposed.

- When it came to being specific about their attitudes to wind energy and wind farms, the adults surveyed in this community survey reflected the following, viz:

    - 96% agreed: *"Wind energy is a good alternative energy source".*
    - 92% agreed: *"Australia should be investing more in wind energy".*
    - 91% agreed: *"I would be happy to see more wind farms in Australia".*
    - 84% agreed: *"Local government should encourage wind farm development".*
    - 65% agreed: *"Wind farm developments contribute to the local economy"*
    - 83% agreed: *"I would be happy to see a wind farm built on farm land near where I live".*

- Placing a focus on the 'local rural area' of respondents, we found (as noted) that 65% of the adults resident in the defined survey area considered that the existing Crookwell wind farm was located in their local rural area: 35% did not. Nonetheless:

    - 94% were aware of the Crookwell wind farm;
    - 82% had seen the Crookwell wind farm;
    - 24% saw the Crookwell wind farm at least once a week – on average it was seen on at least 44 occasions each year by those who had seen it;
    - 68% lived more than 25 kilometres from the Crookwell wind farm
    - 85% were in favour of the Crookwell wind farm – in particular 89% of those who said the wind farm was in their local rural area vs 78% of those for whom the wind farm was not in their local rural area.

- We told respondents that scientific tests conducted at wind farms have shown that people need to be less than approximately 800 metres from the wind turbines for them to hear any significant noise, even in extreme wind conditions. Bearing that in mind we asked whether they would favour / oppose a wind farm if it was to be located at a given distance from where they lived now. We found:

    - 87% favoured a wind farm located 25 km from home (5% opposed)
    - 83% favoured a wind farm located 10 km from home (8% opposed)
    - 79% favoured a wind farm located 3 km from home (13% opposed)
    - 71% favoured a wind farm located 1 km from home (19% opposed)

- We introduced the concept of wind farm size, in terms of the number of wind turbines that comprised a given wind farm, by asking respondents whether or not they were aware of the following wind farm developments in the Southern Tablelands, viz:

    - 71% were aware of Crookwell 2 wind farm near Crookwell with 46 turbines;
    - 63% were aware of Taralga wind farm near Taralga with 69 turbines;
    - 59% were aware of the Gunning wind farm near Gunning with 32 turbines;
    - 54% were aware of Cullerin Range wind farm with 15 turbines
    - 51% were aware of Conroy's Gap wind farm near Yass with 15 turbines.

- We then asked respondents to consider whether they would favour or oppose wind farms of varying sizes in their local rural areas and found, viz:

    - 88% favoured a small wind farm of up to 15 turbines (7% opposed);
    - 76% favoured a 'typical' wind farm with 15 to 80 turbines (19% opposed); and
    - 61% favoured a large wind farm with greater than 80 and up to 120 turbines (32% opposed)

- When asked to consider how two 'typical' wind farms (ie 15 to 80 turbines) should be located in their local rural area, six in ten respondents indicated they would prefer the wind farms to be either adjacent or nearby each other. The remaining four in ten preferred the second 'typical' wind farm to be located further away and out of sight of the first wind farm – on average about 20 kilometres away.

- Having introduced the concept of two 'typical' wind farms in their local rural area, we asked the respondents whether they would favour or oppose two 'typical' wind farms located in their local rural area. We then asked about three wind farms of this size and finally about four 'typical' wind farms each of 15 to 80 turbines located in their local rural area. We found the following, viz:

    - 76% accepted ONE typical wind farms with 15 to 80 turbines in their local rural area (19% opposed);
    - 75% accepted TWO typical wind farms with 15 to 80 turbines in their local rural area (17% opposed)
    - 64% accepted THREE typical wind farms with 15 to 80 turbines in their local rural area (27% opposed); and
    - 56% accepted FOUR typical wind farms with 15 to 80 turbines in their local rural area (34% opposed).

- In the event of the development of a number of 'typical' wind farms on the ridges and hills respondents can see when travelling along the main road or highway in the local rural area, respondents were evenly divided as to whether they should be concentrated in a few clusters, or spread out at reasonable intervals of 8 to 10 kilometres along the highway.

Those respondents with an 'act now' response to global warming make up to half the community surveyed. The adults who fall into this group are strong advocates for wind farms and some 62% of this group would, if necessary, favour four 'typical' wind farms in their local rural area versus only 51% for those in either the 'Do not incur cost' or 'Gradual' response groups. Those who hold the 'act now' response to global warming are quite clearly the drivers for the promulgation of the acceptance of alternative energy sources in the community. In the case of this study, they are the drivers of prospective wind farm development in the Southern Tablelands.

Experience living with wind farms also appears to be a powerful factor inducing the support of wind farm development. 61% of those who presently have a wind farm in their local rural area (ie Crookwell) favour four wind farms versus only 48% of those who don't have a wind farm in their local area. Experience does count!

In terms of optimum development, it would certainly appear that even if the response to global warming wanes somewhat in future, the development of certainly two and perhaps three wind farms of 15 to 80 turbines in the local rural area would attract the support of six in ten adult residents. Higher acceptance levels are probable with the continued experience of living with wind farms in the local rural area. Clearly there is a point at which the addition of another 'typical' wind farm will produce a resounding 'NO' from the community. That point would appear to be beyond four 'typical' sites. Given the size and geographic scope of the Southern Tablelands, the five prospective wind farm developments in this area run across many 'local rural areas' and judging from the 89% who favour these developments in the Southern Tablelands they should attract nothing other than the full endorsement of a clear majority of residents in the Southern Tablelands.

INTRODUCTION

This report presents the outcome of a community survey based on 300 telephone interviews conducted with adult residents of a survey area in the Southern Tablelands of New South Wales in the Goulburn – Yass region. The survey area was selected as it bounds an area where an existing wind farm is located (Crookwell I) and also comprises an area in which future wind farms may be located. A map of the defined survey area may be found in the Appendix to this report. Fieldwork for this study was conducted during the evenings and on the weekend in the period commencing Friday, July 27, 2007 and concluding on Thursday evening, August 2, 2007

The research method and survey questionnaire used in this study was developed by REARK Pty Ltd in conjunction with executives of Environmental Resources Management [ERM] and EPURON Pty Ltd. The study is part of a wider project to be conducted by ERM on behalf of EPURON.

The broad focus of the community survey reported here is to provide a benchmark measure of the community's awareness and acceptance of wind farm development as it exists now in the defined survey area with a view to also providing an insight into the likely cumulative community impact of further wind farm development in this area of the Southern Tablelands.

When reading the report it is important to understand this study has been conducted against the background of community discussion concerning global warming and the consequent interest in the development of alternative energy sources.

Wind farms are not a new phenomenon in Australia. Indeed, Australia's first wind farm was commissioned in 1993 near Esperance in Western Australia. By the end of 2006 there were some 27 wind farms in operation in Australia. Until recent years a wind farm was little more than a curiosity for the average Australian with the early wind farm developments located in more remote, less traveled regions of Australia. However, since 2000 growing concern with 'global warming' has stimulated public interest and curiosity in alternative energy sources and increasingly more Australians have become familiar with the issue and potential alternative forms of power generation.

By late July, 2007, the time when this survey was conducted, news items and articles dealing with 'global warming' and with specific alternative energy sources such as wind and solar power had become almost commonplace. Several years ago news items concerning such issues were buried more deeply in the general news, but in recent times these issues have gradually moved more to centre stage in the news media. No doubt John Howard's announcement in June, 2006 stating the Federal Government had an 'open-mind' on the construction of nuclear power plants in Australia and the former Vice-President Al Gore's much publicised documentary "An Inconvenient Truth" released in November, 2006 and the recent ABC TV series "Carbon Cops" are reflective of media exposure which has accelerated the public interest and concern with the global warming issue, heightened awareness of alternative energy sources and subsequently has assisted related environmental issues capture more of the news foreground.

It is against this background the community survey reported in this document was conducted. Moreover, the community in question is distinguished by the fact that it is located in an area adjacent to or in the vicinity of existing, approved and proposed wind farm developments. In the pages to follow we outline the Research Objectives set for the survey and provide the survey results in detail.

RESEARCH OBJECTIVES

It has been hypothesized community attitudes to wind farms are inextricably bound to attitudes to global warming and the perceived urgency of the need to adopt alternative clean energy sources as a means of ameliorating the impact of global warming. In developing the detailed information objectives for this study we were mindful of contemporary research undertaken by the Lowy Institute and others, including a similar recent study conducted by REARK.

For this survey, interviews were conducted amongst adult residents who lived adjacent to, or in the vicinity of, the existing Crookwell wind farm situated in the vicinity to the North of Goulburn in New South Wales together with those residing in the immediate adjoining areas in which wind farm developments had been announced and others planned – a region termed the Southern Tablelands. The research question was: What is the impact of the existing and proposed wind farm developments in the Southern Tablelands?

To address this question it was determined to measure, in the context of the concern for global warming, the perceptions, experience and expectations of the community residing in the defined survey area based on what they know and understand wind farms to be. The community survey was therefore designed to satisfy the following research objectives, viz:

- Level of community concern with the issue of global warming and perceived responses to this threat;
- Perceptions of clean energy sources and personal preferences;
- Awareness, knowledge and perceptions of wind turbine generators, wind farms and wind farm projects in the Southern Tablelands and specifically in the local area;
- Perceived benefits and advantages/disadvantages of wind farms;
- Attitudes to the construction of wind farms in terms of the trade off between clean energy and landscape; favour/oppose wind farm development in the Southern Tablelands; perceived need for wind energy and perceptions of location close to home;
- Awareness and assessment of existing wind farms and those planned for the local region;
- Perceptions of proximity in wind farm location and progressive acceptability of an increasing number of clusters of wind farm developments in the direct vicinity of the community.

These information objectives were incorporated into the questionnaire employed for the community survey. A copy of the questionnaire in outline form is provided in Appendix II.

A map showing the boundaries of the area in which the community survey was conducted may be found in Appendix I, which also contains details of the research method employed, including a summary of the sampling procedure and call statistics arising from the sampling implementation and fieldwork.

The outcomes from this research are presented on the pages to follow.

RESULTS IN DETAIL

In these pages we present the principal outcomes of this study. The tables presented in this report have been drawn from the Detailed Tabular Results which have been presented separately and which contain a complete analysis of all questions asked in the survey questionnaire. The reference to "DTR Table" contained within the various tables in this report refers to the table number within the Detailed Tabular Results from which the table presented was drawn.

1. Attitudes to global warming

Global warming is commonly defined as an increase in the temperature of the earth's atmosphere and in particular a sustained increase sufficient to cause climate change on a global scale. The scientific consensus is that most of the global warming that has occurred over the last 50 years has its source in human activity. The source of this human-induced activity is the release of carbon dioxide and other greenhouse gases into the atmosphere by the burning of fossil fuels, land clearing and agriculture leading to an increase in the greenhouse effect.

Given there is an active discussion concerning global warming in the media and as part of our daily lives, we wanted to establish as a benchmark within the survey area, the level of concern, if any, that exists within the community and how they felt we should be dealing with the problem.

Table 1: Concern with the threat of Global Warming

Q.1 Recently there has been much discussion in newspapers on radio and television concerning global warming … Overall how concerned would you say you are right now with the threat of global warming and its impact on the environment … would you say you are … *(read out)*

DTR Table: 4.0	TOTAL
WEIGHTED BASE	300
	%
Q1 Overall concern with the threat of global warming and its impact on environment	
Definitely concerned (5)	32%
Somewhat concerned (4)	48%
or, Neither concerned or unconcerned (3)	4%
Somewhat unconcerned (2)	9%
Definitely unconcerned (1)	8%
TOTAL CONCERNED	80%
TOTAL UNCONCERNED	16%
TOTAL	100%
MEAN	3.88
STD DEV	1.18
STD ERR	0.07

As Table 1 shows eight in ten adults say they are concerned, right now, with global warming and its impact on the environment. Less than two in ten say they are 'unconcerned'. 'Concern' as measured here, albeit in a regional area of only one State, is down somewhat when compared to the national 'Wind Energy Study' conducted with a national sample of n = 1505 in October, 2006 when, at the height of the drought, some nine in ten Australians indicated they were 'concerned about environmental issues and climate change'.

Earlier, in July, 2006 the Lowy Institute conducted a national poll of Australians and asked them which of three alternatives best reflected the way they felt about global warming. We asked the same question in this study in order to obtain a reflection of current feeling, albeit from a regional area in only one State, to establish a relative benchmark following the passage of 12 months.

Table 2: Statements concerning global warming

Q.2 Which one of the following statements comes closest to the way you feel *(read out)*					
DTR Table: 5.0			Q1 Concern with Global Warming		
	Lowy Institute National Poll July 2006	TOTAL	Concerned	Neither concerned unconcerned	Unconcerned
WEIGHTED BASE	1007	300	240	11	49
	%	%	%	%	%
Q2 Statement which comes closest to feeling					
Global warming is a serious and pressing problem. We should be taking steps now even if this involves significant costs.	68%	50%	61%	8%	7%
			+++		---
Until we are sure that global warming is really a problem, we should not take any steps that would have economic costs.	7%	17%	12%	24%	41%
			---		+++
The problem of global warming should be addressed, but its effects will be gradual, so we can deal with the problem gradually	24%	33%	27%	68%	52%
			---		++
Don't Know	1%	-	-	-	
TOTAL	100%	100%	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---					

What Table 2 suggests is a growing conservatism in respondents' attitudes to the appropriate response to global warming. In the Lowy Institute Poll 12 months ago just on seven in ten Australians felt global warming is *"a serious and pressing problem [and] we should be taking steps now even if this involves significant costs"* . In the community survey just undertaken only five in ten are demanding an immediate response – a significant difference and a marked downward shift in the urgency of the issue relative to 12 months ago. Indeed compared to the Lowy Institute Poll we can see a migration away from an immediate response to a more gradual response (reflected by three in ten) and a more conservative approach against taking steps that would incur economic costs mentioned by nearly two in ten.

Notwithstanding the decline in urgency, relative to the Lowy Institute Poll, it is nonetheless clear that more than eight in ten respondents are calling for some response albeit gradual in many cases.

Table 2 shows those who expressed 'concern' with the issue of global warming weren't all advocating immediate steps be taken to address the issue. Whilst six in 10 were advocating such a response, of the balance nearly three in ten were suggesting a gradual response, whilst about one in ten were advocating do not incur economic costs until we are sure global warming is really a problem. An outcome that is similar to the Lowy Institute Poll in July, 2006.

Those who indicated they were 'unconcerned' with the global warming issue were more inclined to a gradual response (52%) or averse to incurring economic costs until we are sure global warming is a problem (41%).

2. Clean energy sources

As we noted in the introduction to this report there has been much public discussion and many media reports addressing the issue of clean energy. We asked respondents in this study, which energy sources they felt were clean.

As Table 3 shows sun or solar power emerges ahead of those nominated, marginally ahead of wind power. Indeed just on nine in ten respondents mentioned these two energy sources.

Water or hydroelectric power (69%) and wave or tidal power (57%) were also mentioned by a majority of respondents, albeit at a significantly lower level than solar or wind power. Nuclear power was mentioned by two in ten.

There was no significant difference in the response when analysed by the respondents' response to global warming, save that clean coal or gas fuelled power stations where pollutants are buried was nominated by a significantly greater proportion (20%) than the sample as a whole (14%).

Table 3: Identification of clean energy sources

Q.3 Australia's demand for electricity is rapidly increasing. There are a number of ways of meeting this demand one of which involves the use of 'clean energy' sources. Which of the following do you regard as clean energy sources … *(read out)*?
RANDOMISE ORDER

DTR Table: 6.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q3 Regard as clean energy sources				
Sun or solar power	91%	93%	85%	91%
Wind power	86%	89%	78%	86%
Water or hydroelectric power	69%	67%	74%	67%
Wave or tidal power	57%	57%	44%	63%
Nuclear power	20%	16%	26%	24%
Clean coal or gas fuelled power stations where the pollutants are buried	14%	8%	18%	20%
		--		+
TOTAL	336%	331%	325%	350%

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

3. Clean energy and personal preferences close to home

In order to obtain a measure of respondents' preferences for clean energy sources, we sought to make the choice more realistic by asking which of the clean energy sources we had mentioned they would approve for use in a new electric power station if it was to be built within 10 kilometres of where they live. The outcome is shown in the first column in Table 4 below. Not surprisingly eight in ten respondents selected solar and wind power as approved energy sources for the new power station within 10 kilometres of their home.

As each respondent had nominated about two energy sources, we asked respondents (in Q.4B) to nominate which one energy source they would prefer. The outcomes are shown in the second column of Table 4 below and these have been analysed by respondents' responses to the threat of global warming.

Table 4: Energy sources for a new power station

Q.4A If there was to be a new electric power station built say within 10 kilometres of where you now live, which of the following energy sources would you approve for use by that new power station? Would you approve … *(read out)*
Q.4B IF MORE THAN ONE: And which one energy source would you prefer to see used by such a new power station? RANDOMISE ORDER

DTR Tables: 7.0 & 8.0	Q.4A	Q.4B	Q2 Response to Global Warming		
	TOTAL	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	300	150	52	98
	%	%	%	%	%
Q4A Power station built within 10 kilometres - energy sources approved					
Q4B One energy source prefer to see used by new power station					
Sun or solar power	82%	48%	53%	41%	43%
Wind power	81%	41%	40%	40%	42%
Clean coal or gas where the pollutants are buried	16%	3%	2%	5%	4%
Nuclear power	14%	4%	2%	6%	6%
None of these	3%	3%	1%	6%	4%
Don't know	2%	2%	2%	2%	2%
TOTAL	198%	100%	100%	100%	100%

When it came to choosing just one energy source solar power (48%) emerges marginally ahead of wind power (41%). The other energy source choices languish well behind.

In order to force a choice between solar and wind power, we asked respondents which energy source they would select if solar power was not included and the choices available were restricted to wind power, clean coal or gas or nuclear power. In these circumstances, as is shown in Table 5 below, wind power (80%) emerged as the clearly preferred energy source for a new power station within 10 kilometres of respondents' homes.

It is interesting to note that those whose response to global warming was 'act now despite the costs' had a stronger preference (85%) than the sample overall and significantly greater than those who were opting for a 'gradual response' (73%) to global warming.

Table 5: Choice between wind, coal and nuclear

Q.4C If the choice was between (*read out list*) … which one energy source would you prefer to see used by such a new power station? RANDOMISE ORDER				
DTR Table: 9.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q4C Power source prefer to see used by such a new power station – excludes solar				
Wind power	80%	85%	78%	73%
		+		-
Clean coal or gas where the pollutants are buried	9%	7%	12%	11%
Nuclear power	7%	5%	7%	9%
None of these	1%	0%	0%	3%
				+
Don't know	3%	3%	2%	3%
TOTAL	100%	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

4. Awareness of wind farms

In order to establish attitudes to wind farms later in the questionnaire, we introduced respondents to the topic of wind farms and wind turbines via a reference to recent announcements concerning the construction of wind farms in the Southern Tablelands in New South Wales (ie the area in which the study was conducted). We asked respondents whether or not they had heard of such projects before the conduct of this study.

Table 6: Awareness of wind farms

Q.5A Recently there have been announcements of wind-farms to be built in the Southern Tablelands, encompassing the Goulburn-Yass region, to generate electricity … had you heard of any of these projects before today?				
DTR Table: 10.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q5A Heard of southern tablelands, encompassing the Goulburn-Yass region projects				
Yes	90%	88%	97%	90%
No	9%	12%	2%	10%
			-	
Don't Know	1%	0%	2%	0%
TOTAL	100%	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

Table 6 shows that nine in ten respondents were aware of wind farm projects in the Southern Tablelands. A very high proportion indeed.

As a follow-up to that question, we asked respondents if they could nominate the name(s) and/or the location of the wind farm projects they were aware of. In Table 7 below, we have put forward the full range of project 'names' nominated by respondents.

Table 7: Names of wind farm projects in the Southern Tablelands

Q.5B Which project or projects was that? (*record name and/or location of project*) *Probe once*: Any others?				
Filter: "Yes" in Q5A Heard of wind farm projects in Southern Tablelands				
DTR Table: 11.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	270	131	50	89
	%	%	%	%
Q5B Name of project				
CROOKWELL	20%	21%	15%	20%
TARALGA WIND FARM	16%	14%	10%	21%
YASS	6%	6%	3%	6%
CONROYS GAP WINDFARM	5%	4%	4%	5%
WIND POWER / TURBINE	4%	1%	11%	6%
		--	++	
CULLERIN	4%	3%	3%	7%
WIND FARM	4%	8%	2%	0%
		++		-
GUNNING	3%	2%	1%	5%
WOODLAWN	2%	2%	2%	4%
CULLIN RANGE WIND FARM	2%	4%	0%	0%
		+		
GOULBURN	2%	2%	2%	1%
BLACK RANGE	1%	2%	0%	0%
CANBERRA	1%	1%	0%	1%
COLOURING RANGES	1%	1%	0%	1%
OBERON	1%	0%	2%	1%
BANNISTER	1%	1%	0%	1%
GULLIN RIDGE WINDFARM	1%	0%	0%	2%
CROOKLAND	1%	0%	0%	2%
BREDALIBAE	1%	0%	0%	2%
THE WOODLINE	1%	0%	0%	2%
GUNDARINGA PROPERTY	1%	1%	0%	0%
BUNDASL OR BRADEWOOD	1%	1%	0%	0%
QUEENBIEN WAY	1%	1%	0%	0%
GRABBEN GULLEN	1%	0%	3%	0%
			+	
ORANGE	0%	1%	0%	0%
CURRAWANG	0%	0%	2%	0%
			+	
GURRANDAH	0%	0%	2%	0%
			+	
WOODBURN	0%	0%	0%	1%
MURRUNBATEAN	0%	1%	0%	0%
TARAGO	0%	1%	0%	0%
NUCLEAR POWER STATION	0%	0%	2%	0%
			+	
RODALBIN	0%	1%	0%	0%

Q.5B Which project or projects was that? (<u>record name and/or location of project</u>) *Probe once*: Any others?				
Filter: "Yes" in Q5A Heard of wind farm projects in Southern Tablelands				
DTR Table: 11.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	270	131	50	89
	%	%	%	%
KIALLA	0%	1%	0%	0%
ALL OF THEM	0%	0%	0%	1%
EPPRON	0%	1%	0%	0%
SPRING RANGE	0%	0%	2%	0%
ALLADUILLA SHIRE	0%	0%	2%	0%
ACT BOARDER	0%	0%	2%	0%
COLLEX	0%	0%	0%	1%
TARAGA	0%	1%	0%	0%
WINDELLAMA	0%	0%	0%	1%
BUNGENDORE	0%	0%	0%	1%
TALGANDRA	0%	0%	1%	0%
LAKE GEORGE	0%	1%	0%	0%
DON'T KNOW	15%	19% +	10%	10%
Not answered	30%	24% -	41%	32%
TOTAL	126%	122%	122%	135%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

Table 7 shows the names of wind farm projects provided by the 90% of respondents who were aware of wind farm projects in the Southern Tablelands. Inspection of the table shows that of those who were aware of projects some 45% could not nominate a name of a wind farm project. Of those who could, Crookwell (20%) and Taralga (16%) were the most frequently mentioned.

Similarly, in Table 8 we have provided the locations of wind farm projects nominated by the 90% of respondents who claimed awareness of wind farm projects in the Southern Tablelands.

Table 8: Locations of wind farm projects in the Southern Tablelands

Q.5B Which project or projects was that? (<u>record name and/or location of project</u>) *Probe once*: Any others?				
Filter: "Yes" in Q5A Heard of wind farm projects in Southern Tablelands				
DTR Table: 12.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	270	131	50	89
	%	%	%	%
Q5B Location of project				
CROOKWELL	32%	35%	27%	29%
TARALGA / TRARALGA	21%	18%	21%	25%
YASS	10%	10%	13%	7%
GOULBURN	9%	10%	9%	7%
CONROYS GAP	7%	7%	8%	7%

Q.5B Which project or projects was that? (<u>record name and/or location of project</u>) *Probe once*: Any others?				
Filter: "Yes" in Q5A Heard of wind farm projects in Southern Tablelands				
DTR Table: 12.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	270	131	50	89
	%	%	%	%
GUNNING	5%	3%	8%	7%
CULLERIN	4%	2%	2%	7%
				+
TARAGO	2%	3%	0%	1%
GULLEN	2%	2%	3%	0%
MURRUMBATEMEN / MURRUNBATEAN	1%	2%	0%	0%
WOODLAWN	1%	0%	2%	2%
PARKSBOURNE	1%	2%	0%	0%
WALWA	1%	0%	4%	0%
			++	
BIGGA	1%	0%	4%	0%
			++	
KIALLA	1%	0%	2%	1%
ORANGE	1%	1%	0%	1%
PEJAR	1%	0%	2%	1%
NEAR BOOKHAM	1%	0%	0%	2%
IN THE TABLELANDS	0%	0%	2%	0%
			+	
GUNDOWINGA	0%	0%	2%	0%
			+	
WOODBURN	0%	0%	0%	1%
BLAINY	0%	1%	0%	0%
BANASTA AREA	0%	0%	0%	1%
WARRANGORORY	0%	0%	0%	1%
SPRING RANGE	0%	0%	2%	0%
COLAMARRI RANGES	0%	0%	2%	0%
WALLA WALLA	0%	0%	0%	1%
BOWING	0%	1%	0%	0%
LETTON	0%	0%	0%	1%
BREADALBANE	0%	0%	1%	0%
TARADALE	0%	1%	0%	0%
BLACKRANGE RD	0%	1%	0%	0%
LAKE GEORGE	0%	1%	0%	0%
Not answered	22%	24%	15%	24%
TOTAL	124%	122%	128%	124%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

Unlike the previous table, where just under half the respondents who claimed awareness of wind farm projects in the Southern Tablelands were unable to name the project, only two in ten were unable to nominate a location. The most frequently mentioned locations were Crookwell (35%) and Taralga (21%). Amongst those who could nominate a location, a very wide range of locations were nominated.

It is clear from the outcomes presented here that a very high proportion of respondents in the survey area were aware of the term 'wind farm' and had a high level of awareness, albeit somewhat vague as to name and location in some instances of prospective wind farm projects.

5. Perceptions and knowledge of wind turbines

To ensure that all respondents were aware of what a wind turbine was, in the question to follow, we provided a description of a wind turbine and asked respondents whether or not they were aware of wind turbines as described.

Table 9: Awareness of wind turbines

Q.6 The electricity from these projects is to be generated via the placement of a number of wind turbine generators in each area. Each generator is a large three bladed windmill mounted up high on top of a tubular tower and the wind turns the blades to generate the electric power … A. Were you aware of this type of wind turbine before today?				
DTR Table: 13.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q6A Aware of wind turbine				
Yes	97%	98%	99%	96%
No	3%	2%	1%	4%
Don't Know	0%	0%	0%	1%
TOTAL	100%	100%	100%	100%

In view of the near total awareness of wind turbines, it is not surprising there was a correspondingly high proportion of those adults resident in the survey area who claimed to have either seen a picture of a wind turbine or had seen an actual wind turbine of the type described, viz:

Table 10: Visual experience of wind turbines

Q.6B Have you seen a picture of a wind turbine of the type I have described? Q.6C And have you ever seen an actual wind turbine of the type I have described?				
DTR Table: 14.0 & 15.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q6B Seen a picture of a wind turbine				
Yes	93%	91%	97%	93%
No	6%	8%	3%	6%
Don't Know	1%	1%	0%	1%
Q6C Seen an actual wind turbine				
Yes	89%	91%	91%	86%
No	11%	9%	9%	14%
TOTAL	100%	100%	100%	100%

As the preceding tables demonstrate, adults living in the survey area were informed with respect to the components of a wind farm: nearly all being aware of what a wind turbine is, having seen a picture of one and in most, if not all cases, having seen an actual wind turbine.

6. Awareness and perceptions of wind farms

Whilst most respondents were aware of announcements concerning wind farm projects in the Southern Tablelands and nearly all had an appreciation of what a wind turbine was, we needed to be certain as to what respondents thought wind farms to be. Accordingly, we read a description of a wind farm to respondents and asked them if they were aware of wind farms as described, whether they had seen a wind farm and the location of the wind farm(s) they had seen.

The outcomes of the questioning approach, as shown in Table 11 below, revealed that slightly more than eight in ten respondents were aware of what wind farms were and their power generating capacity prior to the conduct of the survey. Further some nine in ten respondents claimed to have seen a wind farm, reflecting that around one in ten were not aware of its power generating capacity.

Table 11: Awareness and exposure to wind farms

Q.7 A wind farm is a collection of large wind-driven wind turbines of the type I have described … an average to large wind farm makes enough electricity to power a large regional centre …
A Were you aware of this before today?
B Have you ever seen a wind farm?

DTR Table: 16.0 & 17.0	TOTAL	Q2 Response to Global Warming: Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q7A Aware a wind farm is a collection of large wind driven wind turbines				
Yes	83%	80%	86%	85%
No	14%	16%	10%	13%
Don't Know	3%	4%	4%	2%
Q7B Ever seen a wind farm				
Yes	90%	90%	96%	87%
No	10%	10%	4%	13%
TOTAL	100%	100%	100%	100%

When those who had claimed to have seen a wind farm (90%) were asked to nominate where they had seen it, there were many places in Australia and overseas nominated. However, demonstrating a very high awareness of the existence of the site, 85% of respondents mentioned Crookwell.

7. Visual appeal of wind farms

An understanding of the foot print of a wind turbine and subsequently a wind farm has on the landscape where it is situated is potentially an important driver of attitudes to wind farms. Accordingly we asked those respondents who had seen a wind farm (90%) how visually appealing they found them. For the balance, that is those who had not seen a wind farm (10%) we asked them how visually appealing they would expect a wind farm to be.

Table 12: Visual appeal of wind farms

Q.8A IF SEEN: How visually appealing do you find the wind farms you have seen?				
Filter: Q7B EVER SEEN A WIND FARM Yes				
DTR Table: 19.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	270	135	50	86
	%	%	%	%
Q8A Visually appealing find wind farms				
Very appealing (5)	24%	26%	25%	22%
Fairly appealing (4)	43%	42%	37%	47%
or Do you not have an opinion about it (3)	17%	15%	25%	17%
Not too appealing (2)	10%	13% +	3%	8%
Not at all appealing (1)	6%	4%	10%	6%
TOTAL APPEALING	67%	68%	62%	69%
TOTAL NOT APPEALING	15%	17%	13%	14%
TOTAL	100%	100%	100%	100%
MEAN	3.7	3.73	3.63	3.71
STD DEV	1.11	1.11	1.2	1.09
STD ERR	0.07	0.1	0.17	0.11
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

Q.8B IF NOT SEEN: How visually appealing would you expect a wind farm to be?				
Filter: NOT (Q7B EVER SEEN A WIND FARM Yes)				
DTR Table: 20.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	30	15	2	13
	%	%	%	%
Q8B Visually appealing expect wind farm to be				
Very appealing (5)	5%	6%	0%	6%
Fairly appealing (4)	29%	24%	0%	40%
or Do you not have an opinion about it (3)	28%	41%	0%	19%
Not too appealing (2)	24%	21%	52%	22%
Not at all appealing (1)	13%	7%	48%	14%
TOTAL APPEALING	34%	30%	0%	46%
TOTAL NOT APPEALING	37%	29%	100%	36%
TOTAL	100%	100%	100%	100%
MEAN	2.9	3	1.52	3.02
STD DEV	1.14	1.03	0.67	1.23
STD ERR	0.2	0.26	0.47	0.34

As Table 11 shows, two in every three respondents who had seen a wind farm (67%) found them to be visually appealing. 17% had no opinion and only 16% found them to be not visually appealing. For those 10% of respondents who claimed not to have seen a wind farm, they were evenly divided between those who expected them to be visually appealing (34%), not visually appealing (37%) and those who had no opinion (28%).

8. Perceived benefits or advantages of wind farms

We asked respondents to tell us in their own words what they perceived to be the benefits or advantages of wind farms. The principal benefits/advantages as summarised in Table 13, were, viz:

- 56% Safe / low impact
- 49% Source of energy / power / electricity
- 21% Environment / friendly affect on the environment
- 15% Cost effective / low maintenance
- 4% No advantages

As is reflected in Table 13 below few respondents (3%) failed to nominate a benefit or advantage. Wind farms were clearly identified as a power source that was friendly to the environment, safe and had a low impact on their surroundings.

Table 13: Perceived benefits or advantages of wind farms

Q.9 Thinking about wind farms as I have described them …
a) What do you consider the major benefits or advantages of wind farms to be? Probe: "What else?

DTR Table: 21.0 R	TOTAL	Q2 Response to Global Warming		
		Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q9A Benefits / advantages of wind farms				
Environment/friendly affect on the environment				
ENVIRONMENTALLY FRIENDLY/NO IMPACT ON THE ENVIRONMENT	13%	15%	15%	9%
VISUALLY APPEALING/AESTHETIC	3%	4%	0%	4%
QUIET/NOT MUCH NOISE	3%	4%	3%	2%
NO WASTE	2%	4%	2%	1%
ADDRESSES GLOBAL WARMING	1%	3%	0%	0%
Nett: Environment / Friendly affect on the environment	21%	26% +	18%	15%
Source of energy / power / electricity				
NATURAL ENERGY/RESOURCE	11%	10%	11%	13%
SAVES ON FOSSIL FUEL / COAL / OTHER RESOURCES	10%	11%	6%	10%
RENEWABLE ENERGY	9%	11%	4%	9%
FREE GENERATING/FREE ENERGY SOURCE	7%	5%	12%	8%
HARNESS ENERGY THAT IS ALREADY THERE	6%	6%	3%	7%
CAN GENERATE ELECTRICITY/POWER	6%	5%	12%	4%
GOOD SOURCE OF ENERGY/UNLIMITED/SUSTAINABLE	5%	5%	5%	6%
GREEN POWER	2%	3%	0%	1%
CAN SUPPLY ENERGY TO A SMALL COMMUNITY /REMOTE AREA	0%	0%	0%	1%

Q.9 Thinking about wind farms as I have described them … a) What do you consider the major benefits or advantages of wind farms to be? <u>Probe:</u> "What else?				
DTR Table: 21.0 R		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q9A <u>Benefits / advantages of wind farms</u>				
Nett: Source of energy / Power / Electricity	49%	49%	43%	53%
Cost effective / low maintenance				
COST EFFECTIVE/ECONOMICAL	12%	11%	11%	13%
VERY EFFICIENT	2%	1%	3%	4%
LOW MAINTENANCE	2%	1%	8% +++	1%
Nett: Cost effective / low maintenance	15%	12%	17%	18%
Safe/ low impact				
CLEAN ENERGY / NO POLLUTION / CARBON BASED EMISSIONS	55%	57%	44%	58%
SAFE/DON'T DO ANY DAMAGE	1%	2%	0%	1%
LOW AGRICULTURAL IMPACT	1%	2%	0%	0%
MINIMUM DISRUPTION TO ACTIVITIES	0%	1%	0%	0%
Nett: Safe / low impact	56%	59%	44%	58%
Other mentions				
SOURCE OF INCOME FOR LANDOWNERS/FARMERS	3%	4%	2%	1%
WILL BENEFIT FUTURE GENERATIONS	0%	0%	3% +	0%
PROVIDES EMPLOYMENT	0%	0%	0%	1%
Nett: Other mentions	3%	4%	5%	2%
DON'T KNOW	1%	1%	1%	0%
NONE	3%	2%	7%	3%
Nett: None/Don't Know	4%	3%	8%	3%
TOTAL	160%	167%	151%	155%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

9. Perceived disadvantages of wind farms

Respondents were also asked to nominate what they believed to be the disadvantages, if any, they associate with wind farms. The principal disadvantages mentioned by respondents and as summarised in Table 14 below are:

- 29% Effect on the environment
- 18% Appearance
- 10% As a power source
- 6% Takes up a lot of space

- 5% The cost
- 3% Devaluates property
- 2% Safety
- 40% None/DK

About four in ten respondents were unable to nominate a disadvantage they associate with wind farms. By far the greatest disadvantages mentioned related to the visual appeal and the noise or humming emanating from the turbines.

Table 14: Perceived disadvantages of wind farms

Q.9 Thinking about wind farms as I have described them … b) And what disadvantages, if any, do you associate with wind farms? Probe: "What else?"				
DTR Table: 22.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q9B Disadvantages associated with wind farms				
Appearance				
AESTHETICALLY UNAPPEALING/VISUALLY UNATTRACTIVE/SPOILS THE LANDSCAPE	18%	18%	18%	18%
Nett: Appearance	18%	18%	18%	18%
Effect on the environment				
THE NOISE/HUMMING SOUND	24%	24%	30%	20%
HAZARD TO WILDLIFE/BIRDS	8%	7%	11%	9%
STRUCTURE'S LIMITED LIFE SPAN	1%	1%	0%	3%
Nett: Effect on the environment	29%	27%	37%	27%
As a power source				
NOT SUSTAINABLE/UNRELIABLE/RELY ON THE WEATHER	7%	6%	11%	7%
CAPACITY TO PRODUCE POWER IS LOW	3%	3%	2%	3%
Nett: As a power source	10%	9%	14%	9%
The cost				
THE COST OF BUILDING THE TURBINES	2%	2%	6%	2%
THE COST/NOT COMMERCIALLY VIABLE	2%	2%	2%	1%
MAINTENANCE COST	1%	2%	0%	0%
Nett: The cost	5%	6%	8%	3%
Safety				
THE TECHNOLOGY IS OUTDATED	1%	2%	0%	0%
SAFETY CONCERNS/CAN TRIGGER FIRES	1%	1%	0%	1%
Nett: Safety	2%	2%	0%	1%
Other				

Q.9 Thinking about wind farms as I have described them … b) And what disadvantages, if any, do you associate with wind farms? Probe: "What else?"				
DTR Table: 22.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q9B Disadvantages associated with wind farms				
TAKES UP A LOT OF SPACE	6%	5%	5%	9%
DEVALUATION OF PROPERTY	3%	4%	4%	1%
COMMUNITY DISHARMONY/RESIDENTS TAKING OPPOSING VIEWS	2%	3%	0%	2%
TOO CLUSTERED IN SOME AREAS	2%	2%	0%	2%
ENVIRONMENTAL DISTURBANCES	1%	2%	0%	0%
NOT ENOUGH INFORMATION	1%	1%	0%	2%
THE POLLUTANTS CREATED IN CONSTRUCTING THE TOWER	1%	1%	0%	0%
USES FOSSIL FUEL IN OPERATION	0%	0%	0%	1%
Nett: Other	15%	17%	9%	16%
DON'T KNOW	3%	2%	1%	6% +
NONE	37%	37%	36%	37%
Nett: None/Don't Know	40%	39%	37%	43% +
TOTAL	124%	124%	127%	122%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

10. Attitudes to the construction of wind farms

Having established the respondents' awareness, knowledge and perceptions of wind farms, in the next section of the questionnaire we sought to examine specific attitudes of respondents to a variety of specific issues relating to the construction of wind farms.

10.1 Trade-off: clean energy vs landscape

As was evident in the preceding section, a criticism of wind farms by some is their negative affect on landscape values in the areas where they are sited. We posed the question to respondents as to whether or not they were prepared to sacrifice landscape value in order to obtain clean energy from wind farms. We did so by asking which of two statements came closest to the way they felt, viz:

Table 15:   Clean energy vs landscape

Q.10 Wind farms provide clean, renewable energy that doesn't contribute to global warming through generating carbon dioxide. Some people say they detract from the appearance of the landscape. Which of these two statements comes the closest to the way you feel (*read out)*				
DTR Table: 23.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	146	51	103
	%	%	%	%
Q10 Statement which comes closest to feelings				
We need to use wind power as a source of clean energy even if it means changing the appearance of some landscapes, or	91%	92%	90%	91%
We should leave the landscapes unchanged even if it means we are not able to use wind power as a source of clean energy	9%	8%	10%	9%
TOTAL	100%	100%	100%	100%

As the outcome of Table 15 shows, nine in ten adults in the survey area would choose wind power as a source of clean energy, even if it resulted in changing some landscapes. There was no statistically significant difference between the responses of each of the three global warming analysis groups.

10.2 Favour or oppose wind farm projects in the Southern Tablelands

Although they may have been somewhat vague as to the project name or location, as shown in Table 6, nine in ten adults in the survey area were aware of wind farm projects in the Southern Tablelands. We asked respondents whether they favoured or opposed these projects.

Table 16: Favour or oppose wind farm projects in the Southern Tablelands

Q.11 Taking into account the arguments you have heard for and against wind farms, what is your general opinion of the wind farm projects like those being built in the Southern Tablelands … would you say you were (*read out*)				
DTR Table: 24.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q11 Opinion of wind farm projects built in the Southern Tablelands				
Strongly in favour (5)	51%	60%	41%	43%
		++		-
Generally in favour (4)	38%	33%	49%	41%
or... do you not mind one way or the other? (3)	6%	5%	2%	9%
Generally opposed (2)	3%	2%	2%	4%
Strongly opposed (1)	2%	0%	6%	3%
TOTAL IN FAVOUR	89%	93%	91%	84%
				-
TOTAL OPPOSED	5%	2%	8%	7%
TOTAL	100%	100%	100%	100%
MEAN	4.34	4.5	4.19	4.17
STD DEV	0.87	0.72	1	0.96
STD ERR	0.05	0.06	0.14	0.09
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

As inspection of Table 16 shows, support for the construction of wind farm projects in the Southern Tablelands is almost universal. Only 5% of those surveyed declared they were opposed to wind farm projects in the Southern Tablelands, 6% were ambivalent and 89% were in favour. The strength of support whilst uniformly high across our global warming analysis groups did vary in intensity. Amongst those saying they were ‘strongly in favour’, this response was significantly higher amongst those advocating an ‘act now’ response to global warming relative to those proposing a more gradual approach, reflecting the greater urgency felt by this group.

10.3 The positioning of wind energy

It has been said that in a marketing context the only difficulty in positioning wind energy is attempting to position it in the consumer’s personal space. The proposition that wind energy is a clean energy source with low impact on the environment is clearly ‘a winner’ amongst those that feel global warming is a potential threat to the environment … until that is, it invades the personal space of the consumer. That’s a sentiment that is tested progressively in the following series of statements, viz:

Table 17: Wind farm positioning statements

Q.12 How much do you agree with the following statements? *(read out first statement)* And is that (agree/disagree) strongly, or just (agree/disagree) or do you neither agree nor disagree with the statement? DO NOT ROTATE STATEMENT ORDER						
DTR Table: 25.0	Q12L STATEMENTS					
	Wind energy is a good alternative energy source	Australia should be investing more in wind energy	I would be happy to see more wind farms in Australia	Local Govern-ment should encourage wind farm develop-ment	Wind farm develop-ments contribute to the local economy	I would be happy to see a wind farm built on farmland near where I live
WEIGHTED BASE	300	300	300	300	300	300
	%	%	%	%	%	%
Q12 Agree / disagree						
Strongly Agree (5)	61%	63%	55%	53%	30%	45%
Agree (4)	35%	29%	36%	31%	35%	38%
Neither Agree nor Disagree (3)	1%	3%	2%	5%	20%	6%
Disagree (2)	2%	4%	6%	8%	12%	6%
Strongly Disagree (1)	1%	1%	1%	3%	2%	5%
TOTAL AGREE	96%	92%	91%	84%	65%	83%
TOTAL DISAGREE	3%	5%	7%	11%	15%	11%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	4.53	4.49	4.37	4.23	3.79	4.13
STD DEV	0.72	0.82	0.89	1.05	1.07	1.08
STD ERR	0.04	0.05	0.05	0.06	0.06	0.06

Few of the adults in this survey were ambivalent (<3%) or opposed to the views (<7%) that wind farms were a good alternative energy source, that Australia should be investing more in wind technology or that they would like to see more wind farms in Australia. Indeed these views were supported by 91% or more. At a local level however, there was less conviction that *"Local government should encourage wind farm development"*, albeit that 84% did agree with that statement, still remarkably high, even if falling marginally below the nationally oriented statements.

A claim that *"wind farm developments contribute to the local economy*" whilst agreed to by two in three attracted some scepticism: 15% disagreed, but a further 20% were ambivalent. This outcome would suggest that local promotion of the economic benefits flowing from wind farm development to the local area is warranted.

With respect to the statement *"I would be happy to see a wind farm built on farmland near where I live"* agreement is remarkably high (83%) and similar to that accorded to local government supporting wind farm development. 'Strong' agreement with the statement however is significantly lower than both the nationally orientated statements and the local government statement, reflecting less conviction in the agreement.

Analysing these outcomes by the three global warming analysis groups, it is evident that the greatest support for wind energy comes from those who have an ‘act now’ response to global warming.

Table 18: Wind farm positioning statements analysed by response to global warming

Q.12 How much do you agree with the following statements? *(read out first statement)* And is that (agree/disagree) strongly, or just (agree/disagree) or do you neither agree nor disagree with the statement? DO NOT ROTATE STATEMENT ORDER

DTR Table: 26- 31	TOTAL	Q2 Response to Global Warming		
		Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Wind energy is a good alternative energy source				
TOTAL AGREE	96%	96%	95%	96%
TOTAL DISAGREE	3%	3%	2%	4%
Australia should be investing more in wind energy				
TOTAL AGREE	92%	95%	87%	91%
TOTAL DISAGREE	5%	5%	7%	4%
I would be happy to see more wind farms in Australia				
TOTAL AGREE	91%	93%	88%	89%
TOTAL DISAGREE	7%	5%	10%	9%
Local Government should encourage wind farm development				
TOTAL AGREE	84%	89%	79%	79%
		+		
TOTAL DISAGREE	11%	7%	17%	15%
		-		
Wind farm developments contribute to the local economy				
TOTAL AGREE	65%	69%	62%	61%
TOTAL DISAGREE	15%	12%	23%	15%
I would be happy to see a wind farm built on farmland near where I live				
TOTAL AGREE	83%	87%	83%	77%
				-
TOTAL DISAGREE	11%	7%	15%	13%
TOTAL	100%	100%	100%	100%

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

10.4 Living with a wind farm within 10 kilometres of home

As a follow-up question to the statement *“I would be happy to see a wind farm built on the farmland near where I live”,* we asked respondents whether it would make a difference to the way they had responded to that question, if it was proposed to build a wind farm within 10 kilometres of where they live now. As Table 19 shows, seven in ten respondents claimed that having a wind farm within 10 kilometres of where they lived now would make no difference to their response to the statement.

Of the three in ten who claimed the proximity of the wind farm to their place of residence would make a difference to their response: two in ten claimed it would only serve for them to favour the statement more.

Table 19: Favour/oppose wind farms more or less if 10km from home

Q.13 And what if it was proposed to build a wind farm within 10 kilometres of where you live now, would that make any difference to the way you feel? Would it make you *(read out)*				
DTR Table: 32.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
I would be happy to see a wind farm built on farmland near where I live				
TOTAL AGREE	83%	87%	83%	77%
TOTAL DISAGREE	11%	7%	15%	13%
Q13 Difference if wind farm built within 10 kilometres of where live now				
Favour it more	22%	22%	22%	23%
Oppose it more	8%	6%	11%	8%
or, make no difference to your opinion	70%	71%	67%	69%
TOTAL	100%	100%	100%	100%

11. A focus on the local rural area

In this section of the questionnaire we placed a focus on the Crookwell wind farm which was commissioned in July, 1998 and is situated about 10 kilometres South East of Crookwell and located in the North East of the defined survey area – see map of survey area in Appendix I. As Crookwell is presently the only operational wind farm in the survey area, we sought to establish respondents' awareness, knowledge, familiarity and attitude to this wind farm.

As noted earlier in this report (see Tables 7 & 8) with the exception of Crookwell and Taralga, knowledge of other wind farm projects and their locations in the survey area at an unprompted level was somewhat vague, nonetheless there was certainly a consciousness of activity in the Southern Tablelands even if the details could not be recalled with clarity.

11.1 Awareness of the Crookwell wind farm

As inspection of Table 20 shows aided awareness of the Crookwell wind farm was almost universal with 94% of respondents aware of the wind farm. Amongst those who claimed the Crookwell wind farm was in their local area, aided awareness was as expected significantly greater (96%) than those for whom it was not (90%).

Table 20: Awareness of Crookwell wind farm

Q.14 There is presently a small wind farm located near Crookwell in the Southern Tablelands that was constructed in 1997 and has only 8 wind turbines … the wind farm is located to the South East of Crookwell which is about 30 kilometres north-west of Goulburn … a) Were you aware of the existence of this wind farm near Crookwell before today?			
DTR Table: 33.0	TOTAL	Q14D Is Crookwell wind farm in your local rural area	
		Crookwell is local	Crookwell NOT Local
WEIGHTED BASE	300	195	105
	%	%	%
Q14A Aware of existence of wind farm near Crookwell before today			
Yes	94%	96%	90%
		+	-
No	6%	4%	10%
		-	+
TOTAL	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---			

11.2 Personally seen the Crookwell wind farm?

We asked those respondents who were aware of the Crookwell wind farm whether they had personally seen it. As Table 21 shows 87% of those who were aware of the Crookwell wind farm had actually seen it … which, due to the high awareness of the wind farm, is 82% of all respondents.

Table 21: Personally seen the Crookwell wind farm

Q.14B IF YES IN Q.14 a): Have you personally, seen the wind farm near Crookwell?			
Filter: Q14A Aware of existence of wind farm near Crookwell before today			
DTR Table: 34.0	TOTAL	Q14D Is Crookwell wind farm in your local rural area	
		Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	281	187	94
	%	%	%
Q14B Seen wind farm near Crookwell			
Yes	87%	91%	78%
		++	--
No	13%	9%	21%
		--	++
Don't Know	0%	0%	1%
Q14B Seen wind farm near Crookwell – ALL RESPONDENTS			
WEIGHTED BASE	300	195	105
	%	%	%
Yes	82%	88%	68%
		++	--
No/DK	18%	12%	32%
		--	++
TOTAL	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---			

As would be expected those who consider the Crookwell wind farm to be in their local rural area (see later) are significantly more likely to have seen the wind farm, relative to others resident in the survey area.

11.3 Frequency of seeing the Crookwell wind farm

During the course of a year seven in ten respondents in the survey area are in the vicinity and able to see the Crookwell wind farm. Amongst those who are aware of the existence of the Crookwell wind farm and have seen it, the proportion of those that are able to see it during the course of a year is significantly higher (88%)

Table 22: Frequency of seeing the Crookwell wind farm

Q.14C IF YES IN Q.14 b): And how often are you in the vicinity to see the wind farm near Crookwell …would it be (<u>read out if necessary</u>)			
Filter: Q14A Aware of existence of wind farm near Crookwell before today yes and q14b seen wind farm near Crookwell Yes			
DTR Table: 35.0	TOTAL	Q14D Is Crookwell wind farm in your local rural area	
		Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	245	171	74
	%	%	%
Q14C Often in vicinity to see the wind farm near Crookwell			
At least once a day (365)	5%	7%	0%
		+	-
Several times a week (156)	8%	10%	4%
At least once a week (52)	12%	14%	6%
At least once a week	*24%*	*32%*	*9%*
At least once a month (12)	18%	19%	14%
At least once a month	*42%*	*51%*	*23%*
Every two or three months (4)	9%	10%	8%
Three or four times a year (3)	13%	13%	11%
Once or twice a year (2)	24%	17%	39%
		---	+++
At least once a year	*88%*	*90%*	*82%*
less often	12%	10%	18%
TOTAL	100%	100%	100%
MEAN	44.6	56.49	14.21
STD DEV	88.77	100.3	32.86
STD ERR	6.08	8.14	4.21
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---			
ALL RESPONDENTS			
At least once a week	20%	28%	7%
At least once a month	34%	44%	17%
At least once every 6 months	52%	65%	30%
At least once a year	72%	80%	58%
Less often	10%	8%	12%
Never	18%	12%	30%
TOTAL	100%	101%	100%

As Table 22 shows the frequency of seeing the Crookwell wind farm is more frequently on view to those who consider the Crookwell wind farm to be located in their local rural area. Nonetheless 58% of all respondents who don't consider the Crookwell wind farm to be in their local area see the wind farm at least annually and of those who are aware of it and have seen it previously, exposure rises to 82% each year.

Amongst those who have seen the Crookwell wind farm and consider it to be located in their local rural area, 51% see the wind farm at least once each month, compared to 23% of those who have seen the wind farm but do not consider the Crookwell wind farm to be in their local rural area.

11.4 Consider the Crookwell wind farm to be in your local rural area?

We asked all respondents in the survey area whether or not they considered the Crookwell wind farm to be in their local rural area. No assisting definition of what the 'local rural area' comprised was provided, the outcome depending purely on the respondents' perceptions. Two in three respondents considered the Crookwell wind farm was within their local rural area. There was no statistically significant difference across the global warming analysis groups.

Table 23: Is the Crookwell wind farm in your local area

Q.14D ASK EVERYONE: The Crookwell wind farm is located about 10km to the South East of Crookwell … is the Crookwell wind farm in what you would consider to be your local rural area?				
DTR Table: 36.0		Q2 Response to Global Warming		
	TOTAL	Act now despite costs	Do not incur costs	Gradual response
WEIGHTED BASE	300	150	52	98
	%	%	%	%
Q14D Crookwell wind farm considered to be in local rural area				
Yes	65%	62%	67%	68%
No	34%	35%	33%	32%
Don't Know	1%	3% +	0%	0%
TOTAL	100%	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---				

11.5 Distance respondents reside from the Crookwell wind farm

Just on seven in ten respondents indicated they lived more than 25 kilometres from the Crookwell wind farm. Indeed, even amongst those who considered the Crookwell wind farm to be in their local rural area, 57% stated they lived more than 25 kilometres from the wind farm – only 14% said they lived within 10 kilometres.

Amongst the respondents who did not consider the Crookwell wind farm to be in their local rural area (34%) some 90% stated they lived more than 25 kilometres from the wind farm.

Table 24: Distance respondents reside from Crookwell wind farm

Q.14E About how far is the Crookwell wind farm from where you live? If necessary: Would it be …			
DTR Table: 37.0		Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	195	105
	%	%	%
Q14E Kilometres Crookwell wind farm from where live			
less than 1 kilometre (.5)	1%	1%	0%
1 to 3 kilometres (2.5)	1%	1%	0%
4 to 10 kilometres (7)	8%	12%	1%
		+++	---
11 to 25 kilometres (18)	20%	27%	8%
		+++	---
more than 25 kilometres (26)	68%	57%	90%
		---	+++
Don't Know	2%	2%	2%
TOTAL	100%	100%	100%
MEAN	22.46	20.94	25.25
STD DEV	6.23	7.04	2.63
STD ERR	0.36	0.51	0.26
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---			

11.6 Favour or oppose the Crookwell wind farm?

Few of the respondents in this survey (3%) were opposed to the Crookwell wind farm. Indeed it can be said there is no significant opposition to the Crookwell wind farm. Its greatest threat is the ambivalence of respondents, that is, those who are sitting on the fence.

Analysis of the outcome by the global warming response groups shows that those who favour a ‘gradual’ approach to global warming are less committed in their support for Crookwell and exhibit a statistically significant higher level of ambivalence toward the wind farm relative to those who favour an ‘act now’ response. The response of the ‘gradual’ group is similar to those who don’t regard the Crookwell wind farm as falling within their local rural area.

Comparing the responses of those who regard the Crookwell wind farm as falling within their local rural area versus those who don’t, we find a statistically significant difference between the two. Of those who regard Crookwell wind farm as local, 89% favour the farm, whereas for those who do not regard it as local, only 78% find favour with the farm – 18% are ambivalent. It would appear that those who live in the vicinity of a wind farm are more likely to favour it than those who don’t. Proximity appears to mitigate concerns.

Notwithstanding these comments, community support for the Crookwell wind farm can only be summarised as outstanding with 85% of respondents saying they are in favour of the wind farm.

Table 25: General opinion of the Crookwell wind farm

Q.14F And what is your general opinion of the Crookwell wind farm, would you say you are … (*read out*)						
DTR Table: 38.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q14F General opinion of the Crookwell wind farm						
Strongly in favour (5)	50%	59% ++	40%	42% -	53%	45%
Generally in favour (4)	35%	29% -	45%	38%	36%	33%
or... do you not mind one way or the other (3)	12%	10%	10%	17% +	9% -	18% +
Generally opposed (2)	2%	1%	6%	3%	2%	3%
Strongly opposed (1)	0%	0%	0%	0%	0%	1%
TOTAL IN FAVOUR	85%	89%	85%	80%	89% +	78% -
TOTAL OPPOSED	3%	2%	6%	3%	2%	4%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	4.33	4.46	4.19	4.19	4.4	4.19
STD DEV	0.8	0.76	0.83	0.82	0.74	0.89
STD ERR	0.05	0.06	0.12	0.08	0.05	0.09
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

12. How close, is "close to home"?

As we have just seen, if you live in the vicinity of a wind farm you are more likely to favour it, or at least more likely to have an opinion of it, than you are if the wind farm is not located in your vicinity.

Critics of wind farms have, amongst other things, highlighted the lack of visual appeal of wind farms and noise as issues for wind farms. As can be seen in Table 13 above, 24% mentioned 'noise' as a disadvantage of wind farms and a further 18% mentioned the lack of visual appeal as a disadvantage. However, at least two in three who had seen a wind farm felt they were visually appealing (see Table 12), nine in ten respondents accepted that changes to landscape were necessary if we are to adopt wind power (see Table 15) and further just on nine in ten were in favour of wind farm projects in the Southern Tablelands (see Table 16).

In this section, we have sought to address the issue of noise impact of wind turbines and the proximity of wind turbines to respondents' homes. To do this we elected to use the distance of 800 metres, which on advice, we understand is the typical distance, based on scientific testing, at which the noise from a wind turbine at a typical site is no longer significant, even in extreme wind conditions. We recognise that in practice this distance may vary marginally depending on the specific characteristics of a specific site.

Accordingly, in the next section of the questionnaire we advised respondents that scientific testing had established that people need to be less than 800 metres from the wind turbines to hear any significant noise, even in extreme wind conditions. With this in mind, we asked respondents to consider how strongly they either favoured or opposed having a wind farm located 1 kilometre, 3 kilometres, 10 kilometres and 25 kilometres of their home.

We would note in passing, that 83% of respondents agree they would be happy to have a wind farm located in the farm land near where they live and if that was within 10 kilometres of their home, it would on balance make no difference to their opinion (see Table 19).

12.1 A wind farm one kilometre from home?

When asked whether they would favour or oppose a wind farm located one kilometre from their home, 71% of respondents in this community survey said they would be in favour of the wind farm. 19% were opposed and 10% were ambivalent.

Table 26: Favour or oppose a wind farm one kilometre from home

Q.15 Scientific tests conducted at wind farms have shown that people need to be less than approximately 800 metres from the wind turbines for them to hear any significant noise, even in extreme wind conditions. Bearing this in mind …
a) Would you favour or oppose a wind farm if it was located ONE KILOMETRE from where you live now? Would that be *(read out)*

DTR Table: 39.0	TOTAL	Q14D Is Crookwell wind farm in your local rural area: Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	195	105
	%	%	%
Q15A Favour / oppose - wind farm if it was located one kilometre from home			
Strongly in favour (5)	39%	46%	27%
		++	--
Generally in favour (4)	32%	29%	36%
or... do you not mind one way or the other? (3)	10%	7%	14%
Generally opposed (2)	9%	8%	12%
Strongly opposed (1)	10%	9%	11%
TOTAL IN FAVOUR	71%	75%	64%
		+	-
TOTAL OPPOSED	19%	17%	23%
TOTAL	100%	100%	100%
MEAN	3.81	3.95	3.57
STD DEV	1.32	1.31	1.31
STD ERR	0.08	0.09	0.13

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

Whilst there was no significant difference between the responses of the global warming analysis groups, there was a statistically significant difference in the response provided by those who regarded the Crookwell wind farm as falling within their local rural area (75%) and those who did not (64%). This outcome is due in part the higher proportion of those in the 'non-local' group who were ambivalent about the proposition.

12.2 A wind farm three kilometres from home?

When asked to consider a wind farm three kilometres from home, there was a significant increase in the proportion of respondents who were in favour of the wind farm. Those in favour increased from 71% in favour of a wind farm one kilometre from home to 79% for a wind farm three kilometres from home.

Table 27: Favour or oppose a wind farm three kilometres from home

Q.15B Would you favour or oppose a wind farm if it was located THREE KILOMETRES from where you live now? Would that be *(read out)*			
DTR Table: 40.0	TOTAL	Q14D Is Crookwell wind farm in your local rural area	
		Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	195	105
	%	%	%
Q15B Favour / oppose - wind farm if it was located three kilometres from home			
Strongly in favour (5)	46%	48%	43%
Generally in favour (4)	32%	32%	32%
or... do you not mind one way or the other? (3)	9%	8%	10%
Generally opposed (2)	7%	6%	9%
Strongly opposed (1)	6%	6%	6%
TOTAL IN FAVOUR	79%	80%	75%
TOTAL OPPOSED	13%	12%	15%
TOTAL	100%	100%	100%
MEAN	4.06	4.11	3.97
STD DEV	1.16	1.14	1.2
STD ERR	0.07	0.08	0.12

At three kilometres from home there is no statistically significant difference in the outcome for any of the analysis groups, including those who live / don't live within the local rural area of the Crookwell wind farm.

12.3 A wind farm ten kilometres from home?

At ten kilometres from home the proportion in favour of the wind farm rises again. At ten kilometres, 83% support the wind farm, the same outcome as reported earlier (see Table 19).

As can be seen in Table 28 below, support for the wind farm has strengthened at the expense of those opposed or ambivalent to the earlier propositions. Generally, support is more committed amongst those for whom the Crookwell wind farm is within the respondents' local rural area. This outcome tends to reinforce the earlier proposition that the more familiar respondents become with wind farms in their usual environment, the less likely they are to be opposed to them.

Table 28: Favour or oppose a wind farm ten kilometres from home

Q.15C Would you favour or oppose a wind farm if it was located TEN KILOMETRES from where you live now? Would that be *(read out)*			
DTR Table: 41.0		Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	195	105
	%	%	%
Q15C Favour / oppose - wind farm if it was located ten kilometres from home			
Strongly in favour (5)	53%	54%	50%
Generally in favour (4)	31%	31%	30%
or... do you not mind one way or the other? (3)	8%	8%	9%
Generally opposed (2)	4%	2%	7%
		-	+
Strongly opposed (1)	4%	4%	4%
TOTAL IN FAVOUR	83%	85%	80%
TOTAL OPPOSED	8%	7%	11%
TOTAL	100%	100%	100%
MEAN	4.24	4.29	4.14
STD DEV	1.04	1.01	1.1
STD ERR	0.06	0.07	0.11
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---			

12.4 A wind farm twenty five kilometres from home?

At twenty five kilometres from home, 87% of the community sample in the survey area was in favour of the proposition.

Table 29: Favour or oppose a wind farm twenty five kilometres from home

Q.15D Would you favour or oppose a wind farm if it was located TWENTY FIVE KILOMETRES from where you now live? Would that be *(read out)*			
DTR Table: 42.0		Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	195	105
	%	%	%
Q15D Favour / oppose - wind farm if it was located twenty five kilometres from home			
Strongly in favour (5)	57%	59%	54%
Generally in favour (4)	30%	28%	33%
or... do you not mind one way or the other? (3)	9%	9%	9%
Generally opposed (2)	2%	2%	4%
Strongly opposed (1)	2%	3%	1%
TOTAL IN FAVOUR	87%	87%	87%
TOTAL OPPOSED	5%	4%	5%
TOTAL	100%	100%	100%
MEAN	4.37	4.38	4.35
STD DEV	0.9	0.92	0.85
STD ERR	0.05	0.07	0.08

12.5 Acceptance of wind farms by distance from home – a summary

As we have seen in the preceding sections those in favour of a wind farm close to where they live, rises from a low of 71% when the wind farm is located one kilometre from home to a high of 87% when it is located twenty five kilometres away. Table 30 summarises the proportions in favour and opposed for each of the four distances tested.

Table 30: Acceptance of wind farms by distance from home

Q. 15 Scientific tests conducted at wind farms have shown that people need to be less than approximately 800 metres from the wind turbines for them to hear any significant noise, even in extreme wind conditions. Bearing this in mind … Would you favour or oppose a …			
DTR Table: 39.0 to 42.0		Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	195	105
	%	%	%
Q15A <u>Wind farm located one kilometre from home</u>			
TOTAL IN FAVOUR	71%	75%	64%
		+	-
TOTAL OPPOSED	19%	17%	23%
Q15B <u>Wind farm located three kilometres from home</u>			
TOTAL IN FAVOUR	79%	80%	75%
TOTAL OPPOSED	13%	12%	15%
Q15C <u>Wind farm located ten kilometres from home</u>			
TOTAL IN FAVOUR	83%	85%	80%
TOTAL OPPOSED	8%	7%	11%
Q15D <u>Wind farm located twenty five kilometres from home</u>			
TOTAL IN FAVOUR	87%	87%	87%
TOTAL OPPOSED	5%	4%	5%
TOTAL	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---			

When attempting to assess the outcomes of this questioning procedure it should not be forgotten that we have presaged the questions by introducing the concept of wind noise from the wind turbines that comprise wind farms. It will be recalled we advised respondents that *"Scientific tests conducted at wind farms have shown that people need to be less than approximately 800 metres from the wind turbines for them to hear any significant noise, even in extreme wind conditions"*. At the very least, the outcomes from these questions suggest that at least 71% of respondents are prepared to accept a wind farm one kilometre from home, that 10% were ambivalent, not caring one way or the other and that only 19% expressed opposition.

We would note the percentage of respondents opposed to wind farms, drops significantly for wind farms ten kilometres from home (8%) and declines further to 5% at twenty five kilometres.

13. The issue of wind farm size

Whilst we have explored knowledge, understanding and attitudes to various dimensions of wind farms, so far we have not addressed the issue of the size of wind farms. To this point in the questionnaire we have narrowed the focus of the respondents to Crookwell wind farm and use this inter alia as a reference point. The Crookwell wind farm, which we have established is well known to respondents in the survey area, has however only eight wind turbines. In this section we sought to establish the extent to which respondents either favour or oppose wind farms of varying sizes in their local rural area.

13.1 Aided awareness of approved wind farm projects in the survey area

As we have already noted, respondents in the survey area were aware of wind farm projects in the Southern Tablelands, but with the exception of Crookwell and Taralga were somewhat vague as to their location. We addressed this by reading a short list of approved but yet to be constructed wind farm projects in the Southern Tablelands, specifying their locations and the number of wind turbines that would comprise each wind farm.

The purpose of the question was to not only establish awareness of each specific project, but to provide information to respondents concerning the actual size of the wind farm via the administration of the question.

As Table 31 shows at least one in two respondents are aware of each of the wind farm projects nominated. Only 7% were unable to nominate a project. The leading projects were, viz:

- Crookwell 2, mentioned by 71%
- Taralga, mentioned by 63%, and
- Gunning, mentioned by 59%

The Conroy’s Gap and Cullerin range wind farms followed closely behind in terms of aided awareness.

Not unexpectedly, aided awareness of Crookwell 2 (76%) and Taralga (69%) was significantly greater amongst those respondents who described the Crookwell wind farm as falling within their local rural area, albeit that their interest in such projects appears to have been stimulated by the existence of the Crookwell wind farm. Only the Conroy’s Gap wind farm near Yass, the most distant from Crookwell, was better known by those who did not include the Crookwell wind farm in their local rural area.

We would note in passing that analysis of the aided awareness of these approved, but yet to be constructed wind farms, by the global warming groups appears to produce statistically significant aided awareness profiles across these three groups. Given the stated responses of these groups differ; the reasons for the differential responses at Conroy’s Gap, Cullerin Range and Gunning perhaps relate to the differences in the approval process and/or the site histories which is beyond the scope of this report.

Table 31: Aided awareness of approved wind farm projects

Q.16 At present a number of wind farms have been approved, but are yet to be built in the Southern Tablelands … which of the following wind farm developments in the Southern Tablelands were you aware of before today …						
DTR Table: 43.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q16 <u>Aware a number of wind farms have been approved in the southern tablelands</u>						
the Conroy's Gap wind farm near Yass with 15 wind turbines	51%	50%	54%	52%	48%	58%
the Cullerin Range wind farm with 15 wind turbines	54%	44%	70%	61%	56%	50%
		---	++			
the Gunning wind farm near Gunning with 32 wind turbines	59%	52%	75%	60%	62%	53%
		-	++			
the Crookwell 2 wind farm near Crookwell with 46 wind turbines	71%	71%	73%	69%	76%	60%
					++	--
the Taralga wind farm near Taralga with 69 wind turbines	63%	57%	73%	67%	69%	53%
		-			++	--
None of these	7%	9%	2%	7%	6%	9%
TOTAL	305%	283%	346%	317%	317%	283%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

13.2 Acceptance of small wind farms

We explained to respondents that wind farms are usually sited on ridges and hills on private land in rural areas where wind flow is the greatest; that wind farms are built in varying sizes depending on local conditions and may contain as few as 8 wind turbines, but typically 15 to 80 wind turbines spaced about 400 to 500 metres apart. In this context we asked respondents whether they would favour or oppose the development of a small wind farm of up to 15 wind turbines in their local rural area.

Almost all respondents (88%) were in favour of such a project in their local rural area, only 7% were opposed.

Analysis by the global warming groups produced significantly different outcomes between the three groups. Those with an ‘act now’ focus were significantly more disposed to such a project (92% favoured it), whereas those who adopt a ‘gradual’ response were less inclined to favour the project (81%), albeit the level of actual support was very high anyway.

There were no significant differences between those who classified the Crookwell wind farm as falling within/outside their local rural area.

Table 32: Favour or oppose a small wind farm in the local rural area

Q.17 Wind farms are usually sited on ridges and hills on private land in rural areas where wind flow is the greatest … wind farms are built in varying sizes depending on local conditions and may contain as few as 8 wind turbines, but typically 15 to 80 wind turbines spaced about 400 to 500 metres apart …
a) Thinking about the local rural area in your vicinity … would you favour or oppose the development of a small wind farm of up to 15 wind turbines in your local rural area? Would that be (*read out*)

DTR Table: 44.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q17A Favour / oppose small wind farm of up to 15 wind turbines in local rural area						
Strongly in favour (5)	56%	61%	53%	49%	59%	50%
Generally in favour (4)	32%	31%	36%	33%	31%	35%
or... do you not mind one way or the other (3)	5%	3%	2%	9% +	4%	6%
Generally opposed (2)	4%	2%	7%	6%	3%	6%
Strongly opposed (1)	3%	3%	2%	4%	3%	3%
TOTAL IN FAVOUR	88%	92% +	89%	81% -	90%	85%
TOTAL OPPOSED	7%	5%	9%	10%	6%	9%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	4.34	4.46	4.31	4.16	4.4	4.22
STD DEV	0.97	0.88	0.97	1.08	0.94	1.02
STD ERR	0.06	0.07	0.14	0.11	0.07	0.1

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

13.3 Acceptance of typical wind farms

Having established whether respondents either favour or oppose ‘small’ wind farms, we asked whether they would favour or oppose a ‘typical’ wind farm with 15 to 80 wind turbines in their local rural area. Those in favour of a ‘typical’ wind farm with 15 to 80 turbines was significantly lower than for ‘small’ wind farms with those favouring such a wind farm falling from 88% for a ‘small’ wind farm to 76%. Moreover, those opposed to a ‘small’ wind farm (7%) increased significantly to 19% expressing their opposition to a ‘typical’ wind farm. Nonetheless support for a typical wind farm from three in every four adults in this community survey is very strong support.

Support was highest from those with an ‘act now’ focus in response to global warming at 81%, but again significantly lower amongst those advocating a ‘gradual’ approach to global warming at 68%.

Support for a typical wind farm was lower amongst those without a wind farm in their local rural area, but not significantly so – the difference was more in the intensity of the support provided as is shown in Table 33.

Table 33: Favour or oppose a typical wind farm in the local rural area

Q.17B Would you favour or oppose the development of a typical wind farm with 15 to 80 wind turbines in your local rural area? Would that be (*read out*)						
DTR Table: 45.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q17B Favour / oppose typical wind farm with 15-80 wind turbines in local rural area						
Strongly in favour (5)	37%	44%	37%	28%	40%	32%
		+		-		
Generally in favour (4)	39%	37%	40%	40%	38%	40%
or... do you not mind one way or the other (3)	5%	5%	1%	6%	3%	9%
					--	++
Generally opposed (2)	10%	8%	12%	14%	11%	9%
Strongly opposed (1)	9%	6%	11%	12%	8%	10%
TOTAL IN FAVOUR	76%	81%	76%	68%	78%	72%
		+		-		
TOTAL OPPOSED	19%	14%	22%	26%	19%	18%
		-		+		
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	3.86	4.06	3.8	3.58	3.91	3.76
STD DEV	1.26	1.15	1.34	1.35	1.26	1.26
STD ERR	0.07	0.1	0.19	0.13	0.09	0.12
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

13.4 Acceptance of large wind farms

Finally, we asked respondents whether they favour or oppose the development of a large wind farm with greater than 80 and up to 120 wind turbines in their local area. The pattern of support declining with the increase in size of the wind farm continued. Nonetheless, 61% of respondents in the survey area indicated they favoured the development of a large wind farm in their local area. Opposition continued to grow commensurate with the size of the wind farm. Those opposed to the development of a wind farm in their local rural area grew from 7% for a small wind farm, to 19% for a 'typical' wind farm and then to 32% for a large wind farm. Nonetheless, at least six in ten respondents supported a wind farm of greater than 80 and up to 120 wind turbines in their local rural area.

Those with an 'act now' response to global warming were the most positive supporters (68%), but those advocating a 'gradual' response were significantly less supportive (53%).

Those whose local rural area encompassed the existing Crookwell wind farm continued to offer a greater intensity of support relative to their counterparts who lived further away.

Table 34: Favour or oppose a large wind farm in the local rural area

Q.17 C And would you favour or oppose the development of a large wind farm with greater than 80 and up to 120 wind turbines in your local rural area? Would that be (*read out*)						
DTR Table: 46.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q17C Favour / oppose - large wind farm with 80 - 120 wind turbines in local rural area						
Strongly in favour (5)	27%	32%	27%	21%	31%	20%
					+	-
Generally in favour (4)	34%	36%	30%	32%	32%	37%
or... do you not mind one way or the other (3)	7%	8%	2%	9%	5%	11%
Generally opposed (2)	17%	14%	22%	19%	18%	16%
Strongly opposed (1)	15%	10%	19%	20%	13%	17%
		-				
TOTAL IN FAVOUR	61%	68%	58%	53%	64%	57%
		+		-		
TOTAL OPPOSED	32%	24%	41%	38%	31%	33%
		--				
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	3.42	3.66	3.26	3.15	3.51	3.27
STD DEV	1.42	1.33	1.53	1.45	1.43	1.4
STD ERR	0.08	0.11	0.21	0.14	0.1	0.14
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

13.5 Acceptance of wind farms by size – a summary

In Table 35 below we have provided a summary of the response of respondents to the development of wind farms of varying size in their local rural areas. As we have noted in the preceding sections, support for wind farms declines with increasing size when it is proposed they are to be developed in the respondents' local rural areas, viz:

- 88% favour a small wind farm of up to 15 wind turbines
- 76% favour a typical wind farm with 15 to 80 wind turbines; and
- 61% favour a large wind farm with greater than 80 and up to 120 wind turbines.

Those advocating an 'act now' response to global warming demonstrate a statistically significant higher level of support for each option. Conversely, those who advocate a 'gradual' response to global warming demonstrate a significantly lower level of support for each option. Nonetheless, a majority of this group still support the development of a large wind farm.

Table 35: Favour or oppose wind farms of varying size in the local area

Q.17A Thinking about the local rural area in your vicinity … would you favour or oppose the development of a small wind farm of up to 15 wind turbines in your local rural area? Would that be (*read out*)
Q.17B Would you favour or oppose the development of a typical wind farm with 15 to 80 wind turbines in your local rural area? Would that be (*read out*)
Q.17 C And would you favour or oppose the development of a large wind farm with greater than 80 and up to 120 wind turbines in your local rural area? Would that be (*read out*)

DTR Tables: 44.0 to 46.0	TOTAL	Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
		Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q17A Favour / oppose small wind farm of up to 15 wind turbines in local rural area						
TOTAL IN FAVOUR	88%	92%	89%	81%	90%	85%
		+		-		
TOTAL OPPOSED	7%	5%	9%	10%	6%	9%
Q17B Favour / oppose typical wind farm with 15-80 wind turbines in local rural area						
TOTAL IN FAVOUR	76%	81%	76%	68%	78%	72%
		+		-		
TOTAL OPPOSED	19%	14%	22%	26%	19%	18%
		-		+		
Q17C Favour / oppose - large wind farm with 80 - 120 wind turbines in local rural area						
TOTAL IN FAVOUR	61%	68%	58%	53%	64%	57%
		+		-		
TOTAL OPPOSED	32%	24%	41%	38%	31%	33%
		--				
TOTAL	100%	100%	100%	100%	100%	100%

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

14. Cumulative impact of successive wind farm developments

In this final section of the questionnaire we asked respondents to consider a scenario where a typical wind farm of 15 to 80 wind turbines had been constructed on the hills or ridges of private farmland in their local rural area … and, it was proposed that a second wind farm of similar size was also to be located in their local rural area.

14.1 The preferred site for a second wind farm in the local rural area

Given the existence of one typical wind farm in the local rural area, some two in three respondents preferred the second typical wind farm to be located either adjacent or nearby the first wind farm. The balance, roughly one in three advocated somewhere further away and out of sight of the first wind farm, which on average equated to approximately 20 kilometres.

There were no statistically significant differences between the analysis groups.

Table 36: Preferred site for a second wind farm in the local rural area

Q.18 If for the moment you could imagine a typical wind farm with 15 to 80 wind turbines was sited on the hills or ridges of private farmland in your local rural area … and it was proposed to site another wind farm of similar size in your local rural area …
a) Would you prefer that it was (*read out)*
b) IF "BE LOCATED ELSEWHERE": How far away from the existing site should it be located? If necessary: How many kilometres away?

DTR Table: 47.0 & 48.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q18A Preferred site of 2nd wind farm of 15 - 80 wind turbines in local rural area						
sited adjacent to the existing wind farm,	42%	44%	41%	40%	43%	41%
not adjacent, but nearby the existing wind farm, or	21%	20%	29%	16%	18%	26%
be located elsewhere in your local rural area further away and out of sight from the existing wind farm	37%	36%	30%	44%	39%	34%
TOTAL	100%	100%	100%	100%	100%	100%
WEIGHTED BASE	112	54	15	43	77	36
	%	%	%	%	%	%
Q18BCD Kilometres from the existing site should be located						
Up to 5 km	19%	21%	24%	16%	18%	22%
Up to 10 km	21%	16%	16%	27%	20%	21%
Up to 20 km	19%	16%	14%	22%	22%	10%
Up to 50 km	15%	12%	21%	17%	12%	21%
More than 50 km	4%	3%	0%	6%	5%	0%
DON'T KNOW	22%	31%	25%	12% -	23%	24%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	19.34	17.87	16.99	21.54	19.98	17.89
STD DEV	20.53	20.07	14.59	22.68	22.28	16.11
STD ERR	2.11	3.13	4.22	3.51	2.76	2.96

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

14.2 Acceptance of two 'typical' wind farms in local rural area

We had asked respondents earlier (see Table 33) whether they favour or oppose a 'typical' wind farm of 15 to 80 turbines in their local rural area and 76% favoured the proposition. 19% were opposed.

As can be seen from Table 37 below these outcomes basically remain unchanged when respondents are asked to consider whether they favour or oppose two 'typical' wind farms in their local rural area. 75% were in favour and 17% were opposed. Those in the 'act now' global warming response group and those for whom the Crookwell wind farm was in their local rural area were the most committed.

Table 37: Favour or oppose two typical wind farms in local rural area

Q.18 c) Would you favour or oppose the location of two typical wind farms each one of 15 to 80 turbines your local rural area? Would that be (*read out*)						
DTR Table: 49.0		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q18C Favour / oppose two typical wind farms each one 15-80 turbines in local rural area						
Strongly in favour (5)	34%	41%	30%	24%	36%	30%
		++		-		
Generally in favour (4)	42%	38%	40%	48%	43%	40%
or... do you not mind one way or the other (3)	8%	7%	8%	8%	5%	13%
					--	++
Generally opposed (2)	10%	7%	14%	12%	10%	11%
Strongly opposed (1)	7%	6%	8%	8%	7%	6%
TOTAL IN FAVOUR	75%	79%	71%	72%	79%	70%
TOTAL OPPOSED	17%	13%	21%	20%	17%	17%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	3.85	4.02	3.72	3.68	3.9	3.77
STD DEV	1.19	1.14	1.25	1.2	1.2	1.17
STD ERR	0.07	0.09	0.18	0.12	0.09	0.11
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

14.3 Acceptance of three ‘typical’ wind farms in local rural area

When respondents were asked whether they would favour or oppose a third ‘typical’ wind farm, not unexpectedly the proportion in favour declined significantly from the 75% who favoured two wind farms to 64% who favoured three ‘typical’ wind farms. Those opposed rose significantly from the 17% who were opposed to two wind farms to 27% who were opposed to three ‘typical’ wind farms.

Of interest here is the significantly different response emanating from those who already have a wind farm in their local area (70%) from those who don’t (53%) as Table 38 below shows. This outcome highlights that experience of living with wind farms in the local rural area would appear to impact on respondents positive predispositions toward wind farms in their local rural area.

Amongst the global warming response groups we find a significant absolute difference between the ‘act now’ group and the other two groups and in particular a significant increase in the proportion of the ‘gradual’ response group who now oppose the introduction of a third wind farm into their local rural area.

Table 38: Favour or oppose three typical wind farms in local rural area

Q.18 d) Would you favour or oppose the location of three typical wind farms each one of 15 to 80 turbines in your local rural area? Would that be (*read out*)

DTR Table: 50.0		Q2 Response to Global Warming			Q14D Is Crookwell in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q18D Favour / oppose three typical wind farms 15-80 turbines in local rural area						
Strongly in favour (5)	30%	34%	31%	21%	33%	23%
				-		
Generally in favour (4)	35%	34%	29%	39%	37%	30%
or... do you not mind one way or the other (3)	9%	11%	11%	6%	6%	16%
					--	++
Generally opposed (2)	14%	11%	13%	21%	11%	20%
				+	-	+
Strongly opposed (1)	12%	11%	16%	13%	13%	11%
TOTAL IN FAVOUR	64%	68%	60%	61%	70%	53%
					++	--
TOTAL OPPOSED	27%	21%	29%	34%	24%	31%
		-				
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	3.55	3.7	3.46	3.36	3.66	3.34
STD DEV	1.37	1.33	1.47	1.36	1.38	1.33
STD ERR	0.08	0.11	0.21	0.13	0.1	0.13

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

14.4 Acceptance of four 'typical' wind farms in local rural Area

When asked whether they would favour or oppose a fourth 'typical' wind farm of 15 to 80 turbines in their local area, those respondents in favour declined from 64% in favour of three, to 56% in favour of four wind farms. Opposition increased from 27% of respondents who were opposed to three wind farms, to 34% who were opposed to four wind farms as Table 39 below shows.

Once again we see a significant difference in the outcome when comparing those for whom Crookwell is in their local rural area (61% approve) versus those for whom the Crookwell wind farm is not within their local rural area (48% approve). Further examination of those for whom Crookwell is not 'local', shows that the proportion of this group who oppose a fourth wind farm is similar to the overall sample and that a significant proportion of this group remain uncommitted, either way. The same pattern is evident in each of the earlier questions.

Table 39: Favour or oppose four typical wind farms in local rural area

Q.18 e) Would you favour or oppose the location of four typical wind farms each one of 15 to 80 turbines in your local rural area? Would that be (*read out*)						
DTR Table: 51.0		Q2 Response to Global Warming			Q14D Is Crookwell in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell local - Yes	Crookwell Local - No/DK
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q18E Favour/oppose four typical wind farms 15-80 turbines in local rural area						
Strongly in favour (5)	27%	31%	27%	20%	30%	21%
Generally in favour (4)	30%	31%	24%	31%	31%	27%
or... do you not mind one way or the other (3)	10%	10%	12%	10%	7%	17%
					--	++
Generally opposed (2)	18%	16%	15%	23%	18%	19%
Strongly opposed (1)	15%	13%	22%	16%	15%	16%
TOTAL IN FAVOUR	56%	62%	51%	51%	61%	48%
					+	-
TOTAL OPPOSED	34%	29%	37%	39%	33%	35%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	3.34	3.51	3.19	3.16	3.43	3.18
STD DEV	1.43	1.4	1.54	1.4	1.45	1.39
STD ERR	0.08	0.12	0.22	0.14	0.1	0.14
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

14.5 Acceptance of multiple wind farms in local rural area – summary

In Table 40 below, we have summarised the outcomes to each of the three questions in this section and also included the earlier question relating to those who favour / oppose one ‘typical’ wind farm in their local rural area.

These outcomes would suggest that nearly three in four respondents would support two ‘typical’ wind farms each one of 15 to 80 turbines in their local rural area. The addition of a third wind farm would be supported by approximately two in three.

Support reaches its lowest point with the addition of a fourth wind farm. At this number those in favour of a fourth wind farm in the local rural area declines to 56%, still a majority. The outcomes to these questions also suggest that as respondents gain experience living with wind farms in their local rural environment they are likely to become more accepting of them. Hence whilst support for a fourth wind farm falls below a majority for those presently living without a wind farm in their local area (48%), those presently living with a wind farm in their local area continue to provide substantial support (61%) for a fourth wind farm.

Clearly there is a point at which the addition of another ‘typical’ wind farm will produce a resounding ‘NO’ from the community. That point would appear to be beyond four ‘typical’ sites.

Table 40: Favour or oppose multiple wind farms – summary

Q.17B Would you favour or oppose the development of a typical wind farm with 15 to 80 wind turbines in your local rural area? Would that be (*read out*) Q.18 c) Would you favour or oppose the location of two typical wind farms each one of 15 to 80 turbines your local rural area? Would that be (*read out*) Q.18 d) Would you favour or oppose the location of three typical wind farms each one of 15 to 80 turbines in your local rural area? Would that be (*read out*) Q.18 e) Would you favour or oppose the location of four typical wind farms each one of 15 to 80 turbines in your local rural area? Would that be (*read out*)						
DTR Table: 45, 49, 50 & 51		Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q17B Favour / oppose ONE typical wind farm with 15-80 wind turbines in local rural area						
TOTAL IN FAVOUR	76%	81% +	76%	68% -	78%	72%
TOTAL OPPOSED	19%	14% -	22%	26% +	19%	18%
Q18C Favour / oppose TWO typical wind farms each one 15-80 turbines in local rural area						
TOTAL IN FAVOUR	75%	79%	71%	72%	79%	70%
TOTAL OPPOSED	17%	13%	21%	20%	17%	17%
Q18D Favour / oppose THREE typical wind farms 15-80 turbines in local rural area						
TOTAL IN FAVOUR	64%	68%	60%	61%	70% ++	53% --
TOTAL OPPOSED	27%	21% -	29%	34%	24%	31%
Q18E Favour/oppose FOUR typical wind farms 15-80 turbines in local rural area						
TOTAL IN FAVOUR	56%	62%	51%	51%	61% +	48% -
TOTAL OPPOSED	34%	29%	37%	39%	33%	35%
TOTAL	100%	100%	100%	100%	100%	100%
Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---						

14.6 Placement of multiple wind farms in the local rural area

The placement of a number of wind farms in the respondents' local rural area is also a potential issue, given there is some concern for landscape values. We asked respondents whether they would prefer wind farms to be concentrated in a few clusters, close together or spread out at reasonable intervals along the main road or highway, if a number of wind farms were built on the ridges and hills that they can see when travelling along the main road or highway in their local rural area.

The outcomes suggest respondents are evenly divided between a few clusters, close together, or spread out at reasonable intervals along the highway. For those who preferred the wind farms to be 'spread out', a reasonable interval would appear to be 8 to 10 kilometres.

Table 41: Placement of multiple wind farms in the local rural area

Q.19 Finally, if a number of typical wind farms were built on the ridges and hills that you can see when traveling along the main road or highway in your local rural area …
a) Would you prefer the wind farms (*read out*)
b) IF "SPREAD OUT" IN Q.19 a): How far apart should those intervals be? RECORD IN KILOMETRES

DTR Table: 52.0 & 53.0	TOTAL	Q2 Response to Global Warming			Q14D Is Crookwell wind farm in your local rural area	
		Act now despite costs	Do not incur costs	Gradual response	Crookwell IS local	Crookwell NOT local
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Q19A Preference of wind farms seen on ridges / hills when driving						
to be concentrated in a few clusters close together, or	52%	52%	59%	48%	50%	55%
spread out at reasonable intervals along the main road or highway	48%	48%	41%	52%	50%	45%
TOTAL	100%	100%	100%	100%	100%	100%
Filter: Q19A Preference of wind farms seen on ridges / hills when driving spread out at reasonable intervals along the main road or highway						
WEIGHTED BASE	145	72	21	52	98	47
	%	%	%	%	%	%
Q19BCD Kilometres apart should intervals be						
1	20%	19%	28%	18%	21%	16%
2	5%	7%	3%	4%	3%	10%
3	3%	4%	4%	1%	2%	6%
4	1%	1%	0%	2%	0%	4%
5	13%	15%	11%	12%	13%	13%
7	1%	1%	0%	1%	2%	0%
8	0%	0%	3%	0%	1%	0%
10	12%	9%	10%	17%	10%	15%
15	4%	5%	4%	1%	4%	3%
20	7%	3%	13%	10%	7%	6%
25	1%	1%	3%	0%	2%	0%
30	3%	3%	8%	1%	5%	0%
More than 50 Km	1%	0%	0%	2%	1%	0%
DON'T KNOW	28%	31%	12%	30%	30%	25%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	8.46	7.02	11.61	9.50	9.85	6.43

15. Profile of the survey area and principal analysis groups

As noted in Appendix I to this report, the survey data has been post-stratified by age and gender of respondent, in order to ensure that sample variations arising from these variables have been controlled so that the age / gender distribution accords with the most recent Australian Bureau of Statistics estimates for the defined survey area. Three series of data have been presented in this section, viz:

- Profile of the principal demographics of respondents in the defined survey area;
- Profiles of each of the 'Response to Global Warming' groups; and

- Profiles of those respondents who do / don't classify the Crookwell wind farm as falling within their local rural area.

  Examining the profiles of those who regard the Crookwell wind farm as either falling or not falling within their local rural area we find no significant differences between the two groups other than (as expected) do their major weekly grocery shopping.

  Amongst the global warming analysis groups, the 'Act now' group differs from the other two groups insofar as it has a younger profile (fewer are 55 years or more), has a significant bias towards females and those with a university qualification in its profile. The 'gradual' response group is biased to men and those aged 55 years or more.

Table 42: Demographic profiles

DEMOGRAPHIC PROFILES						
		Q2 Response to Global Warming			Q14D Is Crookwell in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell local - Yes	Crookwell Local - No/DK
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Table: 1.0	*Q99BEGCD* *Number of people aged 18 years or older*					
1	34%	38%	33%	29%	34%	35%
2	50%	42%	57%	60%	51%	49%
		--		+		
3	9%	10%	2%	10%	8%	9%
4	5%	6%	7%	1%	5%	4%
				-		
5+	2%	4%	0%	1%	2%	3%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	2.07	2.19	1.97	1.93	2.01	2.19
STD DEV	1.41	1.85	0.77	0.68	1.17	1.8
STD ERR	0.09	0.16	0.12	0.07	0.09	0.19
Table: 2.0	*Q99BEG2* *Age*					
18 to 24 years	10%	13%	10%	4%	9%	11%
				-		
25 to 39 years	23%	25%	22%	21%	25%	21%
40 to 54 years	29%	31%	32%	25%	29%	31%
55 years of age or more	38%	31%	36%	49%	37%	38%
		-		++		
TOTAL	100%	100%	100%	100%	100%	100%
Table: 3.0	*Q99BEG3* *Gender*					
Male	50%	44%	56%	56%	50%	51%
		-				
Female	50%	56%	44%	44%	50%	49%
		+				
TOTAL	100%	100%	100%	100%	100%	100%

DEMOGRAPHIC PROFILES

	TOTAL	Q2 Response to Global Warming			Q14D Is Crookwell in your local rural area	
		Act now despite costs	Do not incur costs	Gradual response	Crookwell local - Yes	Crookwell Local - No/DK
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Table: 64.0	*Q99CON Gender / Age*					
Male 18-24	5%	7%	8%	2%	6%	4%
Male 25-39	12%	11%	9%	14%	12%	12%
Male 40-54	15%	14%	23%	13%	14%	16%
Male 55+	18%	12%	17%	27%	17%	19%
		-		++		
Female 18-24	4%	6%	2%	2%	3%	7%
Female 25-39	12%	14%	13%	7%	13%	9%
Female 40-54	14%	17%	9%	12%	14%	14%
Female 55+	20%	19%	19%	22%	20%	19%
TOTAL	100%	100%	100%	100%	100%	100%
Table: 55.0	*Q99BCD Town do major weekly grocery shopping*					
GOULBURN	58%	60%	54%	57%	68%	40%
					+++	---
YASS	26%	26%	24%	29%	16%	45%
					---	+++
CROOKWELL	10%	7%	15%	11%	14%	2%
					+++	---
YOUNG	3%	4%	2%	2%	1%	7%
					--	++
CANBERRA	2%	3%	1%	0%	1%	3%
GUNNING	1%	1%	1%	0%	0%	2%
BOOROWA	1%	1%	0%	0%	1%	1%
COWRA	0%	0%	2%	0%	0%	1%
			+			
GALVERN	0%	0%	0%	1%	0%	0%
ACT	0%	0%	2%	0%	0%	1%
			+			
BALCONNAN	0%	0%	2%	0%	0%	1%
			+			
NOT SPECIFIED	0%	1%	0%	0%	0%	1%
TOTAL	102%	103%	104%	100%	102%	102%
Table: 56.0	*Q99CCD Work status*					
Working full time	49%	50%	48%	49%	48%	52%
Working part time	18%	21%	23%	10%	16%	20%
				--		
Studying full time	2%	4%	0%	1%	3%	1%
Studying part time	1%	0%	4%	0%	1%	0%
			++			
Undertaking home duties	6%	5%	3%	8%	6%	4%
Retired	23%	20%	22%	29%	25%	19%
Unemployed and looking	0%	0%	0%	1%	0%	1%

DEMOGRAPHIC PROFILES

	TOTAL	Q2 Response to Global Warming: Act now despite costs	Do not incur costs	Gradual response	Q14D Is Crookwell in your local rural area: Crookwell local - Yes	Crookwell Local - No/DK
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
for work, or						
On Sick Leave	0%	1%	0%	0%	1%	0%
Self Employed	0%	0%	0%	1%	0%	1%
On Pension	0%	0%	0%	1%	1%	0%
Disability Pension	0%	0%	0%	1%	0%	1%
TOTAL	100%	100%	100%	100%	100%	100%

Filter: Q99C WORK STATUS Working full time TO Working part time

WEIGHTED BASE	200	106	37	58	124	76
	%	%	%	%	%	%
Table: 57.0	*Q99D Work for company organisation / self employed*					
Work for a company or organisation	69%	72%	65%	67%	71%	67%
Self employed	31%	28%	35%	33%	29%	33%
TOTAL	100%	100%	100%	100%	100%	100%

Filter: Q99C WORK STATUS Working full time TO Working part time

WEIGHTED BASE	200	106	37	58	124	76
	%	%	%	%	%	%
Table: 58.0	*Q99COD Occupation*					
Upper white	21%	23%	16%	20%	22%	19%
Lower white	30%	34%	31%	23%	35%	23%
Upper blue	30%	26%	42%	32%	29%	32%
Lower blue	19%	18%	11%	25%	14%	26%
					-	+
TOTAL	100%	100%	100%	100%	100%	100%

NO Filter: Base is total sample

WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Table: 59.0	*Q99F Highest education level reached*					
Primary only	2%	3%	3%	2%	2%	3%
Up to 4 years secondary	24%	20%	30%	28%	24%	24%
5-6 years secondary	21%	22%	25%	18%	20%	24%
TAFE qualification	27%	24%	28%	29%	25%	29%
University qualification	21%	26%	14%	17%	22%	19%
		+				
Post graduate	4%	4%	1%	6%	5%	2%
TOTAL	100%	100%	100%	100%	100%	100%

DEMOGRAPHIC PROFILES		Q2 Response to Global Warming			Q14D Is Crookwell in your local rural area	
	TOTAL	Act now despite costs	Do not incur costs	Gradual response	Crookwell local - Yes	Crookwell Local - No/DK
WEIGHTED BASE	300	150	52	98	195	105
	%	%	%	%	%	%
Table: 60.0	*Q99G Location of home*					
In town?	59%	64%	46%	59%	63%	53%
			-			
Out of town on a small rural residential property?	24%	22%	33%	23%	24%	26%
Out of town on a medium to large farming property?	16%	13%	21%	18%	14%	21%
TOTAL	100%	100%	100%	100%	100%	100%
Table: 61.0	*Q99H Present home ownership status*					
Renting or leasing your home	11%	10%	7%	13%	11%	10%
Have a mortgage which you are paying off, or	34%	38%	27%	30%	34%	34%
Fully own your home?	56%	52%	66%	56%	55%	56%
TOTAL	100%	100%	100%	100%	100%	100%
Table: 62.0	*Q99I Years been resident in area*					
Less than 12 months (.5)	2%	2%	2%	2%	1%	3%
1 to 2 years (1.5)	2%	1%	2%	3%	1%	4%
						+
3 to 5 years (4)	5%	6%	0%	5%	3%	7%
6 to 10 years (8)	13%	10%	16%	17%	14%	11%
More than 10 years (11)	78%	82%	80%	73%	80%	75%
TOTAL	100%	100%	100%	100%	100%	100%
MEAN	9.91	10.02	10.14	9.62	10.15	9.46
STD DEV	2.46	2.38	2.16	2.71	2.03	3.06
STD ERR	0.14	0.2	0.3	0.27	0.15	0.3

Significance levels: 95% = + or - 99% = ++ or -- 99.9% = +++ or ---

APPENDIX I: RESEARCH METHOD

The research method employed in order to satisfy the research objectives defined for this study, was as follows, viz:

1. Scope

The study was conducted by telephone within a proscribed geographic area as defined by post-codes and locality names in the defined survey area in the Southern Tablelands of New South Wales.

2. Sample Source

The sample was initially derived from the most recent source of Electronic White Pages listing residential numbers in the defined survey area. EPURON in conjunction with ERM provided a listing of locality names and associated postcodes that lay within the bounded survey area. A map of the survey area as agreed with ERM and as provided by ERM has been reproduced and appears on page 3 of this Appendix.

Based on the listing of locality names and post-codes a sample frame was selected from the Electronic White Pages comprising all addresses that contained matching locality names. This approach whilst selecting telephone connected residential dwellings also selected non-residential locations (eg business, institutions) that had to be qualified in the interviewing process and excluded from the sample. From the sample frame compiled in this manner a listing of telephone numbers within the defined survey area was developed.

3. Sample Size

It was determined that a sample size of n =300 be used for this survey. As can be seen from the table below, a survey estimate of 50% of a sample of n = 300 will have a sampling precision of 50 ± 5.7% at the 95% confidence level.

It is important to be aware that when utilising survey sample data, that the precision of each survey estimate is a function of the size of the sample (or sub-sample) to which it relates. Sampling precision is a function of sample size as is reflected in the table below.

Expected Sampling Error (Plus or Minus) At the 95% Confidence Level (Simple Random Sample) Percentage of the sample or sub-sample giving a certain response or displaying a certain characteristic for percentages near:					
Size of Sample or Subsample	**10 or 90**	**20 or 80**	**30 or 70**	**40 or 60**	**50**
300	3.4	4.5	5.2	5.6	5.7
200	4.2	5.6	6.4	6.8	6.9
150	4.8	6.4	7.4	7.9	8.0
100	5.9	7.9	9.0	9.7	9.8
75	6.8	9.1	10.4	11.2	11.4
50	8.4	11.2	12.8	13.7	14.0

4. Respondent Definition

The respondent in this study was defined as a randomly selected adult (using the nearest birthdate technique) resident in a telephone connected dwelling within the defined survey area.

5. Interview Method

The study was conducted by telephone using a state-of-the-art Computer Assisted Telephone Interviewing (CATI) system operated by Oz Info the data collection associate of Reark.

Fieldwork was conducted to the highest industry standards, the Oz Info field team being quality accredited via the industry IQCA scheme and to ISO).

6. Questionnaire

The questionnaire employed in the study was developed by REARK in conjunction with ERM and EPURON who approved the final questionnaire prior to the commencement of fieldwork. The questionnaire took an average of 17 minutes to administer. A copy of the questionnaire employed in this study is included as Appendix II.

7. Fieldwork dates and outcomes

The questionnaire was subject to pilot and time testing prior to the commencement of fieldwork, which following interviewer briefing and practice sessions commenced on Friday, July 27, 2007. Fieldwork was conducted during the evening and concluded on Thursday, August 2, 2007. Call outcomes were as follows:

Contact outcome	**Response Profile**		
	%	*no*	*%*
Interviews achieved	53.19%	300	12.2%
Quota full	0.18%	1	0.0%
Did not qualify	46.63%	263	10.7%
Respondent not available	0.00%	0	0.0%
Total eligible for screening:	*100.00%*	*564*	*22.9%*
Refused		1,274	51.8%
Language barrier		35	1.4%
Total not eligible for screening:		*1,309*	*53.2%*
Nil contact after specified calls		0	0.0%
Answer machine/fax		73	3.0%
Invalid number		515	20.9%
Total Invalid numbers		*588*	*23.9%*
Total numbers used:		2,461	*100.0%*
Status not determined		816	*24.9%*
Total numbers in use:		3,277	

8. Coding & data analysis

Some questions in the survey questionnaire were free response and these were subject to coding.

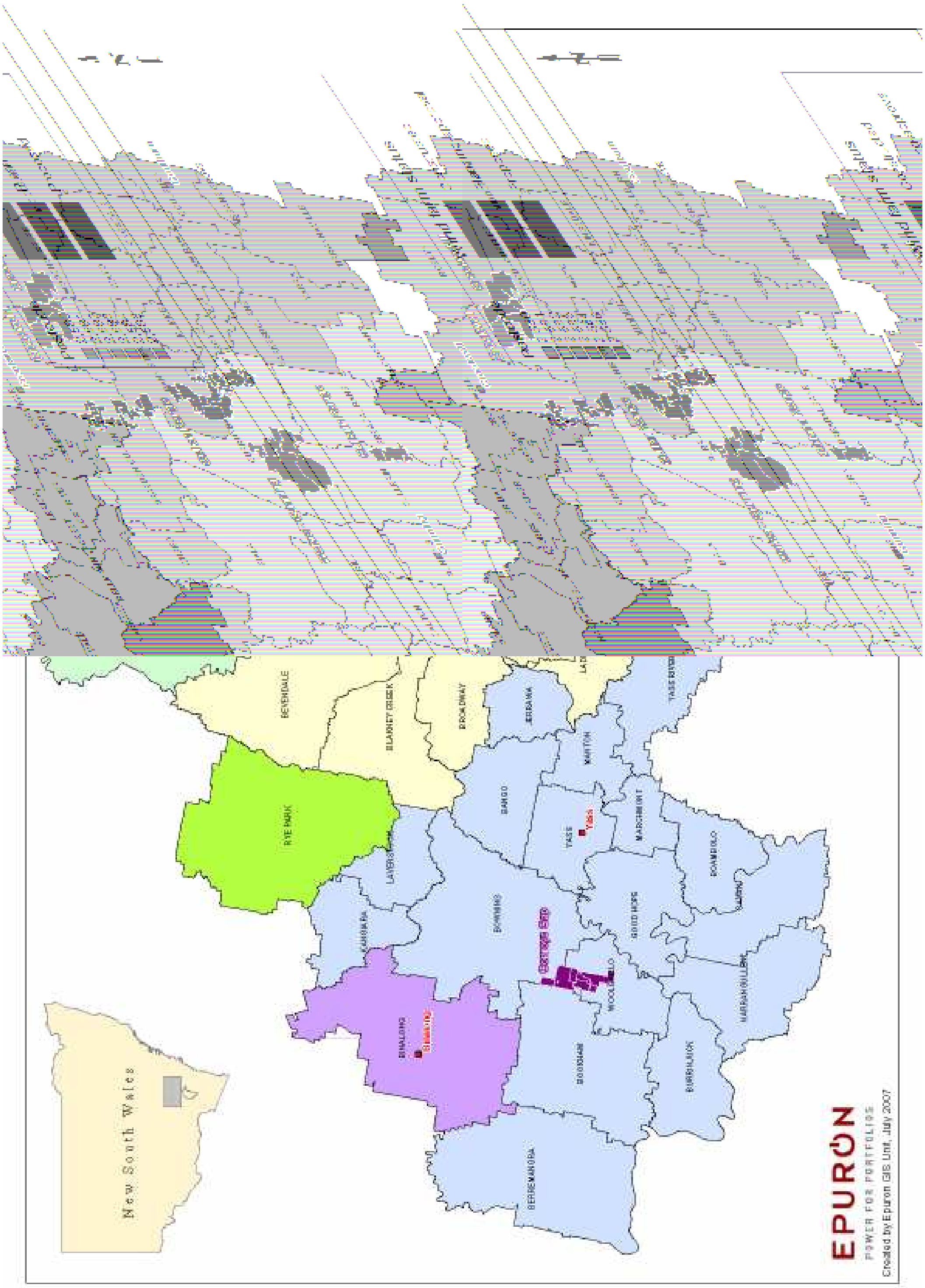
The survey data was post-stratified by Age and Gender based on the most recent Australian Bureau of Statistic census estimates for the defined survey area.

9. Detailed Tabular Results

The detailed tabular results upon which this report has been based have been provided separately.

A data file in SPSS format can be provided on request.

10. Map of defined survey area



APPENDIX II: QUESTIONNAIRE OUTLINE

QUESTIONNAIRE OUTLINE
Windfarm Impact Study – Southern Highlands
EPURON 160707 AR
Version 7 - FINAL
Wednesday, July 25, 2007

INTRODUCTION

Good (…). My name is ….. from Reark Research and at the moment we are talking to people about alternative forms of electric power generation. In this study I must speak to a cross section of the public

a) to help me select the person I need to speak to can you tell me how many persons in this household are aged 18 years or more? *(record #)*
b) In this study I need to speak to the person amongst those *(..say # of people in a)..)* whose next birthday is closest to today's date? Who would that be?

RECORD NAME OF PERSON AND ARRANGE CALL-BACK IF NECESSARY

c) IF LOOKING FOR QUOTA: Can I speak to the *(..man/woman..)* amongst those *(..say # of people in a)..)* whose birthday is closest to today's date?
d) Just to make sure I'm speaking to the correct cross section of people, can you tell me please into which of these age groups do you fall … Are you *(read out)*

- 18 to 24 years
- 25 to 39 years
- 40 to 54 years
- 55 years of age or more

e) If necessary: And are you … *(read out)*

- Male
- Female

PROCEED WITH SELECTED RESPONDENT OR ARRANGE SUITABLE TIME FOR CALL-BACK:

1. Recently there has been much discussion in newspapers on radio and television concerning global warming … Overall how concerned would you say you are right now with the threat of global warming and its impact on the environment … would you say you are … *(read out)*

- Definitely concerned
- Somewhat concerned
- Somewhat unconcerned
- Definitely unconcerned.
- or, Neither concerned or unconcerned

2. Which one of the following statements comes closest to the way you feel *(read out)*

- Global warming is a serious and pressing problem. We should be taking steps now even if this involves significant costs.
- Until we are sure that global warming is really a problem, we should not take any steps that would have economic costs.

- The problem of global warming should be addressed, but its effects will be gradual, so we can deal with the problem gradually

3. Australia's demand for electricity is rapidly increasing. There are a number of ways of meeting this demand one of which involves the use of 'clean energy' sources. Which of the following do you regard as clean energy sources … *(read out)*?

RANDOMISE ORDER

- Sun or solar power
- Wind power
- Water or hydroelectric power
- Wave or tidal power
- Nuclear power
- Clean coal or gas fuelled power stations where the pollutants are buried

4. a) If there was to be a new electric power station built say within 10 kilometres of where you now live, which of the following energy sources would you approve for use by that new power station? Would you approve … (*read out*)

RANDOMISE ORDER

- Sun or solar power
- Wind power
- Nuclear power
- Clean coal or gas where the pollutants are buried
- *(None of these)*
- *(Don't know)*

b) IF MORE THAN ONE: And which one energy source would you prefer to see used by such a new power station?

c) If the choice was between (*read out list*) … which one energy source would you prefer to see used by such a new power station?

RANDOMISE ORDER

- Wind power
- Nuclear power
- Clean coal or gas where the pollutants are buried
- *(None of these)*
- *(Don't know)*

WIND ENERGY & WIND FARMS

5. a) Recently there have been announcements of wind-farms to be built in the Southern Tablelands, encompassing the Goulburn-Yass region, to generate electricity … had you heard of any of these projects before today?

- Yes
- No
- (*Don't Know*)

b) Which project or projects was that? (*record name and/or location of project*) *Probe once*: Any others?

6. The electricity from these projects is to be generated via the placement of a number of wind turbine generators in each area. Each generator is a large three bladed

windmill mounted up high on top of a tubular tower and the wind turns the blades to generate the electric power …

a) Were you aware of this type of wind turbine before today?

- Yes
- No
- *Don't Know*

b) Have you seen a picture of a wind turbine of the type I have described?

- Yes
- No
- *Don't Know*

c) And have you ever seen an actual wind turbine of the type I have described?

- Yes
- No
- *Don't Know*

7. A wind farm is a collection of large wind-driven wind turbines of the type I have described … an average to large wind farm makes enough electricity to power a large regional centre …

a) Were you aware of this before today?

- Yes
- No
- *Don't Know*

b) Have you ever seen a wind farm?

- Yes
- No
- *Don't Know*

c) IF 'YES' IN b): Where was that?

- Near Crookwell (Crookwell 1)
- Near Hampton (Hampton)
- Near Blayney (Blayney)
- Elsewhere in NSW
- Elsewhere in Australia
- New Zealand
- Asia
- Europe
- UK
- North America
- Somewhere else

8. CHECK Q.7(b)

a) IF SEEN: How visually appealing do you find the wind farms you have seen?

- Very appealing
- Fairly appealing

- Not too appealing
- Not at all appealing
- or Do you not have an opinion about it

b) IF NOT SEEN: How visually appealing would you expect a wind farm to be?

- Very appealing
- Fairly appealing
- Not too appealing
- Not at all appealing
- or Do you not have an opinion about it

9. Thinking about wind farms as I have described them …

a) What do you consider the major benefits or advantages of wind farms to be? Probe: "What else?

b) And what disadvantages, if any, do you associate with wind farms? Probe: "What else?"

10. Wind farms provide clean, renewable energy that doesn't contribute to global warming through generating carbon dioxide. Some people say they detract from the appearance of the landscape. Which of these two statements comes the closest to the way you feel *(read out)*

a) We need to use wind power as a source of clean energy even if it means changing the appearance of some landscapes, or
b) We should leave the landscapes unchanged even if it means we are not able to use wind power as a source of clean energy

11. Taking into account the arguments you have heard for and against wind farms, what is your general opinion of the wind farm projects like those being built in the Southern Tablelands … would you say you were (*read out*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other?

12. How much do you agree with the following statements? *(read out first statement)* And is that (agree/disagree) strongly, or just (agree/disagree) or do you neither agree nor disagree with the statement?

DO NOT ROTATE STATEMENT ORDER

- Wind energy is a good alternative energy source
- Australia should be investing more in wind energy
- I would be happy to see more wind farms in Australia
- Local Government should encourage wind farm development
- Wind farm developments contribute to the local economy
- I would be happy to see a wind farm built on farmland near where I live

SCALE
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree

- Strongly Disagree

13. And what if it was proposed to build a wind farm within 10 kilometres of where you live now, would that make any difference to the way you feel? Would it make you *(read out)*

- Favour it more
- Oppose it more
- or, make no difference to your opinion

AWARENESS OF WIND FARMS

14. There is presently a small wind farm located near Crookwell in the Southern Tablelands that was constructed in 1997 and has only 8 wind turbines … the wind farm is located to the South East of Crookwell which is about 30 kilometres north-west of Goulburn …

a) Were you aware of the existence of this wind farm near Crookwell before today?

- Yes
- No
- Don't Know

b) IF YES IN Q.14 a): Have you personally, seen the wind farm near Crookwell?

- Yes
- No
- Don't Know

c) IF YES IN Q.14 b): And how often are you in the vicinity to see the wind farm near Crookwell …would it be (*read out if necessary*)

- At least once a day
- Several times a week
- At least once a week
- At least once a month
- Every two or three months
- Three or four times a year
- Once or twice a year
- less often
- (Don't know)

d) ASK EVERYONE: The Crookwell wind farm is located about 10km to the South East of Crookwell … is the Crookwell wind farm in what you would consider to be your local rural area?

- Yes
- No
- Don't Know

e) About how far is the Crookwell wind farm from where you live?
If necessary: Would it be …

- less than 1 kilometre
- 1 to 3 kilometres
- 4 to 10 kilometres
- 11 to 25 kilometres

- more than 25 kilometres
- (Don't Know)

f) And what is your general opinion of the Crookwell wind farm, would you say you are … (*read out*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

15. Scientific tests conducted at wind farms have shown that people need to be less than approximately 800 metres from the wind turbines for them to hear any significant noise, even in extreme wind conditions. Bearing this in mind …

a) Would you favour or oppose a wind farm if it was located ONE KILOMETRE from where you live now? Would that be *(read out)*

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other?

b) Would you favour or oppose a wind farm if it was located THREE KILOMETRES from where you live now? Would that be *(read out)*

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other?

c) Would you favour or oppose a wind farm if it was located TEN KILOMETRES from where you live now? Would that be *(read out)*

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other?

d) Would you favour or oppose a wind farm if it was located TWENTY FIVE KILOMETRES from where you now live? Would that be *(read out)*

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other?

CUMULATIVE IMPACT

16. At present a number of wind farms have been approved, but are yet to be built in the Southern Tablelands … which of the following wind farm developments in the Southern Tablelands were you aware of before today …

- the Conroy's Gap wind farm near Yass with 15 wind turbines
- the Cullerin Range wind farm with 15 wind turbines
- the Gunning wind farm near Gunning with 32 wind turbines
- the Crookwell 2 wind farm near Crookwell with 46 wind turbines
- the Taralga wind farm near Taralga with 69 wind turbines
- None of these

17. Wind farms are usually sited on ridges and hills on private land in rural areas where wind flow is the greatest … wind farms are built in varying sizes depending on local conditions and may contain as few as 8 wind turbines, but typically 15 to 80 wind turbines spaced about 400 to 500 metres apart …

a) Thinking about the local rural area in your vicinity … would you favour or oppose the development of a small wind farm of up to 15 wind turbines in your local rural area? Would that be (*read out*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

b) Would you favour or oppose the development of a typical wind farm with 15 to 80 wind turbines in your local rural area? Would that be (*read out*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

c) And would you favour or oppose the development of a large wind farm with greater than 80 and up to 120 wind turbines in your local rural area? Would that be (*read out*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

18. If for the moment you could imagine a typical wind farm with 15 to 80 wind turbines was sited on the hills or ridges of private farmland in your local rural area … and it was proposed to site another wind farm of similar size in your local rural area …

a) Would you prefer that it was (*read out)*

- sited adjacent to the existing wind farm;
- not adjacent, but nearby the existing wind farm; or
- be located elsewhere in your local rural area further away and out of sight from the existing wind farm

b) IF “BE LOCATED ELSEWHERE”: How far away from the existing site should it be located? <u>If necessary</u>: How many kilometres away?

- RECORD NUMBER OF KILOMETRES

c) Would you favour or oppose the location of two typical wind farms each one of 15 to 80 turbines your local rural area? Would that be (*<u>read out</u>*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

d) Would you favour or oppose the location of three typical wind farms each one of 15 to 80 turbines in your local rural area? Would that be (*<u>read out</u>*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

e) Would you favour or oppose the location of four typical wind farms each one of 15 to 80 turbines in your local rural area? Would that be (*<u>read out</u>*)

- Strongly in favour
- Generally in favour
- Generally opposed
- Strongly opposed
- or …do you not mind one way or the other

19. Finally, if a number of typical wind farms were built on the ridges and hills that you can see when traveling along the main road or highway in your local rural area …

a) Would you prefer the wind farms (*<u>read out</u>*)

- to be concentrated in a few clusters close together; or
- spread out at reasonable intervals along the main road or highway

b) IF “SPREAD OUT” IN Q.19 a): How far apart should those intervals be?

- RECORD IN KILOMETRES

DEMOGRAPHICS

The last few questions I have to ask are to ensure we have a good cross section in our sample …

A LOCATION
Can you tell me what your post code is there? (*<u>record postcode</u>*)

B SHOPPING
In which town do you do your major weekly grocery shopping? (*record town name*)

C OCCUPATION
Are you currently… (*<u>read out</u>*)

a. Working full time
b. Working part time
c. Studying full time
d. Studying part time
e. Undertaking home duties
f. Retired
g. Unemployed and looking for work, or
h. Something else (Specify _______)

ASK IF WORKING FULL TIME or PART TIME:

D Do you work for a company or organisation or are you self employed?

1. Work for a company or organisation
2. Self employed

E And what is your occupation

....

Record verbatim above and then code into category below:

1. Upper white
2. Lower white
3. Upper blue
4. Lower blue
5. Not employed/retired/pensioner/student

F EDUCATION

Which of the following best describes the highest education level you have reached?

READ AND CODE ONE ONLY.

- Primary only
- Up to 4 years secondary
- 5-6 years secondary
- TAFE qualification
- University qualification
- Post graduate

G URBAN/RURAL RESIDENT

Is your home located …

READ AND CODE ONE ONLY.

- In town?
- Out of town on a small rural residential property?
- Out of town on a medium to large farming property?

H HOME OWNERSHIP

And are you presently …

READ AND CODE ONE ONLY

- Renting or leasing your home
- Have a mortgage which you are paying off, or
- fully own your home?

I PERIOD OF RESIDENCE
Finally, how long have you been a resident in this area … Would it be (*read out)*

- Less than 12 months
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- More than 10 years

PRIVACY STATEMENT

REQUIRED PRIVACY CLOSE:
Thank you, that's the end of the interview. As this is market research it is carried out in compliance with the Privacy Act would you like to know more?

Read out if wanted:
The information you provided will be used only for research purposes. Once this project is completed your contact details will be removed from your responses in approximately four months time. Under the Privacy Act you have the right to request access to the information you have provided.

Read to all:
As part of quality control procedures, someone from our project team may wish to re-contact you to ask a couple of questions verifying some of the information we just collected. Can I confirm your phone number?

Thanks again for your time, just to remind you I'm from Reark Research. If you have any queries you can call the Market Research Society's Survey Line on 1300 364 830.